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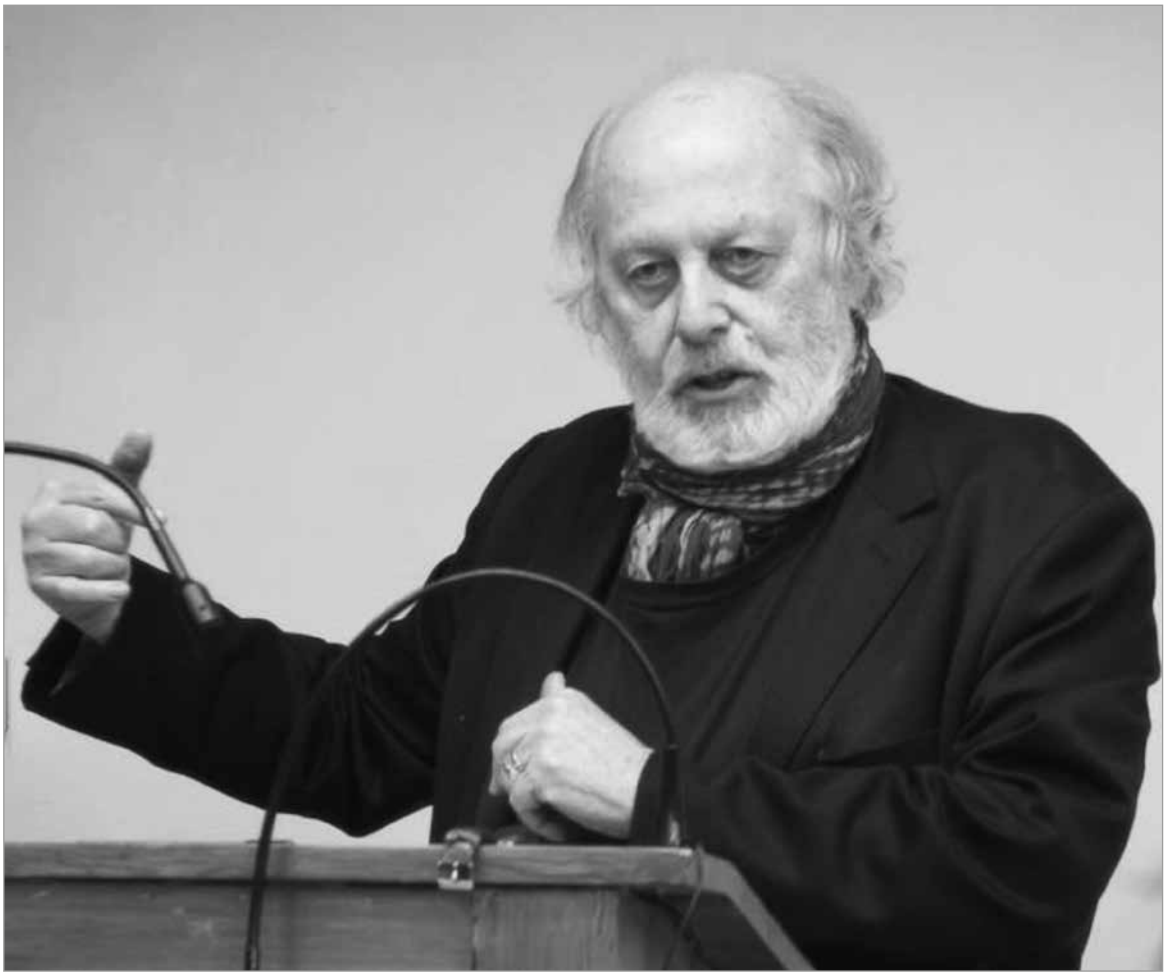

Photo by M. Dąbski

Stefan Karol Kozłowski
1938–2022

Remembering
Stefan Karol Kozłowski

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Professor Stefan Karol Kozłowski (1938–2022)

The 2nd of September 2022 was the day when Professor Stefan Karol Kozłowski left us forever. He was an outstanding person – a world-renowned archaeologist specialising in the Stone Age, an academic lecturer of a unique didactic style, and a devoted friend. I was fortunate to know Stefan in all these dimensions, which makes me even more aware of how severe and grievous our loss is.

During the last years, we worked together on the monumental "Biographical Dictionary of Polish Archaeologists", which we already managed to submit to the publisher. Stefan used to ask jokingly if he was going to live to see the printed volume – he would not. He will also not live to see the published versions of some future books and articles based on the manuscripts he left unfinished, including his memoirs.

Stefan Karol Kozłowski was born on the 4th of November 1938 in Lviv (Polish: Lwów; then part of Poland). In the years 1956–1961, he studied archaeology at the University of Warsaw, under the tutelage of Prof. Włodzimierz Antoniewicz. He obtained his doctoral degree at the same university in 1967, based on a thesis titled *The Mesolithic in Little Poland*, written under the supervision of Prof. Waldemar Chmielewski. Already four years later (1971), he was promoted to a university professor after presenting a monograph titled *Prehistory of Polish Lands from the 9th to 4th Millennium BC*, eventually published as a book (Warsaw 1972). He then went on to become an associate professor in 1982 and a full professor in 1988.

In the years 1961–1996, he worked continuously at the University of Warsaw, in the Department of Prehistoric and Early Medieval Archaeology (transformed into the Institute of Archaeology in 1975, after its integration with the Department of Mediterranean Archaeology). Afterwards, he accepted a professorship at the University Lyon 2 in France, where he spent the next seven years. He returned to Poland in 2002 to take two parallel professorships – at the Antiquity of Southeastern Europe Research Centre, University of Warsaw, and the Cardinal Stefan Wyszyński University in Warsaw. His definitive retirement in 2020 had little to no negative influence on his scholarly and writing activity.

The earlier stages of Professor Stefan Karol Kozłowski's extensive professional career were devoted to studies on the older sections of the Stone Age, especially the Polish and European Mesolithic. Back then, it was still an emerging field – the term "Mesolithic" had been accepted in the official archaeological terminology just about a decade earlier. He conducted fruitful field research on the important Polish Mesolithic sites in Kashubia and the Sandomierz Basin, writing dozens of papers on these problems along the way and making crucial contributions to the scholarly effort of drawing a comprehensive picture of the Central-European Mesolithic.

In 1973, he organised a seminal international conference "Mesolithic in Europe" which gathered the world's top researchers and for many years determined the direction of the studies on this part of European prehistory. The final overview of Professor Kozłowski's ideas in that field was published in Oxford (2009): the book titled "Thinking Mesolithic" contains an array of his most important texts.

In parallel, in the 1970s, Professor Stefan Karol Kozłowski penned a number of publications of fundamental significance, such as two authoritative volumes prepared together with Janusz Krzysztof Kozłowski: *Prehistory of Europe from the 40th to 4th Millennium BC* (Warsaw 1975) and *The Stone Age of the Polish Lands* (Warsaw 1977).

In the 1980s, Professor Stefan Karol Kozłowski initiated field research in the Near East (Iraq, then Israel), soon to concentrate on the problems of local early, pre-pottery, Neolithic. His excavations in Nemrik, M'lefaat, and Gilgal yielded outstanding finds. They resulted in numerous priceless publications, such as *Nemrik. An Aceramic Village in Northern Iraq* (Warsaw 2002), as well as a series of very important conferences. This way, Professor Kozłowski became a world-renowned and indisputable authority also in this prestigious speciality.

During the first decade of the 21st century, he turned much of his attention to the history of Polish archaeology, devoting about a dozen books to this subject: *Professor Leon Kozłowski* (Lviv-Warsaw 2010; with O. Sytnik), *So Much from So Few. Young Polish Archaeology 1905–1928*, (Warsaw-Łódź 2012), *Stefan Krukowski and His Adventure with the State Archaeological Museum* (Warsaw-Łódź 2014; with M. Karczewski, M. Przepałkowska, and

O. Sytnik), or *The Bloom of the Kingdom* (Warsaw-Łódź 2015), among others.

In general, Professor Stefan Karol Kozłowski authored about 280 scholarly publications, including more than a dozen books. In the course of his university career, he promoted 12 PhDs, some of which already obtained their full professorships. For one term, he served as vice director of the Institute of Archaeology at the University of Warsaw. His scholarly achievements were recognised also by the Polish authorities, earning him the Knight's Cross of the Order of Polonia Restituta.

Professor, Stefan, we all miss you.

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Prof. Stefan Karol Kozłowski – our Nemrik Boss in the Memory of His Nemrik Staff

The 2nd of September 2022 was the day when Professor Stefan Karol Kozłowski passed away. We said the last goodbye to him on the 16th of September in the Old Powązki Cemetery.

Professor was an outstanding, world-renowned archaeologist who specialised in the Stone Age. His many scholarly achievements include excavations at the pre-pottery Neolithic site of Nemrik 9 in Iraqi Kurdistan (1985–1989), the fully published results of which became a classic point of reference for the archaeology of the Near East.

To realise the fieldwork, as well as some parts of the laboratory research, Professor Kozłowski gathered a team of several people, including Andrzej Kempisty, Ryszard Mazurowski, Andrzej Reiche, Karol Szymczak, Wojciech Borkowski, and also Rafał Koliński, Włodzimierz Bogusz, and Kazimierz Kuźma. For all of us, participation in the Iraqi expedition of Professor Kozłowski was an extremely important experience and a marvellous adventure of a lifetime, because already at that time we were well aware of the utmost significance of the discoveries we participated in, and that we were writing new pages in the history of global archaeology. To the present day, the site of Nemrik 9 is cited as one of the few earliest Neolithic locations with architecture excavated and documented with outstanding accuracy, together with detailed identification of the internal arrangement of certain dwellings.

At the same time, while visiting Iraq we had an opportunity to see many monuments and places of the highest importance for the world's heritage, and to meet many fascinating people, not necessarily representing the archaeological profession. In the case of some of us, the Nemrikian experience proved fateful even for further careers in the field of archaeology.

Certain responsibilities of all of us were quite quickly determined and, in general, everything went fairly smoothly. Early in the morning, the whole group would set out from our accommodation base in Mosul to the site, situated some km to the north-west. During the first seasons, the car was driven personally by Professor Kozłowski. Every one of us was in charge of an assigned part of the excavation, each assisted by about a dozen workers hired for the season. Our duty was to fully document the position of all the moveable artefacts, produce accurate drawings, and measurements, and describe the situation in our trenches in the field journal. All photographic documentation was managed by Andrzej Reiche.

Fig. 1. Polish Mission at Nemrik (standing from left to right: W. Borkowski, K. Szymczak, S. K. Kozłowski, R. F. Mazurowski, A. Kempisty and Iraqi representative Mr. Faadel, sitting A. Reiche), photo A. Reiche.

After coming back to our base in Mosul, all the archaeological material found during the day had to be described, catalogued, and documented (hand-drawn or/and photographed). It was Ryszard Mazurowski who looked after stone implements, flints were the job of Karol Szymczak, bone and organic remains were entrusted to Wojciech Borkowski, later (Assyrian) artefacts sparked the interest of Andrzej Reiche, while the remaining categories of finds, together with all kinds of samples, belonged to Professor Kozłowski. The whole inventory work was given to Andrzej Kempisty, who was also responsible for documenting and sampling the unearthed architecture. After being put into the inventory, select artefacts were separately described, hand-drawn and photographed. Not too much time for eating, resting and sleeping would remain. But, as we see now, our efforts paid off at least a hundred times.

Besides other books and a good number of papers, the final results of the Nemril 9 excavation project were presented in a comprehensive, monograph edited by Professor Kozłowski in 2002 ("Nemrik, an Aceramic Village in Northern Iraq", Warsaw), who dedicated it: "To my Nemrik staff". With the handful of memories presented below, we, "his Nemrik Staff", would also like to make it known how much we owe to Professor.

The site Nemrik 9 was discovered in March 1985, and the first sounding trenches were immediately opened. This way, the range and perspectives of further work could be established for at least a few following years.

This is how Karol Szymczak remembers those days:

In the first half of the 1980s, despite the still ongoing hard war against Iran, the Iraqi authorities decided not to delay strategic investments and, apart from a network of highways and other objects of military character, they initiated the construction of a great dam, which should bank up the water in the headwaters of the Tigris River. In consequence, it would flood a vast area where a great number of priceless archaeological sites were situated. Such a situation demanded extensive archaeological rescue intervention ahead of the investment. Many respectable archaeological institutions from the whole world were asked to take part in a campaign officially called "Saddam's Dam Salvation Project", with the University of Warsaw among them. The position of Director of one of the missions was eventually given to Professor Stefan Karol Kozłowski.

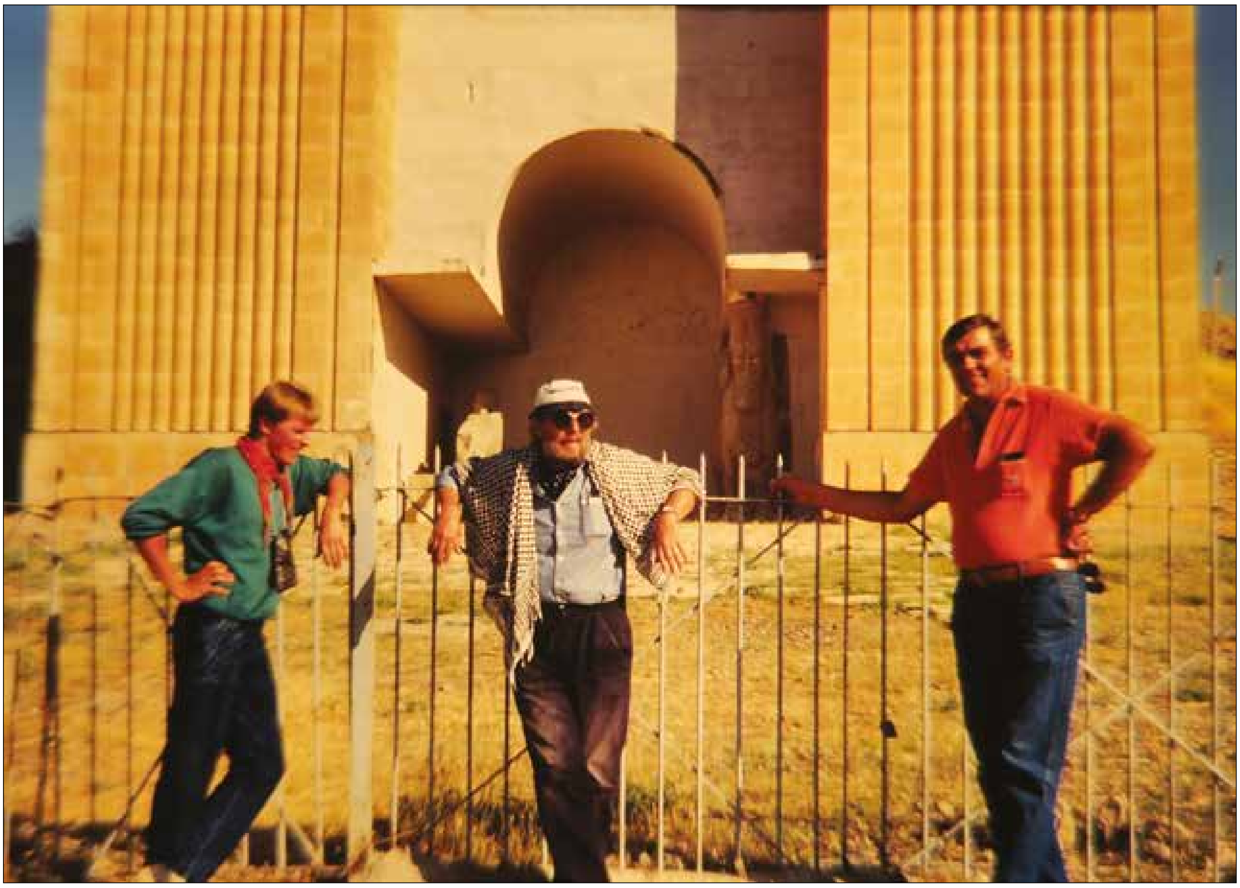

Fig. 2. Iraq; from the left: W. Borkowski, S. K. Kozłowski, R. Mazurowski (photo A. Reiche).

By that time, already for a couple of years, I had been in a group of young graduates of archaeology regularly taken by our Professor to his excavations – at first in Poland (Rydno, Grądy Woniecko), then abroad (Riparo Gaban, Italy; Bijan, Iraq). Perhaps, I was doing not too bad, because, at the end of 1984, the Professor proposed me to accompany him on a pilot trip to Iraqi Kurdistan, to selecting sites for future stationary excavation. If only it worked, we could have at least a few seasons of fieldwork in one of the most attractive archaeological regions of the world. I was overjoyed to accept the proposal. The prospect of accommodation in Mosul alone – on the grounds of ancient Nineveh – was a wonderful attraction in itself.

The majority of the teams from other countries already undertaken their excavations earlier, so we were left with not too much choice as to the area of our research. Eventually, we were assigned to penetrate a strip of land, about a dozen kilometres wide, along the eastern edge of the Tigris River valley. Together with our representative and driver, Mr. Mohammad Zakhi, we started our prospection moving around in an old heavy off-road vehicle. We would simply stop the car in the most promising places – at our disposal, we had just a rough map of the northern part of Iraq, and in the war-torn country we could not count on anything better.

In the distance, we could see the Zagros/Kurdish Mountains where a dozen or so years ago Ralph Solecki uncovered the famous Neanderthal burials in the Shanidar Cave, so we secretly hoped for finds connected with that period. And indeed, we located some open-air Middle Palaeolithic sites but none of them could be qualified for further stationary excavation.

For safety reasons, we had to come back to our Nineveh base already in the not-too-late afternoon, much before dusk. On the third or fourth day of our survey, we found ourselves in the town of Faida, some 50 km north of Mosul. The paved road in this place drifted away from the edge of the Tigris valley, so Professor Kozłowski asked Mr Zakhi to turn left into a sandy and visibly unfrequented byway. After a few kilometres, we reached a village of a dozen or so clay houses, and right behind it, the village road ended on an impressive headland with a wide view over the valley. We could not drive any further. The Professor ordered me to stop and get out of the car just for a short break and a stroll. After opening the car's door, the first object we noticed laying on the ground among the sparse grass was a small, very regular flint core exploited with pressure technique, then another one, and another, accompanied by beautiful regular blades, retouched tools, and arrowheads. It appeared that the whole *surface of the promontory was simply strewn very densely with flint tools and waste, worked stones, here and there also fossilized bones. Within a second, we exchanged glances and nods of agreement: 'Yes, this is here, we got it'. With the help of Mr Zakhi, we established that the name of the village was Nemrik, and the site we had just found was ninth on our list. We noted the details of the road to come back to this place the other day – at that time nobody had any idea what GPS was going to be.*

We still had about ten days for the field work which we decided to spend organising a team of workers and performing a primary-sounding research. Its results were much more than promising: the thickness of cultural layers for sure reached at least 2 metres, heaps of artefacts, first traces of dwelling objects. For some time, the chronology of Nemrik 9 was unclear to us, but on our way back to Bagdad we were practically sure: we had to do with a priceless Pre-pottery Neolithic site, the archaeological problem of the highest tier. Thus, we started what would become four years of really intensive field and laboratory research involving many scholars and specialists.

The whole history of the cooperation between the University of Warsaw and then Iraq in the field of archaeology is best remembered by Ryszard Feliks Mazurowski. This is how he recalls that history and his relationship with Professor Stefan Karol Kozłowski:

I still cannot come to terms with the saddest fact that Professor Stefan Karol Kozłowski has unexpectedly left us for good. He was an enormously distinguished scholar specialising in the archaeology of the Stone Age of Poland, Europe, and the Near East. He also made significant contributions to the studies of the history of Polish archaeology, being at the same time a teacher and tutor of several generations of archaeology students in Poland and abroad. He educated about a dozen PhDs and reviewed professorship applications and academic projects. His outstanding scholarly output has always impressed me – more than a dozen books, hundreds of papers, conference proceedings, expert opinions, and reviews. And the exceptional ability to organise the scholarly environment on both local and international levels – conferences, symposia, congresses. More to it, thanks to his personal management skills, incredible willpower, and the consequences of his actions, the results of his research and his views had a very wide, international impact. I think that all participants of the Nemrik team now appreciate how he encouraged us, or even obliged, to present our results at international as well as local meetings: our interpretations of architecture, flint and stone industry, animal and human remains, and art. Thanks to that, and thanks to our common publications, our names became recognisable in the global archaeological literature and helped us establish valuable personal contacts with archaeologists from other countries. The same effect was brought by the books on Nemrik, authored or co-authored by Professor Kozłowski, including the last one. During our last meeting, in June 2022, I passed to him the final version of my contribution to that volume. "Nemrik – 30 Years After' should be published in the near future.

Even though we had worked in the same unit of the Department of Prehistoric and Medieval Archaeology (nowadays the Faculty of Archaeology at the University of Warsaw) since 1972, our scientific interests, though generally connected with the Stone Age, were rather distant. Suddenly, in April 1984, the then Director of the Institute, Professor Waldemar Chmielewski, proposed that I replace him in the fieldworks undertaken within the freshly-signed research agreement between the Polish Centre of Mediterranean Archaeology, University of Warsaw, and the Department of Antiquities and Heritage, Ministry of Culture and Information in Bagdad, Iraq, and to take part in the "Saddam's Dam Salvage Project". I was pleased with that, and after some consideration, I accepted the proposal, especially since the replacement was to last only one season. Back then, little had I known that this decision was going to have so great an influence on my whole professional career and bring significant changes to my family life. As it appeared right afterwards, during the following6 years, I was to leave home and take part in long (2 to 6 months) field campaigns to the country involved in a war with neighbouring Iran. At home, my wife would stay alone with two little children, while their father vanished for half of a year because also the Polish expeditions should be added to my absences. Just the prose of life of an "archaeological family". All professional, devoted archaeologists know this all too well. Every time, the curiosity to gain insight into the prehistory of humankind's most important region, where the foundations of the Old World's civilization were formed, overbalanced everything else. Now, I am well aware and have no doubts that my dreams were completely fulfilled, and the reality even greatly exceeded my previous expectations. At the same time, I have no doubts that I owe all of that first to Professor Waldemar Chmielewski, and then, especially, to Professor Stefan Karol Kozłowski, who became the only manager of the Iraqi project in 1985 after the former resigned.

In the seasons 1984 and 1985, within this project, I conducted a systematic survey of the Raffaan microregion on the right bank of the Tigris River, just opposite the pre-pottery Neolithic site of Nemrik 9, which was yet to be discovered in the nearest future. At the same time, I also assisted the Mission of the Polish Centre of Mediterranean Archaeology, University of Warsaw, under the direction of Professor Piotr Bieliński, in documenting the results of excavations in Tell Rijim and Tell Raffaan. The above-mentioned survey investigations eventually led to the discovery of as many as 68 previously unknown archaeological sites situated on the two right-bank fluvial terraces of the Tigris River. They are dated from the most ancient periods of prehistory, starting from the Lower Palaeolithic, up to the end of the Epipalaeolithic, together with some younger locations. Today, I realise that these two first seasons on the Iraqi land had an enormous impact on me, because they introduced me to the world of

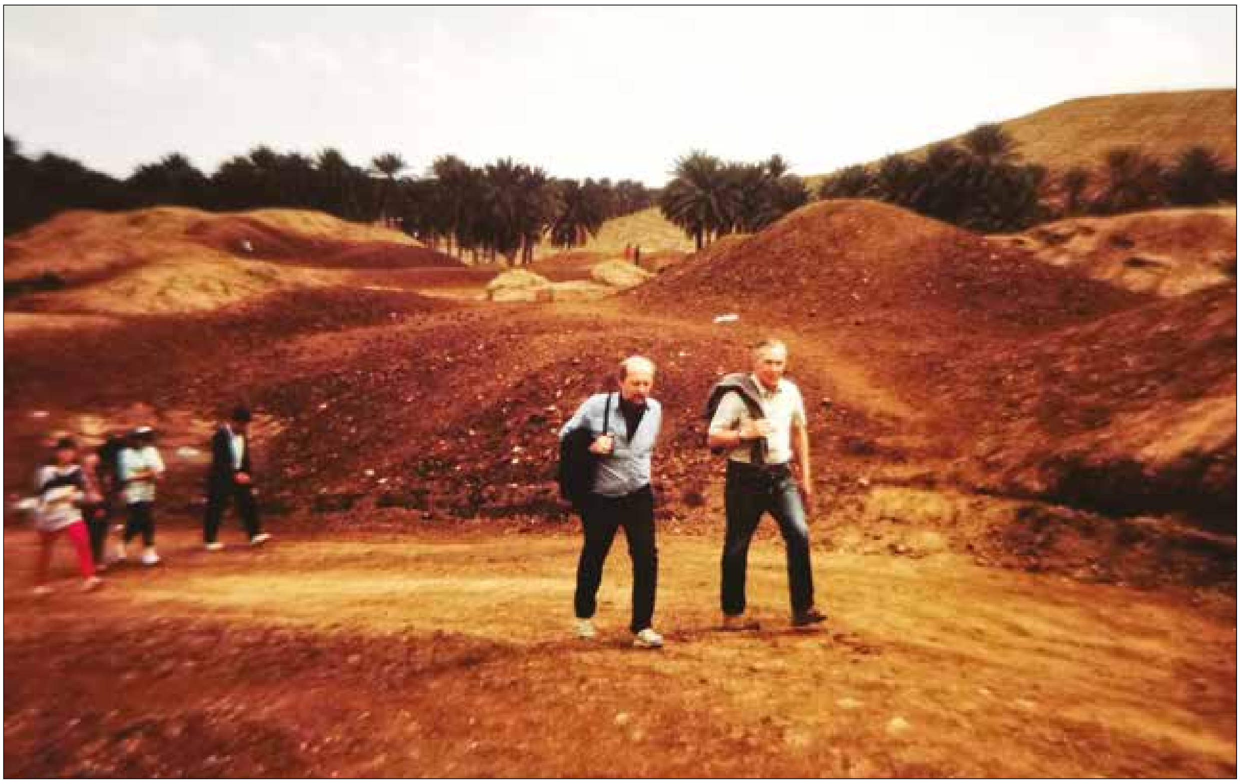

Fig. 3. Iraq; from the left: S. K. Kozłowski, A. Kempisty (photo A. Reiche).

Arabic culture, the customs, especially in the village life, and at least the basics of the Arabic language. The last skill became really important because it allowed me to communicate with our collaborators working in the trenches, local officials, and villagers. It built up a good, favourable attitude between me, as the manager, and the staff working in my section of the excavation. It turned out priceless when, some years later, I became the main director (Arabic: "mudir") of the Caramel Expedition in Syria.

During the excavations in Nemrik, I acquired many new professional skills, such as an ability to tell natural mud layers from architectural structures in the "tauf technique" or sun-dried mud bricks, knowledge of the ways in which mud could be arranged in the external and internal surfaces of walls of dwellings, an eye for distinguishing houses primarily dug into the ground from those built on the surface, etc.

Before the 1986 campaign, Professor Stefan Karol Kozłowski invited me to take part in the works of the Iraqi Mission in the early Pre-pottery Neolithic village in Nemrik 9. I stayed with that team until 1989 when the outbreak of the Gulf War brought a halt to our activity. This conflict resulted in a destruction of our excavation trenches and the loss of all equipment, also including some personal belongings. But worst of all, from that moment onwards, the Polish Archaeological Mission to Iraq lost all prospects of coming back to Iraqi Kurdistan, as it became a zone of highest danger.

I would like to add that thanks to Professor Kozłowski I also had the opportunity to visit a widely known classical aceramic settlement in M'lefaat twice (spring 1989). There, I documented and hand-drawn the uncovered dwellings, and then elaborated all the stone artefacts discovered at the site by the Polish team as well as by Robert John Braidwood's expedition of the 1950s.

During our excavations in Nemrik, I was responsible for managing the exploration of two archaeological trenches and their hand-drawn and descriptive documentation. In addition to that, I also elaborated (detailed description, hand drawing, preparation to photography) all the stone artefacts and objects – some 3000 items in total. In the course of our cooperation, which included living together in the Nabi Younis guest rooms of the Department of the Directory of Antiquities in Mosul, exactly wall to wall with a famous mosque, I had an opportunity to get to know the personality of Professor Stefan Karol Kozłowski a little closer. In my own, perhaps subjective, impression he was a great, prominent figure of Polish and world archaeology, though sometimes showed difficult character which would make the everyday cooperation hard. At the same time, he was an impressive titan of work, demanding much from himself, but also from his collaborators and people around. He would always set the most ambitious, important, and in many cases extremely demanding scholarly goals which he wanted to obtain as quickly as possible with as little labour and costs as *possible. Yet, in pursuit of these goals, he was able to listen to his collaborators, draw proper conclusions, and even revise in part or fully reject his own a priori assumptions. I consider it a great virtue of Professor S. K. Kozłowski. In those moments when some idea formed in his mind, he would start to be somewhat animated, walking nervously here and there around the trenches making short notes in his ever-present one-hundred-page notepad. In the course of exploration on the site, he used to discuss his new ideas with every manager of a particular trench, expecting to confirm them as quickly as possible. If the results of the exploration stood in contradiction with his concept, he was ready to accept that, and after a period of sadness, he would come back to the issue with a new hypothesis. This active, hot-headed I would say, but creative way of being appeared strange to many people, or even annoying, but for sure it was effective.*

I also liked the informal discussions with Professor S. K. Kozłowski in our accommodation base, which took place when he visited the room we shared with the late Andrzej Reiche. We were busy all the time, documenting stone and ceramic artefacts, but we would always offer him tea and engage in long discussions not only on certain archaeological subjects but also non-professional and even private issues. At those times, Professor would change into a different man – open, smiling, talking about problems which bothered him as the boss of the whole enterprise, troubles with the organization, and relationships with local officials. On many occasions, we could observe how much it cost him to direct the whole expedition, even though he would not personally supervise any particular trench. Sometimes, we honestly sympathised with him.

But the next day, in the very, very early morning, some 5.30 or 6.00 o'clock at best, his booming voice could be already heard, as he bustled around in the dining room, calling us up before leaving to the site of Nemrik, located in a distance of some 55 km. Karol Szymczak mentioned that Professor liked to drive our off-road Toyota Land Rover by himself, which he did quite efficiently, and for many years he did not cause any collisions. Nevertheless, those rides were sometimes quite stressful for us. We would drive along the most strategic and busy road with thousands of Turkish tank trucks transporting Iraqi fuel. Sometimes, among the endless row of trucks, Iraqi military vehicles and private cars could also be seen. Even just entering into this miles-long line of vehicles demanded much cunning and courage, not to mention what was needed afterwards. Dramatic. The roadsides were scattered with crashed or burned tank trucks, because there was neither time nor means to remove them. This was why all of us were fully concentrated on the ride – especially that while driving, Professor had a habit of holding a lively conversation with wide gesticulation, habitually raising both hands and letting the driving wheel go (sic!). In such moments, some of us would get really nervous and then it could come to serious clashes and heated exchanges of words. I write as it was because I have no intention to artificially make Professor S. K. Kozłowski look like a bronze or stone statue. Anyway, his personality merits defend themselves, particularly in the context of his comprehensive achievements and integrity in other situations. I recall how during one of our excavations season the representative of the Department of Antiquities in Mosul, Mr Danoon, a person much-liked and valued highly by us, was forced to drive us to Nemrik in a car with defective brakes! It is easy to anticipate that poor Mr Danoon was not able to stop at the first red light and eventually struck a private car. It came to a terrible row with the aggrieved driver and a policeman, and immediately after returning to our accommodation base Mr. Danoon was punished with a fine equalling his three months' salary. Our explanations and testimonies that driving of this defective car was forced by the manager of the transport base were of no help. Our Boss, though upset himself, tried to cheer Mr Danoon, and the next day, already on the site, he passed him in private the sum equivalent to his lost earnings. He was aware that Mr. Danoon had to support his wife and five children. So human, so endearing, so sympathetic gesture from, outwardly, such a tough person! I could quote more examples of similar actions by Professor.

Sometimes these high demands brought pretty funny results, especially when relationships with the officials of the local Department of the General Directorate of Antiquities in Mosul were concerned. The Professor was always of the opinion that if six or seven archaeologists from a foreign country visited Iraq to save its cultural heritage, the local civil workers were obliged to meet all their formal and organisational needs. Urgently – here and now, I would say. All should be ready and waiting for us: a car to drive our team to the site, all the excavation equipment, a furnished office, and a laboratory. The situation always looked more or less like this: the Professor vigorously entered the office and asked for a certain clerk to arrange a particular thing quickly and satisfactorily. At that moment, sounds of multiple slamming doors could be heard in the neighbouring rooms, as the rest of the Department's staff tried to slink out, escape, and avoid being caught. The person Professor turned to was sitting full of fear and tried to explain themselves awkwardly. This way or another, the case had to be solved.

No doubt, Professor S. K. Kozłowski earned my highest recognition and respect with his care and ability to make the fieldwork of the Nemrik mission effective, efficient, and safe. Because of that, we had lively and very friendly contacts with the Polish Embassy in Bagdad, with its unforgettable head, the late Ambassador Witold Jurasz – a great supporter and promoter of our activity. It is owing to his help that Professor could establish relations with Polish construction, agricultural, and geodesic companies operating in Iraq and employing about forty thousand Poles. Thanks to the efforts of His Excellency and our Professor we had at our disposal the off-road car, a Toyota Land Cruiser, with a guarantee of full service in the Polservice garage in Mosul. Good relations with Polservice gave us a very important sense of security, as

Fig. 4. Mosul, Iraq; from the left: local Christian Chaldean family, S. K. Kozłowski with R. Mazurowski (photo A. Reiche).

well as medical care and assistance in case of emergency. We tried to repay by receiving workers of many Polish companies as guests in Nemrik – Professor would give speeches on our excavations and Near-Eastern archaeology, we demonstrated the technique of production of certain artefacts: adornments, stone and bone tools, etc. Sometimes we even guided Polish groups showing them around Nimrud or Babylon.

In my opinion, the life at and work of the Polish Archaeological Mission to Iraq in the Kurdish zone of the war-torn country, the unique experiences of our team, and its members deserve to be written down in a separate book, popularising in character or a novel. Above all, we, members of the Polish Archaeological Mission to Iraq excavating the Neolithic village in Nemrik, already at that time – and even more so at the present day – realised that thanks to Professor S. K. Kozłowski we participated in an extraordinary, seminal scholarly enterprise which was going to make a very significant contribution to the understanding of the beginnings of farming in the Near East – one of the crucial processes in the whole human history. Also, thanks to Professor Kozłowski, the problems of the Pre-pottery Neolithic fascinated me so much that eventually, I wrote my professorial dissertation on "Ground and Pecked Stone Industry in the Pre-pottery Neolithic of Northern Iraq"*, published as the 3rd volume of the Nemrikian series in Warsaw, 1997. What is more, he was appointed to be one of my reviewers. I have to admit that many parts and phrases of his generally favourable review were a source of great satisfaction and enjoyment for me.*

Finally, together with all my Nemrikian baggage of experiences and fascination, I decided to devote my further professional career mainly to problems of the earliest productive economy in the Near East. After 10 years of unfulfilled hopes to come back and comfortably continue excavation in Iraq, I hit upon a site of my life. It was Tell Qaramel near Aleppo in Syria. During twelve seasons of exploration, I uncovered there a Pre-pottery Neolithic settlement much larger than Nemrik, with spectacular architecture (at least five stone towers older than the one known from Jericho), together with numerous pieces of art, sculptures and reliefs. All that was made by hunters and gatherers, who by that time still knew nothing about the domestication of plants and animals. Thank you, Professor Stefan Karol Kozłowski for opening the door to Qaramel for me!

Some personal words directly to Professor: Honourable Professor, it is hard to believe that now you are so far from us and Nemrik. I like to think that even after your passing you continue to stride vigorously with the inseparable notebook in your hand, looking for another captivating adventure in *the New Land, which is probably poorly known from the archaeological point of view. Or maybe you are just taking advantage of your indefinite leave. Rest.*

Wojciech Borkowski recalls:

Six excavation campaigns in the northern-Iraqi Nemrik were undoubtedly my life's adventure. It was half of the 1980s when, after doing my obligatory year of military service, I came back to continue my work at the State Archaeological Museum in Warsaw. I was studying the Neolithic banded flint mines in Krzemionki Opatowskie and that subject fully captured my imagination. I did not suspect that there are more intriguing issues than prehistoric flint mining and secrets of five-thousand-year-old underground shafts. Unexpectedly, Professor Stefan Karol Kozłowski suggested that some young museum workers should join the University of Warsaw's mission to Iraq. The director of the Museum, Dr Jan Jaskanis, chose me, even though I was the youngest employee of the Department of the Stone Age. My six excavation campaigns between 1986 and 1989, which I have mentioned earlier, four in the spring and two in the autumn, amounted to a total of a year and a half spent in the land previously known to me only from the Scheherezade's 'Tales from the Arabian Nights'. I absorbed the fascinating landscape of Mesopotamia with my heart and soul, monuments of the world's most ancient civilizations, graves of the Old Testament prophets, the oldest Christian monasteries, and even much older than all of them – the villages of the first farmers in Nemrik and M'lefaat.

It is quite hard to express in a few words what I felt during those fantastic years. By that time in Poland, the communist system was collapsing in terrible convulsions, but I did not really experience that, living with my wife and newborn-son, and waiting for the next Iraqi adventure.

Undoubtedly, the excavations in Nemrik were a seedbed for all my later archaeological imagination. I realised the Neolithic revolution was one of the most important processes in the development of human civilization. While digging deeper and deeper into more than two thousand years of history of the world's oldest agricultural village – or what we then believed to be the oldest – I had to ask myself many basic questions referring not only to scholarly knowledge but also to my faith and what I believed in. Concerning such problems, it is hard to imagine a better tutor than Professor Stefan Karol Kozłowski. He was our guide to the archaeological sites of Mesopotamia as well as a spiritual mentor. He would take us for excursions to places of famous excavations (Nimrud, Khorsabad, Babylon, Ur), but found time also to show us the legendary graves of the Old Testament prophets, the holy temple of the Yezidis in Lalish, or monasteries reaching the earliest centuries of Christianity. Indeed, he was leading me along the path of expulsion from paradise, the sin of our primary parents. These were many hours of evening discussions after the whole day of work in the heat usually exceeding 40°C. I was 26 at the time, while he reached his fifties, but he never denied us a trip to the desert regions of Iraq in a red-hot car. Or even a night tour after a long day of back-killing work. He would always have limitless patience and liking for me, and it was not only him, I have to admit. I was the youngest member of the team and I felt great. Perhaps, I was treated more as the Old Testament Benjamin, but these were the most intensive months of my life. And it was exactly the kind of time when you can gain the most. The present professors: Andrzej Kempisty, Ryszard Mazurowski, Karol Szymczak, the late Andrzej Reiche, and Kazik Kuźma completed that wonderful research team which for me was a truly fantastic university of field excavation and archaeological skills.

The conditions in which we lived and worked (sometimes extremely dangerous and demanding complete devotion) naturally got us closer to each other, including me to my more experienced and wiser colleagues.

During the last three seasons in Iraq, Professor Kozłowski somehow became the second supervisor of my doctoral thesis, which I wrote about the Krzemionki flint mine. We spent much time together on polishing certain chapters. Professor had a specific, well, hulking style of handwriting. Practically illegible for someone uninitiated. But, on the other hand, he was able to fluently decipher similar doodles left, for example, by the first explorer of Krzemionki, Józef Żórowski*, in the 1920s. During the hours spent reading* Żórowski*'s cryptic notes in our Nineveh residence in Nabi Younis, Professor deciphered for me priceless information concerning the already non-existent parts of the unique mining field of Krzemionki.*

When a close person is leaving us for good, the void could be filled only by memories. The warmest, tremendous, and connected with Stefan Kozłowski, "Funio", the memories which I will cherish for the rest of my days.

Kazimierz Kuźma, another member of Nemrik and M'lefaat staff:

I joined the Iraqi excavation team of Professor Stefan Karol Kozłowski relatively late, in 1989. After some years of exploring the dunes and sandy fields of our Polish Mazovia in search of the Bronze Age Trzciniec culture sites, it was a refreshing change. Our stay in Iraq lasted a little short of three months (March-May). At first, we had to complete the excavations at Nemrik 9 site, exploring trenches to the virgin soil as well as documenting those opened in previous seasons and containing residential features. After that, we started our fieldwork in M'lefaat.

We were accommodated in Mosul, in a part of ancient Nineveh, on the Nabi Younis Tell. In the nearest neighbourhood, there were two mosques with original tombs of Prophet Jonah, as it is believed. Every morning, at 6 o'clock sharp, we would be woken up by the incisive call of the muezzin from the minaret nearby, who summoned the Muslims for the first prayer of the day (namaz). Our living conditions were rather Spartan, with geckos wandering over the walls a common occurrence. It all was so exotic that I sometimes felt like in the scenery of the "Tales of the Arabian Nights".

Professor Kozłowski looked after the social facilities of his team, so the first step after setting up our lodgings was to hire a cook who was responsible for feeding our group. Professor Kozłowski had also a rare ability to smoothly enter into relations with local inhabitants. I remember him talking for hours (through an interpreter) with the oldest resident of the village of Nemrik. This old man, named Mr. Mela, was a rich source of interesting information about the changes of the natural local environment over the last decades. The Professor was able to use all the possible sources of information to reconstruct the biological context of the excavated site.

Right after finishing in Nemrik, in the spring of 1989, we started to excavate the site of M'lefaat, also representing the Pre-pottery Neolithic. In the following season (1990), Professor Kozłowski continued exploring M'lefaat. The site is situated some 35 km east of Mosul, and some 90 km south-east of Nemrik. Before that, in 1954, the site was preliminarily explored by Robert Braidwood. During our field research, I was responsible for the exploration of one of the most characteristic rounded dwellings. At the same time, I documented all the uncovered stone artefacts, replacing Ryszard Mazurowski in this capacity, as he could not participate in that season. Meanwhile, Karol Szymczak together with Jolanta Kamińska carried out an extensive archaeological survey of the area, driving around in a white Toyota Land Cruiser.

The hut I explored was built of very characteristic cigar-shaped sun-dried mud bricks and was one of the oldest constructions of that type in the whole Near East, eventually dating to the 9th*/8*th *millennium BC.*

It was, and still is, the greatest privilege and satisfaction for me that I could be a part of Professor Kozłowski's team in Iraq, and that I could contribute a little to the project which became a classic and has had so much impact on the research on Near-Eastern Pre-pottery Neolithic.

I also cannot miss an opportunity to express my warmest thanks to Professor Andrzej Kempisty, who recommended me to Professor Stefan Karol Kozłowski. That recommendation allowed me to experience one of the greatest adventures of my life, especially that a few years afterwards I had to abandon archaeology and devote my time to something else.

Karol Szymczak:

Participation in archaeological investigations conducted by Professor Stefan Karol Kozłowski, and especially those of the Polish Archaeological Mission to Iraq, not only taught me essential skills in managing large-scale archaeological fieldwork, competence in keeping records, be it in the field or the office, but also made it crystal-clear to me that in archaeology, just as in other scholarly disciplines, the highest satisfaction comes when one copes with problems of utmost importance, crucial for the history of humankind. One such problem is undoubtedly the process of Neolithisation, whose dynamics ought to be recognised as thoroughly as possible.

Since 1989, due to political reasons, the archaeological excavation in Iraq could no longer be continued. At that time, I managed to complete my professorial thesis, where I summed up my previous archaeological projects connected with the oldest periods of prehistory in the north-eastern part of Poland. And then, in 1993, I was unexpectedly invited to conduct a joint archaeological investigation in Uzbekistan. It was a new republic, still in the process of establishing itself as an independent country after the fall of the Soviet Union. Being conscious of how little is known in the western archaeological world about the Central Asian Stone Age (owing mostly to obstacles in exchanging information, deepened by the language barrier), I did not think too long before I accepted this proposal. Thus, two years later I was already exploring the fantastic early Neolithic site discovered by our Polish-Uzbek Archaeological Expedition in the Kyzyl-kum Desert. Its name is Ayakagytma and it represents not farming but rather a nomadic community, that is, a type of Neolithisation based on breeding (cattle, camel, and horse). Today, we are planning to continue the research towards reconstruction of the Early Holocene natural environment in which the local Neolithic communities lived. What is more, in the meantime Central Asia became a crucial region tostudy the mutual relations between the Neanderthals, Denisovians, and modern men at the turn of the Middle and Upper Palaeolithic. This issue is also intensively investigated by our team. Professor Kozłowski and Nemrik gave a start to all that.

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Profesor

Abstract

It is impossible to describe the role of Professor Stefan K. Kozlowski in my professional formation and my personal life. These few remembrances are only a clumsy and incomplete trial to pay homage to Him.

Keywords: Stefan Karol Kozlowski, Mesolithic, teacher

Listopad 1974. Katedra Archeologii Pradziejowej i Wczesnośredniowiecznej, drugie piętro w kamienicy przy ulicy Widok 10. Pierwszy rok studiów. Wykład z Pradziejów Polski (dwie godziny w tygodniu) odbywa się późnym popołudniem, więc za oknem jest już ciemno. Wykład prowadzi docent Stefan Karol Kozłowski. Dystyngowany, w zielonym zachodnio-wojskowym swetrze, błękitnej koszuli i granatowej, jedwabnej apaszce. Wróciłem właśnie z pierwszych studenckich „powierzchniówek" w okolicach Iłży i mam problem. W ramach zajęć dodatkowych rysuję, a właściwie próbuję uczyć się rysować znalezione krzemienne zabytki. W większości jest to krzemień czekoladowy (przecież to Iłża) już dosyć łatwy do odczytania, ale teraz mam problem. Chodzi o niemal wykończony półwytwór czworokątnej siekiery z szarego biało nakrapianego krzemienia świeciechowskiego. Nie widzę fal, nie potrafię określić kolejności i kierunku odbić. Po wykładzie podchodzę do Pana Docenta i proszę o pomoc. Ogląda jedną ze stron siekierki pod światło i rysuje ołówkiem na negatywach odbić strzałki, do tego dodaje kilka słów wyjaśnienia. Taki był mój pierwszy bezpośredni kontakt z Profesorem Stefanem Karolem Kozłowskim – wówczas jeszcze docentem.

Później, z czasu studiów, pamiętam kilka innych nauk. Chociażby tę, którą nazwałem „trzy kupki". Wiktor Stoczkowski przyniósł na proseminarium (trzeci rok) krzemienie zebrane przez niego na powierzchniówkach koło Swornigaci na Pomorzu. Profesor podzielił je na „trzy kupki": „to jest na pewno", „to prawdopodobnie", „nie mam pojęcia, co to jest". Dla mnie było to zachwianie mitu o wszechwiedzy profesorów i nauka, że nawet na takim poziomie erudycji i kompetencji można mieć wątpliwości, czegoś można nie wiedzieć. I można się do tego przyznać. Zasadę „trzech kupek" stosuję do dzisiaj i świetnie działa nie tylko w pracy.

Jedną z metod dydaktycznych Profesora było angażowanie studentów w prawdziwą pracę naukową. Rezultatem jest chociażby *Atlas of the Mesolithic in Europe* (ukończony w 1977, a wydany w 1980), do przygotowania którego włączył uczestników swojego seminarium. Było to dla mnie wielkie przeżycie i wielka satysfakcja. A przede wszystkim bardzo skuteczna nauka warsztatu i bardzo cenne doświadczenie, które formuje badacza nawet na tak podstawowym poziomie jak student trzeciego roku.

Inne wspomnienie: praktyki terenowe w roku 1978. Wykopaliska w Grzybowej Górze na mezolitycznym stanowisku „Rydno". Metoda „planigrafii w polu wg Krukowskiego". Metoda bardzo pomocna, kiedy trzeba kopać szybko, nie ma czasu na dokładne, trójwymiarowe pomiary, a stratygrafia jest mocno zaburzona (zastosowałem ją później podczas wykopalisk ratowniczych w Descartes we Francji). Logistyka, jak to w późnym PRL-u, była skomplikowana, a mimo to wykopaliska w Rydnie stały się dla mnie wspaniałym przeżyciem. Po pierwsze, serdeczne koleżeństwo: Janusz Budziszewski, Marek Zalewski, Karol Szymczak, Jerzy Libera, Ewa Gieysztor, Grażyna Rejchert… Po drugie, kopanie – poznawanie metody, poznawanie materiału. Po trzecie: wykłady w polu, na stanowisku po przerwie, jakbyśmy to dziś powiedzieli, na lunch. Opowiadania o prahistorii, o metodyce, o archeologach Profesor kontynuował często wieczorem, przed kolacją i w jej trakcie, nawet przy wieczornych ogniskach z winem i piosenkami. Jednak zawsze, zanim „impreza rozwinęła się po studencku", dyskretnie wycofywał się do swojego pokoju. Nie czuliśmy w tym oznaki dystansu czy lekceważenia. Prowadzenie wykładów w taki sposób, jakby opowiadał literackie historie, to istotny element dydaktyki Profesora. Świetnym tego przykładem jest Jego artykuł *Imperium atakuje* z 2007 roku (w *Contributions to the Central European Stone Age*, Wrocław). Historia powojennej polskiej archeologii opowiedziana została tam jak wczesnośredniowieczna baśń.

Profesor Stefan Karol Kozłowski zasłużył na swój tytuł nie tylko z racji wartości i objętości pracy naukowej, jej fundamentalnego znaczenia dla wiedzy o mezolicie, czy oficjalnej nominacji. On po prostu BYŁ profesorem. Nie tylko jako nauczyciel, mistrz i wzór w zawodzie, ale też jako wzór postawy w życiu. Mimo że nie przypominam sobie rozmów na tematy polityki, było coś takiego w zachowaniu, co jednoznacznie dawało świadectwo Jego poglądów. Czasami szczegół, jak chociażby wpięty w kieszeń kurtki USA Army wzór M65, przedwojenny wojskowy orzeł w koronie. Z tych powodów niezasłużenie długo czekał na profesorską nominację. W artykule *The Trial of Massive Corruption of Clever Minds* (w: *Between History and Archaeology*, 2018), pisząc o moim pokoleniu archeologów, wyraziłem opinię, że to, iż tak niewielu spośród nas dało się skorumpować mirażem kariery w zamian za zaangażowanie w komunizm, było wynikiem postawy i wzoru, jaki dawali nam nasi uniwersyteccy wychowawcy. W moim przypadku najważniejszym z nich był Profesor Stefan Karol Kozłowski. Nie pouczał, nie komentował, ale swoim sposobem bycia po prostu świadczył „jak zachować się trzeba".

Profesor Stefan Karol Kozłowski podchodził do nas, swoich studentów, trochę też jak do własnych dzieci. Taki zresztą tytuł – *Moje dzieci* – dał jednemu z rozdziałów swojej ostatniej książki *Co przeżyłem, tom opisał* (Warszawa 2022). I rzeczywiście nam ojcował. Myślę, że pragnął widzieć nas jako swoich następców, kontynuatorów, uczniów ze Szkoły Stefana Karola Kozłowskiego. Praca magisterska, którą napisałem pod Jego dyrekcją, była z mojej strony w pewnym stopniu ryzykowna, bo analizowałem w niej materiały, które wcześniej służyły Profesorowi do zdefiniowania i wydzielenia kultury chojnicko-pieńkowskiej (*Pradzieje Ziem Polskich*, PWN 1972). Założyłem sobie zweryfikowanie słuszności tezy o jedności kulturowej obu grup i poddałem te materiały analizie statystycznej użytej przez prof. Romualda Schilda w pracy *Późny Mezolit* (Ossolineum 1975). Na szczęście dla mnie statystyka potwierdziła typologiczną analizę Profesora Stefana Karola Kozłowskiego. Jednak zaakceptowanie przez Profesora takiego tematu pracy studenta daje świadectwo o Jego klasie. Po egzaminie magisterskim w 1979 roku Profesor nie zapomniał o mnie i zatrudnił przy rysowaniu dla niego materiałów krzemiennych, a wkrótce zaproponował mnie do zastąpienia w Dziale Neolitu PMA dr Anny Uzarowicz, która wyjechała na dłuższy urlop. W 1981 roku zaakceptował też jako jednego ze swoich doktorantów na UW (z Karolem Szymczakiem i Januszem Budziszewskim). Zabierał nas ze sobą na wykopaliska we włoskich Alpach. Zorganizował mi miesięczne stypendium w Belgii (w stanie wojennym!). Dzięki temu zebrałem sporo dokumentacji do doktoratu (ponad 500 narysowanych i pomierzonych rdzeni). Niestety z biegiem czasu moje postępy w pracy coraz bardziej traciły rozpęd. Archeologia zajmowała coraz mniej miejsca w moim życiu, a coraz więcej czyniły to druk, kolportaż i redakcja nielegalnych wydawnictw. W 1985 roku rozdział pod tytułem „moja kariera naukowa w Polsce Ludowej" zakończył się aresztowaniem i kilkoma miesiącami „odsiadki" na Rakowieckiej 37. To, że trwała tylko pięć miesięcy zawdzięczam Profesorowi Stefanowi Karolowi Kozłowskiemu, który wystarał się o warunkowe zwolnienie z aresztu za swoim poręczeniem. Nigdy mi o tym nie wspomniał. A ryzykował poważnie w przypadku mojego ponownego aresztowania, bo przecież wiedział, że nadal drukowałem nielegalne wydawnictwa.

Po wyjeździe z Polski w 1988 roku spotykałem Profesora dosyć rzadko, bo też rzadko i na krótko przyjeżdżałem do Warszawy, pierwszy raz w 1992 roku, już w znów niepodległej Rzeczpospolitej. Wiosną 1998 roku Profesor z żoną i synem odwiedzili mnie w mojej pirenejskiej wiosce. Profesor wykładał wtedy na uniwersytecie w Lyonie i z Olivierem Aurenche pisał książkę o neolicie Bliskiego Wschodu (*La Naissance du Neolithique au Proche-Orient ou le Paradis Perdu*, 1999). Pani dr Elżbieta Sachse-Kozłowska, dystyngowana i serdeczna, uczyła polskie dzieci w Szkole Polskiej przy Konsulacie RP w Lyonie. Elżbieta zaproponowała mi wówczas mówienie sobie po imieniu. Na taką poufałość nigdy sobie nie potrafiłem pozwolić wobec Profesora, chociaż On zawsze mówił mi po imieniu. Ich nieletni syn, Karol Kajetan, wprawiał mnie w spore zaskoczenie, kiedy po posiłku grzecznie pytał rodziców, czy może już odejść od stołu. Przedwojenna kindersztuba nadal w rodzinie obowiązywała. Później było też jeszcze niezwykle miłe spotkanie na konferencji w Orońsku w 2003 roku. Ostatni raz rozmawialiśmy w Warszawie 5 sierpnia 2016, kiedy Profesor zjawił się na moim ślubie. Niestety zbyt krótko. Później zostały tylko świąteczne kartki z życzeniami.

Profesor Stefan Karol Kozłowski jest dla mnie bardzo ważną postacią. Jest mentorem, którego charyzma miała duży wpływ nie tylko na kształt mojej wiedzy zawodowej, ale też postawy w życiu. Jeśli mógłbym jeszcze raz Go spotkać, chciałbym móc powiedzieć: **Wielce Szanowny Panie Profesorze, bardzo dziękuję.**

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Profesor, jakiego pamiętam (The Professor I remember)

Abstract

Stefan Karol Kozłowski, whom I remember from my time as a student, was an exceptional professor and scholar who had a remarkable ability to inspire and motivate his students. His passion for prehistory, seen through the lens of flint, was "contagious", and his teachings went beyond the standard curriculum. He involved us in his research on the Mesolithic Atlas of Europe, treating us as valuable collaborators. Professor Kozłowski also organized regular meetings and lectures with his doctoral students outside of the university, where they presented their work and findings on flint artefacts. It was a unique and enriching form of education.

After graduating and defending my master's thesis, which he supervised, we remained in contact. He frequently visited me and my colleagues at the National Archaeological Museum until the end of his days. We all valued Stefan Karol Kozłowski as a wonderful person and scholar. He was a friend and a mentor to us.

Keywords: Stefan Karol Kozłowski, Mesolithic, State Archaeological Museum, Rydno, Krzemionki Opatowskie

Rok 1975. W październiku rozpoczął się kolejny, a dla mnie pierwszy rok akademicki w Katedrze Archeologii Pradziejowej i Wczesnośredniowiecznej na Uniwersytecie Warszawskim. Ledwie zaczęły się zajęcia i poznawanie się z koleżankami i kolegami, a już po dwóch tygodniach wszyscy studenci zostali skierowani na zajęcia terenowe, tzw. „powierzchniówki". Trafiłem do grupy, która pojechała do Iłży. Studenci ze starszych roczników chodzili po polach, a nas, „młodych", jako że było niemiłosiernie zimno, skierowano do badań sondażowych, które zaordynował profesor Waldemar Chmielewski. To oraz dystans, jaki miał do studentów podczas wykładów z paleolitu, sprawiało, że „na dzień dobry" polubiliśmy docenta Stefana Karola Kozłowskiego, który prowadził zajęcia z mezolitu. Żywiołowe wykłady z opowieściami o ludziach w czerwonych i niebieskich sweterkach, tłumaczące zróżnicowanie kulturowe w epoce kamienia, fascynowały niemal wszystkich z roku. Lubił, kiedy studenci byli aktywni. Ja, mając zaliczone jeszcze przed studiami wykopaliska u Krzysztofa Burka na nadbiebrzańskim stanowisku z epoki kamienia w Grądach Woniecko, udzielałem się. Opłaciło się. Na ostatnich zajęciach przed letnią sesją Docent poprosił o indeks i zamaszystym ruchem wpisał mi piątkę. W ten sposób miałem „z głowy" najcięższy egzamin na pierwszym roku studiów. Pozostałych czekał egzamin testowy, który zaskoczył wszystkich. Zwłaszcza niemiłą niespodzianką okazały się pytania przygotowane przez docenta Stefana Karola Kozłowskiego. W przeciwieństwie do „luzackich" wykładów okazały się bardzo precyzyjne i trudne, bo kto by się spodziewał, że ma narysować typowe zabytki dla kultury janisławickiej czy tylczaki typu Komornica i Stawinoga. Pogrom, a potem dla wielu ustny poprawkowy.

Ostatecznie z całego roku tylko ja miałem ochotę na kontynuowanie studiów nad epoką kamienia. Wiązało się to z pewnymi zawirowaniami w moich zajęciach na drugim roku, bo wymuszało uczestniczenie także w zajęciach dla trzeciego, na którym zebrała się silna grupa krzemieniarska z Andrzejem Boguszewskim, Januszem Budziszewskim, Karolem Szymczakiem i Ewą Gieysztor. Tworzyliśmy dobry i zgrany zespół, który lubił swojego promotora, a on nas. Nawiązała się między nami płaszczyzna porozumienia, która wykraczała poza przyjęte na uczelni stosunki w dydaktyce. Nie mając wówczas własnych dzieci, wykładowca przenosił ojcowskie pragnienia na naszą grupę. Wygraliśmy los na loterii życia, bo „Funio", jak go nazywaliśmy, naprawdę po ojcowsku poświęcał nam dużo czasu i uwagi. Wszyscy uczestniczyliśmy w dodatkowych wykładach – spotkaniach organizowanych przez niego w Polskim Towarzystwie Archeologicznym i Numizmatycznym przy ul. Jezuickiej (ze względu na ciasnotę w Katedrze przy ul. Widok), na których referowali postępy w pracach nad doktoratami: Jan Burdukiewicz, Krzysztof Cyrek, Lucyna Domańska oraz Krystian Nowak. Miła atmosfera i naprawdę znakomite doświadczenie. Podobnie było z włączeniem

Fig. 1. Prof. S.K. Kozłowski ze studentami uczestniczącymi w 1978 roku w badaniach Rydna. Od lewej stoją na schodach: Karol Szymczak, koleżanka z polonistyki, Marek Zalewski, Grażyna Rejchert i Jerzy Libera, z miarką siedzą Barbara i Wojciech Michera, a pies gospodarzy Państwa Łyżwów łasi się do Andrzeja Boguszewskiego (fot. J. Budziszewski).

nas w prace nad atlasem mezolitu w Europie. Promotor w sposób elegancki podziękował nam za pomoc. Z żoną Elżbietą zaprosili całą grupę do własnego mieszkania przy ul. Czerwonego Krzyża i jako prawdziwi miłośnicy Francji ugościli nas deską serów i czerwonym winem. Chyba dla wszystkich było to duże przeżycie.

Innym, tym razem mocno stresującym wydarzeniem, była podróż z „Funiem" do Ojcowa, gdzie podczas studenckiego objazdu naukowego miał pokazać jaskinie w Dolinie Prądnika. Mój rok był już na miejscu, a docent, z racji wykładu dla trzeciego roku, miał dojechać dzień później. Po wykładzie zabrał mnie ze sobą i ruszyliśmy „Maluchem" w drogę. „Funio" jak zwykle gestykulował i często zapominał o trzymaniu kierownicy, ale dojechaliśmy szczęśliwie.

Rok 1978. We wrześniu wszyscy uczestnicy seminarium krzemieniarskiego prowadzonego na UW przez docenta Stefana Karola Kozłowskiego oraz Jurek Libera z UMCS pojechali na Rydno na praktyki wykopaliskowe. Zgodnie z „Funiową" tradycją przygotowana została flaga ekspedycji. Jako absolwent liceum plastycznego zaprojektowałem ją, nawiązując do słynnego malowidła z Lascaux z motywem stada reniferów, które dzielnie wyszyły Ewa Gieysztor i Grażyna Rejchert wraz z nazwiskami uczestników. Po zakończeniu ostatniej ekspedycji UW na Rydnie flaga, dzięki Wojtkowi Borkowskiemu i Witkowi Migalowi, uczestników ekspedycj trafiła do Działu Neolitu Państwowego Muzeum Archeologicznego, ale niestety spaliła się w pożarze baraku, gdzie przeniesiono nas na czas remontu w muzeum.

Formalnie badania na Rydnie prowadził Docent, ale ponieważ Grażyna Rejchert miała z nich pisać magisterium, to właśnie jej powierzył zarządzanie ekipą na wykopie. Wszyscy lojalnie podporządkowywali się wytycznym, które ustalała wcześniej z promotorem. „Funio" delikatnie kontrolował sytuację, a wieczorami i w wolnym czasie opowiadał o mezolicie, krzemieniarstwie, archeologii i o życiu. Najczęściej na weekend wyjeżdżał do Warszawy, a jak zostawał, zwiedzaliśmy okolicę lub w ramach rekreacji rozgrywaliśmy mecze piłkarskie. Czasem sędziował, ale też starał się być aktywnym graczem. Parę razy tworzyliśmy we trójkę wraz z Ewą Gieysztor drużynę przeciwko Januszowi Budziszewskiemu i Karolowi Szymczakowi, i niestety zawsze przegrywaliśmy.

Wiele lat później w Rybnie koło Sochaczewa, kiedy już jako profesor przeglądał materiały w znajdujących się tam magazynach Państwowego Muzeum Archeologicznego, zagrałem mecz przeciwko Kozłowskiemu, ale tym razem jego synowi Karolowi, który wraz z młodym Gąssowskim chcieli koniecznie pograć w piłkę. Profesor Jerzy Gąssowski pykał fajkę w fotelu, profesor Stefan Karol Kozłowski sędziował, a ja z moim, kilkuletnim wówczas synem, spokojnie pokonaliśmy profesorskich nastolatków.

Rok 1979. We wrześniu nie pojechałem na badania w Rydnie, bo dzięki łaskawości ówczesnych władz uzyskałem pozwolenie na otrzymanie paszportu oraz promesy na zakup stu dolarów i z żoną wyruszyliśmy w podróż poślubną do Włoch. W październiku jak zwykle były „powierzchniówki", a gdzieś w połowie listopada po seminarium docent Stefan Kozłowski powiedział mi, że w marcu przyszłego roku wyjeżdża na badania wykopaliskowe na Bliski Wschód, i albo złożę pracę magisterską przed jego wyjazdem, albo dopiero w październiku lub listopadzie. Formalnie mogłem to zrobić w roku akademickim 1980/1981, ale byłem już żonaty i zależało mi na wcześniejszym zakończeniu studiów. Zaczął się więc wyścig z czasem. Co dwa tygodnie donosiłem promotorowi kolejne rozdziały do przeczytania i oceny, i w lutym 1980 roku obroniłem pracę magisterską.

Lata 80 i następne XX wieku. Pożegnałem się z Uniwersytetem, ale nie z profesorem Stefanem Karolem Kozłowskim, pozostał bowiem w moim życiu do końca swoich dni. Zresztą nie tylko moim, bo tak-

Fig. 2. Rydno 1978. W przerwach w trakcie badań prof. S.K. Kozłowski często prowadził mini wykłady o archeologii i nie tylko. Tu słuchaczami jego byli Barbara i Wojciech Michera, Andrzej Boguszewski, Grażyna Rejchert i Marek Zalewski.

Fig. 3. Rydno 1978. Profesor S.K. Kozłowski nie stronił od pracy fizycznej na wykopie.

że Sławka Sałacińskiego, Wojtka Borkowskiego i Witka Migala, z którymi po studiach znalazłem się w Dziale Neolitu w Państwowym Muzeum Archeologicznym w Warszawie. Odwiedzał nas często, zawsze głośno witając, wzorując się na Stefanie Krukowskim z hasłem: „dzieci moje kochane". Podczas badań, które prowadziliśmy w Krzemionkach Opatowskich, co jakiś czas podrzucał nam swoich zagranicznych gości. Właściwie byli to młodzi protegowani kolegów Profesora z zagranicznych uczelni. Zostawiał ich z butelką „wiskacza", żeby łagodniej nam przeszło zajmowanie się nimi. Do dziś wspominamy ładną Finkę, której zupełnie nie interesowały prehistoryczne kopalnie i już następnego dnia wyjechała do narzeczonego, który mieszkał w Krakowie. Trafił się nam też niezwykle grzeczny Hindus z dalekich Indii, dla którego na pewno była to wyprawa życia. Niewiele rozmawialiśmy, bo już po wypiciu jednego kieliszka przy obiadokolacji zasypiał przy stole. Trzeźwiał do południa, po czym przychodziła kolejna obiadokolacja i sytuacja powtarzała się. Nie wiem czy coś innego zapamiętał z Krzemionek.

Kiedy Profesor przychodził do muzeum, starał się chociaż na chwilę wpaść do nas do Działu Neolitu i zapytać, nad czym pracujemy. Przynosił kolejne swoje książki, opatrując je „kulfoniastymi" dedykacjami. Ja obdarowywałem go niearcheologicznymi, ale polsko-węgierskimi folderami do wystaw, które organizowałem we współpracy z Instytutem Liszta – Węgierskim Centrum Kultury w Warszawie. W ostatnich latach, przez koronawirusa, wizyty „Funia" w muzeum były rzadsze. Wiedzieliśmy, że pisze wspomnienia. Przynosił rękopisy do naszej koleżanki z muzeum, Giny Dziklińskiej, która je odszyfrowywała i przepisywała. Wojtek Borkowski zaangażował się w wydanie i mimo innych zajęć doprowadził do tego, że schorowany już Profesor zobaczył złożoną książkę. Ja tylko próbowałem negocjować z panią Elżbietą i synem Karolem zmianę zdjęcia na okładce. Wielka szkoda, że nie dane nam było spotkać się na promocji książki. Ale z ogromną przyjemnością przeczytałem *Co przeżyłem, tom opisał*, mając wrażenie jakbym słuchał opowieści „Funia". Niektóre z nich już znałem, w innych sam uczestniczyłem lub słyszałem od kolegów, ale wiele było zupełnie nowych, nieznanych i ciekawych, jak całe życie naszego Przyjaciela i Mistrza.

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In memoriam: Professor Stefan Karol Kozłowski remembered by researchers of the Older and Middle Stone Age from the Nicolaus Copernicus University Institute of Archaeology (Toruń, Poland)

In this short text, the authors take a moment to remember Professor Stefan Karol Kozłowski, an avid supporter of many scholarly activities undertaken by researchers from the Institute of Archaeology of the Nicolaus Copernicus University in Toruń.

These activities were particularly vivid in the years 2003–2019, when the Institute had a Department of the Old and Middle Stone Age, headed by Krzysztof Cyrek, whose cooperation with Stefan Kozłowski had dated back to the time of Cyrek's studies and his later work at the Museum of Archaeology and Ethnography in Łódź. In subsequent years, the cooperation was successfully moved to Toruń and extended to the next generation of local researchers.

The Department's staff – apart from Krzysztof Cyrek, the team included Magdalena Sudoł-Procyk, Łukasz Czyżewski, Magdalena Krajcarz, and Grzegorz Osipowicz – studied a wide range of research problems related to the Palaeolithic and Mesolithic, involving interdisciplinary investigation of cave sites in the Polish Jurassic Upland. Among them, the Biśnik Cave, one of the most important Middle Palaeolithic sites in Poland, undoubtedly held a special place. During the excavations, the site was frequently visited and examined by many scholars, including specialists in the Palaeolithic of Central Europe. One of them, of course, was Professor Kozłowski (Fig. 1). In the course of his visits, he would not only carefully analyse the inventories of flint and bone finds from the cave, but also shared his observations with our team. He would always patiently answer any questions asked by the students, often resorting to quickly jotted diagrams on the creation of flint products or sketches illustrating scenes from the lives of ancient hunters and foragers.

Professor Kozłowski was, therefore, a key participant at the international conference "European Middle Palaeolithic during MIS 8 – MIS 3: Cultures – environment – chronology" held in September 2012 in Wolbrom to summarise and celebrate 25 years of research on the cave.[1] During the plenary sessions and field trips to the Biśnik Cave and other caves of the central Jurassic Upland region, the Professor was an extremely active participant (Figs. 2–3), often speaking in discussions.

During another conference, this time organised by the Institute of Archaeology of the Nicolaus Copernicus University in Toruń and the District Museum in Toruń

[1] Cyrek *et al.* 2012.

Fig. 1. Field consultation on finds from the Biśnik Cave at the Educational and Scientific Centre of Silesian Voivodship Landscape Parks in Smoleń, July 2000 (pictured from the left: B. Ginter, K. Cyrek, S. K. Kozłowski, and A. Dagnan-Ginter). Photo by M. Sudoł.

Fig. 2. Prof. S. K. Kozłowski at the entrance to the Biśnik Cave, during the field session of the conference "European Middle Palaeolithic during MIS 8 – MIS 3: Cultures – Environment – Chronology", 26th of September 2012. Photo by Ł. Czyżewski.

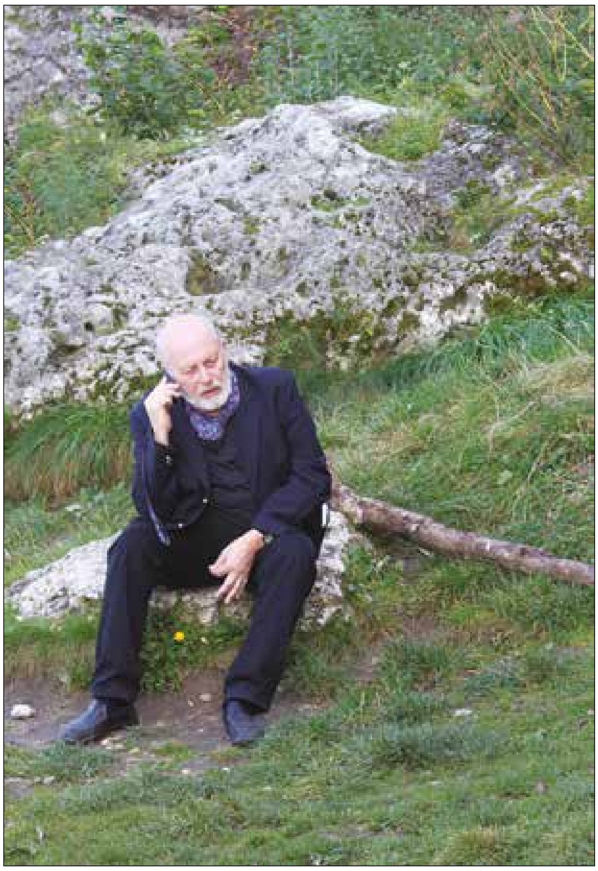

Fig. 3. Prof. S. K. Kozłowski in front of the Stajnia Cave, during the field session of the conference "European Middle Palaeolithic during MIS 8 – MIS 3: Cultures – Environment – Chronology", 26th of September 2012. Photo by Ł. Czyżewski.

Fig. 4. Presentation by Prof. S. K. Kozłowski during the 10th meeting of the SKAM association: "Artefact in Spatial Arrangements. Kshemienitsa – Concentration – Site – Region", 24th of October 2013. Photo by Ł. Czyżewski.

and held on October 23rd–25th of October 2013 by the Institute of Archaeology of the Nicolaus Copernicus University in Toruń and the District Museum in Toruń (10th meeting of the SKAM association: "Artefact in Spatial Arrangements. Kshemienitsa – Concentration – Site – Region"), Professor Kozłowski made his mark with a talk that took less than an hour on the "Ceramic Mesolithic of Mazovia and Podlasie" (Fig. 4).[2] After this insightful lecture, illustrated with author's own beautifully succinct sketches (Fig. 5), a remarkably interesting discussion arose between the speaker and other Neolithic researchers, in particular Professor Stanisław Kukawka (Fig. 6). Excerpts from the talk were published in the post-conference volume *Anthropologie. International Journal of Human Diversity and Evolution*[3] in the form of an article titled "The Janislawice standard and its implications". There, the author highlights the co-occurrence of the Neman pottery with the late Mesolithic Janisławice Culture flint in assemblages from central and eastern Poland in the 5th millennium BC. This was an important reference to the concept of the "ceramic Mesolithic", once proposed by the author and later widely discussed in the professional literature.[4]

One of the results of Krzysztof Cyrek's close cooperation and personal relationship with Professor Kozłowski was the latter's participation in PhD defences conducted at the Department of Older and Middle Stone Age. In total, Professor reviewed three dissertations while working for this institution: by Łukasz Czyżewski, Magdalena Sudoł and Ewa Jurzysta (Fig. 7). These reviews will go down in the annals of the faculty for unique reason: each of the reviews was written in a style peculiar only

[2] Kozłowski 2013.

[3] Cyrek, Czyżewski 2016.

[4] E.g. Kozłowski 1971; 2009; 2016; Cyrek *et al.* 1985; Kukawka 2010.

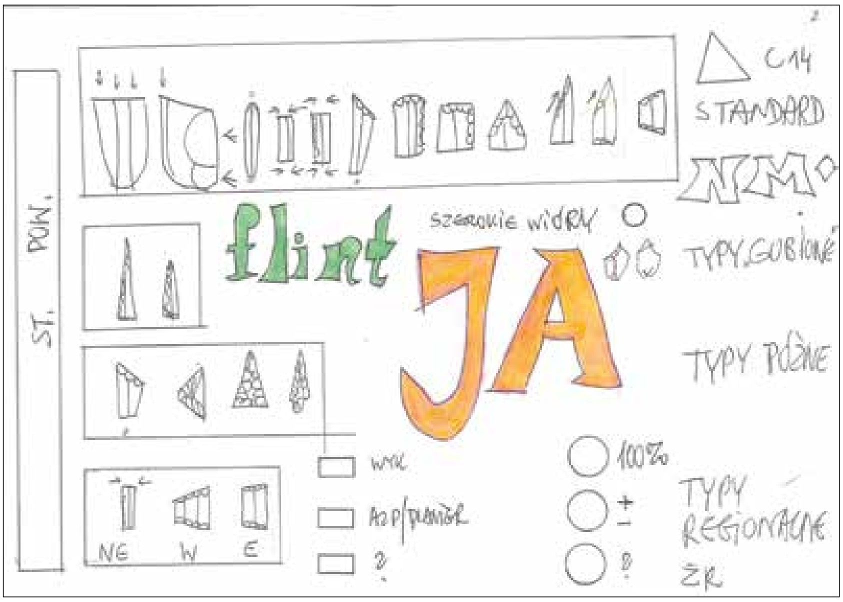

Fig. 5. One of the slides illustrating Prof. S. K. Kozłowski's seminal presentation titled "Ceramic Mesolithic of Mazovia and Podlasie", delivered at the 10th meeting of the SKAM association. Photo by Ł. Czyżewski.

Fig. 6. Discussion between Prof. S. K. Kozłowski and Prof. S. Kukawka during the 10th meeting of the SKAM association: "Artefact in Spatial Arrangements. Kshemienitsa – Concentration – Site – Region", 24th of October 2013. Photo by Ł. Czyżewski.

Fig. 7. Prof. S. K. Kozłowski as a reviewer and examination board member (along with Prof. K. Cyrek, Prof. J. M. Burdukiewicz and Prof. D. Makowiecki), during the defence of the doctoral thesis by M. Sudoł, 8th of September 2013. Photo by Ł. Czyżewski.

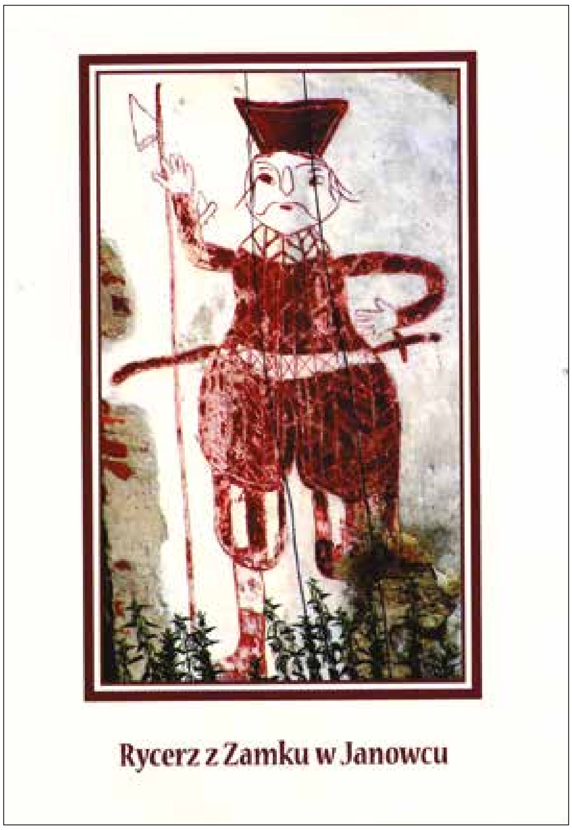

Fig. 8. A postcard from Professor Kozłowski to G. Osipowicz.

to Professor, which was the height of conciseness and synthesis, causing profound consternation in the Dean's office at the time. His reviews, usually covering only a page and a half with quotations, in the Professor's sweeping handwriting, have become the stuff of anecdote at the institute.

Professor Kozłowski's one-of-a-kind directness and succinctness were also experienced by Grzegorz Osipowicz, whose research on Mesolithic sites in the Chełmno-Dobrzyń Lake District at some point entered the Professor's sphere of interest. The discussions with Professor (too few, in hindsight) were invaluable to Osipowicz, then a young Mesolithic researcher: he had the pleasure of discussing the chronology and cultural affiliation of the sites he studied, and, above all, the typological classification of the flint microliths they had yielded. As Osipowicz recalls, Professor Kozłowski had the remarkable and enviable ability to determine the cultural affiliation of a given collection based on a few simple yet crucial questions relating to the forms of the microliths present, and (which was particularly fascinating) a few hand drawings (actually, schematic outlines of geometric forms) based on these descriptions. The most memorable and personally moving moment for Grzegorz Osipowicz, however, was when he received an unexpected postcard from Professor Kozłowski in which, without unnecessary formalities and introductions, Professor asked a question relating to several drawings of flints included in his book (Fig. 8). As Osipowicz recalls, he had never before and never since been so surprised and embarrassed, but at the same time proud of the fact that a person of such scientific reputation was interested in his research and, more importantly, addressed him in such an unusual and candid manner.

We are particularly grateful to Professor not only for his direct participation in the scholarly activities of the Institute of Archaeology of the Nicolaus Copernicus University in Toruń, but also, indirectly, in the training of the next generation of archaeologists, attested, for example, by their continued use of his publications on Palaeolithic and especially Mesolithic studies.[5]

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[5] E.g. Kozłowski 1989; 2009.

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Professor Stefan Karol Kozłowski – an exceptional reviewer

Abstract

When the author was preparing his doctoral dissertation entitled *Mesolithic in Kuyavia*, Professor Stefan Karol Kozłowski became one of the reviewers. The circumstances under which he became the reviewer, as well as the review itself, appear to be quite extraordinary. Numerous encounters with the Professor in the course of writing the doctoral dissertation, during the public defence, and between 2015 and 2018 were all unique as well. The conciseness and succinct character of the review make it justified to see Professor Stefan Kozłowski as an exceptional reviewer.

Keywords: Stefan Kozłowski, doctoral dissertation, Mesolithic, Kuyavia, review

My first indirect meeting with Prof. Stefan Karol Kozłowski took place back in the 20th century, at the beginning of my studies when both Prof. Lucyna Domańska and Marcin Wąs, then a post-grad, recommended Prof. Kozłowski's books and articles as reading material for Stone Age classes. In order to prepare for the examinations in Palaeolithic and Mesolithic studies one was required to read several papers authored or co-authored by Prof. Stefan Karol Kozłowski.[1] In the following years, due to the didactic cycle, I did not return to Prof. Kozłowski's works and it was only after I chose the topic for my master's thesis – on the development of flint material technology from Site 4 in Jastrzębia Góra – that I would become a regular reader of books and articles by Prof. Kozłowski. At that time, I still did not anticipate that I would have the pleasure of meeting Prof. Kozłowski and that he would be the reviewer of my thesis. My first direct meeting with the Professor happened while I was still a student, at the conference *Chocolate Flint in Prehistory*, held in Orońsko in 2003.[2] Later, while still being a student, I had the pleasure of listening to speeches or his voices in discussions at several other conferences or academic meetings. They were always exceptional. The Professor would always come excellently prepared, spoke with gusto and was always keen to take part in discussions.

After I finished my studies and started working at the Museum of Archaeology and Ethnography in Łódź, the situation changed dramatically. Admittedly, like in previous years, I saw Professor at flint-related conferences, including several times at the workshops of the Flint-working Association SKAM, where he actively discussed. A significant change came in 2006 when a very interesting and large assemblage of Mesolithic flint relics was discovered at Site 20 in Redecz Krukowy.[3] This site provided extremely rich Stone Age material and sparked significant interest. It was in this context that the idea of me writing a doctoral thesis on the Mesolithic in Kuyavia emerged during discussions within the Museum, with Ewa Niesiołowska and Piotr Papiernik. In the following seasons, more concentrations of Mesolithic material were discovered. Field-walking surveys and searches in museums or the Polish Archaeological Record database (AZP) showed that the picture of the Mesolithic in Kuyavia might have been different than previously thought. After finding the materials in 2010, thanks to the invaluable help of Ewa Niesiołowska, Professor Zofia Sulgostowska agreed to become my supervisor. We began the laborious work on subsequent chapters straight away. Shortly afterwards, around 2011, Prof. Kozłowski began visiting the Museum in Łódź. These visits were related to his growing interest in the subject of the "Ceramics Mesolithic" and

[1] Kozłowski 1967; 1969; 1971; 1972; 1980; 1989.

[2] Borkowski *et al.* 2007.

[3] Papiernik, Płaza 2018.

the relations between hunter-gatherers and the earliest farmers. During his stays at the Łódź museum, until early 2012, Professor would meet with Ewa Niesiołowska and examine Neolithic and Mesolithic material from several sites, such as Sarnowo, Łykowe, Cieszanowice, Osjaków, or Redecz Krukowy. Each time, it was my duty to prepare the materials for Professor Kozłowski. As a result, I had an opportunity to discuss with him the flints he saw as well as other topics. Professor's visits intensified between the years 2015 and 2018 when he was preparing a book on hunter-farmer contacts together with Professor Marek Nowak.[4] Each of these visits followed a similar pattern. The Professor would arrive in Łódź at around 10.30 am and show up at the museum at 11 am. We had about 3 to 4 hours to study the material, because between 3 and 4 pm Professor had a train back to Warsaw. We would usually leave the museum around 2.30 pm, so that we could "come round" to the Lavenda restaurant, near the Łódź Widzew railway station, at the time a departure points for trains heading to Warsaw. There, we would eat lunch and Professor Kozłowski would have a "small beer". During this time, we had the most interesting conversations about flints and the history of archaeology. Professor picturesquely presented his opinions on the Mesolithic, past excavations, or his perspective on Krukowski, Sawicki, and other people and topics.

To return to the opening statement about the exceptional reviewer, I must briefly describe how Prof. Kozłowski became involved in reviewing the doctoral thesis I was preparing. During one of his visits, in 2013, Professor asked directly if he was going to be my reviewer. Caught off guard, I tried to answer that this decision rested partly with my supervisor and the board of the Institute of Archaeology, but I would be honoured. Professor interrupted me, assuming a commanding tone, by saying that he would, indeed, be one of the reviewers! He went on to say that previously he did not review work on the Mesolithic by a certain PhD student and that he will not have it happen again! I was proud and happy but at the same time confused and concerned, not sure, how it would be to have such a reviewer – the famous Professor Stefan Karol Kozłowski. I was also anxious about my supervisor's reaction! After the Professor departed, I made a short phone call to the supervisor, Prof. Zofia Sulgostoewska, said that she would talk to the Professor the next day. Soon, I received information that they had come to an agreement and the reviewers would be Prof. Stefan Karol Kozłowski and Prof. Michał Kobusiewicz.

After handing in the thesis,[5] I did not wait very long for Professor Kozłowski's review. While writing it, the Professor called me to ask about some details and suggest that I examine and include materials from the sites in Telążnia Leśna and Wistka Szlachecka,[6] which were located outside my area of study in the Płock Basin. I received the review on 19 May 2015. Having nothing to compare it to, and despite being happy with its generally positive tone and the standard final statement that „Dominik Kacper Płaza, MA, had been admitted to the further stages of the doctoral dissertation process, I felt it was rather eccentric. The text began with a brief introduction describing my work and the minor shortcomings associated with not including the aforementioned sites in Wistka and Telążnia. Later, in paragraphs, Professor Kozłowski delivered a systematic review. In the first one, he classified the work *Mesolithic in Kujavia* as a regional study, mentioning my name in the same breath as Mesolithic luminaries: Hanna Więckowska, Zbigniew Bagniewski, Krzysztof Cyrk, Bolesław Ginter, and many others. In the second, he called the work a piece of "Mesolithic giga puzzle"! In the third point, he stated that the work followed the path set by previous foreign studies, mentioning Clark, Gramsch or Rimantiene! In the fourth, he stated that the sources were flawed and, therefore, in the fifth point he referred to the most important site of Redecz Krukowy, which had been at the core of my doctoral research. The points seven and eight identified a couple of errors to be corrected in the official publication. The Professor suggested a change in the dating of the materials from Smólsk, and Kolankowo, and pointed out materials from outside Kuyavia which I deliberately omitted. He had a valid point regarding not including the subject of Dęby type inserts. At this point, Prof. Kozłowski asked for a more thorough description of the contacts between hunters and farmers, which I delivered during the dissertation summary and subsequent stages of the public defence. Point nine dealt with the positive sides of the dissertation according to Prof. Kozłowski. He found the strengths related to technological, planigraphic, functional and spatial analyses and, among others, measurements of selected technological groups. In the final point 10 Professor wrote: "The shortcomings noted are not too great, however, and the author's effort and exemplary treatment of the material suffice to make the work valuable".

The public defence took place on 15 June 2015 at the Institute of Archaeology and Ethnology of the Polish Academy of Sciences in Warsaw (Fig. 1). The committee, of course, included Professor Kozłowski, who promptly asked a question about contacts between the Mesolithic hunters and the earliest farmers, as he suggested in the review. I also know that he participated

[4] Kozłowski, Nowak 2019.

[5] Płaza 2015.

[6] Schild *et al.* 1975.

Fig. 1. Photography from the public defence of the doctoral dissertation of Dominik Kacper Płaza (Zdjęcie z publicznej obrony pracy doktorskiej Dominika Kacpra Płazy).

actively in the discussion commenting on the thesis. The defence ended well and everyone, led by my supervisor Prof. Zofia Sulgostowska, as well as reviewers, Prof. Stefan Kozłowski and Prof. Michał Kobusiewicz, went for refreshments at a nearby Italian restaurant. Since then, I have seen Professor Stefan Kozłowski a dozen times, and these meetings "with an exceptional reviewer" have always been friendly and pleasant. The Professor would often remind me to take his comments into account in the doctoral dissertation I am preparing for publication. I promise to fulfil his request!

Profesor Stefan Karol Kozłowski – wyjątkowy recenzent

Moje pierwsze, niebezpośrednie spotkanie z prof. Stefanem Karolem Kozłowskim miało miejsce w 1999 roku na początku studiów, kiedy zarówno prof. Lucyna Domańska, jak i mgr Marcin Wąs polecali książki prof. Kozłowskiego jako lektury na zajęcia z epoki kamienia. Przygotowując się do egzaminów z paleolitu i mezolitu należało zapoznać się z kilkoma książkami autorstwa lub współautorstwa prof. Stefana Karola Kozłowskiego. W kolejnych latach w związku z cyklem dydaktycznym nie wracałem do prac prof. Kozłowskiego i dopiero po wybraniu tematu pracy magisterskiej dotyczącej opracowania technologii materiałów krzemiennych ze stanowiska Jastrzębia Góra 4 już regularnie czytałem książki i artykuły Pana Profesora. W tamtym czasie wciąż nie przypuszczałem, że będę miał przyjemność spotkań z prof. Kozłowskim i tego, że będzie recenzentem mojej pracy doktorskiej. Pierwsze bezpośrednie spotkanie z prof. Kozłowskim miało miejsce jeszcze w czasie studiów na konferencji *Krzemień Czekoladowy w Pradziejach*, która odbyła się w Orońsku w 2003 roku. W kolejnych latach, przy okazji kilku innych konferencji czy spotkań naukowych, miałem przyjemność słuchać Jego wystąpień lub głosów w dyskusji. Były zawsze wyjątkowe. Pan Profesor był zawsze znakomicie przygotowany, opowiadał ze swadą i zawsze chętnie brał udział w dyskusji.

Po zakończeniu studiów i rozpoczęciu pracy w Muzeum Archeologicznym i Etnograficznym w Łodzi sytuacja diametralnie się zmieniła. Co prawda Pana Profesora, podobnie do lat poprzednich, widywałem na konferencjach krzemieniarskich, w tym m.in. kilka razy na SKAM-ie, gdzie aktywnie dyskutował, ale istotną zmianę przyniosły odkrycia z 2006 roku bardzo ciekawych i licznych mezolitycznych materiałów krzemiennych na stanowisku 20 w miejscowości Redecz Krukowy. Stanowisko to dostarczyło niezwykle bogatych materiałów z epoki kamienia i wzbudzało zainteresowanie. W dyskusjach wewnątrzmuzealnych z Panią Ewą Niesiołowską i Piotrem Papiernikiem pojawił się pomysł napisania przeze mnie pracy doktorskiej dotyczącej mezolitu na Kujawach. W kolejnych sezonach odkrywane były dalsze koncentracje materiałów mezolitycznych, a kwerendy w muzeach oraz w bazie AZP pokazały, że obraz mezolitu na Kujawach nie musi być taki, jak dotychczas sądzono. Po znalezieniu w 2010 roku, dzięki nieoszacowanej pomocy Pani Ewy Niesiołowskiejoraz promotorki Pani prof. Zofii Sulgostowskiej przystąpiliśmy do żmudnej pracy nad kolejnymi rozdziałami. Niedługo potem, czyli około 2011 roku, w łódzkim muzeum zaczął pojawiać się Pan prof. Kozłowski. Związane było to z jego rosnącym zainteresowaniem tematem „mezolitu ceramicznego" i kontaktów łowców oraz zbieraczy z najstarszymi rolnikami. Podczas wizyt w łódzkim muzeum Profesor spotykał się do początków 2012 roku z Panią Ewą Niesiołowską i oglądał materiały neolityczne i mezolityczne z kilku stanowisk np.: Sarnowa, Łykowego, Cieszanowic, Osjakowa czy

Redcza Krukowego. Za każdym razem to na mnie spadała przyjemność przygotowywania materiałów dla prof. Kozłowskiego. Dzięki temu miałem możliwość rozmawiania z nim o oglądanych krzemieniach, jak i o innych tematach. Intensyfikacja wizyt Pana Profesora nastąpiła w latach 2015–2018, kiedy przygotowywał książkę o kontaktach łowców z rolnikami wspólnie z prof. Markiem Nowakiem. Każda z tych wizyt przebiegała w podobny sposób. Profesor około 10.30 przyjeżdżał do Łodzi i o 11.00 pojawiał się w Muzeum. Mieliśmy mniej więcej 3–4 godziny oglądania materiału, gdyż między 15.00 a 16.00 Pan Profesor miał pociąg powrotny do Warszawy. Najczęściej ruszaliśmy z Muzeum około 14.30, tak by „wpaść" na kilkanaście minut do restauracji Lavenda w łódzkiej dzielnicy Widzew. Zjadaliśmy lunch, a prof. Kozłowski konsumował „małe piwko". W tym czasie odbywały się najciekawsze rozmowy o krzemieniach i historii archeologii. Profesor barwnie opowiadał o prowadzonych przez siebie wykopaliskach, o swoim spojrzeniu na Krukowskiego, Sawickiego i innych osobach i tematach.

Przechodząc do tytułowego stwierdzenia o wyjątkowym recenzencie, muszę krótko opisać, w jaki sposób prof. Kozłowski stał się recenzentem przygotowywanej pracy doktorskiej. Podczas jednego z pobytów w 2013 roku Pan Profesor zapytał wprost, czy to on będzie recenzentem. W trakcie próby odpowiedzi, że to zapewne także decyzja promotora i rady, ale byłby to dla mnie zaszczyt, przerwał mi, przechodząc do trybu twierdzącego „U jednego z wcześniejszych doktorantów nie był i teraz tak nie może być!". Czułem się z tego powodu z jednej strony dumny i zadowolony, a z drugiej skonfundowany i zaniepokojony, jak to będzie mieć takiego recenzenta – słynnego profesora Stefana Karola Kozłowskiego. Nie byłem pewny, jak zareaguje Pani promotor! Po wyjeździe Profesora zadzwoniłem do Pani prof. Zofii Sulgostowskiej, która powiedziała, że następnego dnia porozmawia z Panem Profesorem. Po niedługim czasie dostałem informację, że doszli do porozumienia i recenzentami będą prof. Stefan Karol Kozłowski i prof. Michał Kobusiewicz.

Po oddaniu pracy niezbyt długo czekałem na recenzję prof. Kozłowskiego. W trakcie jej pisania Profesor dzwonił do mnie, dopytując o pewne szczegóły, sugerując zobaczenie i dołączenie do pracy materiałów z Telążni Leśnej i Wistki Szlacheckiej, które zlokalizowane były poza obszarem badań w Kotlinie Płockiej. Recenzję otrzymałem 19 marca 2015 roku. Nie mając porównania, ciesząc się, że jest ona pozytywna i zakończona standardowym zapisem o dopuszczeniu mgr. Dominika Kacpra Płazy do dalszego etapu przewodu doktorskiego, wydawała się dość ekscentryczna. Recenzja rozpoczyna się krótkim wstępem opisującym pracę oraz drobne braki związane ze wspominanymi powyżej stanowiskami w Wistce i Telążni. Później w punktach prof. Kozłowski syntetycznie zrecenzował rozprawę. W pierwszym zaliczył pracę *Mezolit na Kujawach* do prac regionalnych, wymieniając mnie między tuzami mezolitu: Hanną Więckowską, Zbigniewem Bagniewskim, Krzysztofem Cyrkiem czy Bolesławem Ginterem i wieloma innymi. W drugim nazywa pracę elementem „giga układanki mezolitycznej"! W punkcie trzecim stwierdził, że praca powiela także schematy zagraniczne, wymieniając Clarka, Gramscha czy Rimantiene! W czwartym stwierdził, że źródła były ułomne i dlatego w piątym punkcie nawiązuje do najważniejszego stanowiska w Redczu Krukowym, które było podstawą doktoratu. Punkt 7 i 8 to wskazanie paru błędów, które powinny być poprawione w publikacji. Profesor zasugerował zmianę datowania materiałów ze Smólska oraz Kolankowa i wskazał materiały spoza Kujaw z Tęlążni i Wistki, których świadomie nie wykorzystałem. Słuszna uwaga dotyczyła nieuwzględnienia tematu wkładek typu Dęby. W tym punkcie prof. Kozłowski poprosił o wypowiedź o kontaktach łowców i rolników, co zrobiłem w czasie autoreferatu i dalszych etapów publicznej obrony. Punkt 9 to pozytywne strony doktoratu według prof. Kozłowskiego. Związane są z analizą technologiczną, planigraficzną, funkcjonalno-zonalną, oraz m.in. pomiarami wybranych grup technologicznych. W ostatnim punkcie 10 Profesor napisał: „Zauważone uchybienia nie są jednak zbyt wielkie, a sam wysiłek autora i wzorowe opracowanie materiału są cenne".

Publiczna obrona odbyła się 15 czerwca 2015 roku w Instytucie Archeologii i Etnologii PAN w Warszawie. W komisji oczywiście brał udział prof. Kozłowski, zadając pytanie o kontakty mezolitycznych łowców z najstarszymi rolnikami, czyli to, co zasugerował w recenzji. Wiem, że zabierał glos w dyskusji, komentując pracę. Obrona zakończyła się pozytywnie i wszyscy na czele z promotorką prof. Zofią Sulgostowską oraz prof. Stefanem Kozłowskim i prof. Michałem Kobusiewiczem udali się na poczęstunek do nieodległej restauracji włoskiej. Od tamtej pory kilkanaście razy widziałem się z Panem Profesorem Stefanem Kozłowskim i zawsze te spotkania „z wyjątkowym recenzentem" były życzliwe i przyjemne. Często Profesor przypominał, bym uwzględnił jego uwagi w przygotowywanej do druku dysertacji doktorskiej. Obiecuję, że wypełnię jego prośbę!

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The Amri Chalcolithic Phase in Sindh (Pakistan): What we Know and What we should Know

Abstract

The problem of the origin of the Indus Civilisation has attracted the attention of many colleagues working on the archaeology of the Indian Subcontinent and the Indus Valley in particular. What is the role played by the cultural processes preceding the origin and spread of one of the most important Bronze Age civilisations of the ancient world? This paper examines some aspects of the Amri Phase, which flourished in Sindh during the 4th millennium BC. Our knowledge in this area is very poor. It relies almost exclusively on the ceramic assemblages retrieved during excavations carried out at the type site in the 1960s. Research currently underway in Lower Sindh has led to the discovery of more sites relevant to this problem. Many of them are located close to the ancient Arabian Sea coastline or on limestone terraces which used to be islands in the Chalcolithic times. They consist of shell middens, whose surface has yielded characteristic Amri Culture knapped stone assemblages.

Keywords: Sindh, Amri Phase, Chalcolithic, chronology, assemblages

Introduction

Our knowledge of the archaeology of the Greater Indus Valley in the centuries that preceded the origin and spread of the Bronze Age Indus Civilisation is still limited due to a lack of research.[1] What we knew of the Chalcolithic in Sindh before the beginning of the 2000s was based almost exclusively on the results of surveys performed by N.C. Majumdar between the end of the 1920s and the beginning of the 1930s,[2] the excavations carried out by the French Archaeological Mission at Amri from 1959 to 1962,[3] the results of the Sindh Archaeological Project and the excavation of Ghazi Shah in Kohistan,[4] and the geoarchaeological surveys conducted by A. R. Khan around Karachi in the late 1970s.[5] Our knowledge has slightly improved during the last 20 years, but many questions about the relationships between the Chalcolithic and the beginning of the Bronze Age remained unsolved. Similarly, the current perspective on the way these relationships may have contributed to the formation of the Indus Civilisation is still just as speculative as it was in 2000.[6]

The present paper analyses the Chalcolithic Amri Phase,[7] its distribution in Sindh,[8] the characteristics of the sites, their material cultural assemblages and radiocarbon chronology, and the way it can be related to other Chalcolithic phases of Balochistan to the west (Nal),[9] and Punjab to the north (Hakra).[10]

The presence of several Amri sites in the Dadu district of Western Sindh has been well-known since the 1930s.[11] Their number varies according to different authors. Unfortunately, in many cases, the distribution and quantity of Amri and Nal sites have been presented together, despite the differences between the two aspects.[12] Amri is the only systematically excavated and

[1] Petrie *et al.* 2010a.
[2] Majumdar 1934.
[3] Casal 1964.
[4] Flam 1993a; Flam 2006.
[5] Khan 1979a; 1979b.
[6] Shaffer, Lichtenstein 1989, 123; Possehl 2000–2001.
[7] Shaffer 1992, 444.
[8] See Flam 1976.
[9] Shudai *et al.* 2009; Cortesi 2015; Franke 2015.
[10] Mughal 1997; Ghauri 2018.
[11] Deva, McCown 1949, Fig. 1.

Fig. 1. Amri: Location of the archaeological site within its surrounding landscape (drawing by P. Biagi).

published stratified mound of this phase.[13] Its chronology is based on the stratigraphic position of the Amri Phase sequence below the Indus Civilisation horizon and two charcoal radiocarbon dates which were obtained more than fifty years ago.[14]

Materials and methods: the sites Amri and its sequence

Amri is located in the Dadu district of Western Sindh, some 300 metres to the west of the right (western) bank of the River Indus, ca. 28 kilometres to the south-east of the shore of the Manchar Lake, at an altitude of ca. 35 metres above the sea level. Amri was visited for the first time by A. Burnes before the middle of the 19th century.[15] The site is situated in an area of ecological tension, but rich in water supplies. Eastwards of the site, there extends the fertile alluvial plain of the Indus, while the easternmost fringes of the Lakhi Range rise to the west of it (Fig. 1).

Amri consists of four mounds, only two of which, ca. 100 metres apart, were partly excavated. The eastern and largest one was called Mound A by Casal (Mound 1 by Majumdar) and the western Mound B by Casal (Mound 2 by Majumdar). The first excavations were carried out in 1929 by N. C. Majumdar, who opened three trenches along the edges of Mound B.[16] From Trench I, he reported the presence of two distinct archaeological horizons, the lower of which, ca. 1.80 to 2.15 metres (6 to 7 feet) deep, yielded a ceramic assemblage which he dubbed "Amri pottery" representing an earlier phase of the Chalcolithic civilisation than that represented by Harappa and Mohenjo-daro.[17] According to the excavator, the pottery of this period was wheel-made, thin and porous with a buff, cream, or pink paste. Many vessels have a reddish-brown band at the neck, and their body is sometimes decorated with a row of lozenges, either solid or filled in by hatches, chevron, rectangles within rectangles, the row of sigmas, and so on.[18]

The French Archaeological Mission excavated several trenches in the mounds A and B. The Amri horizon was discovered in Mound A at ca. 3.50 metres of depth. The Chalcolithic sequence, ca. 2.00 metres thick, was subdivided into four layers from IA to ID.[19] Rectangular or square mudbrick rooms, probably dwellings, and fireplaces were unearthed in layers IB, IC and ID. According to Casal's report, the vessel shapes and decorations varied between layers. The general characteristics of the pottery are those reported by Majumdar in 1934, although the about the lithic assemblages, knapped stones in particular.[20]

Two radiocarbon dates were obtained from unidentified charcoals sampled from Mound A, eastern Trench, Level 28c (Layer IB: 4710±110 BP, TF-864) and Level 19 (Layer ID: 4485 ±110 BP (TF-863).[21] The results give an idea of the probable duration of the Chalcolithic settlement (Tab. 1).

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[12] Flam 1987, Fig. 2; Possehl 2000–2001, 232.
[13] Casal 1964.
[14] Agrawal *et al.* 1971; Shaffer, Thapar 1992.
[15] Burnes 1834.
[16] Majumdar 1934, 25–27; see also Casal 1964, Volume II, Fig. 3.
[17] Majumdar 1934, 27.
[18] Majumdar 1934, 27; Fairservis 1975, Fig. 48.
[19] Casal 1964, Volume II, Fig. 8.
[20] Casal 1964, Volume I, 147–148.
[21] Agrawal et al. 1971, 84.

Table 1. List of the Chalcolithic sites sampled for radiocarbon dating, from which results have been obtained and discussed in this paper. Charcoal (above) and mangrove/marine shell dates (below).

Site name	Sample Location	Province	Coordinates	Alt. (m a.s.l.)	Material	Lab. n°	$\delta^{13}C$	Uncal BP	Cal BC/AD 2σ	Phase	Reference
Amri	Mound B, Level 19	Sindh	26°10'27.1"N-68°00'58.5"E	35	Unid. charcoal	TF-863	n.a.	4485±110	3507-2900	Amri	Agrawal *et al.* 1971, 81
Amri	Mound B, Level 28c	Sindh	26°10'27.1"N-68°00'58.5"E	35	Unid. charcoal	TF-864	n.a.	4710±110	3708-3102	Amri	Agrawal *et al.* 1971, 81
Ghazi Shah	Area 2, Locus VIII, Unit 2	Sindh	26°27'17.5"N- 67°27'51.1"E	50	Unid. charcoal	Beta-32804	n.a.	4420±100	3366-2887	Amri	Flam 1993, 142
Ghazi Shah	Area 3, bead workshop	Sindh	26°27'17.5"N- 67°27'51.1"E	50	Unid. charcoal	Beta-18537	n.a.	4460±90	3366-2911	Amri	Flam 1993, 146
Ghazi Shah	Area 3, bead workshop	Sindh	26°27'17.5"N- 67°27'51.1"E	50	Unid. charcoal	Beta-18536	n.a.	4520±70	3494-2935	Amri	Flam 1993, 146
Sohr Damb	S181	Balochistan	27°41'21.2"N-66°18'27.0"E	1234	Unid. charcoal	Bln-5680	-24.1	4311±29	3011-2886	Nal	Görsdorf 2005, 467
Sohr Damb	SD02/S-1	Balochistan	27°41'21.2"N-66°18'27.0"E	1234	Unid. charcoal	Bln-5518	-24.7	4358±37	3092-2898	Nal	Görsdorf 2006, 388
Sohr Damb	S036	Balochistan	27°41'21.2"N-66°18'27.0"E	1234	Unid. charcoal	Bln-5753A	-24.2	4392±37	3313-2906	Nal	Görsdorf 2004, 406
Sohr Damb	S182	Balochistan	27°41'21.2"N-66°18'27.0"E	1234	Unid. charcoal	Bln-5679	-24.6	4403±36	3319-2911	Nal	Görsdorf 2005, 467
Sohr Damb	S071	Balochistan	27°41'21.2"N-66°18'27.0"E	1234	Unid. charcoal	Bln-5758	-25.1	4417±35	3326-2917	Nal	Görsdorf 2006, 388
Sohr Damb	S070	Balochistan	27°41'21.2"N-66°18'27.0"E	1234	Unid. charcoal	Bln-5757	-25.0	4435±39	3331-2925	Nal	Görsdorf 2006, 388
Sohr Damb	S073	Balochistan	27°41'21.2"N-66°18'27.0"E	1234	Unid. charcoal	Bln-5759	n.d.	4494±89	3491-2916	Nal	Görsdorf 2006, 388

Table 1. Cont.

Site name	Sample Location	Province	Coordinates	Alt. (m a.s.l.)	Material	Lab. n°	$\delta^{13}C$	Uncal BP	Cal BC/AD 2σ	Phase	Reference
Sohr Damb	S075	Balochistan	27°41’21.2”N-66°18’27.0”E	1234	Unid. charcoal	Bln-5760	-24.6	4499±39	3357-3035	Nal	Görsdorf 2006, 388
Sohr Damb	SD01/ S66-B25	Balochistan	27°41’21.2”N-66°18’27.0”E	1234	Unid. charcoal	Bln-5384	-25.3	4501±32	3356-3093	Nal	Görsdorf 2003, 363
Mallomand	MLM-1, 80 cm depth	Punjab	31°15’28.7”N-73°29’54.3”E	189	*Acacia* charcoal	GrM-21856	-27.51	4352±26	3075-2902	Hakra	ul Ain 2021, 151
Hassokay	SSK-1, 20 cm depth	Punjab	31°08’01.8”N-73°21’38.1”E	180	Unid. charcoal	GrM-21855	-25.79	4479±26	3340-3032	Hakra	ul Ain 2021, 143
Rajanpur	RJP-1, 20 cm depth	Punjab	31°09’07.4”N-73°22’52.7”E	182	*Acacia* charcoal	GrM-25334	-27.51	4520±30	3360-3101	Hakra	ul Ain 2021, 145
Tharro Hill, Gujo	THR-3	Sindh	24°43’45.3”N-67°45’07.6”E	13	*T. palustris*	GrA-47084	-5.15	5555±35	3964-3639	Amri	Biagi 2011
Tharro Hill, Gujo	THR-1	Sindh	24°43’45.3”N-67°45’07.6”E	13	Ostreidae	GrN-27053	-0.64	5240±40	3624-3320	Amri	Biagi *et al.* 2018
Gharo, Bhanbore	Garo-8	Sindh	24°45’35.9”N-67°33’18.6”E	26	*T. telescopium*	GrM-30577	-2.50	5230±30	3612-3320	Amri?	This paper
Shah Hussain, Thatta	JSH-1bis	Sindh	24°42’26.0”N-67°48’38.3”E	12	*T. telescopium*	GrA-66636	-4.79	5800±40	4242-3911	Amri?	This paper
Shah Hussain, Thatta	JSH-1	Sindh	24°42’26.0”N-67°48’38.3”E	12	Ostreidae	GrA-45180	-2.34	5325±40	3697-3372	Amri?	Biagi *et al.* 2018
Makli Hills, Thatta	MKL-1	Sindh	24°36’52.5”N-67°51’36.5”E	22	*T. palustris*	GrA-50330	-3.929	5750±40	4206-3835	Amri	Biagi *et al.* 2018
Kalan Kot, Thatta	KKT-4	Sindh	24°42’15.3”N-67°52’15.7”E	26	*T. telescopium*	GrA-59843	-7.03	5460±60	3903-3514	Amri?	Biagi *et al.* 2018
Kalan Kot, Thatta	KKT-5	Sindh	24°42’11.4”N-67°52’15.2”E	26	*T. telescopium*	GrM-29973	-5.02	5415±27	3794-3496	Amri	Biagi *et al.* 2022
Kalan Kot, Thatta	KKT-3	Sindh	24°41’55.9”N-67°52’40.6”E	22	*T. telescopium*	GrA-50324	-5.01	5270±40	3637-3341	Amri	Biagi *et al.* 2018

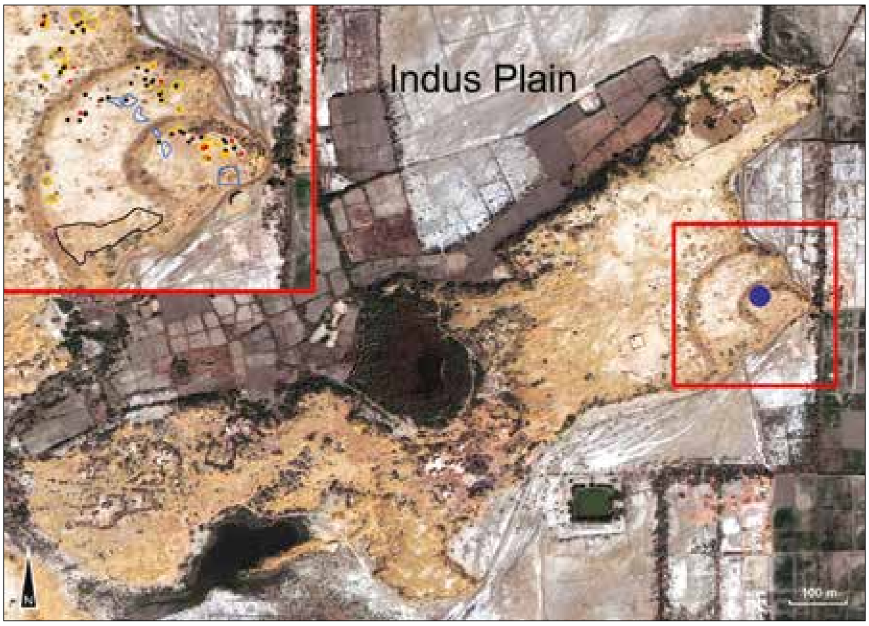

Fig. 2. The Tharro Hill terrace with the location of the Amri archaeological site (red square). Radiocarbon dated samples (blue dot), spots of knapped stone artefacts (black dots), painted potsherds (red dots), limits of the shell scatters (blue lines), limits of ash concentrations (white line), main mounds (yellow circles), limit of a lithic scatter (black line) (drawing by C. Franco).

The Tharro Hill

The Tharro Hill is a limestone terrace ca. 1.5 kilometres long and 0.5 kilometres wide, which rises from the alluvial plain of the River Indus some 2.0 kilometres to the south-west of the small town of Gujo in Lower Sindh. The hill extends in the south-west/north-east direction ca. 10–15 metres above the present sea level. The Chalcolithic Amri settlement is located in the south-eastern part of the terrace, delimited by two parallel, semi-circular stonewalls.[22] Many small mounds and tombs are scattered over an area of ca. 4.000 square metres, inside and outside the two walls (Fig. 2).[23]

The site has never been studied in detail, although it has been summarily described by several authors. Some of them stressed its island character, which is supported by the presence of spots of marine and mangrove shells on some of its surfaces and the inner stonewall rubble.[24] Majumdar reports the presence of an impressive quantity of knapped stone artefacts, which led some authors to think that Tharro was *merely a centre of the flint-knapping industry and not a regular dwelling site*.[25]

Marine and mangrove shells have been sampled for radiocarbon dating from a point close to the southern edge of the inner stonewall.[26] The results show that this part of the site was settled during the first half of the 4th millennium cal BC. In 1928, N.C. Majumdar excavated three rectangular mounds, which yielded red-slipped potsherds and ceramic items with geometric painted patterns. He also illustrated two vessels of undefined cultural attribution.[27] More accurate surveys were conducted in 2008 and 2013.[28]

The chrono-cultural attribution of the finds has sometimes been misinterpreted or incorrectly reported,[29] despite the presence of typical red-slipped and geometrically painted potsherds (Fig. 3) and a rich knapped stone assemblage with prismatic cores, blades, and semi-abrupt retouched artefacts (Fig. 4), which are characteristic features of the Chalcolithic Amri Culture.[30]

Kot Raja Manjera

Kot Raja Manjera (Kafir Kot) is a famous Buddhist site with ruins of a stupa which are still visible in the eastern part of the terrace[31] that extends for ca. 300 metres to the east-west (40 m a.s.l.). The site is located at the south-western edge of an ancient bend of the River Indus, some 5.5 kilometres to the south-west of the town

[22] Carter 1932, 88, note 13.
[23] Majumdar 1934, 21.
[24] Fairservis 1921, 175; Carter 1932, 88; Khan 1979b, 5.
[25] Majumdar 1934, 21.
[26] Biagi 2017, 262.
[27] Majumdar 1934, 21, Table XVI, 24 and 25.
[28] Biagi *et al.* 2018, 12.
[29] Fairservis 1921, 175; Piggott 1950, 197; Allchin 1985, 132; Possehl 1999, 398.
[30] Cleland 1987; Biagi 2005.
[31] Majumdar 1934; Cousens 1998, Fig. 17.

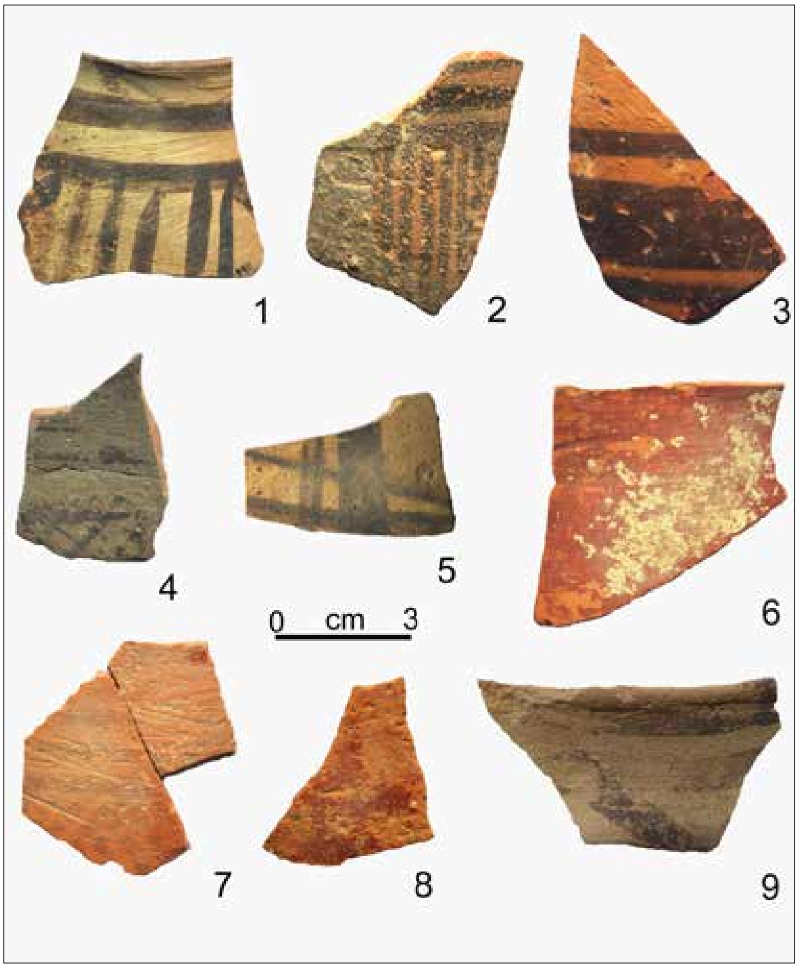

Fig. 3. Tharro Hill: Amri phase painted potsherds with geometric motifs (nos 1–5, 7, 9) and with a red slip (nos 6, 8) (photographs by P. Biagi).

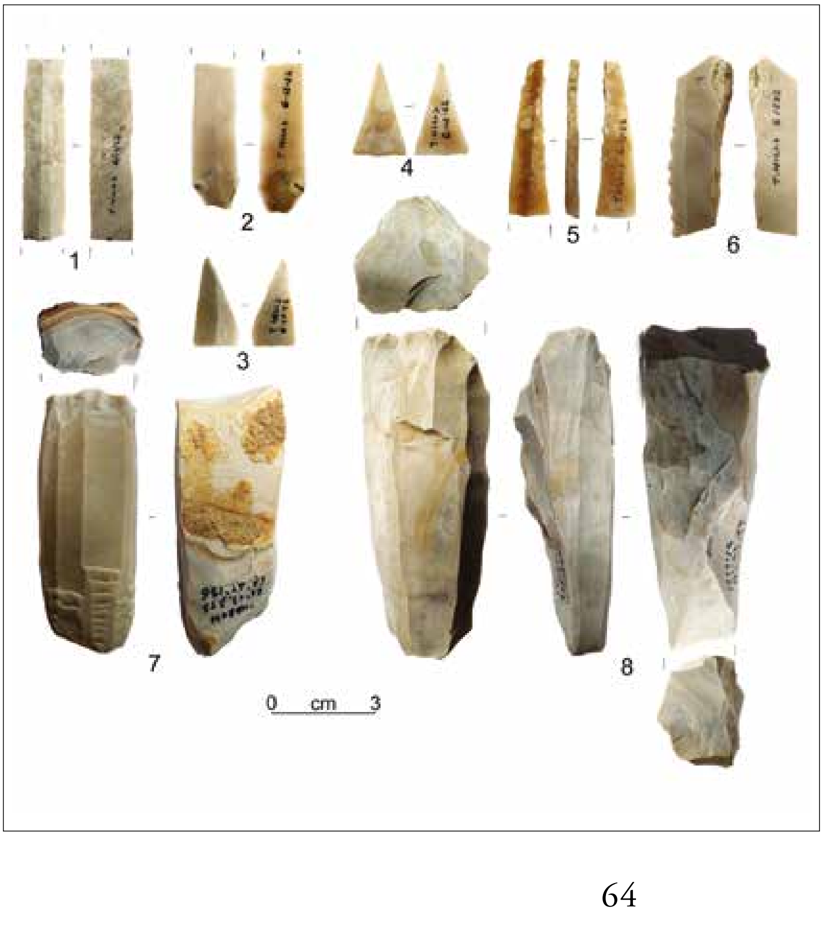

Fig. 4. Tharro Hill: characteristic Amri phase knapped chert artefacts: retouched and unretouche bladelets (nos 1 and 2), Amri Triangles (nos 3 and 4), semi-abrupt-retouched bladelet (n. 5), denticulated bladelet (n. 6), prismatic cores (nos 7 and 8) (photographs by E. Starnini).

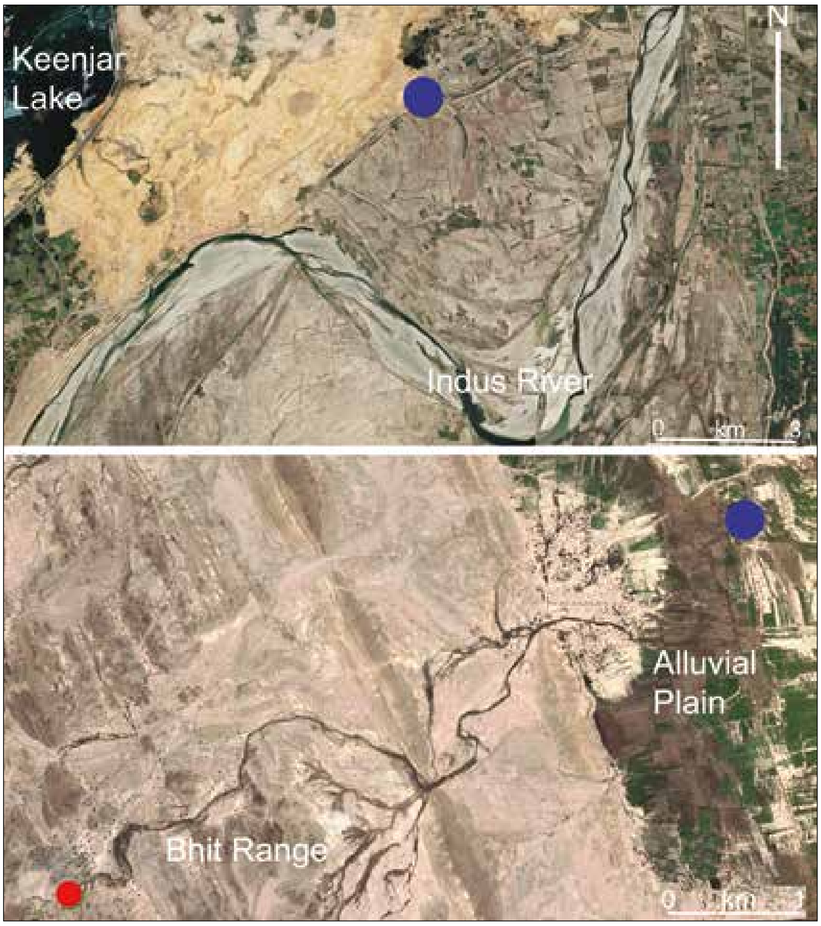

Fig. 5. Kot Raja Manjera: Location of the archaeological site within its surrounding landscape (top); Ghazi Shah: Location of the archaeological site within its surrounding landscape (bottom): Ghazi Shah mound (blue dot), spring (red dot) (drawing by P. Biagi).

of Jerrack (Jhirk) and 8.0 kilometres eastwards of the north-eastern shore of the Keenjar Lake (Fig. 5: top). The Chalcolithic artefacts were scattered over the mesa, which was delimited by a low stone wall attributed to this period. The site was visited by Professor A.R. Khan of the Karachi University in the 1970s. This author collected many knapped stone artefacts, among which are microdrills and straight perforators obtained from microbladelets,[32] most probably showing the presence of a bead manufacturing area, and ceramic potsherds, which he attributed to the Amri Phase.[33]

A more systematic survey was performed in 2009. Several lithic and ceramic spots were recorded mainly along the north-western part of the terrace, which confirmed Professor Khan's attribution of the prehistoric site to the Amri Phase.[34] A few small red-slipped potsherds and a few others with painted zig-zag patterns showed strong similarities to those of the Amri IB or IC ceramic assemblages from the type site described by Casal.[35] One *Terebralia palustris* fragment recovered from this part of the terrace yielded a date of 4635±35 BP (GrA-47083). Although the result is a few centuries more recent than expected, nevertheless it is important because it shows that around the beginning of the Bronze Age, a mangrove was flourishing not far from the site,[36] which reinforces some views regarding the location of the Arabian Sea coastline during this period.[37]

Ghazi Shah and Sindh Kohistan

A concentration of Amri sites has been known for many years along the fringes of the Lakhi Range in the Dadu District of Sindh Kohistan.[38] The site of Ghazi

[32] Khan 1979a, 72.
[33] Khan 1979b, 6.
[34] Biagi 2010.
[35] Casal 1964, Volume II, Fig.51, 57, Plate XVII.
[36] Biagi 2011, Table 1.
[37] Flam 1993a, Fig. 14.5b.
[38] Deva K., McCown 1949, Fig. 1; Flam 1987, Fig. 2.

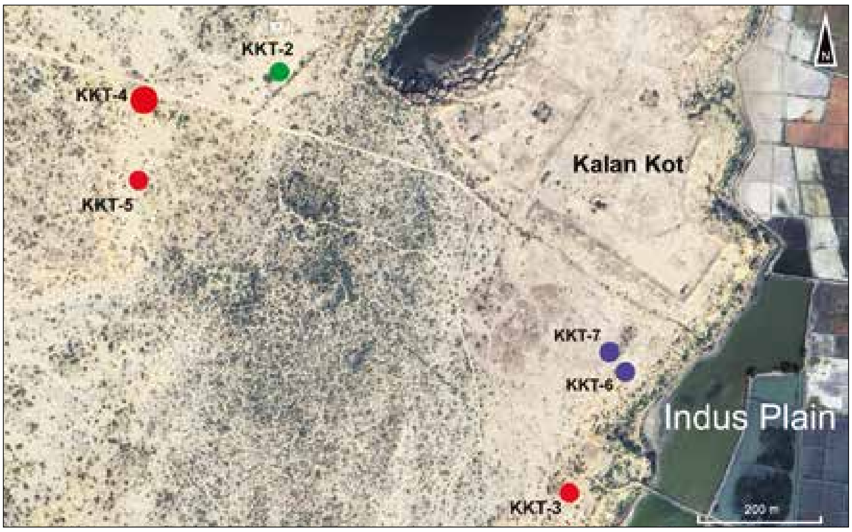

Fig. 6. Kalan Kot: Location of the shell middens within their surrounding landscape: Neolithic radiocarbon dated site (green), Chalcolithic radiocarbon dated sites (red), undated sites (blue) (drawing by P. Biagi).

Shah is located in the alluvial plain of the Naing Nai stream, ca. 4.0 kilometres eastwards of a perennial spring originating from the Bhit Range, which has been reported by several researchers (Fig. 5: bottom).[39] The mound was excavated for the first time by N. C. Majumdar, who opened six trial trenches in the southern part of the site.[40] They showed that Ghazi Shah was settled during both the Amri and Indus periods. The sequence has been confirmed by the excavations carried out by L. Flam in the 1980s, during which three radiocarbon dates were obtained from the Chalcolithic and Bronze Age layers.[41] Unfortunately, most of the assemblages from this site are still unpublished.

Kalan Kot and the shell middens of Lower Sind

Several shell middens and shell clusters mainly represented by fragments of mangrove shells, were discovered during the surveys conducted in Lower Sindh in the last decade.[42] Most of the sites were found on the limestone terraces that rise from the alluvial plain of the Indus, the so-called rocky outcrops described by W.T. Blanford more than a century ago.[43] Although several of them have already been published, more discoveries were made in 2021 and 2022, and more sites have been radiocarbon-dated from mangrove shell samples.[44]

The area around the ancient town of Kalan Kot, in the Makli Hills to the south of Thatta, is of unique importance. Six shell middens consisting of Telescopium telescopium fragments have been recorded around the southern walls of Kalan Kot (Fig. 6). Three of them have been dated to the first half of the 4th millennium BC (KKT-3, 4 and 5) (Fig. 7). They have been attributed to the Amri Phase, thanks to the presence of characteristic Amri type chert artefacts,[45] despite the absence of other material culture and archaeozoological remains.

The site of KKT-4 is a thin shell midden which covers an elliptical surface of at least 100 square metres, inside which different shell clusters have been observed. Most probably, it formed due to prolonged exploitation of T. telescopium by Amri shellfish gatherers, who operated in the mangrove ecosystem flourishing along the Arabian Sea shore a few hundred metres to the east of the site. The Kalan Kot and Tharro Hill discoveries pose important questions regarding the role played by mangroves in the subsistence economy of the Chalcolithic 4th millennium BC Amri communities settled along the northern coast of the Arabian Sea.

Discussion

The distribution of the Amri sites in Sindh is determined by the course of the River Indus in the east, the Arabian Sea in the south, and a part of the Kirthar Range in the west. Professor A. R. Khan reports the presence of just a single fortified settlement along the left bank of the Hab River (Mai Ghari), whose attribution to the Amri Phase is nevertheless uncertain.[46] The northern limit is represented by the Dadu district, north of which Amri

[39] Blanford 1880, 112.
[40] Majumdar 1934, Plate XLIV.
[41] Flam 1993b.
[42] Biagi *et al.* 2018.
[43] Blanford 1880, 154.
[44] Biagi *et al.* 2022.
[45] Biagi 2023, Fig. 5.
[46] Khan 1979b, 6.

Fig. 7. Kalan Kot: Shell middens KKT-4 (above) and KKT-5 (below) (photographs by P Biagi, 2022).

sites have never been discovered (Fig. 8). The detailed chronology of this phase is poorly known due to the scarcity of excavated sites and absolute dates. The radiocarbon chronology developed in the last two decades suggests that it flourished throughout the entire 4th millennium BC, despite some differences between the charcoal and shell radiocarbon dates. The charcoal dates from Amri and Ghazi Shah fall into the second half of the 4th millennium BC, while the majority of the shell middens have been dated to the first half of the same millennium, with some overlaps between the two groups around the middle of the millennium (Tab. 1 and Fig. 9).

All the shell dates have yielded a negative $\delta^{13}C$ value (from -0.64 to -7.03), showing that all the samples came from a mangrove environment and not from open sea waters. This data is important for defining the characteristics of the environment around the islands and along the Arabian Sea coast exploited by the Amri communities.

Another important point regards the chronology of the phase because Amri and Ghazi Shah are provided the only radiocarbon-dated sequences available up to date. Casal presented important information about the characteristics and distribution of the Chalcolithic structures discovered during the Amri excavations (which he subdivided into four subsequent periods) and the pottery with painted patterns which varied from purely geometric to geometric and zoomorphic around the end of the Chalcolithic sequence. Unfortunately, Amri is the only site which yielded such evidence. Some more data are available from Ghazi Shah and Tharro Hill, although the latter seems to have been inhabited for a shorter period, at least its central part.

The Amri Phase knapped stone industry is characterised by pressure-made artefacts represented by prismatic blades and bladelets with parallel sides and semi-abrupt retouched tools. The most important assemblage of this phase comes from Tharro Hill where a detailed collection was gathered in 2008 (Fig. 2). The cores are polyhedral, with one (Fig. 4: 7) or two (Fig. 4: 8) opposed prepared platforms and parallel straight blade detachments on one face. The semi-abrupt technique is systematically employed to make retouched blades with a trapezoidal cross-section

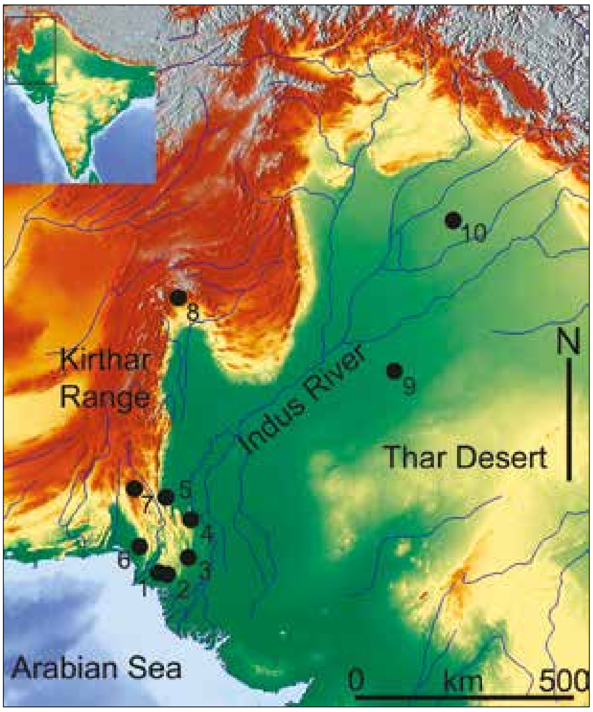

Fig. 8. Approximate location of the sites mentioned in the text: Tharro Hill (1), Kalan Kot (2), Kot Raja Manjera (3), Amri (4), Ghazi Shah (5), Balakot (6), Sohr Damb (7), Mehrgarh (8), Derawar Hakra sites (9), Jaranwala Hakra sites (10) (drawing by P. Biagi).

(Fig. 4: 1), truncations, other types of retouched and denticulated bladelets (Fig. 4: 5–6) and characteristic triangular tools, otherwise called "Amri triangles"[47] (Fig. 4: 3–4). These artefacts are typical of the Amri Phase and were not produced during the following Bronze Age Kot Diji Period which can be firmly dated to the early third millennium BC, at least in north-western India.[48]

Conclusion

Our knowledge of the period preceding the emergence and quick development[49] of the Mature Indus Civilisation is rather unsatisfactory. More results have been achieved during the surveys and excavations carried out in some regions of Punjab as well as along the terraces delimiting the ancient course of the Hakra River in the Bahawalpur district[50] and neighbouring India.[51] In particular, the surveys conducted by R. Mughal in the Cholistan Desert yielded a few Hakra-knapped stone assemblages.[52]

From a chronological point of view, many of the charcoal dates from the Amri, Nal, and Hakra sites have yielded comparable results (see Tab. 1 and Fig. 9). Until a few years ago our knowledge of the Chalcolithic Period was based almost exclusively on pottery seriations and typological comparisons between vessel shapes and decorations from different sites and local/regional complexes,[53] which nevertheless have yielded useful results.[54] However, some progress has been made during the last decades which helps clarify the complex situation.[55] Apart from radiocarbon dating, the research underway has stressed the importance of the techno-typological characteristics of the lithic assemblages and the provenance and circulation of the knappable raw material.

As reported above, the Amri assemblages are easy to recognise because of their uniqueness,[56] although their manufacturing method and function need to be more precisely defined. This observation can be extended to all the Early and Middle Holocene industries of Sindh, and the entire Greater Indus Valley in general. This is a seriously underrated problem, considered and discussed in detail by a few archaeologists.[57]

Regarding Balochistan, the Chalcolithic settlement of Mehrgarh III has yielded a laminar knapped stone assemblage whose techno-typological characteristics can be compared with those from Tharro Hill discussed in this paper.[58] Unfortunately, the important Mehrgarh Period is not radiocarbon-dated. It can be attributed most likely to the 4th millennium BC because it precedes Period IV, from which only a single charcoal sample is available, obtained from the overlying Horizon IV (Ly-1528: 4190±140 BP).[59] Some chronological and typological data are available from the Quetta Valley, where the lowermost layers of the mound of Damb Sadaat have yielded a Chalcolithic complex with pottery similar to that from Amri,[60] from which we have a few charcoal radiocarbon dates which fall into the 4th millennium BC.[61] The same can be said of the Nal horizon dates from Sohr Damb, which yielded comparable, homogeneous results.[62]

47 Biagi 2005.
48 Uesugi 2012, 2.
49 Shaffer, Lichtenstein 1989, 133.
50 Mughal 1995.
51 Uesugi 2012; Ghauri 2018.
52 Mughal 1997, Plate 43.
53 de Cardi 1983, 7–9.
54 Shudai *et al.* 2013.
55 Possehl 2000–2001.
56 Biagi 2005.
57 Hoffman, Cleland 1977; Cleland 1987; Pelegrin 1994; Lechevallier 2003.
58 Lechevallier 2003, 93–117.
59 Jarrige *et al.* 1995, 556.
60 Fairservis 1952, Fig. 2.
61 Shaffer 1986, Table I.
62 Görsdorf 2003; 2004; 2005; 2006.

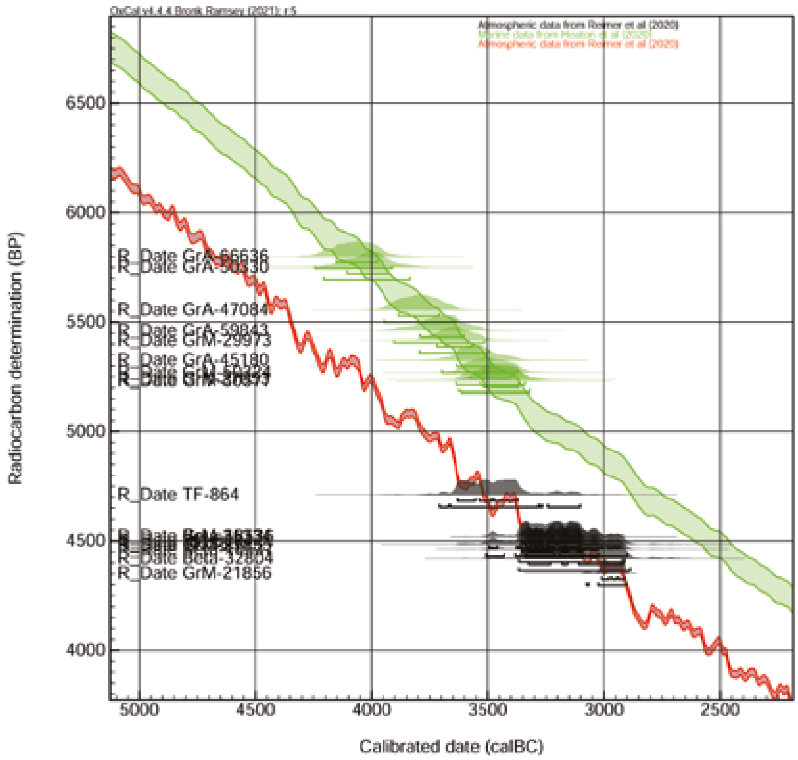

Fig. 9. Plots of the calibrated dates from charcoal from the Chalcolithic sites of Amri (Sindh: Amri phase), Ghazi Shah (Sindh: Amri phase), Sohr Damb (Balochistan: Nal phase), Mallomand (Punjab: Hakra phase), Hassokay (Punjab: Hakra phase), and Rajanpur (Punjab: Hakra phase) (grey), and the mangrove and marine shell dates from the Chalcolithic shell middens and scatters of the Tharro Hill, Gharo, Shah Husain, Makli Hills and Kalan Kot in Lower Sindh (green) (data from Tab. 1) (Plot by T. Fantuzzi, 2023).

At present, we do not have any useful information about the lithic assemblages of the Nal and the Chalcolithic "Balakotian" levels of Balakot,[63] from which we have two 4[th] millennium BC dates.[64] Additional data are available from the Lake Siranda: Chalcolithic shell middens of Las Bela region which have yielded knapped stones strictly comparable with those of the Amri Phase.[65]

Interestingly, also the Chalcolithic horizons of the well-dated site of Sheri Khan Tarakai in the Bannu district[66] have yielded a pressure-made, laminar lithic industry with cores, prismatic bladelets and retouched tools whose techno-typological characteristics are very similar to those discussed in the present paper.[67]

To conclude: more work is necessary to understand the Chalcolithic Period of the Greater Indus Valley and the role it may have played in the formation of the Indus Civilisation. Our present knowledge is too limited, and we are unable to suggest any conclusion. One of the interesting points advanced here concerns the knapped stone assemblages. They show very similar common traits in manufacturing techniques, type of retouching and tool types, regardless of their geographic location, which are nevertheless different from those of the following Bronze Age. This is remarkable because the subdivisions into phases have been established based on pottery analysis, while lithics have not been considered, at least in most cases. However, the situation seems to have slightly improved, especially regarding the definition of the Amri Phase, thanks to the results of the surveys underway in Lower Sindh, a new set of radiocarbon dates, and the systematic study of the lithic and pottery assemblages from the Tharro Hill.

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[63] Dales 1979, 254.
[64] Shaffer 1986, Table I.
[65] Biagi, Nisbet 2023, Fig. 14.
[66] Petrie *et al.* 2010b.
[67] Inizan *et al.* 1994.

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The Late Palaeolithic in the Northern Part of Central Poland in the Light of Current Data

Abstract

The history of research and discovery of the oldest finds dating back to the end of the Older Stone Age in the northern part of central Poland dates back to the second half of the 19th century. Since then, numerous archaeological sources have been collected and documented to testify to the presence of the oldest communities in this area. The present article aims to draw attention to the Late (Final) Palaeolithic archaeological finds from this part of Poland, taking into account the current state of knowledge and the latest research conducted in the field.

Keywords: Late (Final) Palaeolithic, Toruń Basin, the lower Vistula River basin, Tanged Points Technocomplex, Poland

Introduction

Excavations, surface surveys, and stray finds in the northern part of central Poland have a long history, dating back to the second half of the 19th century. The work of several generations of archaeologists significantly increased the number of archaeological sources testifying to the presence of the Late Palaeolithic communities in the area. Distinct clusters of sites, from which artefacts (mostly flint) were obtained, are recognisable, especially around the cities of Toruń, Bydgoszcz, and Grudziądz. In this context, a special place is occupied by the Toruń Basin, where numerous flint products and tools associated with the Late Palaeolithic communities have been discovered.

The history of research and archaeological sources (until 2014 including archives) from the northern part of central Poland and related to the Late Palaeolithic (also known as the Final Palaeolithic) has been already published in an extensive work with a catalogue of sites,[1] therefore they will be only outlined here, taking into account the latest discoveries and research in the field.[2]

In the northern part of central Poland, there are 201 archaeological sites[3] which can be associated with both the Late Palaeolithic and the complex in Brzoza. Included in the present study are also stray finds of flint and organic products as well as certain sites which yielded flint products during the Polish Archaeological Record surface surveys (Archeologiczne Zdjęcie Polski; hereafter as AZP) (101 sites and settlement points). However, the flint materials collected during the said AZP surface surveys will not be discussed in this article. A selection of these was included in another publication by the author.[4] New sources were supplied by excavations[5] conducted since 2015 by the District Museum in Toruń on Site 50 in Brzoza, located in the Toruń Basin.

[1] See Bielińska-Majewska 2018a for the older literature.

[2] The data behind the article was earlier presented by the author during an international conference – 26th EAA (European Association of Archaeologists) Annual Meeting in Budapest, Hungary, 26–30 August 2020 – under the title "The Late Palaeolithic in the northern part of central Poland". In the present contribution, the previous information has been supplemented by the current state of research (up to and including the year 2022).

[3] The article does not take into account the sites in Ludowice and Paliwodzizna, where Mesolithic settlements dominate. According to the authors of the research, selected flint materials from these sites can be associated with the Late Paleolithic (Osipowicz *et al.* 2022).

[4] Bielińska-Majewska 2018a.

[5] The excavations have been conducted since 2013 under the direction of the author of the publication.

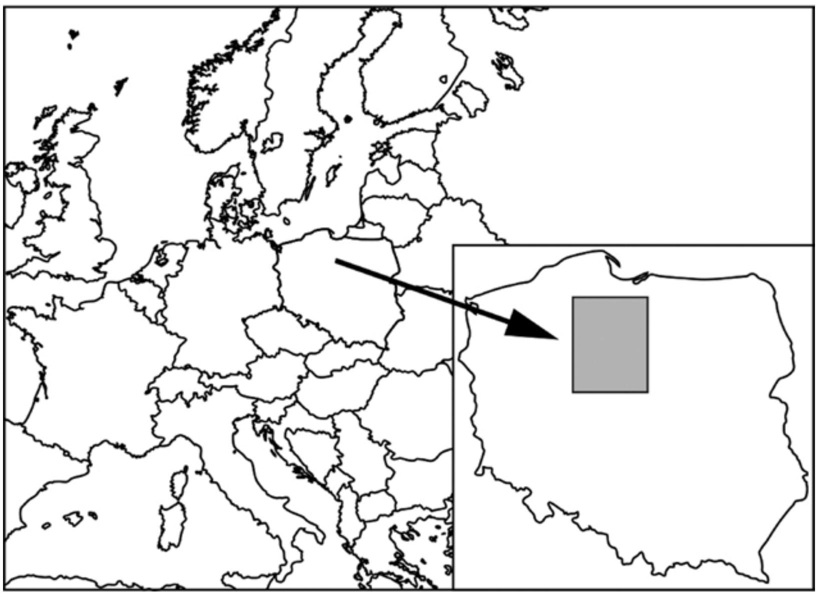

Fig. 1. The northern part of central Poland. The territorial scope of the discussed area (computer processing by M. Majewski).

Location and research history

In this article, the northern part of central Poland will be identified with the area referred to as the South Baltic Lake District according to the division by Jerzy Kondracki,[6] which includes numerous micro- and macroregions. The territorial range established for the study, within which the Late Palaeolithic finds were discovered, covers the area between the basin of the lower Vistula, reaching the vicinity of Gniew, and the upper Noteć. According to the current administrative division of Poland, it belongs partly to the Kuyavian-Pomeranian and Pomeranian Voivodship (Fig. 1).

Archaeological sources associated with the Late Palaeolithic and discovered in the northern part of central Poland have rarely been mentioned in synthetic works. This is especially true of finds discovered near Toruń. The few studies by Polish authors sometimes include single objects or selected sites from this part of Poland.[7] Some studies contain outdated information about the location, name, or numbering of specific sites, as well as the place where collections are stored.[8] Only single sites from the basin of the lower Vistula and the upper Noteć are mentioned in the works of foreign researchers, although the history of their acquisition and research dates back to the second half of the 19th century.[9]

In the second half of the 19th century and at the beginning of the 20th century, the first chance discoveries and expeditions-excursions were made, among others, by people acting on behalf of the existing scholarly societies (Polish and German). Their activities consisted mainly of collecting archaeological finds (including flint) for the needs of museums that were being established at that time. The Interwar Period (between the First and Second World Wars) and after 1945 is the time of surface surveys, leading to the discovery of new archaeological sites documenting the oldest history of the region. At that time, the vicinity of Toruń and Bydgoszcz was visited by specific archaeologists operating in various research centres in Poland. Konrad Jażdżewski or Józef Kostrzewski must be mentioned in this context.[10] At the beginning of the 1960s, the vicinity of Bydgoszcz sparked the interest of Michał Kobusiewicz, who, on behalf of the Archaeological Museum in Poznań and together with Czesław Potemski from the District Museum in Bydgoszcz, conducted excavations in this area. Earlier, in the 1950s, new Palaeolithic sites in this region were discovered by Tadeusz Wiślański.[11]

The 1970s–90s were a time of extensive surface verification and surface exploration of archaeological sites, carried out mainly as part of the AZP, which was also continued in the early 21st century. The works were

[6] Kondracki 2009.

[7] Kostrzewski 1966; Schild 1975; Sulgostowska 1989; 2005; 2009; Kobusiewicz 1999; Sobkowiak-Tabaka 2011.

[8] Schild 1975; Sulgostowska 1989; Woźny 1996; Cyrek, Sudoł 2009; Osipowicz 2010; 2019; Galiński 2019.

[9] La Baume 1931; Taute 1968; Winkler 2019.

[10] Bielińska-Majewska 2017; 2018b.

[11] Kobusiewicz 1999.

managed by employees of various scientific and scholarly institutions, museums, and the Kuyavian-Pomeranian Voivodship Office for the Protection of Monuments in Toruń operating in the discussed area. Some sites located in the southern part of the Kashubian Lake District, where Palaeolithic artefacts have been discovered (along with Mesolithic ones), were studied by Zbigniew Bagniewski, acting on behalf of the Wrocław University.[12] In the 1970s, several Palaeolithic sites in the vicinity of Bydgoszcz were discovered by Wiktor Stoczkowski.[13] More information on the oldest archaeological discoveries can also be found in the works of Jacek Woźny.[14]

In the 1970s, the area around Toruń was surveyed by Andrzej Prinke from the Archaeological Museum in Poznań and Bogusława Wawrzykowska from the District Museum in Toruń, as well as Marian Marciniak and Wojciech Mroczyński. The researchers conducted surface surveys in a dune area, until the early 1990s known as Toruń-Rudak (later as Brzoza). Earlier, in 1934, on behalf of the Baltic Institute, surface reconnaissance in this area was conducted by Jacek Delekta and in 1965 and 1970 by Bonifacy Zielonka. The entire zone, a dune field about 1200 x 600 metres in size, yielded numerous flint products and is referred to in the literature as a complex of flint concentrations, finds, or sites. Since 2015 (according to the findings of the Kuyavian-Pomeranian Voivodship Office for the Protection of Monuments in Toruń), the area has been renamed to Site 50 in Brzoza. In the 1990s, research in this area was carried out by, among others, Stanisław Kukawka from the current Institute of Archaeology of the Nicolaus Copernicus University in Toruń (IA NCU), B. Wawrzykowska from the District Museum in Toruń and Wojciech Sosnowski from the Kuyavian-Pomeranian Voivodship Office for the Protection of Monuments in Toruń, as well as Krzysztof Cyrek from the IA NCU (in 2001).

Understanding the history of research in the discussed place requires familiarity with the current nomenclature and the issues related to the numbering of individual concentrations. Otherwise, it would be easy to create and reproduce (following the older literature) incorrect and outdated information regarding, for example, the number of sites, as well as the location of the complex in Brzoza.[15] Information on the above subject has been explained in selected publications.[16]

In the vicinity of Grudziądz, there are also several sites (including archival ones) where flint products associated with the Late Palaeolithic were discovered, such as Grudziądz-Mniszek or Grudziądz-Rudnik, among others.[17] Another is a multicultural Site III in Grudziądz-Mniszek, where Late Palaeolithic flint products were registered. The site was studied in the 1980s by M. Marciniak from the Museum in Brodnica and Andrzej Bokiniec from the IA NCU.[18]

In the northern part of central Poland (between Toruń and Grudziądz), there is also Site 36 in Trzciano, which was excavated by Ryszard Kirkowski in the 1990s. It is a multicultural site, where among the materials dating to the Late Neolithic and Early Bronze Age there were also flint products typologically attributable to the Late Palaeolithic.[19]

Further source data was provided by wide-scale rescue excavation related to the construction of the A-1 motorway, which took place in the 1990s and at the beginning of the 21st century. It led to the discovery of several sites (e.g. Stare Marzy 4 and 5/5A, Szynych 12 and 13, Klonówka 47, or Kamionki Duże 15), where flint products associated with Late Palaeolithic settlements were present.[20]

Flint products with Late Palaeolithic features were also recorded at such multicultural sites as Dzikowo 26 (researched in 2003) and Osiek nad Wisłą 8 (1988, 2010). These sites were examined by archaeologists from the IA NCU. The archaeological work in the aforementioned localities was carried out by S. Kukawka and Jolanta Małecka-Kukawka, in the latter place also by A. Bokiniec in the 1980s.[21] In 2013, the District Museum in Toruń carried out excavations at the multicultural Site 14 in Skrzypkowo, where Late Palaeolithic flint materials were discovered. Since 2015, the museum has been conducting excavations on one of the largest complexes of settlements dating back to the Late Palaeolithic in the Polish Lowlands (Site 50 in Brzoza), located in the north-eastern part of the Toruń military training ground.[22] For many years, scientific research in the northern part of central Poland, and especially in the Toruń Basin, has also been carried out by specialists from various fields of science, including those from the Faculty of Earth Sciences of the Nicolaus Copernicus University in Toruń (FES NCU), whose research results are extremely important for studies on the oldest settlements in this part of Poland.[23]

[12] Kobusiewicz 1999; Bagniewski 1987; 1997; 1999.

[13] Stoczkowski 1982.

[14] Woźny 1993; 1996; 2003; 2006; 2021.

[15] Cyrek, Sudol 2009; Osipowicz 2010; 2019.

[16] Prinke 1980; Marciniak, Mroczyński 1983; Bielińska-Majewska 2012; 2015; 2018a.

[17] Łęga 1927; 1933; Marciniak 1982.

[18] Bokiniec, Marciniak 1987.

[19] Osipowicz, Weckwerth 2016; Bielińska-Majewska 2018a.

[20] Cyrek 2002; Cyrek, Sudoł 2009; Klimek, Dzięgielewski 2005; Cyrek, Bielińska-Majewska 2014; Bielińska-Majewska 2018a.

[21] Bielińska-Majewska 2017; 2018a.

[22] Bielińska-Majewska 2018a; 2021; 2023.

[23] Niewiarowski, Tomczak 1973; Celmer 1996; Weckwerth 2007; Jankowski 2000; 2012; 2017; 2019.

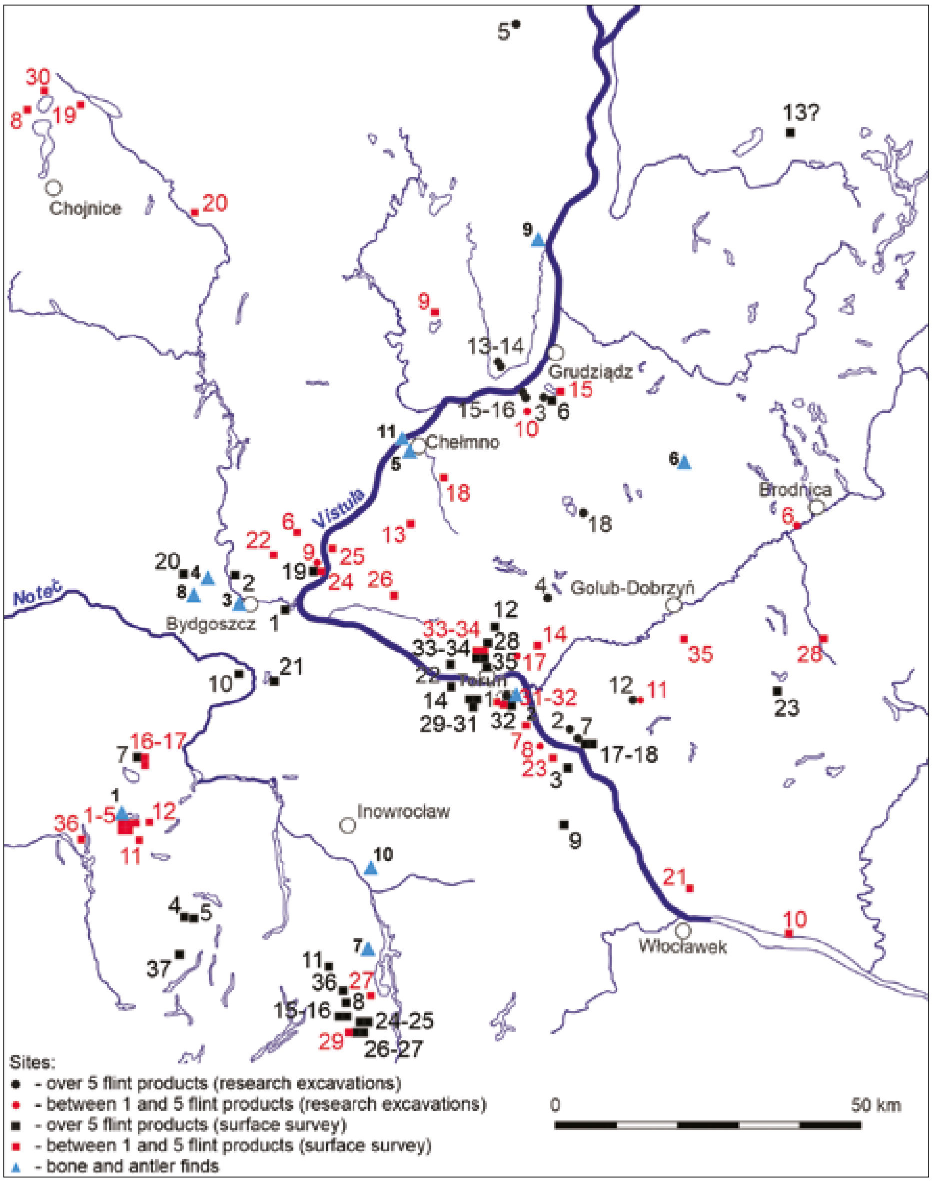

Fig. 2. The northern part of central Poland. Distribution of sites associated with the Late Palaeolithic. The numbers on the map correspond to entries in tables 1, 3–5 (according to Bielińska-Majewska 2018a with modifications, computer processing by M. Majewski).

Archaeological sources and cultural affiliation

In the northern part of central Poland, over 200 archaeological sites are known, including the complex in Brzoza (Site 50) associated with the Late Palaeolithic (Fig. 2). At these sites, mainly flint products, stone and organic objects, and recently also amber were discovered. These finds were obtained during surface surveys and excavations. Some of them are also chance discoveries.

In the northern part of central Poland, there are 11 known sites where excavations were conducted (yielding more than five Late Palaeolithic flint artefacts each), apart from the Brzoza complex, from which the largest number of flint artefacts were obtained (Tabs. 1–2). The latest discoveries in the Toruń Basin come from the complex of Site 50 in Brzoza (2015–2022). In addition to the above-mentioned complex, excavations were carried out at such sites as Dzikowo 26, Klonówka 47, Grudziądz-Mniszek III, Kamionki Duże 15, Skrzypkowo 14, Stare Marzy 4 and 5/5A, Szynych 12 and 13, Trzciano 36, or Osiek 8 (Tab. 1).

The excavated sites mentioned above are strongly varied in terms of the quantity of the acquired inventories. The richest sites are Stare Marzy 5/5A, from which a total of over 2,000 flint products were collected, and the complex in Brzoza, with over 8,000 flint products obtained until 2001 (not counting the archival collection). The excavations at the Szynych Site 13 provided 1,071 flint products.

Table 1. A list of archaeological sites with flint products discovered during excavations in the northern part of central Poland. The ordinal numbers correspond to sites in Fig. 2 (according to Bielińska-Majewska 2018a, with modification).

No.	Archaeological site	Site (number)	Type of research	Number of finds	Comments
1	Brzoza	Complex	S, R	**8792+** (research until 2001); **24000+**	(until the 1990s Toruń-Rudak); without archival collections; As of 2015 site 50 (see also table 2) (2015–2022)
2	Dzikowo	26	R	8+	–
3	Grudziądz-Mniszek	III	R	43+	–
4	Kamionki Duże	15	R	29	–
5	Klonówka	47	R	200+	–
6	Mszano	14	R	2	–
7	Osiek nad Wisłą	8	S, R	190+	–
8	Otłoczyn	1	R	4	–
9	Pałcz	5	R	1	–
10	Ruda	3-6	R	1	–
11	Skrzypkowo	13	R	1	–
12	Skrzypkowo	14	S, R	92	–
13	Stare Marzy	4	R	8	–
14	Stare Marzy	5, 5A	R	2341	–
15	Szynych	12	R	107	–
16	Szynych	13	R	1071	–
17	Toruń	327	R	1	–
18	Trzciano	36	R	30+	–
Total				**36921+**	–

S – surface survey; **R** – research excavation; **+** – means more than the given number

The latest excavations carried out at Site 50 in Brzoza[24] (2015–2022) revealed over 24,000 flint products (in several concentrations) from the preserved stratigraphic alignment and were documented in a planigraphic system.[25] (Tab. 2). In the acquired inventory, over 200 cores and over 470 flint tools were distinguished, as well as numerous chips, flakes, scales, and wastes related to various stages of flint processing. Three types of products dominate among the flint tools: tanged points, burins, and end scrapers (Figs. 3–6). Stone objects related to the processing of flint and fragments of animal bones were also found. During the latest seasons of excavation in Brzoza, amber was also discovered[26] (fragments of amber and two items, probably lumps; Fig. 6: 6). Very important for this site are the results of specialist research conducted so far, such as an analysis of the geographical environment and pedostratigraphy[27] of the site, as well as petrographic, archaeozoological,

[24] In the case of Brzoza Site 50, excavations and desk research has not yet been completed, therefore the present article discusses only preliminary findings related to the latest discoveries.
[25] Bielińska-Majewska 2021; 2022; 2023.
[26] Amber obtained from this site will be the subject of a separate publication. It is currently under analysis (author: Barbara Łydżba-Kopczyńska, PhD, Cultural Heritage Research Laboratory, Faculty of Chemistry, University of Wrocław).
[27] The analysis was performed by prof. Michał Jankowski, Faculty of Earth Sciences and Spatial Management of the NCU, who is also a regular consultant for the Brzoza excavations.

Table 2. Brzoza site 50, Toruń district. A summary of excavation surface and the number of flint products obtained within trenches excavated 2015–2022

Excavation season	**Excavation surface (m²)**	**Number of manual probing drillings**	**Number of flint materials obtained from the surface**	**Number of flint materials obtained from the trenches**	**Number of flint products (according to field inventory)**
2015	86	46	252	2615	2867
2016	43	40	82	3140	3230
2017	75	–	29	2829	2858
2018	72	18	114	3063	3185
2019	23	–	57	4118	4180
2020	25	–	38	3001	3075
2021	36	17	35	3402	3439
2022	32	–	114	1938	2052
Total	**392**	**121**	**721**	**24106**	**24886**

and traseological analyses,[28] which provide data needed for further interpretations related to the activities of the past human groups in these areas.[29]

In the area in question, there were also six excavated sites with only individual flint products (between 1 and 5) associated with the Late Palaeolithic. These include the Mszano Site 14, Otłoczyn Site 1, Pałcz Site 5, Toruń Site 327, Ruda Sites 3-6, and Skrzypkowo Site 13 (Tab. 1). All of these are chronologically associated predominantly with cultures younger than the Late Palaeolithic.[30]

In the northern part of central Poland, there are also many sites where the Late Palaeolithic flint products were obtained through a surface survey (Tabs. 3–4). Currently, 37 such archaeological sites are known (over 5 flint products each). Apart from that, there were single archaeological finds (between 1 and 5 artefacts) at 36 sites. The surface-surveyed sites vary significantly in the quantity of obtained materials. The largest number of flint tools was obtained from the following sites: Bydgoszcz-Czersko Polskie, Jeziora Wielkie 3, Kobylarnia 1, Nożyczyn 3, Osiek nad Wisłą 69 and 34, Pałcz 1,[31] Sierakowo 6, Toruń (sandhills), and Toruń-Kozackie Góry.[32] It should also be noted that the flint tools discovered at these sites were separated from the collected inventory, which also featured elements characteristic of the Mesolithic and the Neolithic.

The basic raw material used for tool making by the communities of that time in the northern part of central Poland was mainly erratic flint of various colours. The Baltic erratic flint, also known as the Cretaceous flint, is one of the frequently found raw materials at Late Palaeolithic sites in this part of Poland. In the discussed area, single products made of the imported chocolate flint were also discovered, which occurred at such sites as Bydgoszcz-Czersko Polskie, Dzikowo 26, Kamionki Duże 15, Nożyczyn 3 and 4, Sierakowo 7, Sierakówko 2, Stare Marzy 4 and 5/5A, Szynych 12, Toruń-Kozackie Góry, Toruń-Wrzosy, or Wycinki 1. Larger quantities of products made of the chocolate flint were recorded at such sites as Brzoza 50, Jeziora Wielkie 3, or Sierakowo 6. At some sites, there were also single items made of the Pomeranian flint, e.g. Brzoza 50 or Stare Marzy 5/5A. Moreover, flakes made of fine-crystalline gneiss[33] were discovered at Kobylarnia Site 1.[34] At the site of Brzoza 50, a burin (?) made of gneiss was discovered in 2018.[35]

[28] Currently, further research in this area is being conducted (author: Małgorzata Winiarska-Kabacińska, PhD, Archaeological Museum in Poznań).

[29] Bielińska-Majewska 2021; 2022; 2023; Jankowski 2017; Krajcarz 2019; 2020; 2021; 2022; Winiarska-Kabacińska 2022.

[30] Stoczkowski 1982; Maciukiewicz-Czarnecka 1972; Kobusiewicz 1999; Marciniak 1998.

[31] Without flint artefacts obtained during the AZP surface survey.

[32] Bielińska-Majewska 2018a.

[33] Petrographic identification was conducted by prof. Maciej Krajcarz, Institute of Geological Sciences Polish Academy of Science, Warsaw.

[34] Stoczkowski 1982.

[35] Krajcarz 2019.

Fig. 3. Brzoza site 50, Toruń district. Selection of flint tools discovered in 2015–2016:
1–3 – trench 3; 4–5 – trench 3B; 6–12 – trench 3C (collection of the District Museum in Toruń, photo by K. Deczyński, computer processing by M. Majewski).

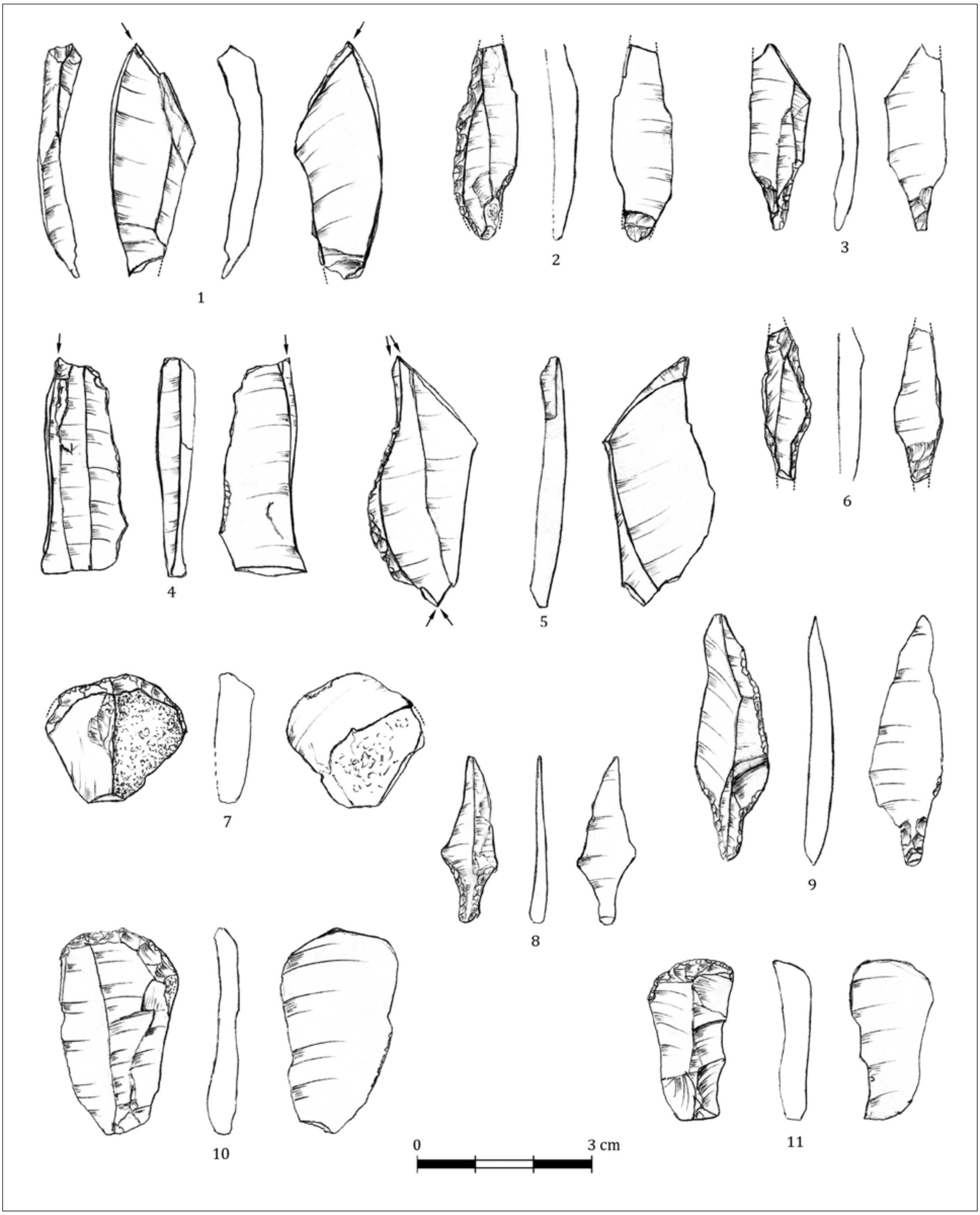

Fig. 4. Brzoza site 50, Toruń district. Selection of flint tools discovered in 2018–2019:
1–3– trench 14; 4–5 – trench 14A; 6–7 – trench 12; 8–11 – trench 15 (collection of the District Museum in Toruń, drawing by B. Bielińska-Majewska, computer processing by M. Majewski).

Fig. 5. Brzoza site 50, Toruń district. Selection of tools discovered in 2020–2021: 1, 2, 4, 5 – trench 15C; 3 – trench 15B; 6 – trench 15D; 7, 8 – trench 16; 9 – trench 17 (collection of the District Museum in Toruń, photo by K. Deczyński, computer processing by M. Majewski).

Fig. 6. Brzoza site 50, Toruń district. Selection of flint tools, cores and amber discovered in 2021: 1, 2, 4, 5, 6 – trench 15E; 3 – trench 15C (collection of the District Museum in Toruń, photo by K. Deczyński, computer processing by M. Majewski).

Stone objects include, among others, hammerstones and stone bases or fabricators made of stone other than flint. In the presented area, a small number of such items were obtained along with Palaeolithic flint products. From the northern part of central Poland, several objects made of stone are known. Among them, there are three stone hammerstones (made of quartzite and granitoid[36]) obtained during the excavations in Brzoza in 2001, a postglacial boulder with a smaller stone discovered in Szynych Site 13,[37] and a few presumed hammerstones, including two discovered at Site 5 in Stare Marzy. There is also a fabricator discovered at the site of Trzciano 36 and probably a polishing stone/fabricator (?) from the Scandinavian slate[38] discovered in Stare Marzy 5.[39]

During the last excavations at the site of Brzoza 50 (2015–2022) more than 20 items made of material other than flint were discovered. Some of them bear signs of damage and traces of anthropogenic origin. Petrographic identification[40] performed for the stone objects showed that quartzite sandstones and gneisses dominate among

[36] Specification of the raw material defined by Halina Pomianowska, PhD, NCU.
[37] Cyrek 2002.
[38] Specification of the raw material defined by Marek Kachnic, PhD, NCU.
[39] Bielińska-Majewska 2018a.
[40] Petrographic identification was conducted by prof. Maciej Krajcarz, Institute of Geological Sciences Polish Academy of Science, Warsaw.

Table 3. A list of archaeological sites with more than 5 flint products discovered during a surface survey in the northern part of central Poland. The ordinal numbers correspond to sites in Fig. 2 (according to Bielińska-Majewska 2018a).

No.	Archaeological site	Site (number)	Type of research	Number of finds
1	Bydgoszcz-Czersko Polskie	?	S	72
2	Bydgoszcz-Jachcice	10	S	7
3	Ciechocinek	4	S	7
4	Chwałowo	1	S	9
5	Chwałowo	8	S	9+
6	Grudziadz-Mniszek	?	PS	73
7	Januszkowo Kujawskie	12	S	6
8	Jeziora Wielkie	3	S	88+
9	Jeziorno	?	PS	15
10	Kobylarnia	1	S	76
11	Kozie Doły	2	S	6
12	Łysomice	?	S	26
13	Location unknown	?	PS	8
14	Nieszawka	1	S	7
15	Nożyczyn	3	S	23+
16	Nożyczyn	4	S	5+
17	Osiek nad Wisłą	69	S	65
18	Osiek nad Wisłą	34	S	157
19	Pałcz	1	S	22+
20	Pawłówek	?	S	13
21	Prądocin	1	S	9
22	Przysiek	?	L	18
23	Ruda	?	S	6
24	Sierakowo	6	S	28+
25	Sierakowo	7	S	10+
26	Sierakówko	1	S	4+
27	Sierakówko	2	S	4+
28	Toruń-Kozackie Góry	?	S	73
29	Toruń-Podgórz	1	S	27
30	Toruń-Podgórz	2	S	1+
31	Toruń-Podgórz	4	S	13
32	Toruń-PołudniowaObwodnica	8	S	7
33	Toruń-Wrzosy	1	S	5+
34	Toruń-Wrzosy	?	S	14
35	Toruń-wzgórza piaskowe	?	S	136
36	Wycinki	1	S	9+
37	Wydartowo	2	S	3+
Total				**1061+**

S –surface survey, **PS** – probably surface survey, **L** – stray find, + – means more than the given number

Table 4. A list of archaeological sites with single flint products (between 1 and 5) discovered during a surface survey in the northern part of central Poland. The ordinal numbers correspond to sites in Fig. 2 (according to Bielińska-Majewska 2018a).

No.	Archaeological site	Site (number)	Type of research	Number of finds
1	Biskupin	?	S	1
2	Biskupin	2	S	3
3	Biskupin	15	S	2
4	Biskupin	15a	S	2
5	Biskupin	17	S	1
6	Borówno	1	S	3
7	Brzoza (wieś)	?	S	1
8	Chociński Młyn	?	S	1
9	Czersk Świecki	?	S	1
10	Dobrzyń	?	PS	2
11	Gąsawa	2	S	1
12	Godawy	5a	S	1
13	Gołoty	?	S	2
14	Grębocin	?	PS	1
15	Grudziądz-Rudnik	?	S	1
16	Januszkowo Kujawskie	5a	S	1
17	Januszkowo Kujawskie	11	S	1
18	Małe Czyste	?	PS	1
19	Męcikał	3	S	1
20	Nowy Młyn	?	S	1
21	Osiek	?	PS	2
22	Osielsko	1	S	1
23	Otłoczyn	?	S	1
24	Pałcz	II	S	4
25	Rafa	?	S	1
26	Rzęczkowo	?	PS	4
27	Rzeszyn	?	S	1
28	Rypin (okolica)	?	PS	4
29	Sierakówko	?	S	3
30	Swornegacie	?	S	1
31	Toruń-PołudniowaObwodnica	3	S	3
32	Toruń-Południowa Obwodnica	9	S	1
33	Toruń-Wrzosy	2	S	1
34	Toruń-Wrzosy	3	S	4
35	Węgiersk	?	PS	4
36	Wiewiórczyn	3	S	1
Total				**64**

S –surface survey, **PS** –probably surface survey the analysed material (Figs. 7–8). One of the discovered objects was made of sedimentary rock – mudstone (Fig. 8: 2); the smoothness of its surface may be anthropogenic.

In addition, in one of the trenches of the 2022 season at Site 50 in Brzoza, a ferruginous concretion was discovered (in two fragments). According to Maciej Krajcarz,[41] this is not typical ochre, but the specimen could potentially be used to obtain a red-brown pigment (Fig. 8: 4).

From the northern part of central Poland, there are a dozen or so bone and antler objects, at least some of which can be interpreted as Late Palaeolithic (Tab. 5; Fig. 9). Most of these items are barbed harpoons, both uni- and biserial. There were also bone blades and a fragment of a hoe. Such finds as bone blades are problematic to order chronologically, as they can be characteristic of both the Palaeolithic and the Mesolithic. In resolving the issue of their chronological affiliation radiocarbon dating would be helpful. The largest number of antler and bone tools in this area is known from a limestone mine in Lisi Ogon, Site 13, which yielded: a uniserial harpoon (Törring type), three Type 13 three-edged blades as well as a reindeer antler Lyngby-type hoe.[42] From the study area, there are also tools obtained in Biskupin, Site 24, from the vicinity of Bydgoszcz, and Lachmirowice, Site 2[43]: Biskupin 24 – a fragment of a uniserial harpoon of type 12A1 according to Stefan Karol Kozłowski;[44] the vicinity of Bydgoszcz – a bone harpoon with six one-sided barbs (currently only the lower part of the harpoon head with a single row of barbs is preserved), Type 11 according to Clark[45] or, according to a different typology, type Surbajny Rękawczyn;[46] Lachmirowice, Site 2 – a biserial harpoon with a separate shaft of Type 12B.[47]

Furthermore, the literature on the subject also mentions a harpoon from the Vistula, found in the vicinity of Chełmno, which supposedly had close analogies to the harpoon from Stellmoor,[48] and a harpoon made of reindeer antlers from Książki near Jabłonowo.[49] Further items of organic materials originate from the complex in Brzoza, Bydgoszcz-Osowa Góra (Ossowo), Nowe, and Site 1 in Szarlej.[50]

During the latest excavations (2015–2022), carried out at the site of Brzoza 50, fragments of animal bones were found.[51] The obtained animal bones (over 800) were significantly fragmented and burned, which precluded precise determination of the animal species (Fig. 9: 7–8). As determined by Magdalena Krajcarz, most of the bone fragments probably came from animals the size of a reindeer/boar and a hare/fox. A bone fragment found in one of the trenches in 2018 was submitted for ^{14}C radiocarbon dating. The age of the sample was determined to be 10,370±60 years BP (cal. 12,297±189 years BP),[52] which is chronologically connected with the end of the Younger Dryas and agrees with the uncovered flint inventory.[53]

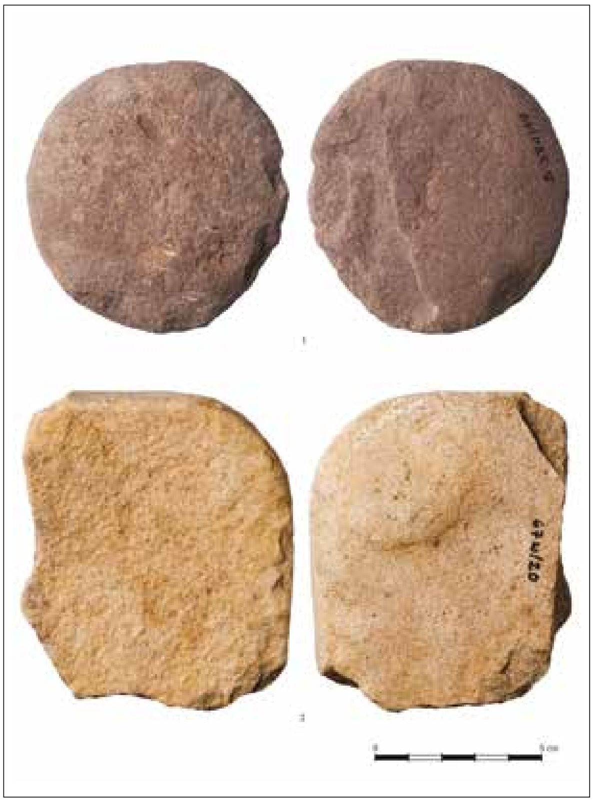

Fig. 7. Brzoza site 50, Toruń district. Selection of items made of sandstone discovered in 2017, 2020: 1 – trench 8; 2 – trench 14 (collection of the District Museum in Toruń, photo by K. Deczyński, computer processing by M. Majewski).

[41] Krajcarz 2022.

[42] Kozłowski 1920; Kostrzewski 1949; Potemski 1963; Kobusiewicz 1999; Olszewski 2010; Sobkowiak-Tabaka 2011; Bielińska-Majewska 2018a; Orłowska, Osipowicz 2019.

[43] Kozłowski 1977; Galiński 1986; Kobusiewicz 1999; Sobkowiak-Tabaka 2011.

[44] Kozłowski 1977; Galiński 1986.

[45] Clark 1936.

[46] Clark 1936; Galiński 1986; Olszewski 2006; Sobkowiak-Tabaka 2011.

[47] Kozłowski 1977.

[48] Galiński 1992.

[49] Marciniak 1998.

[50] Kozłowski 1920; Kostrzewski 1955; Galiński 1986; Kobusiewicz 1999; Bielińska-Majewska, Makowiecki 2011.

[51] The archaeozoological analysis was performed by Magdalena Krajcarz, PhD, IA NCU.

[52] Poznań Radiocarbon Laboratory (dating was funded from the Polish National Science Centre research project no. 2016/23/B/ST10/01067 "Geneza i historia rozwoju gleb Kujaw", project manager: Prof. Michał Jankowski, NCU).

[53] Bielińska-Majewska, Jankowski 2021.

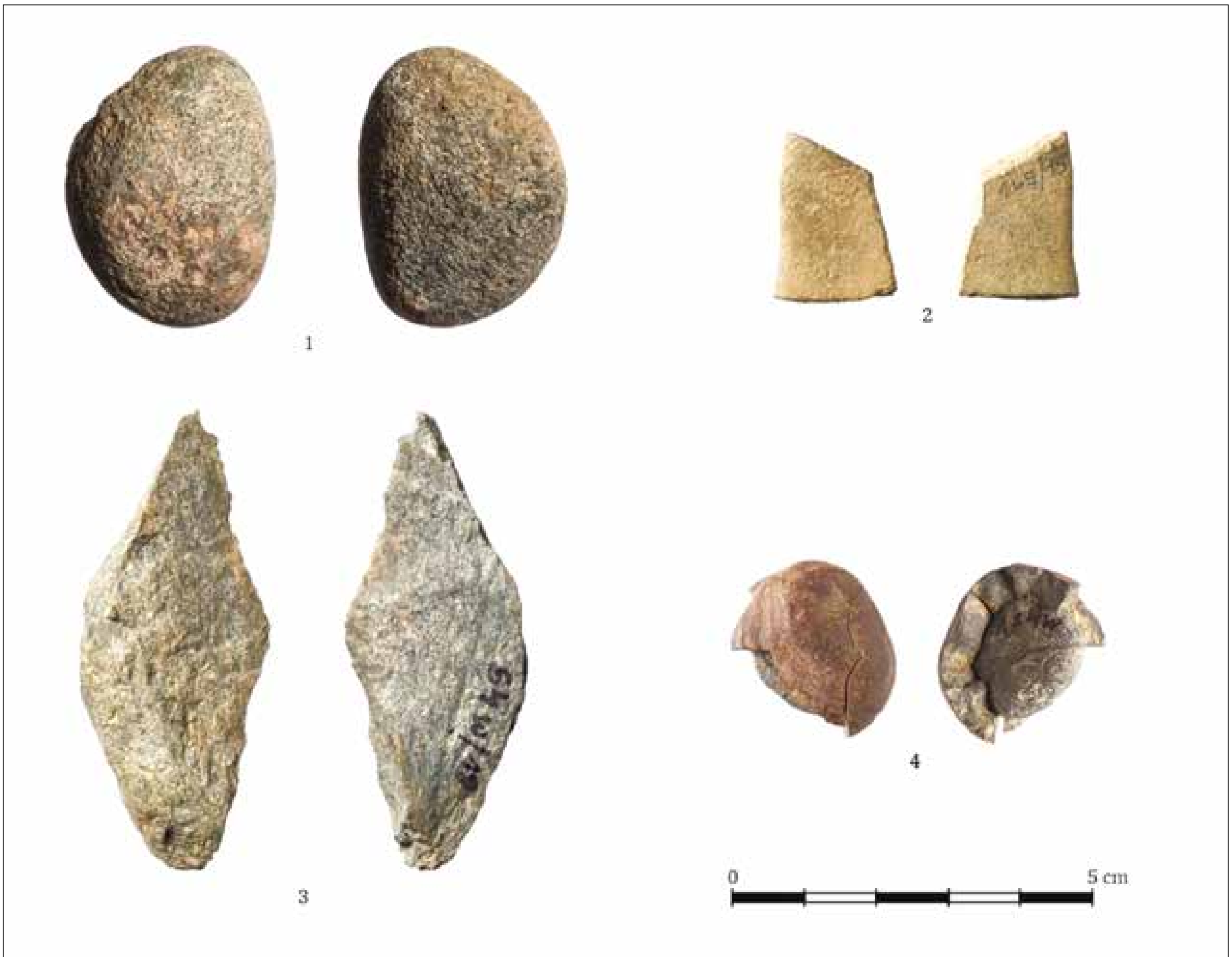

Fig. 8. Brzoza site 50, Toruń district. Selection of items made of stone discovered in 2015–2018 and – ferruginous concretion discovered in 2022: 1 – gneiss (?), 2 – mudstone, 3 – gneiss, 4 – ferruginous concretion; 1 – from the surface; 2 – trench 3B, 3 – from the surface, 4 – trench 15D (collection of the District Museum in Toruń, photo by K. Deczyński, computer processing by M. Majewski).

Among the discovered materials, M. Krajcarz was able to distinguish four bone fragments, which were defined as reindeer phalanges (Rangifer tarandus; Fig. 9: 7).

In light of current data from the northern part of central Poland, the presence of single typological flint products related to the Arch Backed Technocomplex was found only on a few of the sites examined through excavation and surface surveying. These elements occurred, among others, at such sites as Brzoza 50 (complex), Stare Marzy 5/5A, Skrzypkowo 14, Pałcz 1, and Toruń (sandhills). Most flint items typologically referring to the above technocomplex were recorded in Brzoza (complex).

The flint items obtained from the area in question are mainly associated with the Tanged Points Technocomplex, primarily with the Swiderian Culture, although there are also typological elements characteristic for the Ahrensburg Culture. Single typological Bromme[54] tanged points appeared at such sites as Brzoza 50 (complex), Bydgoszcz-Czersko Polskie, Chociński Młyn 1 (Chocimki Młyn), Męcikał 3, Pałcz II, or Toruń (sandhills). In addition, Z. Bagniewski lists two more sites (with individual Lyngby artefacts) that fall within the discussed area: Swornegacie and Czersk Świecki.[55] A flint tool (Desna shouldered point) was also discovered in the area in question, which, according to M. Marciniak,[56] can be associated with the Desna Culture. This tool was obtained during the study of the Mesolithic Site 14 in Mszano.

[54] A single Lyngby-type point was also discovered at Grabowiec, Site 6, and Brodnica during the research conducted as part of the AZP (Marciniak 1995, 42, fig. 1).

[55] Bagniewski 1997, 82, fig. 35; 1999,137.

[56] Marciniak 1998.

Table 5. The northern part of central Poland. List of sites where tools of bone and antler were discovered. The ordinal numbers correspond to sites in Fig. 2 (according to Bielińska-Majewska 2018a).

No	Locality	Find type									Total	Chronology
		Hoe mounting + interchan geable blade	**Hoe**	**Three-edged blade**	**Awl**	**Mullerup type harpoon**	**Gniewino type harpoon – with one barb**	**Uniserial barbed harpoon**	**Biserial barbed harpoon**	**Other**		
1	Biskupin	–	–	–	–	–	–	1 P	–	–	1	Late Palaeolithic
2	Brzoza (Toruń--Rudak)	–	–	–	2 P?	–	–	–	–	–	2	Late Palaeolithic ?
3	Bydgoszcz (the vicinity)	–	–	–	–	–	–	1 P	–	–	1	Late Palaeolithic
4	Bydgoszcz--Osowa Góra (Ossowo)	–	–	–	–	1 P/M	–	–	–	–	1	Late Palaeolithic / Mesolithic
5	Chełmno (the vicinity)	–	–	–	–	–	–	–	–	1 P	1	Late Palaeolithic / Mesolithic
6	Książki	–	–	–	–	–	–	–	–	1?	1	Late Palaeolithic ?
7	Lachmirowice	–	–	–	–	–	–	–	1 P	–	1	Late Palaeolithic
8	Lisi Ogon	2 P?/M	1 P	3 P/M	1? P/M	–	–	1 P	–	–	8	Late Palaeolithic / Mesolithic
9	Nowe	–	–	–	–	–	1 P/M	–	–	–	1	Late Palaeolithic / Mesolithic
10	Szarlej	–	–	–	–	–	–	–	–	1 P/M	1	Late Palaeolithic / Mesolithic ?
11	From Vistula – the vicinity of Chełmno	–	–	–	–	–	–	–	–	1 P/M?	1	Late Palaeolithic / Mesolithic ?
Total		2	1	3	3	1	1	3	1	4	**19**	

P – Late Palaeolithic, **M** – Mesolithic

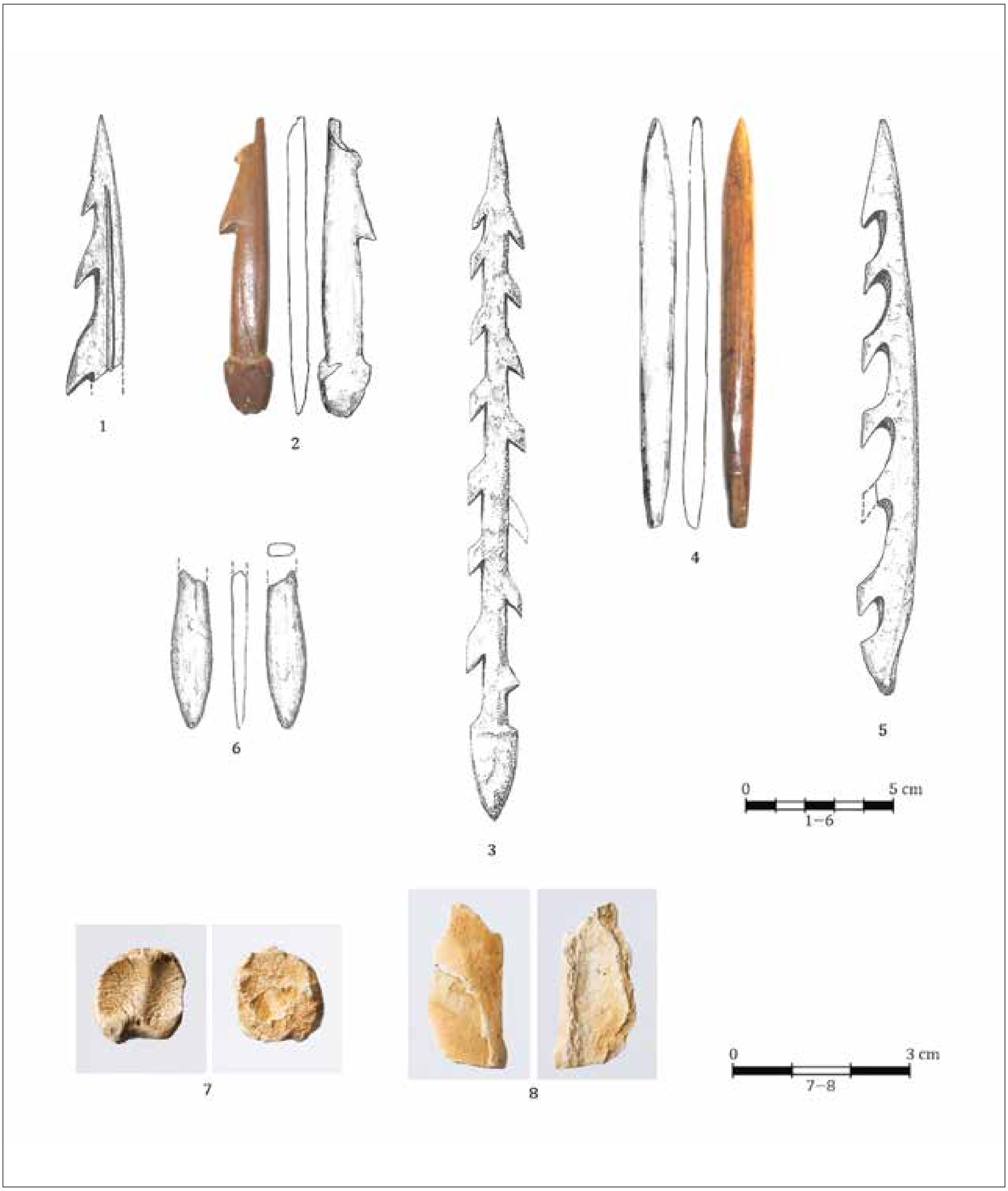

Fig. 9. The northern part of central Poland. Selection of tools from organic raw materials (bone, antlers) and an example of the state of preservation of animal bones in Brzoza site 50. Sites: 1 – Biskupin 24; 2 – Bydgoszcz (the vicinity); 3 – Lachmirowice 2; 4 – Lisi Ogon 13; 5 – Lisi Ogon 13; 6 – Szarlej 1; 7 (the proximal epiphysis of reindeer's second phalanx), 8 (unspecified long bone shaft fragment) – Brzoza 50, excavation season 2016 (1 – according to Kobusiewicz 1999, 88. Fig. XXII; 2, 4 – a collection of the District Museum in Bydgoszcz, photo by B. Bielińska-Majewska; 3 – according to Kobusiewicz 1999, 89, fig. XXIII; 5 – according to Kobusieiwcz 1999, 88, fig. XXII; 6 – a collection of the District Museum in Toruń, according to Bielińska-Majewska, Makowiecki 2011, 104, Fig. 7; 7, 8 – a collection of the District Museum in Toruń, photo by K. Deczyński; computer processing by M. Majewski).

The largest number of typological elements corresponding to the Ahrensburg inventory was found in Brzoza.[57] Furthermore, single-tanged points were also found, among others, at the sites of Januszkowo Kujawskie 12, Klonówka 47, Prądocin 1, Stare Marzy 5/5A, or Wiewiórczyn 3.

Based on the available source data, it can be said that settlements associated with the Tanged Points Technocomplex dominate in the northern part of central Poland and are linked mainly with the Swiderian groups. It should be noted, however, that in the Toruń Basin, at Site 50 in Brzoza, a significant number of points was discovered (compared to other sites in this part of the country), some of which represent tools of the Ahrensburg type, as well as single ones of the Bromme type.[58] The issue of the presence of morphologically differentiated points on selected sites and their cultural and chronological affiliation requires further verification, analysis, and discussion, especially concerning sites that were excavated and where the artefacts were discovered in a specific stratigraphic context.

Final remarks

Flint finds from the northern part of central Poland assigned to the Late Palaeolithic are mostly in the chronological range from Allerød to the end of the Younger Dryas and the beginning of the Pre-Boreal. The acquired cultural inventories are associated with communities that represent the Late Palaeolithic Arch Backed Technocomplex and the prevalent Tanged Points Technocomplex.[59]

Based on the collected archaeological sources, it can be concluded that the area in question was influenced from different directions, which is visible in the discovered flint inventories. Explicit clusters of Palaeolithic habitation traces can be distinguished around Toruń, Grudziądz, and Bydgoszcz, where the highest number of Late Palaeolithic sites was recorded.

Based on the analyses, it was established that in the northern part of central Poland, there are sites with the remains of domestic activity areas and home-based workshops. Most of the sites are located in sandy areas, the only exceptions being Skrzypkowo 14 in the vicinity of Toruń and Trzciano 36 near Grudziądz. Site 5/5A in Stare Marzy, located in the basin of the lower Vistula, was also an important place for the hunters of that time. The arrangement of preserved flint concentrations (assuming that they are contemporary to each other) with the analogy to Troniny, Site 5, on the upper Warta,[60] suggests a deliberate layout of the camp with a free space in the centre.[61]

When considering the oldest settlements in the northern part of central Poland, a special place is held by the Toruń Basin, where numerous flint items and tools associated with the communities of the Late Palaeolithic have been discovered, the latest finds, uncovered in a well-defined context in Brzoza, Site 50, are the starting point for further taxonomic and chronological determinations concerning climatic changes in this area. The relations between individual cultures within the Tanged Points Technocomplex and the issues related to the presence of flint goods associated with the Arch-Backed Technocomplex (based on technological and typological features) and their connections with other Late Palaeolithic cultures in this region are other issues to be solved. In light of current knowledge, the northern part of central Poland, and especially the Toruń Basin, seems promising for further research on the Late Palaeolithic.

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[57] Marciniak, Mroczyński 1983; Bielińska-Majewska 2018a; 2022.

[58] Bielińska-Majewska 2022.

[59] Schild 1975; Kozłowski, Kozlowski 1975; Kozłowski 1999; 2006.

[60] Cyrek 1996.

[61] Cyrek, Sudoł 2009.

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Arrowheads of the Sośnia Type – A Technological and Typological Phenomenon in Para-Neolithic Flintworking

Abstract

The Sośnia-type arrowheads are an extremely interesting example of combining distinct chronological and technological elements in a single item. These arrowheads integrate technology drawing from the Mesolithic traditions and the Neolithic way of shaping the surface, which suggests that these blades should be placed between the Mesolithic trapezoids and the Neolithic arrowheads. The function of these tools remains unknown, so the name "arrowheads" is based on a functional image derived from the Neolithic traditions. Until recently, the Sośnia-type arrowheads were considered to have been related exclusively to para-Neolithic flintworking known from sites in Podlachia, Lithuania, and Belarus. This view was verified as a result of archaeological research conducted in the first decade of the 21st century on Eneolithic sites from southeastern Poland, for example at the cemetery of the Lublin-Volhynian Culture in Książnice. The presence of para-Neolithic elements in the Lublin-Volhynian environment is not limited to the Sośnia-type arrowheads but is represented also by other categories of insets with Mesolithic features. In addition, traces of mutual influences have also been observed in ceramic vessels.

Keywords: last hunter-gatherers, Late Neolithic, Neman Culture, projectile points, Sośnia-type arrowheads, Sośnia-type tool forms, flintworking

The Sośnia-type arrowheads are one of the most outstanding of the Neman flint artefacts, belonging to the broadly defined category of points, presumably used for arming arrows. Their specific technological and typological characteristics place them between insets with Mesolithic features and arrowheads of the Neolithic or Early Bronze Age types. The first to identify and define them was Elżbieta Kempisty, who studied flint materials from the settlement of the Neman Culture in the village of Sośnia, Grajewo district, which was reflected in the name of these arrowheads. Their description was included by the researcher in her classic elaboration of cultural material from the forest zone in Mazovia and Podlachia.[1] Due to the specific technological nature of these products, their discoverer interpreted them as a kind of transitional form, combining the features of Mesolithic blade blanks with younger forms of retouch.[2] As a result of such a combination of seemingly mutually exclusive elements, a technological and typological hybrid was created, linking two separate chronological and technological ideas, i.e. the form of a Mesolithic trapeze produced of a microlithic blade with the Neolithic arrowhead with a surface retouch. In recent years, the Sośnia-type arrowheads have been repeatedly referred to in studies dealing

[1] Kempisty 1973, 31.

[2] Kempisty, Więckowska 1983, 17, 67.

with various issues related to the para-Neolithic in the territory of Poland[3] and Belarus.[4]

Until recently, the Sośnia-type arrowheads were considered products related exclusively to para-Neolithic flintworking known from sites in Podlachia, Lithuania, and Belarus. This view was verified as a result of archaeological research conducted in the first decade of the 21st century on Eneolithic sites from southeastern Poland. There, in the cemetery of the population of the Lublin-Volhynian Culture in Książnice, apart from other insets with Mesolithic or para-Neolithic features, the Sośnia-type arrowheads were also discovered.[5] This discovery provokes a particularly interesting research question, because in the light of studies on flint arrowheads clear connections emerge between some categories of products of para-Neolithic groups and the Eneolithic Lublin-Volhynian Culture.[6] It should be emphasised here that the presence of para-Neolithic elements in the Lublin-Volhynian environment is not limited to the Sośnia-type arrowheads but is represented also by other categories of insets of the Mesolithic type.[7] In addition, traces of mutual influences were observed in pottery.[8] Moreover, penetration of the Lublin-Volhynian population has been traced to areas located quite far northwards from their native lands.[9] The find from Książnice is extremely important for one more reason – as mentioned earlier, the Sośnia-type arrowheads were previously interpreted only as points used for arming arrow shafts, just like other microliths. In light of the discovery from Książnice, these artefacts could also have had other uses. The Sośnia-type arrowheads discovered there, together with other microliths, were arranged in an arch, which may indicate that they had originally been elements embedded in a segment implement.[10] Furthermore, they were made of chocolate flint, which is one of the basic raw materials used in the Lublin-Volhynian flintworking,[11] while all specimens known so far from sites of the Neman Culture were made of local Cretaceous erratic flints, which is one of the typical features of the lowland para-Neolithic production.[12] The grave goods from the Książnice complex are among the southeasternmost examples of these points outside of the previously recognised para-Neolithic territorial range of their occurrence. Despite the relatively small number of specimens discovered so far in the zone covered by the settlement of the Neman Culture (Tab. 1), based on the cartographic analysis (Fig. 1), we can assume that the Sośnia-type arrowheads are concentrated in the area to the east of the Vistula line, and their number in Poland increases while moving towards the east. Their presence in the south, in the Lublin-Volhynian settlement zone, is a separate research issue, to be addressed in another study.

Table 1. Frequency of Sośnia-type arrowheads in materials from selected sites of the Neman culture. Sośnia site 1 – according to Kempisty, Więckowska 1983; Sośnia "Swedish Bridge" according to Dziedzic 2019, Woźna Wieś site 1 – Kempisty, Sulgostowska 1991: GrądyWoniecko, site 1 - according to Wawrusiewicz *et al.* 2017.

Site	**Frequency of the Sośnia-type arrowheads**
Sośnia, Site 1	13
Sośnia „Szwedzki Most"	2
Woźna Wieś, Site 1	1
Grądy Woniecko, Site 1	5
Total amount	21

In terms of basic typological, technological, and raw material features, the Sośnia-type arrowheads produced by the para-Neolithic population constitute a distinct and relatively consistent group. This uniformity results primarily from production with the use of microlithic blade blanks with Mesolithic features and the surface retouch applied on these points – a characteristic feature of flintworking in the Neolithic and Early Bronze Age. As already mentioned, all known specimens were made of local Cretaceous erratic flints, which is one of the features of Neman flint assemblages.[13] Therefore, their identification should in principle not raise any major doubts. Despite this, even within such a consistent typological group a number of variants can be distinguished, based

[3] Kempisty 1983, 183; Kempisty, Więckowska 1983, 27, 29, 31, 43, 50, 67; Iliaszuk 1985, 159; Kempisty, Sulgostowska 1991, 37; Libera, Zakościelna 2013; Kowalewski, Przeździecki 2017, 180; Kowalewski 2019a; 2019b, as well as Lithuania Jablonskité-Rimantiené 1965, figs. 5, 18, 22; Kempisty 1983, 183; Kowalewski, Przeździecki 2017, 178.

[4] AB 1997, 5, mal. 48; Lakiza 2003, fig. 12.1–2.

[5] Zakościelna 2006a, 88; Zakościelna, Libera 2007, 260, tab. 1, fig. 2; Kufel-Diakowska, Wilk 2018, 247, 255, fig. 12.

[6] Borkowski, Kowalewski 2020.

[7] Zakościelna 2006a, 88.

[8] Gardawski 1958, 305; Gurba 1959, 14–16, fig. 5:a; 1973, 86, 87; Gajewski, Gurba 1965, 32, 33; Zakościelna 2006a, 88; Borkowski, Kowalewski 2020.

[9] Bargieł, Zakościelna 2005, 40.

[10] Zakościelna 2006b, 284; 2010, 170.

[11] Zakościelna 1996; 2006a, 88, 90; Kufel-Diakowska, Wilk 2018, 255.

[12] Borkowski, Kowalewski 2022, 266.

[13] Borkowski, Kowalewski 2022, 266.

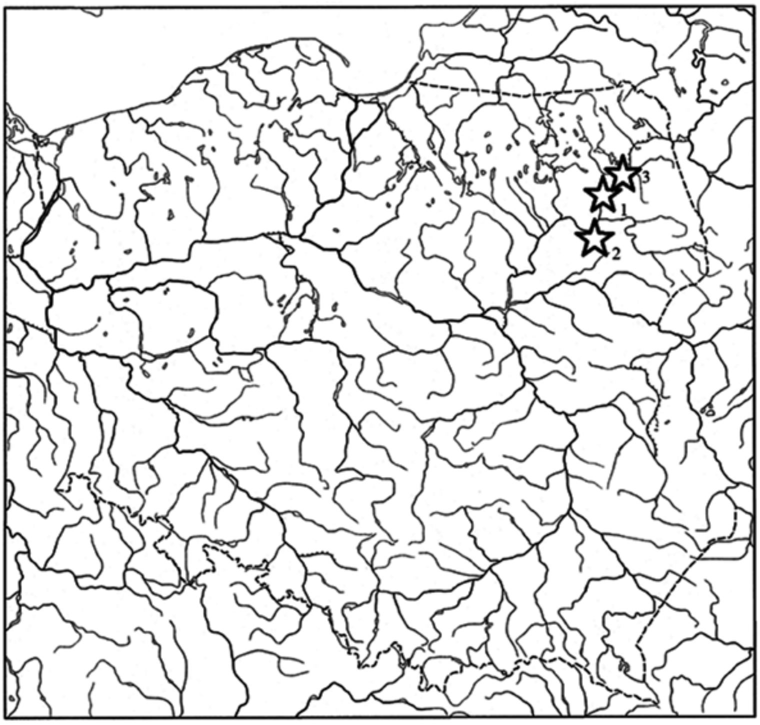

Fig. 1. Sites of the Neman culture with Sośnia-type arrowheads. 1 – Sośnia; 2 – Grądy Woniecko; 3 –Woźna Wieś.

on slightly different versions of the surface retouches and the way how they are distributed on the item. The simplest varieties of the described arrowheads resemble trapezes with a relatively flat retouch extending onto the surface.[14] Apart from the Sośnia-type arrowheads of microlithic form, there are also specimens formally approaching the typological category covering the triangular arrowheads.[15] Some of these artefacts have pseudo-trough retouches, which may suggest their younger age. It should be noted here that the classification of certain trapezes from para-Neolithic sites sometimes raises doubts. They have a relatively flat retouch, extending slightly onto the surface, which makes them formally similar to the category of Sośnia-type arrowheads.[16] Nevertheless, due to the general typological shape, they should still be treated as trapezes.

Table 2. The frequency of Sośnia arrowheads within the selected types in materials from selected sites of the Neman culture. Sośnia site 1 – according to Kempisty, Więckowska 1983; according to Więckowska, Kempisty 1970; Sośnia Szwedzki Most, according to Dziedzic 2019; Woźna Wieś, street 1 – according to Kempisty, Sulgostowska 1991; Grądy Woniecko, site 1 – according to Wawrusiewicz *et al.* 2017.

Site	**Types of arrowheads**					**Total**
	I	II	III	IV	other	
Sośnia, Site 1	1	8	2	2	–	13
Sośnia „Szwedzki Most”	–	1	–	–	1	2
Woźna Wieś, Site 1	1	–	–	–	–	1
Grądy Woniecko, Site 1	1	2	–	2	–	5
Total amount	3	11	2	4	1	21

[14] Kempisty, Więckowska 1983, pl. XVII: 3; Kempisty, Sulgostowska 1991, pl. XXX: 1.

[15] Kempisty, Więckowska 1983, pl. III: 6–8; Wawrusiewicz *et al.* 2017, pl. LVIII: 229.

[16] Kempisty, Więckowska 1983, tab. IV: 1; Wawrusiewicz *et al.* 2017, figs. III.95: 8; LXVI: 373; LXVIII: 417.

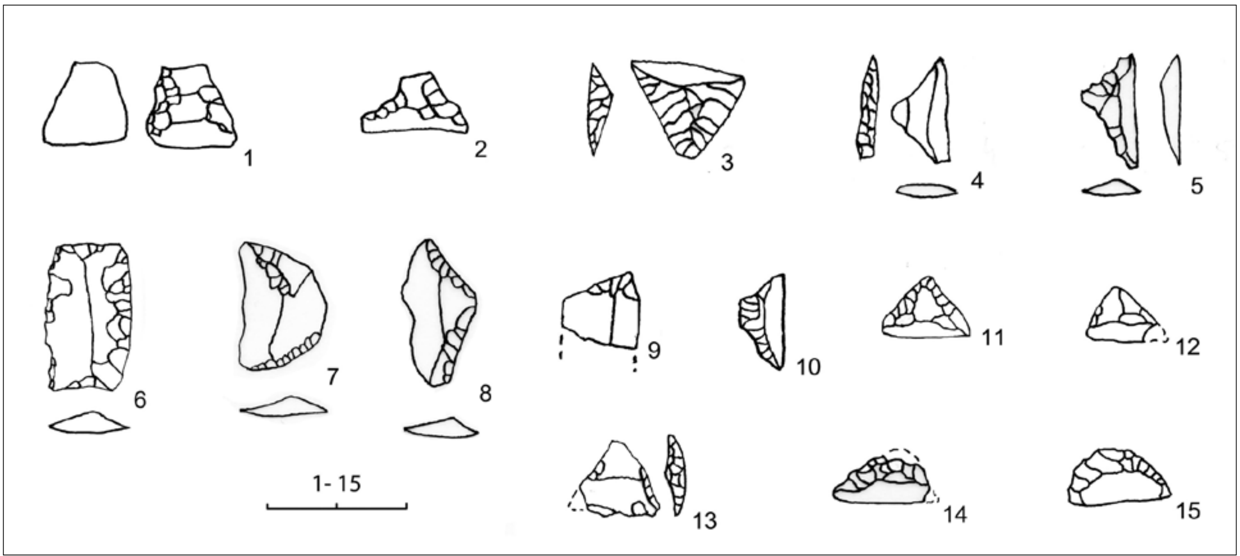

Fig.2. The Sośnia-type arrowheads from para-Neolithic sites of Poland – Woźna Wieś st. 1: 1 (according to Kempisty, Sulgostowska 1991, tabl. XXX: 1); Sośnia st. 1: 2, 9–15 (according to Kempisty, Więckowska 1983, tabl. III: 6–9; IV: 8; V: 3, 4; XVII: 3; Sośnia st. Szwedzki Most: 6–8 (according to Dziedzic 2019, tabl. 13: 21, 23; 37: 12; Grądy Woniecko st. 1: 3–5 (according to Wawrusiewicz *et al.* 2017, ryc. III. 90: 1–3).

Slightly more than twenty Sośnia-type arrowheads were analysed. Specimens from archaeological excavations of three paramount para-Neolithic sites in Poland and from the former collection of Zygmunt Gloger make up this number (Table 1). Moreover, the Sośnia-type arrowheads published by Lithuanian[17] and Belarusian researchers[18] were taken into account. Despite such a small size of the collection, it is possible to initially identify four basic types of these arrowheads. The first are products that are formally classic trapezes, but with a flat edge retouch, clearly and quite deeply extending onto the surface (Fig. 2. 1, 7, 9). The second type includes arrowheads in which the morphology is clear in the form of a trapezium, but they are covered with a retouch extending onto the surface, wherein it is located in such a way that the retouched edges are convergent, giving the product a shape similar to a triangle. Within this type, several subtypes can be distinguished. In some of them, the convergence of the retouched edges is tangential, closing in the form of a triangle top (Fig. 2. 4, 5, 8, 11, 12), on others there remains a gap, which still creates a legible shape of a trapeze (Fig. 2. 2, 13). Two basic variants can be distinguished among such specimens because some of them have straight retouched edges (Fig. 2. 11, 12, 13) whereas others have concave ones (Fig. 2. 2, 4, 5, 8, 10). The third type is represented by "crescent-shaped" forms, formally similar to the second type but shaped by a continuous retouch forming a semi-circular edge, which deprives them of a legible trapezoidal shape (Fig. 2. 14, 15). The fourth type consists of artefacts which, due to their definitely triangular form and retouches covering almost the entire surface, already formally refer to triangular arrowheads (Fig. 2. 3). Pseudo-trough retouches are most common on such specimens. It should be noted that the arrowheads of Type IV are formally similar to some Type II specimens due to their triangular shape. The only difference is the method of retouching, which in Type II is peripheral and in Type IV often covers the entire surface. Finally, it is worth mentioning one arrowhead from the site of Sośnia "Szwedzki Mos"t which eludes the framework of four separate types (Fig. 2. 6). It is most similar to the semi-circularly retouched "crescent" specimens included in Type III, but its retouched edge is straight, giving the tool a rectangular shape. Due to the size and proportions, as well as morphological features, this artefact resembles a cutting inset for a segment tool rather than a point. The common feature of specimens from all types is that they were made of blades with Mesolithic features and retouched on the dorsal surface, as in typical trapezes. Within individual types, symmetrical and asymmetric specimens can be distinguished, which is extremely interesting in light of the analysis of para-Neolithic arrowheads, because in their case this feature is clearly noticeable.[19] At the current stage of research, due to the small number of Sośnia-type

[17] Jablonskité-Rimantiené 1965, figs. 5, 18, 22.
[18] AB 1997, 5, mal. 5; Lakiza 2003, fig. 12.1–2.
[19] Kowalewski 2019a.

arrowheads, it is difficult to decide arbitrarily and definitively about the character of their typological diversity. The observed variability may result from either chronological differences or local technological customs, as well as from functional differentiation. Then, the shape of an arrowhead would have resulted even from its location in the shaft of the arrow. Nevertheless, at the moment this issue should be left open.

At the current stage of research, it is still difficult to decide what lies behind the quite distinct typological and morphological variability resulting from the range of chronological and technological features of surface retouches used in the Sośnia-type arrowheads. We are not yet able to determine whether the tangible typological differences express chronological stages or are functional.[20] Due to the technological duality of the analysed products, it is difficult to establish a clear chronological position for them. It should be assumed that, as a technological idea consisting in the production of insets from microlithic blades, these arrowheads date back to the Mesolithic Period, but at the same time they were shaped by surface retouches, typical of the Neolithic, and sometimes also by an even later variety in the form of pseudo-trough retouches considered a feature of Eneolithic and Early Bronze Age industries.[21] We cannot exclude the possibility that some of these features may be regarded as yet-to-be-specified chronological determinants reflecting evolution taking place in successive stages in the development of the para-Neolithic population. In light of the frequently cited research limitations resulting from the lack of assemblages of sources and materials coming from one developmental phase of the Neman Culture,[22] chronological ordering of these artefacts is extremely difficult. Many of the general problems and interpretative issues indicated in this analysis of the Sośnia-type arrowheads also apply to other types of points known from para-Neolithic sites.[23] On the other hand, the relative diversity of morphological and technological features can be treated as a potential expression of a functional character, which would mean that the technological and chronological differences observed in the applied retouches are apparent and related only to the function performed in a specialised economic system. At the same time, it cannot be ruled out that the observed multiplicity of the used technological solutions is associated with intra-group variability within the Neman communities. In this case, the individual variants would constitute identifiers of particular subgroups.

The presented research problems show the Sośnia-type arrowheads as artefacts potentially crucial for understanding the complexity of the para-Neolithic cultural system. The analysis of these points revealed a clear picture of recurring patterns. Despite their relatively small number, it can already be said at this stage of research that the Sośnia-type arrowheads are the most interesting category in the Neman flint instrumentarium and well-worth of further study. The genetic multi-threading of the technological elements combining the idea of a trapezoidal inset with a Neolithic arrowhead allows us to see the Neman flint industry in a new light.

Summary

The Sośnia-type arrowheads are an extremely interesting example of combining distinct chronological and technological elements in a single item. They integrate technology with Mesolithic traditions and a Neolithic way of shaping the surface, which suggests that the place of these blades should be seen between Mesolithic trapezoids and Neolithic arrowheads. We do not know the function of these tools, so the name “arrowheads” is based on a functional image derived from the Neolithic traditions. Until recently, the Sośnia-type arrowheads were considered products related exclusively to para-Neolithic flintworking known from sites in Podlachia, Lithuania, and Belarus. This view was verified as a result of archaeological research conducted in the first decade of the 21st century on Eneolithic sites from southeastern Poland, for example at the cemetery of the Lublin-Volhynian Culture in Książnice. The presence of para-Neolithic elements in the Lublin-Volhynian environment is not limited to the Sośnia-type arrowheads but is represented also by other categories of insets with Mesolithic features. In addition, traces of mutual influences have also been observed in ceramic vessels.

[20] Kowalewski 2019b, 228, 229.

[21] Libera, Zakościelna 2013, 217, 225.

[22] Gardawski 1958, 303; Więckowska, Kempisty 1970, 196; Balcer 1971, 63; Kempisty 1973, 13, 28; Kempisty, Więckowska 1983, 81, 85; Kempisty, Sulgostowska 1991, 57; Szymczak 1995, 150, 152; Kobusiewicz 1999, 153, 154; Kowalewski 2019a, 226, 227; 2022, 14.

[23] Kowalewski 2019a.

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The Story of One Burial…

ABSTRACT:

In brief, the article tells the story of the research on the famous Mesolithic grave in Janisławice – from its discovery in 1937 and the monographic publication of Maria Chmielewska in 1954; through the repeated analyses and verifying field studies of K. Cyrek in the years 1978–1995, and several expert analyses that involved modern technologies; lastly, to the exposition organised in the State Archaeological Museum (PMA) presenting, among others, the most recent findings about the assemblage from Janisławice. Many years of studies conducted by over ten researchers of various specialities verified the previous findings, confirming them for the most part. Janisławice can be interpreted as an isolated burial of a man about 30 years of age who most likely, hunting aside, was also obtaining chocolate flint in the older stage of the Atlantic period.

Keywords: Mesolithic grave, chocolate flint, grave goods

The Mesolithic grave in Janisławice is one of those archaeological sites that have been drawing the attention of many researchers for decades… It was a relay race where every scientist referred to his or her predecessor's findings while inspiring a subsequent study. Since the discovery of the grave in 1937, nearly twenty researchers of various specialities have tackled this subject.

The first one was Konrad Jażdżewski; as a representative of the State Archaeological Museum (PMA), he carried out archaeological rescue excavations in the location of the accidental discovery of the grave and immediately informed of this fact in a popular science periodical.[1]

In 1977, the author of that article had the opportunity to talk about this discovery with Professor Jażdżewski, who mentioned 40 years later that when he arrived in Janisławice, the upper part of the grave pit was destroyed. This meant that some of the finds were in a secondary deposit and some others were probably missing… This is evidenced by, for instance, several flint products, including a chocolate flint pre-core[2] discovered in the 1980s by Zofia Sulgostowska in the PMA collection; according to the identification tags made by Stefan Krukowski's hand, they came from nowhere else but the grave in Janisławice. Besides, both the raw material (chocolate flint), the form, the manufacturing technique, and the state of preservation showed huge similarities with the products from Janisławice. It was no one else but Krukowski who was supposed to become the main author of a monography concerning Janisławice that was planned, but this was interrupted by the outbreak of the war. The profound meaning of this burial, the oldest one in Poland, was addressed by Jażdżewski in the Polish and German language versions of the synthesis *Pradzieje Europy Środkowej*[3] published in 1981 and 1984. In this single-author synthesis (the last one in the history of Polish archaeology, which covered the entire prehistory – from the Lower Palaeolithic to the Early Middle Ages in Central Europe), he found a surprising analogy for the grave in Janisławice in the form of a burial in Bad Dürrenberg (Thuringen). Back then, this grave was interpreted as being related to the corded ware culture,[4] characterised by Mesolithic goods very similar to those from Janisławice.

After Professor Jażdżewski, the next archaeologist who undertook to explore this exceptional find was Maria Chmielewska, PhD (back then, an employee at MaiE, Łódź), to whom the professor entrusted further research on Janisławice in 1951.

[1] Jażdżewski 1937.
[2] Sulgostowska 1985.
[3] Jażdżewski 1981, 1984.
[4] Bicker 1936.

At that time, a source monograph[5] was created, where the author used notes produced and the information obtained by the man who discovered the site, as well as zoological expert reports (specifications on identification tags made by Professor Lubicz-Niezabitowski, verified many years later by Alicja Lasota-Moskalewska[6]) and an anthropological study by Stęślicka-Mydlarska.[7] It is a highly reliable study that contains a detailed description of the preserved grave inventory along with its analysis and interpretation. Back then, the author formulated several significant interpretative conclusions, which were mostly confirmed by subsequent researchers. The exception here was the chronology of the find dated back to the pre-Atlantic period, which back then was plausibly justified by the lack of trapezes among insets. Such a chronology was contradicted by radiocarbon dating results obtained many years later during the studies performed owing to Sulgostowska.[8] They showed that the grave was related to the Atlantic period (6580 ± 80 ^{14}C BP (Gd-2432). This is a good example of the unreliability of typological criteria on the one hand, and the verification of older interpretations owing to modern technology on the other.

Another researcher who tried to complement and verify Chmielewska's findings was the man who was writing these words. As in Chmielewska's case, this time, too, the motivation to do so came from Professor Jażdżewski, my first master. For a novice scientist, it was a wonderful adventure that spanned several years, involving fieldwork, office analyses, and a couple of publications, in which the role of the source work that presents the entire inventory available at that time was served by discontinued issues of Inventaria Archaeologica.[9] Verifying excavations conducted in the years 1979–1981 in the presence of living witnesses of the 1936 discovery[10] confirmed the individual nature of the site in Janisławice and, at the same time, provided finds that could be interpreted as evidence of chocolate flint processing near the grave. Here, it is important to mention the surface penetration carried out in the area by Maria Chmielewska and Waldemar Chmielewski, Maria Cyrek and Krzysztof Cyrek, Tadeusz Horbacz, Andrzej Kosiorek, Zbigniew Lechowicz and Andrzej Szymczak, which brought no positive results.

What sparked my highest interest was the peculiar composition of the grave inventory, which stands out among other European finds of this kind. Most of all, the refitting of a core and flakes knapped off it, along with the interpretation suggested by Chmielewska on this matter, according to which they were obtained shortly before being deposited in the grave, inspired me to check if there were possibly similar technical relations between the insets. As a result of a meticulous analysis, three pairs of insets were successfully matched. The obtained refitting provided grounds for a reconstruction of a formerly unknown way of inset manufacturing, in which one flake served for making two typologically different insets.[11] This suggested that the insets were produced shortly before being put in the gravel pit, too, which was confirmed many years later by a traceological analysis.[12] This new way of forming Mesolithic insets cast some doubts and was disputed in the literature.[13] At that time, having been granted access to the entire inventory from Janisławice, including antler artefacts solely mentioned by Chmielewska in her study, I had the opportunity to subject it to a detailed analysis, also a microscopic one. Owing to this, a conclusion was formulated that the bone products could have been personal belongings of the deceased used for a long time during his hunting and mining activities. In turn, the flint products were made shortly before being put inside the grave, perhaps during the funeral ceremony.[14] This interpretation was party questioned by Andrzej Jacek Tomaszewski,[15] who suggested an alternative interpretation for the burial in Janisławice. The chocolate flint tools might have been manufactured since the buried man had a part in obtaining and transporting the chocolate flint. Given the state of knowledge on the location of chocolate flint deposits at that time, this interpretation prompted me to reconstruct the scheme of the hypothetical distribution of that raw material.[16] The analysis of the flint inventory from Janisławice became an important element of the synthetic monograph dedicated to the extraction and use of flint raw materials in the Mesolithic in the basin of the Vistula and upper Warta.[17] The works carried out back then on the distribution of flint, chocolate flint included, were a significant element in several studies initiated by Krukowski,[18] which have been continued to this day. A good example of this is the research on chocolate flint deposits and striped flint deposits discovered in the Middle Jurassic, that is, outside the traditional area in which these flints occur.[19] In this context, an important

[5] Chmielewska, 1954.
[6] Lasota-Moskalewska *et al.* 1985.
[7] Stęślicka-Mydlarska 1954.
[8] Sulgostowska 1990.
[9] Cyrek M., Cyrek K., 1980.
[10] Cyrek 1984.
[11] Cyrek 1978, Cyrek M., Cyrek K., 1980.
[12] Pyżewicz 2013.
[13] Więckowska 1998, Cyrek 1999.
[14] Cyrek 1978, 1980, 1983.
[15] Tomaszewski, Willis 2014.
[16] Cyrek 1995.
[17] Cyrek 1983.
[18] Krukowski 1920.

research postulate would be to try to identify the region that the chocolate flint present in the grave in Janisławice comes from, which would allow us to verify the previous identifications concerning its acquisition and distribution.

A new stage in the work on the Janisławice find that involved modern technology started in 2011 with a geophysical prospection at the site carried out by Furmanek and Masojc in 2012.[20] The non-invasive studies conducted using the geomagnetic method showed no presence of other Mesolithic objects in the immediate vicinity, which seems to confirm the belief that the grave is isolated and, consequently, played an exceptional role in the chocolate flint distribution process.

The research verifying the previous findings should be considered to include a number of radiocarbon dating studies using AMS, which pertained to Mesolithic human remains from Poland, including those from Janisławice.[21] Several bone samples were dated and the analysis of the results showed that the most reliable dating of the Janisławice skeleton is that of the femur, namely, 6885 ± 30 BP, i.e., 5840–5715 cal BC. This chronology is close to that of 14C dating using the traditional method conducted years ago (cf. above) and verified it positively, at the same time confirming the Atlantic age of the find.

Some interesting results concerning the condition and the lifestyle of the Janisławice Man were brought by an anthropological re-examination using modern clinical technology.[22] The findings confirmed, among others, his continuous, strenuous physical effort that could be linked to activities related to chocolate flint excavation, as I suggested years ago.[23]

The many years of studies on the grave in Janisławice culminated in a temporary exhibition titled, *Prehistoryczny łowca. Wystawa o człowieku z Janisławic* [Prehistoric Hunter. An Exposition about the Janisławice Man] organised in PMA – the place where the famous find is stored along with a number of expert studies that were published in the exposition catalogue.[24] This publication included, among others, a highly scrupulous catalogue of all the excavated artefacts that make up the grave goods in Janisławice.[25]

To conclude, it should be stressed that there is a scientific relation between my master Professor Stefan Karol Kozłowski and Janisławice, as he distinguished a separate Mesolithic taxonomic unit that he termed the Janisławice culture.[26] When investigating Janisławice and exploring other matters in my research work, I could always count on Stefan's friendly support and professional advice.

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[21] Piotrowska *et al.* 2019.

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La question de l'Epigravettien oriental (The question of the Eastern Epigravettian)

Abstract

The designation, under the name of Epigravettian, of all industries in Central and Eastern Europe from the last glacial maximum and up to the end of isotopic stage 2, masks the variety of industries and prevents an understanding of the adaptations of hunter-gatherer societies to climate variations.

- For Eastern Europe (Dnieper, Boug and Don basins): Eastern Gravettian, Final Eastern Gravettian, Local Aurignacoid Industries (Muralovkian, Zamiatnine culture and others), Early Epigravettian of the steppe area, gap, Mezinian of the Dnieper Basin, late Epigravettian of the steppe area,
- For the northeastern foothills of the Carpathians (Dniester, Prut and Bistrita basins): Eastern Gravettian, Aurignacoid Industries, gap, Early Epigravettian (Molodovian s.s.), gap, Final Epigravettian,
- For Central Europe: Eastern Gravettian, gap, Aurignacoid Industries, gap, Sagvarian, gap, Magdalenian and Late Epigravettian.

The typological and technological studies of lithic and bone industries reveal large differences, due to strong changes in human systems during the last glacial maximum. The mere presence of backed bladelets (which also exist in the Solutrean, Badegoulian and Magdalenian cultures in Western Europe) is not sufficient to cluster these industries under the same name of Epigravettian. So, we propose to give different names to these different industries.

Keywords: Eastern Europe, Upper Palaeolithic, Epigravettian

Résumé

La dénomination, comme Epigravettien, de toutes les industries d'Europe centrale et orientale du dernier maximum glaciaire et jusqu'à la fin du stade isotopique 2, masque la variété des industries et empêche une compréhension des adaptations des sociétés de chasseurs-cueilleurs aux variations du climat.

La mise à jour des dernières données disponibles et publiées met en évidence la chronologie suivante:

- pour l'Europe orientale (bassins du Dniepr, du Boug et du Don): Gravettien oriental, Gravettien oriental final, Industries aurignacoïdes locales (Muralovkien, culture de Zamiatnine et autres), Épigravettien ancien de la zone des steppes, Mézinien du bassin du Dniepr, Epigravettien récent de la zone des steppes,
- Pour le piémont nord-est des Carpates (bassins du Dniestr et du Prut): Gravettien oriental, Industries aurignacoïdes, lacune, Epigravettien ancien (Molodovien s.s.), lacune, Epigravettien final,
- pour l'Europe centrale: Gravettien oriental, lacune, Industries aurignacoïdes, lacune, Sagvarien, lacune, Magdalénien et Epigravettien récent.

L'étude typologique et technologique des industries met en évidence de grandes différences dans ces industries, dues à des changements drastiques des systèmes humains durant le dernier maximum glaciaire. Et la seule présence de lamelles à dos (qui existent aussi dans le Solutréen et le Magdalénien en Europe occidentale) n'est pas suffisante pour désigner ces industries sous le même nom d'Epigravettien. Nous proposons donc de donner des noms différents à ces différentes industries.

Mots-clés: Europe orientale, Paléolithique supérieur, Épigravettien

1. Introduction

Depuis les années 1980, les connaissances des peuplements en Europe centrale et orientale entre 22 000 BP et 13 500 BP ont fortement progressé. Les datations ^{14}C sont devenues plus nombreuses, mais aussi plus contradictoires.[1] Les contextes stratigraphiques sont mieux connus grâce à l'étude approfondie des séquences de lœss et de leurs sols fossiles,[2] en bonne corrélation avec une paléoclimatologie générale.[3] L'étude des industries dans un contexte européen et plus seulement national permet des rapprochements et des comparaisons, rendant plus claire l'évolution des peuplements aussi bien sur un plan chronologique que territorial.[4] La prise en compte simultanée de ces nouvelles informations rend possible l'élaboration de synthèses permettant de reconstituer une paléogéographie humaine du paléolithique supérieur.[5]

Depuis les années 1990, les difficultés de la période postsoviétique ont entrainé des réductions budgétaires qui ont limité les opérations de terrain. Les fouilles ont continué mais avec des moyens plus réduits, sauf exception. Des collaborations internationales ont démarré, notamment à Gontsy (Ukraine), à Kostienki (Russie), à Mitoc (Roumanie), à Temnata (Bulgarie) et à Cosaoutsy (Moldavie). En conséquence, les études sur la culture matérielle, les études archéozoologiques et les synthèses se sont multipliées.

En Ukraine, un programme de datation radiocarbone a été lancé dans les années 2000, dans le cadre de la collaboration franco-ukrainienne pour les fouilles du site de Gontsy, pour dater des sites du maximum glaciaire dans la zone des steppes du sud de l'Ukraine, et dont plusieurs résultats inédits sont cités ici.

2. La fin du Gravettien en Europe vers 22 000 BP

Entre 22 000 et 20 000 BP, dans toute l'Europe moyenne, on assiste à une disparition du peuplement gravettien par reflux vers le Sud de l'Europe. Des régions entières sont abandonnées, comme la moitié nord de la France, la Belgique, l'Allemagne, l'Autriche, la Moravie, la Pologne, la Hongrie, la Slovaquie, la plus grande partie de l'Ukraine et de la Russie, la Roumanie, la Bulgarie. Partout dans ces pays, dans les stratigraphies une lacune d'au moins 2 000 ans sépare la dernière occupation gravettienne, vers 22000 BP, des réoccupations suivantes.

En Europe occidentale, le peuplement gravettien est marqué par un repli général vers la côte méditerranéenne occidentale et la péninsule ibérique à partir de 22 000 BP. Le Gravettien final est caractérisé par le faciès anciennement appelé Protomagdalénien.

En Europe méditerranéenne, le Gravettien évolue localement vers un Épigravettien ancien sur le golfe Adriatique. Dans la longue séquence de Paglici (Pouilles), il n'y a pas de lacune stratigraphique ni de rupture dans les datations ^{14}C et la typologie révèle une évolution continue des industries (séquence gravettienne continue de 28 000 à 20 000 BP). L'utilisation du terme Épigravettien (que G. Laplace avait qualifié antérieurement de Tardigravettien en 1966) y est donc parfaitement justifiée.[6]

En Europe centrale, le Gravettien est présent à partir de 24 000 BP avec le faciès du Gravettien récent à pointe à crans (faciès de Willendorf-Kostienki) ou Gravettien oriental. Cependant, les informations disponibles concernant l'existence d'un Gravettien final en Europe centrale sont peu fiables, voire inexistantes. Les sites candidats sur des bases typologiques ou sur des dates plus jeunes que 22 000 BP, sont vieillis par de nouvelles datations[7] comme à Lubna VI en Bohème[8] autour de 23 000 BP ou à Jeneralka autour de 22 000 BP. Il serait cependant aussi bien possible d'imaginer l'existence encore non découverte d'un Gravettien final comme en Europe orientale que de conclure à son départ précoce due à la péjoration climatique plus rapide dans la plaine de Pannonie du fait de l'extension maximale de l'inlandsis. Dans les deux cas, les données argumentent l'hypothèse d'un abandon complet du territoire à la fin du Gravettien.

En Europe orientale, le peuplement Gravettien récent est présent sur le territoire de la grande plaine avec le Gravettien à pointes à cran de Kostienki (Kostienkien) ou Gravettien oriental, identique et contemporain à celui d'Europe centrale.[9] Il est présent dans le bassin du Don (Gagarino, Kostienki), le bassin de la Desna (Khotylevo 2, Avdeevo, Berdysh). Le site le plus septentrional connu aujourd'hui est le site de Zaraïsk, sur le bassin de l'Oka, affluent de la rive droite de La Volga (mais situé aussi non loin des sources du Don). Ces industries du Gravettien oriental présentent une variabilité qui a fait l'objet d'une synthèse récente.[10]

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[1] Damblon, Haesaerts 1997; Sinitsyn *et al.* 1997; Sinitsyn 1999; Djindjian 1999b.

[2] Ivanova 1959; 1987; Velichko 1981; Haesaerts 1990; Haesaerts *et al.* 2003.

[3] Dansgaard *et al.* 1993.

[4] Otte 1981; Kozlowski 1986; Grigoriev, Gvosdover 1977; Iakovleva 2016.

[5] Djindjian *et al.* 1999.

[6] Djindjian 2003, note 1; Palma di Cesnola 1993; Montet-White, Kozlowski 1983; Palma di Cesnola, Bietti 1983.

[7] Wilczynski *et al.* 2020.

[8] Sida 2016.

[9] Anikovitch 1998.

[10] Sinitsyn 2007.

Dans le bassin du Dniepr, le Gravettien semble plus rare, sans doute seulement en apparence. Les sites russes du bassin de la Desna, Khotylevo II (sur la Desna), Avdeevo (sur la Seim, affluent de la Desna) et Berdysh appartiennent au bassin supérieur du Dniepr. Coté ukrainien, plusieurs sites sont cependant connus, notamment les sites de Pouchkari sur la Desna (cf. *infra*) et de Klyusi,[11] attribués à un Gravettien final (cf. *infra*).

Plus au Sud, entre Boug méridional et Dniepr, le site de Troyanove 4[12] appartient à une occupation régionale (Vladimirovka, 7, 8; Ozerove) qui présente des affinités avec le Gravettien de la vallée du Dniestr.

Au Sud-est, dans le bassin du Severski-Donetz en pré-Azov, il faut signaler le probable site d'Iami avec une date alors trop jeune et, en Crimée, le site de Zaskalnaya IX[13] et le site stratifié en abri de Buran-Kaya III.[14]

Dans le bassin du Dniestr, les industries de Molodova V (niveau 7), de Korman IV (niveau 7) et plus récemment de Dorochivzi III (niveau 6) appartiennent également au techno-complexe du Gravettien récent d'Europe orientale. Mais les séquences les mieux connues font apparaître des occupations discontinues. À Molodova V, couche 7 ou à Korman IV, couche 7, le Gravettien le plus récent est daté entre 23 000 et 25 000 BP. À Molodova V, couche 6 et à Korman IV couche 5, les niveaux postérieurs sont datés de 17 000 à 18 500 BP, soit une lacune de près de 5 000 ans.[15]

La position chronologique du Gravettien oriental le situe entre 25 000 et 22 000 BP, fourchette qui se précise avec la multiplication de nouvelles datations ^{14}C AMS.[16] En conséquence, le peuplement du Gravettien oriental a une durée courte, comme son équivalent d'Europe centrale (Willendorfien), et lui est contemporain, confirmant l'existence d'une vaste région de peuplement couvrant la grande plaine orientale, le bassin du Dniestr, la petite Pologne, la Moravie, la Basse-Autriche et la Slovaquie entre 25 000 et 22 000 BP.

Le Gravettien final de Pouchkari

Les sites pouvant être rattachés à ce faciès sont situés autour de Novgorod-Severskii sur le bassin de la Desna: Pouchkari, Pogon, Novgorod-Severskii. Á Pouchkari I, les dernières datations radiocarbone GIN (21 100 et 22 350 BP) placent ces sites à la fin du Gravettien. L'industrie est caractérisée par la présence de pièces à dos convexe obtenues par troncature oblique, la pointe d'Anosovka, au sein d'un outillage dominé par les burins et les troncatures. Les fouilles menées depuis une trentaine d'années par V. Belaeva[17] ont fait l'objet de nouvelles études et publications.[18] Les structures d'habitat correspondent à un ensemble de petites zones d'habitations circulaires contiguës, qui ont fait abandonner le modèle d'habitat défini par Rogachev sous le nom d'Alexandrovskaia-Pouchkari. L'industrie de Pouchkari (comme celle de Kliusy) a récemment fait l'objet d'une comparaison avec les sites de Kostienki 21 couche III et Kostienki 11 couche II,[19] qui confirme l'attribution de cette industrie à un Gravettien final.

L'existence d'un Épigravettien ancien à Kostienki a été récemment proposée[20] sur la base d'une révision de la distribution spatiale de couche III de Kostienki 21,[21] en séparant, en deux ensembles culturellement différents, la zone de l'habitat des zones d'activités: pointes d'Anosovka du Gravettien final versus pointes de Gmelin (petites pointes à cran d'une dimension moitié des pointes de Kostienki) pour un Epigravettien ancien. Il est imprudent de définir un nouveau faciès chronologique en se basant sur un niveau III épais de près de 40 cm, qui serait donc le résultat *de facto* d'un mélange ou d'une stratigraphie mal observée durant les fouilles. Cette proposition doit donc rester hypothétique en attendant de la baser sur un niveau intègre en stratigraphie et daté.

Un Tardigravettien à Zaraisk?

Le site de Zaraisk a fait l'objet de fouilles récentes[22] qui ont conclu à la présence d'un site multi-loci avec plusieurs occupations gravettiennes sans changement typologique datées entre 23 000 et 15 600 BP mais avec deux occupations principales, la première autour de 23–21 000 BP et la seconde autour de 20 000 BP. Une dernière occupation beaucoup plus récente vers 17 000 BP a été trouvée dans un sol fossile. Des discussions controversées se sont faites jour à propos de la stratigraphie de ce site, perturbée par des processus périglaciaires, comme il arrive généralement dans les sites de hautes latitudes: «*Une grande dispersion des datations par radiocarbone et de nombreux détails microstratigraphiques posent le problème de la durée d'occupation du site…20 dates entre 15 600*

[11] Vasiliev 2019.

[12] Zaliznyak *et al.* 2010.

[13] Kolosov *et al.* 1990; cf. note 2.

[14] Yanevich 2014.

[15] Chernysh 1961; 1973; 1977.

[16] Djindjian 2003, note 2 pour la discussion sur un histogramme de dates dû à l'effet de la pollution non éliminée des échantillons.

[17] Belaeva 1997; 2000; 2002.

[18] Demay *et al.* 2016; Vasiliev 2019; 2020.

[19] Reynolds *et al.* 2019.

[20] Lisitsyn *et al.* 2019.

[21] Reynolds *et al.* 2019.

[22] Amirkhanov 1998a; 1998b; 2000; 2009.

± *300 (GIN-3700) et 23 000 ± 400 (GIN-8397a) ont été obtenues* ».[23] Il apparaît que plusieurs interprétations puissent être données : soit il s'agit de plusieurs niveaux d'occupation réellement datés entre 23 000 et 17 000 BP, démontrant la perduration d'un peuplement Gravettien sans changement typologique pendant six mille ans (ce qui est la position des archéologues travaillant sur le site, en particulier S. Lev), soit il s'agit de niveaux d'occupations du Gravettien oriental datés entre 23 000 et 21 000 BP (en éliminant les dates trop récentes), suivis d'une courte occupation saisonnière vers 17 000 BP, résultant d'une incursion estivale de groupes humains localisés plus au Sud. Cette courte occupation saisonnière plus récente, qui est située dans un sol fossile qui correspond à un épisode bien connu des séquences des lœss d'Europe orientale, a été particulièrement bien observée dans les années 2010 dans le locus B.[24] L'argument principal pour une occupation permanente sur 6000 ans est que l'industrie du locus B plus récent est annoncée comme une industrie du Gravettien oriental. Néanmoins, la présence de lamelles à dos tronquées et l'absence de pointes à cran a été signalée. La question que cette industrie soit gravettienne ou épigravettienne doit donc être clairement posée.

3. Le climat de l'Europe au maximum glaciaire (22 000–17 000 BP)

Entre 22 000 BP et 17 000 BP, le dernier maximum glaciaire (LGM) est une période très froide entrecoupée d'épisodes plus humides,[25] anciennement désignés en Europe occidentale sous le nom de Laugerie (20 000-19 000 BP) et Lascaux (18 000–17 000 BP). Si cette terminologie proposée par Arl. Leroi-Gourhan sur la base de diagrammes polliniques contestés a été abandonnée, ces épisodes sont cependant bien réels. Ils sont connus en Europe centrale et orientale sous la forme de sols fossiles dans plusieurs séquences de lœss (les sols Cos VI et Cos V) comme à Molodova V,[26] à Cosaoutsy[27] ou à Dorochivzi III[28] dans le bassin du Dniestr. Ces épisodes humides favorisent le retour d'une végétation arborée et créent un environnement plus favorable aux zoocénoses animales que l'homme exploite par des réoccupations courtes, marquées par des camps saisonniers estivaux ou par des adaptations avortées ou réussies de peuplement permanent.

4. L'entrée dans le dernier maximum glaciaire (vers 21 000 BP)

L'entrée dans le maximum glaciaire voit un changement significatif dans les industries à partir d'un substrat gravettien qui s'était déjà régionalisé du fait du cloisonnement géographique et adapté à la conséquence climatique de l'arrivée vers le maximum glaciaire. Ce changement affecte l'ensemble du continent européen, avec des traits technologiques différentiés mais surtout avec des traits technologiques communs, que les préhistoriens s'accordent à définir comme aurignacoïdes, phénomène dont nous avions révélé l'existence il y a plus de vingt cinq ans.[29]

En Europe occidentale (France/Espagne/Portugal), l'entrée dans le maximum glaciaire est marquée par les industries du Protosolutréen (ex-Aurignacien V) et du Solutréen ancien.[30]

En Europe centrale, des industries aurignacoïdes sont connues entre 20 000 et 18 000 BP en Basse-Autriche: Langmannersdorf,[31] Albendorf, GrossWeikersdorf; en Moravie: Stranska Skala IV, Urcice,[32] en Slovaquie: Kasov,[33] Cejkov et en Hongrie, Arka.

Dans les Balkans, une industrie aurignacoïde avec lamelles à dos, parfois hypermicrolithiques est connue dans la grotte n°1 de Klissoura en Argolide.[34]

Dans la zone des steppes, en Pré-Azov, une industrie aurignacoïde, datée entre 21 000 et 19 000 BP, est également présente à Muralovka[35] et Saggaidak I.[36] On peut rattacher à la même tradition le site de Zolotovka.[37] La particularité de cette industrie qui ne comporte pas de lamelles à retouche abrupte mais des lamelles à retouche marginale, est parfois individualisée sous le nom de Muralovkien.

Plus récemment, plusieurs sites à industrie aurignacoïde ont été découverts: en Ukraine, sur le bassin moyen du Dniepr, à Gordashivka, dans la région de Cherkassy,[38] en Moldavie à Rachkov VII[39] et en Roumanie, à Girgiu-Malu Rosu, non loin de Bucarest.[40]

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[23] Sinitsyn 2007, 186.
[24] Lev, Es'kova 2012; 2016.
[25] Bosselin, Djindjian 2002.
[26] Ivanova 1959; Haesaerts *et al.* 2003.
[27] Haesaerts *et al.* 1998.
[28] Kulakovska *et al.* 2015.
[29] Djindjian 1996.
[30] Djindjian 1999a.
[31] Angeli 1952–53; Umgeher *et al.* 2010.
[32] Correspondant à l'Èpiaurignacien de Oliva 1996.
[33] Banesz *et al.* 1992.
[34] Kouzoumelis *et al.* 2001.
[35] Praslov, Philippov 1967.
[36] Smolaninova 1990.
[37] Praslov *et al.* 1980.
[38] Gladkikh *et al.* 2010.
[39] Grigorieva, Ketraru 1973; Ketraru *et al.* 2007; Sapozhnikov *et al.* 2007.
[40] Alexandrescu *et al.* 2004.

Le site de Radomyshl (région de Jytomyr, Ukraine) fouillé par Shovkoplass en 1957 et 1959, est un site unique en Europe orientale. Son industrie a été attribuée à une industrie de transition, à l'Aurignacien, à un Èpiaurignacien, à un faciès particulier du Gravettien oriental[41] sans qu'aucune évidence ne s'impose réellement. Les datations peu sûres, autour de 19 -20 000 BP, sur du matériel osseux mal conservé d'un niveau archéologique situé à faible distance de la surface, se rapportent au maximum glaciaire. L'industrie présente une allure gravettienne par la qualité et la diversité de techniques des burins, quelques grattoirs carénés qui sont des nucléus à lamelles, mais ne possède ni pointe de la Gravette, ni lamelle à dos ni pointe à cran. Il pourrait s'agir d'une industrie du maximum glaciaire dont l'équivalent serait à rechercher dans des sites d'Europe centrale comme Langmannersdorf en Basse-Autriche qui présente les mêmes structures en os de mammouths, ou en Russie, dans la culture de Zamiatnine (cf. *infra*).

Dans le bassin du Don, à Kostienki,[42] la culture de Zamiatnine, représentée par les sites de Kostienki 2, 3, 11 (Ia) et 19, et les célèbres structures d'habitat de type Anosovka, est caractérisée par une industrie où les pièces esquillées dominent, avec nombreux outils sur éclat, surtout grattoirs et burins, des pièces d'allure aurignacoïde, et de rares pièces à retouche abrupte, avec base aménagée.[43] Les fouilles très récentes,[44] qui ont permis de découvrir une troisième structure d'habitat, ont également fourni de nouvelles datations fiables qui confirment l'ancienneté de cette occupation qui se place au début du dernier maximum glaciaire avec six datations radiocarbone autour de 20 600 BP. Les trois structures d'habitat circulaires de grande superficie découvertes à Kostienki 11 Anosovka 2 révèlent une architecture originale avec un muret en os de mammouths de pourtour de grand diamètre (paroi faisant office de protection, de fermeture et de coupe-vent?), une zone d'activités et une habitation centrale. Il faut cependant faire remarquer que le maximum de l'inlandsis se trouvant en Europe centrale, les régions périphériques (Europe occidentale avec le Solutréen) et la partie la plus orientale de l'Europe orientale (bassin du Don et de la Volga) pourrait permettre une réoccupation plus précoce au maximum glaciaire.

Cette entrée dans le dernier maximum glaciaire marque une déstabilisation des groupes humains face à la perte des territoires de chasse et des gites d'approvisionnement en bon silex. Elle se traduit dans la culture matérielle par le développement du débitage lamellaire (dont les résidus de nucléus à lamelles donnent cet aspect aurignacoïde à l'industrie) et des pièces esquillées, tout en conservant une diversité des burins qui ne sont qu'une autre solution technique pour produire des lamelles, avec la présence significative de lamelles à dos.

La question se pose donc de trouver un nom pour désigner ces industries. Leurs caractéristiques aurignacoïdes sont en fait dues non pas à de réels traits aurignaciens, mais au développement d'une technologie de débitage de nucléus à lamelles. Ce processus de différentiation présent sur une grande partie du territoire européen semble plutôt lié à des changements de stratégie d'approvisionnement en matières premières qu'à une tradition culturelle homogène. Les peuplements sont en outre distants les uns des autres et les industries traduisent des différentiations locales.

Si le terme d'Épigravettien pas plus que le terme d'Épiaurignacien ne sont adaptées pour désigner ces industries (pas plus que le terme d'Epigravettien aurignacoïde que nous avions proposé en 1997), comme jadis le Solutréo-gravettien ou le Solutréo-aurignacien du Levant espagnol, le choix d'un terme unique ne semble pas non plus adéquat. Le terme d'industries aurignacoïdes du dernier maximum glaciaire semble, même provisoirement, le mieux adapté à l'état actuel de nos connaissances.

D'autres industries aurignacoïdes sont présentes à partir de 18 500 BP comme le Badegoulien en Europe occidentale ou le Sagvarien en Europe centrale. Cependant, l'imprécision de nombreuses datations radiocarbone et l'absence de stratigraphies longues, empêchent parfois de diagnostiquer si le site appartient aux premières vers 21 000 BP ou aux secondes vers 18 500 BP.

5. Les zones de peuplement en Europe orientale au maximum glaciaire (20 000–17 000 BP)

Le modèle de peuplement général correspond à un abandon total des territoires de l'Europe moyenne, puis à une occupation saisonnière estivale dans des zones et dans des épisodes climatiques plus favorables et enfin à occupations permanentes par des adaptations au climat glaciaire.

Dans la zone des steppes du pourtour septentrional de la mer Noire (alors un lac), un Epigravettien ancien est présent autour de 19 000 – 18 000 BP avec de nombreux sites dont les mieux connus sont Amvrosievka[45] et Anetovka II.[46] La région a fait l'objet de plusieurs synthèses, dont la thèse de S. Smolaninova[47] sur le bassin du

[41] C'est dans sa thèse, la proposition de Kononenko 2018.

[42] Praslov, Rogachev 1982.

[43] Bessudnov 2019.

[44] Pryor *et al.* 2020.

[45] Krotova 1996.

[46] Stanko *et al.* 1989.

[47] Smolaninova 1990.

Boug méridional, d'I. Sapozhnikov[48] sur l'embouchure du Dniestr, d'Olenkovski[49] sur l'embouchure du Dniepr. Cette zone des steppes, où de nombreux sites ont sans doute été engloutis par la transgression de la mer Noire, a été une zone de refuge permanente des populations gravettiennes pendant le maximum glaciaire. Nous avons proposé une première synthèse de ces peuplements en 1997 et complétée en 2006.[50] L'industrie est caractérisée par une industrie laminaire avec une abondance des burins et de pièces à retouche abrupte et semi-abrupte (pointe longue et fine d'Amvrosievka, microgravettes d'Anetovka).

Dans le bassin du Dniestr, un peuplement important est présent sur la période 19 000 – 17 000 BP, avec de nombreux sites répartis aujourd'hui en Ukraine: Molodova V, couches 4, 5, 6; Korman IV, couche 5,[51] et Bolshaia Akkarjah;[52] en Moldavie: Cosaoutsy,[53] Rachkov VII[54] et en Roumanie moldave.[55] Les industries présentent cependant toujours une forte composante gravettienne (pointes de la Gravette, pointes à dos convexe, éléments tronqués). La présence de ces chasseurs de renne semble s'étendre sur l'ensemble du piémont Nord-est des Carpates: plateau de Volhynie (Lipa), vallée du Dniestr moyen (Molodova V, Korman IV,[56] Cosaoutsy,[57] Climauti),[58] vallée du Raout, affluent du Dniestr en Moldavie (Ciutulesti I), embouchure du Dniestr (Bolshaia Akkarjah),[59] vallée du Prut (Crasnaleuca, Cotu-Miculinti),[60] vallée de la Bistrita (Poiana Cireşului, Bistricioara-Lutarie III, Lespezi-Lutarie)[61] et vallée du Seret, et former une tradition culturelle bien définie. Le terme de Molodovien, proposé pour désigner toutes les industries de Molodova de la couche 10 à la couche 1, pourrait être mieux utilisé pour désigner seulement les industries des couches 4, 5, 6, et la tradition culturelle de cette région au maximum glaciaire.

La contemporanéité des sites et la similarité des industries de la zone des steppes et du Molodovien, semble mettre en évidence un territoire commun, spécialisé dans la chasse au bison (et au cheval) dans la zone des steppes et dans la chasse au renne (et au cheval) dans le bassin du Dniestr à la bonne saison.

Le bassin du Dniepr en Ukraine semble par contre délaissé, à cette époque. S'agit-il seulement de lacunes dans nos connaissances ou d'un abandon total ou saisonnier du territoire? Un exemple intéressant à ce titre est le site de plein air à plusieurs loci de Byki[62] sur la rivière Seim, affluent de la Desna, en Russie non loin d'Avdeevo. Le site est daté de la fin du LGM avec des dates autour de 18 à 17 000 BP. Il s'agit de camps de chasse de courte occupation caractérisant des remontées estivales de peuplements plus méridionaux. L'industrie lithique, avec de nombreuses pointes et lamelles à dos, mais aussi des triangles scalènes, se rapproche des sites épigravettiens anciens de la Mer Noire.

Le site de Siuren en Crimée a fait l'objet de nombreuses fouilles: Merejkovski (1879–1880), Bonch-Osmolovski (1926–29), jusqu'aux reprises récentes de la base de la stratigraphie en 1994–1997. Malheureusement la datation de la séquence stratigraphique est incohérente ce qui est sans doute à l'origine de débats sur la détermination des industries (caractérisées plus par la présence de lamelles à retouche inverse, directe, ou alterne que par des types aurignaciens: grattoirs carénés, burins busqués, lames retouchées) situées au-dessus du moustérien (H, G, F, A-E); Aurignacien de type Dufour-Krems pour Yu. Demidenko[63] ou Epigravettien aurignacoïde pour I. Sapozhnikov. Seules de nouvelles datations directement sur l'industrie osseuse permettraient de résoudre la question. Des traces d'Epigravettien et de Shankobien sont décelables dans le sommet de la séquence.

En Roumanie, sur le piémont septentrional des Carpates, dans les vallées de la Bistrita[64] du Seret et du Prut,[65] comme en Moldavie[66] (entre Prut et Dniestr, les sites en stratigraphie de lœss de versant de vallée, fournissent des séquences comprenant l'Aurignacien, le Gravettien, l'Epigravettien ancien (Molodovien) et l'Epigravettien récent, mais avec des lacunes importantes entre niveaux archéologiques. Il est souvent souligné que les différences technologiques et typologiques entre Gravettien et Epigravettien et entre Epigravettien ancien et récent sont faibles, ce qui explique des déterminations parfois mouvantes dans le paléolithique supérieur roumain suivant les spécialistes.[67]

[48] Sapozhnikov 1994.
[49] Olenkovski 1991.
[50] Djindjian, Iakovleva 1997; Djindjian, Sapozhnikov, Stepanchuk, Sapozhnikova 2006.
[51] Chernysh 1973; 1977.
[52] Sapozhnikov 2003.
[53] Borziac 1993; Noiret 2004.
[54] Ketraru *et al.* 2007.
[55] Chirica 1989; Chirica *et al.* 1996.
[56] Chernysh1961; 1973; 1977.
[57] Borziac 1991; 1993
[58] Borziac *et al.* 1992
[59] Sapozhnikov 1994; 2003.
[60] Brudiu 1974.
[61] Anghelinu *et al.* 2012.
[62] Ahmetgaleeva 2019.
[63] Demidenko *et al.* 2012.
[64] Anghelinu *et al.* 2012.
[65] Chirica 1989; Chirica *et al.* 1996.
[66] Noiret 2004; 2007.
[67] Carciumaru 1999.

6. Les zones de peuplement en Europe Centrale au maximum glaciaire (20 000–17 000 BP)

En Hongrie, une industrie dominée par les grattoirs avec la présence de lamelles à dos a été reconnue entre 20 000–17 000 BP: le Sagvarien.[68] Les outils sont réalisés sur des supports laminaires débités sur des galets de roche locale en radiolarite et en chaille. V. Dobosi[69] a conclu à des habitats de plein air présents seulement pendant les épisodes de Laugerie et de Lascaux. G. Lengyel[70] a récemment révisé les industries hongroises et a bien insisté sur les différences typologiques entre un Gravettien oriental récent, un Sagvarien (qu'il nomme Epigravettien ancien) et un Epigravettien (qu'il nomme Epigravettien évolué). Les sites de Sagvar (couche inférieure et supérieure), Mogyorosbanya, Arka (couche inférieure), Jaszefelsoszentgyorgy et Madaras font partie de cet ensemble Sagvarien.

En Basse-Autriche, le site de Grubgrabben,[71] avec de nombreuses dates situées entre 19000 et 18000 BP, peut être rattaché à la tradition du Sagvarien, ainsi que, **en Moravie**, le site de Stranska Skala IV

En Slovaquie, le site de Moravany-Zakovska[72] fait partie d'un ensemble de sites près de Moravany sur la rivière Vah, qui ont été rattachés au Gravettien oriental (notamment Podkovica, Lopata, Noviny et Banca). Mais Moravany-Zakovska est un site plus récent, quoique insuffisamment daté autour de 20 000–18 000 BP. Son industrie peut être rapprochée du Sagvarien, ainsi que le site de Kasov (couche supérieure).

Dans ce relatif court intervalle 21 000–17 000 BP, il serait imprudent de trop prêter confiance à des datations radiocarbone effectuées par des laboratoires utilisant des méthodes différentes d'élimination de la pollution. Si l'ordre de grandeur d'une datation LGM est plausible, sa date plus précise au début ou à la fin de LGM reste hypothétique dans l'attente de nouvelles datations plus fiables. L'industrie du Sagvarien, qui présente une variabilité sur l'ensemble du bassin de Pannonie en Europe centrale, dépend de la matière première (radiolarite, limno-quartzite, obsidienne, chlorite, etc.) qui révèle un approvisionnement local à courte distance (à la différence du Gravettien) et qui argumente une réoccupation pendant le maximum glaciaire, à l'instar du Badegoulien en Europe occidentale. Ces industries sont marquées par un pourcentage de grattoirs supérieur à celui des burins, la présence de lamelles à dos (mais pas de gravettes ni de microgravettes), et des traits aurignacoïdes résultant plus de la présence de nucléus à lamelles sur des petits rognons de matière première variée et locale que d'outils vraiment aurignaciens. L'utilisation du terme Epigravettien pour ces industries, sur la proposition de J. Kozlowski dans les années 1970, n'est plus appropriée. Pour une chronologie fine qui n'est pas malheureusement pas connue en stratigraphie sur ces sites de plein air, l'hypothèse la plus plausible serait de s'attendre à avoir la séquence suivante: Gravettien oriental, (Gravettien final), lacune, industrie aurignacoïde, lacune, Sagvarien au sens large, lacune, Epigravettien récent.

7. Le pléniglaciaire supérieur (17 000 BP-13 500 BP)

À partir de 17 000 BP, le climat redevient sec et moins froid, favorable au développement de la steppe froide et de sa zoocénose (notamment le mammouth).

En Europe atlantique, cette période correspond à l'émergence et au développement du Magdalénien inférieur et moyen. En Europe méditerranéenne, elle correspond à l'Épigravettien évolué.

Vers 15 000 BP, le Magdalénien connaît une expansion géographique spectaculaire qui l'amène progressivement à partir de la zone aquitaino-cantabrique, à recoloniser, en suivant les cours d'eau, le bassin de la Loire puis le bassin de la Saône, puis le bassin supérieur du Rhin, puis le bassin supérieur du Danube, lui donnant ainsi accès à l'Europe centrale jusqu'en Moravie et en petite Pologne.[73]

Dans les régions méditerranéennes, l'Épigravettien évolué, succédant à un Épigravettien à pointes à crans, occupe la Provence, la côte tyrrhénienne, le golfe adriatique et la côte occidentale de la péninsule balkanique.[74] Il est progressivement repoussé par l'expansion magdalénienne du Languedoc au-delà de la rive orientale du Rhône,

En Europe centrale, l'état de nos connaissances ne nous permet pas aujourd'hui d'établir une carte du peuplement, comme si le territoire était déserté ou occupé seulement à la bonne saison autour de 15 000–14 000 BP. De rares industries souvent mal datées sont attribuées à un Épigravettien, dans le bassin du moyen Danube. Les sites de Hongrie révisés par G. Lengyel:[75] Nadap, Estergom-Gyurgyalag et les fouilles récentes de Zold cave[76] mettent en évidence la présence d'occupations brèves à la fin du

[68] Gabori 1965; Dobosi 1994.
[69] Dobosi 1994.
[70] Lengyel 2016.
[71] Montet-White 1990.
[72] Hromada, Kozlowski 1995.
[73] Djindjian *et al.* 1999.
[74] Palma di Cesnola 1993.
[75] Lengyel 2016.
[76] Beres 2021.

pléniglaciaire. En Moravie, les sites de Brno Styrice III et Velke Pavlovice[77] semblent marquer l'avancée la plus occidentale des groupes épigravettiens, au cours de déplacements estivaux probablement originaires du bas Danube comme à Temnata en Bulgarie.[78] Plus au Nord, localisé près de la porte de Przemysl coté polonais, le site de Swiete 9,[79] semble poser la question de l'arrivée de groupes humains venus de l'Est au-dessus des Carpates, au contact des groupes magdaléniens comme le laissait supposer l'étude de la grotte Maszycka.[80] D'autres sites épigravettiens de cette période sont connus en Pologne, comme Sowin 7 et Targowisko 10.

Dans le bassin du Dniestr, pourtant si riche en sites gravettiens et du maximum glaciaire, aucune industrie ne peut être indiscutablement datée de cette période (16 500–13 500 BP). La longue séquence de Molodova V montre une lacune entre la couche 4 (17 100 BP) et la couche 3 (13 370 BP). À Cosaoutsy, la séquence, très bien datée, s'arrête avec la couche 1 (17 200 BP). Il en est de même pour l'ensemble du piémont septentrional des Carpates (Roumanie, Moldavie).

La zone des steppes, il est vrai avec des séquences particulièrement mal datées, n'a jusqu'à présent offert que peu de sites attribuables à cette période, comme Kammenaia Balka.[81] Il existe cependant de très nombreux sites, souvent de plein air, dans la zone des steppes dont un certain nombre, sur des bases uniquement typologiques, a été attribué à cette période. Cette pauvreté n'est donc sans doute que provisoire. Ainsi, en Crimée, les découvertes récentes ont daté l'industrie de l'abri Skalisty entre 14 500 et 15 500 BP.[82] Dans le bassin du Don, à Kostienki, les sites post-LGM ne sont connus qu'à Borshevo,[83] du nom d'un village contigu au village de Kostienki. Le site de Borshevo 1 a livré des dates contradictoires mais semble plus probablement être situé entre 15 100 et 15 600 BP (en conservant les quatre dates GIN et en éliminant la date trop ancienne LE). L'outillage où dominent les grattoirs et les burins, possède des pointes à dos (avec quelques exemplaires à cran et à soie) et des lamelles à dos (dos simple, dos tronquées et dos bitronquées), qui le rapproche des industries du Mézinien, contemporaines. Le site de Borshevo 2 est plus récent, tardiglaciaire, autour de 12 500 BP.

À cette apparente ou réelle pauvreté des sites dans les régions traditionnellement riches en sites paléolithiques, correspond paradoxalement la très grande richesse des habitats à cabanes en os de mammouth du Mézinien, dont la richesse n'a d'équivalent contemporain que le Magdalénien moyen d'Europe occidentale. Ces habitats sont situés dans le bassin du Dniepr moyen et du Dniepr supérieur, en particulier de son affluent oriental, la Desna, et ont reçu dans la littérature des noms dont la variété cache mal la profonde identité de cette culture pléniglaciaire : culture de Mezine, culture de Mejiriche-Dobranichivka-Gontsy, culture d'Elisseevichi, culture de Ioudinovo-Timonovka (Ioudinovo;[84] Mezine;[85] Dobranichivka;[86] Gontsy;[87] Mejiriche;[88] Timonovka;[89] Elisseevichi).[90] L'étude statistique de cette variabilité que nous avions présentée au colloque sur le 130° anniversaire de la découverte de Gontsy en 2001, révèle la profonde unité de cette industrie avec des variabilités dont les origines sont plus taphonomiques que culturelles, comme le montre bien la dispersion des assemblages provenant d'un même site mais de fouilles de différentes périodes.

Les 74 datations ^{14}C recensées en 2003 possèdent une grande variabilité en situant ces sites entre 19 000 et 12 000 BP ce qui a amené de nombreux auteurs à croire à une continuité de peuplement avec le Gravettien (Cf. supra). Les datations ^{14}C AMS ont depuis ramené cette variabilité entre 14 000 et 15 000 BP.[91] Les 11 dates AMS effectuées sur les deux niveaux d'occupation du site de Gontsy ont une variabilité très faible comprise entre 14 110 et 14 670 BP sans qu'il soit même possible de différentier les deux occupations dans le temps).[92] L'affirmation de cette courte durée de peuplement avait surpris voire provoqué quelque scepticisme dans les années 1990. Mais les 20 nouvelles datations AMS réalisées à Mejiriche confirment bien cette durée courte du peuplement Mézinien entre 14 320 et 15 430 BP.[93]

Depuis les débuts de la datation radiocarbone dans les années 1950, les laboratoires ont eu à répondre à de nombreux défis techniques pour rendre la méthode fiable et précise. Il y eu d'abord le comptage AMS qui remplaça le comptage conventionnel dans les années 1990. Puis ce fut dans les années 2000, la calibration des dates

[77] Nerudova *et al.* 2015.
[78] Kozlowski *et al.* 1994.
[79] Lanczont *et al.* 2021.
[80] Kozlowski *et al.* 2012; Wiśniewski *et al.* 2017.
[81] Leonova, Min'kov 1988.
[82] Cohen 1996; Cohen *et al.* 1996.
[83] Praslov, Rogachev 1982.
[84] Abramova 1995; Abramova *et al.* 1997; Abramova, Grigorieva 1997.
[85] Chovkoplass 1965.
[86] Chovkoplass 1955.
[87] Iakovleva, Djindjian 2005; 2015; 2017; 2018; Iakovleva 2015; 2016.
[88] Pidoplichko 1969; 1976.
[89] Velichko *et al.* 1977a.
[90] Velichko *et al.* 1977b.
[91] Iakovleva 2016.
[92] Iakovleva, Djindjian 2005.
[93] Haesaerts *et al.* 2015.

^{14}C d'abord jusqu'à 11 000 ans grâce à la dendrochronologie puis jusqu'à 40 000 ans, calcul correctif qui est aujourd'hui banalisé et facile grâce à des programmes en accès libre. Le défi suivant fut celui de l'élimination de la pollution de l'échantillon par du carbone récent intrusif. Le problème fut soulevé par l'un d'entre nous à l'occasion du congrès «*^{14}C et Archéologie*» de Lyon en 1998.[94] Quelques pourcentages de pollution entrainent des rajeunissements qui peuvent atteindre des milliers d'années pour des dates du paléolithique supérieur. La conséquence est que nos histogrammes de dates pour une culture donnée sont des histogrammes de pollution et non des histogrammes de durée de peuplement, à l'origine de graves erreurs commises par les préhistoriens, trop confiants dans les méthodes de datations, pour l'apparition ou la disparition de ces cultures, ou sur leur diffusion géographique. Les laboratoires de datations qui risquaient la concurrence de laboratoires de chimie pour la préparation de l'échantillon, ont réagi dans les années 2010 et proposé des améliorations. Les échantillons débarrassés de leur pollution ont fourni en conséquence des dates vieillies. Un corollaire de cette amélioration est cependant la difficulté voire l'impossibilité de comparer des dates obtenues avec des comptages différents (Conventionnel, AMS) et des préparations chimiques différentes. Le cas du Mézinien est à ce titre instructif: des dates comprises entre 19 000 et 12 000 BP jusque vers la fin de 1990, des dates entre 14 110 et 14 670 BP à Gontsy effectuées entre 1994 et 2000 (laboratoire d'Oxford), des dates entre 14 380 et 15 430 à Mejiriche en 2010 (les dates du laboratoire de Saclay étant significativement plus anciennes que celles de Groningen et d'Oxford, sans doute dues à des protocoles de traitements différents de ces laboratoires), trois dates entre 15 610 et 15 850 à Barmaki réalisées en 2019 par le laboratoire d'Oxford à comparer à une date de 14 300 BP effectuée dans les années 2000.[95] Dans ce contexte, il semble illusoire de pouvoir conclure à une plus ou moins grande ancienneté d'un site ou d'un autre site sauf à comparer des dates obtenues sur des échantillons de même matériau, récoltés avec la même procédure, dépollués avec la même préparation chimique et datés par le même laboratoire. Nous écrivions dans les années 2000 que le Mézinien est un peuplement de relative courte durée entre 15 000 et 14 000 BP. Avec le progrès de la dépollution des échantillons, nous écririons aujourd'hui que c'est un peuplement de relative courte durée entre 15 900 et 14 500 BP, soit entre 19 000 et 17 500 calibré BP.

L'industrie de ces cultures, assez homogène, est caractérisée par la prédominance des burins et des grattoirs (souvent courts et unguiformes) et la présence restant cependant faible de lamelles à dos et de pointes à dos, sans microgravettes, la rendant nettement différente d'un Épigravettien. Ces industries ont fait l'objet de plusieurs études sur les sites ukrainiens.[96] La multitude des faciès proposés (parfois même un par site) est une conséquence de l'abandon du concept de cultures préhistoriques et protohistoriques pendant la période soviétique. Plus récemment, D. Nuzhnyi[97] a proposé de définir quatre faciès (Ioudinovo, Mejiriche, Mezine, Ovruch) sur la base de la morphologie de pièces à dos et de lamelles à dos, façonnées sur lames et lamelles: pointes lancéolées à dos, rectangles, pointes à dos droites, dans une approche qui est plus caractéristique d'un mésolithicien spécialiste de microlithes que d'un paléolithicien. La variabilité des formes et des façonnages entrent cependant dans les définitions classiques du paléolithique supérieur que sont les pièces à dos, les pièces à dos appointées, les pièces à dos tronquées, les pièces à dos tronquées et appointées, les pièces à dos bitronquées, que leurs supports soient des fragments de lames, des lamelles ou des microlamelles. En outre, la disponibilité du silex (en quantité et en volumes des rognons), qui influence significativement les dimensions des supports et l'exhaustion du façonnage, est probablement à l'origine de cette variabilité.

Bien au-delà de la typologie des artefacts et des faciès culturels, la compréhension du fonctionnement du système socio-économique des chasseurs-cueilleurs dans leur environnement demeure l'enjeu essentiel de nos recherches, et qui permet en outre d'expliquer naissance, développement et disparition. Le Mézinien est une adaptation à l'environnement du pléniglaciaire supérieur récent, la steppe froide ou steppe à mammouths, dans la période post-LGM, qui voit le repeuplement progressif de l'Europe moyenne, adaptation basée sur une économie du mammouth, au moment où leurs troupeaux, subissant l'humidité croissante du climat, et en conséquence, d'abondantes chutes de neige dans la mauvaise saison, sont retrouvés congelés à la sortie de l'hiver. Outre le mammouth, le renne, le cheval, le bison, les carnivores (ours, loup, renard polaire), les rongeurs (lièvre, marmotte) font l'essentiel du régime alimentaire carné des chasseurs-cueilleurs. Les sites à structures d'habitat en os de mammouths sont souvent situés sur une terrasse de versant de vallées, à proximité de ravines où sont trouvées des accumulations de carcasses de mammouths. Le modèle de d'exploitation du territoire[98] est centré autour d'un habitat semi-résidentiel occupé depuis le début du printemps jusqu'à la fin de l'hiver, comme le révèlent les

[94] Djindjian 1999b.

[95] Chabai *et al.* 2000.

[96] Notamment Gladkhyk 1973; 1977; Nuzhnyi 2008; 2015.

[97] Nuzhnyi 2015.

[98] Iakovleva 2016.

études de saisonnalité, avec des déplacements pour des chasses saisonnières et des approvisionnements à longue distance pour le silex (dont l'inventaire des gîtes reste à faire) et les coquillages (affleurements de coquillages fossiles du Sarmatien, rivages de la Mer noire qui est alors un lac). Le bassin moyen et supérieur du Dniepr est un territoire de peuplement d'une superficie d'environ 500 000 km^2 d'un réseau de groupes humains qui a pu être estimé à un nombre de 100 à 500 groupes humains (d'une trentaine d'individus) avec une densité de 0,007 à 0,035 h/ km^2,[99] et dont nous ne connaissons les vestiges que d'une vingtaine de sites.

En conclusion, la dénomination d'Épigravettien pour ces industries apparues après 16 000 BP, sans rapport direct typologique et stratigraphique avec des industries antérieures, et ne comportant que peu d'éléments gravettoïdes dans son industrie, est inappropriée. Ces industries, bien que souvent désignée dans la littérature sous le nom d'Épigravettien oriental,[100] devraient donc être désignée sous un nom unique, et le nom de Mézinien, semble historiquement le plus approprié.

Dans la zone des steppes, autour de 15 000 BP, comme dans le piémont nord-est des Carpates, les sites sont plus rares comme si le peuplement très présent au LGM s'était ensuite déplacé vers le Nord. Le site de Kammenaya Balka en est le représentant le mieux connu[101] avec Fedorovka et Solone Ozero. Mais de nombreux sites de surface, non datés pourraient combler cette lacune.[102]

8. Conclusions

L'utilisation du terme Épigravettien pour désigner toutes les industries postérieures au Gravettien en Europe centrale, orientale et méditerranéenne a caché la réelle diversité des industries, dans leurs processus d'adaptation aux variations climatiques et environnementales ainsi qu'aux différentes latitudes.

Le Gravettien est une adaptation en Europe moyenne des groupes humains à la péjoration climatique du MIS 2, succédant à l'Aurignacien qui était un système adapté aux mêmes territoires dans la deuxième moitié du MIS 3. Avec la montée vers le LGM, le Gravettien s'est trouvé cloisonné par les massifs montagneux et s'est différentié à l'Est des Alpes (Gravettien oriental) et à l'Ouest (Gravettien moyen, Gravettien récent). Le stade ultime du Gravettien à l'Ouest (Protomagdalénien ou Gravettien final) et à l'Est (Gravettien final type Pouchkari) voit la raréfaction des groupes humains. Puis l'arrivée dans le dernier maximum glaciaire (LGM) entraîne un effondrement du système obligeant les groupes humains à se réfugier vers les régions méditerranéennes. Perdant son système de ressources alimentaires dans le cycle annuel et ses gîtes d'approvisionnement, son industrie change brutalement, et se traduit par des faciès aurignacoïdes (lié au recours à un débitage lamellaire sur des matières premières plus médiocres) qui présentent des constances à travers toute l'Europe mais aussi de très nombreuses particularités régionales. Dans ce contexte, il est nécessaire de donner des noms différents à ces systèmes régionaux: Protosolutréen à l'Ouest, culture de Zamiatnine sur le Don, Muralovkien de la zone des steppes, «Epiaurignacien» d'Europe centrale, «Rashkovien» du piémont septentrional des Carpates, etc.

Les groupes humains gravettiens se stabilisent dans leurs nouveaux territoires méditerranéens et mettent en œuvre des systèmes régionaux qui se différentient: Solutréen en péninsule ibérique, Epigravettien ancien tyrrhénien, Epigravettien ancien du golfe adriatique, Epigravettien ancien du piémont septentrional des Carpates, Epigravettien ancien de la zone des steppes.

Les deux épisodes climatiques plus humides du LGM permettent à ces groupes de remonter à la bonne saison vers le Nord, en latitude moyenne, pour y trouver des ressources alimentaires (renne, cheval principalement) et des gîtes de matières premières de qualité (Solutréen récent en Europe occidentale). Dans d'autres cas, ils décident de s'installer durablement et leur industrie change tout en retrouvant certains traits aurignacoïdes: Badegoulien en Europe occidentale, Sagvarien en Europe centrale. Parallèlement dans les régions méditerranéennes, la tradition épigravettienne perdure (Episolutréen en Europe occidentale, Epigravettien des zones méditerranéennes).

La compréhension de ce peuplement européen s'éclaire en se basant sur des sites stratifiés, malheureusement en nombre insuffisant, qui révèlent des séquences continues (comme à Paglici ou en Aquitaine) ou lacunaires (comme les sites en séquences de lœss des bassins du Dniestr et du Prut (Molodova V, Korman IV, Cosaoutsy, etc.) et du Don à Kostienki), qui montrent des lacunes entre Gravettien et Epigravettien ancien et entre Epigravettien ancien et Epigravettien final.

La fin du LGM voit le retour d'un climat sec (et froid) similaire à celui du MIS 2 précédant le LGM et des systèmes très proches sinon identiques: le Magdalénien en Europe occidentale qui colonise l'Europe centrale au Magdalénien moyen, l'Epigravettien récent qui évolue dans les régions méditerranéennes et balkaniques, le

[99] Djindjian 2014.
[100] Desbrosse, Kozlowski 1988.
[101] Leonova, Minkov 1988.
[102] Olenkovski 1991; 2000; 2008.

Mézinien en Europe orientale. A partir de 15 000 BP, la plaine de Pannonie en Europe centrale devient alors le point de convergence de ces groupes humains qui arrivent de l'Ouest (Magdalénien) en descendant le Danube, du Sud-est en remontant le Danube (Epigravettien récent), et de l'Est, au-dessus des Carpates (Mézinien).

Dans cette approche systémique où les cultures ne sont que des états stables dans des processus d'adaptation aux variations climatiques dans l'espace européen, il est important de bien identifier, distinguer, caractériser et nommer ces états par des termes non ambigus. L'utilisation du terme Epigravettien pour désigner toutes les cultures LGM et post LGM d'Europe centrale, méditerranéenne et orientale est une erreur et un frein important dans notre compréhension de ces changements.

En outre typologiquement et technologiquement, des différences significatives peuvent être observées. Le Mézinien ne possède pas plus de traits épigravettiens que le Magdalénien! Les industries aurignacoïdes encore moins! En Europe occidentale, le Badegoulien a été distingué du Magdalénien dont à l'origine il marquait les débuts (stades 0/1).

Il faut donc réserver le terme d'Epigravettien à des industries, dont la filiation technologique et typologique gravettienne est indiscutable et ne pas hésiter à nommer des industries qui s'en differentient differemment.

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Prehistoric Novae

Abstract

Neolithic flint tools were discovered in three sectors in Novae (II, IV, and XII): polished axes, scrapers, and blades. An arched beaked point was discovered at the Ostrite Mogili site, east of Novae. These discoveries prove that a previously unknown Neolithic settlement existed there, at least within the site of Novae. This seems to be confirmed by the finding of a ceramic fragment with a motif characteristic of the Vădastra Culture. The tools discovered in Novae were made of raw material extracted from flint deposits located near Novae – in Nikopol. It can, therefore, be assumed that the prehistoric settlement belonged to the Vădastra Culture and its inhabitants specialised in the extraction, processing, and export of flint tools.

Keywords: Novae, flint tools, Neolithic pottery, Vădastra Culture

Situated by the Danube in northern Bulgaria (ca. 4 km eastwards from the present-day Svištov) (Fig. 1), in what was initially a part of the Roman province of Moesia, renamed to Moesia Inferior in AD 86, the ancient archaeological site of Novae is known first and foremost as the home town to the *legio VIII Augusta* and then to the *legio I Italica*[1] (Fig. 2). Starting from the mid-3rd century AD (Fig. 3) and until the medieval period it remained an important urban centre.[2] However, the history of the town began before the first Roman legionaries, ever arrived by the Danube.[3] Evidence for this has been discovered in three spots within the site (Fig. 4). The first spot was the area excavated by us and situated just beside the *porta praetoria*, at the junction of two streets: *via praetoria* and *via sagularis*. It is the so-called Section IV, which contains an unearthed military hospital – *valetudinarium.* The second spot is the so-called Section XII – located on the eastern side of the *principia* – where wooden barracks of the First Cohort of the *legio VIII Augusta* once stood, later replaced by the stone-built house of the centurion – *primus pilus* – of the First Italic Legion.[4] Finally, the third spot was an *intervallum*, situated near the western fortification wall of the fortress, excavated in the 1980s by archaeologists from the University of Wroclaw.[5] Finds from these three spots included a fragment of a polished axe, scrapers, and blades.

When subjected to archaeological prospection, the area known locally as Ostrite Mogili, located ca. 3 kilometres eastwards from Novae, yielded an arched beaked point (Fig. 5).[6] The prehistoric times are also witnessed by yet another artefact. On the Danubian bank westwards from Novae, a ceramic fragment was found, bearing a decorative motif characteristic of the Vădastra Culture, identified in 1933 by I. Nestor.[7] These artefacts show that Novae and the surrounding area must have been intensively settled both in the Palaeolithic and the Neolithic periods – despite centuries of disruption in the area a relatively large number of prehistoric relics were preserved.

[2] Novae I, 115–246.
[3] Dyczek 2001.
[4] Dyczek 2018, 43–57.
[5] Dyczek *et al.* 1987, 105–110.
[6] A detailed analysis of the flint artefacts was to be performed by Prof. Stefan K. Kozłowski, a long-term employee of the Centre. Previously, he delivered a preliminary identification of the tools, see *Novensia* 22, 2011. Sadly, his passing brought a halt to these analyses. The present paper is dedicated to his memory. I am greatly indebted to Dr Małgorzata Kot and Prof. Karol Szymczak for support and all the remarks which made writing it possible.
[7] Nestor 1933, 56.

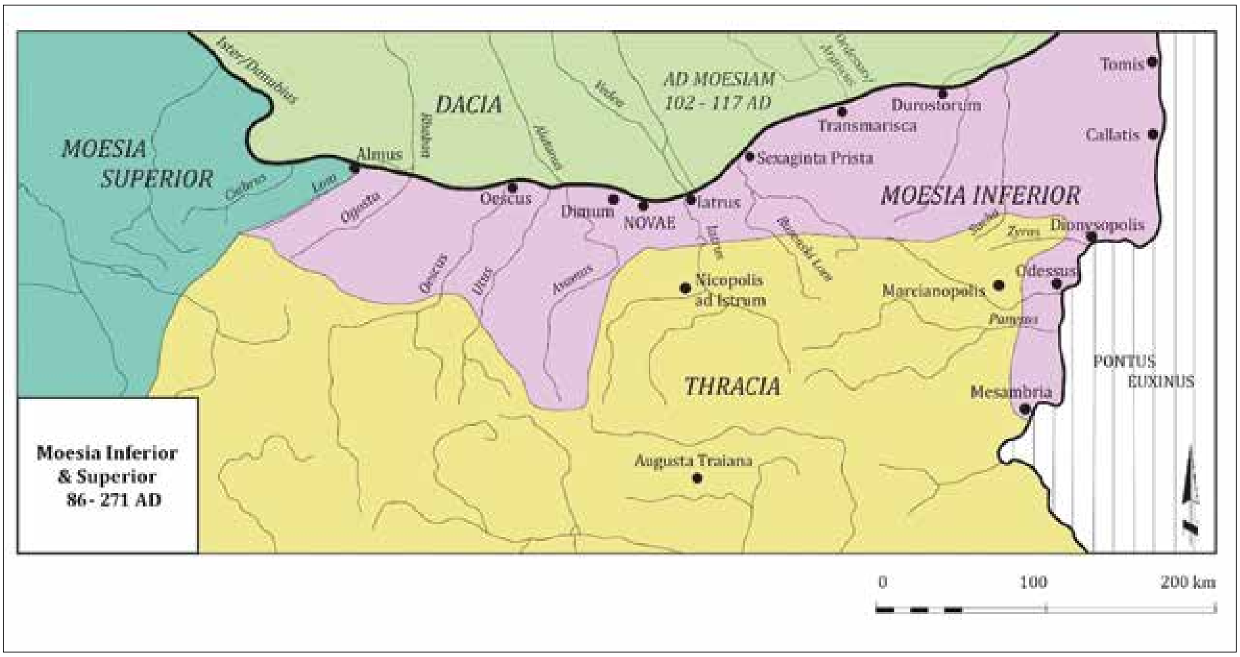

Fig. 1. Moesia Inferior after AD 86, compiled by P. Dyczek.

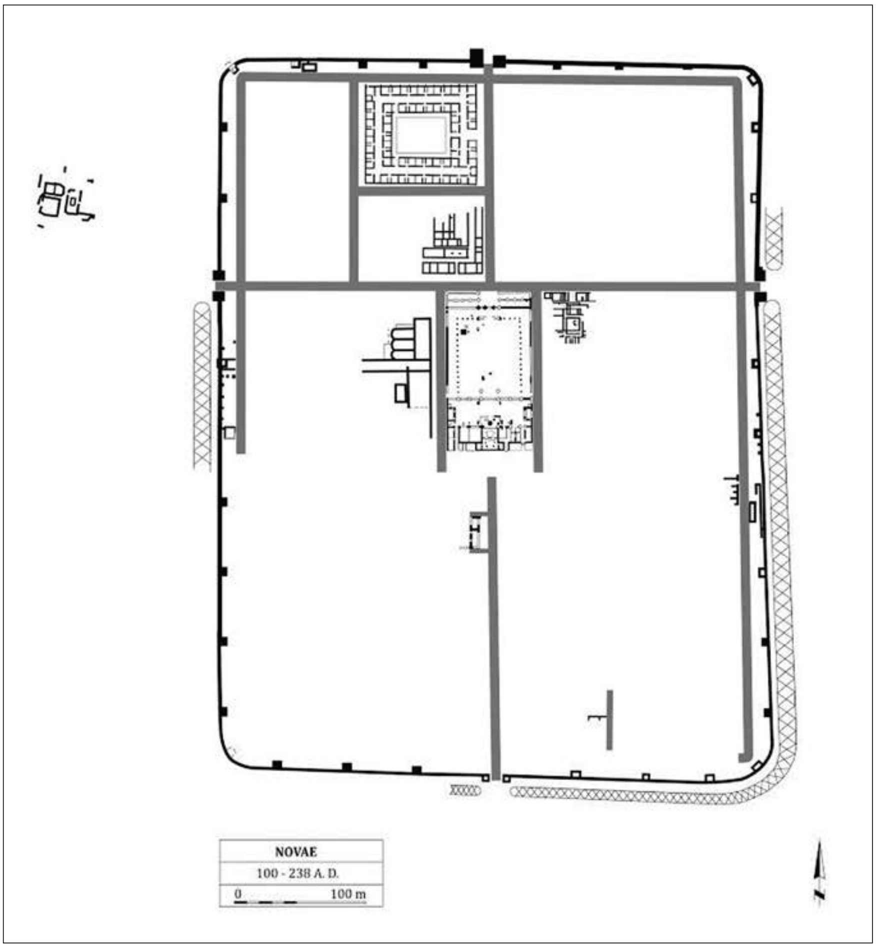

Fig. 2. Plan of *castrum* Novae, drawing by P. Dyczek, T. Słowik, B. Wojciechowski.

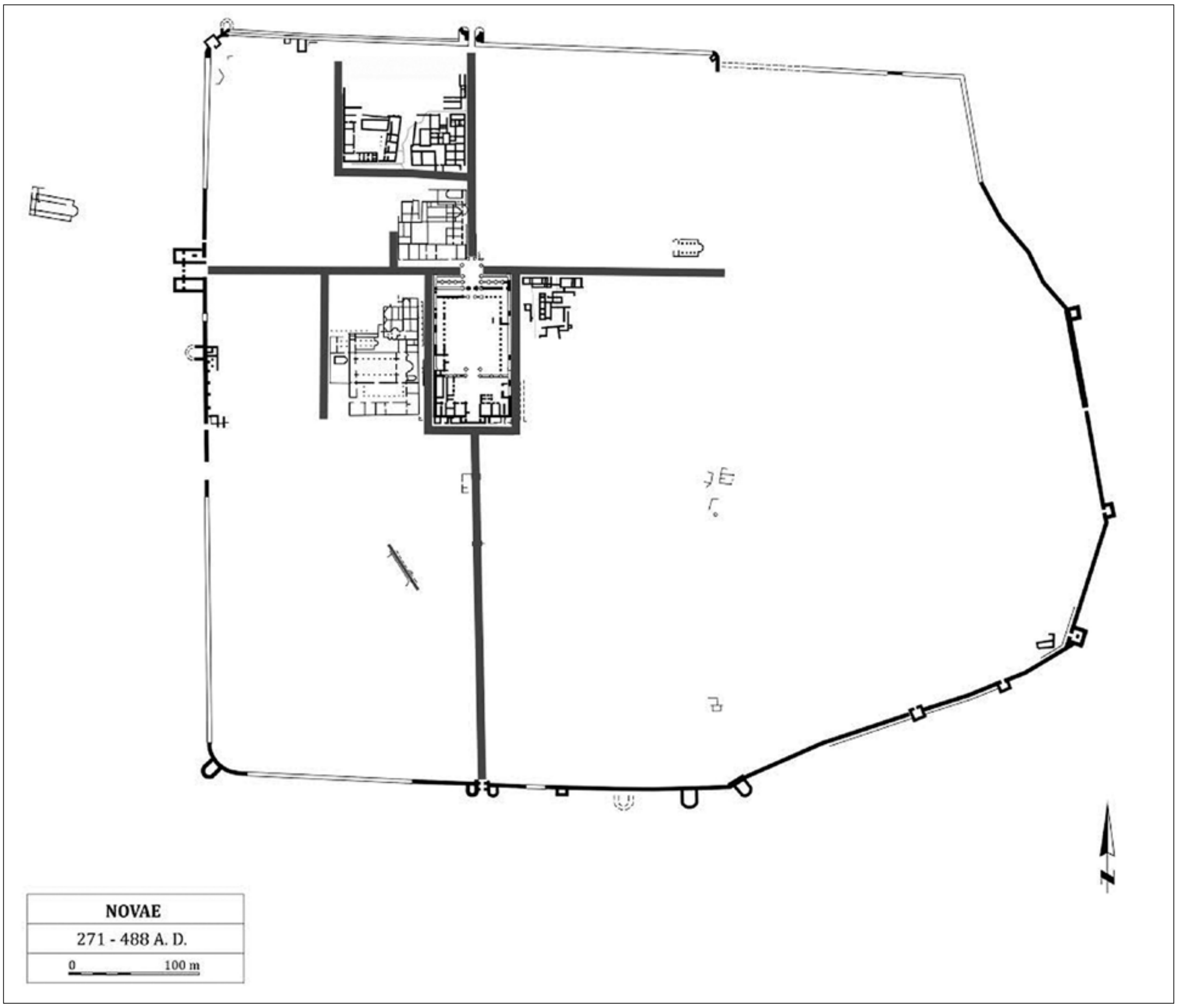

Fig. 3. Plan of Novae – Roman town, compiled by P. Dyczek, T. Słowik, B. Wojciechowski.

The flintstones were discovered either in the top part of a loess layer forming the natural geological substrate or in the construction strata left by the legionary structures, whose foundations were embedded directly in the natural ground. The excavations reached the loess level in only a few deepest trenches and no other remains of these early periods were found. However, it is statistically justified to say that the area where the camp was later built used to be a significant settlement site already in prehistory.

Admittedly, no Bronze Age relics have been found so far, but the excavations revealed a considerable number of fragmented hand-built Thracian pottery, characteristically formed as an urn decorated with a thread motif. It means that there must have been important reasons attracting settlers to this place in different periods. In my opinion, two things explain such settlement dynamics. The first is topography. The area is situated at the exact spot where the bed of the Danube bends maximally towards the south. Moreover, a number of variously sized islands were and still are created near the river bend, thus making it easier to cross. The discussed area lies on a high – and well-protected – embankment by the Danube. It descends slightly towards the river, limited by low hills from the south. To the west, there is another erosional scarp, at the foot of which the river called Dermendere flows today.

In addition, the elevation itself is surrounded from the west and east by relatively deep ravines, which perhaps acted as a natural barrier for settlement. The whole area, at least in the Roman Period, was covered by a mixed forest dominated by oaks.[8] The easy access to

[8] Dyczek 2019a, 55–64; Jankowska, Kozakiewicz 2018, 83–98.

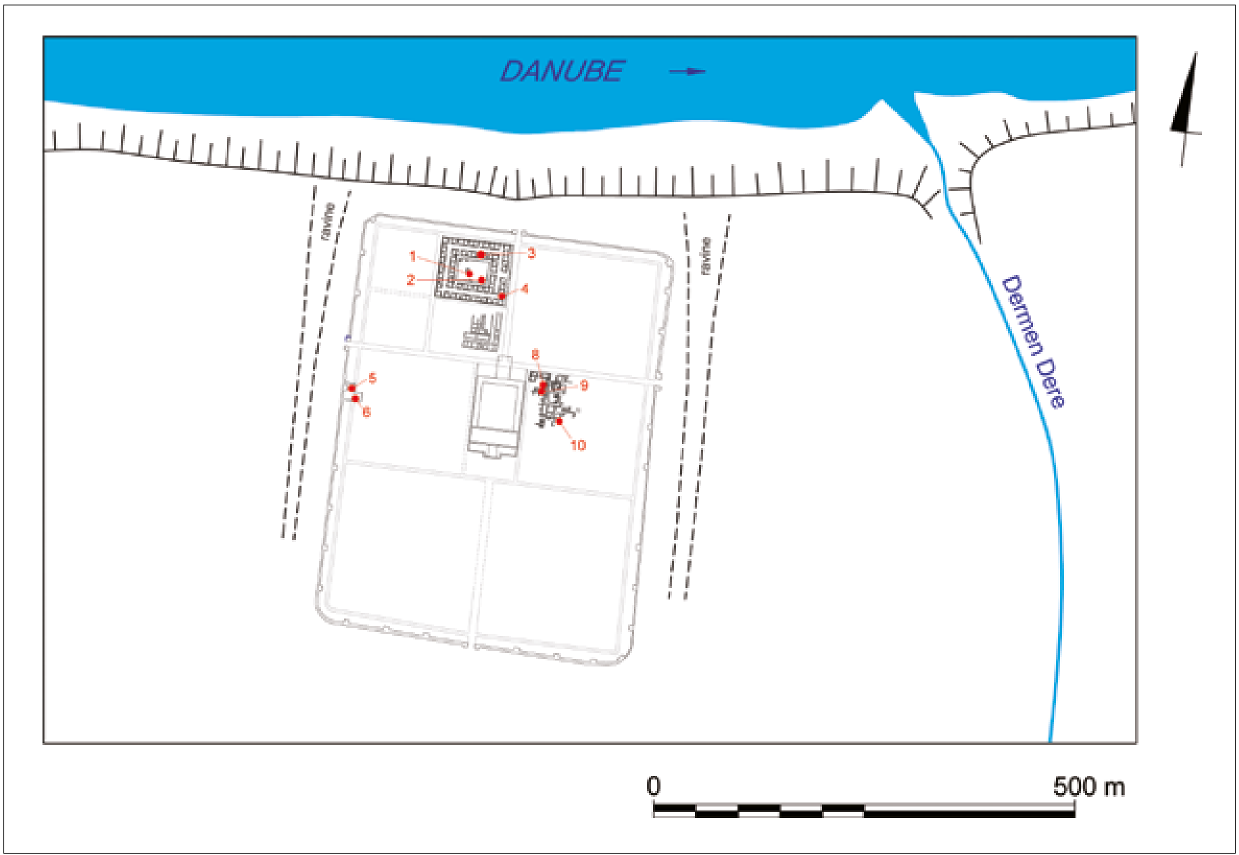

Fig. 4. Flint finds from the area of Novae: 1–4 Sector IV; 5–6 – Sector II; 8–10 – Sector XII, compiled by P. Dyczek, B. Wojciechowski.

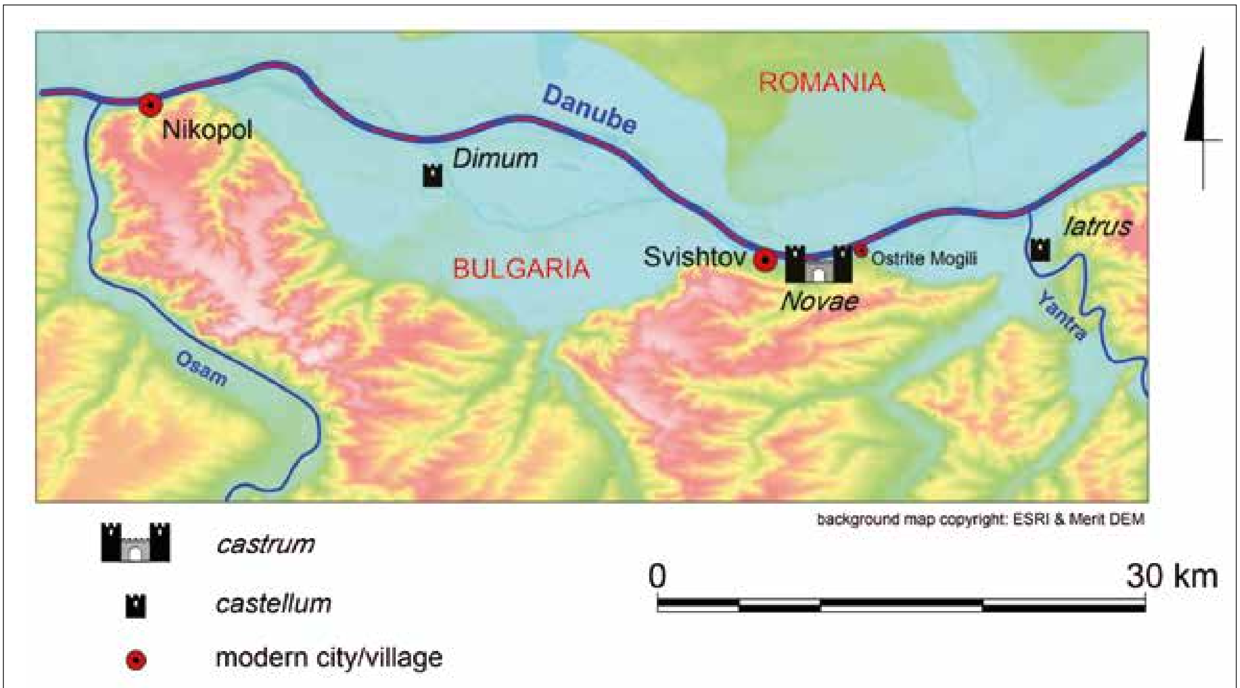

Fig. 5. Flint finds from the area around Novae, compiled by P. Dyczek, B. Wojciechowski.

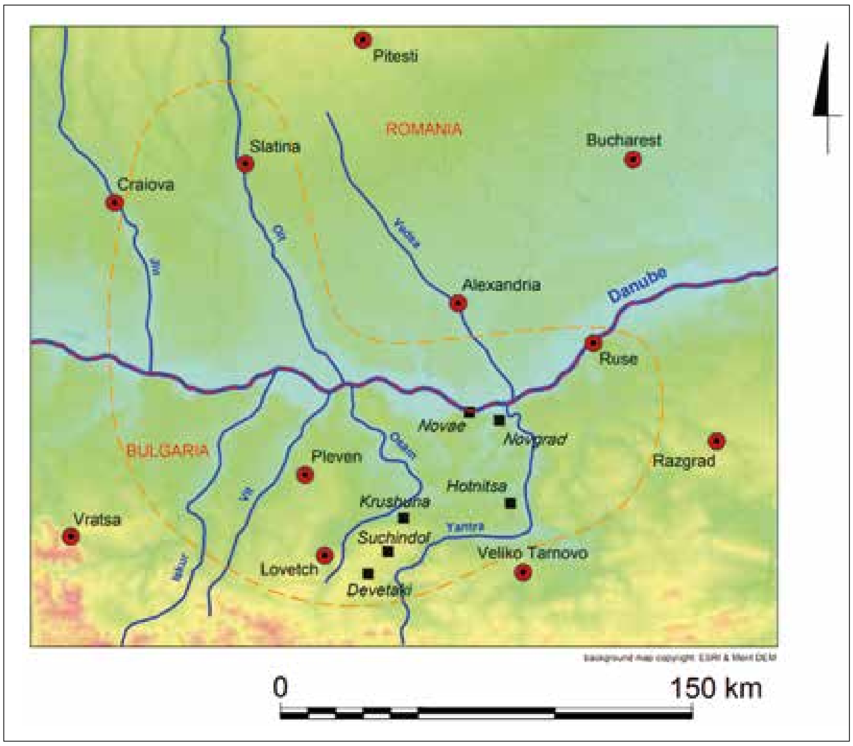

Fig. 6. Major settlements of the Vădastra culture discovered around Novae, compiled by B. Wojciechowski.

the bank of the Danube facilitated river transportation, whereas the karstic layout of the southern bank of the river created favourable conditions for land travel – the opportunity later exploited by the Romans building the Danubian road.

But there is another important reason. A glimpse at the map of Neolithic sites reveals that they are grouped in several areas (Fig. 6). I believe that these groupings relate to easily accessible sources of flint identical to that used to make the aforementioned excavated stone tools. The deposits easiest to exploit are located near the present-day town of Nikopol, where flint outcrops are visible in the embankment by the Danube. Other rich deposits of this mineral, albeit covered by several layers of earth and thus harder to exploit, are located in Pleven (Fig. 7). Found on the bank of the Danube, likely relocated somewhat by the river, the ceramic fragment is characteristic enough to be not only easy to link to a particular place of origin but also, thanks to a convex motif preserved on it, to specific the kind of item it used to be a part of. The fragment was made of clay fired to grey and decorated with an intricate geometric pattern carved into the form of a zigzag arranged into parallel lines, sometimes crossing over each other and sometimes intersecting at right angles (Fig. 8). The spaces between the lines – narrow channels or grooves – were filled with white paste (lime or chalk). This manner of decoration is unique, raising questions regarding its origin.[9] The characteristic features of the motif strongly suggest that, as mentioned earlier, its makers hailed from the Vădastra Culture (Fig. 9).

This cultural formation is associated with Oltenia, related to the River Olt (*Alutanus* for the Romans), south-eastern Romania. It flows into the Danube near the town of Nikopol. Its range stretched from south-eastern Muntenia and north-western Bulgaria. This culture is counted among the cultural cycles of the Middle and Late Neolithic. It evolved in many states whose precise definition remains problematic.[10] There are two competing points of view. According to the first, represented by C. Mateescu[11] and M. Nicara, the Vădastra Culture can be divided into two phases. On the other hand, D. Berciu[12] and M. Nica[13] believe that there were four or five phases.[14] Certain controversies are also related to absolute dating. Some argue that the culture developed from 5400 to 4900 BC,[15] others that from 5500 to 4700 BC,[16] and yet others that from 5500 to 5000 BC.[17]

[9] Dragoman 2009, 96–98.
[10] Chapman 2010, 85.
[11] Mateescu 1959, 61–73.
[12] Berciu 1939, 37–49; 1966, 97–98.
[13] Nica, 1968, 5–15.
[14] Popovici, Lazăr 2020, 88–105; Mirea 2008, 283–284.
[15] Dragoman 2009, 95.
[16] Gâță, Dragoman 2007, 8.
[17] Popovici 2010, 91.

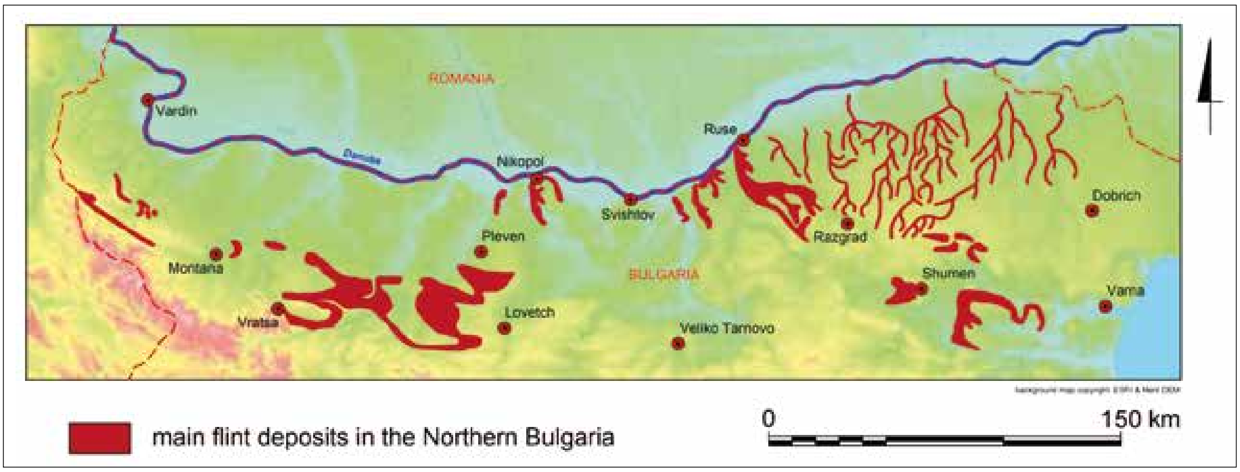

Fig. 7. Flint deposits in northern Bulgaria, compiled by B. Wojciechowski.

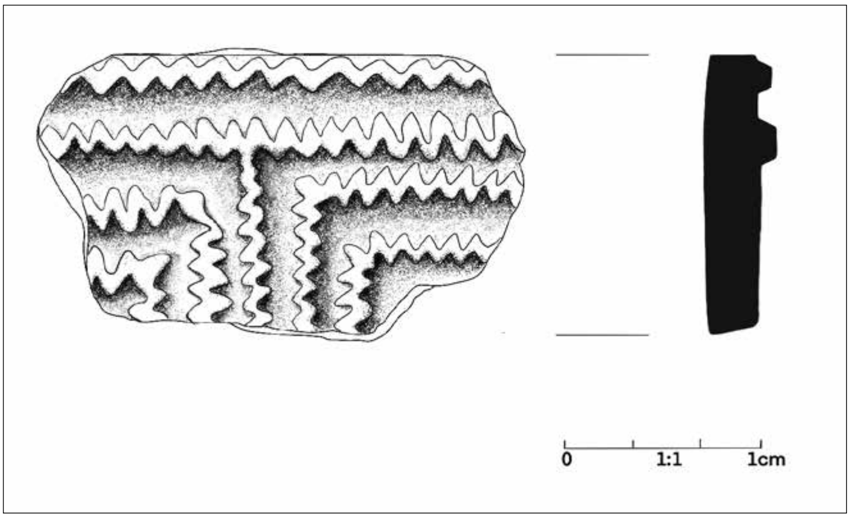

Fig. 8. Figurine fragment found in Novae, compiled by W. Maszewska.

The Vădastra Culture is considered synchronous with the phases A3, B1–B2–C of the Vinča Culture and phases II–III of the Karanovo Culture.[18] However, the earliest phase of the Vădastra Culture matches the first phase of the Boiana Culture,[19] since the cultural strata of the Vădastra site – Măgura Fetelor – contained fragments of pottery of the Bolintineanu type.[20] The Vădastra Culture was first mentioned in the literature in 1932.[21] However, it had been excavated already in the years 1871 and 1873 by C. Bollia, at the site of Măgura Fetelor.

The small ceramic fragment discussed above is characteristic enough to suggest that it may have been a part of a figurine. The clay which it was made of was worked well and its surface polished.[22] The intricate motif, characteristic technological features, and form – all these aspects suggest that the potters paid considerable attention to the quality of their figurines. Some scholars suppose it may have been a joint effort,[23] as indicated by traces found on hand-built vessels showing the hands of more than one person.[24] Three types of figurines have been distinguished for the Vădastra Culture.[25] The discovered fragment comes from a type known as "violin-like" (Fig. 10). They measure between 20 and 50 centimetres in height and are shaped to resemble a flattened cylinder

[18] Mantu 2000, 85.
[19] Petrescu-Dâmbovița 1978, 53.
[20] Gâță Dragoman, 2015, 9–20.
[21] Nestor 1932, 56–57.
[22] Mirea 2008, 288–289.
[23] Dragoman 2009, 99.
[24] Mateescu 1965, 260.
[25] Neagoe 2001, 13–20.

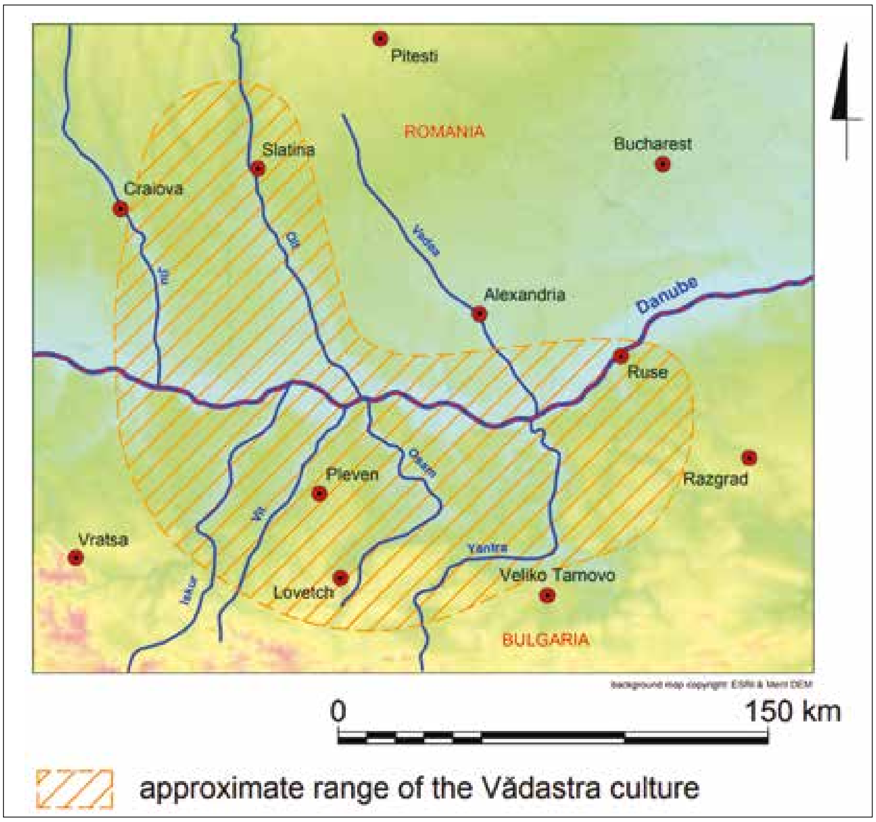

Fig. 9. Range of the Vădastra culture, compiled by B. Wojciechowski.

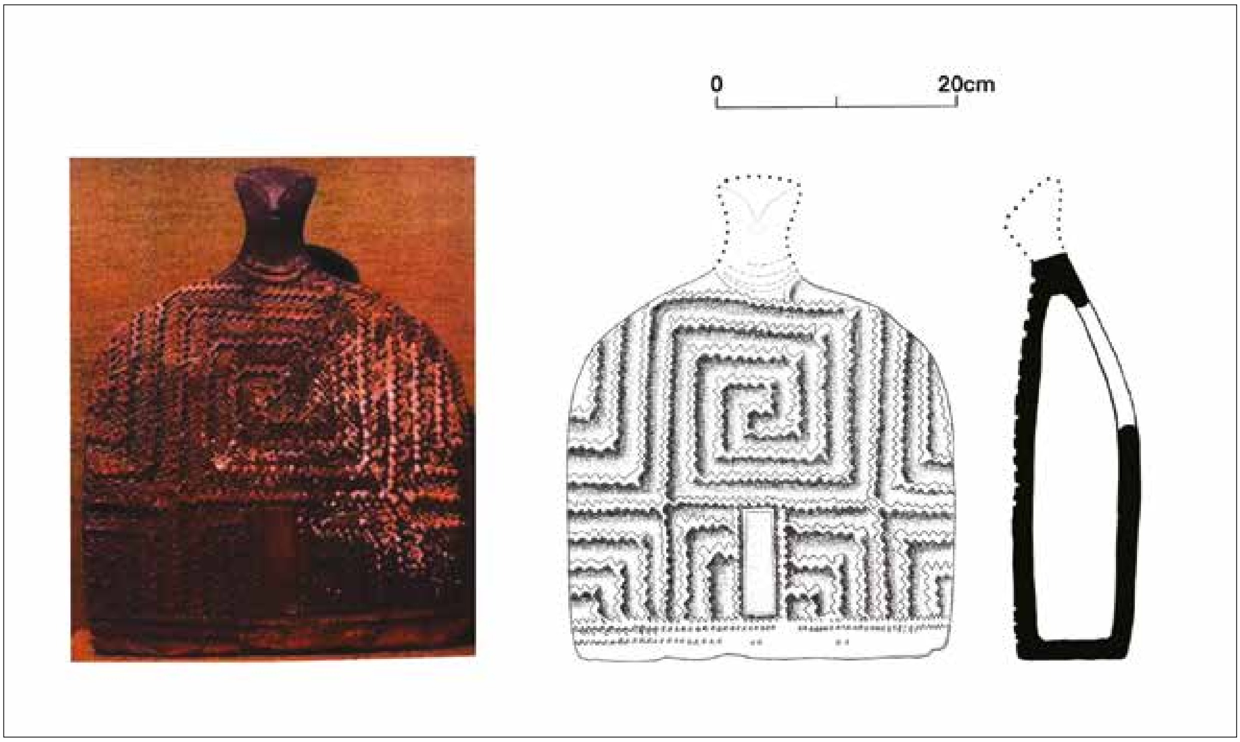

Fig. 10. Flint tools and flakes from Sector XII, compiled by W. Maszewska, J. Recław.

and hollow inside. Many scholars believe that their form was anthropomorphic. For this reason, they are sometimes referred to as 'curled' – their upper end is shaped schematically to resemble either a head or opulent curly hair with parting.[26] Depending on the accepted assumptions, the figurine is dated to either Phase II or IV of the discussed culture.

The anthropomorphic interpretation of the shapes of the figurines suggests their potential function. According to the traditional view, introduced by M. Gimbutas, they are material relics of a cult, revolving around the idea of fertility and a feminine deity.[27] Other scholars proposed to see them as offerings, toys, urns, or portraits.[28] Of course, these considerations are nothing but speculative. However, it remains a fact that although the figurines resemble human silhouettes, elements of the human body are not clearly shown on them. Their anthropomorphism can be inferred only from their general form and upper endings – the supposed heads or curly hair. In my view, another hypothesis can be proposed, if we take into account that the figurines are hollow and rest on square bases. They look more like models of houses, certain examples of which are knownVădastra Culture.[29] One feature of their structure is especially worth noting.. Along the main axis on the base, there is an undecorated square resembling an entrance. This hypothesis seems to be corroborated by the fact that excavations at some sites unearthed ruins of houses which enabled their preliminary reconstruction.[30] In this context, the supposed head or curls may be interpreted as decorative rafters. Similar iconographic patterns are known from many other cultures. This is just a supposition in need of further research.

The repertoire of flint tools discovered in Novae and its vicinity indicates that the area may have been settled already in the Palaeolithic.[31] People inhabiting it benefitted from the proximity of deposits of high-quality flint stone. The oldest tool – arched beaked point from the Upper Palaeolithic – is characteristic of the Gravettian Culture.

Although the tool discovered in Novae (Sector II and XII) was made of flint coming from around Nikopol (Fig. 11), it should be noted that deposits of this material appear in four places in present-day Bulgaria: north-western Bulgaria, north Bulgaria, Dobruja, and the Rhodope Mountains to the south.[32] Outcrops of only two deposits reach the Danube: Nikopol and the western section of the Dobruja deposit. Such geological situation facilitated the exploitation of these deposits and distribution of flint stone, first by the Danube and then also through the basins of its tributaries.

A separate question is the technique used to work the stones. Those coming from Novae show visible influence of the technocomplex characteristic for the Karanovo Culture I and II.[33] Such impact of the Karanovo Culture on toolmaking in distant areas in present-day Bulgaria has already been noted.[34] However, it reached also to territories occupied by other cultures, as far away as the Aegean Islands.[35]

Despite the said technological connections with the Karanovo Culture, the assemblage of tools from Novae finds analogies in the repertoire of tools known from the Vădastra Culture, for instance, Magura Buduiasca. Therefore, all the currently available data indicate that these tools originated from the latter culture but were modelled on artefacts from the Karanovo Culture. Similarly, to Novae, the assemblage from the aforementioned archaeological site is also dominated by blades and scrapers.[36] Another feature shared by both sites is the presence of large numbers of flakes attesting that the tools were made locally from imported flint cores. Moreover, in Novae these flakes are concentrated in the south-eastern part of the area where flint items have been discovered so far. This would indicate that the flint-knapping workshops were confined to a single and relatively small area within the settlement. The above conclusion is additionally supported by chronology.

As of today, due to the lack of publications from Bulgaria and the ongoing methodological debates, we cannot determine precisely the chronological frame when the interactions between the two cultures occurred or their intensity. Nevertheless, the process itself is already traceable in the currently known archaeological record.

Based on the spatial distribution of the flint artefacts, it may be stated that at the outskirts of Novae there existed a Neolithic settlement of the Vădastra Culture. It covered ca. 3 hectares on the embankment on the Danube, near the delta of the Dermendere River and between two natural ravines. It may also be presumed that flint-knapping workshops were located in its south-eastern part. Since Novae lies closest to the flint deposit in Nikopol, it should be assumed that the settlement could have been an important centre of flint processing, perhaps of more than local significance. The above hypothesis may be verified only by future studies, especially new discoveries of flint artefacts.

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[26] Nica 1980, 27–57.

[27] Gimbutas 1982; 1991; Gimbutas, Dexter 2001.

[28] Bailey 2010, 122–123.

[29] Anthony 2010, 31.

[30] Ştefan 2015, 128, fig. 8,1; cf. Gheorghiu 2008, 172–173, fig. 5–6.

[31] Kowal, Kozlowski 2011, 7–13.

[32] Guilbeau, Erdoqu 2011, fig. 1; Gurova, 2008, fig 11.

[33] Gurova 2008, 7–8, fig 9.

[34] Tsonev 2000, 29–35.

[35] Guilbeau, Erdoqu 2011, 6.

[36] Mirea 2008, 286; Kowal, Kozłowski 2011, fig 5, 6.

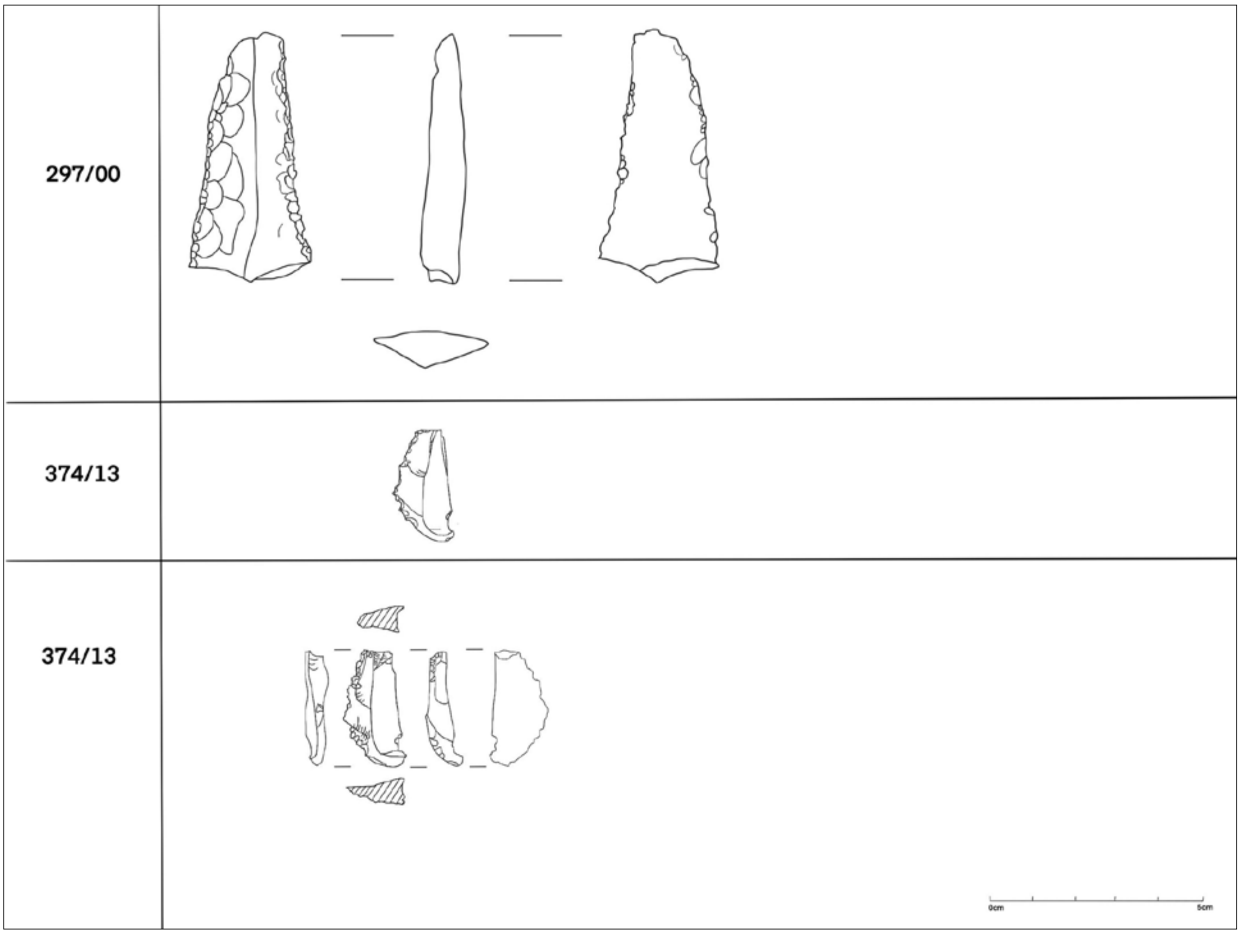

Fig. 11. Flint artefacts from Sector XII in Novae, compiled by P. Dyczek, B. Wojciechowski.

The finds from Novae invite a more general conclusion that the aforementioned items related to the Vădastra Culture seem to indicate that although this culture's birthplace was the Teleorman Valley it would quickly spread into the northern parts of Bulgaria. Such rapid expansion appears to have been driven by the rich deposits of high-quality flint stone located in the region. In the subsequent phases, the Vădastra Culture expanded further eastwards, all the way to the Beli Lom River. It is confirmed also by observations from Romania – the sites located in relative proximity would be found in terraces of river basins. The only difference is that in Bulgaria they lie close to flint deposits. The discoveries from Novae add to our knowledge of the development and economic base of the Vădastra Culture. They also expand the catalogue of sites with a new and apparently quite significant one – Novae.

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Stylistic Changes in the Pottery Production of the Linear Pottery Culture in the Lower Odra Region in the Light of Most Recent Studies

Abstract

This article is the first contribution to a multi-faceted study of the origins of food production in the lower Odra region. Since 2004, the author has conducted microregional surveys to identify Stone Age settlements in the studied region. Later, starting from 2015, a number of settlements of the Band Pottery horizon in the microregion have been investigated (Linear Band Pottery, Stroke-Ornamented Pottery Culture, and Rössen Culture), as well as the roundel at Nowe Objezierze. As of 2018, crucial research is taking place in a central settlement (7/10 ha) of the Linear Pottery Culture (LBK) in Mierzyn 5: PAR 30-04/106, where 20,000 artefacts, 25 homesteads, and 13 identified post-house structures were found.

The author's recent studies demonstrate the lower Odra region to be crucial for understanding stylistic changes in the Early Neolithic. The results of recent research in the lower Odra region, conducted as microregional studies, provide numerous and valuable assemblages reflecting the overall LBK settlement development in the region. Already in the first phase of the work with ceramic materials, it became clear that there was a need to create a periodisation system that would take into account the specifics of the region and the archaeological material. As a result, it is proposed that the division of Phase II into Subphases A and B is not sufficient, thus making it necessary to distinguish new units within Phase III. At the same time, the Skoroszowice-type pottery seems to have been used in the lower Odra region. Currently, it is considered very likely that groups of people continued to exist in the Proto- Proto-Stroke-Ornamented Pottery Culture Horizon.

Keywords: Lower Odra, Early Neolithic, in-depth reading, LBK, farmers, pottery, Music-Note Phase

Introduction

This article is the first contribution to a multi-faceted study on the origins of food production in the lower Odra region. Since 2004, the author has been conducting microregional surveys to identify Stone Age settlements in the studied area. Next, since 2015, several settlements of the Band Pottery horizon in the microregion (mainly in the vicinity of Przecław, Stare Czarnowo, Stobno, and Przylep) were investigated, including the Linear Band Pottery (*Linearbandkeramik*; hereafter as LBK), Stroke-Ornamented Pottery Culture (*Stichbandkeramik*; hereafter as STbK), and Rössen.[1] As of 2023, crucial research is taking place in the LBK's central settlement (7/10 ha) in Mierzyn-Ostoja-Przylep, Police county (the site is inventoried as Mierzyn 5 in the Polish Archaeological Register: PAR 30-04/106).[2] The discovery of a roundel at Nowe Objezierze in 2016 should also be seen in the context of this microregional project.[3] Over 20,000 objects, more than 25 homesteads, 13 identified post-house structures (Fig. 2A), and one completely excavated homestead are the results of the last four years of research (Fig. 2B).

The following article conveys the main trends and conditions related to the postulated stylistic changes. Each aspect addressed will be treated in detail in more extensive future studies, to be published shortly as individual articles. At this stage of the work, the author considers the data and results related to the LBK in the

[1] Dziewanowski 2019a; 2021a, 51, 53; 2021b.

[2] Dziewanowski 2013; Dziewanowski, Żuk 2005.

[3] Dziewanowski 2019, 250.

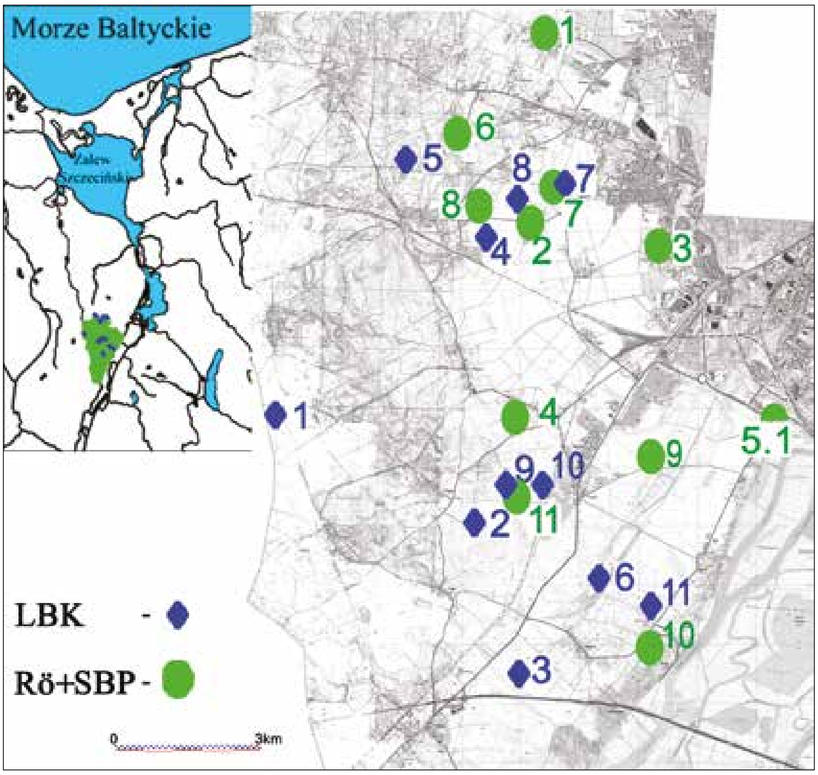

Fig. 1. Microregion of the Szczecin Hills. Elaborated by M. Dziewanowski.

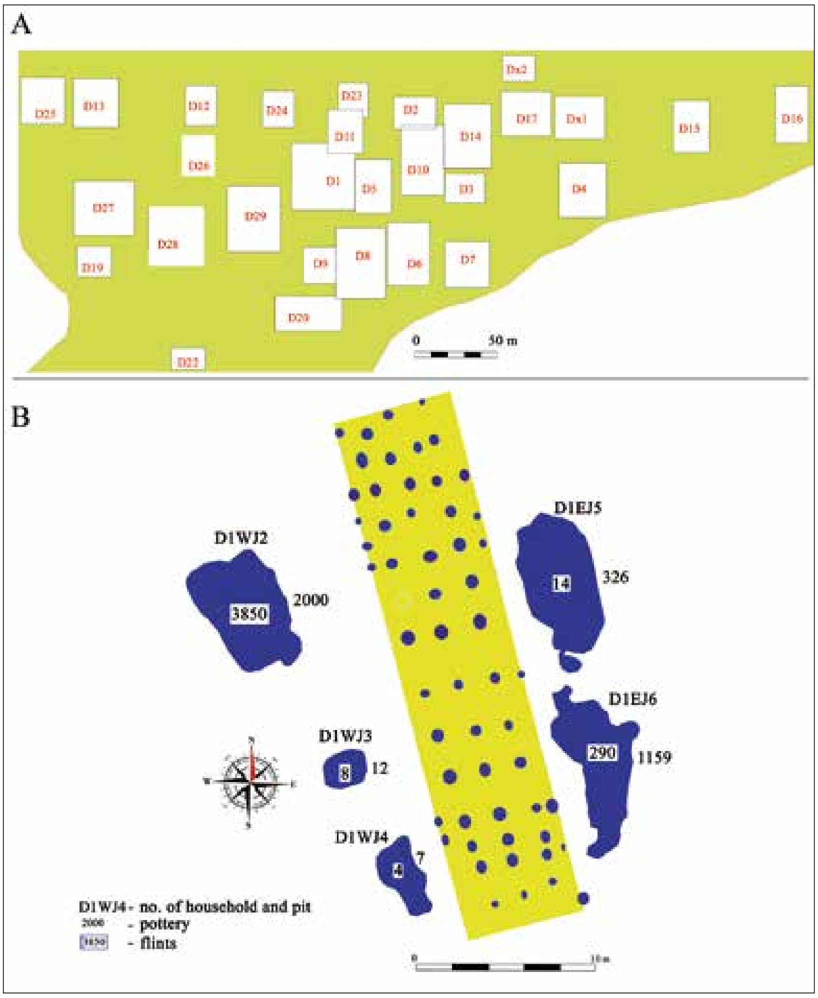

Fig. 2. Mierzyn, site no. 5. Dobra commune. An LBK settlement and homestead in the central settlement. Elaborated by M. Dziewanowski.

Vistula Basin as reference material. Comparative studies with other regions are planned at the next stages of data collection and processing.

Preparations are also being made to extend the study to the last Mesolithic groups and late hunter-gatherer populations of the Proto-Neolithic cultures.[4] The immediate motivation is the need to reinterpret a Mesolithic triangle found in the LBK oven at Mierzyn 5.[5] Of the recent finds, an axe with Early Neolithic (late 7th millennium BC) features found at the Mesolithic site in Bolków is particularly intriguing.[6]

So far, there have been no attempts at periodisation of the LBK in the lower Odra region. The available publications are limited to mentions,[7], selective reports,[8] and references to detailed studies of a few selected finds.[9] Therefore, the author's study has a pioneering character, which requires making some initial considerations.[10] Regrettably, a significant number of finds accumulated in the museum repositories have not yet been published as a monographic study.[11]

The Linear Pottery settlements

Before 1945, German researchers had depicted LBK settlement patterns in the lower Odra basin as clusters scattered across the Wkra forests and the region of Pyrzyce on both sides of the glacial valley of Odra.[12] This model was widely accepted and repeated in the following decades. T. Wiślański conducted several archaeological expeditions in the 1970s to verify it, but these studies did not progress beyond the planning stage.[13] In published materials on the Neolithic Period in the Polish Lowlands, the LBK settlement on the lower Odra River continues to be associated exclusively with the Pyrzyce Lowland.[14] The group of sites on the Szczecin Hills is the most recent discovery in the region, but also the most important for the understanding of cultural processes in Central Europe at the end of the 6th millennium BC. The first LBK sites were identified by the author in 1994 (sites of the Rössen Culture and the STbK) and 1998 (sites of the LBK), but the first publication appeared in 2005, when the soundings of Mierzyn 5 were completed.[15] Thanks to the author's in-depth settlement studies, 11 LBK sites are known from the Stobno cluster alone, and another dozen remain to be verified. Based on the results of the survey conducted so far in the largest LBK settlement, the number of LBK homesteads is estimated at 60 (25 of them were documented on 2.5 ha out of 7/10 ha), with the total number in the Kołbaskowo commune being 80–100.

In the last two decades, several archaeological expeditions were carried out in connection with the large construction projects in the lower Odra region. Although they considerably broadened the source base, they did not generally bring significant changes in our understanding of chronological, stylistic, and settlement-related historical questions. Today, this region is a kind of a large construction site and, despite the huge area under archaeological supervision, there are no new discoveries. The region of Pyrzyce, once known as an important Neolithic centre, seems to lose its significance. Of course, this cannot be due to the lack of evidence, but rather to other systemic factors possibly driven by social and environmental reasons.[16] Another problem is the low reliability of archaeological survey results associated with major construction investments. Many years of archaeological monitoring yielded negative results. Verification investigations carried out by the author in the LBK central settlement at Mierzyn 5[17] showed that the area where construction activities took place was densely occupied by LBK longhouses; post structures are recognisable, as well as rows of lateral pits.[18] In addition, overlaps of the LBK structures with settlement remains of the Rössen and STbK cultures were detected.

Conditions of stylistic dating

The basic LBK settlement unit is composed of a homestead with associated structures, including a post house, lateral pits, and construction pits, which form a kind of extension and roofing over the working spaces located in the lateral pits.

The construction of such a complex must have been a great effort. The use of high-quality tree species such as oak and intentionally charred logs made it more durable. Providing the domestic areas with drainage by digging ditches prevented the development of decay. All this leads us to believe that the natural durability of the structure of 30 to 60 years is quite reasonable. However, the reasons for the abandonment of the houses are currently difficult to determine.[19]

[4] Galiński 1992; 2012; 2016.
[5] Dziewanowski 2021, fig. 3: 1; see also Wąs 2005; 2012.
[6] Galiński 2022.
[7] Kowalski 1998; 2003.
[8] Uciechowska-Gawron, Kamiński, Słowiński 2011.
[9] Balcer 1983; 1985; Kulczycka-Leciejewiczowa 1975.
[10] Dziewanowski, Żuk 2005.
[11] Nawrolska 1976.
[12] Kowalski 2003; Wiślański 1974.
[13] Balcer 1983; Nawrolska 1976, 48.
[14] Marciniak *et al.* 2022, 24–25, fig. 1.
[15] Dziewanowski, Żuk 2005.
[16] Dziewanowski 2013; 2019; 2021a.
[17] Dziewanowski 2021a; 2021b.
[18] Dziewanowski 2021a; 2021b.
[19] Czekaj-Zastawny 2008, 50; Gackowski 2021, 88.

In the Central Polish Lowlands, Phase III of the LBK lasted between 5125/5060 and 5080/5000 cal. BC (95% confidence interval), as recent studies show.[20] Thus, the durability of a house might have roughly corresponded to the duration of this phase of cultural development. Lateral pits can contain the youngest and oldest materials, but also mixed elements from different phases of the life of the house. The case of multiphase sites is more complicated, since the deliberate deposition of younger finds in older pits cannot be ruled out.[21] Therefore, statistical analysis of inventories assigned to houses according to their features and characteristics, while providing statistically important data, may give a false picture of stylistic changes.

The author's research on multiphase settlements, where Rössen and STbK occupations often overlap with LBK homesteads, has provided valuable information on taphonomic processes. Most of the lateral pits could have been backfilled even a few hundred years later. In such cases, only the distribution of pottery finds makes it possible to distinguish between the 6th-millennium layer and that accumulated in the second quarter of the 5th millennium BC. This shows that it is even more difficult to imagine that we can reliably distinguish the layers that have formed over a period of 100 to 150 years, while the settlement was growing and becoming more active.

Knowing that a layer of soil at least 100 centimetres thick disappeared due to erosion since the settlement was abandoned makes us more cautious and sceptical when interpreting the results of investigations of settlements, which in most cases consisted of homesteads.

Periodisation of the Linear Pottery Culture

For the Polish Lowlands, a periodisation in three phases (I–III) is common,[22] developed for the Kuyavian assemblages.[23] Phase II (the so-called Music-Note Phase) is divided into IIA and IIB.[24] In southern Poland, a more detailed subdivision of Phase III is in use: the Želiezovce Phase for Lesser Poland[25] and the Szarka Phase for Silesia.[26]

The author's recent studies allow us to consider the lower Odra region as crucial for understanding stylistic changes in the Early Neolithic, although Phase I has not been confirmed and Phase IIA (early Music-Note) has not yet been conclusively demonstrated in this region.[27] Often trivialised and described simply as younger and the youngest, the lower Odra materials are now proving to be of fundamental importance to the latest research trends on the Early Neolithic in Central Europe. During Phase III, which may have lasted for only 60 years according to recent findings, there may have been at least 200 homesteads. The riddle of the beginning and the end of Phase III will hopefully be solved by further research in the studied region.

Absolute chronology

Absolute dating based on ^{14}C age determination is one of the most important, but also most controversial methods.[28] Even ignoring the implicit assumptions of this method, many limitations can be pointed out that reduce the reliability of dating if an event is to be dated with an accuracy of 100 years. This is all the more remarkable when one considers that the recent discussion is about whether the last LBK should be placed around 5000 or 4950 BC. Recently, some individual ^{14}C estimates for features from Lower Odra have been published, the content of which has not yet been adequately studied and published,[29] not to mention the discussion on homogeneity of the discussed assemblage. Today, there is no doubt that the future of ^{14}C-based chronology with a higher degree of reliability depends on obtaining a series of samples from an archaeological feature that is closely related to other features that can be dated. An example of such a desirable architectural feature would be a pit containing grains, bones, bark, and flint with remnants of organic material, as well as pottery covered with birch tar and carbon deposits. Such analyses would most likely reveal the limitations of the method. They would certainly also provide an opportunity to develop an account that would be consistent with the state of theory development. Samples of the same feature would need to be sent to multiple laboratories.[30] If the results obtained were similar, each of the dates could be considered reliable. The author aims to provide a compilation of ^{14}C dates valuable for versatile studies in line with the current methodological trends.

In recent years, research has been conducted to obtain representative data. The first study will make it

[20] Marciniak *et al.* 2022.

[21] see studies: Allard, *et al* 2013, fig. 9; Bostyn *at al* 2012, figs. 51, 80; Bosquet *at al* 2010; Rück 2013, fig. 5; for the interpretation of re-fittings, see Fiedorczuk 2007.

[22] Czekaj-Zastawny 2008, 13–18.

[23] Pyzel 2010.

[24] Pyzel 2010.

[25] Kadrow 2020, figs. 6–7; Pavúk 1969.

[26] Kulczycka-Leciejewiczowa 1979; Wojciechowski 1978.

[27] Dziewanowski 2021; see also Słowiński 1991, figs. 1.5–1.7.

[28] Denaire 2009.

[29] Marciniak *et al.* 2022, 17–18.

[30] Marciniak *et al.* 2022.

possible to establish criteria in the form of features and assemblages of diagnostic properties and exclude trivial characteristics.

Artefacts from the investigation of the settlement of Mierzyn 5 are crucial for the new periodisation. It is suggested to distinguish subphases to the already known phases, as well as to add the last phase as a transitional period connected to the transformation of the Early Neolithic into the Middle Neolithic (post-Linear) system. These new assemblages will play a key role in testing the feasibility and limitations of the ^{14}C method.

Selected aspects of the pottery style features of the Linear Pottery Culture

Spiral and single-line main motifs, including curved incisions as additional motifs, are the hallmarks of early LBK. The techniques are single "musical notes" that do not form rows, as well as broad and deep lines, while the pottery forms are flowerpots and ovoid specimens. I connect the question of criteria for evaluation of how the change in style from the classical to late Music-Note Phase manifested itself with the S-bands consisting of four lines. A crucial point is also the degree to which different parts of a vessel are filled with the "music note" motifs, which allows a connection to the "Szarka" ornamental patterns. Patterns consisting of five, six, seven, and nine lines reflect the successive phases of motif development. However, did these occur at such intervals that it was possible to obtain appropriate data for each of the postulated stages of development? The field research also focuses on these questions.

Period I – the pioneering phase

Already in the second research season, the complexity and multilinearity of the stylistics within the ceramic subgroups became clear[31] and the search for comparative databases provided an incentive to recognise older ceramic admixtures in some of the finds. It should be noted that the finds represent stylistics and decorative (spiral) motifs that have not been confirmed this far to the northwest of the Noteć River valley. In the backfill of Oven Pit D1WJ2, undoubtedly in a secondary context, fragments of some vessels were found with spiral motifs and single "music notes" that do not form lines (Fig. 3B). A vessel discovered in the wall of an oven on the eastern side of Homestead D14 is particularly puzzling (D14EJ1). This vessel is unique in every way, and no counterpart has yet been found (Fig. 3C). It has wide, deep incisions about 1 centimetre apart, forming a motif consisting of an incomplete spiral filled with two continuous lines. A model for this design is found in Saxony, in the Flomborn horizon, where bands filled with pairs of incised lines and the additional "swallowtail" motif were popular[32]. In addition, an assemblage of pottery representing at least five vessels was recovered from a partially investigated Pit D10WJ4, including a thin-walled form with a broad and deep line and several small beakers with trilinear S-band motifs and inset triangles (Fig. 3A). No "music note" pattern was observed in any of them. Instead, additional motifs in the form of three incised lines stand out. The only bowl is a specimen with thick walls and abundant plant admixture. In the group of stylistically homogeneous collections, this one is among the earliest.

Period II – the phase of settlement development

In several cases, groups of features typical of Phase IIB were found (Fig. 4). Subgroups of pottery documented in the homesteads D12(WJ1), D23 (WJ1) and D14 (WJ1-5) show only three-line motifs, whereas four-line patterns are absent or weak. The "music notes" are in rows but occur rarely and only at the end of the lines. Between the lines, there is a distance of at least 5 millimetres, and it happens that they are finely drawn.

Period III – the phase of intensive settlement colonisation

Subgroups with a significant proportion of four-line motifs found in the homesteads D1, D10, and D14 (EJ1) may be associated with the period of actual colonisation and intensive development of the central settlement (Fig. 5). Motifs that are considered the 'proto-Szarka' type can occur in several different variations and may be generally associated with the more common strokes. The earliest Szarka motifs were executed with clearly separated strokes, often placed not on lines but on the horizontal line formed by incisions. However, when looking at the ceramic materials as a whole, we can see that they indicate a rather archaic way of applying ornaments, expressed in the size of the strokes and the distances between them, as well as in their width and thickness, and so on.

[31] Dziewanowski 2021a, 47; Dziewanowski 2021b, figs. 2–3.

[32] Dziewanowski 2021b, fig. 3. 3.

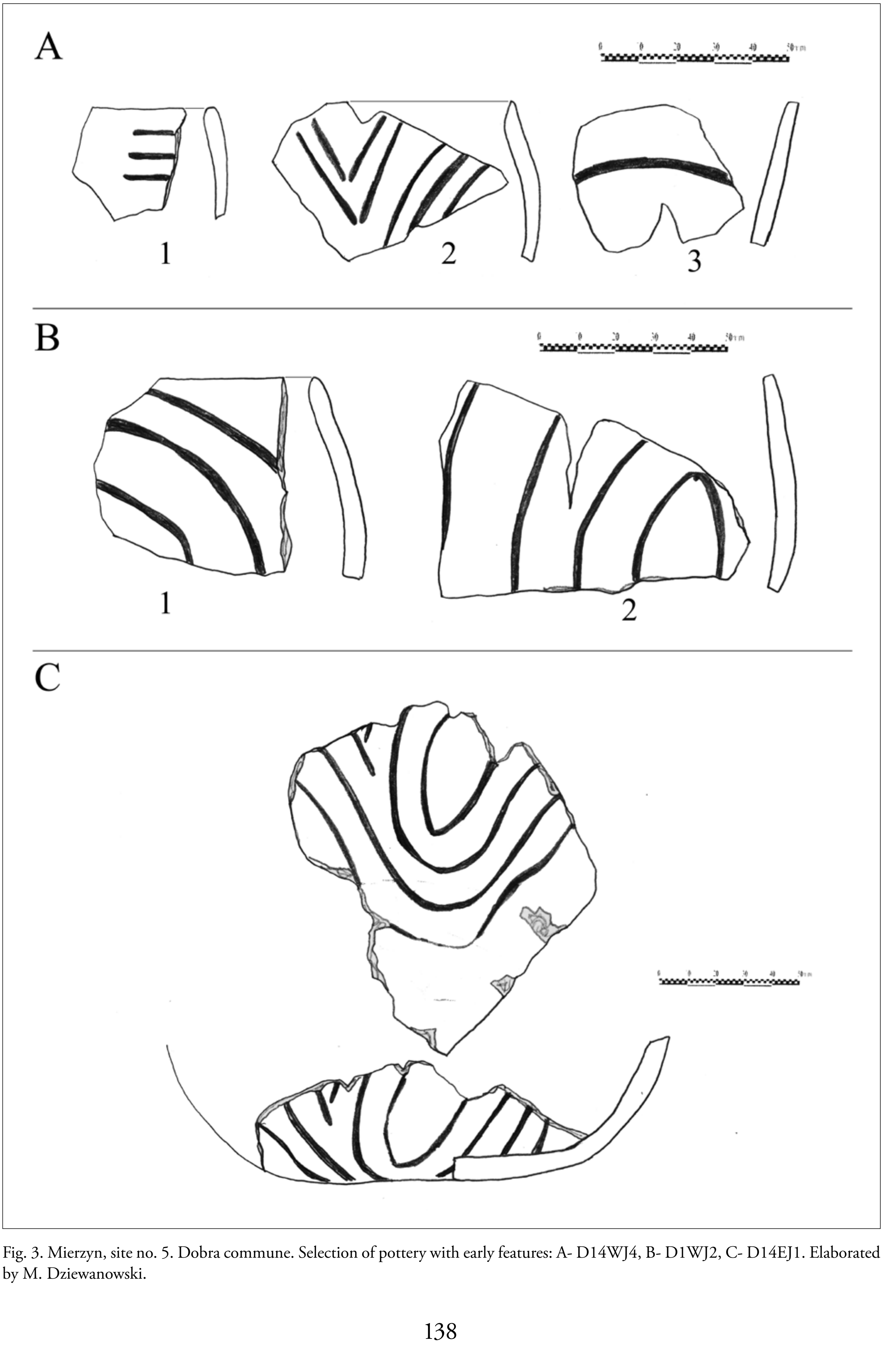

Fig. 3. Mierzyn, site no. 5. Dobra commune. Selection of pottery with early features: A- D14WJ4, B- D1WJ2, C- D14EJ1. Elaborated by M. Dziewanowski.

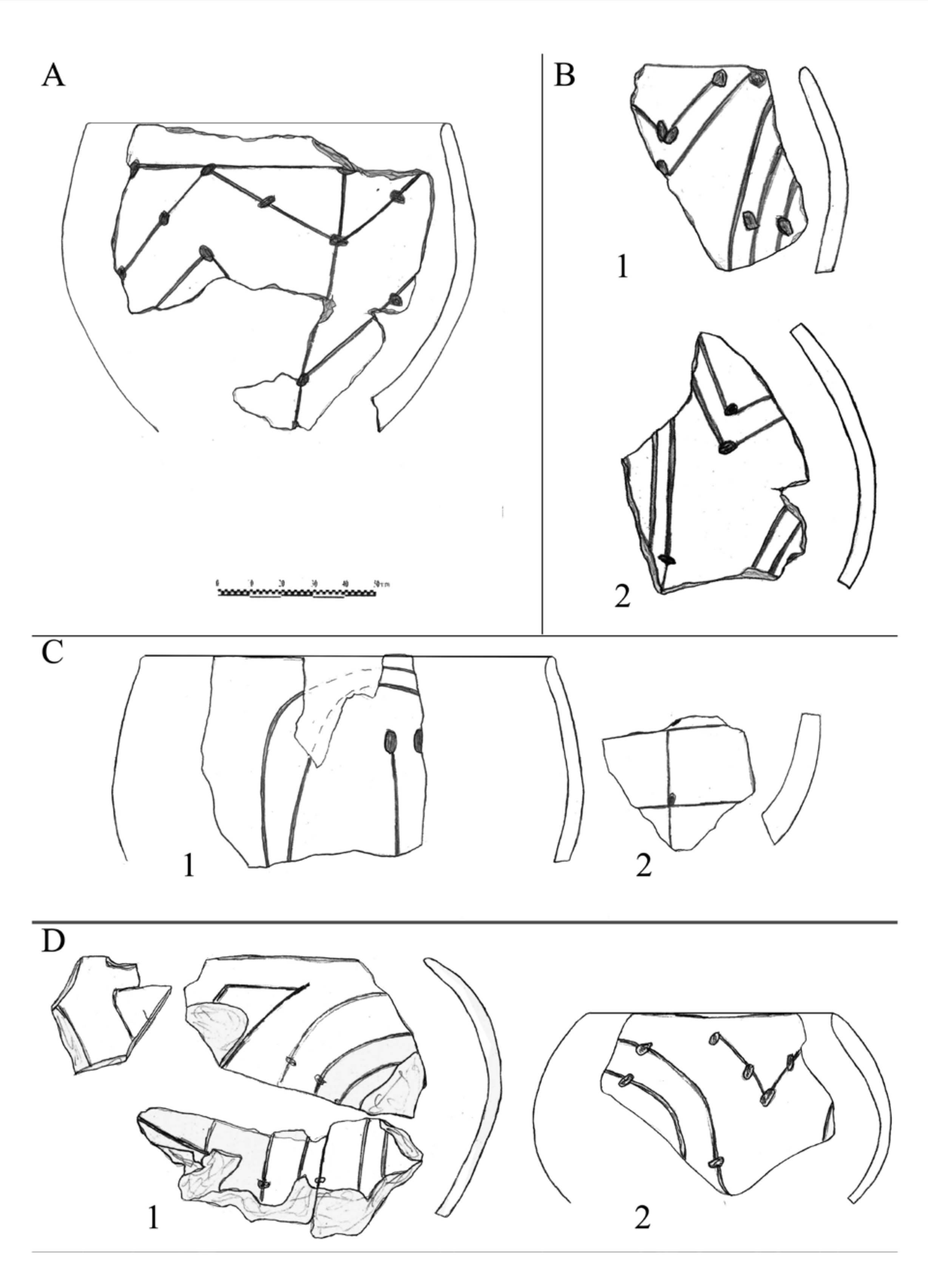

Fig. 4. Mierzyn, site no. 5. Dobra commune. Selection of music-note pottery: A- D10EJ1; B- D14WJ2; C- D12WJ1; D- D14WJ3. Elaborated by M. Dziewanowski.

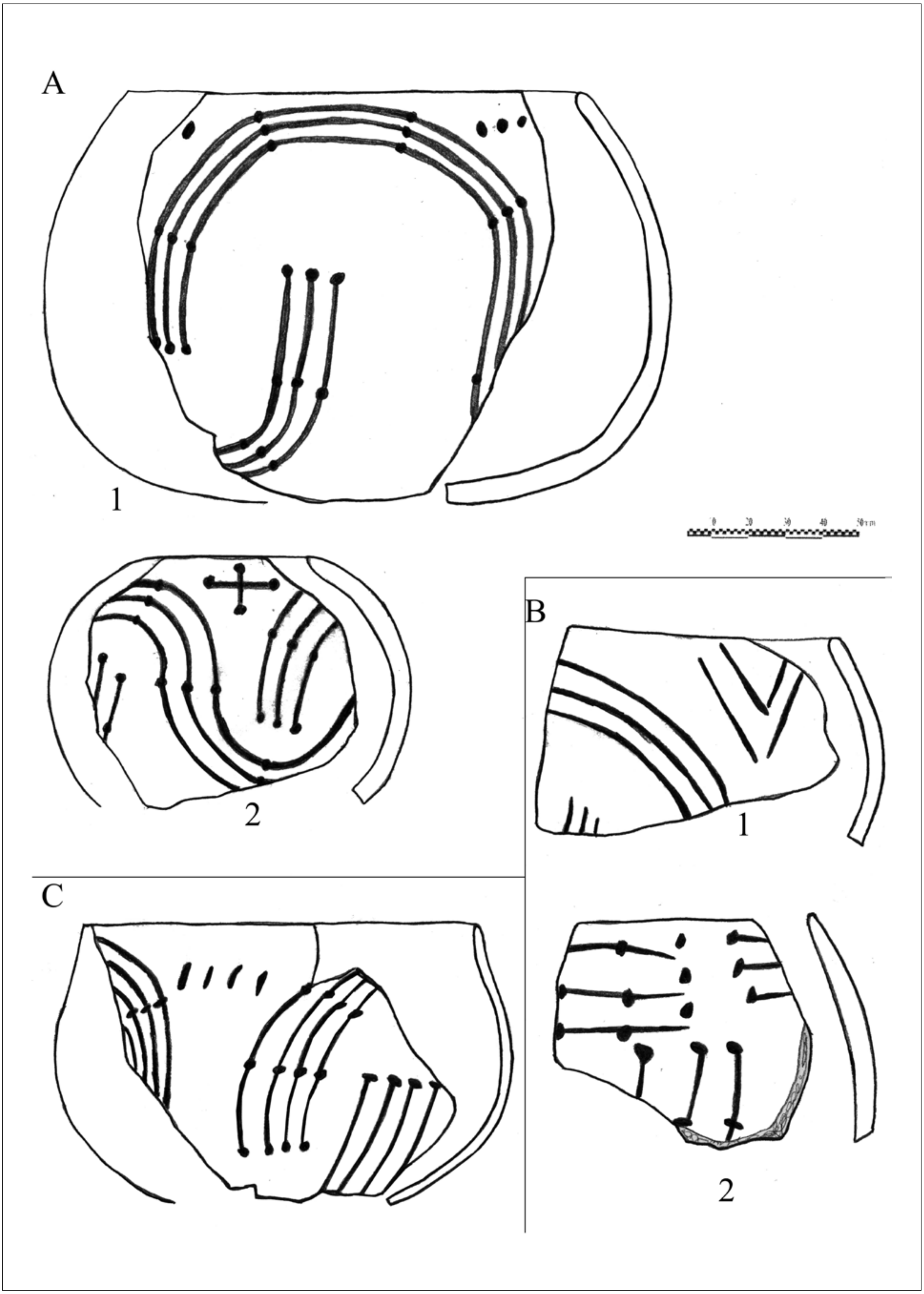

Fig. 5. Mierzyn, site no. 5. Dobra commune. Selection of late music-note pottery: A- D10WJ2; B- D10WJ1; C- D7EJ5. Elaborated by M. Dziewanowski.

Period IVa – the phase of permanent settlement

Another subgroup is characterised by the fact that the motifs of the Szarka type were used to varying degrees, but the incisions are much more precisely executed (Fig. 6A). In this respect, the ceramic assemblages of homesteads D16 and D7 are the most typical and representative of this period. Lines are fine, parallel, and more densely drawn. The patterns consisting of five lines are the most striking feature, but it could be that their appearance marks a new stage in the stylistic development. At this time, the "tooth" motifs known as *Kleberverzierung* gained importance.

Period IVb – the phase of settlement reduction

Another stylistic group shows more developed motifs in every respect and all likelihood the number of lines increases to six, seven, or even nine in approximately the same period (Fig. 6B). Most likely, it would be possible to prove the chronological sequence and indicate a subsequent phase in the development of the style or the next generation, which would involve a thickening of the lines. To prove this, however, field research would have to be intensified to obtain representative assemblages. This stylistic group was determined based on materials from Homestead D4 and finds from Stare Czarnowo, Site 63.[33] In general, the number of settlement relics in the region is increasing, but at the same time, there is evidence of a decline in older settlements.

Period V – time of crisis

The recent discovery at Mierzyn 5 adds a new insight to the studies on the Early Neolithic in the Polish Lowlands, namely that there could have been a transitional phase between the LBK and the STbK – the so-called Skoroszowice Phase.[34] In macromorphological and ornamental aspects, the peculiar character of this stylistic group is evident. Although the forms of the coarse and fine ware are similar in both cultures, the neck is an element that was much more frequently distinguished. A rather extensive collection of pottery was recovered from Feature D6WJ1 (Fig. 7). S-banded motifs seem to lose importance in favour of angular and rectilinear patterns. Linear patterns are multiplied and there are many more "music notes" in the rows (Fig. 6B: 2, 4; 7: 2–7). Even though the strokes are small and often triangular, they are more densely packed and give the impression of furrow stitches (*Furchenstich*) (Fig. 7: 3–4). Also, the additional motifs are different; there are oblique and vertical lines, similar in idea to the STbK ornamental patterns (Fig. 7: 1).

Was there a great colonisation of the Lower Odra River region?

There are two main concepts for the development of the LBK in Kuyavia.[35] The first one states that the first LBK settlement lasted for a long time and there was probably no hiatus,[36] although the possibility of this culture disappearing in Phase III has been recently accepted.[37] It is very likely that the LBK disappeared in some regions and transformed in others during the late 6th and early 5th millennia BC. As a result of social and stylistic changes, for example in Bohemia and Silesia, the STbK may have emerged from the groups of the Szarka Phase of the LBK.

According to the other idea,[38] at the very end of Phase II, the Kuyavian populations could have made a great migration to the west, along the Noteć valley, and on their way settled, among others, the area of the lower Odra River. The studies and considerations delivered by the advocates of both concepts about the origin and the real nature of the cultural processes before the Middle Neolithic are complex.

However, inspired only by these strands of historiography, the author presents some important results of his studies and outlines the most probable pattern of Neolithisation of the lower Odra region. There is no doubt that the level of knowledge about the LBK settlement in the studied region is disproportionate to its potential and resources. It is through the recent microregional studies initiated by the author[39] that the overall perception of the region is changing, along with its importance for the dissemination of ideas and the establishment of interregional contact networks.

Virtually all published LBK material for the regions of Pyrzyce and the Stobniański Ridge has been, until recently, associated with the last phase (III) of the LBK, or with the terminal part of Phase II. An exception was the ceramic assemblage from Brzezin 7,[40] which, however, could not be better evaluated due to its small size. These facts rightly suggest that the LBK settlement took

[33] Dziewanowski 2018, fig. 6.

[34] see: Wojciechowski 1978.

[35] Marciniak *et al.* 2022, 4–5; see also Pyzel 2010, 221–226.

[36] Pyzel 2021, 211.

[37] Marciniak *et al.* 2022, 4.

[38] Marciniak *et al.* 2022, 5.

[39] Dziewanowski 2015.

[40] Słowiński 1991.

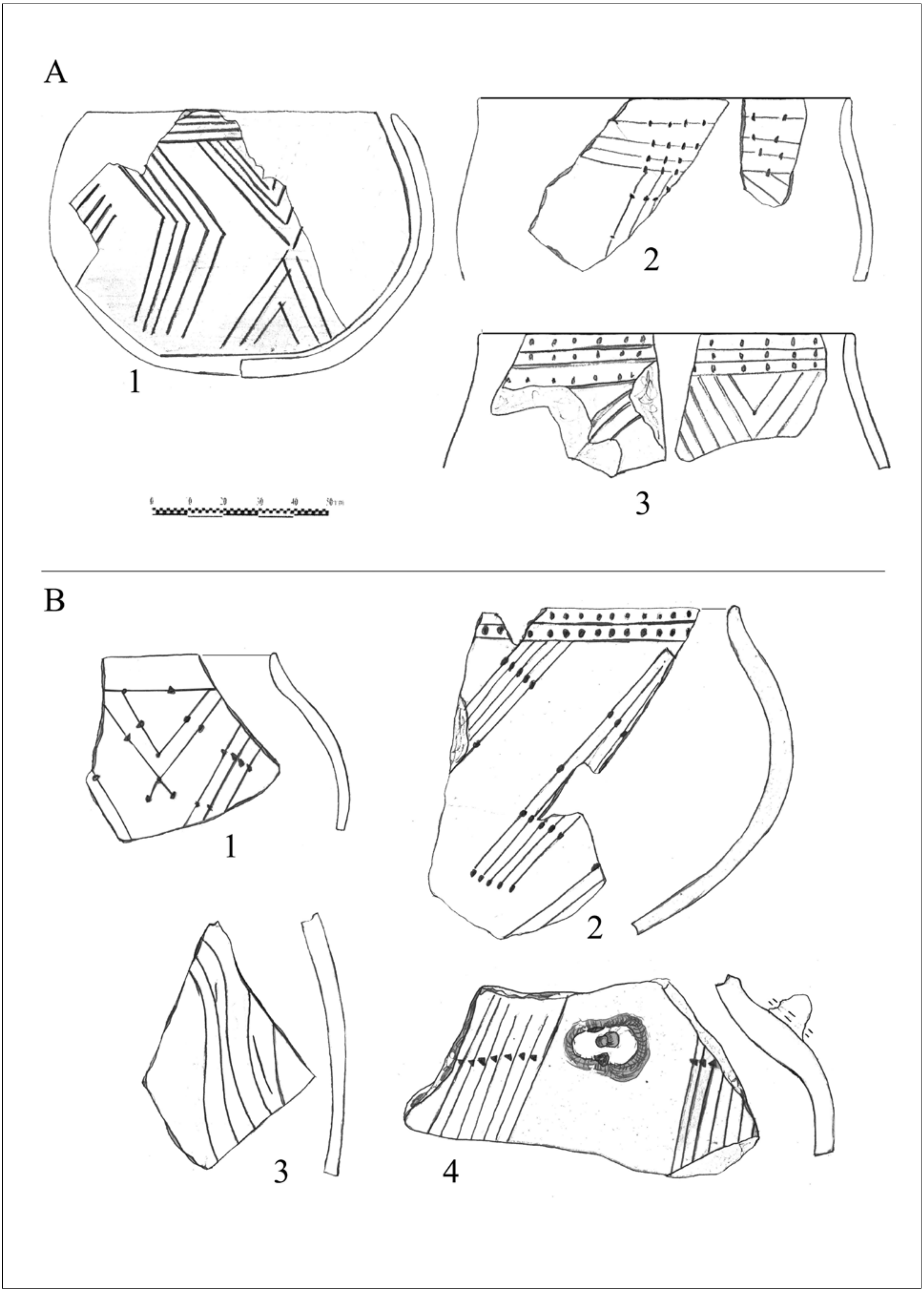

Fig. 6. Selection of classical Szarka Horizon pottery from Stare Czarnowo 63 (A) and late Szarka Horizon pottery from Przecław 45 (B). Elaborated by M. Dziewanowski.

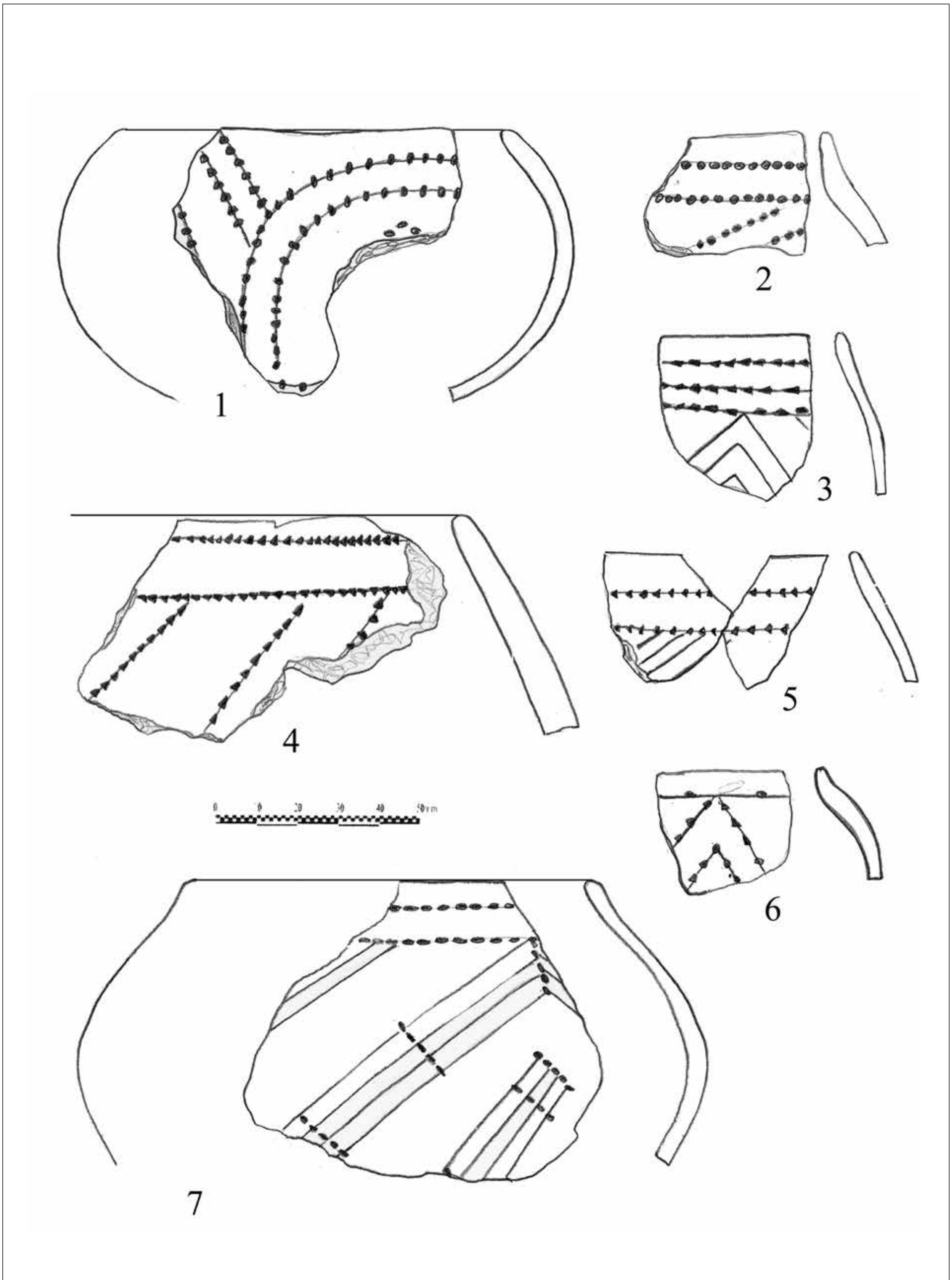

Fig. 7. Mierzyn, site no. 5. Dobra commune. Selection of Skoroszowice horizon pottery: D6WJ1. Elaborated by M. Dziewanowski.

place in a later period and was limited to the formation of a new settlement enclave. The presence of the youngest elements, which did not involve the Linear background, was indicated in connection with the Szarka Phase. It would be difficult to deduce from these data the reasons for the end of the Early Neolithic, and only by assuming the refugial character of the region were scholars able to consider the subject closed.

However, the arrival of larger populations is already recognisable at the end of Phase IIB in the lower Odra region, as evidenced by intensive traces of early Neolithic occupation and the fact that a central settlement of more than 7 hectares in size was established. This may have happened at a time when the region of Kuyavia was in crisis. It is noteworthy that in Kuyavia there is little material of Phase III comparable to what was found in recent years in the lower Odra region.

During the investigations in the central settlement, the author found that the lateral pits associated with homesteads of the second and third periods contained the richest finds, including botanical remains. In contrast, homesteads represented by the ceramic subgroups of periods four through six are relatively poor in finds, at least in quantity. Is it, therefore, reasonable to see this as evidence for the first symptoms of crisis after the considerable expansion of the settlement area in the developed phase of Szarka? Is there a decline in grain (as in the homesteads D3, D6, and D19) coupled with an increase in the importance of, for example, hazelnuts (as in the case of Homestead D4)? Perhaps the area near the settlement was already a barren land at that time, which could also be due to climatic changes. It is quite certain that the LBK existed longer than previously thought in the Lower Odra region, and the question of the later fate of this community takes on a new meaning.

Recapitulation

The results of recent research in the lower Odra region, conducted as microregional studies, provide numerous and valuable assemblages reflecting the overall LBK settlement development in the region. Already in the first phase of work with ceramic materials, the need to create a periodisation system that takes into account the specifics of the region and the archaeological material became clear. It is also obvious that the division of Phase II (Music-Note) into subphases A and B is not sufficient for an adequate classification of the subgroups. Moreover, abundant evidence and a variety of inventories containing the Szarka type and later elements suggest that it is necessary to distinguish new units within Phase III. Finds of pottery with obvious transitional features between the LBK and the STbK, known in Silesia as the Skoroszowice type, lead us to propose a new period in the development of the LBK in the lower Odra region – Phase IV. At the same time, it must be stated that the idea of classifying the finds in the convention of settlement phases is also insufficient in light of the collected data. In search of a way out of the impasse of classification and information, the author proposes to develop systems based on stylistic and technological groups, taking into account the representative nature of the assemblage and qualitative and quantitative assessment.[41] There is no doubt that when the centre of Neolithisation flourished on the lower Odra River, the LBK society of the adjacent areas already had a general idea of the region and the necessary knowledge about possible directions of expansion.

Both field and conceptual studies are being intensified, so it is expected that in the coming years, a research corpus will emerge that can significantly change our understanding of the LBK in the lower Odra Basin in the context of interregional contacts.

The main objective is undoubtedly to increase the number and quality of data on the earliest and the latest settlements in order to outline the two central epochs. Currently, it is considered very likely that groups of people continued to exist in the Proto-STbK horizon, but they were significantly smaller. Such assemblages found in settlements would indicate that there was no hiatus between the Early Neolithic and the Roundel horizons, i.e. Phase IVa of the STbK, or that settlement was interrupted for a short period corresponding to the phases II–III of the STbK. The extent to which both recent studies and new evidence show a tendency toward intensification of settlement, the questions of origin of the presumed large group that arrived at the end of Phase IIB and the possibility of a large migration from the east, i.e. from the middle Vistula Basin, will probably arise again with increased force.

[41] Lech 1989, 282

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Middle and Upper Palaeolithic surface finds from Iłża 3 "Krzemieniec II"

Abstract

In the present paper, we would like to discuss the results of preliminary field research in the vicinity of the chocolate flint outcrops in Iłża, Site 3, "Krzemieniec II" (Kielce Upland, south-eastern Poland), including the discovered lithic finds – debitage products (flakes and blades), cores, and formal tools, such as bifacial knives. We attempted to infer the chronology of those lithic specimens which were found during the surface survey or in trenches without preserved stratigraphy. Based on their spatial distribution, as well as typological and technological analysis, we distinguished the oldest traces of occupational activities of prehistoric societies in the vicinity of Iłża related to the Middle and Upper Palaeolithic. Additionally, we conducted a microscopic analysis of the state of preservation of characteristic lithic artefacts. This showed possibilities of linking specific states of preservation of flint surfaces with a generalised chronology of the Stone Age and Bronze Age.

Keywords: Middle Palaeolithic, Upper Palaeolithic, lithics, bifacial technology, patina, Iłża sites, south-eastern Poland

In this paper, we would like to tackle the problem of distinguishing Middle and Upper Palaeolithic lithics from surface collections. The identification of such finds can be problematic in some cases, especially in places where raw materials had been extracted and where traces of human activity were identified for different periods.

We conducted our study on materials from Site 3 in Iłża, located in the vicinity of chocolate flint outcrops (Kielce Upland, south-eastern Poland). During our preliminary research, we used typological, technological, and microscopic analyses. We focused on flint tools, namely bifacial forms in the type of Bockstein knives, cores, debitage products, as well as forms related to blade technology.

The site

The slope on which the archaeological site of Iłża 3 "Krzemieniec II" is located shows western exposure and stretches for several hundred metres. In the vicinity of the site, there is an outcrop of the chocolate flint which was exploited during different times in prehistory. The archaeological sites in this area were first discovered by Stefan Krukowski in the interwar period.[1] In the 1990s, another field research was carried out, but the flint materials obtained at that time have not been published.[2] Despite the discovery of Middle and Upper Palaeolithic materials, further research was abandoned at that time, because most of the artefacts were found in a secondary position in the

[1] Schild 1971.

[2] Bednarz 1997; Budziszewski, Bednarz 1997.

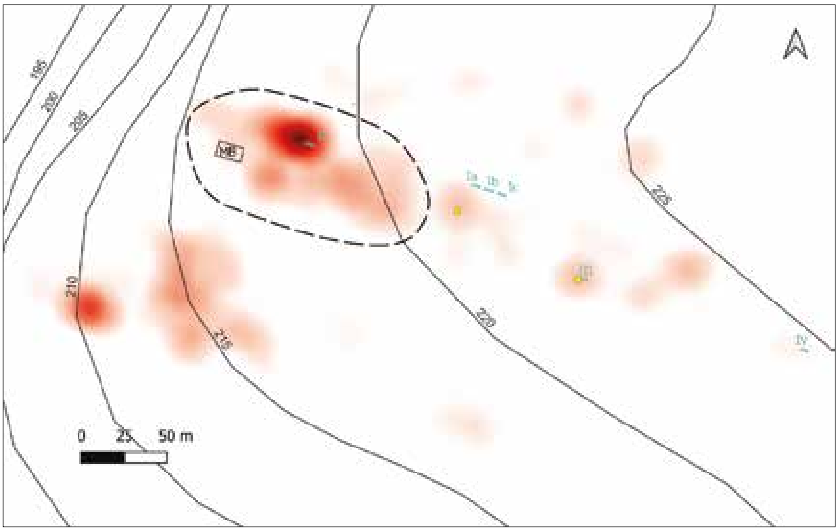

Fig. 1. Iłża, Site 3 "Krzemieniec II". The heat map shows the distribution of lithics. Dashed line – the main lithic cluster; yellow dots – bifacial knives; MB – excavations of Marcin Bednarz from the 1997 season; Ia, Ib, Ic, II, III, IV – test trenches from the 2021 season.

topsoil. Underneath it, in the place where the trenches were located, there was mostly limestone from which the hill was formed. The lithics obtained from this research were not included in the analysed sample.

Knowing the location of the site from the documentation, we decided to come back to Iłża 3 "Krzemieniec II" in 2021. Our field research consisted of field walking, drilling with hand augers, and trial-trenching. We aimed to verify whether the site still existed and whether it was possible to find the layers with flint artefacts dated to the Pleistocene. As a result of the undertaken research, we were able to determine the area of the site and its chronology. The artefact clusters are scattered across an area of ca. 7 hectares (Fig. 1). The most numerous concentrations are located in the lowest part of the slope, near its steep edge (205 m a.s.l.) offering a view on the majority of the Iłżanka River valley. From this point, flint clusters continue for 400 metres further eastwards, up the slope and to its end at 225 metres above sea level. On the lower part of the site, more fragments of the limestone bedrock were recorded on the surface, which indicated thinner quaternary sediments and accumulation of materials as a result of the mass movement process and agricultural activity – ploughing. The middle part of the site was not accessible, due to the apple orchard planted on it, which resulted in the lack of findings and influenced the heat map to some extent.

The trenches Ia, Ib, Ic, II, III, and IV were located in different parts of the slope. In most cases, the limestone bedrock was recorded just underneath the topsoil. The trenches Ia, Ib, III, and IV have not yielded any lithic materials. In trench Ic, there was only a single blade, found directly underneath the topsoil. The most promising trench II was excavated in a part of the slope showing a high density of lithics and stratigraphy analogous to the rest of the trenches. The only difference was the occurrence of a karst fissure from which two flint precores were excavated. Most probably, the artefacts were redeposited into the karst, which is filled up with both Quaternary and Tertiary sediments. The lithics were located in the upper part of the karst. The excavated sediments were sampled for further analysis, but the state of preservation of artefacts, which is analogous to the ones from the surface, indicates that they have been redeposited a long time after their making.

Materials

During the study, we discovered remains of the exploitation and processing of flint raw material dating from the Middle Palaeolithic to the Early Bronze Age. The collection consists of 258 flint pieces which formed clusters in different parts of the site (Fig. 1).

Typological and technological analysis

The oldest traces of activity on Site 3 in Iłża are represented by two biface knives and one flake core sharing similarities with the Levallois method of reduction (Figs. 2–3). All forms were found in the middle part of the site, but they are scarce and spatially removed from each other, which precludes interpreting them as a lithic cluster. Their state of preservation is associated with post-depositional processes – there is a thick patina, extensive "natural" abrasion, and gloss on their whole surface. To prove the Middle Palaeolithic chronology of bifacial knives, we present them separately, along with a detailed description of the technological traits identifying them, in our opinion, as "Neanderthal-made" forms rather than a result of the Early Bronze Age production. The discussion in Polish literature about mistakes in attribution between the Middle Palaeolithic and

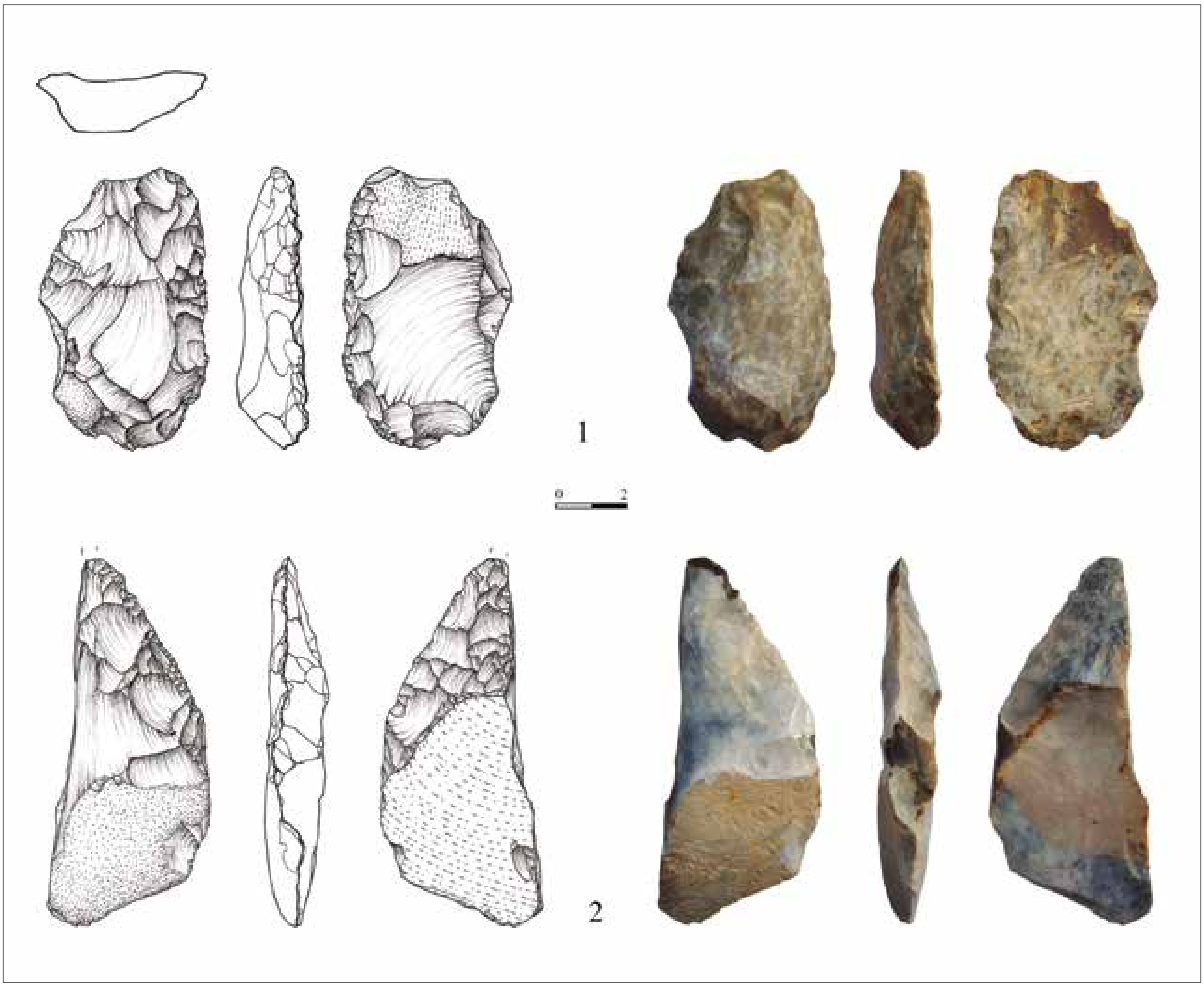

Fig. 2. Iłża, Site 3 "Krzemieniec II": 1 – bifacial knife of the Świeciechów flint; 2 – bifacial knife of the chocolate flint (drawing by A. Pałasz, photo by W. Grużdź).

Early Bronze Age bifacial materials has a long history,[3] but it is worth mentioning that the first published example illustrating this problem was item noted by Stefan Krukowski in "Paleolit" as a "niby-prądnik" artefact from Iłża "Krzemieniec".[4]

The first knife made of the Świeciechów flint is plano-convex (this is a characteristic feature of Middle Palaeolithic bifacial tools) and asymmetrical towards the working edge (Fig. 2. 1). Most of the reduction was carried out on the convex side of the tool. The opposite side was shaped with one main blow that left a large negative and a smaller one caused by the shaping of the working edge and the base. The natural surface on the flat side indicates that this part was not extensively reduced. The second knife was shaped from the chocolate flint and is also plano-convex, corresponding typologically to the Bockstein knives (Fig. 2. 2). The flat surface was shaped starting from the working edge and towards the natural back, with some cortex left on the base. The opposite side was flaked starting from the working edge and the back of the knife. On this side, the negatives are smaller, and 2/3 of the form is left with the natural surface, which betrays it as a result of frost or tectonic crack. The second characteristic feature that supports the Middle Palaeolithic chronology of the artefact, is the treatment of the working edge. In contrast to the Early Bronze Age bifaces that had working edges shaped at the last stage of reduction, in the case of the Middle Palaeolithic knives shaping of the cutting edge was important and started at the early phases of reduction. Very often the rest of

[3] E.g. Schild 1971; Migal, Urbanowski 2008.

[4] Krukowski 1939–1948, pl. 38.

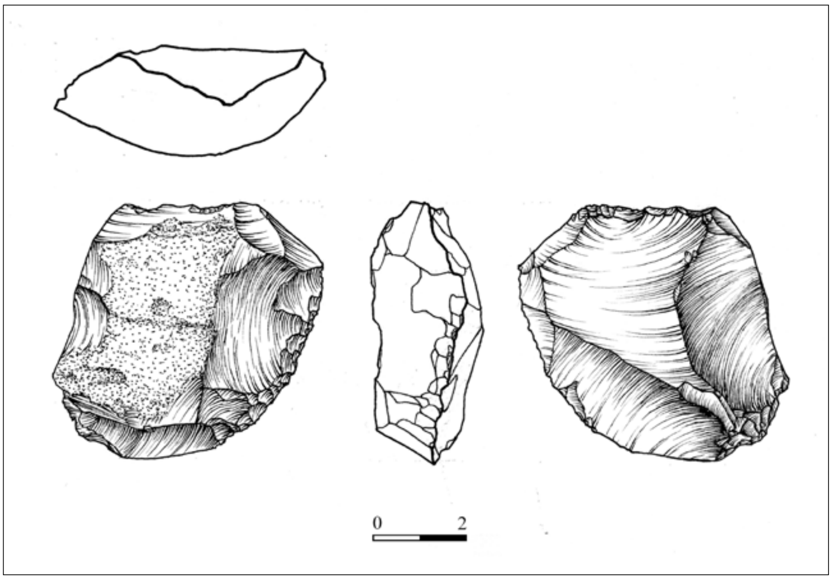

Fig. 3. Iłża, Site 3 "Krzemieniec II". The flake core of the chocolate flint with the Levallois reduction (drawing by A. Pałasz).

the tool was left natural or only slightly shaped to fit the needs of the maker. This feature is easily noticeable when we are dealing with a very straight and regular working edge that does not exceed 1/3 of the tool length, and the rest of the tool is left almost unshaped.

The second collection is the most numerous and was discovered in a concentration near the edge of the slope, which can be attributed to an unspecified Upper Palaeolithic community occupying the area. It is associated with manufacturing blades from the local chocolate flint. This lithic scatter is characterised by high density – within this location limestone pieces are visible on the surface of the topsoil. Additionally, two precores from the karst fissure can be linked to the surface collection. Most of the materials from this scatter, can be distinguished also based on the occurrence of "natural" abrasion and glossy surface and patina, as in the case of the previous group. The blade technology in the main lithic scatter is represented by 18 blade cores (13 single-platform and 3 double-platform cores) and their fragments (2 pieces), 11 blades, and 5 tools. Additionally, 40 flakes and 12 precores/flake cores were included in this group, based on their state of preservation, comparable to the rest of the collection, as well as on the fact that they were found within the same scatter (Fig. 4). The lithic production was aimed at rather thick blades with irregular edges and ridges, detached from the single- and double-platform cores. The acute flaking angle of the debitage products and the big bulbs seen on them suggest the application of direct percussion with a hammerstone or a billet (Fig. 4. 1–3, 5, 7). Platforms of cores were usually plain (Fig. 4. 6), with traces of trimming and abrasion. Most of the tools discovered in this cluster were typologically classified as flakes and blades with retouch, except a single burin (Fig. 4. 4).

On the site, but outside the main lithic scatter, we discovered five blade cores with more regular negative scars and extensive faceting, which was aimed at isolating the point of impact in the shape of a spur. Such cores are well known from the Magdalenian assemblages (Fig. 5) and were used to detach blades with *en éperon*. Unfortunately, without more data and stratigraphic reference, it remains uncertain whether they can be linked to the rest of the debitage sequences or rather result from a separate chronological event. Additionally, within the researched area, we recorded artefacts without any post-depositional alterations. In some cases, these materials typologically and technologically correspond to flint technologies from the Neolithic (end scraper) and Neolithic or Bronze Age (splintered pieces). Lithics from this group were less common and found in different parts of the site without any discernible spatial pattern.

Analysis of the state of preservation

We are fully aware that patination should not be considered a reliable age marker for archaeological lithics because it is related to deposition in sediments and post-depositional factors. Nevertheless, we decided to investigate the state of preservation of some specimens. For this purpose, we selected characteristic typological forms, the chronology of which could be determined on the basis of their morphology (presented above). Additionally, we analysed five specimens from the site of "Krzemieniec I", situated next to Iłża 3, where we found remains of an Early Bronze Age workshop.

Previous studies showed that patina can form on lithic artefacts as the result of natural soil processes, and it is usually related to the properties of the environment surrounding the artefacts, such as acidity, alkalinity, and

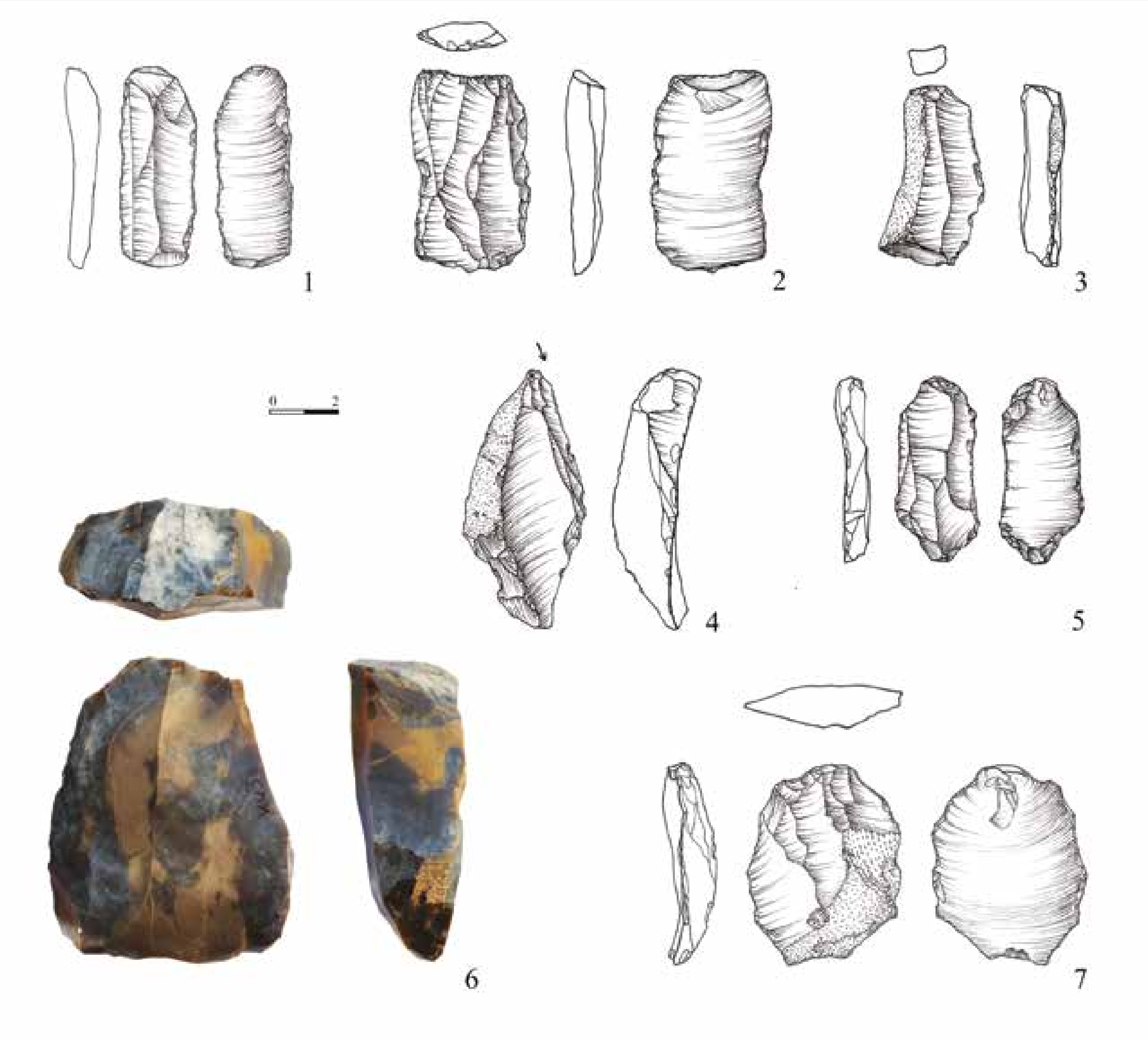

Fig. 4. Iłża, Site 3 "Krzemieniec II". 1–3, 5 – retouched blades; 4 – burin; 6 – blade core; 7 – flake (drawing by A. Pałasz, photo by W. Grużdź).

humidity. The formation of surface sheen on lithic artefacts is associated with mechanical and chemical processes, such as the activity of water and sand.[5]

We conducted macroscopic and microscopic analyses and used a digital microscope Keyence VHX-7000 with magnification from 20x to 1000x. As a result of our analysis, the collection of lithics could be divided into three groups. The first group is characterised by intense patination (blue and white) and surface sheen, with the occurrence of intense abrasion of the edges and ridges caused by natural factors (Fig. 6. 1,2). This group consists of artefacts that can be described as Middle and Upper Palaeolithic. The second group (consisting of Early Bronze Age materials from the above-mentioned workshop) is distinguished by a well-developed white patina but almost no surface sheen and abrasion of the ridges or edges (Fig. 6. 3,4). It is worth noting that this kind of patina is very often found on the chocolate flint near its extraction places, most probably being a result of deposition near limestone in the area. Some of the researchers in Poland also call it a "mining patina". The last category consists of lithics which are not covered by

[5] E.g. Plisson, Mauger 1988; Van Gijn, 1990, 51–53; Levi Sala, 1993; 1996, 31–32, 71; Kamińska, Szymczak, 1994; Burroni *et al.* 2002.

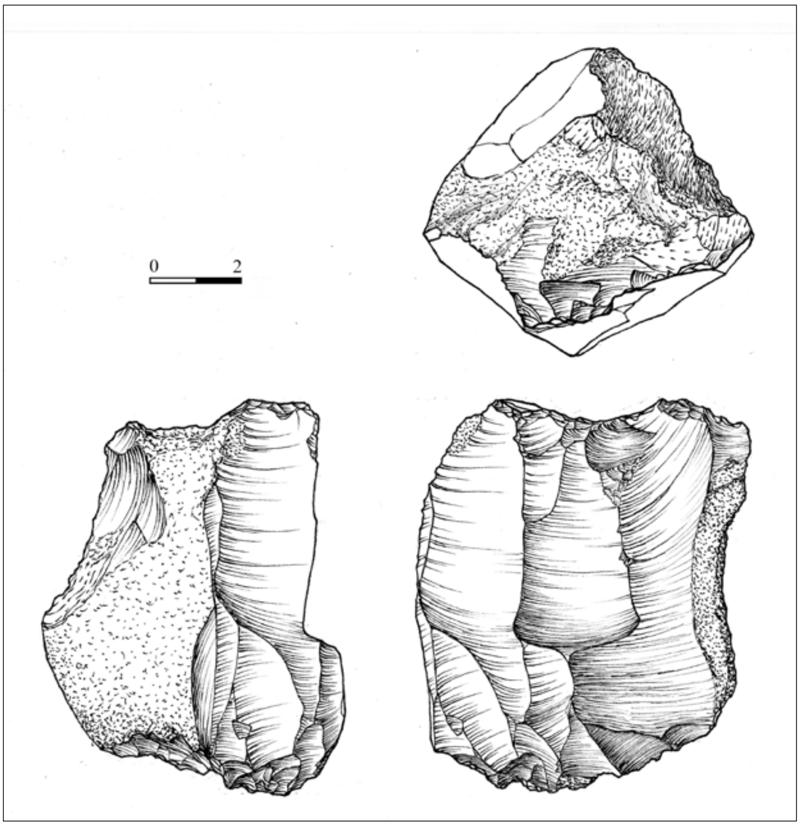

Fig. 5. Iłża, Site 3 "Krzemieniec II". The blade core with the facetted platform (drawing by A. Pałasz).

patina, without any clear surface sheen (there are only single sheen spots) or abrasion, and these artefacts are close to examples produced during modern knapping experiments (Fig. 6. 5,6). The second and third groups consist of artefacts which can be described as Neolithic and Early Bronze Age lithics.

Conclusions

Based on the conducted field research and technological, typological, and microscopic analyses, we can conclude that remains of settlements of Middle Palaeolithic and Upper Palaeolithic groups were found within the site of Iłża 3 "Krzemieniec II". These are the oldest traces of prehistoric societies occupying the vicinity of Iłża.[6] Their presence was probably related to the acquisition of chocolate flint nodules for further processing – outcrops of the chocolate flint are located several hundred metres from the site. The lithic production on the site is proven by the numerous precores or post-preparation flakes. At the same time, formal tools were obtained from the site – finished bifacial knives, including one made of the Świeciechów flint, or a burin – which proves that Palaeolithic communities undertook, at least sporadically, other everyday activities.

In addition, the preliminary microscopic analysis of the state of preservation indicates that it is possible to link specific states of preservation of flint surfaces with a generalised chronology. There are clear differences between the Middle and Upper Palaeolithic specimens compared to the Early Bronze Age ones. These data are an important contribution to the discussion on methods of recognising lithic artefacts at multicultural sites, located near mining centres and lacking any preserved stratigraphy, as exemplified by Iłża 3 "Krzemieniec II". Doubts related to determining the chronological affiliation of the bifacial forms and waste products from their manufacturing – whether it is a Middle Palaeolithic or an Early Bronze Age relic – were mentioned by researchers in earlier flint studies.[7] We hope that the results of our microscopic analysis will facilitate future identification of analogous lithic specimens found during surface surveys or at sites without preserved stratigraphy.

[6] E.g. Bujakowski 2016.

[7] Krukowski 1939–1948; Schild 1971; Migal, Urbanowski 2008.

Fig. 6. Iłża, Site 3 "Krzemieniec II" (1–2, 5–6) and "Krzemieniec II" (3–4). The different stages of surface preservation on flint: 1–2 – first category, intense patination (blue and white) and surface sheen; 3–4 – second category, moderate patination, lack of intense surface sheen; 5–6 – third category, no noticeable post-depositional changes (photo by K. Pyżewicz).

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The iconography of the mythological programme of the Mithraic sanctuary in Hawarte (Syria)

ABSTRACT

Hawarte is a small village located north of Apamea, one of the most spectacular cities of Roman Syria. In the area of that small village, unexpectedly a large Mithraic sanctuary located in a cave was brought into the light. The shrine was richly decorated with paintings covering almost the whole available space. Those discovered paintings represented a very rare Mithraic programme, which shows some variants of the Mithraic doctrine. Moreover, some architectonic elements discovered during the excavations gave a chance to correlate the time of the cultic ceremonies and rituals with the exact days of the calendar. Those unique elements recorded during the field works were a reflection of the broad-scale distribution of the Mithraic religion. In that field, doubtlessly an important role-played Roman legions distributed almost in every corner of the Roman Empire. Those soldiers, who were dislocated in various places, and various locations effectively transferred a new doctrine. One of the variants of that doctrine or reflection of regional Mithraic tradition was discovered in Hawarte.

Keywords: Hawarte, Syria, Mithraic sanctuary, Mithraic religion, Roman legions, painting decorations

The discovery of a cave decorated with paintings in Hawarte located in north-western Syria happened by accident. For the academic community, as well as for enthusiasts of ancient cultures and art, the discovery of this cave confirms once again that the eastern part of the Mediterranean area, and Syria in particular, is still a great treasure trove that awaits a good moment to reveal its secrets to the audience. When the cave was recognised as a Mithraic sanctuary, thanks to Professor Gawlikowski's expertise, soon after an archaeological expedition began fieldwork.[1] The project was led by Professor Michał Gawlikowski, whose determination and proactivity in the field allowed all of the team members to take part in an unforgettable intellectual and archaeological adventure.

The remains of a Mithraic sanctuary were detected and recorded among other ruins distributed among modest buildings forming the modern village of Hawarte, situated atop a hill.[2] The local landscape seems to be much more important than the village itself since it has not changed much from Antiquity. The hills are the southernmost part of the Jebel Ziwije, which is a part of the Limestone Massif stretching across northern Syria.[3] The localisation of the Hawarte Mithraic cave seems to be in the middle of nowhere when looking at the map of the region (Fig. 1). This impression is misleading, however, since the prosperous and flourishing city of Apamea is located less than 20 kilometres to the south, which gives a much better perspective for the cultic activity.

To be clear, in late Antiquity the vicinity of Apamea was a stage of Christian monastic movement, which flourished due to the Christian community that settled in this region. Therefore, as a part of that process, religious structures – specifically churches – were constructed in Hawarte. Constructions recorded during the excavations carried out by Pierre Canivet demonstrated how the Christians were determined to create architecture dedicated to cultic practices.[4] The so-called Photios Church was a typical basilica construction, erected upon the remnants of a Mithraic cave situated underneath the church's floor level. One of the characteristic structures dominating the excavation area is the so-called Maison Halil – the house of Halil – the building which undoubt-

[1] Gawlikowski 1999; 2000; 2001a; 2001b; 2002; 2007.
[2] Jakubiak 2021.
[3] Jakubiak 2012.
[4] Canivet *et al.* 1987.

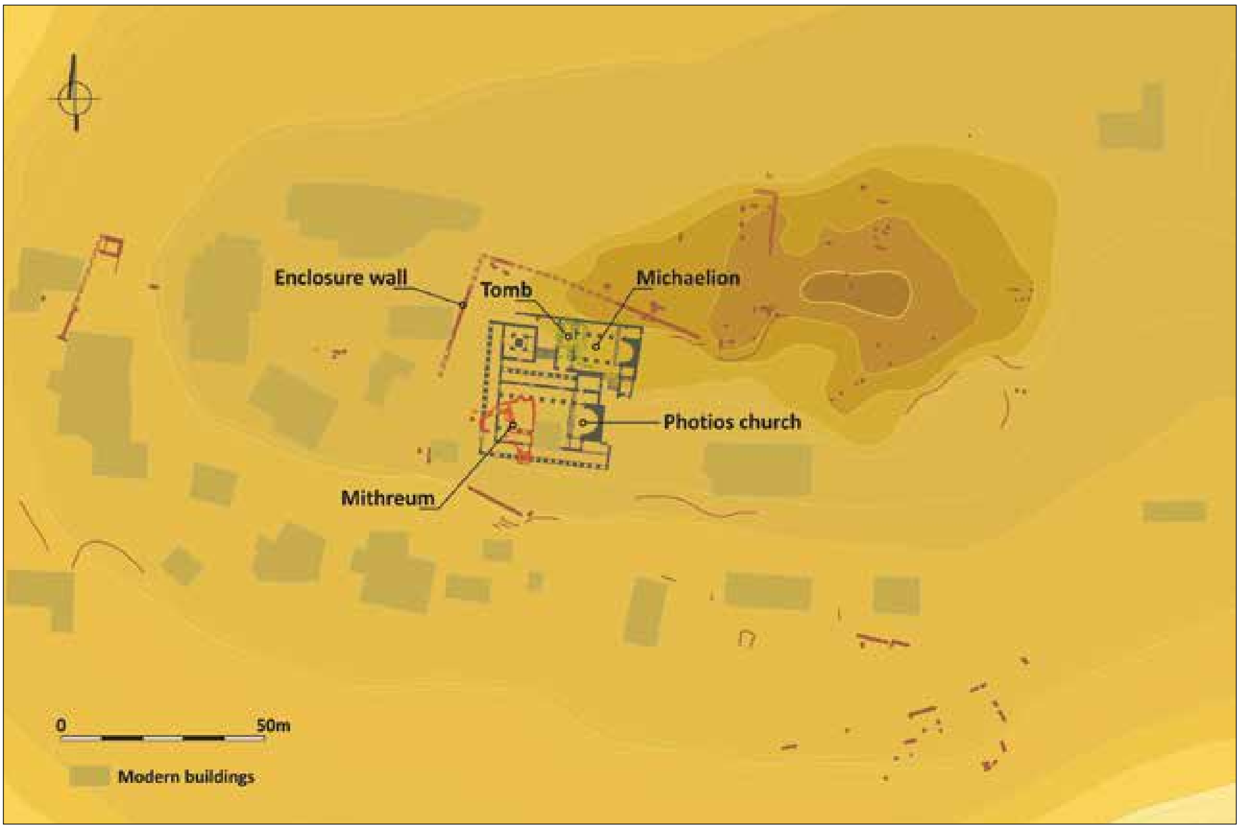

Fig. 1. Hawarte, the archaeological site's general plan, drawn S. Maślak.

edly had a sentimental significance for Pierre Canivet, who started excavations at the site. The house owner certainly knew that his property was built up upon the ancient ruins, but he did not even imagine that next to the western wall of the modest house, beneath the church, there would be relicts of the once-active *Mithraeum*.

Localisation of the Mithraic sanctuary under the church was proven beyond doubt. The irregular layout of the space dedicated to the cultic practices was irregular in shape and corresponded to the original shape of the cave (Fig. 2). At first glance, it is possible to recognise the correlation and relation between both sacral structures. It is evident that a part of the church's architecture was badly demolished and destroyed the previous structure – pagan if viewed from the Christian perspective. The general layout of the sanctuary devoted to Mithra shows three separate chambers, all of which form the core of the sanctuary. Chamber A was the central and most important architectural element of the whole sacral structure.[5] The most prominent part visible on the plan is a semi-circular niche where a representation of the tauroctony was exposed to the secret community of Mithra worshippers. Chamber B was located westwards of the central room. The function of this space is still difficult to decipher, but certain elements discovered during exploration can shed some light on its function. The last architectural unit recognised during fieldwork was recorded as Chamber C. From the functional point of view, this space was a kind of vestibule providing a potentially comfortable entrance for the worshippers.[6] A stairway leads to the entrance, stepping down from the ground level towards the cave –located underground, inside the natural hill.

At the beginning of the excavation project, only the basic and minimal layout of the Mithraic cave in Hawarte was cleaned up – the three aforementioned chambers. There, however, more details are recognisable. Bearing in mind the plan of the sanctuary, chambers C and A deserve a short commentary.

Chamber C, which acted as a kind of vestibule to the sanctuary, was not only a kind of space that separated the sacred from the profane – the outside world, as the people who were not members of the Mithraic congregation should keep away from the underground sacral space. The chamber – besides its basic function as the vestibule –

[5] Gawlikowski 2012.

[6] Gawlikowski 2012.

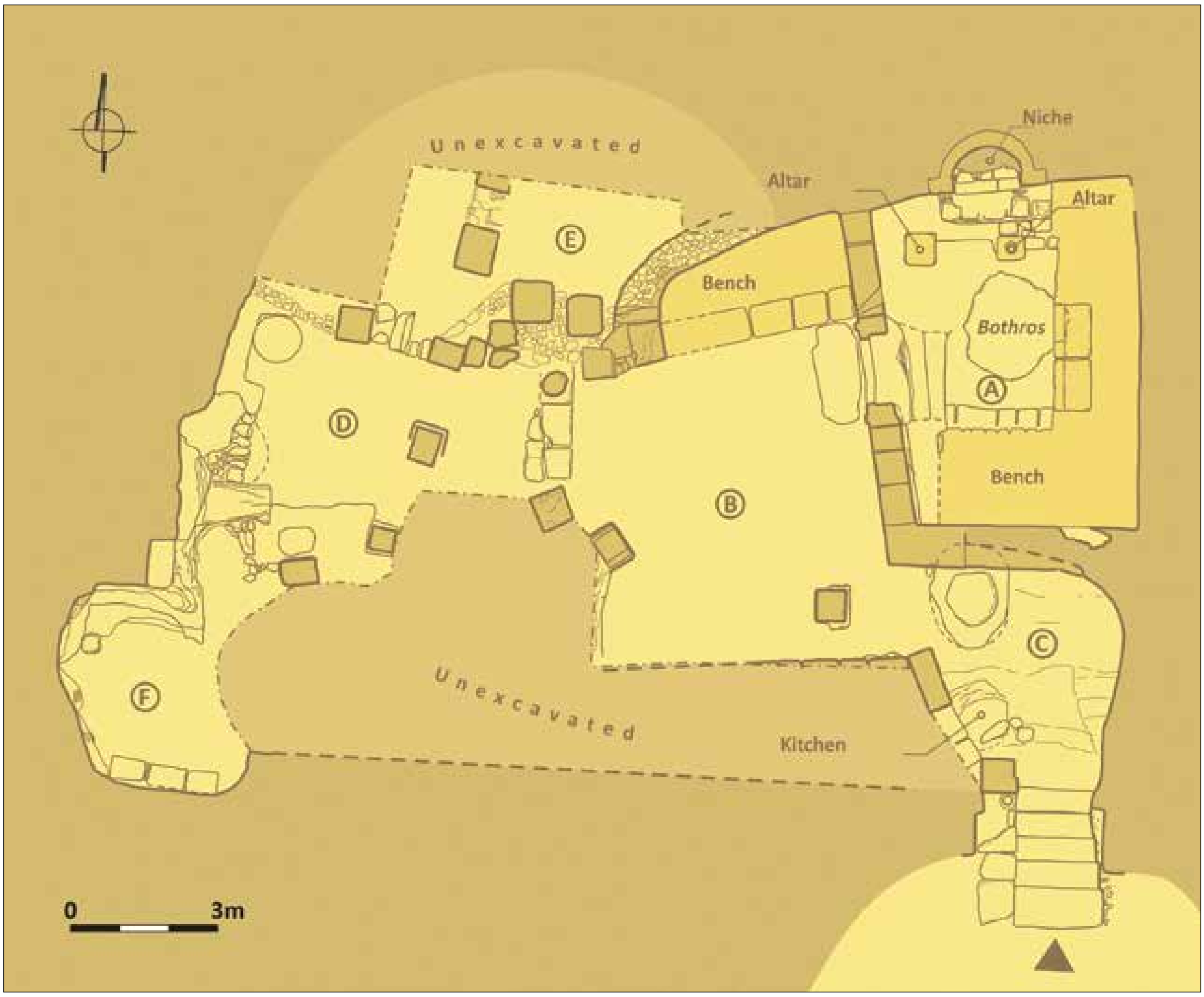

Fig. 2. Hawarte *Mithraeum*, general plan, drawn S. Maślak.

had another, additional purpose. During the excavations, two different structures which shed some light on that additional function, were already postulated. In the plan view, an oval-shaped pit (*botros*) hewn in the bedrock can be identified. The inside of the pit was filled with numerous potsherds and a collection of animal bones. Traces of an ancient grill were detected on the eastern wall of the vestibule, manifested as numerous small holes drilled in the wall to fix a grill, which was a part of a kitchen-like construction. Near the "kitchen" section, more animal bones were accumulated by the cave wall.[7] Additionally, in the western part of the vestibule, which was badly damaged by the later church building, a large deposit of pottery was found. Bearing in mind that all the objects that were brought to the shrine for ceremonial purposes would somehow become sacral too, the sacral objects, even if not used anymore, could not be taken outside of the sacral space and thrown away into an ordinary refuse heap. The sacral behaviour and practices required finding a space for the sacral waste, and the need was served by the nearby entrance to the sacral space. Inside Chamber A, a similar *botros* (large pit) hewn in the central part of the room was brought to light. Additionally, two relatively large banks were attached to the eastern and southern walls. These structures, except liturgical elements, were the dominating features in the chamber interior.

Returning to the sanctuary vestibule – it is clearly visible how the entrance to the cave was finished. At the first glance, at least two separate phases could be postulated there. The original entrance was hewn and formed a roughly rectangular entry. Later, the steps leading to the cave were rearranged, just as the entrance, which was

[7] Piasecki 2000.

Fig. 3. Hawarte, Zeus fighting against anguipedae, computer rendering D. Zielińska.

partially blocked with large stone blocks, visible on the left side of it. Inside, traces of painted decoration survived on the vestibule's back wall. A lion standing among poppy flowers had originally ornamented this part of the sanctuary.

Doubtlessly, Chamber A analysed above was the main one and originally served as the area or space where the most important ceremonies and practices, as well as sacrifices, were performed by the initiated members of the Mithraic congregation. The most significant fact about the sanctuary discovered in Hawarte is that it was richly decorated and covered with paintings. In a way, it resembles the famous Mithraic sanctuary discovered in Dura Europos. In Hawarte, however, the style of decorations, their character, finesse, and mastery of the decorative elements and finishes is very unique when compared to other similar sanctuaries, commonly found within the Roman Empire. The central point of the chamber – as it is recognised – as a deep niche decorated with a curved frame situated to the left from the entrance to Chamber A. This element of the architectural decoration was changed over time. Originally, the niche was decorated with a relatively modest stone frame. Then a podium below the niche was added – extending the space for offerings dedicated to Mithra, whose sculpture depicting the act of slaying a bull was doubtlessly the focus of worship there. Also, several stone altars located in front of the podium, or a platform, were used for religious ceremonies. Most probably, nonetheless, a kind of wooden shutter hiding the Mithra sculpture was the final episode in the development of the niche. This supposition seems corroborated by the remains of a frame fixed around the niche. The remains of the frame are manifested as a shallow carving, semi-circular in shape and originally serving as a technical element connecting the shutters to the wall. Bearing in mind that the whole chamber was richly painted, it cannot be excluded that the wooden shutters were also decorated with multi-coloured motifs associated with Mithraic mythology. Unfortunately, nothing of the sort survived, rendering the above supposition a speculation.

As it was already mentioned, what makes the Hawarte Cave unique is its rich painting decoration covering almost every corner of the walls. Inside Chamber A, however, the most important elements of the original decorative program were painted, and they established a kind of Mithraic circle and narrative illustration of the Mithraic mythology that in a way resembles modern comic books. In effect, just near the cultic niche, a Mithraic iconographical programme started. As always, the gallery is opened with the creation of the world – or more precisely – the fight of Zeus/Jupiter against the chthonic snake-legged creatures or monsters (Giants).

Fig. 4. Reconstruction of the painted decoration of the eastern wall in the Chamber A, computer rendering D. Zielińska.

From a symbolic point of view, this iconographic representation shows how the world was created in an act of confrontation with chaos. The final effect is the world in order, as perceived by the people living on the planet. The final act of creation and the fight against disorder is closed in a representation of enthroned Zeus located in the central part of a tondo painted as a wreath of leaves – most probably laurel (*Laurus*). The creation of an orderly world opens another chapter of the story, where Mithra plays the main role for the first time (Fig. 3).

Further analysis of the elements of decoration shows how the story of Mithra started according to the Hawarte Cave iconographical programme. One of the motives painted there shows how Mithra was born. This representation is typical, known from other sanctuaries, and shows Mithra emerging from the rock and holding a Phrygian cap in his left hand. Next to the rock, another episode from the Mithraic mythology was painted on the wall. Young Mithra is hiding among the branches of a cypress after climbing up the tree. Next to the tree, Helios is standing in his whole glory. The deity is shown frontally in a radial tiara. He is performing a gesture that can be interpreted as a benediction of Mithra hidden among the cypress branches (Fig. 4).

Unfortunately, the subsequent parts of the story did not survive. In some places, however, several very badly preserved fragments of earlier phases of the painted decorations were preserved, which can suggest how that part of the composition should be reconstructed. Based on those observations, it can be postulated that the next scene would represent the moment when Mithra carried a bull on his back to the place where the animal would be slain as an offering.

Following the mythological narratives, the next scene based on the fragments of preserved decorations should be reconstructed as the slaying of the bull by Mithra. It means that in this place, beside the statue of the deity depicting the act of bull sacrifice, the same motif was additionally painted on the cave wall. Beneath that essential scene, which constituted the main axis of the Mithraic religion, some Mithraic attributes in a rectangular panneau completed the whole composition. These attributes quite frequently accompanied the bull slaying scenes known from other sanctuaries, especially those active on the Rhine and Danube limes.[8] The selection of attributes painted in Hawarte resembles to a certain extent the attributes typically seen in the already-mentioned regional sanctuaries dedicated to Mithra. Pieces such as a large crater or a lion were rather unknown in other regions but are present in Hawarte.

As has already been pointed out, much of the original painted decoration perished or survived in a very bad condition. Nonetheless, the next mythological episode, which originally decorated the wall next to the reconstructed representation of bull slaying, shows the image of Helios kneeling in front of Mithra. A torch, a symbol of solar glory, is held in the hand of Mithra, who is clad in oriental Persian dress and a Phrygian cap. Helios, on the other hand, is dressed in the Roman style. This act of respectful obedience or submission expressed by Helios is observed by two persons assisting and watching it. On one side is a partly preserved person in a Phrygian cap holding an arrow, while the other side bears a partly preserved depiction of Luna.

Although quite a large part of the decorations is missing, thus making a full-scale reconstruction of the original decoration impossible, some fragments of the so-called Mithra's hunt were recorded opposite the cult niche (Fig. 5). This episode, also known from the *Mithraeum* in Dura Europos, decorated two walls in Hawarte – the

[8] Campbell 1968, 291–334.

Fig. 5. Hunted animals, Chamber A, western wall, computer rendering D. Zielińska.

southern and the western ones in Chamber A.[9] The figure of Mithra riding on horseback survived in a very bad condition on the southern wall. To be precise, this representation originally belonged to one of the earlier phases of the cave decorations. After a careful analysis of the paintings, it was possible to distinguish that in Hawarte the same painted Mithraic programme was renovated five times. It is highly possible that the chronological bracket between the oldest and the latest phase of the paintings was not so wide. Certainly, the remnants of the latest phase survived in a much better condition. In some places, only the earlier relics of the painted decorations were detected. It seems to be highly possible that all of the phases were painted within an approximate time span of 100 years, no more than 150.

Returning to the Mithra's hunt scene, the surviving depicted animals were all male – what seems to be obvious bearing in mind the character of the Mithraic doctrine – and can be identified as a stag, wild boar, panther, or even a bear. Most probably, the group of hunted animals was originally much larger, but most of them vanished.

The last decorative element which closes the whole Mithraic programme is a representation of the so-called stronghold of darkness.[10] This element decorates the northern wall of Chamber A, next to the cultic niche, which was the central point of the whole sanctuary. There (Figs. 6–7) a fortification wall with a broadly opened dark gate can be recognised – it seems to be welcoming evil spirits, or rather giving a chance for the evil to spread or enter the world. On the top of the wall, numerous devilish or demon-like creatures are gathered and looking forward. One of such creatures additionally crawls through the gate. It is difficult to judge whether this demon is escaping or just leaving the stronghold of darkness, but the motif is very intriguing. The character of the devilish creature is also peculiar and has no analogy to the other sanctuaries devoted to Mithra. These demons were not fully anthropomorphic in shape but limited or reduced to heads only. Particularly characteristic, however, is that every single demon is depicted as struck by a painted yellow beam, which symbolises the solar power of Mithra or the Sun. This element symbolically closes the decoration programme painted inside the most important area of the whole sanctuary.

Completely different decorations were painted outside Chamber A. Most probably, Chamber B was originally a space where the candidates of the Mithraic congregation gathered and waited for permission to join the initiation ceremony. Plausibly, these people were acting

[9] Rostovtzeff 1939; Cummont 1975; Leriche 2001.

[10] Gawlikowski 2007.

Fig. 6. Stronghold of Darkness, original painting, photo M. Gawlikowski.

as a kind of supporting staff during religious ceremonies. The iconographic programme of this room also has its own dramaturgy and symbolism. The wall separating Chamber B from Chamber A was decorated with representations of white stallions and people clad in Persian dresses holding dark-skinned human figures. One of them, which was preserved in a much better condition than others, shows unchained Siam twins who were firmly held by the person dressed in Persian garb. It cannot be excluded that it was Mithra himself, but since the upper part of the original decoration is missing this supposition is only speculative. Both of these representations flanked the entrance to Chamber A, thus symbolically protecting the sacral space against infamy and desecration by evil spirits, which had to be kept away from the holy space. There, the second guardian of the entrance is visible. Unfortunately, the one found on the southern part of the separating wall was preserved in a much worse condition.

On the northern wall inside Chamber B, some other representations decorated this part of the sanctuary. This part of the construction was painted a bit differently compared to the wall that originally divided chambers A and B. Although the original paintings survived in a very bad condition, with some of them destroyed in late Antiquity and simply vanished, turning into dust after they fell off the walls, some motifs can still be recognised. These surviving fragments shed some light and make it possible to attempt a reconstruction of the iconographical programme located in that part of the *Mithraeum*. The lower part of the wall was decorated with several decorative wreaths of palm leaves situated on both sides of each circular motif. Above it, originally there were dynamic and very brutal scenes where large lions were killing black-skinned male figures. Since the representations survived in bad condition, it is still difficult to judge whether the people attacked by lions were men or young boys (Fig. 8).

Returning to the layout plan of the Mithraic cave, it is necessary to take a look at the final shape of the sanctuary, which was made possible after the last excavation season. During the latest fieldwork, two additional chambers marked on the plan as D and E were partly unearthed. Unfortunately, no other decorations were recorded on that part of the site. It means that the western

Fig. 7. Stronghold of Darkness, reconstruction, computer rendering D. Zielińska.

part of the cave did not play any important role during the Mithraic rituals and ceremonies. Supposedly, this part, originally used as an active cellar in the cave, played a supporting role in the ceremonies organised in the eastern section. It cannot be excluded that some of the goods needed for the ceremonies were stored there. Regrettably, further excavations could lead to the destruction of the church built on top of the cave, thus precluding further archaeological exploration.

All of the scholars who have been interested and focused their scholarly fascination on the Mithraic doctrine know that searching for facts and separating them from "myths" is not an easy task. Since this religion had a mysterious character, it is quite futile to search for written sources describing the character of the doctrine and ceremonial behaviour directly and objectively. Consequently, the excavations in Hawarte, with the discovered rich decorative programme, can shed some light on key concepts of the Mithraic religion and its internal dynamics. Even if the iconographical programme did not survive in its entirety, its character and the narrative expressed on the cave walls belong to the most complete visualisations of this religious formation. The iconography and the sequence of the paintings show the whole Mithraic cult and its mythological arch, from the creation of the world to the last struggle between the forces of light and darkness. This element of the final confrontation was shown in a symbolic way, as a stronghold of darkness, where the demons are struck by the beams of sunlight. It is difficult to find inspiration for that element of the iconographical programme. To some extent, this component can be interpreted within the framework of Persian religion, as was pointed out by Lucinda Dirven, which provides a very intriguing explanation for the icono-

Fig. 8. Hawarte, Chamber B, painting decorations, computer rendering D. Zielińska.

graphical concept.[11] This possible interpretation shows that the Mithraic doctrine was much more dynamic and open to other religious influences. This would, in turn, means that the Mithraic religion was not a petrified dogma, system of beliefs, and vision of transcendence. As a consequence, it cannot be excluded that a local version of the Mithraic doctrine was cultivated in Syria, or more precisely in Hawarte.

Still, it is difficult to judge whether some Persian influences can be recognised there or whether the choice of painted decorations reflects local beliefs flourishing on the substate of the Mithraic religion. If the latter was true, then it would mean that the local Syrian religion survived until the Roman Period. It is hardly surprising, given that religion tends to be very conservative, and the local populations were strongly tied to old beliefs. Therefore, it is possibly pointless to search for analogies of the demonic creatures depicted in Hawarte within the realm of Persian culture. As far as we understand it, the only Persian element in the Mithraic religion is Mithra himself, an enormously powerful Oriental god. As it was already mentioned, every religion is characterised by the conservative status of rituals, mythological concepts, and perception. Therefore, the inspiration for the iconography of the stronghold of darkness should, perhaps, be sought in the local Syrian tradition. If this postulate is accepted, the local Syrian mythology needs to be taken into consideration. The Ugaritic tradition provides information about the sons of darkness active in a cave.[12] Hence, possibly, the traditional cave motif could have been transferred and survived through the centuries only to undergo a change and become the Mithraic stronghold of darkness. In some sense, therefore, the cave, as a place that is very easy to defend and an isolated hidden space, conceptually corresponds to fortification. Additionally, the old Canaanite religion survived and transmuted during the later periods in the form of the Western Semitic tradition. Some aspects of the Aramaic beliefs were included, surviving in an almost untouched pantheon which endured the collapse of the Bronze Age societies. With this evidence in mind, it cannot be excluded that the concepts of the Sons of Darkness also survived there, elaborated into the ultimate enemies in the Hawarte iconographical programme. The supposition postulated above is based not only on an analysis of the regional tradition but also application of possible syncretistic mechanisms deeply rooted in the religious behaviour of the Greek-Roman Period recorded in the territories of Syria and Levant. For that reason, it can be observed by analysing syncretic concepts and changes in religious behaviour in the provinces of the Eastern Roman Empire.

It remains possible that in Hawarte, which is situated in the vicinity of Apamea, one of the most important cities of Syria and a community open to many intellectual influences, several concepts of local beliefs

[11] Dirven 2016.

[12] Healey 1977, 81–-83.

intermingled and merged with the original conceptual framework of the Mithraic religion. In a way, it brought new values, as manifested in the unique cultic decoration. If the reorientation of the sacral space is taken into account as an additional factor, the idea of dynamic changes in the concept of religion seems to be corroborated. The orientation of sacral space belonged to the most important drivers determining the character of ritual practices and behaviours since the beginning of sacral architecture. Two places inside a single chamber where the tauroctony scenes were originally located are unique among the sanctuaries dedicated to Mithra. This essential element of the Mithraic religion, providing a kind of intellectual "backbone", was the main symbol exposed for veneration by believers. Therefore, the change in orientation needed to either involve a radical shift in religious conceptualisation or be influenced by astronomic orientation (Fig. 9).

The painting decoration which makes the Mithraic cave in Hawarte unique among other similar religious structures and facilities provokes a question: How did it happen that such a specific structure could have been active in the Syrian province, catering to the religious needs of a local community or a local Mithraic congregation? How large was the group of Mithra believers and how many of its members were gathering inside the cave? Answering these questions, I am afraid, is still beyond our reach based on the present knowledge. However, while searching for the final inspiration for the Mithraic cave in Hawarte, it is necessary to take a closer look into the history of Roman military presence in Syria. As commonly accepted, Roman soldiers were supposedly the main drivers behind the swift spread of the Mithraic doctrine to every single corner of the Empire. It is also assumed and accepted that one of the oldest structures dedicated to the cult of Mithra was brought to light during archaeological excavations in Novae (Bulgaria). Recently, the results of older excavations were once again carefully revisited, providing the latest confirmation for the early dating of the sanctuary.[13] When the dating of Novae's *Mithraeum* – postulated to the mid-1st century AD – is compared to the oldest pottery associated with the religious practices performed inside the Hawarte Cave, the artefacts from Hawarte seem to have originated from a period contemporaneous with the construction of the sanctuary.[14] Knowing that Novae was a military post and home to the *Legio I Italica*, the association of the soldiers with the believers of Mithra is almost self-explanatory. If members of the military were the medium that distributed the Mithraic religion rapidly within the vast territories of the Roman Empire, then, maybe, there is a chance that traces of their activity and dislocation are found in the vicinity of Hawarte.

According to the theory by Franz Cumont, Commagene was that part of the Middle East where Mithraism was born as a religious concept.[15] This concept, more than one hundred years old, was rejected by later scholars, albeit without presenting any better ideas or regional alternatives pointing to the origins of Mithraism. In light of the excavations, not only in Hawarte but especially in Doliche,[16] where another discovery of a Mithraic cave was made, the discussion around Cumont's thesis should be revived. Taking into consideration that Doliche is situated not so far from Zeugma (less than 50 km as a crow flies westwards from the afore-mentioned town), it cannot be excluded that this urban centre, a long-time headquarters of the *Legio IIII Scythica*, could be associated with the dissemination of the Mithraic cult in that region. Given that Mithra had been venerated there in the past, only in a different form than in the Roman version, it seems highly likely that in Commagene the Persian-inspired form of the original local religion could have been transmuted into the Roman variation of the Mithraic cult. Therefore, the soldiers dislocated in Zeugma could be familiar with the Oriental religion and beliefs. The troops, especially active in the eastern flank of the Roman Empire, certainly contacted and operated side by side during that period. These activities were a perfect opportunity for the new religious idea to transfer from one military unit to another. If this supposition is right and accepted, then the next Roman legion based in Syria could play an important role in the transfer of the Mithraic cult to western Syria. The *Legio III Gallica*, located in Raphanea until the 4th century AD, could well be the unit that accepted the Mithraic doctrine before spreading it among the troops. Bearing in mind that Raphanea was located in the vicinity of modern Hims,[17] the distance from the legionary fortress to Apamea and onwards to Hawarte was not that long. The third factor or Roman unit possibly active in the veneration of Mithra in Hawarte was the *Legio II Parthica*, which was stationed in Apamea in AD 218–234.[18] In the last case, it seems to be imaginable that some of the soldiers making up the legionary staff could have quite well known the cave in Hawarte as a place of veneration of Mithra.

[13] Lemke, Tomas 2015.

[14] The pottery was analysed by Grzegorz Majcherek. I wish to express my thanks for the information he shared.

[15] Cumount 1956.

[16] Shütte-Maischatz, Winter 2000.

[17] Parker 1957, 134–140.

[18] Balty 1988.

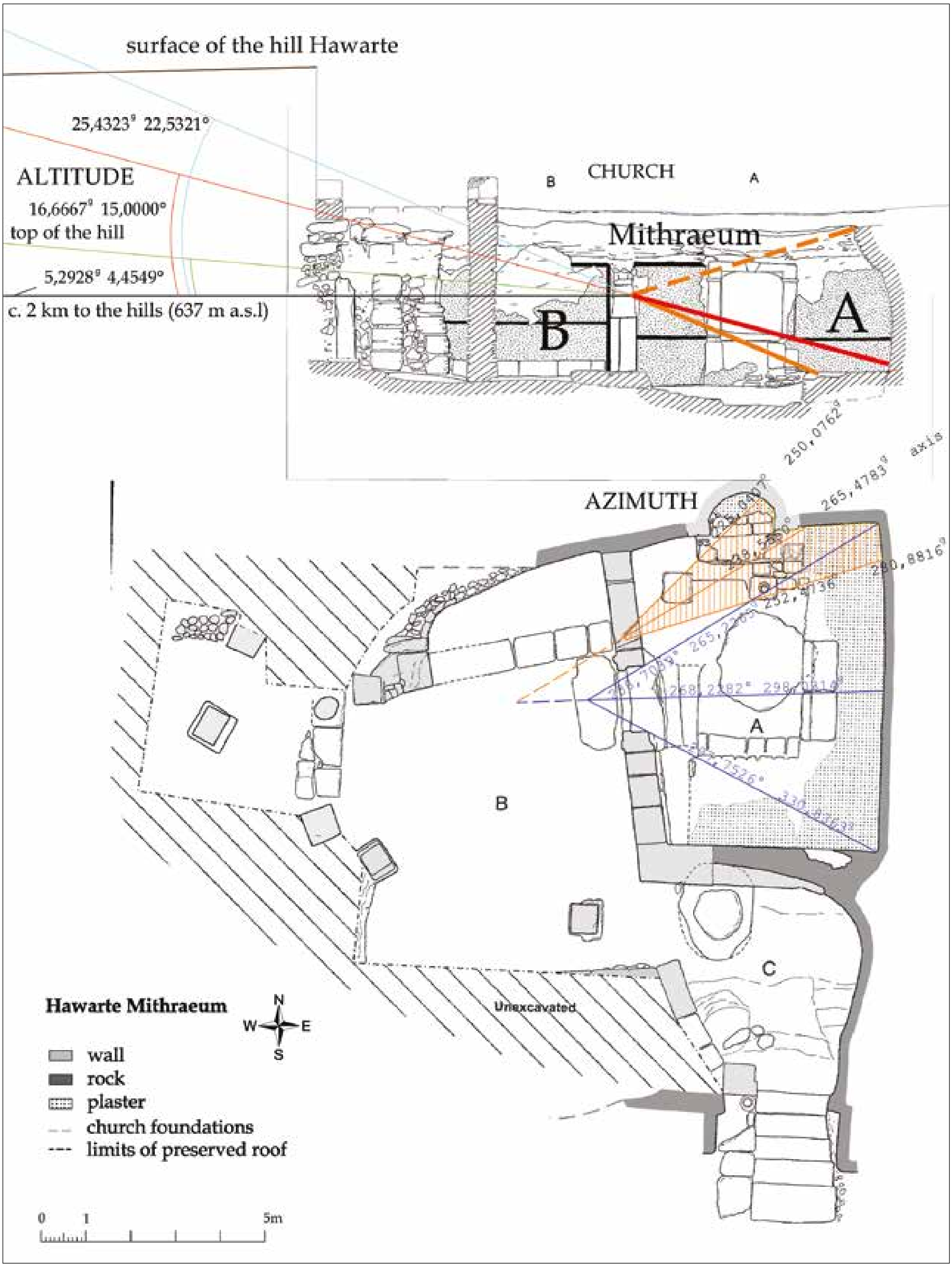

Fig. 9. Hawarte, plan and calculations, drawn S. Maślak, W. Małkowski.

Even if the spread of the Mithraic religion was strongly supported by the Roman military units, it certainly does not mean that the group of believers was only limited to soldiers and military men. Without a good religious ground, intellectual foundation, and society open to novel religious concepts and new religious factors and systems, the Mithraic religion would not have reached the high position and popularity it enjoyed among diverse communities of the Roman Empire. It means that even if the religion was transferred from one place to another in a very dynamic way, thanks to the movements of the Roman legions, the civilians needed to be open-minded and fascinated by the new religious concept. Therefore, in a way, Mithraism is shown to have had universal value which was commonly accepted among a relatively large part of the male population of the Roman Empire. These, somehow "magnetic", theological concepts and ideas needed to be attractive to potential new members of the Mithraic congregations. The admiration for this concept is recognised in Hawarte. Even if the Hawarte Cave is located some distance away from Apamea, it does not mean that the sanctuary had a provincial character. The finished cave decorations present during the final phase of the religious activity show that the congregation or the donators or founders of the sanctuary were not only very rich but also belonged to the local elite and, in addition to that, had good artistic taste.

In conclusion, the iconographical programme discovered in Hawarte is unique in some respects and represents quite an intriguing episode in the development of the Mithraic doctrine. On the other hand, it recycled episodes already very well-known from other sanctuaries, for instance, Dura Europos. What makes Hawarte nevertheless exceptional is the special motif associated with the final struggle against evil spirits hiding behind the walls of the stronghold of darkness. Another element, which is at the same time puzzling, is the second original representation of the bull-slaying scene (Fig. 4). It means that the original orientation of the *Mithraeum* was, most probably, aligned along the E-W axis. Therefore, it seems that this orientation can be associated with the original Mithraic doctrine. The change of orientation and localisation of the cultic niche along the S-N axis consequently seems to be a later concept. During that later time, the last phases of the painted decorations were finished inside the sacral space. Paying attention to the fact that this period in the functioning of the Mithraic sanctuary should not be dated earlier than the Aurelian rule opens new possibilities for deciphering the iconography. All the crucial elements of the programme were strongly associated with solar aspects. In other words, the lion from the vestibule and the lions fighting the black-skinned figures can be interpreted as symbols of the sun. These iconographic elements were not placed accidentally and seem to keep the evil spirits and darkness out of Chamber A, which was the most important space within the whole sanctuary. The next element associated with the sun as the highest deity activity is the sunbeams falling upon the demons from the fortress of darkness. When were solar aspects boldly manifested in the Mithraic doctrine? It was during the time of the Aurelian rule that a strong association of Mithra with Sol Invictus could be observed.[19] Precisely, the association of both deities – Mithra and Sol – known from the beginning of the Mithraic religion, gained added value and legitimisation in the Aurelian period, most probably owing to the support of the Roman emperor. This explains why the astronomical connotation needed to be officially changed, as recorded in the Mithraic sanctuary in Hawarte. This new concept and intermingling of the two deities sharing similar characters manifested itself as the association of Sol Invictus and Mithra since at that time both gods were sharing their powers and aspects. It cannot be excluded, however, that in Hawarte this new concept was set in stone. The main festival of Sol Invictus, which took place on December 25th, prompted changes in the internal axis of the sanctuary (Fig. 9). The struggle of light (the sun) against darkness – during the winter solstice – was recorded in Hawarte based on the astronomical observation.[20] This value was accentuated additionally by the iconographic elements which made the Hawarte Cave unique among other Mithraic sanctuaries.

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[19] Halsberger 1972; Pichard 1976; Clauss 2010.

[20] Gawlikowski, Jakubiak, Sołtysiak, Małkowski 2011.

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Lithics and Habits – Magdalenian foragers in Thuringia (Germany)

Abstract

The investigation is part of basic research on the Magdalenian of Central Germany. It presents quantitative and qualitative data of two lithic assemblages – one revisited 70 years after its publication, the other poorly known until now. The discussion supports archaeostratigraphic taxonomy which developed for over a century. Spatial distribution of sites does not reflect human settlement patterns but is an outcome of past and present geomorphodynamics as well as of the research tradition.

Keywords: Upper Palaeolithic, Central Germany, lithic artefacts, lithic tool types, archaeostratigraphic taxonomy, spatial distribution of sites

Basic science entails at least some knowledge banality.[1]

Introduction

Approximately 130 Magdalenian and Final Palaeolithic sites are known in Central Germany.[2] Nearly one-third of these sites have been published or re-investigated in the last 25 years (Fig. 1; Table 1). Among them are excavations, such as *Abri Fuchskirche, Altendorf, Bad Frankenhausen, Gera-Binsenacker, Lengefeld-Bad Kösen, Kniegrotte, Nebra, Oelknitz, Saaleck*, or *Teufelsbrücke*, but also huge collections of surface finds, including *Ahlendorf, Kahla-Löbschütz*, or *Wallendorf*, among others. Additionally, numerous small surface collections have been studied, leading to first-time publications of artefact frequencies, attributes, and drawings of lithic blank and tool types. As part of these studies, the assemblages of *Gera-Pfortener Berg* and *Sankt Gangloff* were investigated in 2020 at the University of *Jena*. Prior to that, only a portion of the lithic material was published for *Gera-Pfortener Berg* 70 years ago, whereas *Sankt Gangloff* was just a dot on a large-scale map.

Gera – Pfortener Berg

The *Pfortener Berg* is a narrow ridge-like hill, ca. 250 metres above sea level and 1.5 kilometres long, composed of calcareous *Zechstein* and situated on the eastern outskirts of the town of *Gera*. On its northern and southern sides, small creeks run towards the west, eventually flowing into the *Weiße Elster* River situated ca. 70 metres below the *Pfortener Berg*. Near its western end, the *Lindenthaler Hyänenhöhle* was destroyed already in the 1870s.[3] Quarrying, construction of roads, and building activity have changed the surface morphology of the *Pfortener Berg*. However, between the 1870s and the 1980s, numerous archaeological relics were collected and excavated in its western part.[4] Among them were

[1] Hussain, Soressi 2021, 25.
[2] Küßner 2009, 203–205.
[3] Küßner 2003, 337–342.
[4] File *Gera-Pfortener Berg* at the Thuringian Office of Archaeology, Weimar (inspected by J. Jeschke in 2020).

Table 1. Magdalenian and Final Palaeolithic sites in Thuringia and adjacent areas.

no. in Fig. 1	site name	references
1	Abri Stendel	Street *et al.* 2002
2	Steinkirche	Veil 1988
3	Halle-Galgenberg	Toepfer 1955
4	Oberthau	Ansorg 2020
5	Taucha	Dunkel, Dunkel 1977
6	Wallendorf	Küßner 2009
7	Nebra	Mania 1999
8	Lengefeld-Bad Kösen	Richter *et al.* 2021
9	Saaleck	Bock *et al.* 2013; Grünberg 2004; 2006; Terberger 1987; Weiß 2016
10	Gosel	Geupel 1974
11	Bad Frankenhausen	Küßner 2009
12	Gorsleben	Pasda *et al.* 2019
13	Bärenkeller	Müller *et al.* 2018/19; Pfeifer 2022
14	Abri Fuchskirche	Benecke *et al.* 2006
15	Teufelsbrücke	Bock *et al.* 2017; Feustel 1980a; 1980b; Müller, Pasda 2023; Pfeifer 2015; Wüst 1998
16	Jena	Hemmann *et al.* 2008
17	Oelknitz	Bock *et al.* 2015, 2016; Brasser 2010/11; Gaudzinski-Windheuser 2013; Gelhausen 2015
18	Rothenstein	Hemmann *et al.* 2008
19	Altendorf	Pasda 2016/17
20	Großpürschütz	Pasda *et al.* 2019
21	Kahla-Löbschütz	Balthasar *et al.* 2011
22	Hummelshain	Pasda *et al.* 2019
23	Lausnitz	Küßner 2009
24	Kniegrotte	Berke 1989; Bodenschatz *et al.* 2021; Höck 2000; Pfeifer 2020
25	Etzdorf	Bergmann *et al.* 2011
26	Ahlendorf	Balthasar 2015
27	Hartmannsdorf	Bergmann *et al.* 2012
28	Sankt Gangloff	this article
29	Renthendorf	Pasda *et al.* 2019
30	Gleina	Küßner 2003; currently under investigation at the University of Jena
31	Gera-Zoitzberg	Küßner, Terberger 2006
32	Gera-Pfortener Berg	this article
33	Gera-Binsenacker	Küßner 2009
34	Gera-Schafgraben	Küßner 2009
35	Pötewitz	Bergmann *et al.* 2012

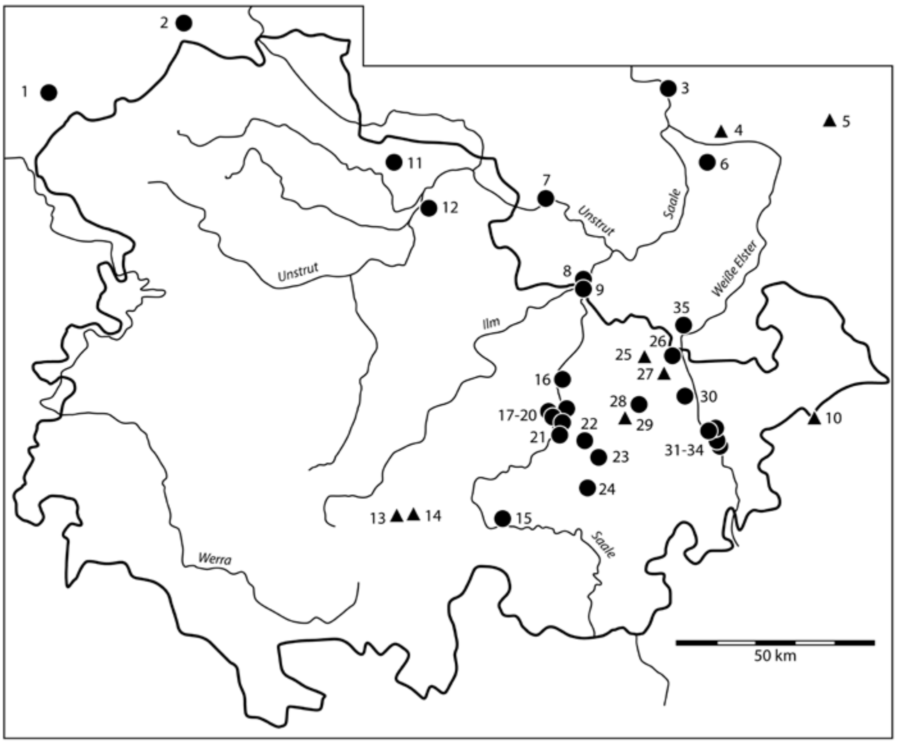

Fig. 1. Federal State of Thuringia with major rivers (in italics), Magdalenian sites (dots), sites with mixed Magdalenian and Final Palaeolithic artefacts (triangle), and Final Palaeolithic sites (triangle). For site names, see Table 1 – compiled by C. Pasda.

ca. 15,000 lithic artefacts, reportedly including tools of the Final Palaeolithic/Azilian and the Mesolithic Period.[5] Moreover, ceramic sherds and stone adzes from the Neolithic Period were also registered.[6] The first information on the presence of the Magdalenian was made by Rudolf Feustel in the 1950s:[7] he investigated the lithics from an excavation conducted by the Historical Society of *Gera* at the end of the 1930s. Within the area of ca. 8 square metres, approximately 1,000 lithics were found 40–50 centimetres below the recent humic soil, presumably in a loess. These finds included numerous blades, many backed bladelets, as well as some burins and borers. Since this publication,[8] *Gera-Pfortener Berg* has been known as a Magdalenian site.[9]

The whole collection from *Gera-Pfortener Berg* is currently stored at the Municipal Museum of *Gera.* All the lithics, weighing nearly 27 kilograms, were investigated in a master's thesis at the University of *Jena.*[10] The aim of the investigation was to present quantitative data relevant to the verification of the presence of a Magdalenian site. As it was impossible to separate the assemblages made by different collectors and excavators all the lithic tools (Table 2) and 65 burin spalls were selected to discuss their archaeostratigraphic position.

The most common lithic tool type is the end scraper. The modification was made on short flakes and broken blades (Fig. 2. 1–4). This tool type occurred in the Final Palaeolithic, Meso-, and Neolithic.[11] The bifacially retouched arrow points (Fig. 2. 8–9) have straight to slightly convex lateral edges and a concave base, indicating a Middle-Neolithic type,[12] which is supported also by the presence of ceramic finds from this period. The truncations (Fig. 2. 5), the lateral retouched pieces, the borer (Fig. 2. 6), the splintered pieces, and most of the combinations are types which were manufactured from the Upper Palaeolithic to the Neolithic.[13] The microburin (Fig. 2. 10) and the microliths (Fig. 2. 11–17) belong to the Meso- and/or Neolithic.[14] The gun flints (Fig. 2. 7) date from the 16th to 19th century AD.[15]

[5] Auerbach 1910; 1930; Feustel 1958, 170; 1961, 22–23; Reuter 1953/54.
[6] Brause 1933; Schimpff 1984.
[7] Feustel 1954/55, 8–11.
[8] Feustel 1954/55.
[9] Behm-Blancke 1961, Abb. 1; Hanitzsch 1957, 35; Küßner 2009, Abb. 1; Toepfer 1970, 400; Toepfer, Nuglisch 1961, 162.
[10] Jeschke 2021.
[11] Kind 2012.
[12] Pfeifer 2011.
[13] Floss 2012; Gehlen 2012a; 2012b; Kieselbach 2012; Pasda 2012a; 2012b; 2012c.
[14] Heinen 2012; Schön 2012.
[15] Weiner 2012.

Table 2. Lithic tools from *Gera-Pfortener Berg*.

tool class	N	tool type	n
end scraper	91	simple end scraper double end scraper	83 8
backed retouch	70	backed bladelet	70
burin	25	burin on truncation double burin on truncation dihedral burin burin on break multiple burin	15 1 4 4 1
microlith	22	lateral retouched microlith triangle segment trapeze microburin	11 7 2 1 1
lateral retouch	19	lateral retouch	19
borer / point	14	borer	14
splintered piece	14	splintered piece	14
arrow point	12	arrow point	12
truncation	5	truncation	5
combination	5	end scraper-borer/point end scraper-burin on truncation end scraper-truncation end scraper-splintered piece	2 1 1 1
gun flint	2	gun flint	2
total	**279**	**total**	**279**

Besides these tools, there are 70 backed bladelets, 25 burins, and 65 burin spalls (Fig. 3. 11). When arguments for Thuringia are applied to these lithics,[16] they are datable to the Late Upper Palaeolithic. In addition to 64 unilateral backed bladelets (Fig. 3. 1–4, 6), three bilateral backed bladelets, two unilateral backed bladelets with truncation, and a single bilateral backed bladelet with two truncations were registered. Several of the backed bladelets are pointed (Fig. 3. 5, 7–9). Comparable types occur in the Upper Magdalenian.[17] Whether any of them represent curved backed points of the Final Palaeolithic/Azilian (Fig. 3. 7–9), which started in Central Germany around 14 ka cal BP,[18] is difficult to judge. Most burin platforms are truncations (Fig. 3. 10, 12–14). Dihedral burins are rare (Fig. 3. 15). No Lacan burins are present. To sum up, the previous proposition to consider *Gera-Pfortener Berg* as a Magdalenian site[19] is supported by the master thesis as numerous backed bladelets and burins on truncation are characteristic features of the Upper Magdalenian in Central Germany.[20]

Sankt Gangloff

In July 1959, Arno Reuter, an amateur archaeologist from Gera, collected 221 lithic artefacts at *Herber* Mountain, where a tractor had ploughed a clearing in today's State Forest of *Sankt Gangloff*. On the 27th of August

[16] Pasda *et al.* 2019, 12–15.
[17] Cattin 2012, fig. 17; Debout 2003; Veil 1983, Tafel 22.
[18] Pasda 2018.
[19] Behm-Blancke 1961; Feustel 1954/55; Hanitzsch 1957; Küßner 2009; Toepfer 1970; Toepfer, Nuglisch 1962.
[20] Pasda, Weiß 2020.

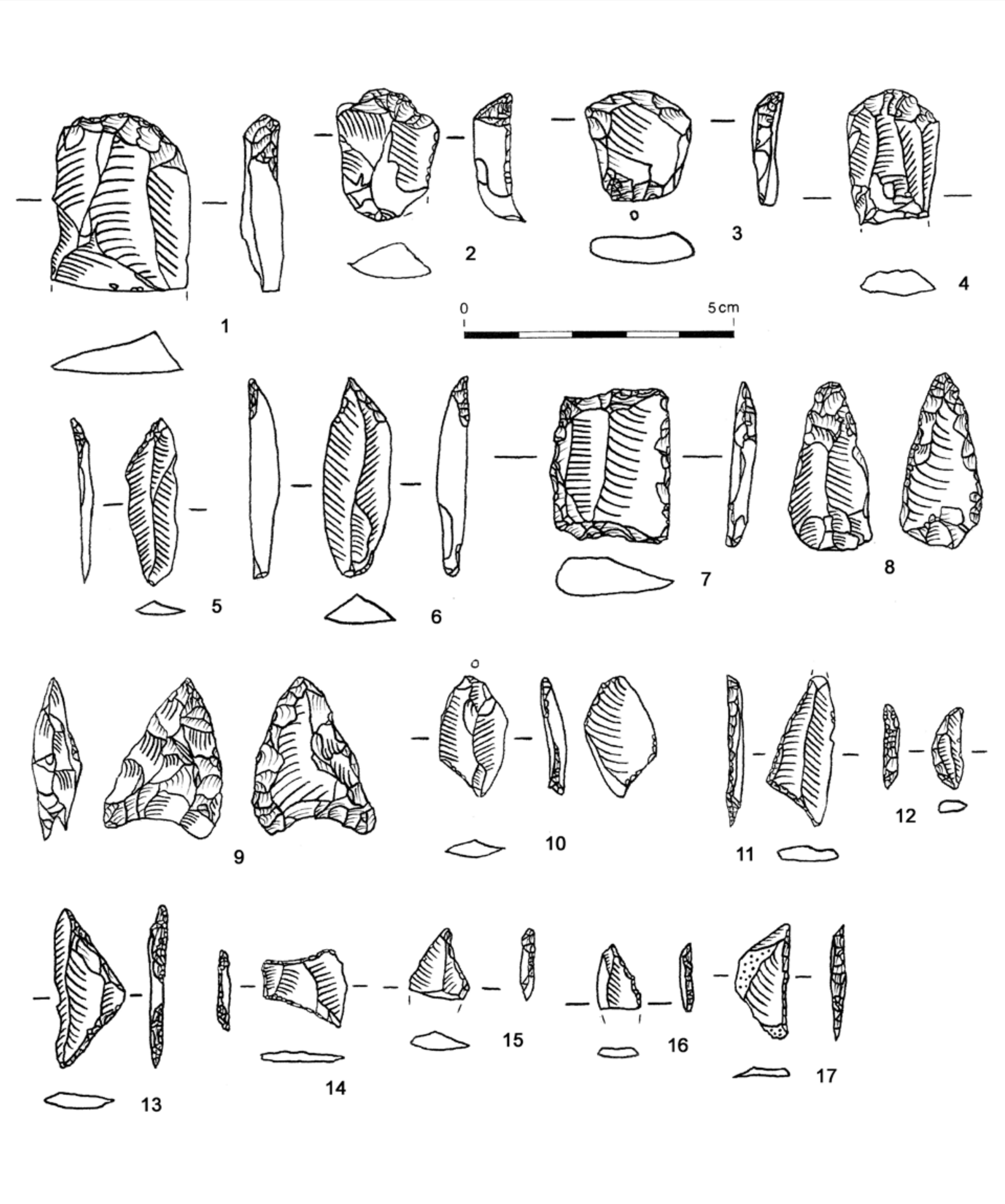

Fig. 2. Lithic artefacts from *Gera-Pfortener Berg* (1–4 – end scraper; 5 – truncation; 6 – borer; 7 – gun flint; 8–9 – arrow point; 10 – microburin; 11, 13 – triangle; 12 – segment; 14 – trapeze; 15–16 – fragmented microlith; 17 – lateral modified microlith. Drawings by J. Jeschke, adapted and completed by C. Pasda.

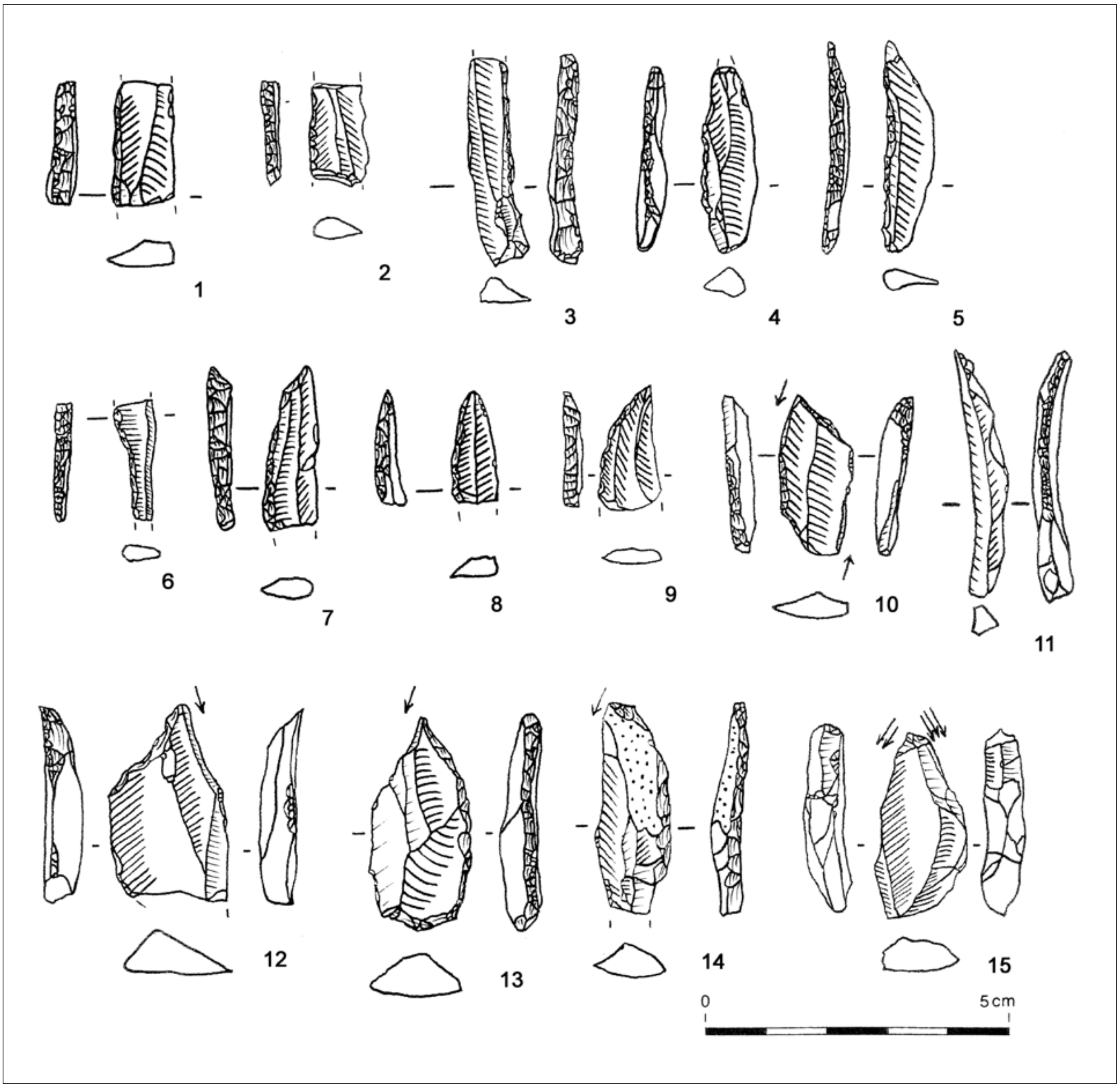

Fig. 3. Lithic artefacts from *Gera-Pfortener Berg* (1–9 – backed bladelet; 10 – double burin on truncation; 11 – burin spall; 12–14 – burin on truncation; 15 – dihedral burin. Drawings by J. Jeschke, adapted and completed by C. Pasda.

1959, the Archaeological Museum of Thuringia, *Weimar*, recorded the locality as a Stone Age site. The collection obtained there is stored at the Municipal Museum of *Gera*. This museum holds also another, smaller box, marked with the caption *St. Gangloff*. It contains ten lithic artefacts – four blades, one flake, two lateral retouched pieces, a backed bladelet, a truncation and a splintered piece – and a few ceramic sherds. This assemblage was collected by Willi Misslitz, another amateur archaeologist from *Gera*, on the 30th of November 1960. On the 28th of February 1961, the Archaeological Museum of Thuringia in *Weimar* noticed the Reuter collection as belonging to the small site discovered by Reuter the year before.[21] It seems that, one and a half years after ploughing and reforestation with pines, Misslitz found only large lithics, as all the artefacts were larger than 1 centimetre – all burin spalls and small backed bladelets had been collected by Reuter already in 1959. The ceramics collected in 1960 may be dated to the

[21] File *Sankt Gangloff* at the Thuringian Office of Archaeology, *Weimar* (checked by C. Pasda in 11/4/2021).

Römische Kaiserzeit,[22] thus it has nothing to do with the Stone Age. However, the collections of *Sankt Gangloff* were recognised as representing Magdalenian presence already in 1961 by Günter Behm-Blancke,[23] at this time the head of the Archaeological Museum of Thuringia. The archaeostratigraphic position was later confirmed by Hanitzsch.[24] One has to emphasize that Sankt Gangloff is the only Magdalenian site in Thuringia which is situated in a forest – a characteristic which will be discussed later.

The objects found by Reuter[25] and Misslitz[26] were analysed by the male author of this article using a modified version of a published lithic attribute list.[27] Today, 231 lithic artefacts are known from *Sankt Gangloff* (Table 3). As in nearly all Magdalenian sites of Central Germany, erratic flint was used most often, with quartzite being a rare find (Fig. 4. 16).[28] The small amount (8.0%) of lithics smaller than 1 centimetre is common for surface collections.[29]

Table 3. Blank type and raw material from *Sankt Gangloff*.

blank type	**flint**	**quartzite**	**indet.**	**total (n)**	**total (%)**
flake	121	2	–	123	53,2
flake with cortex	17	–	–	17	7,4
cortex flake	2	–	–	2	0,9
preparation flake	4	–	–	4	1,7
blade	46	1	–	47	20,3
blade with cortex	4	–	–	4	1,7
primary crested blade	4	–	–	4	1,7
core	1	–	–	1	0,4
burin spall	6	–	–	6	2,5
heat chunk, chunk or frost debris	3	–	1	4	1,7
unmodified blank < 1 cm	19	–	–	19	8,2
total	**227**	**3**	**1**	**231**	**100**

In *Sankt Gangloff*, lithics affected by fire amounted to 8.2 % (n=19), being more common in comparison to other Magdalenian sites.[30] A summary of attributes of lithics of the Magdalenian in Central Germany was presented two years ago.[31] Sankt Gangloff adds new data: the lithics (Table 4) are characterised by the same amount of facetted and non-faceted butts and by a greater frequency of irregular than regular butts. The blanks often show dorsal reduction, irregular distal ends, and hinges. Unidirectional negatives predominate. 2.1% (n=5) of the lithics show an *en* éperon preparation of the butt (Fig. 4. 18–19).

Due to their dimensions (Table 5), the blanks of *Sankt Gangloff* are comparable to the blanks of Altendorf, a modern excavation with sieving, which is situated 20 kilometres to the west.[32]

With 9% (n=21), the amount of lithics with natural edge damage is low. This may indicate a Palaeolithic site well-preserved in a forest until its discovery after clearing in the late 1950s.

Backed bladelets are the most common tool type at *Sankt Gangloff* (Table 6). Among them are seven simple backed bladelets (Fig. 4. 1–6, 9), a simple backed bladelet with truncation (Fig. 4. 7), and a simple backed bladelet with additional lateral retouch (Fig. 4. 8). The single burin has an oblique and straight truncation as a platform for removal of burin spalls (Fig. 4. 10). Six burin

[22] Determination by C. Brückner, *Jena* 2020.
[23] Behm-Blancke 1961, Abb. 1: 52.
[24] Hanitzsch 1972, Abb. 21: 20.
[25] City Museum of *Gera*, inventory no. 85/89-7.
[26] City Museum of *Gera*, inventory no. 85/89-12.
[27] Auffermann *et al.* 1990.
[28] Bodenschatz *et al.* 2021, 2.
[29] Balthasar *et al.* 2011, 301.
[30] Bodenschatz *et al.* 2021, 15.
[31] Bodenschatz *et al.* 2021.
[32] Pasda 2016/17, Tab. 5.

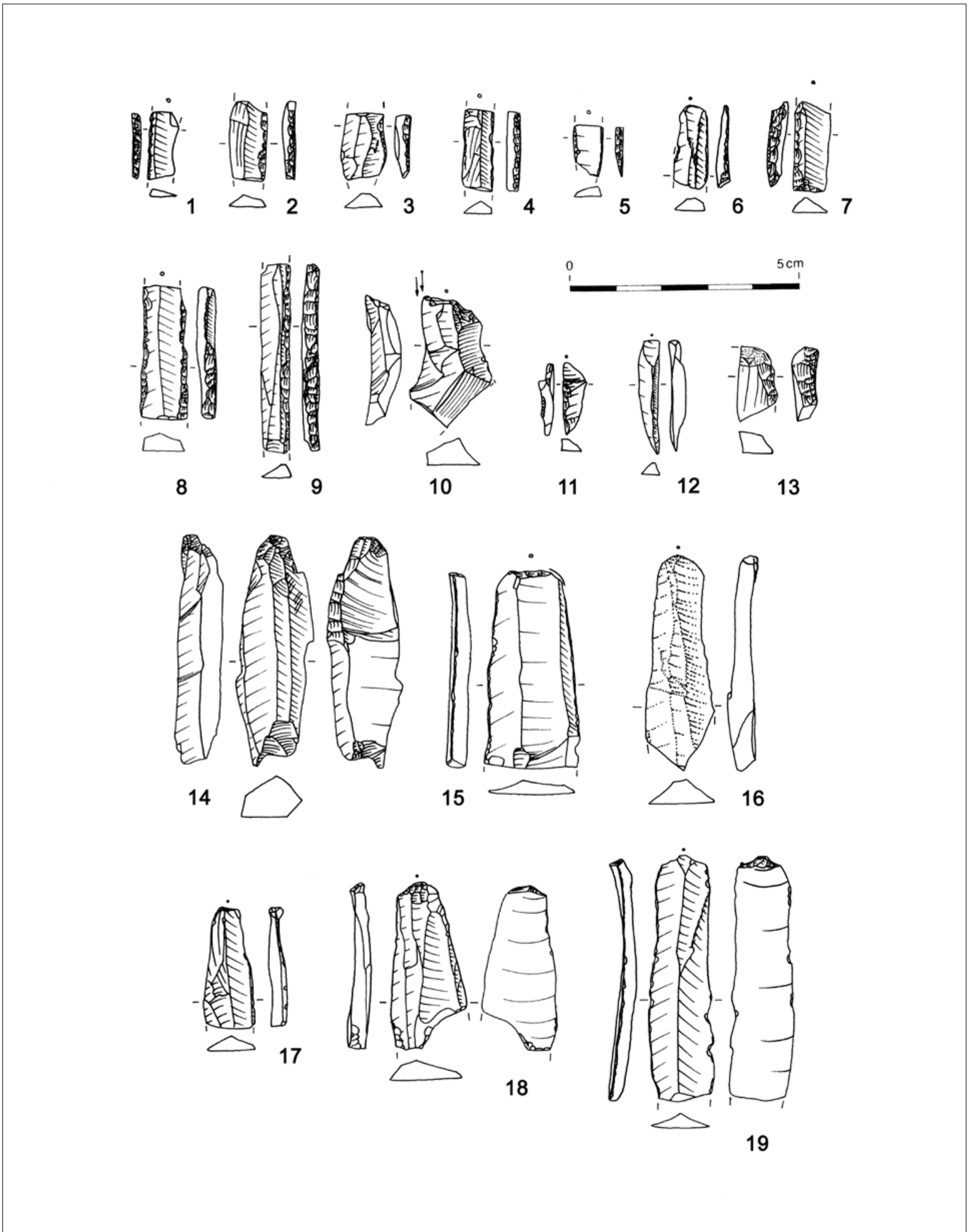

Fig. 4. Lithic artefacts from *Sankt Gangloff* (1–9 – backed bladelet; 10 – burin on truncation; 11–12 – burin spall; 13 – lateral modified piece; 14 – splintered piece; 15 – truncation; 16–17 – blade. Reuter collection: 1–8, 10–13, 17; Mißlitz collection: 9, 14–16, 18–19. Drawings by C. Pasda.

Table 4. Butt type, butt form, dorsal reduction, type of distal end, and direction of dorsal negatives of flakes and blades (with and without cortex) from *Sankt Gangloff*.

preparation of the butt	**cortical**	**plain / not prepared**	**primary facetted**	**secondary facetted**	**indet. facetted**	**total**
flake	3	12	1	3	4	23
blade	–	5	6	–	6	17
total (n)	**3**	**17**	**7**	**3**	**10**	**40**
form of the butt	**irregular**	**oval**	**triangular**	**rectangular or trapeziform**	**chapeau de gendarme**	**total**
flake	18	3	–	3	1	25
blade	7	4	4	2	–	17
total (n)	**25**	**7**	**4**	**5**	**1**	**42**
preparation of platform edge	**no dorsal reduction**	**light dorsal reduction**	**normal dorsal reduction**	**dorsal reduction with edge abrasion**	**heavy dorsal reduction**	**total**
flake	8	5	2	1	7	23
blade	3	3	5	3	2	16
total (n)	**11**	**8**	**7**	**4**	**9**	**39**
shape of distal end	**pointed**	**straight**	**irregular**	**hinge**	**foot of core present**	**total**
flake	2	7	5	7	5	26
blade	2	2	1	2	–	7
total (n)	**4**	**9**	**6**	**9**	**5**	**33**
direction of dorsal negatives	**unidirectional**	**bipolar**	**unidirectional and transverse**	**bipolar and transverse**	**transverse**	**total**
flake	20	–	10	1	3	34
blade	18	4	6	–	1	29
total (n)	**38**	**4**	**16**	**1**	**4**	**62**

Table 5. Dimensions (in cm) of lithic blank types from *Sankt Gangloff*.

length	**mean value**	**standard deviation**	**median**	**minimum**	**maximum**	**n**
flake	1.5	0.7	1.4	0.4	5.4	87
blade	2.4	1.3	1.9	1.1	5.6	42
width	**mean value**	**standard deviation**	**median**	**minimum**	**maximum**	**n**
flake	1.3	0.5	1.2	0.4	3.4	87
blade	0.9	0.4	0.7	0.4	2.2	42
thickness	**mean value**	**standard deviation**	**median**	**minimum**	**maximum**	**n**
flake	0.3	0.2	0.2	0.1	0.9	87
blade	0.3	0.1	0.3	0.1	0.6	42

Table 6. Lithic tool types from *Sankt Gangloff*.

tool type	n
backed bladelet	9
burin on truncation	1
truncation	1
lateral modified flake	1
splintered piece	1
total (n)	**13**

spalls (Fig. 4. 11]–12) indicate that more burins than just this one were manufactured at the site. The piece with lateral retouch is part of a larger tool of unknown type (Fig. 4. 13). Additionally, a splintered piece (Fig. 4. 14) and a blade with truncation (Fig. 4. 15) are present.

When comparing the lithic tools of *Sankt Gangloff* with other sites in Central Germany, the lack of tool types which are present in *Breitenbach*[33] and *Bilzingsleben-Simsensee*[34] is evident. No triangles are present, like those in *Kniegrotte* and *Oelknitz*,[35] no shouldered points similar to those from *Etzdorf*,[36] and no curved backed points resembling those known from *Abri Fuchskirche*.[37] This indicates that *Sankt Gangloff* is neither an early/middle Upper Palaeolithic nor a Hamburgian or Final Palaeolithic/Azilian site. In contrast, the dominance of blades for tool manufacture and the many backed bladelets[38] may suggest that Sankt Gangloff is a site from the Upper Magdalenian.

Discussion

Besides information on research history, the present article is the first to present quantitative data on lithics from *Gera-Pfortener Berg* and *Sankt Gangloff*. This is not a banality but a scholarly contribution to 150 years of knowledge production in Palaeolithic archaeology. In this kind of basic research, it is seen as "a virtue rather than a burden to produce comparatively unspectacular findings and to recede from result-oriented research interests and quick dissemination strategies. Basic science, in this view, at least includes a 'slow' component of knowledge production in which the evidence is continuously expanded, archived, reviewed, re-analysed, and re-conceptualized and in which 'data' is considered as important as reflecting upon preconditions of knowledge production".[39]

When reflecting on knowledge production, two aspects have to be emphasised. First, for over 100 years there has been a continuity in assigning lithic assemblages in Central Germany to the archaeostratigraphic units of the Magdalenian, and Final Palaeolithic/Azilian: the views of such researchers as Behm-Blancke, Feustel, Hanitzsch, Mania, or Toepfer are, more or less, supported and expanded by new local excavations, re-investigations, development of a more precise chronostratigraphy, as well as new research abroad.[40] Ongoing discussions on details show that archaeology has learned to deal with problematic questions – for example, whether *Etzdorf* should be assigned to the Hamburgian or the early Final Palaeolithic.[41] Contradictory results are often due to mixed assemblages, "old" excavation methods, and preservation conditions. For example, some assemblages should be left out of discussion on the Late Upper Palaeolithic, since convincingly Magdalenian artefacts have been absent at *Lindenthaler Hyänenhöhle*,[42] *Rehmen*,[43] *Seehausen*,[44] *Udersleben*,[45] *Urdhöhle*,[46] and *Wandersleben*.[47] The same applies to assemblages with only one or few burins, with the simultaneous lack of other diagnostic tool types. These assemblages are *Bad Sulza, Merkers, Oldisleben, Trockhausen*, and *Ranis-Schmalzgrube*.[48] For other sites, for example, *Maua*,[49] the origin of Magdalenian artefacts is questionable. Only a few sites have not been recently revisited, for example, *Großeutersdorf*,[50] *Kleingrabe*,[51] *Magdala*,[52] *Orlamünde/Eichenberg*,[53] the *Herta* Cave and the *Ilsen* Cave at *Ranis*,[54] or the *Wüste Scheuer*.[55]

[33] Moreau 2012.
[34] Mania 2009.
[35] Bock *et al.* 2015; Höck 2000.
[36] Bergmann *et al.* 2011.
[37] Benecke *et al.* 2006.
[38] Küßner 2009; Pasda, Weiß 2020.
[39] Hussain, Soresssi 2012, 25.
[40] Benecke *et al.* 2006; Grünberg 2006; Höck 2000; Küßner 2009; Küßner, Terberger 2006; Pasda 2018; Pasda *et al.* 2019; Pasda, Weiß 2020; Pfeifer 2015; 2020; 2022.
[41] Bergmann *et al.* 2011.
[42] Küßner 2003, 337–342.
[43] Pasda *et al.* 2019, 2–3.
[44] Pasda *et al.* 2019, 7.
[45] Pasda *et al.* 2019, 7.
[46] Terberger *et al.* 2003.
[47] Pasda *et al.* 2019, 1.
[48] Pasda *et al.* 2019.
[49] Bock *et al.* 2013, note 1.
[50] Mania, Mania 1994.
[51] Küßner 2009, 203.
[52] Küßner 2009, 203.
[53] Mania, Mania 1994.
[54] Küßner 2009, 203.
[55] Küßner 2009, 203.

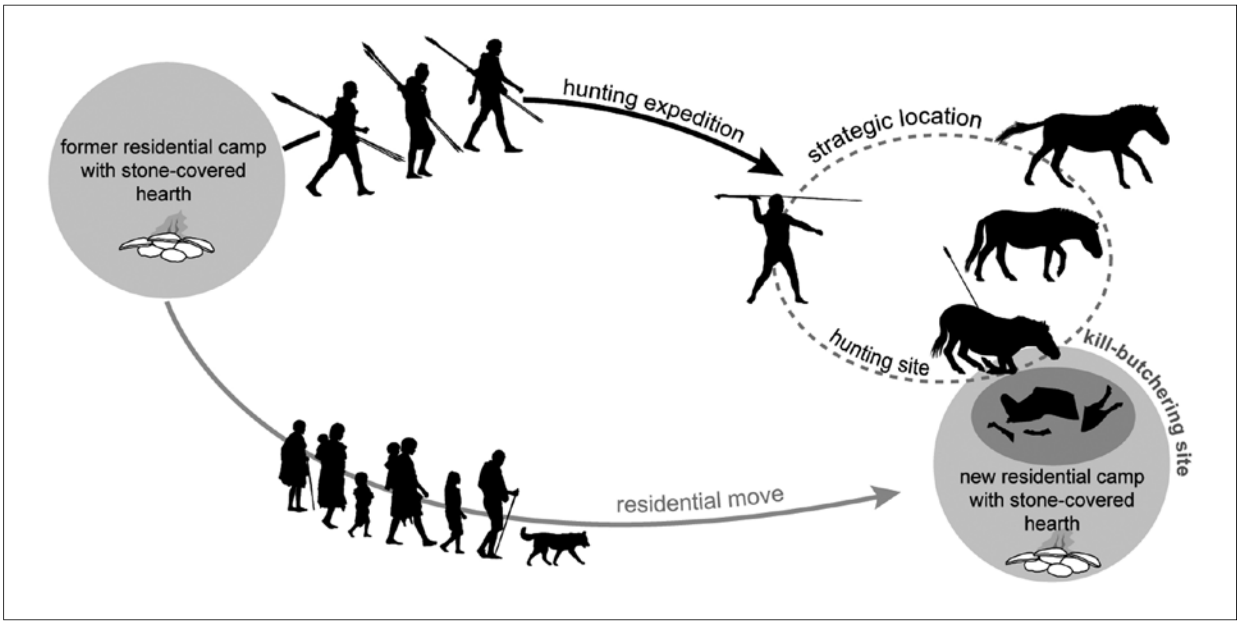

Fig. 5. Model proposed by Denise Leesch for the creation of the material record during the Magdalenian by hunting, group mobility, and domestic activities using stone-covered hearths (original from Leesch *et al.* 2019, 115, adapted by Müller, Pasda 2023; reprinted with permission).

Second, in a recent contribution, Denise Leesch presented a model explaining how the material record of the Magdalenian was created.[56] Her interpretation is based on two recently excavated and exceptional well-preserved Magdalenian sites analysed with a combination of refitting of lithics and rocks, reconstruction of the operation chain, typology, spatial data, study of micro-refuse, contextualisation of this data with experiments, and a critical review of Upper Palaeolithic, ethnographic, and ethno-archaeological studies. According to this model, the material record of the Magdalenian was created after a successful hunt in the vicinity of the kill site where hunters and other members of a small social unit met to consume the prey (Fig. 5). Consumption and related domestic activities were done while using an open-air, stone-covered hearth.[57] Hearth use was performed within a very short time period as only a single or few large animals had to be processed and supplemented with hunting small prey.[58] This behaviour did not differ seasonally nor between open-air, rock shelter, and cave sites but, due to the successive hearth uses, a huge amount of lithic artefacts, rocks, and animal bones could accumulate at a given locality. As more or less the same domestic activities were performed during each hearth use, the material record is more or less uniform.[59] This model has important implications for the current view of human life in the Magdalenian – and, maybe, for the whole Upper Palaeolithic: i) humans did not use base camps and affiliated special-task camps but rather lived in very small groups with high residential mobility (Fig. 6), ii) the architecture and placement of residential buildings remains unknown[60], iii) the material record is a result of domestic activities after a singular hunting event, iv) the kill site is difficult to detect today, as small features of the Pleistocene landscape, which may have favoured hunting, have disappeared today due to erosion or are covered and levelled by thick Holocene deposits.[61] Thus, Magdalenian sites can be expected everywhere. Of course, this is not the case as research tradition and geomorphodynamic processes influence the discovery of sites.[62] This will be shown in the following section.

In Thuringia, the late Upper Palaeolithic sites are concentrated in the eastern part of the Federal State (Fig. 1). This does not reflect dense Magdalenian occupation along the rivers *Saale*, *Weiße Elster*, and *Orla* but results from research history: the majority of the sites (n=13) have been discovered by a few enthusiastic amateurs around their hometowns in the late 1920s and

[56] Leesch 2014; Leesch *et al.* 2019.

[57] Leesch 1997; Leesch, Bulinger 2012; Moseler 2020; Plumettaz 2007.

[58] Leesch 1997; Morel, Müller 2010; Müller 2013.

[59] Pasda, Weiß 2020.

[60] Leesch, Bullinger 2012.

[61] Rodzik *et al.* 2014; Wolf, Faust 2013.

[62] Barbieri *et al.* 2018; Eriksen 1991: 78–81; Floss *et al.* 2022.

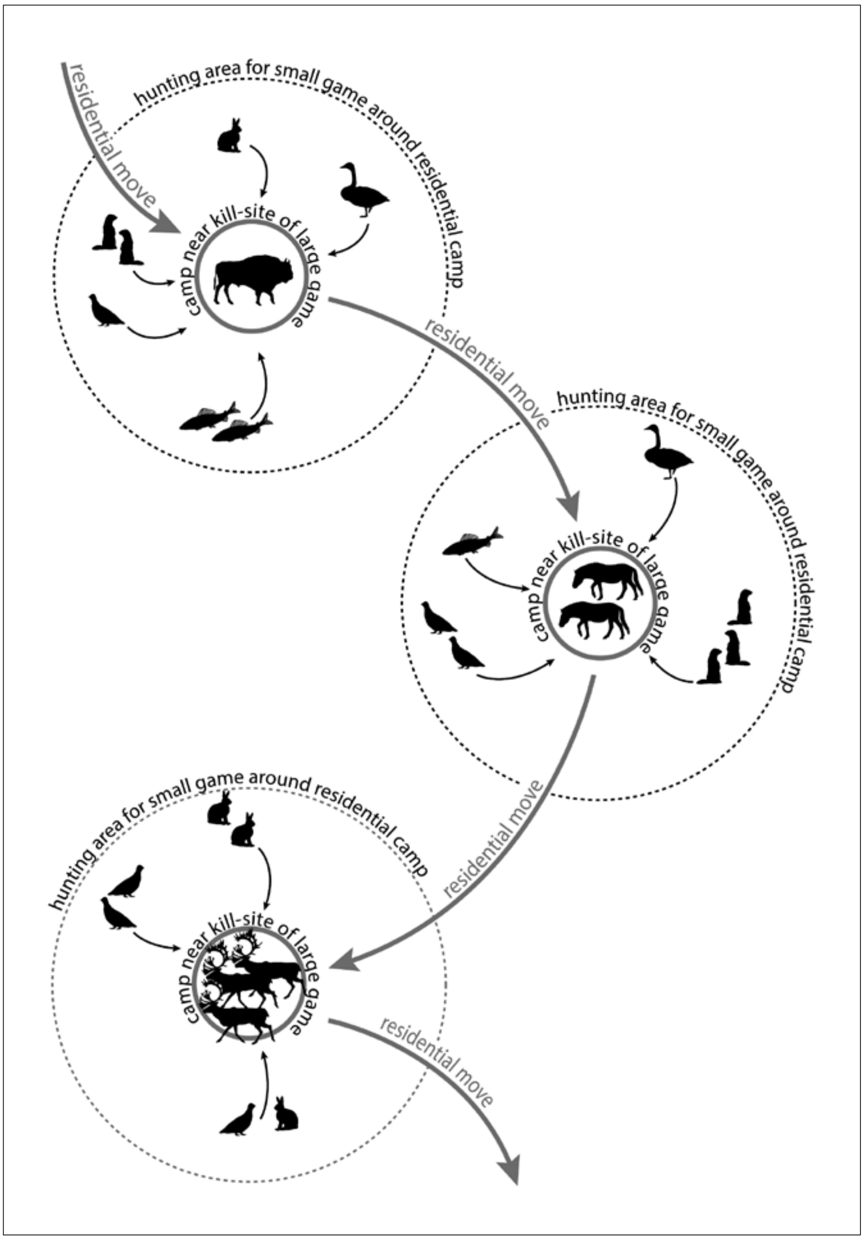

Fig. 6. Model proposed by Denise Leesch for high residential mobility of small groups in the Magdalenian (original from Leesch *et al.* 2019, 122, adapted by Müller, Pasda 2023; reprinted with permission).

1930s, mainly by surface surveying, for instance along the *Saale* River to the south of Jena (collectors Bromme and Trommler), in *Gera* (collectors associated with the local Historical Society), and along the *Weiße Elster* River to the north of *Gera* (collectors Kretzsch and Misslitz). At the same period, other sites were excavated, legally and illegally, by amateurs in the *Orla* valley. Two sites were discovered already in the late 19th century by early excavations conducted by Klopfleisch, a professional archaeologist from the University of *Jena*. In contrast, from the 1950s to the 1980s new sites were discovered in other areas of Central Germany, mostly in the effect of works undertaken by professional archaeologists. When taking knowledge of the Late Pleistocene sediment deposits into consideration, the lack of sites connected with Late Weichselian fluvial deposits has to be mentioned. These deposits are important archives for the Magdalenian in the *Paris* Basin.[63] In Thuringia, these layers are situated several metres below the contemporary rivers,[64] which renders them invisible on the surface. A single dihedral

[63] Taborin 1994.

[64] Ballasus *et al.* 2022; Bischoff 1999; Kirchner *et al.* 2022; Marcinek *et al.* 1970; Steinmüller 1971, 2002.

burin was found in 1983 at *Merkers*, extracted from fluvial deposits ca. 2 metres below the surface.[65] *Merkers* is situated in westernmost Thuringia, where the *Werra* River leaves the federal border for the first time (Fig. 1: left side of the map), ca. 140 kilometres far away from eastern Thuringia where the majority of sites have been discovered. Thus, *Merkers* may be not only an indication of the archaeological potential of sub-surface sites in Thuringian River valleys, maybe as well-preserved as those in the *Paris* Basin, but also of the possibility that many more sites outside of eastern Thuringia await discovery. Last not the least, *Sankt Gangloff*, the site presented above, has to be mentioned. *Sankt Gangloff* is the only site in Thuringia which was discovered in a contemporary forest. All other sites are situated on agricultural land, in caves, rock shelters, or on eroding slopes. Thus, like recently in south-western Germany,[66] prospection in contemporary forests, which cover 33% of Thuringia,[67] may have the potential to reveal previously unknown sites and increase our knowledge on the Magdalenian in and outside the current research areas, far away from the major river valleys.

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[65] Feustel 1983; Pasda *et al.* 2019, 1.

[66] Floss *et al.* 2019, 2022; Wettengl *et al.* 2021.

[67] Leibniz-Institut für Länderkunde 2003, 93.

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Eneolithisation from the Steppes. A Case Study on Volhynia

Abstract

The aim of the article is to formulate a hypothesis explaining the chronology and genesis of the Lublin-Volhynian Culture, with particular emphasis on such important elements of this culture as the white painting of pottery, the use of trough retouch, and the deposition of flint daggers retouched in this way in the graves of some men. At the same time, two different Eneolithisation processes are reconstructed: from the east (with flint daggers) and from the south-west (with copper metallurgy). It has been pointed out that adaptation of the cultural elements mentioned above must have taken place no later than 4100 BC. The most likely place where this happened was the basin of the upper Styr and Horyn in Volhynia. From about 4400 BC, the area was inhabited by representatives of the late phase of the Malice Culture. This community exploited local deposits of excellent-quality Volhynian flint and supplied it to the population of the Tiszapolgár Culture on the upper Tisza and Bodrog rivers. Processes fuelling cultural heterogeneity were taking place in Volhynia. In some grave complexes, there are elements of the Malice, Trypillia, and Polgar cultures. Heterogenisation and cultural hybridisation fostered the emergence of new cultural units. The emergence of the Lublin-Volhynian Culture was impacted decisively by the Skelya Culture, which instilled among the late-Malice people the ideas of hierarchisation of local communities and the rise of the elites (a group of male warriors, distinguished by the possession of blade-daggers).

Keywords: Eneolithisation, Volhynia, flint daggers, white-painted pottery, trough retouch, Skelya Culture, Malice Culture, Lublin-Volhynian Culture

Introduction

The present article was inspired by an excellent doctoral dissertation written by Stanisław Wilk in 2020 and defended a year later at the Faculty of History of the Jagiellonian University in Cracow – the work is entitled *Adaptacja zakarpackich wzorców kulturowych epoki miedzi na Wyżynie Małopolskiej* [*Adaptation of Transcarpathian cultural patterns of the Copper Age in the Lesser Poland Upland*]. We found many of the theses and research results presented in the said dissertation worthy of admiration and considered them valid in our own contribution.

Because S. Wilk's work has not yet been published, we will not quote details of the numerous analyses included in it or debate those research results that may raise doubts. Instead, we will engage certain questions which were omitted or only briefly discussed. The use of white paint on pottery, trough-like retouch, and daggers made of the Volhynian flint – as well as the use of Volhynia as the territory of cultural references – are among those aspects of the Lublin-Volhynian Culture (hereafter: LVC) that were neglected or presented but summarily in the dissertation. However, they are pivotal for characterising and determining the chronology of the earliest phase of Eneolithisation of the territories occupied by the discussed culture. These elements were also essential for the process of defining the LVC – e.g., the (Moravian) Painted Band Pottery Culture,[1] Painted Band Pottery

[1] Żurowski 1930.

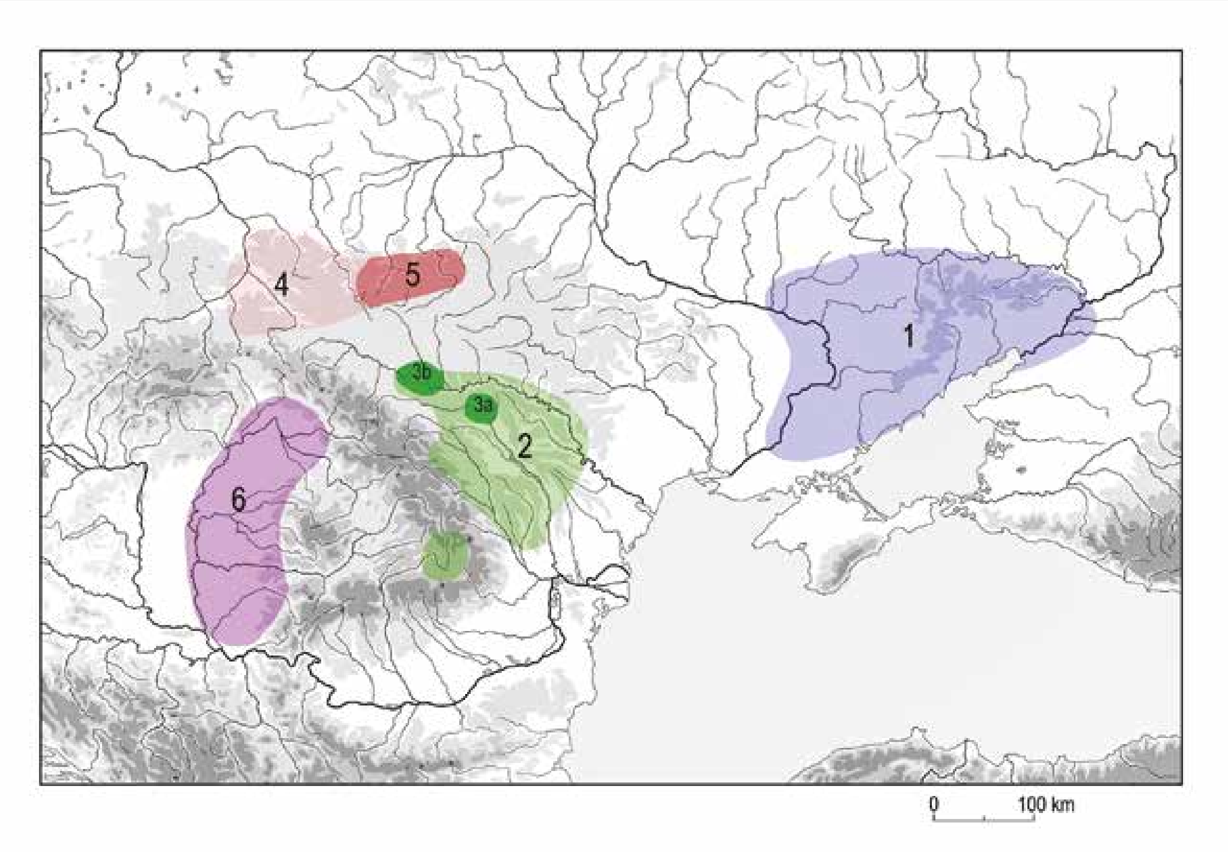

Fig. 1. Cultural situation ca. 4200-4050 BC: 1 – Skelya culture; 2 – CTCC, phase A/BI; 3a – CTCC, phase A3-A4/BI, centre of the Drăguşeni group; 3b – CTCC, phase A4/BI-BI/BII, type Nezvisko II, centre of absorbing Polgar influences; 4 – MC, Rzeszów phase; 5 – MC, Rzeszów phase; formative area of the LVC; 6 – Tiszapolgár-Bodrogkeresztúr. Graphic design by E. Starkova.

Culture,[2] Lublin-**Volhynian** Painted Pottery Culture,[3] **White Painted** Pottery Culture,[4] **White Painted** Pottery Group or Lublin-**Volhynian** Group,[5] Lublin-**Volhynian** Culture).[6]

S. Wilk's reconstruction of the complex and multi-phase Eneolithisation process of the Lesser Poland Upland does not include the aforementioned important aspects of the LVC. Thus, their significance and role in these developments cannot be explained by the said reconstruction alone. In a simplified model of the hypothetico-deductive method, the aspects in need of explanation are referred to as anomalies.[7] Therefore, they form our research questions in the present paper. In order to answer them, we formulate pertinent hypotheses. These will serve as a starting point for new research projects aiming to obtain data which could be used to reconstruct a more complete view of the Eneolithisation processes – including previously disregarded cultural aspects.

Malice Culture and Lublin-Volhynian Culture in their eastern and south-eastern zones

The compact range of LVC sepulchral sites reaches the Styr River near Lutsk – except for a grave discovered in Trostianets, near Dubno, ca. 40 kilometres further to the east.[8] The cluster of LVC sites with flint inventories reaches the Ustia River, which is a left tributary of the Upper Horyn[9] (Fig. 1). The settlement site at Ostrog-Zeman is located furthest to the east (Fig. 2).

[2] Podkowińska 1953; Nosek 1955.
[3] Gurba 1973; Zakościelna 1996.
[4] Kamieńska 1967.
[5] Kulczycka-Leciejewiczowa 1979.
[6] Kruk, Milisauskas1985; Kadrow, Zakościelna 2000.
[7] Lisiński 2016.
[8] Zakościelna 2010, fig. 1.
[9] Zakościelna 1996, 1; Zakościelna 2006a, fig. 1.

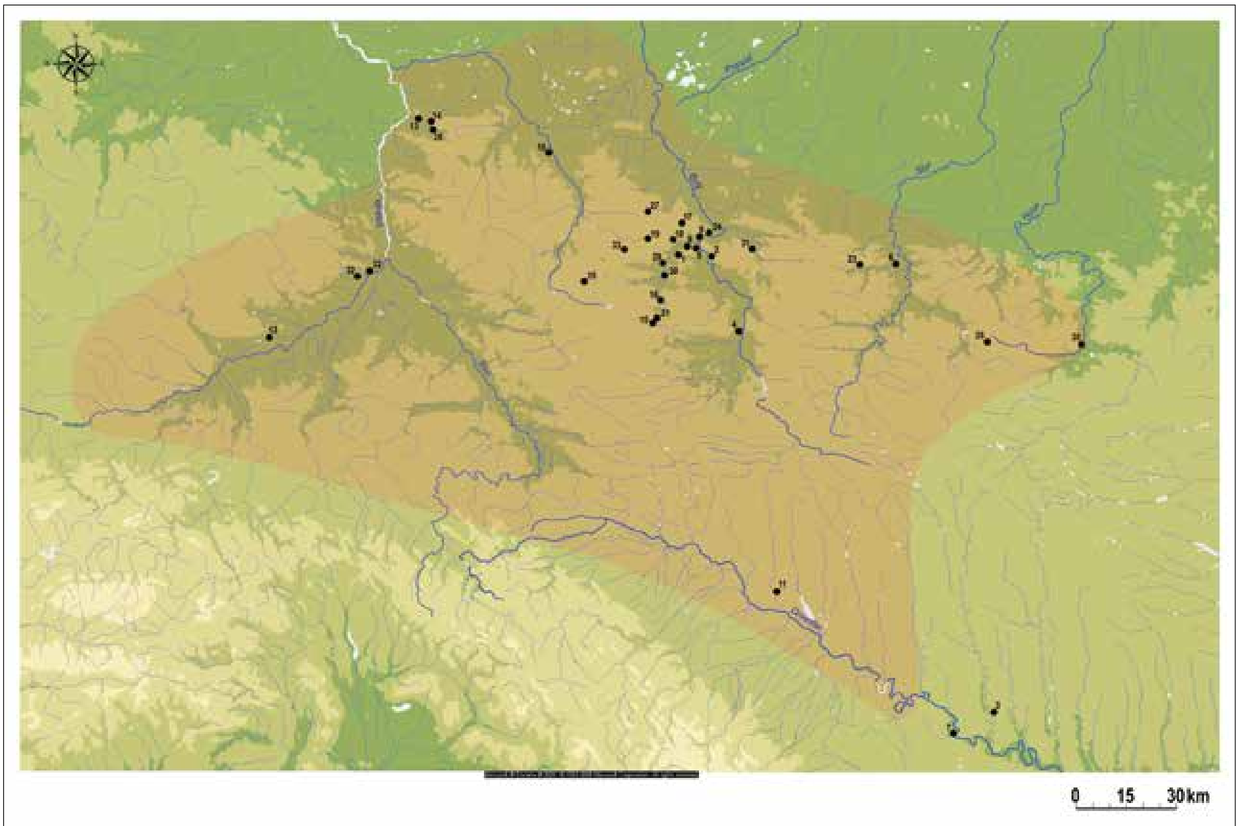

Fig. 2. LVC ceramic dispersion decorated with white oil paint: 1 – Alojzów 9, Hrubieszów District, Lublin Province; 2 – Ambukiv, Volodymyr Rayon, Volyns'ka Oblast'; 3 – Bilče Zolote Ogród II, Borščiv Rayon, Ternopil Oblast'; 4 – Dobriačyn, Sokal Rayon, Volyns'ka Oblast'; 5 – Gródek 1C, Hrubieszów District, Lublin Province; 6 – Holyshiv, Luc'k Rayon, Volyns'ka Oblast'; 7 – Horodnycia, Horodenka Rayon, Ivano-Frankivs'k Oblast'; 8 – Hrubieszów-Podgórze 1a, Hrubieszów District, Lublin Province; 9 – Husynne 2, Hrubieszów District, Lublin Province; 10 – Jaszczów 5, Łęczna District, Lublin Province; 11 – Kolokolin, Rohatyn Rayon, Ivano-Frankivs'k Oblast'; 12 – Książnice 2, Busko Zdrój Rayon, Świętokrzyskie Province; 13 – Las Stocki 7, Puławy District, Lublin Province; 14 – Łopatki, Puławy District, Lublin Province; 15 – Łubcze 27, Tomaszów Lubelski District, Lublin Province; 16 – Mikulin 8, Tomaszów Lubelski District, Lublin Province; 17 – Moniatycze Kolonia, Hrubieszów District, Lublin Province; 18 – Nieledew, Hrubieszów District, Lublin Province; 19 – Ornatowice, Zamość District, Lublin Province; 20 – Ostrog-Zeman, Ostrog Rayon, Rivne Oblast'; 21 – Podlodów 2, Tomaszów Lubelski District, Lublin Province; 22 – Sandomierz Wzgórze Zawichojskie 1, Sandomierz District, Świętokrzyskie Province; 23 – S'omaki, Luc'k Rayon, Volyns'ka Oblast'; 24 – Strzyżów I, II, 2A, 26, Hrubieszów District, Lublin Province; 25 – Topornica 36 – Zamość District, Lublin Province; 26 – Trostianec', Dubno Rayon, Rivne Oblast'; 27 – Turowiec, Chełm District, Lublin Province; 28 – Wąwolnica 6, Puławy District, Lublin Province; 29 – Werbkowice Kotorów I, Hrubieszów District, Lublin Province; 30 – Wronowice-Paprzyca 5, Hrubieszów District, Lublin Province; 31 – Zymne, Volodymyr Rayon, Volyns'ka Oblast'; 32 – Złota, Sandomierz District, Świętokrzyskie Province; 33 – Żuków, Hrubieszów District, Lublin Province. Graphic design by E. Starkova.

The presence of the LVC in the territories spreading between the Upper Styr and Horyn was preceded by the chronologically earlier settlement of the Malice Culture (hereafter: MC), which is linked with its late-stage (Rzeszów Phase) and reached even further to the east. Several sites are even located eastwards of the Horyn (e.g., Hoshcha)[10]. This settlement was more intensive. In the older literature in Russian and Ukrainian, it is referred to as the Hoshcha-Werbkowice-(Kostianets) Culture.[11] Meanwhile, Polish archaeologists consider it the eastern zone of the late MC.[12]

Cucuteni-Trypillia Cultural Complex

The settlement linked with the late phase of the MC was pioneering – there was no prior colonisation

[10] Kadrow 1988, fig. 1.

[11] Cf., for instance, Černyš 1982b, 257–258.

[12] Kruk 1980, 38; Kadrow 1988, 16, fig. 1.

by the population of the classical phase of the MC.[13] At that time, the population associated with Phase A/BI of the Cucuteni-Trypillia Cultural Complex (hereafter: CTCC) occupied territories located by the Upper and Middle Dniester and Upper Southern Bug River, 150 to 200 kilometres to the south of the discussed settlement cluster of the MC (Fig. 1). The appearance of the late MC population in this area was probably linked with exploitation and distribution of the Volhynian flint, whose easily accessible outcrops were located between the Upper Styr and Upper Horyn.[14] The Volhynian flint – extracted by miners associated with the late phase of the MC – was distributed mainly among the population of the Tiszapolgár Culture from the Hungarian-Slovak borderland, by the rivers of Tisza and Bodrog (Fig. 1).[15]

The drainage basin of the Upper Dniester was settled in the classical phase (Ib) of the MC.[16] During the late phase (Rzeszów), the population of this culture did not inhabit the discussed territory.[17] Because of the incidental character of discovered sites located by the Upper Dniester and previously attributed to the LVC, we think that the discussed territory should not be included in the settlement zone of this culture. Single cases of LVC vessels discovered in Horodnytsia and Bilche-Zolote were only imports in the CTCC environment, whereas attribution of the pottery from Kolokolyn to the LVC is questionable.

There are two sepulchral sites located by the Horyn, in the eastern margin of the discussed region: Ostrog-Zeman[18] and Rivne, Stepowa Street.[19] Both included graves containing pottery of a heterogeneous character (attributed to the CTCC, MC, and LVC). It is a clear trace of advanced and ongoing multicultural processes of blending and hybridisation.

Remarks on the chronologies of the MC and LVC

Because there are no ^{14}C dates from the drainage basin of the Upper Styr and Horyn, we can present only an absolute chronological framework of the MC and LVC for the territory of Lesser Poland in order to extrapolate it to the former area.

The classical phase (Ib) of the MC in the Targowisko settlement region, on the Wieliczka-Bochnia loess cover, is dated to ca. 4700–4500 BC.[20] The chronological range of stratum 6 from the tell in Herpály is similar but somewhat wider.[21]

The idea of the late classical phase (Ic) of the MC came to life as a result of the necessity to classify MC pottery discovered in the Cluster of Pits 108 at Site 16 in Rzeszów, Osiedle Piastów – which blends the features of pottery from the classical and late (Rzeszów) phases.[22] The forms of the vessels and some elements of the stroked ornamentation (although in disintegrated patterns) are a continuation of features characteristic for the classical phase (Ib), but they are accompanied by the appearance of pit (or deep-stroked) ornaments, which are typical of the Proto-Tiszapolgár Phase.[23] The chronologies of the end of the classical (Ib) phase and the beginning of the late phase (II) allow us to date the late-classical (Ic) phase of the MC to 4500–4400 BC.

The formation of the Rzeszów stage of the MC (Phase II) was gradual and took many years.[24] Its essential features include distinct shoulders of bowls and vases. The same applies to the Gumelniţa Culture (phases A1–A2) as well as the Karanovo VI[25] and Tiszapolgár cultures.[26] Another important feature is rich pit ornamentation, which appeared first in the Proto-Tiszapolgár Phase and predominated throughout the Tiszapolgár B Phase.[27]

The Rzeszów stage (Phase II) of the MC at the site of the Wzgórze Zawichojskie in Sandomierz was dated to 4400–4200 BC. It was established that the traces of the LVC discovered at this site came from 4000–3900 BC.[28] Two absolute dates linked with the Rzeszów stage of the MC come from Site 31 in Rzeszów. They also indicate the time frame of 4400–4200 BC.[29]

In the Lesser Poland Upland, the LVC is dated to 4030–3830 BC.[30] According to S. Wilk, the period between 4250/4200 and 4050 BC marks its initial stage. The scholar suspects that it was the time when the culture emerged (formed) on the cultural substrate of the

[13] Kadrow 2006, 63–64, fig. 1.
[14] Terekhina *et al.* 2022; Kadrow, Zakościelna 2022, fig. 14.
[15] Kaczanowska 1985, 176–181, chart 5; Zakościelna 1996, 86–87.
[16] Bandriwski 2004, fig. 7.
[17] Kadrow 1988, fig. 1; Zakościelna, Gurba 1997, fig. 1.
[18] Pozìhov´skij, Samoylûk 2008.
[19] Bardec´kij *et al.* 2020.
[20] Kadrow *et al.* 2021, 167–169, fig. 11; Golański, Kadrow 2022, 480; Kadrow *et al.* 2022, 27–29, fig. 22; Zastawny 2022, 168–169, fig. 10.
[21] Kalicz, Raczky 1987a, 28–30.
[22] Kadrow 1990, 70, fig. 11; Kadrow 1996, fig. 17.
[23] Kalicz, Raczky 1987a, 27.
[24] Żaki 1962; Kamieńska 1973; Kadrow 1988; 1996; Kadrow, Zakościelna 2000.
[25] Cf. Voinea 2005.
[26] E.g. Bognár-Kutzián 1972.
[27] Kalicz, Raczky 1987a, 27; 1987b, 116.
[28] Włodarczak 2017, 103, figs 2, 7, 9.
[29] Dębiec, Pelisiak 2008, 136–139, figs. 5–6; Zastawny 2022, figs. 9–10.
[30] Wilk 2018, 492.

Modlnica Group, under the influence of the Ludanice, Balaton, and Bodrogkeresztúr cultural units.

Covering pottery with white paint

At the beginning of this subsection, we would like to state that we are interested only in paints of a specific composition and a particular application technique. The white paint used for colouring the LVC vessels discovered in Wąwolnica was made of chalk mixed with organic adhesives (hen egg whites and beeswax) and applied on already-fired vessels.[31] The paint covering the vessel from Ornatowice contained vegetable oils or animal fats which served as organic adhesives.[32]

Applying white paint with organic admixtures on already fired vessels was the only method of colouring pottery used by the population of the LVC (Fig. 2). The same is true of the youngest phases of the Herpály and Csőszhalom-Oborin I cultures in the drainage basin of the Tisza. White and red oil paints were used there at the end of the Neolithic. The same colours were predominant during the older stage of the Herpály III Phase (stratum 7 and the earlier part of stratum 6 from the tell in Herpály) as well as in the Csőszhalom-Čičarovce Phase, which is dated to the same time.

Only white paint was used in the younger period of the Herpály III Phase (top of Stratum 6) and in the Csőszhalom-Oborin I phase.[33] It was used to create the following patterns: rhombus, triangle, oblique check, checkerboard, and meander, the last of which saw the most widespread use in the upper part of stratum 6. Stratum 5 of the tell in Herpály contained artefacts from the Proto-Tiszapolgár Phase, but it lacked white-painted pottery[34] – it was substituted with pottery ornamented with conical knobs, handles, and pits or deep strokes forming double parallel rows.[35] As we mentioned before, the latter ornament became characteristic for the Tiszapolgár Culture.[36] Colouring pottery with oil paint completely ceased to be used in territories located by the Tisza River already ca. 4500 BC. This means that it could not have been the inspiration for using white paint by the LVC population due to the considerable temporal hiatus between the two cultures.

In the period corresponding to the late phases of the Herpály and Csőszhalom cultures, i.e. in the classical phase (Ib) of the MC, white and red mineral paints were only sporadically used.[37] A large, pear-shaped beaker – whose external surface is covered with red oil paint and whose shoulder is marked with a narrow horizontal band of white oil paint – should be probably associated with the context of the same phase (Ib) of the MC.[38].

Uncertain, modest traces of colouring pottery with red and black mineral paints were recorded in materials from the Wzgórze Zawichojskie, Sandomierz, dated to the late (Rzeszów) phase of the MC.[39] We do not know a single example of using white oil paint during this period, which corresponds to the times of the Tiszapolgár Culture.

In other cultures, this method of painting vessels was used only sporadically. This can be said, for example, about the Drăguşeni Group of the CTCC (from the younger period of the A3–A4/BI phase), dated to ca. 4300–4050 BC.[40] Sites attributed to this culture are located by the Upper and Middle Dniester and Upper Prut (Fig. 1).[41] They were nearest to the south-eastern range of the MC in the Rzeszów Phase (drainage basin of the Upper Styr and Horyn in Volhynia).[42] This distance did not exceed 200 kilometres. Hence, the aforementioned sites might have been the source of know-how pertaining to manufacturing of the white-painted pottery used by the LVC people.

Until recently, it was widely believed that CTCC vessels were painted before they were fired. In 1999, Natalia Podvigina and her team detected organic adhesives (egg whites, beeswax) in paints, especially when the painted motifs were composed of several layers.[43] The bottom layers of paint – which were thin – did not contain mineral adhesives. This means that they were applied to the vessels before firing. The thicker paint layers from the surface sometimes contained such adhesives, thus they must have been administered after firing. The firing of the pottery probably consisted of two stages. In the second stage, vessels were fired at low temperatures in order not to damage the organic adhesives, which gave the surface layer of paint a characteristic 'oily' look.[44] Similar results for pottery discovered at several CTCC settlements (Nezvisko, Polivaniv Yar, Vladimirivka, Nemyriv,

[31] Starkova, Zakościelna 2018, 80.
[32] Gurba, Jasiński 1963, 362.
[33] Kalicz, Raczky 1987a, 26, 30.
[34] Kalicz, Raczky 1987b, 108, 111.
[35] Kalicz, Raczky 1987a, 27.
[36] Kalicz, Raczky 1987b, 116.
[37] Kadrow 2006, 67.
[38] Czerniak *et al.* 2007, fig. 4; Golański, Kadrow 2022, figs. 7, 11.
[39] Kowalewska-Marszałek 2017a, 53, fig. 5ab; 2017b, pls. II.45: 8 and II.46: 1.
[40] Lazarovici *et al.* 2009, 74, 108–110.
[41] Palaguta 2007, fig. 89; 2016.
[42] Cf. Kadrow 1988, fig. 1.
[43] Podvigina *et al.* 1999, 35–37.
[44] Podvigina *et al.* 1999, 35–37.

and Krynichki) were published by Kamila Kalinina and Elena Starkova.[45]

Trough-like retouch, retouched blade daggers, warrior graves with daggers

Other essential elements of the cultural inventory associated with the LVC are trough-like retouch and blade daggers of Volhynian flint formed with this retouch. In the last decade, the discussed type of retouch has been defined several times in the archaeological literature.[46] Also, the questions related to the retouched blade daggers have been tackled.[47] Moreover, it has recently been discussed by the authors of the present article.[48] Large-scale research allowed us to draw conclusions that – besides the territory of the eastern Balkans, where trough-like retouch was used by the population of the Kodjadermen-Gumelnița-Karanovo VI Cultural Complex (hereafter: KGK VI) only to form a small number of bifacial points[49] – this method of shaping the edges of (mainly) retouched blade daggers and points appeared for the first time in the northern Pontic steppes, in the grave inventories of the Early Eneolithic Skelya Culture.[50]

Across territories roughly corresponding to the range of the LVC, the trough-like retouch appeared in the CTCC context at settlements associated with the transitory stage between A/AB and A/BI (ca. 4500 BC), by the Middle Dniester, where it was used to shape triangular points, and later – since the end of Phase BI– also retouched blades.[51] During the BI/BII phases, it was present in the drainage basin of the Southern Bug,[52] in the interfluvial zone of the Dniester and Prut[53] as well as in the interfluve of the Prut and Siret.[54] In the BII and C phases, it was already the most common technique of shaping tools across the whole range of the discussed cultural complex.[55] The CTCC inventories lack classical retouched blade daggers and single specimens of similar forms were discovered only in a small number of graves dating to Phase CII (Krasnyj Hutor and Sofievka).[56]

The trough-like retouch recorded on artefacts from settlements attributed to the late (Rzeszów) stage of the MC – but only across its eastern territories, between the Upper Styr and Horyn – is a result of contacts between this culture and the CTCC. It was used to form retouched blades of different types, but never for retouched blade daggers or triangular points.[57]

The population of the LVC adopted the use of trough-like retouch through the intermediary of the MC communities from the Rzeszów Phase. This technique was most universally used in the flint production of the LVC. It was employed to shape end scrapers, truncations, massive points of piercers, triangular points, and – especially – various types of retouched blades.[58] Retouched blades with trough-like retouch have been discovered across the entire range of the LVC – in materials dated to different phases of its development – and are made of various flint varieties. They come from all of the researched settlements, but they are usually fragmented, most often reshaped into other tool types.[59] The most impressive, completely preserved and elaborately formed retouched blade daggers – almost always made of the Volhynian flint – represent a modest number of finds discovered in graves of adult, mature, and elderly men (as well as in one female grave).[60] They are unusual burials, whose inventories include different types of artefacts made of various raw materials. They are also composed of other socially esteemed artefacts associated with the male gender: copper or bone daggers, copper axes and chisels, battle axes made of deer antlers, and macrolithic Volhynian flint blades.[61]

Retouched blade daggers were discovered in important, conspicuous places near the buried dead – mainly next to the head or on the ribcage (Książnice 2, Grave 5;[62] Gródek 1C, Grave 2/1987 – Fig. 3)[63] and, in one case, near the waist (Złota Grodzisko II, Grave 101[64]).

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[45] Kalinina, Starkova2012, 387–388.

[46] Libera, Zakościelna 2013, 228; Zakościelna, Libera 2014, 198.

[47] Zakościelna 2008; 2010, 164–166, 211–213.

[48] Kadrow, Zakościelna 2022.

[49] For example, Păunescu 1970, fig. 31: 2, 10, 12; Lichardus, Lichardus-Itten 1995, 234–237, fig. 3; Manolakakis 2005, pls. 85: 4, 9; 108: 2, 119: 5, 142: 1–3, 9–10.

[50] Skakun 2008, fig. 7; Rassamakin 1999; 2004a, 93–95, figs. 76, 77; 2004b, pls. 194; 195; 252–254; 191.

[51] Popova 2003, fig. 13; Radoms´kij 2018, figs. 70: 2, 7, 8, 11, 12.

[52] Zaec, Ryžov 1992, figs. 55: 2, 7, 14, 18; 55: 3, 13, 17; 57: 6, 11–17, 19, 20; 58: 3, 7–9, 11–16.

[53] Sorokin 1991, 27; figs. 6: 7, 11, 16; 12: 8, 10; 16: 1–3, 5–8.

[54] Marinescu-Bîlcu, Bolomey 2000, figs. 33; 38: 9, 17, 22; 40: 6, 7, 16, 19; 43; 44: 1–12.

[55] Černyš 1982a, 207; Konoplya 1990b, 22–24, fig. 5; 1990c, fig. 7; Egnovatova 1993, 16–17; Kadrow *et al.* 2003, figs. 40: 1–5, 7, 12; 42: 8, 11, 12; 43: 1, 3–5, 10, 11; 47: 6, 8, 9; Terekhina *et al.* 2022, figs. 2: 2; 3: 4.

[56] Budziszewski 1995, figs. 3: c; 4: a, b.

[57] Konoplya 1990a, 9–10; Zakościelna 1996, 93, pls. LI–LV.

[58] Zakościelna 1996, 56, 60–70, 92, 93; Libera, Zakościelna 2013, 219.

[59] Zakościelna 1996, 63–66.

[60] Zakościelna 2008, 583–586.

[61] Zakościelna 2010, 183–189, tab. 47.

[62] Wilk 2006, fig. 5.

[63] Zakościelna 2008, 583; 2010, pls. IX, IXb: A.

[64] Sałacińska, Zakościelna 2007, fig. 18, 19; Mączyński, Zakościelna 2017a, figs. 2–3.

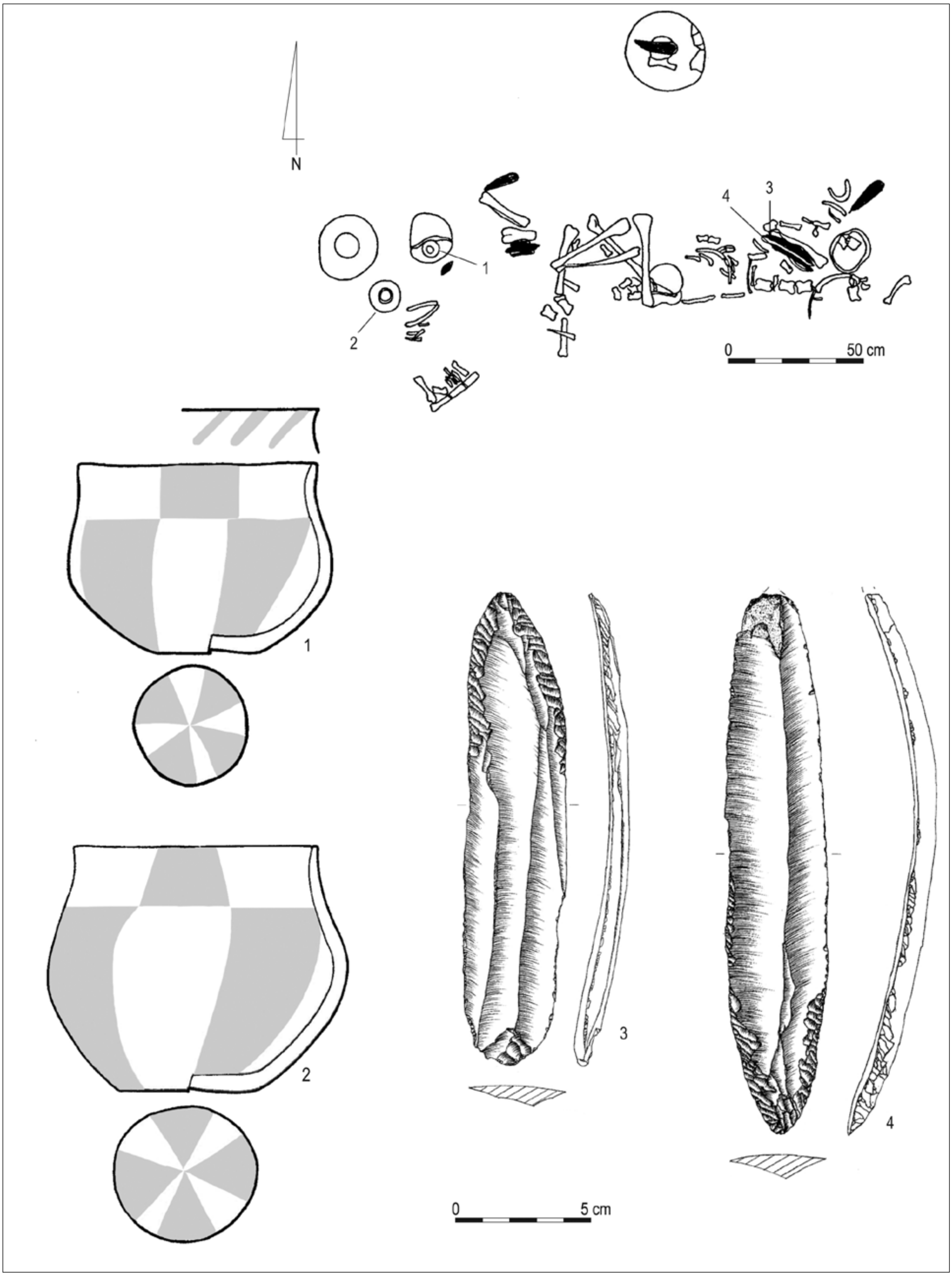

Fig. 3. Gródek, site 1C, grave 2/1987. Buried adult man with two retouched blade daggers on his chest (according to Zakościelna 2010, with changes). Graphic design by M. Juran.

The location of such artefacts on the ribcage is especially telling. It indicates that – equipped with handles and probably kept in sheaths – the blade daggers were carried on the chest. The discussed tools were prestigious items and manifested their owners' high social position.[65]

Among the discovered LVC graves, 10 burials contained bodies of men – mainly adults and mature individuals – placed there with retouched blade daggers or macrolithic blades (Tab. 1). Particularly noteworthy in this group are two well-preserved graves containing retouched blade daggers located in the most 'classical' position. In Grave 5 from the cemetery in Książnice 2, the discovered retouched blade dagger – with the tip pointing downwards – was placed on the ribs of the buried man, under the left humerus.[66] The grave contained also a copper axe, three vessels, and 11 other flint artefacts carried by the man in a pouch by the belt.[67] The man buried in Grave 2/1987 from Gródek 1C had two retouched blade daggers on his chest (Fig. 3). Beside them, there were also seven flint artefacts located in different parts of the grave pit (two shorter retouched blades, five macrolithic blades), five vessels, and a bone "needle".[68]

Table 1. Male graves of the Skelya Culture and the LVC with the retouched blade daggers (the administrative data of the Ukrainian localities are based on the resolution of the Supreme Council of Ukraine / On the creation and liquidation of districts / https://www.rada.gov.ua/news/Novyny/196122.html, published on the 20th of July 2020 – access date: 10th of March 2023).

Skelya Culture				
No.	**Locality**	**Rayon, oblast (district, voivodship)**	**Placement in relation to the buried individual**	**Literature**
1.	Aksaj "Muhin II" Burial Mound 5, Grave 9	aksayskiy ray., rostovskaya obl.	retouched blade dagger made of obsidian and a flint blade on the stomach of the buried individual	Rassamakin 2004b, 86–87, pl 291: 1, 10
2.	Oleksandriya, Graves 18–19	kupyanskiy ray., khar'kovskaya obl.	retouched blade dagger and a long blade between the right clavicle and the skull of Skeleton 18	Rassamakin 2004b, 64, pl. 194: 1–3
	Oleksandriya, Grave 20		retouched blade dagger along the right arm	Rassamakin 2004b, 64, pl. 194: 6–7
	Oleksandriya, Graves 23–24		retouched blade dagger on the right arm of Skeleton 23	Rassamakin 2004b, 65, pl. 195: 1–2
3.	Oleksandrivsk, Burial Mound 1, Grave 46	luganskiy ray., luganskaya oblast'	retouched blade dagger by the right arm (?)	Rassamakin 2004b, 67, pl. 203: 1, 3
4.	Chapli, Grave 3a	dneprovskiy ray., dnepropetrovskaya obl.	retouched blade dagger along the right arm	Rassamakin 2004b, 79, pl. 248: 2
5.	Igran' (Staraya Igran'), Grave 8/1946	novomoskovskiy ray., dnepropetrovskaya obl.	retouched blade dagger	Rassamakin 2004b, pl. 253: 7
	Igran' (Staraya Igran'), Grave 10/1946		retouched blade dagger by the waist	Rassamakin 2004b, tabl. 254: 1–2
	Igran' (Staraya Igran'), Grave 11/1946		two retouched blade daggers: one on the pelvis and the other by the right arm	Rassamakin 2004b, 80, pl. 252: 1–3
	Igran' (Staraya Igran'), Grave 2/1986		two retouched blade daggers: on the right side and near the pelvis	Rassamakin 2004b, pl. 257: 2–3

[65] Zakościelna 2008, 542; 2010, 164–167; Mączyński, Zakościelna 2017b, 347–349.
[66] Wilk 2006, fig. 5; Zakościelna 2006b, figs. 1–6.
[67] Wilk 2006, figs. 7–8.
[68] Zakościelna 2010, 249–251, pls. IX–IXb: a.

No.	Locality	Rayon, oblast (district, voivodship)	Placement in relation to the buried individual	Literature
6.	Yaama, Burial Mound 1, Graves 5–6 – double	bakhmutskiy ray., donetskaya obl.	retouched blade dagger by the knees of Skeleton 6; fragment of a retouched blade dagger with the trough-like retouch on the left side of Skeleton 5	Rassamakin 2004b, 70, pl. 223: 2–3
7.	Kut, Burial Mound 8, Grave 7	krivorozhskiy ray., dnepropetrovskaya obl.	retouched blade dagger along the spine, slightly above the pelvis	Rassamakin 2004b, 73, pl. 232: 4–5
8.	Lugansk, Burial Mound 1, Grave 2 (triple)	luganskiy ray., luganskaya oblast'	Skeleton 1 – retouched blade dagger on the chest, two long blades by the skull, one by the left elbow; Skeleton 2 – on the right side of the skull, eight macroliths, including a retouched blade dagger; on the right side of the skull, a long blade and a retouched blade dagger; in each hand, one long blade; under the left illium, an end-scraper, fragment of a blade, two flint axes, two stone axes; Skeleton 3 – long blade in the right hand	Rassamakin 2004b, 69–70, pl. 217–220; Skakun 2008, Fig. 5: 5–7, Fig. 7: 3–5.
9.	Orlivs´ke	volnovskiy ray., donetskaya obl.	retouched blade dagger and a long blade, axe, two blades	Rassamakin 2004b, 158, pl. 478: 5
10.	Petro Svistunove	zaporozhskiy ray., zaporozhskaya obl.	three retouched blade daggers	Rassamakin 2004b, 73–75; pl. 243: 3, 5, 244: 2
		KL-W		
11.	Gozdów 1, Grave 1	Hrubieszów District Lublin Voivodship	retouched blade dagger on the chest (?)	Zakościelna 2010, 245–246, pl. VIa: A-1
12.	Gródek 1C, Grave 2/1987	Hrubieszów District Lublin Voivodship	two retouched blade daggers on the chest	Zakościelna 2010, 249–250, pl. IXa: 9–10
	Gródek 1C, Grave VI		retouched blade dagger in a vessel by the head	Zakościelna 2010, 255–256, pl. XIVa: 5
13.	Książnice, Grave 5	Busko District, Świętokrzyskie Voivodship	retouched blade dagger on the chest,	Wilk 2006, Fig. 5, Fig. 9: P
	Książnice, Grave 15		retouched blade dagger by the hip	Wilk, Kufel-Diakowska 2016, Fig. 5
14.	Moniatycze Kolonia, Grave 2	Hrubieszów District Lublin Voivodship	retouched blade dagger, unknown location in relations to the skeleton	Zakościelna 2010, 279–280, pl. XLIVa: 23
15.	Sitaniec Wolica, Grave 1	Zamość District, Lublin Voivodship	retouched blade dagger by the head (?)	Zakościelna 2010, 286–287, pl. L: 6
16.	Strzyżów 26, Grave 4	Hrubieszów District Lublin Voivodship	retouched blade dagger by the head	Zakościelna 2010, 298–300, pl. LXIV
17.	Tyszowce 3, Grave 1	Tomaszów District, Lublin Voivodship	retouched blade dagger by the hip (?)	Zakościelna 2010, 302–303, pl. LXX
18.	Złota, Grodzisko II, Grave 101	Sandomierz District, Świętokrzyskie Voivodship	retouched blade dagger by the hip	Zakościelna 2010, 308, pl. LXXV: 3

In several graves, the places where retouched blade daggers were found were occupied by macrolithic blades (Gródek 1A, Grave 2; Strzyżów 1A, Grave 1[69]).

The importance of macrolithic flint artefacts as items attesting to the social position of their owners is particularly well-evidenced by Grave 1 from the cemetery in Strzyżów 26, which contained remains of a man buried with a long blade and a copper dagger (the only such specimen discovered in a LVC grave!) reshaped into a pendant on his chest.[70]

Graves with retouched blade daggers within the range of the LVC are located between the Bug and Wieprz rivers. Only the cemeteries in Złota 'Grodzisko II' and Książnice 2 are located slightly to the west of the Vistula River (Fig. 4). They are mainly dated to the late phase. The only two burial features attributed to the classical phase – both located near settlements – are Grave 1 from Strzyżów 1A and Grave 2/1987 from Gródek 1C. They also contained vessel sets typical of this phase, especially the feature from Gródek 1C – three cups decorated with a white paint (Fig. 3).

Hypothesis on the formation of the LVC in Volhynia

Retouched blades formed with the trough-like retouch – serving as prestigious daggers – were elements of inventories attributed to two cultures: the Skelya Culture and the LVC[71] (Fig. 4). The former developed between 4550 and 4100/4000 BC[72] or between 4750 (?) and 4100 (?) BC.[73] The LVC in the Lesser Poland Upland is dated to 4030–3830 BC.[74] It is also worth noting that there is no evidence for using the discussed type of daggers or any signs of social hierarchisation in the late (Rzeszów) stage of the MC (4400–4200 BC).

Chronological relations between the two aforementioned cultures indicate that the idea of flint daggers spread from the Skelya Culture to the LVC. This must have taken place in 4100 BC at the latest. Most probably, this process of transmission took place somewhat earlier, before the Skelya Culture ceased to exist. At that time (before 4100 BC), the LVC must have contained at least some rudiments of social elites – adult male warriors – which might be the reason for (and explanation of) the adaptation of prestigious flint daggers. The aforementioned transmission must have taken the form of direct contact because we do not know any possible intermediaries. For sure, this role was not played by the CTCC communities from the A and BI phases, because there are no known examples of making or using the discussed type of daggers by these people – although they often formed their artefacts with the trough-like retouch.

The region of the late MC and LVC by the Upper Styr and Horyn was the closest one to the area of the Skelya Culture (Fig. 4). The territories of both cultures were located over 500 kilometres apart, but this does not have to mean that direct contacts were impossible to establish. We must remember that the elites of the Skelya Culture participated on a daily basis in the system of exchange of prestigious foodstuffs with even more distant production centres associated with the Varna Culture. They also interacted – but to a considerably lesser degree – with the population of the Pre-Maikop Period from the foreland of the Caucasus and with the Khvalynsk Culture by the Lower Volga River.[75]

The idea of the retouched blade dagger and its meaning as a prestigious tool did not come into being in the LVC. It was neither borrowed from the tradition of the Rzeszów Phase of the MC (like the macrolithisation of the flint industry and the trough-like retouch) nor resulted from contacts with the CTCC (white oil paint used for ornamenting vessels). As mentioned before, the retouched blade daggers attributable to the Eneolithic of the south-eastern, eastern, and central Europe occur only in the funerary inventories of the Skelya Culture and the LVC, whose elites needed different prestige goods to demonstrate their social position. The processes of social diversification and the formation of elites in the Skelya Culture resulted from influences from the KGK VI Cultural Complex, whose artisans produced various prestigious goods (including macrolithic blades), and the CTCC A3–A4 and BI, which served as intermediaries in the spread of the idea of such artefacts to the steppe populations.[76] On the other hand, the retouched blade daggers formed with the trough-like retouch are an 'invention' of the Skelya Culture – the idea of this artefact type must have come to the LVC in the interfluvial zone of the Styr and Horyn directly from the territories of this culture because we cannot find it in the inventories of the CTCC and the Rzeszów Phase of the MC.[77]

The local Drăguşeni-Jura[78] Group, sometimes referred to as the Drăguşeni-Druţa Type (Fig. 1),[79] was

[69] Zakościelna 2010, 247, pl. VII: 1, 296, pl. LXI.
[70] Zakościelna 2008, fig. 5B: 1, 2; 2010, pl. LXI: 1, 2.
[71] Cf. Kadrow, Zakościelna 2022, 160–166, figs. 3–5.
[72] Rassamakin 1999, 129.
[73] Rassamakin 2004a, 180–182.
[74] Wilk 2018, 492.
[75] Rassamakin 1999, 111, fig. 3.42.
[76] Rassamakin 1999, fig. 3.49.1.
[77] Kadrow, Zakościelna 2022, 179–182.
[78] Lazarovici *et al.* 2009, 74–75, 108–110.
[79] Palaguta 2007, fig. 89.

Fig. 4. Male graves of the Skelya culture and the LVC containing retouched blade daggers (according to Rassamakin 2004a, 2004b; Zakościelna 2010). Graphic design by E. Starkova.

located by the Upper and Middle Dniester and Upper Prut, ca. 200 kilometres to the south of the drainage basin of the Upper Styr and Horyn. Its area was probably the zone from which the population of the LVC – forming at that time on the late MC substrate – borrowed the technology of decorating previously fired vessels with white oil paint (Fig. 2; completely neglecting the decorative motifs as well as the morphological and micromorphological elements of pottery attributed to the environment of the Drăguşeni Group). The checkerboard motif, which was the predominant decorative pattern present on the LVC vessels, was probably the original contribution of this culture. In the discussed cultural group, dated to the CTCC A3–4/BI phases (4300–4050 BC), we can see certain signs of dynamic stylistic transformations in pottery, which were harbingers of the subsequent phase (Cucuteni AB/Trypolye BII).[80]

The north-western margin of the Drăguşeni Group (Nezvisko II type),[81] by the Upper Dniester, was occupied by a cluster of CTCC sites (created at the end of Phase BI and during the BI/BII phases). Pottery with features corresponding to the Polgar style was discovered.[82] Such features were also recorded at other sites of the Drăguşeni Group located more to the east.[83] As we can see, the settlement agglomeration of the borderland between the Upper and Middle Dniester (Drăguşeni Group) became the main centre of cultural changes (e.g., in pottery stylistics) at the end of the 5th millennium BC. It was ahead of the other peripheral groups of the CTCC in developmental processes by more than 100 years.[84] It also had intensive contacts with foreign cultural environments, for example with the drainage basin of the Tisza and – probably – that of the Upper Styr and Horyn in Volhynia, where the communities of the late phase of the MC exploited Volhynian flint – mainly for their own needs as well as for the population of the Tiszapolgár Culture.

The above-presented data identifies the territories and cultures which can be linked with the origin of important aspects characteristic of the LVC. They also

[80] Lazarovici *et al.* 2009, 74.

[81] According to Palaguta 2007, fig. 89.

[82] Kruc, Ryžov 1997, figs. 1, 3–4.

[83] Palaguta, Starkova 2018, fig. 2.

[84] Harper 2021, fig. 3.

suggest the latest possible time when these aspects were adopted by this culture. The flint daggers (Fig. 4) probably originated in the Skelya Culture (4100 BC at the latest). The trough-like retouch is also associated with this culture, but it reached the LVC through the intermediary of the Late MC. Colouring pottery with white oil paint was selected – not later than 4100/4050 BC – from a wide range of different painting technologies used during the younger phase of the Drăguşeni Group within the CTCC (A4). The poor state of research on the Volhynian territories makes it impossible to determine the contours of the region where the aforementioned adaptations took place and where the mechanisms of the LVC origin formed. Most probably, this region is confined within the extent of the drainage basin of the Upper Styr and Horyn (Fig. 1) – inhabited by communities linked with the late phase of the MC and open for contacts with the Tiszapolgár Culture (by "exporting" Volhynian flint, borrowing ornaments in the form of deep strokes on pottery, and the tradition of distinctly profiling bowls and vases). At the beginning of the CTCC BII/AB (from ca. 4100 BC onwards), also the Trypillian "influences" penetrated this territory (e.g., Holyshiv, Bodaki, Ostrog-Zeman and Rivne, Stepova Street).

The heterogenisation (mixing) of cultures – whose best example is pottery discovered in the grave from Rivne, Stepova Street, with features typical of the Polgar, Late Malice, and Trypillia cultures[85] – must have taken place as early as before 4100 BC, but it probably occurred gradually since ca. 4200 BC.

Contrary to beliefs rooted in culture-historical archaeology, the phenomena of culture merging and the resultant creation of cultural hybrids should not be considered as aberrations.[86] Modern cultural scholarship questions the validity of defining cultures as pure, homogenous units with clear-cut borders.[87]

In times of crises, hierarchical relations are replaced by horizontal network structures. These are the times when the phenomena of multiculturalism or polyculturalism, heterogenisation, and multi-ethnicity come into being.[88] Hybrids abolish cultural borders, greatly contribute to the formation of new entities, and foster the creation of different cultures.[89]

The above-presented image of a crisis in the drainage basin of the Upper Styr and Horyn in Volhynia is corroborated by analyses and reconstructions of broader demographic and environmental changes in south-eastern Europe. Climatic changes on a great scale – and lasting for prolonged periods – provoked different reactions from people inhabiting various regions.

For example, between 4500 and 4000 BC, we can observe the continuation of the demographic decline of the Gumelniţa Culture, which led to its collapse ca. 4000 BC. The deepening crisis of this culture was accompanied by the demographic and territorial expansion (lasting for several centuries) of the CTCC population during Phase A/BI.[90] At the end of the 5th millennium BC, the main route of population shifts and migrations was directed eastwards, to the drainage basin of the Sieniucha River (between the Upper Southern Bug and Middle Dnieper), which led to the creation of gigantic settlements in the first half of the 4th millennium BC.[91]

In the shadow of the above-described important events, between 4200 and 4100 BC, a new entity – the LVC – started to develop in Volhynia, in the environment of the late phase of the MC, which was subjected to the processes of cultural heterogenisation. Only the flint dagger – borrowed from the steppe Skelya Culture and mediating the idea of a hierarchical social structure – could overcome the disintegration of the MC and combine the features of this old entity in the new, now Eneolithic, culture – the LVC.

We use the term "Eneolithisation" according to the definition by Evžen Neustupny, for whom the main aspect of this phenomenon was the patriarchalisation of the social life and a considerable reinforcement of the role of men.[92] Some males (representatives of elites) might have used prestigious goods – made of different materials, not only copper – to legitimise their new social status. When the LVC started to develop in the drainage basin of the Upper Styr and Horyn, only the retouched blade daggers made of the Volhynian flint could have played this role.

If the above-presented assumption is confirmed, it will mean that the LVC emerged as a result of two independent currents of Eneolithisation: western, based on copper metallurgy (already corroborated by S. Wilk) and eastern – based on the production of flint daggers (which is postulated in this paper).

Verification/falsification of the hypothesis

We came to a conclusion that the superb reconstruction of the Eneolithisation of the Lesser Poland

[85] Bardets`kyy *et al.* 2020.
[86] Kadrow *et al.* 2021, 156–157.
[87] Barker 2005.
[88] Maffesoli 2008.
[89] Barker 2005.
[90] Harper 2019, fig. 3.
[91] Diachenko 2019, 74–76.
[92] Neustupný 2008, 11; Kadrow 2015, 248–249.

Upland by S. Wilk omits several important cultural aspects. According to us, the anomalies which require explanation are: colouring pottery with white oil paint and the manufacture of retouched blade daggers formed with the trough-like retouch. These questions became our research problems. In order to solve them, we formulated two pertinent assumptions, which are part of the main hypothesis on the more complex process of Eneolithisation of the territory spreading from the Dłubnia River in the west to the Horyn in the east, which was influenced by at least two independent cultural currents. The above-presented problem is linked to the question of absolute chronology.

The value of our hypotheses can be estimated through a field research project, which is supposed to result in finding graves located in the drainage basin of the Upper Styr and Horyn and containing flint daggers as well as pottery decorated with white paint, whose radiocarbon dates are earlier than 4100 BC.

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New finds of the Lyngby-type tanged points in the interfluve of the middle Vistula, Bug, and lower San rivers

Abstract

In the interfluve of the middle Vistula and Bug rivers, as well as around the lower San, among various types of Late Palaeolithic tanged points, a dozen or so specimens stand out morphologically referencing the Lyngby-type. Among these, more than half are specimens of considerable size – with lengths in the range of 70–110 and widths of 17–42 mm. The weight of the largest specimens is in the range of 28–36 g. They are mostly stray finds, also with an unclear cultural context, made of local flint raw materials (Świeciechów, Rejowiec, Mielnik types), in a few cases perhaps made of Volhynian flint. Regardless of whether we consider them as manifestations of influences /links with the Lyngby culture (= Bromme; = Bromme-Lyngby; = Bromme-Segebro), they undoubtedly belong to unconventional forms among the Tanged Points Technocomplex dated from the second half of Alleröd until the first half of Dryas III.

Keywords: Lyngby tanged points, Tanged Points' Technocomplex, Vistula-Bug-San interfluve, Alleröd, Dryas III

Among the numerous Late Palaeolithic tanged points found in the interfluve of the middle Vistula, Bug and lower San rivers, dominated by Swiderian, and to a much lesser extent Ahrensburgian and post-Swiderian ones, the tanged points defined as the Lyngby-type stand out. Taking morphological and metric criteria into account, Wolfgang Taute divided them into large points – more than 55 mm long and 17 mm wide, small points, less than 55 mm long, and less than 17 mm wide.[1] Irrespective of their size, they all have to varying degrees a distinct tang retouched most often (semi) steeply towards the upper (dorsal) side, occasionally to the underside, and rarely also with an inverse retouch. Sometimes the bulb of the tang is abraded with a flat retouch. The tip is formed either by natural edges or by retouched ones, on one or both sides. In the former case, their shape resembles an oblique truncated blade, in the latter – a perforator. There are also specimens with a tip formed by a burin blow.[2]

The presence of Lyngby-type tanged points (and similar specimens) in the area between the middle Vistula, Bug, and lower San rivers was first brought to our attention at the end of the last century.[3] Subsequent Museum research and chance finds have broadened the base of these sources (Libera 2015, catalogue, Fig. 1c). Currently as many as 15 items of that form are known, among which more than half are specimens of considerable size – their metric values oscillate between 70–110 mm in length and 17–42 mm in width (cf. summary).

Among the most impressive are the unpublished, relatively stocky points from Hedwiżyn (110 x 33 x 13 mm; Fig. 1: 1) and Zubowice (92 x 42 x 7 mm; Fig. 2: 1) – weighing 36 and 28 g, respectively. Both were formed from irregular flakes. The former was detached from a double-platform core, and the latter from a single-platform core. Both have massive, well-isolated, tapered tangs formed with a semi-steep retouch on the dorsal side. Only the point from Hedwiżyn is slightly retouched on the ventral side. The edges of the relatively broad tips are flaked with a steep retouch resembling a truncated piece. Only the specimen from Zubowice has two medium-sized retouched niches on the opposite tip.

[1] Taute 1968, 11–12; a subdivision challenged by Karol Szymczak 1991, 174, as well as Michał Kobusiewicz 2009, 85.

[2] Taute 1968, Tafel 68:3; 93:2; 151:2.

[3] Libera 1990, with earlier literature; 1995, 26, map 5; 1998, catalogue; Siemaszko 1990; they were previously unknown in the study area (cf. Kocoń 1987, map 3).

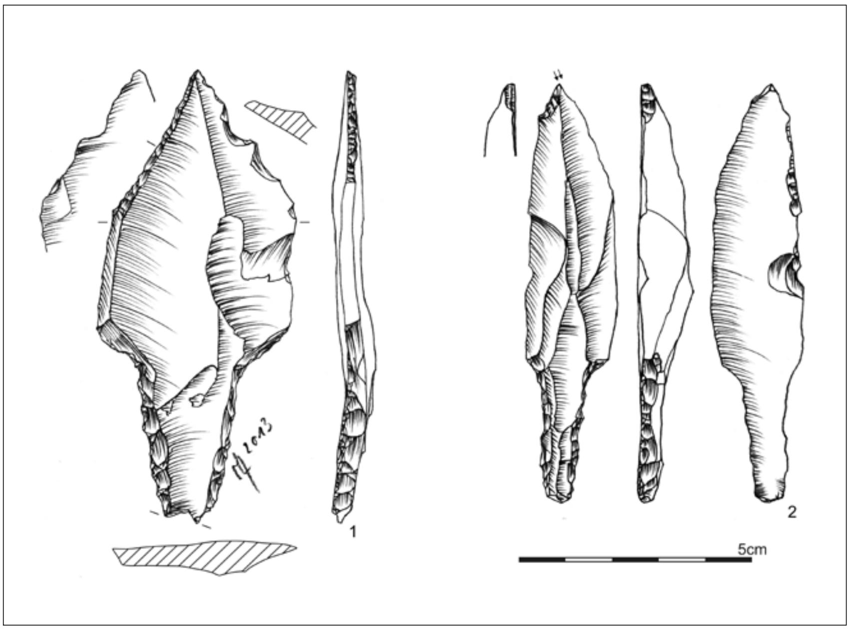

Fig. 1. Tanged points from Zubowice, Zamość County (1) and Zakrzew, Lublin County (2). Fig. J. Libera; compiled by P. Mączyński.

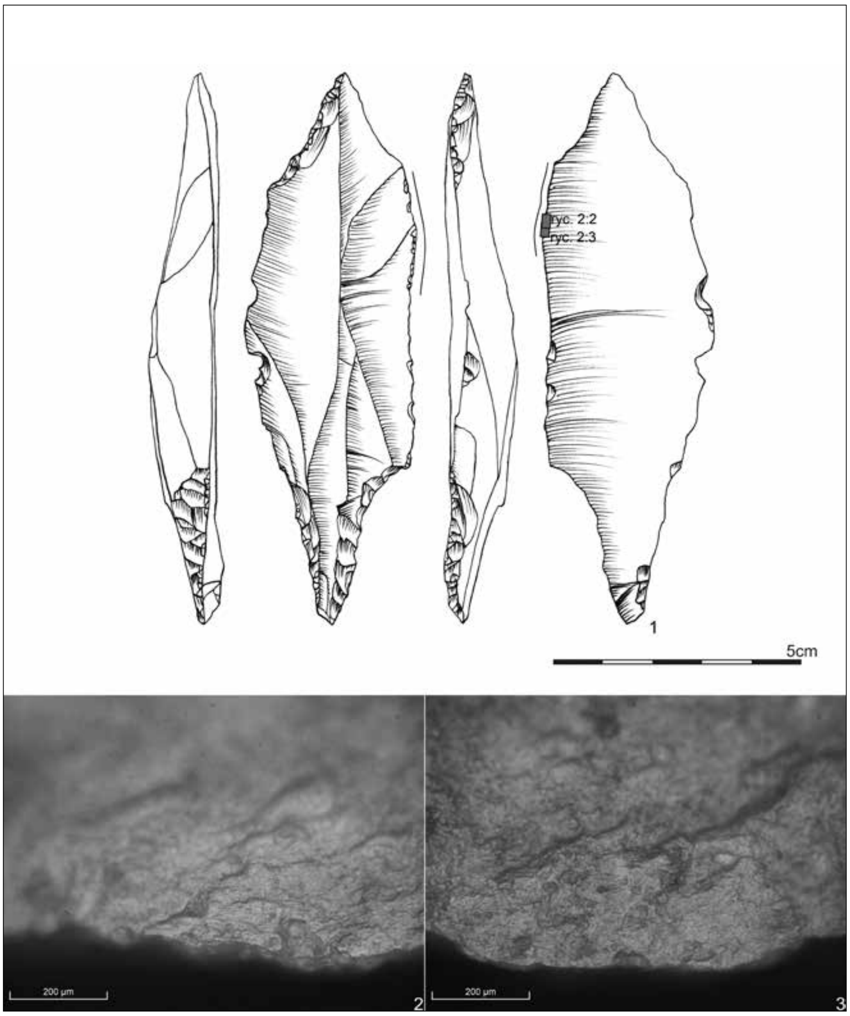

Fig. 2. Tanged point from Hedwiżyn, Biłgoraj County. Drawn by J. Libera, photo by P. Mączyński; compiled by P. Mączyński.

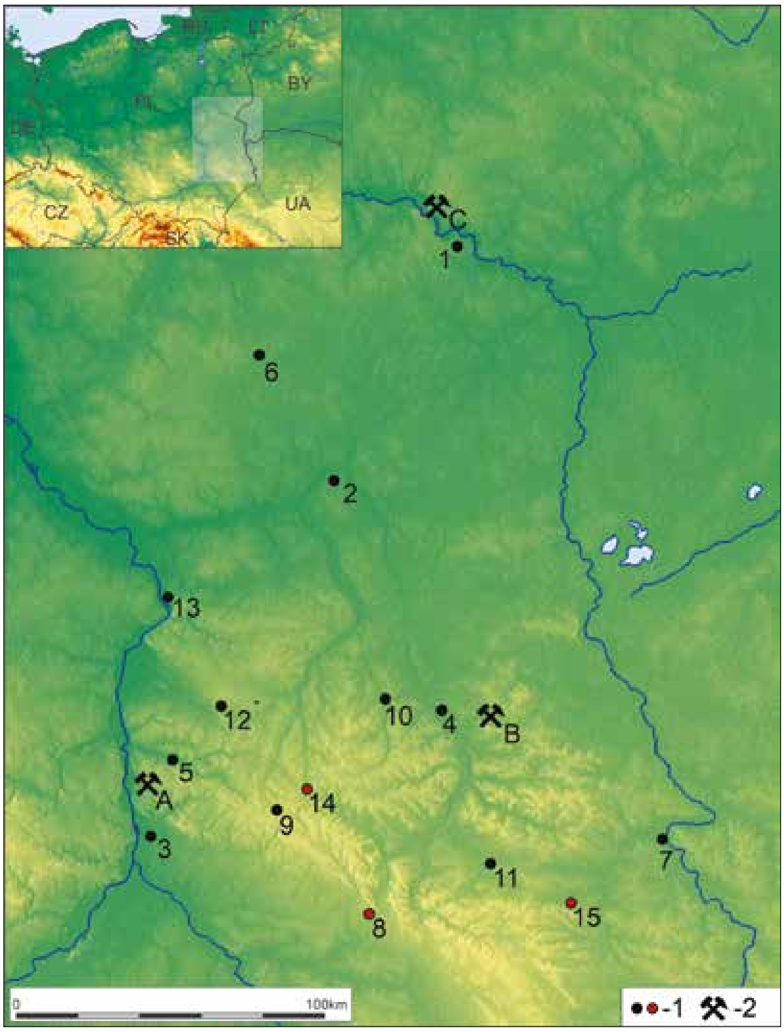

Fig. 3. Distribution of Lyngby-type tanged points in the interfluve of the middle Vistula and Bug rivers and the lower San River (1–15 – numbering according to the list in the text; illustrated blades are marked in red) and the regions of flint deposits: Świeciechów (A), Rejowiec (B), Mielnik (C). Map background https://maps-for-free.com. Compiled by P. Mączyński.

Whereas, the micro-retouch of the tang, and the truncation are intensely worn. Different in form and metric proportions is another specimen found in the Zakrzów area (90 x 20 x 11 mm; Fig. 1: 2) made from a massive but slender blade detached from a single-platform core, with a tang flaked with a steep retouch towards the dorsal surface, and the tip surmounted with a central burin on truncation formed by two blows.[4]

The leading technique for obtaining debitage in the Lyngby knapping technique was the exploitation of single-platform volumetric, or (sub)conical blade flake cores with an angle of percussion close to 90 degrees, and also the cores with doubled striking surface. In both cases, hard and soft hammers were used.[5] Both of these techniques are confirmed in the analyzed sources. The core preparation resulted in specific debitage (preferential flakes), which formed the basis, especially for the massive/stocky Lyngby-type tanged points.[6]

The distribution of Lyngby-type tanged points in the interfluve of the middle Vistula and Bug rivers and the lower San is limited to areas of the Lublin Uplands, in one case also the Volhynia Uplands. Others come from the lowland zone: northern Dorohucza (Volhyn Polesie) and Czemierniki and Borsuki (Southern Podlasie Lowland), including the southern parts like Chwałowice and Hedwiżyn (Sandomierz Basin) – (Fig. 3).

[4] All three specimens are stray finds, now originating from the collections of: the Museum of the 24th Cavalry Regiment, Branch of the National Museum in Lublin (Zakrzów); the Institute of Archaeology of the Maria Curie-Sklodowska University in Lublin (Żubowice); and the Biłgoraj Land Museum in Biłgoraj (Hedwiżyn).

[5] E.g. Szymczak 1991, 170; Migal 2007, 187 *et al*; Kobusiewicz 2009, 84.

[6] E.g. Migal 2006; 2007, 190; also, Przeździecki 2019, 62 *et al*, fig. 12.

Several points were made of excellent quality Świeciechow flint raw material, which indicates a connection with deposits of this flint in the area of the Rachów anticline located in the region of Świeciechów, Nowy Rachów or Wymysłów[7] – in a distance between 15 km (Dzierzkowice-Wola) and 20 km (Chwałowice) to 80 km (Hedwiżyn). The presence of this raw material in the Late Palaeolithic inventories of the Lublin Uplands and the nearby Sandomierz Basin is widespread and well documented, both in outcrop areas, e.g. the workshops located near the Kopiec mine,[8] and beyond.[9] It is much more difficult to attribute the location of the remaining specimens to the regions of the deposits, as specimens from the Volhynian (Gródek, Sitaniec Wolica, Zakrzew and Zubowice), Cretaceous (Dorohucza and Trzciniec) and erratic (Włostowice) materials often have similar characteristics in terms of texture, degree of crystallinity, and mass colour. In the case of the analyzed area, it was possible to retrieve local rocks – both mined (Rejowiec) and erratic flint, occurring in large areas of the Chełm Hills,[10] distant from the above-mentioned finds from 20 km (Dorohucza) to over 90 km (Trzciniec). Here, too, we have a well-recognized workshop and direct settlement base possibly relating to the Late Paleolithic tanged point technocomplex. Numerous workshop sites based on Rejowiec Flint are concentrated in three regions of the Chełm Hills: I – Rejowiec region (in the area of two towns – Rejowiec and Rejowiec Fabryczny), II – Krobonosz region (Sawin commune) and III – Tarnów region (Wierzbica commune).[11] In the isolated case of the tanged point from Borsuk, it is most likely that the flint for its manufacture came from a deposit in the Mielnik area, less than 10 km away. Taking into account the dispersion of Lyngby-type tanged points in the area of western Ukraine and Belarus,[12] it is possible that the raw material from Volyn, whose rich deposits are located in the upper Horyń and Styr basins, or possibly Cretaceous flint occurring over Russia, is involved.

The presence of Lyngbian tanged points in the zone of the Baltic Lowlands has been analysed from various cultural aspects.[13] An opinion was also expressed about their utilitarian character as a manifestation of specialisation in hunting. "The Lyngby tanged point – spearhead or arrowhead – was simply an excellent, effective invention as a hunting weapon. It belonged to the hunting toolkit of all hunters. Originating in the late Madelaine of Western Europe, the invention spread throughout the Lowlands. [...] The differences in size and form are due to the different purposes (spearhead or arrowhead), and the abundance of raw material. The largest Lyngby blades are known from Denmark and the upper Volga – in both cases from areas abundant in good flint. Probably the shape of the wares was also influenced by the individual tastes and abilities of their maker".[14]

Interesting observations were made during functional analyses of the specimen from Hedwiżyn. As a result, traces were registered on the edge of one of the sides, indicating its use as a knife for cutting soft material, most probably meat or leather. Significantly, no marks indicating the use of the tanged point as a ranged weapon were detected. It is worth noting, however, that such changes are usually produced by striking the blade on hard material (wood, bone), whereas when hitting a soft target (meat, internal organs) the level of damage may be very low, even undetectable, with the methods used. Therefore, the results obtained do not completely negate the interpretation that the points at some stage may have acted as the head of a projectile weapon, although this is less likely.[15]

Regardless, of whether we consider the analyzed tanged points as a manifestation of influences/links with the Lyngbian culture (= Bromme; = Bromme-Lyngby; = Bromme-Segebro), or as creations "representing a cross-cultural asset", they undoubtedly belong to unconventional forms among other Late Palaeolithic groups with tanged points. Their occurrence in the interfluve basin of the middle Vistula and Bug rivers, as well as the lower San, extends to the foreland of the Carpathian Mountains.[16]

Although the analysed Lyngby-type lithics are mainly loose specimens or of indeterminate cultural context, e.g. Gródek 1C, or Dzierzkowice-Wola,[17] they undoubtedly represent unique sources in the upland zone and its forelands between the Vistula and Bug rivers. They represent an extension of the 'Lyngbian' finds of the left bank of the Vistula (Nowy Młyn Ia; Nowy Młyn Ib; Jacentów 10; Grzybowa Góra X/59+IV/60) towards similar finds in western Ukraine.[18] So far it has not been possible to specify their chronology. Generally, they are referred to the Tanged Points Technocomplex and dated to the second half of the Alleröd and the first half of Dryas III or to the last Dryas only.[19]

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[7] E.g. Libera, Zakościelna 2002.

[8] E.g. Libera 2002b, 33 ff.

[9] E.g. Libera 2015, catalogue.

[10] E.g. Libera *et al.* 2014.

[11] Cf. Libera 2006, fig. 5; Libera, Szeliga 2006.

[12] E.g. Kobusiewicz 2009, Fig. 2 some sites in south-eastern Poland were erroneously located); also, Залізняк 2021, fig. 1.

[13] E.g. Szymczak 1995, 31; Sobkowiak-Tabaka 2016, 190 *et al.*

[14] Kobusiewicz 2009, 85.

[15] The traseological research was carried out by Dr Piotr Mączyński of the Institute of Archaeology of the Maria Curie-Skłodowska University in Lublin, for which the author would like to thank him.

[16] Pakoszówka, Sanok County; Rydlewski 1990, fig. 5: b.

[17] Libera 1990.

[18] Kobusiewicz 2009, fig. 2; also, Залізняк 2021, fig. 1.

[19] Kobusiewicz 2009, 73, among others.

A compilation of Lyngby-type tanged points in the middle Vistula and Bug rivers and the lower San:

1.	Borsuki, municipality Sarnaki	85x28x10	kred	Siemaszko 1990
2.	Czemierniki, municipality loco	48x23x?		Libera 1990, 17, fig. 2:b
3.	Chwałowice, municipality Radomyśl	61x24x6	św	Libera 1990, 17, fig. 2:a
4.	Dorohucza, municipality Trawniki	41x19x5	kred	Libera 1990, 18, fig. 2:c
5.	Dzierzkowice-Wola, municipality loco	71x17x9	św	Libera 1990, 14–17, fig. 1:a
6.	Dziewule, municipality Zbuczyn			Szymczak 1995, 34, pl. XVII:4
7.	Gródek, municipality Hrubieszów	87x30x?	woł	Libera 1990, 18–19, fig. 3:a
8.	Hedwiżyn, municipality Biłgoraj	110x33x13	św	–
9.	Majdan Grabina, municipality Zakrzówek	55x22x5?		Libera 2016, 225
10	Piaski Wielkie, municipality Piaski	42x14x5?		Libera 2016, 226, fig. 2:f
11.	Sitaniec Wolica, municipality Zamość	42x14x6	woł	Libera 2016, 227, Fig. 2:h
12.	Trzciniec, municipality Chodel	63x18x7	kred	Libera 1995, pl. LXXVII:6; 1998, 94
13.	Włostowice (Puławy-Włostowice)	28x17x3	narz	Libera 1990, 17–18, fig. 2:d
14.	Zakrzew, municipality loco	90x20x11	woł?	Libera 2016, 227–228
15.	Zubowice, municipality Komarów-Osada	97x42x7	woł?	Libera 2016, 228

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Neolithic lithic industries of the Eastern Wing of the Fertile Crescent: Paying homage to Professor Stefan K. Kozłowski

Abstract

A systematic study by Stefan K. Kozłowski during the 1990s and the 2000s revealed marked techno-typological differences between the Neolithic lithic industries of the "Eastern and Western Wings" of the Fertile Crescent of Southwest Asia. The present article addresses regional variability in Pottery Neolithic flaked stone industries within the Eastern Wing. It suggests the potential existence of lithic variability between the plains and the mountains of central Mesopotamia. Given the known lithic variability also in the Eastern Wing of northern Mesopotamia, the present study suggests the need to define the variability of lithic industries in other parts of each wing; such research would help better explain the historical, ecological, and cultural backgrounds of regional differences.

Keywords: Neolithic Fertile Crescent, Mlefatian, Matarrah, pressure debitage, Zagros Mountains

Stefan K. Kozłowski made a number of significant archaeological contributions to prehistoric studies on the Fertile Crescent of Southwest Asia. The one referred to in this article is his modelling of regional differences in Neolithic lithic industries between the "Eastern and Western Wings" of the region. In an important monograph, Kozłowski[1] described such differences in detail. Later, he reinforced his model through an extensive literature survey[2] and original data from his fieldwork in Nemrik and M'lefaat, northern Iraq,[3] incorporating archaeological records other than lithics.

I have been particularly intrigued by this series of Kozlowski's studies since I began excavating the Neolithic site of Tell Seker al-Aheimar, north-eastern Syria, in 2000. The reason was that this Pre-Pottery Neolithic B (hereafter as PPNB) site, despite being situated in Syria and supposedly belonging to the Western Wing, yielded lithic assemblages remarkably different from those of other sites in Syria. The PPNB lithic industry of Tell Seker al-Aheimar was characterised by pressure core reduction technology while showing no evidence of the local use of naviform core technology[4] popular in the Levantine Pre-Pottery Neolithic industries. Consequently, Tell Seker al-Aheimar, situated at the westernmost edge of the Eastern Wing, provides a unique opportunity for understanding the nature of the east-west distinction in the Neolithic lithic industry of the Fertile Crescent.

Kozłowski[5] defined Mlefatian, named after the site of Tell M'lefaat excavated by Robert L. Braidwood and by himself, as a major lithic industry representing the Eastern Wing of the Zagros Mountains.[6] Mlefatian is characterised by the use of bullet core technology for pressure blade blank production and the manufacturing of backed bladelets. Its chronological (Early, Late, and Post-Mlefatian) and regional (Jarmo, Kermanshah, Abdul Hosein, Zagros, and Deh Luran groups) variabilities were also defined using the then-available data.[7]

This scheme provides a useful framework for exploring the variability of Neolithic industries in the Zagros Mountains, which occupy a large portion of the Eastern Wing. However, no one, including Kozłowski, has surmised that a single lithic industry (Mlefatian) dominated the entire region of Neolithic Zagros for millennia. As a matter of fact, many studies have since attempted to evaluate this scheme. I myself have proposed a further periodisation of the Mlefatian, adding

[1] Kozłowski 1999.
[2] Kozłowski, Aurenche 2005.
[3] Kozłowski 1998; 2002.
[4] Nishiaki 2016.
[5] Kozłowski 1999.
[6] Kozłowski 1998.
[7] Kozłowski 1999.

Fig. 1. Collection sampling by the University of Tokyo team at the stepped trench of Matarrah (Braidwood's Operation VIII), Iraq, 5th of July 1957 (after Verhoeven 2006).

a pre-Mlefatian phase[8] and dividing another of its phases, the Post-Mlefatian, into early and late subphases.[9] More temporal and spatial variants will likely be identified in future research that will contribute to the understanding of the complex development trajectories of Neolithic lithic industries in the Eastern Wing. In terms of spatial variability, Kozłowski[10] identified another lithic industry in the Eastern Wing, the Nemrikian, while diagnosing plain sites in northern Mesopotamia. However, Neolithic lithic variability within the Eastern Wing remains little explored, especially in central Mesopotamia to the south.

In this regard, a Japanese archaeological mission recently reported on an interesting lithic industry of the 6th-millennium-BC Pottery Neolithic at Shakar Tepe[11] and Shaikh Marif[12] in the Shahrizor Plain, Zagros Foothills. This industry differs from the Mlefatian in that it "lacks evidence of pressure blade production and is instead characterised by the production of large robust blades" and is thought to represent "another type of local lithic tradition" during the Pottery Neolithic Period in central Mesopotamia. Moreover, the report suggests that no parallel for it has been found in the Zagros Mountains but instead could be located in Matarrah, a site situated approximately 100 kilometres to the west.[13]

Given that the comparison was based on a photograph of the lithics in a preliminary report of the original excavations at Matarrah in 1948,[14] I examined a surface-sampled lithic collection from this site stored at the University Museum, University of Tokyo. The collection was obtained during a general survey conducted by a team from the University of Tokyo in 1957.[15] The available archives suggest that the step trench that opened in 1948 was still visible at the time of sampling on the 5th of June 1957 (Fig. 1). A study of the pottery collection made by the University of Tokyo[16] reveals that it mostly consisted of Neolithic specimens from the Hassuna and Halaf periods.

The flaked stone artefacts from Matarrah preserved in the University of Tokyo collection comprise 53 specimens, including three obsidian pieces that were likely imported from Anatolia (Fig. 2: 12–13). The remaining chert assemblage, which is our focus, consisted of 27 tools (Fig. 2: 1–9), 8 cores (Fig. 2: 10–11), and 18 other pieces. The most characteristic tools are blades with truncations at both ends, most of which exhibit glossed edges derived from sickle use (Fig. 2: 1–9). In terms of core reduction technology, the chert assemblage emphasises blade production by direct percussion: five single platforms (Fig. 2: 10–11) and three exhausted cores. The plain butts of the blade and flake products indicate that the striking platforms of the cores were rarely facetted. The blade blanks (Fig. 2: 1–9) showed a width range between 13.1 and 38.0 millimetres, with a median of 21.2 millimetres (n=29). The thickness ranged from 3.8 to 13.9 millimetres, with a median of 7.1 millimetres. Similar to Shakar Tepe and Shaikh Marif, the existence of robust percussion-flaked blades is noteworthy (Fig. 2: 1–4). There is no clear indication of the use of pressure technology for blade production. There do exist two narrow blades with parallel ridges and lateral edges, 14.5 millimetres (Fig. 2: 8) and 13.2 millimetres (Fig. 2: 9) in width, respectively, that may represent pressure-detached products. However, their on-site production has not been demonstrated. The situation is the same for interpreting the existence of

[8] Nishiaki, Darabi 2018a.
[9] Nishiaki *et al.* 2018b.
[10] Kozłowski 1999.
[11] Odaka *et al.* 2023a.
[12] Odaka *et al.* 2023b.
[13] Odaka *et al.* 2023a.
[14] Braidwood *et al.* 1952.
[15] Tani-ichi and Matsutani 1981, pls. 95.2–98.2; Verhoeven 2006.
[16] Odaka 2019.

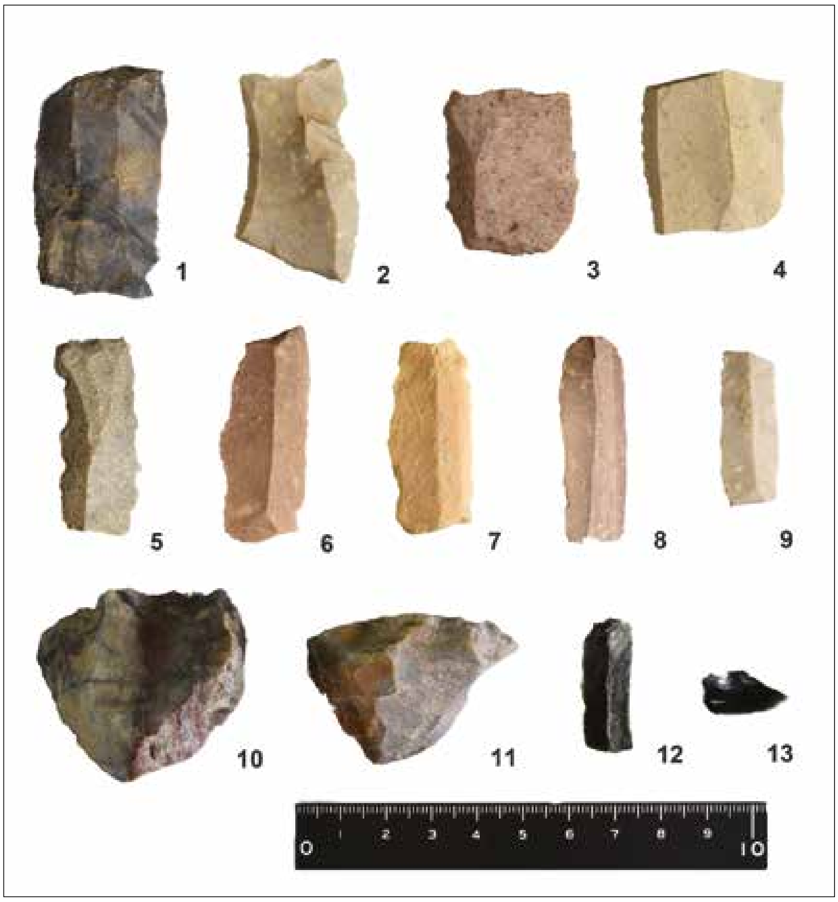

Fig. 2. Lithic artefacts from the 1957 sampling at Matarrah. 1, 5, 9 – Glossed blades; 2–3, 7 – Truncated blades; 4, 8 – Edge-damaged blades; 6 – Unretouched blade; 10–11: Single-platform cores; 12 – Obsidian edge-damaged blade; 13 – Obsidian side-blow blade flake.

pressure-flaked obsidian blades (Fig. 2: 12). Furthermore, if pressure blade production had occurred on-site, its frequency would have been very limited at Matarrah, similar to Shakar Tepe and Tepe Shaikh Marif. The lithic assemblages in question do not match our definition of the post-Mlefatian period.[17] Collectively, these results suggest that a distinct industry was distributed in the plains of central Mesopotamia during the 6th millennium BC.

A non-contextual collection from Matarrah should not be interpreted broadly. This article marks the beginning of further research on the variability of Neolithic industries in the Eastern Wing, which has remained much less investigated than the Western Wing or the Levant. This study was guided by Professor Kozłowski's insightful work, for which I sincerely express my deepest respect. Last but not least, I would also like to thank Takahiro Odaka, Kanazawa University, and Osamu Maeda, Tsukuba University, who inspired me to consult the University of Tokyo collection from the Matarrah site.

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Expected and Unexpected Results from ^{14}C Dating and ZooMS on a Late Upper Palaeolithic Osseous Projectile Point from the Nová Drátenická Cave in the Moravian Karst (Czech Republic)

Abstract

This contribution presents new information on a long-known Late Upper Palaeolithic site in the Moravian Karst in the Czech Republic: the Nová Drátenická Cave. Previous interpretations of the peculiar archaeological assemblage oscillated between attribution to the Epigravettian on the one hand and to the Magdalenian on the other, as both industries were present in Moravia after the end of the Last Glacial Maximum. In either case, a rather early dating has been supposed. We reassessed the stratigraphy, lithic and osseous industry, and subjected an antler projectile point to ^{14}C dating and palaeoproteomic analysis. We did not find any evidence for stratigraphic mixing and, thus, propose that the assemblage of Nová Drátenická reflects a single or several successive occupa-

tions. On typo-technological grounds, we come to the conclusion that the finds are rather consistent with the Magdalenian. The radiocarbon date of the point is 16–15.7 ka cal BP, which places it in the first half of GS-2a. This is congruent with the identification of the raw material as reindeer through ZooMS. Hence, the Nová Drátenická Cave currently provides the earliest solid evidence for the Magdalenian in the Moravian Karst. Together with the contemporaneous assemblages of Kniegrotte in eastern Germany, Dzierżysław 35 in southern Poland, and potentially also Vilshofen-Kuffing in south-eastern Germany and Hranice in Moravia, it probably attests to the first major expansion of the Magdalenian into eastern Central Europe at around 16 ka cal BP.

Keywords: Central Europe, Magdalenian, 14C chronology, ZooMS, FTIR, osseous industry, lithic industry

Introduction

In 2009, Gerhard Bosinski contributed to a *Festschrift* offered to Stefan Karol Kozłowski with a paper discussing lithic-backed bladelets attached to organic projectiles of the Magdalenian. As an instructive example, he chose a set of three similar grooved antler points from the Nová Drátenická Cave in the Moravian Karst.[1] Since their discovery, these three points have been featured repeatedly in studies on the Late Upper Palaeolithic of Central Europe, sparking controversies regarding their age and cultural attribution because of their intriguing appearance, obvious interrelatedness, and characteristic morphology.[2] Within the extensive corpus of Central European Magdalenian osseous projectile points, the pieces from Nová Drátenická with their distinct combination of base morphology, arrangement of longitudinal grooves, and tip geometry are clear outliers.[3] Karel Valoch was well aware of this and assumed that the osseous and lithic assemblage from Nová Drátenická might in fact be attributable not to the Magdalenian but to the Epigravettian.[4] Gerhard Bosinski, on the other hand, interprets the Nová Drátenická points as a rare variety of Upper Magdalenian (16/15 ka cal BP) osseous projectiles.[5] Another facet to the discussion was added recently when a paper on the recolonisation of Central Europe after the Last Glacial Maximum highlighted some remarkable similarities between the Nová Drátenická points and certain published osseous projectiles from the early Epigravettian of Eastern Europe that date to the Last Glacial Maximum (c. 25–19 ka cal BP).[6] Based on this observation, it was stated that "this speaks in favour of a relatively early occupation of Nová Drátenická".[7]

It becomes clear that there can be two mutually inconsistent vantage points on this site: firstly, in terms of chronology (LGM vs post-LGM); and secondly, in terms of cultural attribution (Magdalenian vs Epigravettian). Our contribution in memory of Stefan Karol Kozłowski aims to revisit Nová Drátenická and discuss the pending questions of its dating and position within the Pleniglacial cultural landscape of eastern Central Europe through new physical age determinations and palaeoproteomics, as well as a revision of stratigraphy and the lithic and osseous assemblages of this and selected other sites.

Nová Drátenická Cave site: excavation history, stratigraphy, and previous numerical dating

The Nová Drátenická Cave (ID 1119)[8] is situated in the middle part of the Moravian Karst (Fig. 1A–B) in Moravia, the Czech Republic, in the cadastre Březina u Křtin on the left bank of the stream Křtinský potok. Several small caves (e.g. Drátenická and Žitného) are situated in a prominent limestone cliff while the largest cave system on the left bank, the Výpustek Cave, with two natural and two artificial entrances, is located approximately 200 metres to the south-west of the cliff (Fig. 1D).

The Nová (New) Drátenická Cave belongs to a cave system consisting of a lower (Nová Drátenická) and upper floor (Stará Drátenická – Old Drátenická). The front part of Nová Drátenická, named Krápníkový kout (Stalactite Corner), is located 393 metres a.s.l. and 12 metres above the Křtinský potok stream. It has a natural entrance facing to the north (Fig. 1C). The entrance, originally filled with sediments (Fig. 2b), is 1.0–1.5 metres wide and gradually extends to where the Palaeolithic remains were found – the Stalactite Corner, which is 8–10 metres wide. From the rear part of this area, a cor-

[1] Bosinski 2009.
[2] E.g. Bosinski 2007; Klíma 1949; Maier *et al.* 2020; Valoch 1979; 1996; 2001; 2010.
[3] Cf. Pfeifer 2021.
[4] Valoch 1996; 2001; 2010.
[5] Bosinski 2009.
[6] Maier *et al.* 2020.
[7] Maier *et al.* 2020, 437.
[8] Musil (ed.) 1993.

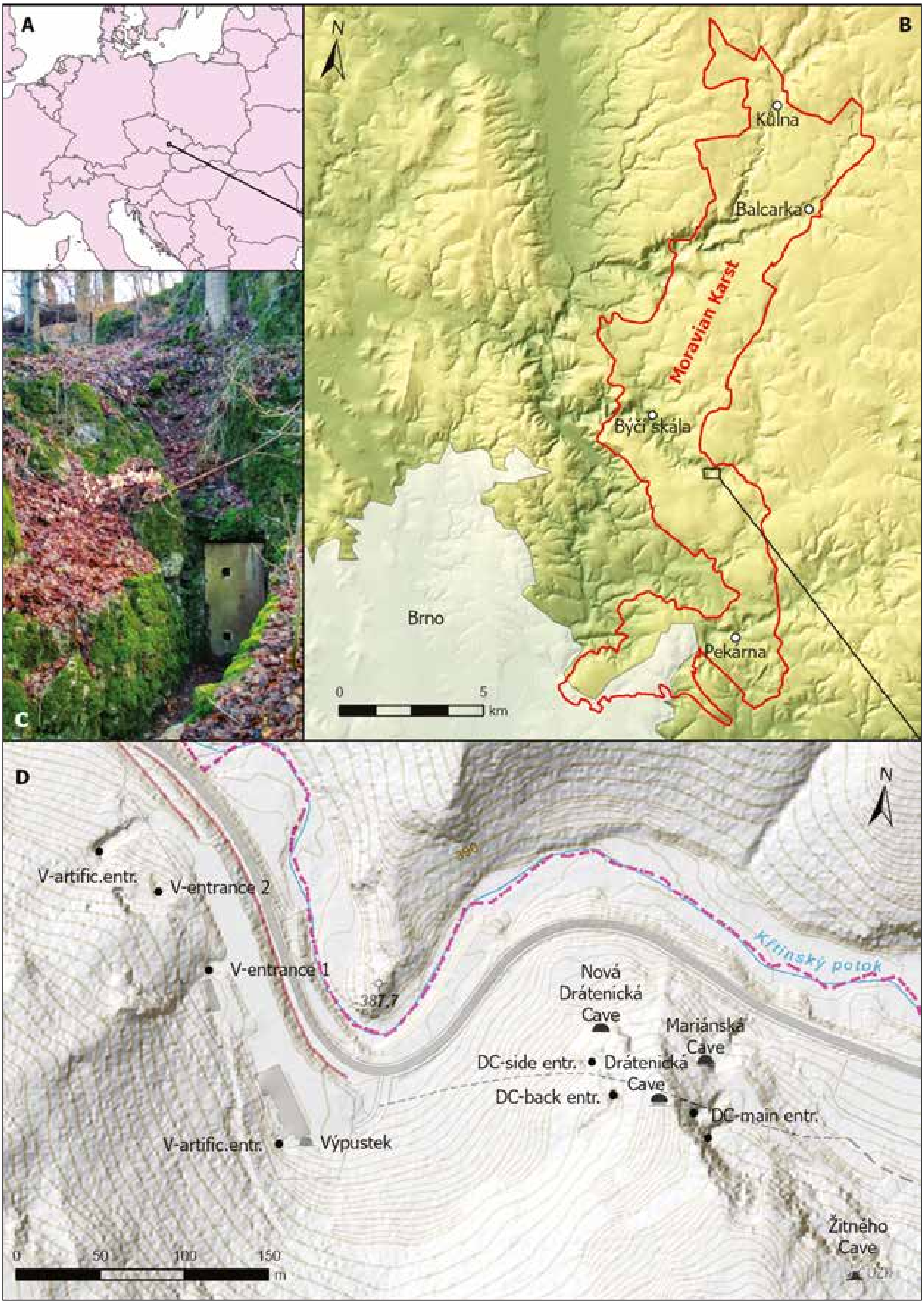

Fig. 1. Situation of the Nová Drátenická Cave on the map of Europe (A), the Moravian Karst in the Czech Republic (B), and in relation to the cluster of sites in the valley of the Křtinský potok stream (D). C – contemporary entrance to the cave, DC – Drátenická Cave, V – Výpustek Cave. Modelling and photo by P. Neruda.

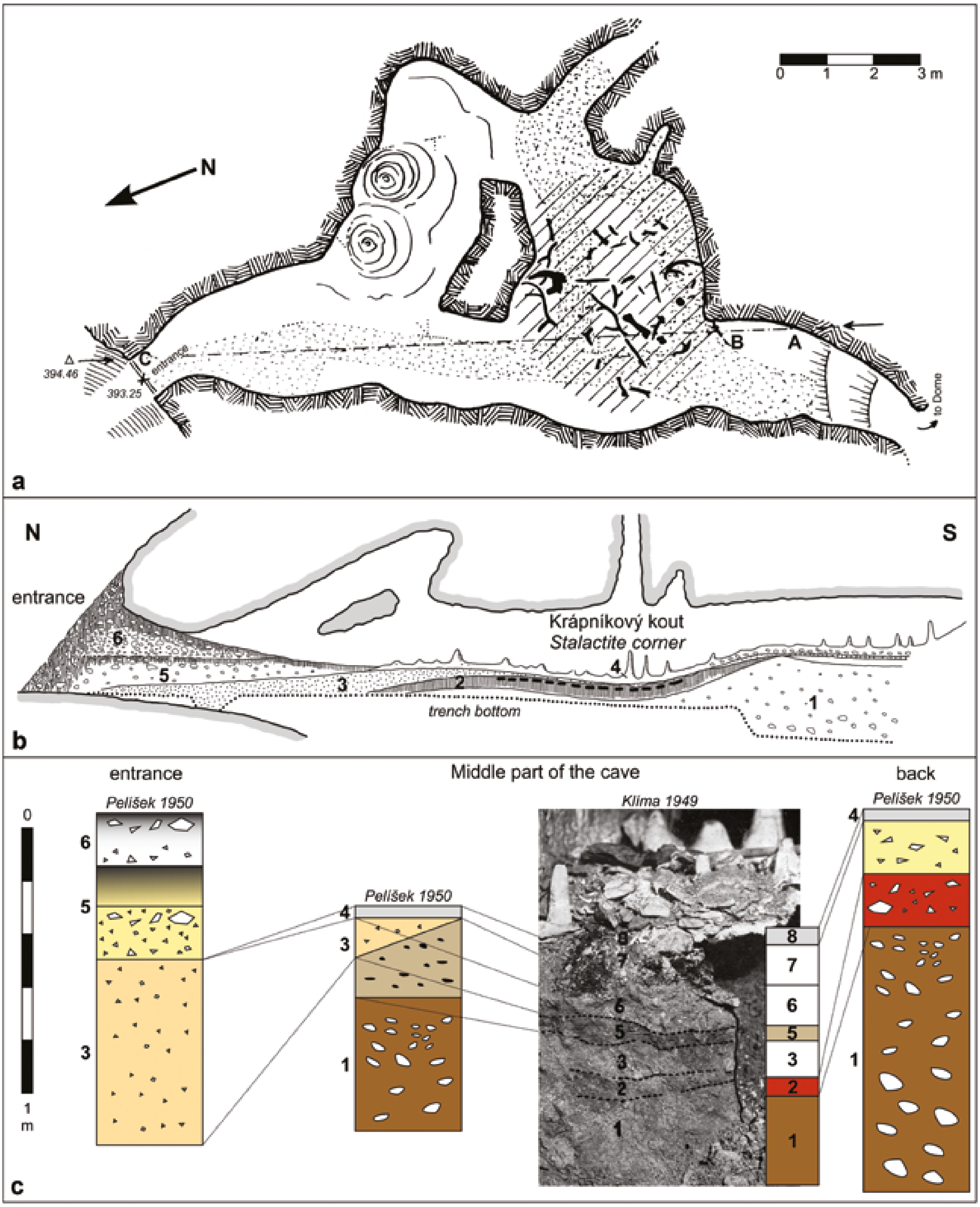

Fig. 2. Plan of the Stalactite Corner with the localisation of finds (a), longitudinal cross-section according to Pelíšek (b), and juxtaposition of Klíma's and Pelíšek's profiles (c). Digitisation and modelling by P. Neruda.

ridor heading to the south-west opens into the dome of the inner cave system (Fig. 2a).

The Nová Drátenická Cave was discovered in 1947 during a speleological prospection of the Stará Drátenická.[9] Both caves were artificially connected, and later speleologists reopened the sediment-filled natural entrance of Nová Drátenická.[10]

The cave was archaeologically investigated in July and November of 1948 by Bohuslav Klíma, who uncovered both archaeological and faunal remains in the Stalactite Corner and attributed them to the Late Upper Palaeolithic techno-complex of the Magdalenian.[11] This interpretation is still broadly accepted today.[12] J. Pelíšek, who participated in the excavations, documented the longitudinal profile of the site.[13] A detailed analysis of the faunal remains was carried out by Z. Hokr (see below).[14]

The rear part of the Stalactite Corner, that is, the findspot of the aforementioned archaeological and faunal remains, had a relatively simple stratigraphy (Fig. 2a). According to Klíma,[15] there was a sinter plate at the top (Fig. 2c: Layer 8) lying on sharp-edged limestone debris (Fig. 2c: Layer 7). Below, there was a loess sediment (Fig. 2c: Layer 6; loam according to Klíma) covering a grey-coloured loam containing the Palaeolithic artefacts (Fig. 2c: Layer 5). The aforementioned subjacent travertine horizon (Layer 4) is not visible in the trench (compare photo in Fig. 2c). At the bottom of the profile, there was a light loess-loam sediment (Fig. 2c: Layer 3, 10–20 cm), reddish sediment with fragments of limestone (Fig. 2c: Layer 2, 15 cm), and, finally, phosphate loam with coarse limestone clasts and boulders (Fig. 2c: Layer 1).

In order to better understand the formation processes, we must correlate this stratigraphy with Pelíšek's later description.[16] He divided the longitudinal profile into three different units: the rear part, the central part, and the entrance. In the rear part of the Stalactite Corner, a carbonate layer (Fig. 2b–c: Layer 4) covered a 10–20 centimetres thick light yellowish loam with small flat limestone debris that, again, laid on top of "heavy" reddish loam with limestone clasts, partly consolidated by carbonates. The lowermost layer was represented by "heavy" brown loam (Fig. 2b–c: Layer 1).

The central part of the profile recorded stratigraphy around the archaeological structure. Contrary to Klíma's description, we see a progression of layers towards the outside and inside of the cave. The most important is Layer 2 (Fig. 2c: Klíma's Layer 5) fading out towards the outside and inside of the cave. Its maximal depth was 20–30 centimetres. The archaeological horizon was situated in the upper part of this layer and covered by a plate with stalagmites (Pelíšek's Layer 4 – Klíma's Layer 8). Towards the entrance, a layer of ochre-yellow loess (Fig. 2b–2c: Pelíšek's Layer 3) was wedged between the stalagmite plate and Layer 2 (Klíma's Layer 5) or, where Layer 2 disappeared, laid on the limestone bedrock.

In the entrance area, the carbonate plate disappeared, and Layer 3 was covered by a layer of calcareous gravel with traces of yellow loess and humus containing the Rendzina horizon (Fig. 2b–c: Pelíšek's Layer 5). Layer 5 partly covered the carbonate plate and, therefore, must be younger. The uppermost part of the sequence is represented by calcareous gravel (Fig. 2b–c: Pelíšek's Layer 6) with humus containing the Rendzina horizon at the top.

Pelíšek correlated the layers 4, 5, and 6 with the Holocene.[17] According to him, Layer 4 represents the Atlantikum and, therefore, cannot be of as recent age as suggested by Klíma.[18] The Pleistocene sedimentation is reflected by Pelíšek's layers 1–3. Musil pointed out the problem of different positions of the reddish loam sediment (Klíma's Layer 2) in both profiles.[19] However, it is related to the development of sediments in different parts of the cave and does not affect the archaeological horizon.

The archaeological situation has been dated by three ^{14}C measurements on unmodified mammalian bones.[20] They yielded a long-time range spanning between 11,670 and 13,870 uncal BP. Only one dated antler sample can be associated with the archaeological horizon with certainty; the origin of two remaining bones is unclear (Tab. 1). Nevertheless, dating possibly related to human activities would be too young for the proposed Late Upper Palaeolithic occupation.[21]

[9] Klíma 1949.
[10] Musil (ed.) 1993.
[11] Klíma 1949.
[12] E.g. Maier 2015; Oliva 2005; Svoboda *et al.* 2009; Valoch 1960; 2001.
[13] Pelíšek 1950.
[14] Klíma 1949.
[15] Klíma 1949.
[16] Pelíšek 1950.
[17] Pelíšek 1950, 41.
[18] Klíma 1949, 128, fig. 3.
[19] Musil 2002, 77.
[20] Valoch 1996, 166.
[21] Cf. Valoch 2010.

Table 1. Overview of ^{14}C dates for the Nová Drátenická Cave. Calibrated using OxCal 4.4 ver. 155, implementing the IntCal20 calibration curve.[38]

LabNo.	Date	Cal. BP (95.4%)	Material	Context
OxA-1953	13,870±140	15,826–15,023	Large mammalian bone	Situation 2, relation to human activities unclear
OxA-1954	12,900±140	17,285–16,388	Large mammalian bone	Probe IV, relation to human activities unclear
OxA-1952	11,670±150	13,987–13,185	Antler	Palaeolithic horizon
MAMS-55260	13,230±50	16,056–15,712	Antler point, N.Drat 8446	Palaeolithic occupation
MAMS-56122	12,170±40	14,184–13,875	Large mammalian bone, N.Drat 8444	Relation to human activities unclear
MAMS-56123	no collagen		Large mammalian bone in sinter, Lab. no. ND2022-3	Relation to human activities unclear

Lithic artefacts

The collection of lithic artefacts from Nová Drátenická is not abundant in comparison to other Moravian caves with Late Upper Palaeolithic material. Seventeen lithic pieces were uncovered during the excavations in 1948 and another two a year later.[22] Today, the collection of lithic artefacts contains 11 tools and eight un-retouched blanks. Tools are represented by different types of backed pieces. One backed blade (Fig. 3. 1) has a regular abrupt retouch. The apical end is slightly pointed, and the proximal end is rounded and tapered with an abrupt retouch. We would like to note that the piece has no retouch on the proximal part of the ventral side, contrary to how it was previously drawn by B. Klíma.[23] A bi-truncated backed piece (Fig. 3. 2) is regularly retouched, with a concave distal truncation. The retouch of the lateral edge is straight and abrupt. A backed bladelet (Fig. 3. 3) has both ends recently damaged, and the retouch on the lateral edge is straight and abrupt. A transversally retouched backed micro-bladelet (Fig. 3. 4) has a fine marginal retouch at the distal end which could be of unintentional origin. Another backed bladelet (Fig. 3. 5) with a slightly rounded apical part has a straight and probably unfinished retouch on the lateral edge. The abrupt retouch at the apical part continues with a marginal and fine retouch.

Pieces previously classified as Gravette[24] (Fig. 3. 6) and micro-Gravette points (Fig. 3. 13) have no retouch in the apical parts of the ventral sides. The proximal part of the larger point is missing and unlike in all previous publications, the micro-point should be correctly oriented with the pointed end at the bottom. The distal part of the artefact is missing.

The backed blade (Fig. 3. 7) has a straight, discontinuous semi-abrupt retouch of the lateral edge. Two mesial parts of backed bladelets (Fig. 2. 11,12) are modified by straight and abrupt retouches – the second piece bears recent damage in the proximal part. A backed micro-bladelet (Fig. 3. 14) has a fine marginal retouch on one edge – the second edge is only discontinuously retouched on the margins. Burins or end-scrapers are absent. Finally, the collection of lithic artefacts also contains unretouched forms – one flake (Fig. 3. 10), three blades (Fig. 3. 8,15,19), a blade and a flake both with edge damages (Fig. 3. 16,18), and two undeterminable fragments, probably flakes (Fig. 3. 9,17).

Blades and bladelets are regular but in most cases fragmented, which makes it impossible to specify their original length. Only three blades are complete (Fig. 3. 1,5,19). The width of the retouched blades varies between 5.0 and 8.0 millimetres, with thickness ranging from 0.7 to 4.0 millimetres. The dorsal scar pattern indicates that

22 Klíma 1952.
23 Klíma 1952, 107.
24 Klíma 1949, fig. 4: 6–7.
25 Klíma 1949, 133–134.
26 Klíma 1949, 134.
27 Musil 1958a; 1958b; 2002.
28 Musil 2002.
29 Cf. Averbouh 2000; Pfeifer 2016.
30 Langley 2015.
31 Bosinski 2009.

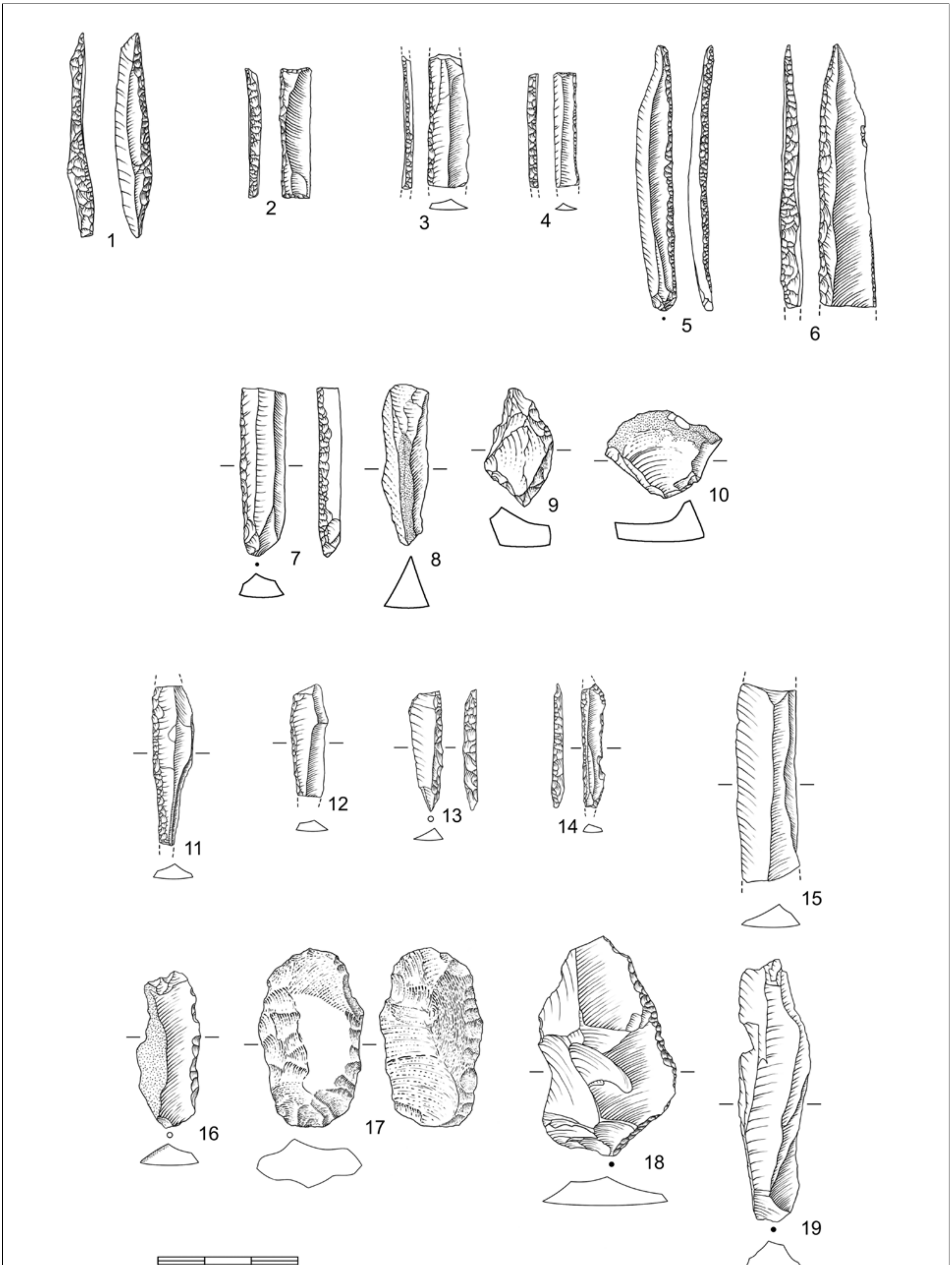

Fig. 3. Lithic artefact assemblage from the Nová Drátenická Cave. Raw materials: 1–7, 10–15, 18 – erratic flints; 8, 16 – calcites; 9 – orthoquartzite of the Drahany type; 17 – (burnt); 19 – Jurassic chert. Drawing by T. Janků.

some of the blades were knapped from laminar bidirectional cores (Fig. 3. 7,11). The butts are preserved in only three cases (Fig. 3. 5,7,9) and all are punctiform.

The majority of lithic artefacts were made from erratic flint and were covered by a thick layer of white patina. Two pieces are made from calcite (Fig. 3. 8, 16), two from Jurassic chert (Fig. 3. 17, 19), and one irregular piece represents orthoquartzite of the Drahany type (Fig. 3. 9). One chert (Fig. 3. 17) was exposed to heat. The thermic traces are preserved on both dorsal and ventral sides (Fig. 3. 17). Contrary to Klíma's and Valoch's pictures, we show the pieces in their correct orientation and with dorsal scar patterns.

Faunal remains

The faunal analysis by Hokr determined 20 species. Mammals: *Tallpa europaea*, *Canis lupus*, *Vulpes vulpes*, *Alopex lagopus*, *Mustela erminea*, *Felis* cf. *silvestris*, *Ursus spelaeus*, *Rhinoceros* sp., *Bos* or *Bison* sp., *Equus* sp., *Cervus elaphus*, *Rangifer tarandus*, *Capra ibex*, *Lepus* sp., *Arvicola terrestris*, and *Dicrostonyx torquatus*. Birds: *Lagopus mutus*, *Lagopus altus*, *Falco peregrines*, and *Tatra ourogallus.*[25] Some remains could not be determined. Hokr also paid attention to the taphonomy of bones and divided them into two groups based on stratigraphy and preservation: an older one, represented especially by cave bear bones and originating from the lowest phosphate loam layer (Klíma's Layer 1), and a younger one, associated with the Palaeolithic occupation (Klíma's Layer 5), and comprising all other mammal and bird species with a predominance of reindeer. Hokr also noted potential anthropic impact on bone fragments coloured with red ochre and bearing fine but irregular striations. A cave bear talus bone was misidentified as human remains.[26]

The small collection of bones was not studied since then, with the faunal assemblage from Nová Drátenická featured only a few times in synthesising contributions focused on Weichselian or Late Upper Palaeolithic fauna.[27] Due to the predominance of reindeer over bones of other large mammals, such as ibex, bovid, and horse, the site was interpreted as a seasonal reindeer hunting camp.[28]

Osseous projectile points

Nová Drátenická is known above all for three comparatively big and well-preserved osseous projectile points (ID N.Drat 8445–8447) which share an unusual morphology (Fig. 4). Each piece was made from cervid antler with well-recognisable compact and spongy tissue. The *compacta* thickness ranges from 6.0 to 9.0 millimetres, indicating that the raw material originated from adult males.[29] The preservation is excellent, including the spongy part, and testifies to extensive longitudinal scraping and smoothing meant to obtain a very regular surface. Two pieces retain their complete length and one piece, N.Drat 8447 (Fig. 4. 3), features a use-related bevelled break on its basal part. In the current condition, the points measure 250, 266, and 276 millimetres, respectively. All specimens feature an oval cross-section and a double-bevelled base with incised zigzag lines whose likely function was to assist in attaching them to wooden hafts. Whereas N.Drat 8446 and N.Drat 8447 have long, well-defined base bevels (Fig. 4. 2,3), the base of N.Drat 8445 is markedly shorter and somewhat irregular (Fig. 4. 1). This may be due to rejuvenation,[30] which is also suggested by the longitudinal grooves running down onto the base of this piece. Longitudinal grooving is a characteristic feature of all three points and is always executed perpendicularly to the base bevels. N.Drat 8445 and N.Drat 8446 bear two juxtaposed grooves in both *compacta* and *spongiosa* (Fig. 4. 1,2) while N.Drat 8447 (Fig. 4. 3) has only a single one located in the *spongiosa*. The lengths of the grooves range from 133 to 257 millimetres. Following Bosinski's suggestion,[31] we regard these grooves as slots for small lithic insets, some of which have also been recovered on-site (see above). Lithic-backed bladelets used as projectile components are widespread in the European Late Upper Palaeolithic.[32] A distinctive feature of the Nová Drátenická points is their broad, flat, cutting tip section, which in two cases (N.Drat 8445 and 8447 – Fig. 4. 1,3) also notably broadens. Despite some deviations, the points are so similar to each other that it is quite likely that they used to be a set belonging to a single individual and deposited during one occupation event.[33] Doubtlessly, they share the same cultural background and dating.

FTIR, ^{14}C dating, and ZooMS

As outlined above, Nová Drátenická did not yield any significant stratigraphy and the previously performed ^{14}C measurements on unmodified bones were ambiguous. Therefore, direct ^{14}C dating of the osseous points appears the only viable option for establishing a reliable chronology and getting a hint at the archaeological classification of the site.

Since the osseous points from Nová Drátenická are part of the National Cultural Heritage of the Czech

[32] E.g., Houmard 2003; Lengyel *et al.* 2021; Pétillon *et al.* 2011.

[33] Pfeifer 2017.

Fig. 4. Set of three antler projectile points from the Nová Drátenická Cave. 1 – N.Drat 8445; 2 – N.Drat 8446; 3 – N.Drat 8447. Moravian Museum. Note the glued sediment fracture on 8446 (arrow), dismantled for sampling. Note that different lighting may cause chromatic misinterpretations. Photos and drawings by Sebastian J. Pfeifer.

Republic, minimising the impact of sampling was mandatory. Firstly, we considered that all three points are typologically similar and have the same age. Therefore, we decided to subject only one of them to radiocarbon dating and ZooMS. Secondly, of key importance was to protect the original surface features. Point N.Drat 8446 was sediment-fractured and assembled from two fragments (Fig. 4. 2 – arrow). Disarticulation of this piece would therefore open the possibility of obtaining material from the inner part of the while minimising the risk of modern contamination or damaging its surface. Thirdly, since sufficient collagen preservation is mandatory for reliable ^{14}C dates, we decided to conduct non-destructive infrared Fourier spectroscopy (FTIR) measurements on the surface before sampling. This analysis was carried out at the facilities of *CEITEC NANO* (Brno, the Czech Republic; Project Log 0662) in two different spots on N. Drat. 8446 and two animal bones also belonging to the Upper Palaeolithic horizon.

Applying FTIR Vertex 70v with microscope Hyperion 3000 and ATR objective with Ge crystal, two spots on the point were measured. The results show that the surface was covered with a protective layer based on wax and nail polish, andhence no IR vibration lines of osseous material (amide or apatite) are visible in the absorbance spectrum. The same results were obtained for the surface of the glue in the fracture. Additionally, a large mammalian bone fragment from the Upper Palaeolithic layer (N.Drat 8444) and a large mammalian bone fragment extracted from a carbonate concretion (sample no. ND2022-3) were subjected to FTIR. Some powder was obtained from both bones and measured using a diamond crystal. Comparison with reference values for bone collagen[34] indicated the presence of organic material, probably collagen.

[34] Martinez-Cortizas, López-Costas 2020; Paschalis *et al.* 2011.

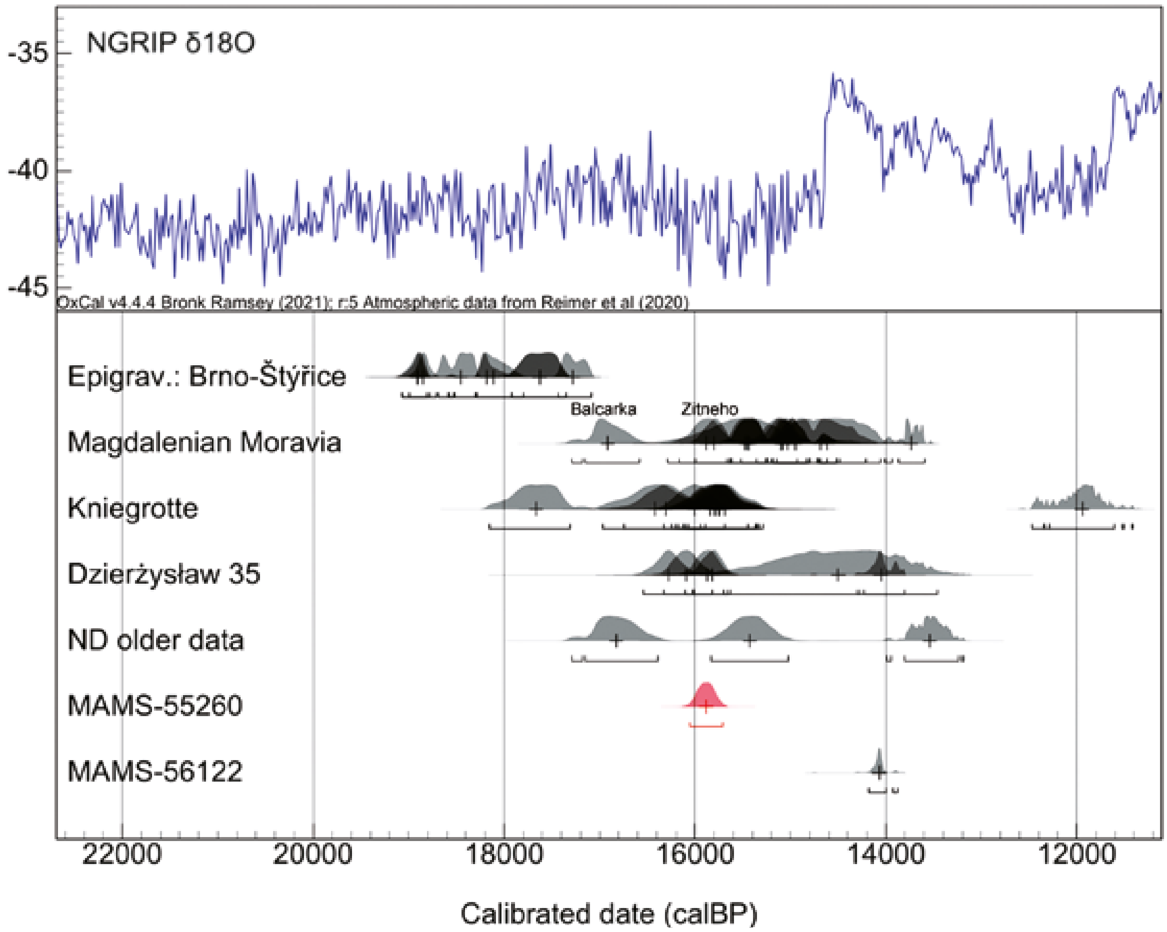

Fig. 5. Chronological position of the previous (ND) and latest ^{14}C measurements from the Nová Drátenická Cave, distribution of the Magdalenian dates for Moravia, Kniegrotte, and Dzierżysław 35, and late Epigravettian dates from Brno-Štýřice. The point N.Drat 8446 is marked in red. Modelled in OxCal 4.4, calibration curve IntCal20. Modelling by P. Neruda.

Although the FTIR analysis of the projectile point was not successful in terms of identifying organic matter, the obtained data helped to find a suitable solvent for dismantling both parts for sampling. We decided to use pure acetone that was injected into the joint through small holes in the glue surface. Subsequently, the area was covered with soft paper soaked with acetone and then wrapped with food foil. After twelve hours of soaking, the point was easily dismantled, and the exposed fracture surfaces were cleaned with a *Dremel* tool. Next, small holes were drilled into the compact tissue of either fragment to obtain 300 milligrams of powder for ^{14}C dating and 30 milligrams for ZooMS. The sampling equipment had previously been cleaned with a solution of water and bleach. The sample from N. Drat. 8444 was obtained by scraping the inner part of the bone. The third sample, ND2022-3, consists of a small fragment mechanically extracted from the breccia of the bone and surrounding carbonate.

Ultrafiltration of the samples and ^{14}C dating were performed at the MICADAS AMS facility of *Curt Engelhorn Zentrum Archäometrie* (Mannheim, Germany). As for the projectile point, collagen content was 3.0 %, and the C:N ratio of 3.3 indicated good collagen preservation. Thus, we deem the sample suitable for providing reliable results. It gave an age of 13,230±50 ^{14}C BP (MAMS 55260). Calibration was performed using OxCal v4.4, ver. 155[35] with the INTCAL 20 curve implemented[36] and resulted in 16,056–15,712 cal BP (95% probability) and 15,971–15,814 cal BP (68% probability), respectively. If this date is regarded as representative for all three osseous points from Nová Drátenická, then the pieces were manufactured during the first half of GS-2a, well before the onset of the Lateglacial Interstadial Complex.

[35] BronkRamsey 2021.

[36] Reimer *et al.* 2020.

The age of the points aligns well with the oldest dates for the Moravian Magdalenian as well as with the dating of the Magdalenian occupations of Kniegrotte in Germany and Dzierżysław 35 in Poland. Between the youngest Epigravettian occupation of the cluster of sites in Brno-Štýřice[37] and the point from Nová Drátenická, however, there is a gap of approx. 1 kyr (Fig. 5).

The second sample, N.Drat 8444, had a collagen content of 6.4 %, a C:N ratio of 3.4, giving it an age of 12,170±40 ^{14}C BP (MAMS-56122).After calibration, the age of the bone is 14,184–13,875 cal BP (95.4% probability), thus corresponding to GI-1 in the first half of the Lateglacial Interstadial Complex. The third sample, ND2022-3, yielded no collagen at all. 30 milligrams of material from the point were analysed by peptide mass fingerprinting (ZooMS) using the acid insoluble protocol. The species was identified as reindeer (*Rangifer tarandus*).

Discussion

The question of homogeneity of the archaeological horizon from Nová Drátenická is an important part of the re-evaluation of the site and especially the three projectile points. The stratigraphic evidence suggests a single archaeological layer (Pelíšek's Layer 2) that, judging by the quantity and structure of finds, appears to be homogeneous. According to Pelíšek's data, finds are neither present in the underlying Layer 1 nor in the overlying Layer 3. No cryogenic processes have been recorded that could move artefacts between layers. During the Holocene, the cave's entrance was small and gradually filled with sediment. Nothing attests production of either lithic or osseous tools, as neither cores nor blanks from the preparation of cores are present. Instead, the composition of the archaeological and faunal assemblage corresponds to hunting activities. We consider the archaeological record as resulting from a single occupation or repeated short visits by the same group of Late Upper Palaeolithic humans.

Nevertheless, such a conclusion is in conflict with the results of radiocarbon dating. The obtained ^{14}C dates from animal bones cover a long-time range of 17.3–13.2 ka cal BP (Tab. 1). Both of the new dates also fall within this interval, with the gap between them amounting to nearly 2 kyr. There are three possible explanations for the wide range of dates (which may, of course, be partially complementary): a palimpsest of Late Upper and Final Palaeolithic occupation events, the impact of carnivores, and the post-depositional processes. The palimpsest hypothesis is not supported by the character of the artefact collection, which does not show any mixing of types from several techno-complexes. On the other hand, the use of the cave by carnivores as a den cannot be ruled out, especially since none of the dated mammalian bones appears to have been processed by humans. Since the cave's entrance was not closed until the Holocene, the site was accessible to carnivores throughout the Late Glacial and, therefore, they could have accumulated bones over a longer period, both concurrently and non-concurrently to the human occupation. Lastly, individual samples could have been affected by post-depositional processes. The archaeological horizon lies under a carbonate layer with stalagmites and, therefore, individual bones could have been secondarily enriched with different amounts of carbon from carbonates. These influences must also be taken into account when determining the age of the archaeological horizon. Of all the radiocarbon dates obtained so far, the result from the antler point must be considered the most relevant, since it is demonstrably a human-made object. If we take into account that even this sample could have been secondarily enriched with carbon, which would render it too young, the period of human presence in the cave can be determined to be approximately 16.0–15.7 ka cal BP at the latest.

Classification of the archaeological assemblage from Nová Drátenická is not a trivial task, because the collection contains only a limited number of artefacts and features lithic types that can be found in several techno-complexes. The dating of the projectile point puts the site into a time range when both Magdalenian and Late Epigravettian (Epiaurignacian, respectively) could in principle have coexisted in southern Moravia (Fig. 6).[38] Perhaps this explains the difficulty in the cultural classification of Nová Drátenická. Its original interpretation by Klíma as Magdalenian was later challenged by Karel Valoch, who noted the presence of Gravette and micro-Gravette points as well as truncated backed bladelets. Based on that, he preferred attributing the assemblage to the "Gravettoid" industries rather than to the Magdalenian ones. According to our analysis, however, the lithic points from Nová Drátenická do not meet the criteria of Gravette points and, therefore, we do not classify them as such. Such "atypical" points can be found also in Magdalenian contexts[39] and bi-truncated backed pieces (Fig. 3. 2) are encountered both in the Magdalenian of Germany, Switzerland, and south eastern France, as well as in Central European Late Gravettian assemblages.[40]

[37] Nerudová, Neruda 2014; Nerudová *et al.* 2022.

[38] Wiśniewski *et al.* 2017.

[39] Demars, Laurent 1989.

[40] Demars, Laurent 1989; Polanská *et al.* 2020; Lengyel 2018; Wilczyński *et al.* 2015, 2020.

Table 2. Comparison of technological features between LUP techno-complexes and the lithic assemblage from the Nová Drátenická Cave (ND) not preserved, + presence, – absence.* One organic antler hammer was preserved at the Epiaurignacian site of Albendorf (Austria),[41] while indirect evidence for the use of an organic hammer is mentioned in the context of an Epiaurignacian assemblage from Mohelno (the Czech Republic).[42]

Magdalenian	ND	Technological feature	Epiaurignacian	Epigravettian
+	?	Preparation of a core striking platform	-	-
+	-	Dorsal abrasion of the proximal part of a blank	Not frequent	Not frequent
+	?	Long regular blades	Not frequent	+/Not frequent
+	?	Butts *en* éperon	-	-
+	+	Mineral (soft stone) hammer	+	+
+	?	Organic (antler) hammer	-/? *	-
+	+	Direct percussion	+	+
-	?	Specific reduction strategy focused on microliths	+	-

The lithic artefacts are also ambivalent from the technological point of view. However, previous analyses of technological features of Gravettian, Epigravettian, Epiaurignacian, and Magdalenian industries suggest that these techno-complexes differed from each other,[43] the small number of lithics from the Nová Drátenická Cave complicates the characterisation of individual technological features and, as a result, distinguishing other Late Upper Palaeolithic techno-complexes in this cave.

Dorsal abrasion on the blanks was not applied, but preserved butts indicate the use of a mineral hammer typical for the Epigravettian (Tab. 2). On the other hand, the measurements and morphology of blades and bladelets as well as the presence of bipolar knapping do not preclude the Magdalenian classification of the Nová Drátenická lithic collection. Although the typo-technological information is limited, its general character aligns better with the Magdalenian than with the Epigravettian. Concerning the raw material composition, the collection is similar to other Magdalenian assemblages from the Moravian Karst. The geographic location of the site lends further support to attribution of the Nová Drátenická lithic industry to the Magdalenian. To date, no assemblage assigned to the Epigravettian or Epiaurignacian has been registered in the Moravian Karst.[44] Conversely, there are several small cave sites in the immediate vicinity (e.g. Verunčina, Srnčí, Adlerova, or Žitného) that are clearly associated with the Magdalenian.[45]

How do the peculiar reindeer antler projectile points from Nová Drátenická relate to that? As their closest morphological analogy in Moravia, Valoch presents a grooved ivory point from the early excavations at the Kůlna Cave, also situated in the Moravian Karst.[46] However, judging from the depiction of this particular specimen (Fig. 6. 5), the longitudinal grooves are located in the same symmetry plane as the double-bevelled base rather than perpendicularly to it, while the tip tapers regularly without any noticeable broadening or cutting edges. Hence, the piece from Kůlna is actually more reminiscent of a standard Magdalenian point.[47] On the other hand, three distal point fragments from the Upper Magdalenian rock shelter of Fontalès (Dép. Tarn-et-Garonne, France), introduced previously by Bosinski,[48] are much more similar to Nová Drátenická's nos. 8445 and 8447, especially given their broadened, cutting tips and perpendicular orientation of the longitudinal grooves (Fig. 6. 2–4). As for morphological analogies from the east, the Early Epigravettian open-air site of Cosăuţi in the Middle Dniester Valley (the Republic of Moldova) is of note. According to published drawings, the archaeological horizons 2–6, dated to around 23–21 ka cal BP and, thus, to the Last Glacial Maximum,[49] yielded several

41 Steguweit 2010.

42 Škrdla *et al.* 2014.

43 Nerudová, Moník 2019.

44 Nerudová, Neruda 2015.

45 Valoch 2001.

46 Valoch 2001, 147.

47 Cf. Pétillon 2016; Pfeifer 2021.

48 Bosinski 2009, fig. 4.

49 Noiret 2009.

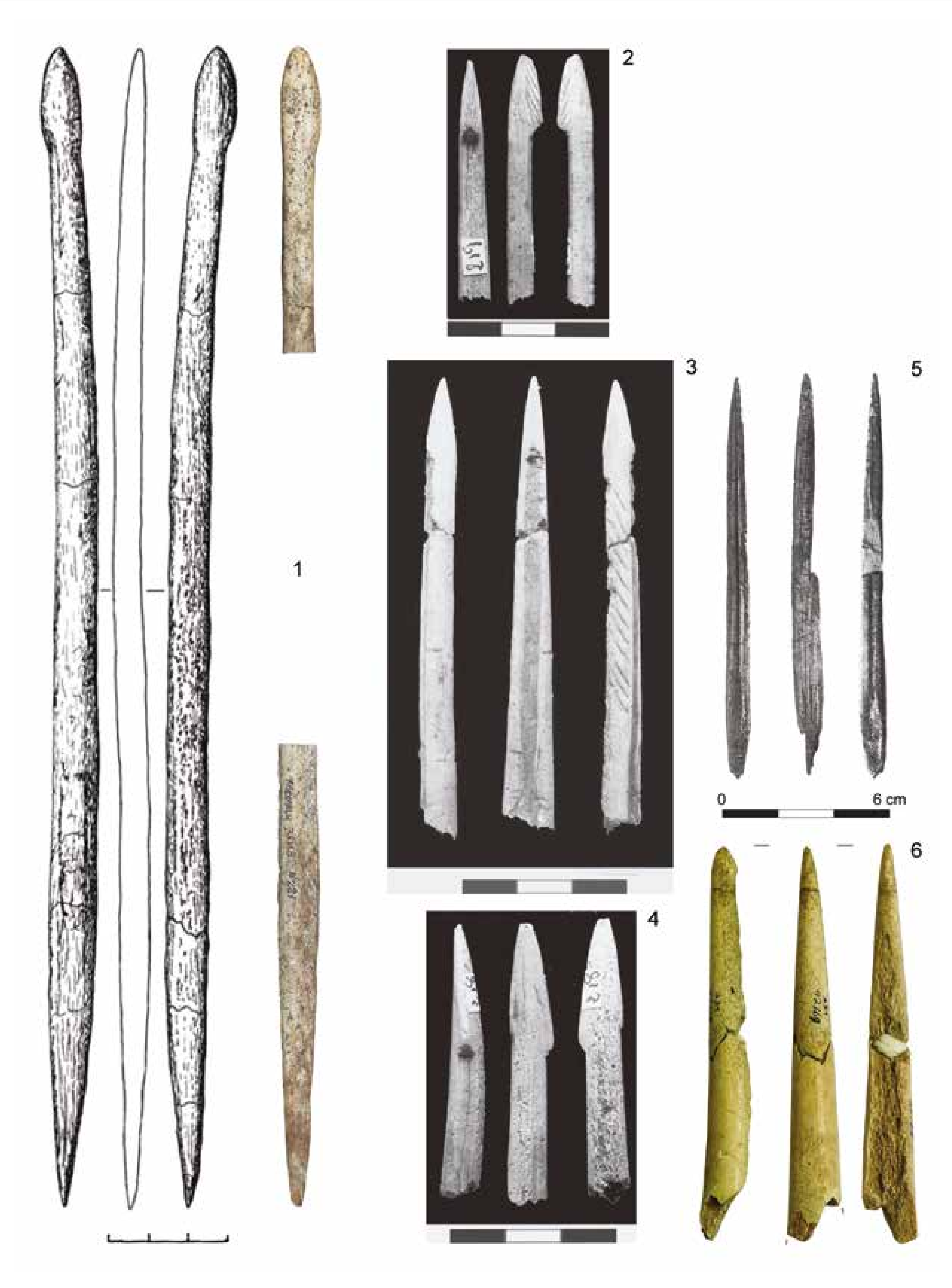

Fig. 6. Late Upper Palaeolithic osseous points with broadened, flattened tips. 1 – Cosăuți AH3 (after Covalenco, Croitor 2016); 2–4 – Abri Flageolet (after Bosinski 2009); 5 – Kůlna, old excavations (after Valoch 1979); 4 – Kniegrotte. 1 – National Museum of History of Moldova, inv.no. N221; 2–4 – Museum d'Histoire Naturelle in Toulouse; 5 – Moravian Museum; 6 – State Office of Cultural Heritage of Thuringia, inv.no. 42/69. Unless stated otherwise, the scale bar is 3 cm. Colour photos by Sebastian J. Pfeifer.

points with what looks like bevelled bases with incisions and broadened, cutting tips.[50] Closer examination of the original projectile points from Cosăuți carried out recently, however, reveals significant differences: firstly, they have massive or, rarely, tongue-shaped bases without bevels; and secondly, the few specimens with broadened, flattened tips lack longitudinal grooves (Fig. 6. 1).[51]

In line with the morphological differences from the projectiles from Cosăuți, the newly obtained dating of the Nová Drátenická antler points clearly separates them from the Early Epigravettian by at least five millennia. Therefore, currently, the most viable hypothesis is to associate the points with the Magdalenian, as suggested by the lithics and location of the site, and to see them as members of the same typological family as the pieces from Fontalès. The notion of projectile points with broadened, flattened tips being a Magdalenian variety is further corroborated by a sturdy specimen with refitted use-related fractures from the Kniegrotte cave site in Thuringia, eastern Germany. The piece now appears to be un-grooved, but it is preserved fragmentarily, with severe decomposition of the *spongiosa* (Fig. 6. 6).

But why is this projectile morphology so rare? A look into the typo-technological evolution of Magdalenian hunting equipment might provide a clue. Between 16 and 15.8 ka cal BP, a short-lived but very characteristic lithic tool type made its appearance in Magdalenian assemblages: scalene triangles.[52] In Central Europe, the aforementioned Kniegrotte is a well-known triangle-bearing site with over 200 pieces.[53] The weighted average of nine ^{14}C dates on humanly modified bones is 15.9 ka cal BP[54]. Another well-dated site with scalene triangles is Dzierżysław 35 in Poland,[55] with a weighted average of three dates resulting in the same age.[56] In Moravia, the open-air site of Hranice – Velká Kobylanka is of relevance, as it has yielded several scalene triangles. Unfortunately, no datable organic material accompanied the.[57] The same applies to the large collection from Vilshofen-Kuffing in Bavaria, Germany[58]. According to the radiometric dates, the Nová Drátenická points share the temporal horizon with the scalene triangles, and since these lithic tools are most likely insets of osseous points,[59] it could be hypothesised that the rarity of Nová Drátenická/Fontalès points may be due to the short timeframe when the scalene triangles were in use. This view, as tempting as it may seem, is nevertheless problematic on several points. For one, the small lithic assemblage from Nová Drátenická does not contain any scalene triangles but rather 'ordinary' backed bladelets and blades (see above), which suggests that the latter were insets in this particular case, as already pointed out by Bosinski.[60] Three of these artefacts bear clear traces of dynamic impact (Fig. 3. 6,15 on both ends; probably also 11), but it should be noted that, given their dimensions and morphologies, not all of them appear to be suited for attaching to organic points (compare Fig. 3. 5 and Bosinski's Fig. 2. 10). Although Kniegrotte yielded an antler point reminiscent of the Nová Drátenická specimen (see above), the majority of osseous projectiles from that site are of the common single- or double-bevelled Magdalenian varieties.[61] And lastly, there are two directly dated, double-bevelled projectile points without grooves from the Kesslerloch Cave (Schaffhausen, Switzerland) and Tunnelhöhle (Bavaria, Germany), both dated to 16,026–15,436 cal BP (OxA-5746)[62] and 16,231–15,840 cal BP (Erl-14814),[63] respectively. Considering these dating ranges, both points may well relate to the temporal horizon of scalene triangles. However, no such artefacts have been reported from either site. Therefore, it appears that at the turn of the Middle to the Upper Magdalenian, around 16 ka cal BP, a variety of osseous projectile points and lithic insets were used in Central Europe[64] and that the scalene triangles were not necessarily linked to a specific osseous point morphology.

To sum up, the three antler points from Nová Drátenická probably relate to the Magdalenian occupation of this site. Since the Magdalenian in the Moravian Karst appears to be fully established by around 15 ka cal BP at the latest,[65] their dating is of significance in that it corroborates the view that bearers of this techno-complex visited the region somewhat earlier. Several conspicuous osseous points from the Pekárna Cave (distr. Mokrá Horákov, the Czech Republic) may have witnessed their presence as early as the early Middle Magdalenian, at 19/18 ka cal BP[66]. Around 17 ka cal BP, ephemeral late Middle Magdalenian human presence in the Moravian Karst is suggested on typological grounds by a few characteristic osseous artefacts and ornaments from the caves of Pekárna and Balcarka (Ostrov u Macochy, Blansko,

[50] Noiret 2009.
[51] Comp. Covalenco, Croitor 2016, figs. 3–4.
[52] Maier 2015; 2020, 52–59.
[53] Bodenschatz *et al.* 2021; Feustel 1974; Höck 2000.
[54] Maier 2020, tab. 2.
[55] Ginter *et al.* 2005.
[56] Maier 2020, tab. 2.
[57] Klíma 1951; Neruda, Kostrhun 2002; Valoch 2001.
[58] Adaileh 2017.
[59] Höck 2000, Fototafel 6; Maier 2015, 59.
[60] Bosinski 2009.
[61] Höck 2000, Fototafel 6; Pfeifer 2020; 2021.
[62] Housley *et al.* 1997.
[63] Steguweit, Händel 2010.
[64] Langlais *et al.* 2016; Maier *et al.* 2020.
[65] Neruda 2010; Reade *et al.* 2021; Valoch, Neruda 2005.
[66] Maier *et al.* 2020, 439; Nerudová *et al.* 2019, 187.

the Czech Republic) with strong ties to southwestern Europe.[67] A conventional ^{14}C date from Balcarka is in line with that (Fig. 5), but whether it resulted from human activity remains unclear, since it was obtained from an unmodified mammalian bone. So far, the earliest solid evidence for post-LGM, probably Magdalenian, human presence in the Moravian Karst is, therefore, provided by the directly dated projectile point from Nová Drátenická and coincides with the transition from the late Middle to the early Upper Magdalenian between16 and 15.8 ka cal BP. Together with the big contemporary sites of Kniegrotte, Dzierżysław 35, and potentially the nearby Žitného Cave with an unmodified mammalian bone dated to the same period (Figs. 1, 5), as well as the typologically related assemblage from Hranice, this suggests that the Magdalenian colonisation of eastern Central Europe gained momentum finally turning the Moravian Karst into a focal area with dozens of sites.[68]

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Contributor roles

S. J. P.: conceptualisation, study of the osseous artefacts; P. N. & Z. N.: re-evaluation of the stratigraphy, analysis of the lithic assemblage, modelling of the ^{14}C dates; K. D.: performance and interpretation of the ZooMS analysis; A. N.: performance and interpretation of the FTIR analysis. S. J. P., P. N., Z. N., A. N., K. D.: writing the manuscript.

Competing interests

The authors declare that there are no competing interests.

Data handling

All relevant data are provided in the article.

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[67] Lucas 2021; Pétillon, Sacchi 2013; Pfeifer 2017.

[68] Maier 2015, fig. 7.34; Nerudová *et al.* 2021, fig. 10; Reade *et al.* 2021; Valoch, Neruda 2005.

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Mesolithic Art in Stefan Karol Kozłowski's Papers

Abstract

In his publications on the Mesolithic in Poland and Europe, S. K. Kozłowski mostly focused on lithic artefacts in terms of their styling, cultural origin, and archaeological context. On the margins of the above pursuits, S. K. Kozłowski examined finds of Mesolithic art from Poland, his main interest here being their cultural classification. Additionally in his works, S. K. Kozłowski mentioned the possibility of dating zoomorphic figurines and some amber pendants to the Mesolithic due to the similarity of their forms to those known from today's Denmark. In his opinion, Mesolithic art objects found in Poland were linked to the Northern Complex – either through its influence or due to the presence of Maglemose cultural communities in north-western Poland.

Keywords: Mesolithic, art, ornamentation, Maglemose Culture

Introduction

From the very moment of their discovery in northern Poland, mostly before the Second World War, antler and bone artefacts with geometric ornamentation were associated with the Mesolithic art typical for north-western Europe. Foremost amongst them were the deer antler batons from Szczecin-Podjuchy,[1] Szczecin-Grabowo,[2] and Woźniki, Łosice commune,[3] as well as Ostrołęka[4] and Nitki, Pisz commune.[5] The north of Poland, namely the vicinity of Gdańsk,[6] Słupsk,[7] the area between Drezdenko and Dobiegniew,[8] and Połczyn-Zdrój,[9] also yielded finds of amber figurines depicting animals. Additionally, this part of Poland produced amber pendants with pit ornamentation. Whereas the chronology of antler items was reasonably clear, the dating of amber items was subject to debate, with the prevailing opinion assigning them to the milieu of the Pit-Comb Ware Culture.[10]

The spurt of interest in the Mesolithic in the 1960s produced many papers addressing this period plus two monographs comprehensively covering the Middle Stone Age in Poland.[11] Although these works focused on the cultural classification and chronology of lithic finds, they could not leave unmentioned the loose finds of antler and bone hunting weapons and art objects. One of the papers by S. K. Kozłowski was even entirely dedicated to Mesolithic points and harpoons from Poland in the context of the European Mesolithic.[12]

Antler, bone and amber objects

Early papers about the Mesolithic in Poland, written by S. K. Kozłowski in 1965–71, gave scant coverage to art. These articles, addressing the cultural differentiation and chronology of the Mesolithic in Poland, were based almost exclusively upon lithic finds, with little mention of ornamented artefacts – or simply items from antler and bone in general. Only in the paper on the Komornica Culture did Kozłowski mention that to the north of the Warsaw-Berlin ice-marginal valley, one may find items (e.g. bone points) of Maglemosian character (even if, for unknown reasons, he limited their extent to the Gdańsk Pomerania).[13] From this period we also have a paper, kept in a light tone, concerning an anthropomorphic depiction of a deer antler baton,[14] discovered before the Second

[1] Kunkel 1935.
[2] Kunkel 1936.
[3] Werner 1917.
[4] Sawicki 1921.
[5] Gaerte 1931.
[6] Virchow 1884.
[7] Virchow 1887.
[8] Virchow 1884.
[9] von Richthofen 1930.
[10] E.g. Jażdżewski 1981.
[11] Kozłowski 1972; Więckowska 1975.
[12] Kozłowski 1969.
[13] Kozłowski 1967.

Fig. 1. Szczecin-Podjuchy. An ornamented red deer baton. Photo by Tomasz Gąsior.

Fig. 2. Szczecin-Podjuchy. The geometric ornamentation in the distal part of the baton. Photo by Tomasz Gąsior.

World War in Szczecin-Podjuchy (Figs 1, 2). There, Kozłowski described the geometric style of depiction and identified its connection to either the Maglemose or Duvensee Cultures or the Northern Complex in general. He also ventured into crafting a timeline, dating this engraving to around 7000–5500 BC (uncalibrated). Already in these papers, the Author was inclined to believe that at the close of Boreal north-western Poland hosted cultural developments possibly associated with finds from southern Scandinavia.

In S. K. Kozłowski's[15] monograph on the Mesolithic in Poland, art objects were one of the elements used for characterising the cultural units he had distinguished.[16] The problem with their cultural association stemmed from the character of discovery – all were loose finds, obtained accidentally in circumstances precluding identification of their original context of deposition. Kozłowski, whose attention had focused chiefly on batons, noted the similarity of their "engraved line ornamentation" with decorations found on similar artefacts from Northern and

[14] Kozłowski 1968.

[15] Kozłowski 1972, 152–153.

Central Europe (southern Scandinavia, Mecklenburg, and Brandenburg), both loose finds and excavated objects. Amongst the ornamentation patterns seen on artefacts from Poland S. K. Kozłowski pointed out "a-d" motifs (several variants of barbed lines), hatched geometric shapes (motifs "k" and "l"), and the zigzag lines ("h"), following J. G. D. Clark's classification[17] (Fig. 2). There, S. K. Kozłowski mentioned the Maglemosian milieu and the Duvensee sites dated to the Boreal. Hence, the statement that Kozłowski probably assigned the finds from north-western Poland to the then-distinguished Chojnice-Pieńki Culture or Oldesloe comes across as rather odd. Both of these cultures, in his opinion, evolved chiefly during the Atlantic Period – a time when traditional Maglemosian art was no more. S. K. Kozłowski indeed suggested the existence of a Boreal phase of the Chojnice-Pieńki Culture, beginning from its final stage, yet evidence supporting this view is very weak.

The finds from Woźniki, Nitki, and Ostrołęka raise further issues, as the Author regards these as being located beyond the eastern reaches of both Chojnice-Pieńki and Komornica Cultures. These artefacts cannot be related to the Kunda Culture representing eastern traditions, hence their only possible association in this area is with the Janisławice Culture. Here we note the disconnection between the Maglemosian styling of the ornament and the later dating of the Janisławice Culture, the finds of "northern" art objects evidencing the inclusion of the Janisławice Culture in the Northern Complex of the Mesolithic.

In this work, S. K. Kozłowski also presented a novel – in the Polish literature – interpretation of the amber animal figurines discovered in the vicinity of Dobiegniew, Gdańsk, and Słupsk.[18] Previously, these had been considered as Neolithic and associated with the Pit-Comb Ware Culture or kindred groupings.[19] According to Kozłowski, they resemble Danish finds, due to the used material and technique of execution (polishing), size, the same manner of generalisation of details, the depicted species, as well as the ornamentation style on some of the artefacts. Moreover, S. K. Kozłowski added to this group the horse from the corpus of amber artefacts fished out at Juodkrantė on the Curonian Spit (today part of the Neringa municipality).[20] Hence, since the Danish finds – following J. G. D. Clark's[21] and J. Brøndsted's[22] suggestions – may be dated to the Mesolithic, the Polish examples must be of similar age and associated with the Chojnice-Pieńki or Oldesloe cultures. S. K. Kozłowski also suggested that some of the finds of amber beads from northern Poland may be associated with the Chojnice Group, even though "a major part may belong to Neolithic cultures". The truth is that at that point all those finds were treated as a group of uniform age, in spite of their likely belonging to different periods. The prevalent stance was that of Clark, who stated that ornament on the figurine from Resen on Zealand bears the features of Mesolithic geometric ornament, hence all figurines depicting animals must belong to this group. Yet no amber figurine had been discovered in an archaeological context dated to the Mesolithic.

S. K. Kozłowski modified the above findings and hypothesis in the monograph on the Stone Age in Poland, co-written with J. K. Kozłowski.[23] The Author associates the ornamented antler and bone artefacts as well as the zoomorphic amber figurines[24] and ornamented pendants with the Sværdborg Culture traditions – present in this area in the second half of the 7th millennium BC (uncalibrated), or with the early, Boreal phase of the Chojnice Group. The third possibility – Maglemosian traditions in the Chojnice-Pieńki Culture in the 6th millennium BC (uncalibrated) – is rated by S. K. Kozłowski as not very likely. He continued to associate the ornamented antler batons discovered to the east of the Vistula with the Janisławice Culture. In a paper from two years earlier – "Pradzieje Europy" – he surmised that these represented the Maglemosian style inside that culture.[25] In that work, amber figurines were assigned to the Chojnice-Pieńki Culture, as the Authors did not mention ornamented items from Pomerania, apparently inclined to associate them with the Sværdborg Culture instead, in line with the map enclosed in the book.

In a newer look at the Mesolithic in Poland S. K. Kozłowski presented a different take on the chronology and cultural origin of art objects.[26] He deemed the batons from Szczecin-Podjuchy and Szczecin-Grabowo and the three aforementioned amber figurines from Pomerania to be typical examples of the Maglemosian styling, venturing that these may be connected to the Boreal Sværdborg group which occupied the land bridge between Pomerania and Scandinavia (later flooded by the Baltic) and West Pomerania. The decorated deer antler batons from lands to the east of the Vistula could be – in his opinion – linked to the very same temporal horizon, at

[16] Kozłowski 1972, 152–153.

[17] Clark 1936.

[18] Kozłowski 1972, 190, 192.

[19] See Gula 1977, with further literature.

[20] Klebs 1882; Gaerte 1929.

[21] Clark 1936.

[22] Brøndsted 1957.

[23] Kozłowski, Kozłowski 1977.

[24] However, at that time he did not know about the figurine from Połczyn-Zdrój (information from conversation with S. K. Kozłowski at the "First Polish Archaeological Congress" in Warsaw, 19–21.09.2013).

[25] Kozłowski, Kozłowski 1975.

[26] Kozłowski 1989, 149–153.

Fig. 3. Pułtusk. An ornamented red deer baton. Photo by Tomasz Gąsior.

Fig. 4. Trudna. An ornamented bone mattock. Photo by Tomasz Gąsior.

that time and in that area represented by the Komornica Culture (Fig. 3). The mattock unearthed in the 1970s[27] in Trudna, Złotów commune, was also associated by S. K. Kozłowski with the northern traditions (Fig. 4). This view was based upon the ornament which, although original, bore certain features of the Maglemosian styling. There, he repeated the assertion of L. Domańska who regarded this find as a product of an earlier Boreal migration of Maglemosian bands to Pomerania.[28] This find could be associated with either the Komornica Culture or the Chojnice Group. S. K. Kozłowski also upheld the hypothesis about the Mesolithic dating of amber figurines from Pomerania, Kuyavia, and Lithuania, associating them with the Maglemosian traditions, which he described as the "Sværdborg-Chojnice tradition". In the case of Kuyavia, he had in mind the figurine of an unidentified animal found in a Neolithic pit at the site of Brześć Kujawski 4, Włocławek commune,[29] whereas regarding Lithuania he referred to the horse from Juodkrantė. He also associated amber pendants with pit ornamentation from Pomerania and the Masurian area with the Mesolithic traditions. These amber items, loose finds in S. K. Kozłowski's opinion, could be dated only broadly to the Mesolithic (and even then, without full certainty). He regarded the amber figurine from Brześć Kujawski as possessing Mesolithic features and witnessing contacts between farmers on the one hand and hunters and gatherers on the other.

In the last book, "Thinking Mesolithic", S. K. Kozłowski repeated views already presented in the 1989 monograph.[30] The Author associated the ornamented antler and bone artefacts as well as amber figurines and pendants from northern Poland with the Maglemosian art: in Pomerania, or parts thereof, this view stemmed

[27] Domańska 1973; 1976.
[28] Domańska 1977.
[29] Cyrek *et al.* 1983.
[30] Kozłowski 2009.

from the actual presence of Maglemosian communities, whereas the finds from eastern Poland were linked to the Komornica Culture, which had been a part of the Northern Complex. The Author unequivocally articulated a link between the western and central Pomeranian finds and the presence of "the Sværdborg Culture" communities,[31] doubtlessly grounded in the discoveries of this culture's lithic inventories at Gudowo 3 and Wierzchowo 6.[32] The ornamented artefacts from Polish sites were described by the Author as representatives of the art of the north-western Baltic Basin, distinct in style from the north-eastern Baltic Basin.

Mesolithic art in studies of ancient hunters and gatherers

The few preserved examples of Mesolithic art from Poland were examined on the margin of an analysis of lithic inventories, be it in papers or monographs dealing with this period. Such a state of affairs did not arise from the fact that these were stray finds from accidental contexts. In Denmark, publications concerning such classical sites as Sværdborg or Lundby, which yielded more numerous finds of art objects, also focused on lithic or bone artefacts.[33] This seems to have stemmed from the conviction that it is possible to arrive at proper differentiation of culture and social organisation through analyses of mass materials, such as tools or debris from their manufacture. From such a viewpoint, art objects would bring supplementary information on the "spiritual culture", the term used at that time for symbolical aspects of culture. It is difficult to track down the roots of this attitude. It seems to reflect the mindset of many archaeologists from the second half of the 20th century, revealing a typological and (in a different measure) technological approach to the lithic finds, combining traditional perceptions of the role of tools in culture differentiation with a dose of views borrowed from the New Archaeology. Apprehension as to the possibility of reconstructing former *religious institutions and spiritual life* using archaeological discoveries was clearly expressed by the British archaeologist Christopher Hawkes in his work on the Ladder of Inference.[34] This paper was universally known and exerted enormous influence on European archaeologists.[35] Research into the role of symbols and symbolical culture in studies of ancient cultures was more readily accepted when these concerned early farmers,[36] among which symbolical culture could assume much more elaborate forms than amongst hunter-gatherers.

Decorated Mesolithic items were thus used to substantiate the conclusions pertaining to the cultural diversity of Polish lands, ranging from the influence exerted by the Northern Complex to the physical presence of Maglemosian communities in north-western Poland. Such views often use the notion of "migration" and the metaphor of "periphery".[37] Yet still very little is known about the cultural situation in Pomerania or the Pomeranian-Great Poland borderland in the early Mesolithic, as it has been investigated in a patchy manner and elucidated by few sites with organic artefacts.[38] It is difficult to affirm whether it participated in the peripheral Maglemosian settlement, or whether the remains of the settlement witnessed any migrations. Finds of Late Palaeolithic art seem to suggest the presence of traditions which may have given rise to the Maglemose Culture. This is strongly evidenced by the ornamented artefact from Rusinowo near Świdwin, dated to the end of the Palaeolithic and bearing many features of the Maglemosian art.[39] This means that at least part of Pomerania belonged to an area inhabited by communities which later developed the Maglemosian Culture. Also, there was no need for them to migrate north at the closing stages of the Glacial, given that these groups could have simply adapted to the warmer conditions at the onset of the Holocene.[40]

Conclusion

S. K. Kozłowski's comments on the Mesolithic art from Poland may be included in the initial systematisation-focused phase of analysis of the Middle Stone Age material discovered in Poland. It is worth noting that such cultural classification was not a one-off exercise, but a process extending over time. New discoveries, mostly from Pomerania, forced a gradual modification of previous perspectives on the artefacts' cultural interpretation and their chronology. It was the later research that provided a fuller picture of these finds, including their timelines and technology of manufacture and ornamentation, as well as the rate at which new patterns emerged. Nevertheless, the artefacts of Mesolithic art in the 1970s and 80s were inscribed into the tapestry of cultures found in Poland in the Mesolithic as perpetuated by S. K. Kozłowski, an image in large part still true today.

[31] Kozłowski 2009, fig. 4.5.6f (map).
[32] Bagniewski 1990.
[33] Bille Henriksen 1976; 1980.
[34] Hawkes 1954.
[35] Evans 1998.
[36] Hodder 1982; 1992.
[37] Domańska 1977.
[38] Kabaciński *et al.* 2008; Galiński 2014.
[39] Płonka, Kowalski 2017.
[40] Płonka *et al.* 2020.

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Late Chalcolithic Flint Assemblage from the Prehistoric Settlement of Telish-Laga

Abstract

The paper presents the result of a techno-typological analysis of the flint implements from the archaeological investigation at the settlement Telish-Laga. The flint assemblage comes from the context of two geological horizons, which refer to the Late Chalcolithic culture of Krivodol-Salkutsa-Bubani.

The collection consists of 1398 artefacts. Typologically, it is divided as follows: specimens with traces of preparing the cores, cores, debitage products, and retouched forms. A detailed analysis of the flint assemblage suggests the following conclusions:

- relatively small number of cores,
- the debitage products were mainly obtained from unidirectional cores,
- the blades significantly prevail among the debitage products,
- relatively large number of retouched tools, as more than half of the tools are on blades,
- the end scrapers prevail in the composition of the assemblage,
- lack of typological variety in retouched tools.

The quantitative dominance of end scrapers in the assemblage and macroscopically visible traces of wear on some of them indicate manufacturing is directly oriented on the processing of animal products, such as skin, meat, bone or horn. In general, the structure of the assemblage indicates that the preparation of the core was mainly carried out off-site. Other kinds of activities were performed on-site, including manufacturing flakes/blades from cores, retouches, repairs, and so on.

The settlement in Telish-Laga occupied a stratigraphic hiatus between the horizons II and III of the prehistoric settlement of Telish-Redutite. Both settlements refer to the so-called "altitude settlements", characteristic of the area of the Krivodol-Salkutsa-Bubani ethno-cultural complex. However, it is possible to accept a different hypothesis – the settlement from the locality of "Laga" may have continued Horizon II of Redutite.

In the technological and typological aspect, the assemblage of Telish-Laga finds analogies in certain Neolithic collections, such as Gradeshnitsa-Malo Pole, Gradeshnitsa-Lukanovo Darvo, or Zaminets. It also shares similarities with the late Neolithic-Early Chalcolithic assemblages of Altimir-Bresta and Gradeshnitsa-Gradishteto.

Keywords: Telish-Laga, flint assemblage, Late Chalcolithic, Pleven region, Bulgaria

The Late Chalcolithic settlement of Laga occupies an area of 5 acres located about 1 kilometre north of the village of Telish, Pleven region, at the end of a high plateau, 196 metres above sea level. About 1 kilometre to the south of it, on the same plateau, there is another site from the same period – Telish-Redutite. It was discovered in 1979 by Ventsislav Gergov. The excavations of the archaeological site of Telish-Laga were carried out on a total area of 275 square metres. The depth of the trenches varies between 0.5 and 1.2 metres. In accordance with the assumed research strategy, certain areas were selected for a detailed examination of their archaeological contexts, which led to determining that the site was inhabited several times. The flint assemblage comes from the context of two geological horizons which refer to the Late Chalcolithic culture of Krivodol-Salkutsa-Bubani.

Raw materials

A system based on specific macroscopic characteristics – colour, structure, transparency, inclusions, smoothness, lustre, and cleavage – was used to describe the raw materials.[1] The following main types of raw materials could be distinguished:

BG-TL-F1 – wax-brown colour, matte, opaque, without inclusions, smooth fracture, partly light brown stripes, good cleavage.

BG-TL-F2 – light beige in colour, matte, opaque, inclusions in the form of white to beige dots, smooth fracture, slightly rough cortex in whitish colour, good cleavage.

BG-TL-F3 – light beige colour, matte, opaque, inclusions in the form of small dots and spots, smooth fracture, good cleavage.

BG-TL-F4 – brownish to dark brownish colour, matte, opaque, smooth fracture, inclusions in the form of small and large dots and spots in whitish colour, good cleavage.

BG-TL-F5 – light brownish to light greyish colour, matte, opaque, smooth fracture, whitish-brownish colour cortex, poor cleavage.

BG-TL-F6 – light brownish to dark brownish colour, matte, opaque, smooth fracture, inclusions in the form of dots and whitish stripes, dark reddish colour cortex, good cleavage.

BG-TL-F7 – light brownish with whitish yellow emulsion, matte, opaque, inclusions in the form of partly dark brown stripes, relatively good cleavage.

BG-TL-F8 – light grey colour, matte, opaque, smooth fracture, inclusions in the form of regular dots of light/dark grey colour, amorphous formations, good cleavage

BG-TL-F9 – light grey colour, darker grey amorphous formations, matte, opaque, slightly transparent, grey-coloured cortex, good cleavage.

BG-TL-F10 – dark grey colour, matte, opaque, smooth formation, regular inclusions in the form of light dots, good cleavage.

BG-TL-F11 – dark grey, glossy surface, transparent, smooth fracture, partial inclusions in the form of dots, good cleavage.

BG-TL-K – quartzite, light colour, amorphous formation in yellowish colour, good transparency, poor cleavage.

BG-TL – igneous rock, greenish colour, average grained structure.

BG-TL-FOB1 – brownish to dark reddish, glossy, opaque, smooth fracture, inclusions in the form of light dots, thermal cracks, good cleavage.

The raw material used has an amorphous structure, with the light beige, grey-beige, and brown-yellow colour with whitish inclusions in the form of spots and small dots. The vast majority of lithic artefacts were made of flints F2, F5, and F6, which represent about 60% of the total number of investigated artefacts. The other types of raw materials provide an opportunity to divide them into two groups based on their usage – one with a more significant quantitative superiority and the other consisting of the raw materials used in equal or smaller amounts. All types of raw materials are represented in the most numerous technical-typological group of the assemblage – the debitage – as well as in the group of tools. Only in the manufacturing of the cores some of the raw materials are not represented.

Manufacturing of flint artefacts depends mainly on the quality of raw materials used to make them. The supply of raw materials was obtained mainly from deposits of local and meso-local origin. Diverse resources were available in different parts of Bulgaria. The high quality of raw materials during the Chalcolithic Period and the different raw materials used in the late Neolithic Period essentially determined the production of artefacts in these two epochs. Generally, the Chalcolithic is characterised by the manufacturing of blades, while during the late Neolithic, a significant number of flakes were still manufactured in parallel with blades. This aspect undoubtedly influenced the manufacturing represented in the assemblage.[2]

The flint collection from Telish-Laga consists of 1398 artefacts, which are divided into the following techno-typological groups: specimens with traces of core preparation, cores, debitage products, and retouched forms.

[1] Pawlikowski 1990.

[2] Todorova 1986.

Table 1. The general structure of the Telish-Laga flint assemblage.

techno-typological groups	number of finds	%
cores and specimens with traces of core preparation	49	3.5%
flakes (and fragments)	471	33.7%
blades (and fragments)	511	36.6%
retouched forms	329	23.5%
post-production remains	38	2.7%
TOTAL	1398	100.0%

Cores (49)

Exceptionally, cores in this group included also concretions, specimens with traces of core preparation, and pre-cores. Most of the concretions and massive fragments showed traces of "unorganised" blows with an idea of removing the cortex or "searching" for a place to locate a platform or flaking platform, without making the next specific technological processes. Resignation in the majority of cases was due to cracks (fractures) in the flint mass or failed blows. For the most part, the flint concretions are preserved with the cortex. The assemblage contains nine flint concretions, four of which are of enormous size and made of the raw material F9. Their lengths vary between 7.0 and 10.0 centimetres. Some of the specimens were secondarily used as hammers. The other five specimens are of the beige coloured F3 flints, with partially preserved cortex, and smaller in size, varying between 6.0 and 8.0 centimetres in length. Two of the specimens are shaped very similarly to hand axes.

Pre-cores (10)

Six of the pre-cores were formed on flakes and the rest on flint concretions. The flakes are of medium size, with the cortex partially preserved on the dorsal surface. The ventral parts of the flakes were used as flaking platforms. In many cases, traces of preparation of platforms or flaking platforms are visible on the pre-cores. All of the pre-cores are unidirectional and meant for obtaining flakes. Most specimens show clear signs of attempted flaking platform preparation on the wider part of the concretions.

Cores (30)

Seven cores were formed on flakes, including one on a fragment of a flake. The flakes are not large in size – they are about 5.0–6.0 centimetres long and the ventral surface of the fragment was used as a platform. Only one of the cores has a rounded (discoidal) flaking surface and was used for blades.

Twenty-one cores were formed on concretions measuring between 3.5 and 6.0 centimetres in length, 4.0 to 7.0 centimetres in width, and 2.0 to 4.5 centimetres in thickness. The cores are preserved with prepared striking platforms as well as rear and side surfaces. The cores were meant chiefly for flakes, except for a single blade-oriented specimen.

Two cores are of small sizes and were deposited while in their final stages of exploitation, probably used for flakes.

The majority of the cores are preserved with single platforms formed with a single blow, but there are also specimens with platforms formed with multiple blows.

- the flaking surfaces are primarily wide, flat, less often semi-rounded/rounded, and are located on the wider side of the concretion. Only in two cases, the flaking surface was situated on the narrower side of the concretion;
- the cores have conical, rectangular, oval, and prismatic shapes and most are in an advanced phase of exploitation;
- the cores were used predominantly for manufacturing flakes.

Debitage products (1020)

The debitage from the Telish-Laga flint collection includes: 294 flakes and 177 flake fragments, 511 blades (and fragments), and 38 undetermined fragments.

- flakes – 294 pieces with several subgroups distinguished in this category, based on the following criteria:
  - metric – the flakes were divided into four subgroups according to their length;
  - technological:
    - presence of cortex,
    - type of butt,
    - upper surface features;
- fragments of flakes (177), divided into distal, mesial, and proximal;
- undetermined pieces (38);
- blades and their fragments (511), divided into distal, mesial, and proximal.

Table 2. The general structure of the debitage products from the Telish-Laga flint assemblage.

debitage	number of finds	%
flakes	294	28.8%
flake fragments	177	17.4%
blades	97	9.5%
blade fragments	414	40.6%
undetermined fragments	38	3.7%
TOTAL	1020	100.0%

Flakes (294)

The flakes measure from 10.0 to 82.0 millimetres in length and can be grouped into four categories based on this dimension. Flakes with length ranges of 10.0 to 30.0 millimetres and 31.0 to 50.0 millimetres are almost equally represented, followed by those of lengths from 51.0 to 70.0 millimetres. The flakes longer than 70.0 millimetres are rare.

In terms of width, the flakes range from 7.0 to 53.0 millimetres and could be grouped into six categories. The prevalent group are flakes measuring from 10.0 to 40.0 millimetres in width, constituting 95% of the total number of flakes. The other width ranges are represented sporadically.

The thickness of the flakes oscillates between 2.0 and 23.0 millimetres, with five categories based on this dimension. The most typical thickness range for flakes is between 5.0 and 10.0 millimetres. Flakes thicker than 20.0 millimetres are poorly represented.

In the first metric category (10–30 mm) the dominant flakes are preserved without cortex (77%). In this category, all types of butts are represented, with significantly formed ones predominating, followed by linear and cortical ones. The butts of the flakes with less than 50% cortex remaining are mainly natural, formed, and linear. Dihedral and faceted butts are missing. The flakes with 50% and less than 50% cortex on the dorsal sides usually have formed butts with crust, while prepared, facetted, and dihedral ones are absent. The most scantily represented are flakes with fully preserved crust. Only formed and cortical butts are represented. For this metric group, flakes without cortex and with formed butts are particularly characteristic.

Table 3. Metric parameters of the entire collection of flakes from the Telish-Laga flint assemblage.

length range (mm)	number of finds	%	width range (mm)	number of finds	%	thickness range (mm)	number of finds	%
10–30	130	44.2%	< 10	4	1.4%	< 0.5	57	19.4%
31–50	134	45.6%	10–20	82	27.9%	5–10	184	62.6%
51–70	28	9.5%	21–30	132	44.9%	11–15	41	13.9%
> 70	2	0.7%	31–40	64	21.8%	16–20	8	2.8%
			41–50	9	3.0%	> 20	4	1.3%
			> 50	3	1.0%			
TOTAL	294	100%	TOTAL	294	100%	TOTAL	294	100%

In the second category (31–50 mm), the dominant flakes are without cortex and with formed butts. The rest of the flakes with other types of butts are less frequent, while facetted and linear butts are entirely missing. The butts of the flakes with no more than 50% cortex remaining are mainly formed. Flakes with other types of butts are missing or are poorly represented.

The flakes of the third metric category (51–70 mm) are a small group, in which the intact cortical flakes are absent, with flakes with formed butts being the dominant category.

Massive flakes (above 70 mm) are represented by only two specimens. One has less than 50% of the cortex remaining and a formed butt and the other has more than 50% of the cortex preserved and a cortical butt.

The majority of the flakes have been removed from unipolar cores, small specimens show diverse negatives, whereas a few have bidirectional negatives.

The shape of the flakes is usually rectangular/square, which is true for about half of the specimens, while the remaining items are trapezoidal, oval, triangular, and irregular. Flakes with straight and convex profiles predominate.

The characteristics of the flakes in the Telish-Laga assemblage can be summarised as follows:

- the largest group are medium-sized flakes, measuring from 30.0 to 50.0 millimetres;
- the typical width of a flake ranges from 10.0 to 40.0 millimetres, which covers the medium-length flakes. The same applies to the thickness of the flakes;
- the most numerous categories are flakes with formed butts, with other categories much less frequent;
- most often the flakes have no cortex, and specimens with more than 50% or completely preserved crust are exceptional;
- the flakes are mainly oval or irregular in shape.

Flake fragments (177)

Among the fragments of flakes, the frequency of the mesial ones is the highest, followed by proximal. The distal fragments are the least represented.

Undetermined fragments (38)

This category included all finds that did not fit into other typological groups. These are mainly fragments which could not be reliably assigned to any particular category of flakes, fragments, or blades. They are of irregular, indeterminate shape and show traces of processing, but it is difficult to precisely determine their place in the *chaîne opératiore*.

Blades and their fragments (511)

Intact blades are represented by 97 specimens, with the rest being fragments (414), which could be divided into distal, mesial, and proximal. Among them, the mesial ones predominate, and the group of distal fragments is the least numerous (Table 4).

Table 4. Technological subgroups of the blades from the Telish-Laga flint assemblage.

technological subgroups		
blades	**number of finds**	**%**
complete blades	97	19 %
distal fragments	89	17%
mesial fragments	179	35%
proximal fragments	146	29%
TOTAL	511	100%

The most frequently encountered blades have no cortical remains and those with preserved crust form less than 50% of the assemblage. The other categories are completely missing.

Regarding the types of butts, the majority are formed. Among the blades without crust, dihedral and cortical butts are not found. The next largest group are blades with natural, prepared, and cortical butts, which are represented almost equally. Blades without crust show the greatest frequency, followed by those with up to 50% of cortex remaining. Blades and their fragments with linear and facetted butts are the least frequent in the assemblage.

The lengths of the blades vary between 17.0 and 80.0 millimetres and could be divided into two categories. The most common length range is from 40.0 to 59.0 millimetres, followed by 20.0 to 39.0 millimetres. The second group includes also categories which are scarcely represented (Table 5).

The widths of the blades are mainly in the range from 6.0 to 39.0 millimetres, with the majority of artefacts measuring between 10.0 and 20.0 millimetres. The other width categories of blades are less common or only sporadically represented.

From the three categories of thickness, the first one is dominant (1–5 mm), followed by the second (6–10 mm). The last category is represented by a single specimen.

In conclusion, it should be emphasised that the majority of the blades are fragmented. The mesial fragments predominate, followed by the proximal ones. The analysis of traces on the dorsal surfaces convincingly showed that a great number of blades had been detached from unidirectional cores, except for a few specimens with traces of bidirectional cores. The majority of blades have parallel lateral edges, followed by the group of specimens gathered in the distal and, rarely, proximal parts. The cross-sections are mostly triangular, with other variants less numerous. The profiles are often straight, rarely convex or S-shaped. In most cases, the blades bear traces of lateral fragmentation.

A comparison of the results of the analysis of the assemblage revealed a prevalence of the debitage without cortical remains and specimens with formed butts among the flakes and blades.

Table 5. Metric parameters of the blades from the Telish-Laga flint assemblage.

length range (mm)	**number of finds**	**%**	**width range (mm)**	**number of finds**	**%**	**thickness range (mm)**	**number of finds**	**%**
< 20	2	2.0%	< 10	5	5.1%	1–5	71	73.2%
20–39	39	40.2%	10–20	73	75.3%	6–10	25	25.8%
40–59	44	45.4%	21–30	18	18.6%	> 10	1	1.0%
60–80	12	12.4%	31–40	1	1.0%			
TOTAL	97	100%	TOTAL	97	100%	TOTAL	97	100%

Retouched forms (329)

In any Stone Age collection, the retouched forms are of greatest interest. The tools are diagnostic markers for the cultural and chronological characteristics of a given archaeological assemblage. The study found that the retouched forms represent 23.6% of the entire material and within that group end-scrapers are most frequently encountered, amounting to more than half of the retouched forms, followed by the retouched blades and fragments, while the other types of tools are scarcely represented.

Table 6. Typological distribution of the tools from the Telish-Laga flint assemblage.

typological groups	**number of finds**	**%**
retouched flakes and fragments	53	16.2%
retouched blades and fragments	135	41.0%
truncations	14	4.3%
end scrapers	122	37.0%
perforators	2	0.6%
burins	1	0.3%
bifacial retouched tools	2	0.6%
TOTAL	329	100.0%

End scrapers (122)

End scrapers are one of the numerous typological groups that include about half of the retouched forms. Generally, the end scrapers are formed on blades. Typologically, they can be divided into:

- end scrapers with convex fronts, shaped mostly with an abrupt and semi-abrupt retouch (Fig. 2.7, 10). In some cases, the specimens have a semi-abrupt retouch on one of the lateral edges. In other cases, the retouch is abruptly denticulated on the ventral surface and with marginal retouch on both lateral edges;
- end scrapers with straight fronts, with an abrupt retouch (Fig. 2. 8,11), formed mainly on blades or blade fragments. Only five of these specimens are on flakes and fragments. Some of the end scrapers have semi-abrupt/abrupt retouches on both lateral edges;
- end scrapers with asymmetrical fronts, with an abrupt or, in some cases, semi-abrupt retouch. Three of the specimens are on flakes, the rest on blades or fragments.

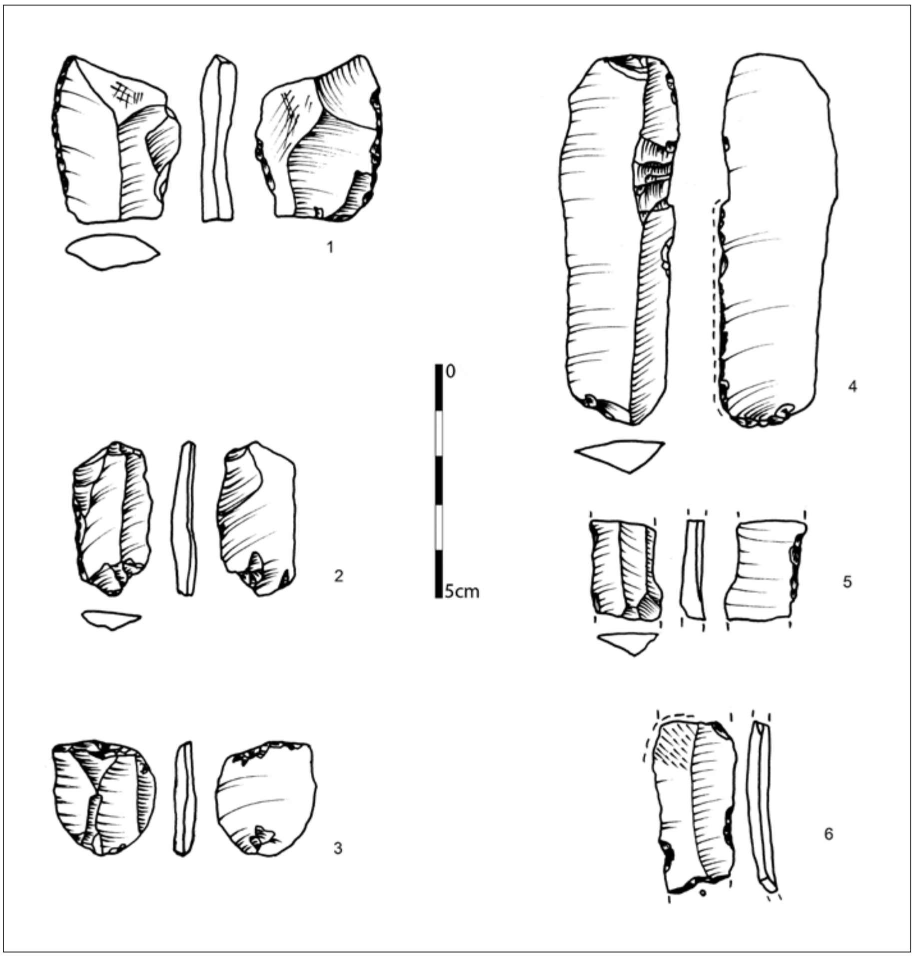

Fig. 1. Telish-Laga. Chalcolithic flint assemblage: 1–3 – retouched flakes; 4–6 – retouched blades (drawing by Elka Anastasova).

Some of the end scrapers have semi-abrupt or abrupt retouches on either or both side edges (Fig. 2. 9).

The end scrapers typically have convex fronts, shaped with an abrupt and semi-abrupt retouch. A minimal number of them have straight fronts. End scrapers with a sharply arched and asymmetrical front are represented by only one specimen. Some of the end scrapers have a small, marginal, semi-steep bilateral retouch.

The analysis of end scrapers suggests that those with a convex front and an abrupt retouch are characteristic for the discussed assemblage. Only 13 specimens were retouched on the lateral edges.

Retouched blades and blade fragments (135)

Blades and blade fragments with various types of retouches applied most often to the lateral edges belong to this group. Fragments of blades predominate, and mainly the mesial ones. According to the type and location of retouches, they can be divided into the following categories:

- blades with a semi-abrupt or abrupt denticulated retouch (Fig. 1. 6) on either or both lateral edges. Only in one case was the retouch found on the ventral side of the blade;
- blades with fine, marginal retouch on either or both lateral edges. Some of the specimens are mesial and proximal blade fragments;
- blades with a semi-abrupt or abrupt retouch on either lateral edge (Fig. 1. 5) on the ventral side or on both edges (Fig. 1. 4). The majority of specimens are fragments of blades.

Retouched flakes and flake fragments (53)

- flakes with notches, formed by an abrupt or semi-abrupt retouch, mainly on one of the lateral edges. In one case, the notch is located on the ventral side of the flake;
- flakes with an alternative retouch on both lateral edges (Fig. 1. 1);

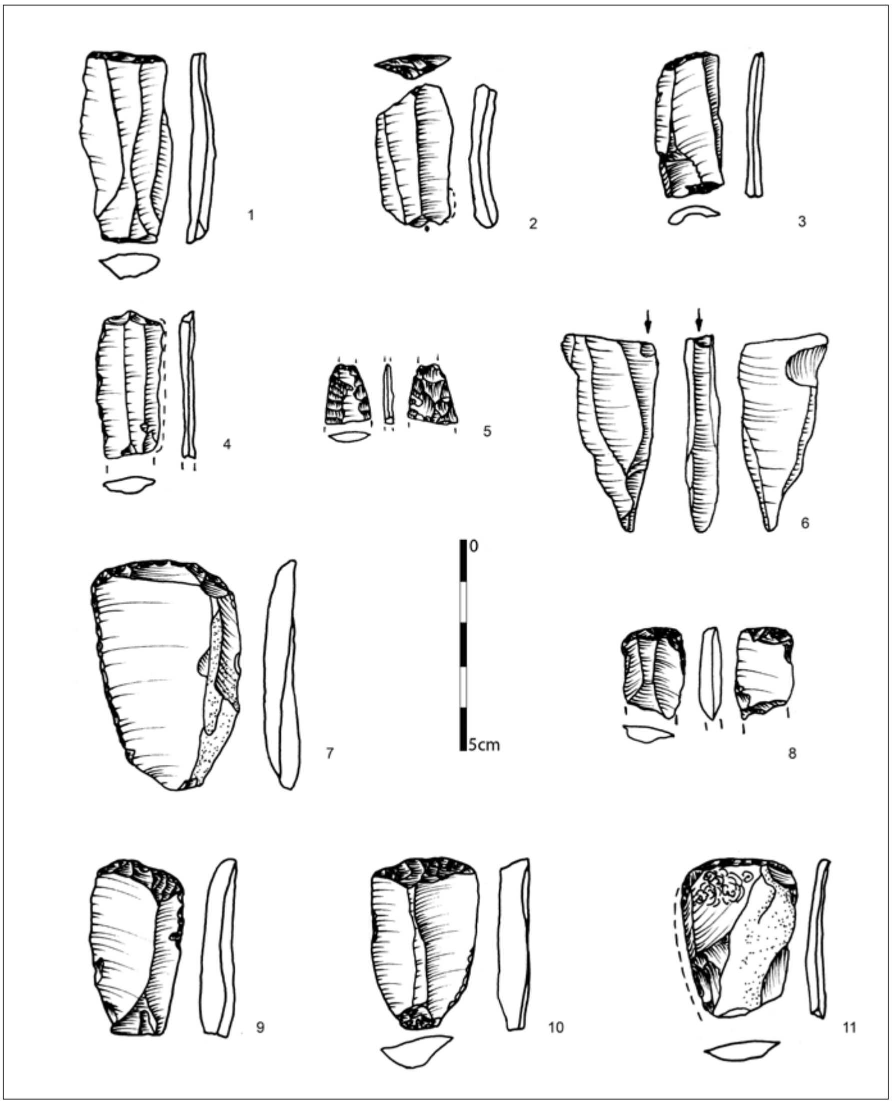

Fig. 2. Telish-Laga. Chalcolithic flint assemblage: 1–3 – truncated tools; 4 – perforator; 5 – arrowhead fragment; 6 – burin; 7–11 – end scrapers (drawing by Elka Anastasova).

- flakes with fine, marginal retouch on either or both lateral edges on the ventral side (Fig. 1. 2,3).

Truncated tools (14)

All of the truncated tools are formed on blades. Only four specimens have oblique truncation (Fig. 2. 1,2). The rest have straight truncation (Fig. 2. 3). The majority of the blades have unidirectional cores and straight profiles. Some of the specimens were retouched on either or both lateral edges. Others are notched, formed by an abrupt or semi-abrupt denticulated retouch.

Bifacial tools (2)

One of the specimens is a fragment of a tool and the other is a distal part of an arrow. They have been formed on fragments of blades. The retouches are usually flat and covered (Fig. 2. 5).

Burin (1)

It is a single burin on a proximal fragment of a blade (Fig. 2. 6).

Perforators (2)

One of the perforators is on a mesial fragment of a blade with a symmetrical pointed tip formed with a semi-abrupt retouch. The other specimen is on a flake with a formed butt, a well-exposed pointed tip with an abrupt retouch (Fig. 2. 4).

The techno-typological structure of the Telish-Laga flint assemblage suggests the following conclusions:

- a relatively small number of cores;

- from a technological point of view, the debitage products were obtained mainly from unidirectional cores;
- the blades significantly prevail among the debitage products in the assemblage;
- the examination of the butts of debitage and the retouched tools indicated (proved) the formed butts as the most numerous groups of finds, which is directly connected with the preparation of the cores;
- relatively large number of retouched tools. More than half the tools are on blades. The end scrappers prevail in the assemblage. In most cases, the end scrapers have convex fronts, shaped by abrupt and semi-abrupt retouches. Still, another large group contains retouched blades with steep, semi-steep, on one or two lateral edges;
- lack of typological diversity in the retouched tools.

Comparing the results of the technological analysis of the flakes and blades in the assemblage, it can be concluded that the frequency of mesial blades and mesial flake fragments is the highest. The prevalence of end scrapers in the assemblage, as well as traces of wear macroscopically visible on some end scrapers, indicate manufacturing activities directly oriented towards processing animal goods, such as skin, meat, bone, and horn. In general, the structure of the assemblages indicates that the basic processing and preparation of the cores was mainly carried out off-site. Within the site area, other kinds of processes occurred, such as manufacturing flakes or blades from cores, retouching, repairs, and so on.

The study of the manufacturing cycle and an attempt to reconstruct it are essential to the flint assemblage analysis.[3] To reconstruct the manufacturing cycle for a given assemblage, it is necessary to include key components in its structure:

- The first stage – testing of the raw materials; initial shaping of the pre-cores took place outside the settlement, in the proximity of the sources of raw materials or in workshops in their vicinity;
- The second stage – the final preparation of the cores as well as manufacturing of the blades, flakes, and retouched forms probably took place inside the settlement.[4]

The flint assemblage from Telish-Laga undoubtedly possesses the characteristics necessary to link it to the Chalcolithic Period. The most numerous among the tools is the group of end scrapers, formed with a semi-abrupt or abrupt retouch typical for that period.[5] The flint assemblage also includes tools typical for the period, such as retouched blades, truncations, backed tools, and others.

The settlement in the locality of Laga occupied the stratigraphic hiatus between the horizons II and III of the prehistoric settlement of Telish-Redutite. Both sites belong to the so-called "altitude settlements", characteristic for the area of the Krivodol-Salkutsa-Bubani ethno-cultural complex. However, it is also possible to accept a different hypothesis – the settlement from the locality of Laga may have continued Horizon II of Redutite.[6]

In the technological and typological aspect, the assemblage of Telish-Laga finds analogies in certain Neolithic collections, such as Gradeshnitsa-Malo Pole, Gradeshnitsa-Lukanovo Darvo, or Zaminets.[7] It also shares similarities with the late Neolithic–Early Chalcolithic assemblages of Altimir-Bresta[8] and Gradeshnitsa-Gradishteto (Kaleto).[9]

The present study of the flint assemblage from Telish-Laga represents a step towards enriching our knowledge about the nature of flint production in the discussed area.

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К вопросу об освоении Центра Русской равнины в позднеледниковье и раннем голоцене по данным геоархеологии

On the colonisation of the Central Russian Plain in Late Glacial and Early Holocene according to geoarchaeological data

Abstract

Until recently, interpreting archaeological data on the colonisation of the Central Russian Plain during the last glacial epoch (Late Valdai, Vistulian) had been hampered by the prevailing view that vast areas along the ice sheet boundary were submerged by large proglacial lakes. Under the hypothesis that the Tver proglacial lake was covering Upper Volga lowlands and the Dubna depression, these territories would not be habitable until the Pleistocene-Holocene boundary when they finally dried up in the process of deglaciation.

In 2018–2021, geoarchaeological investigations were carried out in Zabolotsky peatland (Moscow Region) to test this hypothesis. It was found that during the whole Late Valdai (Vistulian) glacial epoch, the prevailing environmental conditions in the Dubna Lowland were fluvial, rather than lacustrine. Thus, it is entirely plausible that large parts of the Zabolotsky area could already start to become populated at that time. AMS-dating of resin samples from the grooves of bone and hornbeam artefacts attributed to Epigravettian Resseta culture pinpoint the potential *timing* of this event to circa 15,500 cal BP. During Early Holocene, Zadnepilevo industry was the successor to Resseta tradition.

Other populations known to exist in Central Russian Plain during late Pleistocene – early Holocene are attested from Bromme, Ahrensburg, Kultino and Purgasovo culture complexes. The identification of Elin-Bor, Butovo and Ienevo cultures in the Volga-Oka basin during the Mesolithic had been made by tampering with primary data. Therefore, any further allusion to these cultures would be unethical.

Seasonal migration patterns of both Resseta and Zadnepilevo populations are evidenced not only by data from the Russian Plain, but also from the Scandinavian Peninsula. Here, they are represented by the so-called “eastern pulse” industry. To piece together the cultural and historical development of Eastern and Northern Europe, a substantial increase in field research is needed.

Keywords: Russian Plain, Valdai (*Weichselian, Vistulian*) glacial epoch, Late Glacial, geoarchaeology, palaeohydrology, Tver proglacial lake, Pleistocene, Holocene, alluvial accumulation, radiocarbon (AMS) dating, Resseta culture, Zadnepilevo culture (Русская равнина, валдайская (вислинская) ледниковая эпоха, позднеледниковье, геоархеология, палеогидрология, плейстоцен, голоцен, аллювиальная аккумуляция, радиоуглеродное (AMS) датирование, рессетинская культура, заднепилевская культура)

Введение

Территория Центра Русской равнины в эпоху максимума валдайского (вислинского) оледенения (Last Glacial Maximum – LGM) не была покрыта ледниковым щитом, и потенциально была доступна для заселения, если, разумеется, имелись соответствующие людские ресурсы. В эпоху позднеледниковья (Late Glacial Time – LGT) в процессе дегляциации возможности для освоения приледниковых областей существенно расширялись.

Между тем, единичность археологических свидетельств о присутствии в центральной части Европейской России пунктов позднеледникового возраста осложняется как практическим отсутствием для них независимых радиоуглеродных дат, так и выразительных фаунистических остатков, где бы присутствовали представители мамонтового фаунистического комплекса, *являющихся надёжным маркёром* плейстоценового возраста[1]. Другим фактором, сдерживающим понимание реальной картины освоения территории в LGT, служило представление о широком распространении на Русской равнине системы ледниково-подпрудных озёр, которые протянулись вдоль края Скандинавского ледникового щита и покрывали своими водами просторы низменностей рек Арктического бассейна и Верхневолжского водосбора[2]. В соответствии с этой гипотезой считалось, что заселение Верхнего Поволжья было ограничено моментом осушения гипотетического Тверского палеоозера, деградация которого на вепсовском этапе валдайского (вислинского) оледенения привела к формированию в южной части Верхне-Волжской равнины р. Дубны и каскада остаточных озёр, одним из которых было Заболотское, сохранившееся до наших дней в восточной части Заболотского торфяника[3].

Активное изучение за последние годы геоморфологических условий региона на протяжении поздневалдайского времени[4] и проведение геоархеологических изысканий совместной экспедицией ИА РАН и ИГ РАН под руководством А. Н. Сорокина и А. В. Панина на примере Дубнинской низменности[5] позволило получить достоверные сведения о развитии гидрографии и рельефа, а также возможности освоения этой территории людьми ранее рубежа плейстоцена – голоцена. В работе систематизированы краткие итоги изысканий 2018–2021 гг. на территории Дубнинской низменности в границах Заболотского края (Московская область, Талдомский и Сергиево-Посадский районы), где были получены наиболее зна*чимые* результаты.

Вплоть до начала предметных изысканий считалось, что повсеместно залегающие под торфяником суглинистые отложения являются донными осадками Тверского палеоозера, а смена вверх по разрезу суглинков торфами указывает на его последовательную деградацию в ходе дегляциации, постепенное обмеление акватории и её постепенное заболачивание, начиная со среднего голоцена. В соответствии с этой концепцией заселение Дубнинской низины могло произойти после распада Тверского приледникового озера, при переходе от плейстоцена к голоцену, когда локальные возвышения обсохшего озёрного дна стали пригодными для обитания участками суши. В результате, как представлялось, хозяйственная деятельность и повседневная жизнь населения каменного века Дубнинской низменности были тесно связаны с мелководными реликтами бывшего крупного озёрного водоёма и их флуктуациями[6].

В последние годы стали накапливаться материалы, ставящие под сомнение существование в бассейне верхней Волги в поздневалдайское время обширных подпрудных озёр[7]. Появились и археологические свидетельства более раннего, чем считалось, появления человека в этом регионе[8]. И то, и другое имеет большое значение для интерпретации накопленных результатов изучение Заболотского края и для определения стратегии его дальнейших исследований. Следует также отметить, что вопрос о времени заселения Верхнего Поволжья и естественных условий миграций первобытного населения лежит в более широком контексте проблемы «восточного импульса». Говоря иначе, - одного из путей в ходе первоначального заселения Фенноскандии[9].

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[1] Markova, van Kol'fskhoten (ed.) 2008.
[2] Kvasov 1975; 1979.
[3] Aleshinskaya *et al.* 1992; 2001; Gracheva *et al.* 2015; Lozovskaya 2018; 2019; Lozovskaya (ed.) 2018; Lozovskiy *et al.* (ed.) 2013; 2014; Nikolayev *et al.* 2002; Sidorov 1996; 2009; 2020; Sorokin 2009; 2016a; Sorokin *et al.* 2018.
[4] Astakhov *et al.* 2016; Baranov *et al.* 2019; Konstantinov *et al.* 2021; Panin *et al.* 2011; 2020; Sidorchuk *et al.* 2014; 2018.
[5] Panin *et al.* 2020; 2020a, b; 2021; Sorokin *et al.* 2019; 2020; 2021; 2022.
[6] Lozovskiy *et al.* (ed.) 2013; 2014; Lozovskaya (ed.) 2018; Sidorov 1996; 2009; 2020.
[7] Baranov *et al.* 2018; 2019; 2022; Borisova *et al.* 2022; Panin *et al.* 2020; 2020a, b; Utkina 2017; Utkina *et al.* 2017.
[8] Sorokin 2006a, b; 2007; Sorokin *et al.* 2009; 2014; Zhilin 2007.
[9] Carpelan 1999; Damlien 2014; Damlien *et al.* 2018a, b; Larsson 1990; 1996; Kleppe 2018; Knutsson *et al.* 2012; 2016; Manninen *et al.* 2011; 2014; 2021a, b; Sørensen *et al.* 2013; Takala 2004.

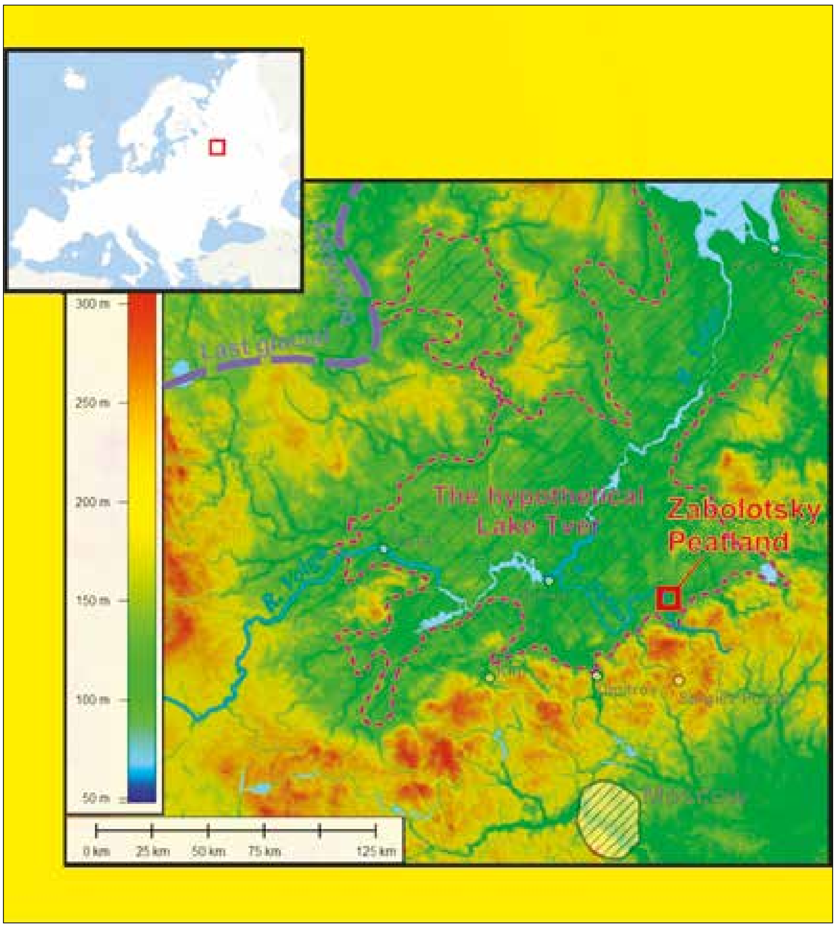

Рис. 1. Положение района исследований в пределах Верхневолжской низменности с гипотетическими поздневалдайскими приледниковыми озёрами, реконструированными Д. Д. Квасовым (1975).

Fig. 1. Location of the study area within the Upper Volga Lowland with hypothetical Late Valdai proglacial lakes proposed by D. D. Kvasov (1975).

В результате назрела насущная необходимость разрешения противоречий между свидетельствами раннего освоения территории и доминировавшей в течение длительного времени палеогеографической концепцией, а также обосновывается положение о возможности первоначального заселения Заболотского края уже в LGT. С этой целью в 2018–2021 гг. были проведены геоархеологические исследования в границах Заболотского торфяника, предварительные результаты которых были частично опубликованы[10]. В этой работе полученные данные подвергаются более детальному анализу.

Природные особенности территории

Район исследований находится в 150 км к юго-востоку от максимальной границы валдайского (*вислинского*) оледенения (18–20 тыс. л. н.) (рис. 1; Fig.1) и приурочен к левобережью регулярно затапливаемой заболоченной поймы р. Дубны – левобережного притока самой крупной водной артерии Русской равнины р. Волги. По данным ряда исследователей[11], изучаемая территория сложена торфяником мощностью от 0,5 до 2,0 м, подстилаемым 1,5–3,0 м толщей средних и тяжёлых суглинков, со следами криогенеза и эфемерного почвообразования позднеплейстоценового-раннеголоценового возраста, покоящихся на алеврите, формирование которого вплоть до недавнего времени традиционно связывали с отложениями Тверского приледникового озера[12].

В суглинистом субстрате непосредственно под торфом обнаруживается верхняя погребённая почва позднеголоценового возраста с выраженными следами гидроморфизма (железисто-гумусовыми потёками и вивианитовыми конкрециями), которая,

[10] Panin *et al.* 2020a; Sorokin *et al.* 2020a, b, c; 2021.

[11] Gracheva *et al.* 2015; Nikolayev *et al.* 2002; Vandenberghe *et al.* 2010.

[12] Gracheva *et al.* 2015; Nikolayev *et al.* 2002; Vandenberghe *et al.* 2010.

как полагали, маркировала фазу обмеления Заболотского озера[13]. Период вторичного затопления Заболотской котловины ассоциировался с прослоем бурого суглинка, залегающего в кровле рыхлых напластований, который сформировался 2,6–2,9 тыс. л. н. на рубеже суббореального и субатлантического периодов голоцена[14]. А в основании суглинков дислоцируется нижняя погребённая почва, время формирования которой простирается от финала плейстоцена и вплоть до среднего голоцена[15].

В ходе изысканий 1997–2008 гг. было выявлено, что поверхность погребённых торфами суглинков обладает относительно пересечённым рельефом. Вследствие этого было высказано предположение о существовании системы ложбин и межложбинных возвышений, определявших контуры участков, вполне пригодных для освоения в каменном веке[16]. Было также установлено, что этапы стабилизации палеоландшафтов, сопрягающиеся с почвообразованием, представляли временные интервалы, вполне комфортные для заселения территории[17]. Не было ясно лишь время их формирования и начало реального освоения региона.

Методика исследований

Полевые исследования 2018–2021 гг. носили комплексный характер и были направлены на изучение природных и культурных факторов развития палеосреды и первобытных обществ, что позволяет относить их к категории геоархеологических. Геоархеология – это дисциплина, представляющая собой симбиоз естественных наук (четвертичной геологии, геоморфологии, палеогеографии, почвоведения, тафономии) и гуманитарной археология, которая генерирует новые знания о природных и общеисторических закономерностях на основании естественнонаучных методов исследования, материалы для которых получают в процессе полевых археологических изысканий[18]. В силу этого, наряду с классическими археологическими методами, проводились различные естественнонаучные изыскания, необходимость которых была вызвана как задачами реконструкции окружающей среды и ландшафта, так и решением сугубо гуманитарных задач – этологией человека, составом и характером культурно-исторических процессов, протекавших на переломе геологических эпох.

Естественнонаучный блок включал площадную тахеометрическую съёмку изучаемого полигона, ортофотосъёмку территории с беспилотного летательного аппарата (БПЛА) «DJI Mavic 2 Pro», георадиолокационное зондирование отложений георадарами «ОКО-2» (ООО «ЛогиС», Россия) и «Питон» (Radar Systems, Inc., Латвия) (до глубины 6,5 м), механическое бурение напластований с помощью мобильной установки «Pride Mount 80» на шасси «УАЗ 3310» усовершенствованным шнековым способом (до глубины 18,5 м), почвенные исследования, радиоуглеродное (AMS и OSL) датирование отложений и артефактов, а также был выполнен обширный комплекс лабораторных естественнонаучных анализов. Их методика, состав и результаты были подробно описаны в работах авторов[19]. Важно отметить, что все эти изыскания проводились по заказу археологов, инициировались ими и были нацелены на полноценное изучение памятников археологии в качестве объектов биосферы.

Натурные археологические изыскания основывались на использовании комплексных междисциплинарных методов, составляющих базис геоархеологии. В их состав входили пешие разведки и стационарные раскопки. Рекогносцировки (2018–2021 гг.) производились путём тщательного обследования узловых аномалий, выявленных путём геофизического зондирования местности и в процессе съёмки беспилотным летательным аппаратом (БПЛА). Раскопкам в 2018–2019 гг. подверглись два разногенетических участка комплексного памятника Минино 2, который сочетает в себе структуры грунтового могильника и многослойной стоянки[20]. Главными целями раскопок, помимо пополнения коллекции, служили предметное изучение воздействия почвенных процессов на культурные слои и артефакты, вопросы генезиса и тафономии напластований и объектов. На основе комплексного анализа полученных данных производились реконструкция среды обитания, погребённых ландшафтов и динамики поселенческой стратегии древнего населения[21].

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[13] Gracheva *et al.* 2015; Lozovskiy *et al.* (ed.) 2014; Vandenberghe *et al.* 2010.

[14] Lozovskiy *et al.* (ed.) 2013; Vandenberghe *et al.* 2010.

[15] Nikolayev *et al.* 2002.

[16] Gracheva *et al.* 2006; 2015; Nikolayev *et al.* 2002; Vandenberghe *et al.* 2010.

[17] Gracheva *et al.* 2006; 2015; Sorokin 2016a, b; Sorokin *et al.* 2018; Vandenberghe *et al.* 2010.

[18] Ayala *et al.* (eds) 2007; Butzer 1982; Davidson *et al.* (eds) 1976; Medvedev 2008; Sorokin 2018a; Sorokin *et al.* 2018.

[19] Manninen *et al.* 2021a; Panin *et al.* 2022; Sorokin *et al.* 2021.

[20] Sorokin 2009; 2011; 2014; Sorokin *et al.* 2014; 2018.

[21] Berdnikova *et al.* 2001; 2011; Medvedev 2008; Panin *et al.* 2020a, b; 2022; Sorokin *et al.* 2018; 2019; 2020a, b; 2021.

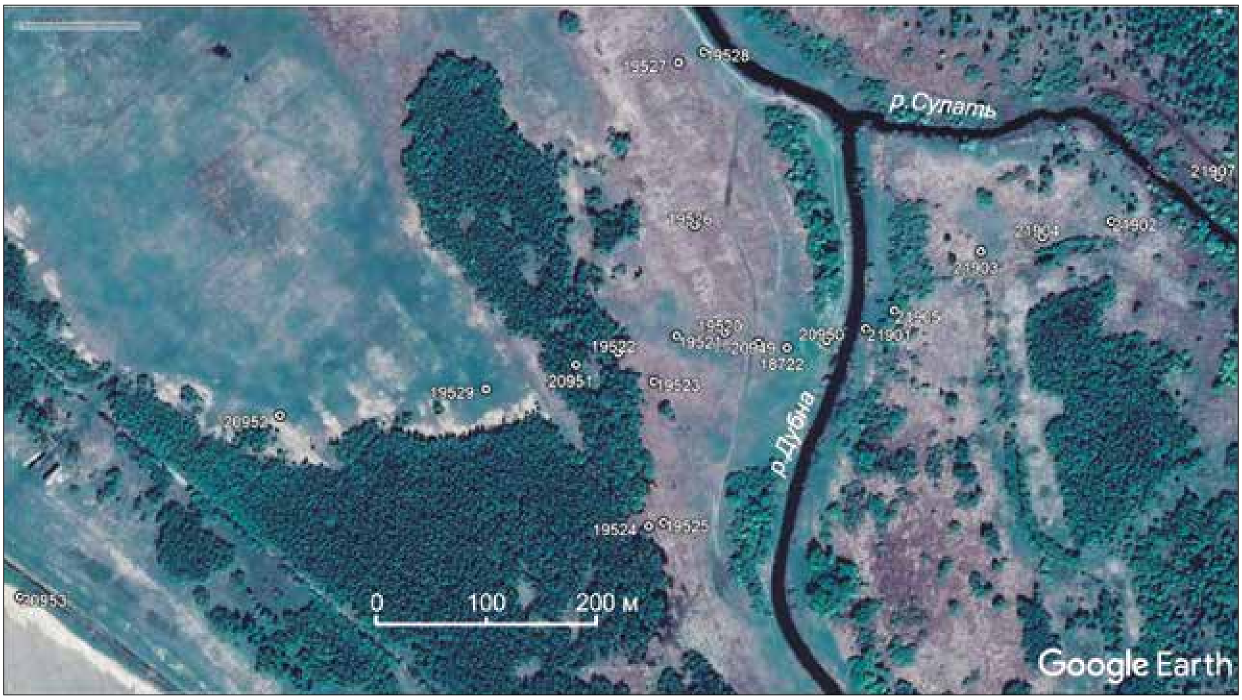

Рис. 2. Заболотский торфяник: местоположение буровых скважин.

Fig. 2. Zabolotsky peat bog: location of boreholes.

Результаты геоморфологических и палеогеографических исследований

Бурение мобильной буровой установкой «Pride Mount 80» на шасси «УАЗ 3310» (рис. 2; Fig. 2) подтвердило основные особенности геологического строения района, отмеченные всеми предыдущими исследователями[22]. Торф, покрывающий пойму реки Дубна, подстилается суглинками, кровля которых содержит серо-гумусовую почву с обильными кротовьими норами и рытвинами, что вместе с его морфологией свидетельствует о луговых условиях его формирования. Две 14С даты были получены из кровли этой почвы в скважине 19520, 9560±20 cal BP для растительных остатков и 9090±50 cal BP для общего органического углерода. Обе они указывают на окончание процесса почвообразования, вероятно, из-за заболачивания территории и начала формирования торфяника во второй половине раннего голоцена. С того времени условия жизни там стали неблагоприятными.

Фациальный анализ напластований 24 буровых скважин и AMS-даты образцов из них (рис. 3, Fig. 3) позволили выявить три генерации древних речных русел[23]. Возраст самого глубокого из них (дно на 11–12 м ниже современного уровня реки) составляет 30–40 тыс. л. н., второго (дно на 6 м ниже реки) - датируется примерно 16 тыс. л. н. Третий уровень включает в себя два неглубоких, широких палеоканала с ложем на высоте 2–3 м от межени, их возраст составляет порядка 14,5–15,5 тыс. л. н.

Два более старых палеорусла полностью погребены, а оба более молодых прослеживаются в современной топографии поймы в виде широких впадин. Их интерпретация в качестве палеоканалов подтверждается не только бурением, но и данными георадара, с помощью которого удалось выявить характерные закономерности осадконакопления[24].

Для шести образцов из основных литостратиграфических единиц разреза скважины 19520 О.Н. Успенская провела анализ биологических макроэлементов[25]. Суглинок тёмного цвета на глубине 1,9 м, непосредственно под основанием торфа, содержал почти исключительно высшие растения,

[22] Gracheva *et al.* 2015; Nikolayev *et al.* 2002; Vandenberghe *et al*, 2010.

[23] Panin *et al.* 2022.

[24] Panin *et al.* 2022.

[25] Panin *et al.* 2020b; 2022.

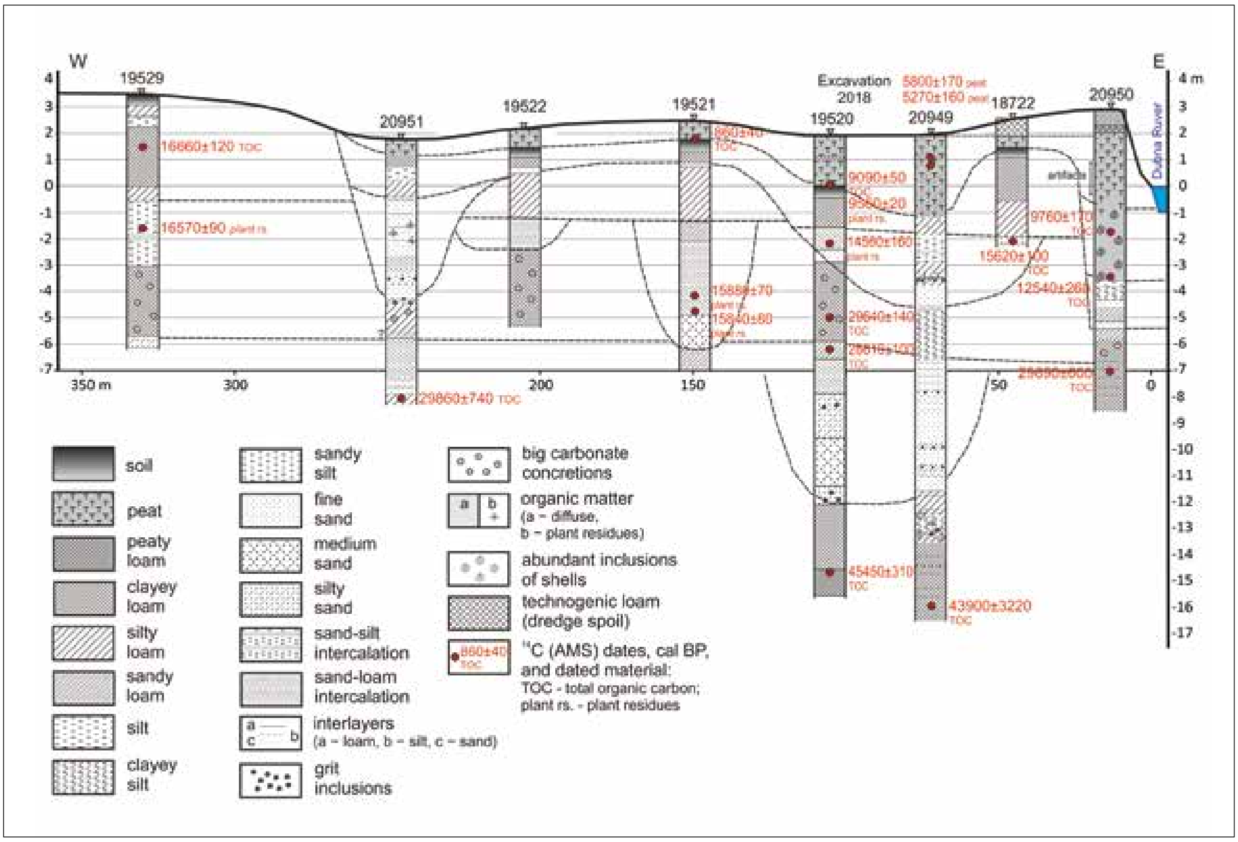

Рис. 3. Геологическое строение поймы р. Дубны: буровые профили скважин и АМС-даты образцов.

Fig. 3. Geological structure of the Dubna River floodplain: borehole profiles and AMS sample dates.

как древесные, так и водно-болотные, которые, возможно, были занесены паводковыми водами. Это подтверждает первоначальную интерпретацию слоя как гидроморфной пойменной почвы. Аналогичный состав биологических остатков был продемонстрирован суглинками на глубинах 3,1 и 5,3 м. Дополнительное указание на их субаэральное происхождение (пойменные, а не озёрные отложения) заключается в наличии одиночных капсул яиц червей. Озёрные (озёрно-болотные) отложения были распознаны на глубине 16–18 м по обилию остатков типичных водных растений (разнообразие водорослей, *Scirpus*, *Potamogeton*) и животных (*Spongia*, *Cladocera*). Из этих отложений были получены радиоуглеродные даты 43000-45000 cal BP.

Таким образом, новые данные позволяют со всей очевидностью отказаться от оценки пачки рыхлых напластований выше 16 м в качестве озёрных и считать их аллювием пойменной фации.

Результаты археологических исследований

Реальным итогом **археологических** разведок стало увеличение почти в 1,5 раза числа памятников Заболотского торфяника (с 25 до 35; рис. 4, 5; Figs 4, 5), а также обнаружение и локализация двух новых «кустов» стоянок на правобережье р. Дубны в низовьях р. Сулати, сопряжённых с ныне погребёнными гривами и островами. Немаловажно и выявление с помощью дрона только в границах контрольного полигона, площадь которого не достигает и 15% габаритов Заболотского края, не менее 50 погребённых структур, где высока вероятность обнаружения новых геоархеологических объектов.

В процессе стационарных раскопок Минино 2 (рис. 4; Fig. 4) было продолжено комплексное изучение неординарного памятника эпохи каменного века, в котором площадь многослойной стоянки использовалась и для совершения грунтовых захоронений. Сочетание структур могильника, прорезающих и подстилающих поселенческие напластования, в условиях длительного воздействия разнообразных природных процессов позднеплейстоценового и голоценового времени (педогенез, педотурбация, криотурбация, оруденение, аэрация, тафономия и т. д.) привело к радикальной трансформации культурных слоёв и культуросодер-

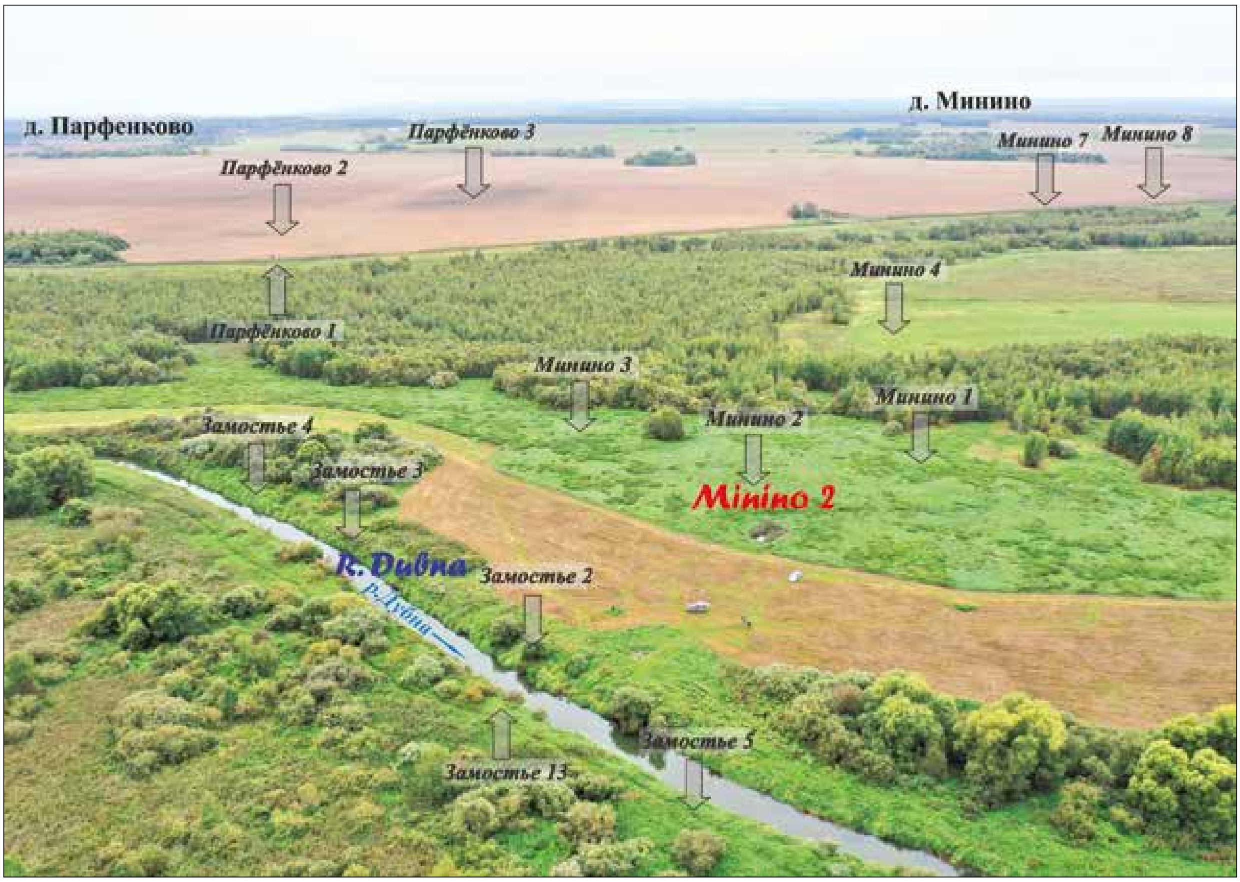

Рис. 4. Аэроснимок Заболотского торфяника с дрона: местоположение стоянок вдоль русла р. Дубны.

Fig. 4. Aerial view of Zabolotsky peat bog from drone: location of the sites along the Dubna River.

жащих прослоев и образованию разнообразных палимпсестов, требующих значительных усилий по своей фиксации, локализации и интерпретации. Существенную негативную роль в состоянии всех памятников сыграли и процессы новейшего времени, являющиеся результатом мелиорации Заболотского торфяника 1920-х и 1970-х гг.

Всего в ходе стационарных раскопок стоянки-могильника Минино 2 в 2018–2019 гг. были вскрыты два участка, первый из которых (15 кв. м) был заложен на суходоле в жилой зоне стоянки, второй (50 кв. м) - в прибрежной обвоженной части памятника.

Субаэральное залегание участка 2 принципиально не отличалось от предыдущих исследований (1997–2001, 2006–2008)[26]. Культурные отложения здесь были радикально преобразованы почвенными процессами (педогенез и педотурбация), из-за которых артефакты были в значительной степени перемешаны. В то же время участок 6 дал чёткую стратиграфическую картину, причём основание погребённой почвы здесь состояло из двух разнородных литологических горизонтов. В верхнем из них собраны артефакты голоценового возраста, относящиеся к заднепилевской мезолитической культуре, в нижнем, плейстоценового возраста, находились предметы рессетинской финально-палеолитической культуры.

В верхней части разрезов обоих участков, непосредственно под торфом, дислоцируется буроватый прослой очень плотного глинистого сапропеля аллювиального происхождения, нарушенный трещинами усыхания. Это верхний культуросодержащий прослой памятника, образовавшийся в результате повышенной паводковой активности между 2600 и 2900 гг. до н. э., когда Заболотская котловина была в значительной мере затоплена[27]. Его относительно плоское основание свидетель-

[26] Sorokin 2009; 2011; 2016a, b; Sorokin *et al.* 2014; 2018.

[27] Gracheva *et al.* 2015; Vandenberghe *et al.* 2010.

ствует о водной эрозии подстилающих отложений, а узкие торфяные клинья проникают в его кровлю через трещины усыхания. Как и в предыдущие годы, находки состояли из редких фаунистических остатков, небольших фрагментов льяловской, верхневолжской и протоволосовской керамики, кремнёвых отщепов и отдельных орудий, в том числе двух неолитических наконечников стрел листовидной формы, тщательно обработанных двусторонней ретушью, и орудий эпохи мезолита.

Предметы из нижнего культурного слоя участка 2 относятся к заднепилевской мезолитической (8500-10000 cal BC) и рессетинской позднепалеолитической (10500-13500 cal BC) культурам. Всего их 1687, включая 269 фаунистических фрагментов, 32 сильно фрагментированных костяных (роговых) орудия и 1442 каменных предмета, из которых 354 были с вторичной обработкой.

Интересно, что большинство фаунистических остатков и древесных фрагментов на участке 6 концентрировались около удалённой от суходола восточной стенки раскопа, тогда как немногочисленные каменные изделия практически все локализовались около его западной стенки. Судя по всему, в процессе раскопок была вскрыта, прирусловая часть памятника, куда фауна, древесина и разнообразные артефакты были перемещены в результате делювиальных процессов или в процессе водных занятий. О специфике участка 6 говорят также общее плавное понижение всех прослоев в восточном направлении и турбированный характер нижней погребённой почвы. Здесь была собрана выразительная коллекция из органических материалов, правда, из-за значительной удалённости от жилой площадки стоянки их общее количество уступает тому, что было обнаружено на прилегающем участке 5 в 2000–2001 гг.[28]. Численно преобладают фаунистические остатки хорошей сохранности (364). Это неудивительно из-за уровня их залегания и сравнительно высокой обвоженности напластований. Немаловажна и скорость захоронения фауны и артефактов в водной среде. Артефакты представлены серией выразительных орудий из кости и рога (78), что увеличило коллекцию не менее чем на четверть[29]. А с учётом того, что среди них присутствует и ряд неординарных вещей, подобный результат следует признать весьма удачным.

Среди находок особого внимания заслуживают почти целая тонкая костяная игла с просверленным ушком – это первое изделие подобного рода на Заболотском торфянике, да и вообще в финально-палеолитических - мезолитических памятниках Центральной России. Крайне интересно и уникальное роговое композитное изделие, не имеющее аналогий, состоящее из двух деталей, скреплённых штифтами, вставленных в отверстия, в которых сохранилась смола, образцы которой переданы в лабораторию ИГ РАН для AMS-датирования. Не исключено, что это своеобразное навершие копьеметалки. Выразительны и другие изделия - роговой топор-клевец со сверлиной в средней части, веретенообразные наконечники стрел, мотыга из рога лося, тёсла, выполненные из крупных трубчатых костей. К массовым находкам относятся косые и симметричные острия, использовавшиеся в качестве наконечников копий и рогатин, ножи из лопаток лося и скребки из челюстей бобра.

Таблица 1. ГАО Минино 2 Список AMS-дат [30].

Table 1. Minino 2, The radiocarbon dating results

Site	Number	Lab. code	Date ±	Cal BP	Median
Minino 2	Y-2 P-1 Nr. 1 (274B-169/-171)	AAR-27604	12946 ± 61	15721 15250	15473
Minino 2	Y-5 P-2 Nr. 123 (66Г-238)	AAR-27607	12115±58	14135-13782	13997
Minino 2	Y-5 P-2 Nr. 114 (54A-201)	AAR-27603	10653±47	12708-12553	12631
Minino 2	Y-5 P-2 Nr. 172(276БГ-214/-216)	AAR-26567	9613±50	11169-10768	10944
Minino 2	Y-5 P-2 Nr. 193 (sample 1, slot) (6A-242)	AAR-26568	9206±35	10491-10253	10358
Minino 2	Y-5 P-2 Nr. 193 (sample 2, handle) (6A-242)	AAR-27606	9173± 43	10486 10237	10333
Minino 2	Y-5 P-2 Nr. 152 (6B-232)	AAR-27605	9200±45	10496-10247	10357

[28] Sorokin 2009; 2011; 2014; Sorokin *et al.* 2014; 2018.

[29] Sorokin 2014; Sorokin *et al.* 2018.

[30] Manninen *et al.* 2021.

В процессе изысканий в радиоуглеродной лаборатории Архузского университета (Дания) было получено семь AMS-дат по смоле, сохранившейся в пазах вкладышевых наконечников (Табл. 1; Table 1), три из них позднеплейстоценовые для артефактов рессетинской культуры и четыре раннеголоценовые - для изделий заднепилевской культуры. Следует отметить и практическое совпадение дат, полученных по смоле из паза и остаткам древесины с черешка одного и того же крупного копья (№ 193). Это наблюдение крайне интересно для проверки эффективности радиоуглеродного метода и в источниковедческом отношении.

Таким образом, благодаря прямому AMS-датированию артефактов удалось впервые надёжно обосновать позднеплейстоценовый возраст рессетинских древностей. Немаловажно и то, что была подтверждена раннеголоценовая хронология заднепилевских изделий.

Палеогеографические условия и заселение Дубнинской низменности

Новейшие сведения позволяют по-новому взглянуть на природную обстановку на протяжении позднего плейстоцена — голоцена и начальные этапы освоения Дубнинской низины. Данные бурения показывают, что не позднее 30 тыс. л. н. дно котловины уже дренировалось р. Дубной — об этом свидетельствует погребённое палеорусло, вскрытое на глубине 9–14 м в скважине 19520 (рис. 2, 3; Figs 2, 3). Перекрывающие его плотные суглинки с карбонатными конкрециями встречаются повсеместно и образуют выдержанный покров в интервале от 1 до 6 м ниже уровня воды современной реки. Обилие карбонатных конкреций говорит о засушливости климата во время формирования или сразу после накопления слоя (до его захоронения). Эти суглинки представляют собой пойменную фацию аллювия периферической поймы, накапливавшуюся, когда река протекала где-то в стороне от скважины, на довольно большом расстоянии от неё. Обширная Заболотская котловина, периодически затапливавшаяся слабо текущими, местами стоячими, речными водами по условиям осадконакопления мало чем отличается от полупроточного сезонного озера.

Нельзя исключать, что частично суглинки отлагались и в постоянных озёрах, образовавшихся на периферии речной поймы, что вполне типично для пойм рек с направленной аккумуляцией наносов. Русла таких рек и приречные поймы постепенно растут вверх за счёт накопления в них аллювия, тогда как удалённые участки вследствие более низких скоростей наилконакопления в наращивании отстают. В этих относительно пониженных периферических частях поймы могут формироваться и многочисленные озёра. Примером может служить современный нижний Амур[31]. На тенденцию к аккумуляции в долине р. Дубны как минимум с 30 до 15 тыс. л. н. указывает последовательный подъём в разрезе палеорусел, обнаруженных в ходе бурения. Так образовалось, по-видимому, современное Заболотское озеро, а также другие, ныне уже заболоченные, но хорошо просматривающиеся на космических снимках вдоль долины р. Дубны и известные в литературе как Дубнинский озёрный каскад[32]. В заиливающихся древних протоках, помимо крупных, могли существовать и мелкие озёра, например в районе скважины 19520 и в ложбине западнее скважины 19522. Они могли быть постоянными и сезонными, остававшимися после очередного половодья и пересыхавшими к концу лета. Все эти водоёмы, а также сама р. Дубна, несомненно, играли важную роль в жизни и хозяйстве древнего населения. Важно, однако то, что их происхождение напрямую не связано с последним ледниковым покровом и не имеет прогляциального характера.

Большая ширина ложбин-палеорусел указывает на то, что в LGT Дубна была рекой значительно более многоводной, чем сейчас, однако сток воды существенно снизился ещё в позднем плейстоцене, после чего амплитуда перемещений русла, судя по отсутствию стариц и вееров блуждания, стала незначительной, а течение было слишком слабым, чтобы эродировать берега. В мезолите и неолите русло р. Дубны на изучаемом участке находилось, по-видимому, в 150–200 м восточнее — там имеется ложбина, хорошо заметная на спутниковых снимках. Современное положение река заняла в результате спрямлений при мелиоративных работах в советское время.

Рельеф поймы р. Дубны в период отмирания палеорусла 14–15 тыс. л. н. был более пересечённым, чем сейчас, с перепадами высот до 3–4 м, что хорошо визуализируется отражающими граница-

[31] Makhinov 2006.

[32] Sidorov 1996; 2009; 2020.

[33] Aleshinskaya *et al.* 1992; 2001; Kvasov 1975; 1979; Lozovskaya 2018; 2019; Lozovskaya (ed.) 2019; Lozovski *et al.* 2014; Lozovski *et al.* (eds) 2013; Nikolayev *et al.* 2002; Sidorov 1996; 2009; 2020.

ми на георадиолокационных профилях. В дальнейшем он постепенно выравнивался пойменной аккумуляцией. Во время половодий в LGT вода разливалась тонким слоем по широкой пойме. Течение было слабым, возникали застойные зоны, где из мутной воды отстаивался наилок. В результате пойменная фация имеет очень тонкий состав — тяжёлые суглинки, принимавшиеся ранее за озёрные отложения.

В раннем голоцене перепады высот уже не превышали 2.0–2.5 м, значительно уменьшается и пойменное осадконакопление, что приводит к формированию почвенного профиля в кровле пойменных суглинков. Это было самое «сухое» время в пойме Дубны за весь голоцен, максимально благоприятное для её освоения древним человеком. Цифровая модель контакта покровных торфов и подстилающих суглинков, построенная по данным георадиолокации, даёт представление о палеотопографии поверхности, осваивавшейся людьми в мезолите и неолите. На возвышенных участках в раннеголоценовое время активно развивалась серо-гумусовая почва лугового облика, перекрытая позднее покровом торфа. Её верхняя часть разбита трещинами дессикации (усыхания). Обнаруженные норы землероев и их зернохранилища свидетельствуют о луговой обстановке в условиях достаточно тёплого климата.

Накопление аллювия и торфяной залежи привело к сглаживанию поверхности. В результате перепады высот в настоящее время составляют всего 1–1.5 м. Несмотря на это в современном рельефе по-прежнему различимы некоторые крупные древние русловые формы — бывшие русловые протоки и разделяющие их каплевидные повышения — острова, образованные в LGT, ширина которых достигает 50–70 м.

Полученные в 2018–2021 гг. результаты вполне определённо указывают на ошибочность представлений о существовании в поздневалдайское время Тверского ледникового озёра, которое занимало всю Верхне-Волжскую низменность и её составную часть – Дубнинскую низину[33]. Судя по новейшим данным, формирование русла р. Дубны и Дубнинского озёрного каскада связано с деградацией московского оледенения в конце среднего плейстоцена (190–130 тыс. л. н. – MIS 6). Во время последней ледниковой эпохи дно бассейна было занято мигрирующей рекой Дубной, и за пределами её берегов накапливались паводковые отложения - аллювий пойменной фации. В разных местах Дубнинской низины могли, без сомнения, формироваться небольшие пойменные озёра, но единого крупного озера, занимавшего в позднем валдае и/или раннем голоцене всю Заболотскую палеокотловину, не существовало.

Вследствие малых уклонов, обусловленных геоморфологическим условиями (полузаполненная ледниковая котловина), река и весенние паводковые потоки текли крайне медленно, что и обусловило очень малую крупность аллювия. Русловая фация представлена заиленным мелким песком и супесями, пойменная фация — алевритистыми средними и тяжёлыми суглинками, очень похожими на озёрные отложения, что и поддерживало долгие годы иллюзию о существовании здесь обширного озера[34], которое было осушено незадолго до или уже во время прихода сюда первых людей. На самом деле, в последние 30 тыс. лет в Дубнинской низине господствовали флювиальные обстановки рельефообразования, что способствовало первоначальному освоению территории Заболотского края населением рессетинской эпиграветтской культуры уже во второй половине поздневалдайской (*вислинской*) эпохи, а не рубежу плейстоцена и голоцена, как считалось ранее. Этот вывод подтверждается полученной серией радиоуглеродных (AMS) дат по смоле из пазов костяных и роговых изделий Минино 2, относящихся к LGT[35]. Наиболее древняя дата образца смолы, взятого из паза вкладышевого рессетинского наконечника, составила 15720–15250 cal BP (AAR 27604).

Судя по анализу остеологической коллекции стоянки-могильника Минино 2, люди могли обитать здесь во все сезоны года, кроме поздней весны, когда широкая полоса поймы вдоль р. Дубны, по-видимому, затапливалась талыми водами. О круглогодичности заселения территории говорить при этом, разумеется, не приходится, и речь может идти исключительно о сезонном пребывании здесь популяций первобытного населения.

Разумеется, нельзя исключать существования в пределах Дубнинской низменности в целом и Заболотской акватории в частности отдельных небольших по площади мелководных озёр — вполне типичного элемента ландшафта пойм мигрирующих русел рек. Однако не они определяли гидрографию и орографию региона, а также общую

[34] Aleshinskaya *et al.* 2001; Lozovskaya (ed.) 2018; Lozovskaya 2019; Lozovski *et al.* (eds) 2013; Lozovski *et al.* 2014; Sidorov 1996; 2009; 2020.

[35] Manninen *et al.* 2021.

Рис. 5. Аэроснимок Заболотского торфяника с дрона: местоположение стоянок вдоль русла р. Сулать.

Fig. 5. Aerial view of Zabolotsky peat bog from drone: locations of sites along the Sulat River.

систему расселения первобытного населения. Всё это заставляет отказаться от традиционной интерпретации памятников каменного века Заболотского торфяника в качестве «озёрных поселений»[36].

Несмотря на то, что сам позднеплейстоценовый возраст инициального заселения Дубнинской низины и Заболотского края населением рессетинской культуры[37] сомнения больше не вызывает, вопрос о точной дате этого события ещё рано снимать с повестки, и дать на него ответ смогут лишь новые исследования. Немаловажно и переосмысление генезиса слагающего пойму суглинка, его речной и пойменный, а не озёрный и донный характер. Это означает, что в перспективе возможно обнаружение артефактов на глубинах свыше 2.5–3.0 м от дневной поверхности, в подстилающих пойменные суглинки напластованиях. Это означает, что необходим пересмотр всей стратегии полевых изысканий и техническое перевооружение экспедиции. В качестве оперативного способа выявления погребённых геологических структур[38] уместно более широкое применение геофизических методов зондирования и разнообразных геоархеологических исследований.

Полученные результаты в европейском археологическом контексте

В настоящее время в Центре Русской равнины зафиксированы материалы четырёх финально-палеолитических (бромме, аренсбург, рессетинская, култинская) и трёх мезолитических (култинская, заднепилевская, пургасовская) культур[39].

Наибольший интерес среди памятников **культуры бромме**[40] на территории России вызывают Аносово 1, 4[41], Подол 3/1, Подол 3/2, Вышегора[42],

[36] Lozovskaya (ed.) 2018; Lozovskaya 2019; Lozovski *et al.* (eds) 2013; Lozovski *et al.* 2014; Sidorov 1996; 2009; 2020.

[37] Sorokin *et al.* 2018.

[38] Panin *et al.* 2020a, b.

[39] Sorokin *et al.* 2009; 2018; Sorokin 2022.

[40] Burdukiewicz 1986; 1996; Johansson 1996; Kobusiewicz 1999; 2009; Kozlowski J., Kozlowski S. 1975; 1977; Larsson 1996; Madsen 1983; 1996; Mathiassen 1946; Riede 2017; Salomonsson 1964; Schwabedissen 1954; Taute 1968.

[41] Gurina 1972.

[42] Sinitsyna 1996; 2000; 2003; 2015; Vasil'yev *et al.* 2005.

Троицкое 3[43], Теплый Ручей 2[44], Усть-Тудовка 1[45], Ладыжино 3[46], Ростиславль 1[47] (рис. 8; Fig. 8).

Гомогенные памятники **культуры аренсбург**[48], известные в Европейской России, единичны – это Гремячее 1[49], Смоленск[50], Черепеньки 1[51], Ростиславль 2[52] и некоторые другие (рис. 9; Fig 9).

Рессетинская культура была выделена А. Н. Сорокиным *в 1985 г.* на основе изучения своеобразных каменных изделий происходящих из раскопок памятников, расположенных на Верхней Волге и Оке[53]. Среди них наиболее выразительные коллекции дали Борки[54], Ланино 1, раскопы 4 и 8[55], Альба 1, 3, Рессета 3[56], Суконцево 8–11[57], Култино 3, Усть-Тудовка 4, нижний слой; Замостье 5, слой 9[58]; Минино 2, нижний слой[59]; Троеручица[60]. Известны они и на территории восточной Беларуси[61].

Каменное охотничье вооружение рессетинской культуры включает только два морфологически выраженных типа - асимметричные наконечники стрел, изготовленные на микропластинах (рис. 6.1–11, 22–28; 7.1–9; Figs 6.1–11, 22–28; 7.1–9), и микролиты с затупленным ретушью краем (рис. 6.12–15, 18–21, 29–35; 7.10–14; Figs 6.12–15, 18–21, 29–35; 7.10–14). Прототипы асимметричных наконечников и микролитов широко представлены в «восточно-граветтских» комплексах Русской равнины[62]. Следует отметить, что в ряде коллекций имеются единичные наконечники стрел с вентральной ретушью, но их гомогенность достоверно не подтверждена. Микропластины и их фрагменты, лишённые вторичной обработки, а также усечённые ретушью микролиты, также широко использовались в качестве вкладышей в композитных орудиях.

Костяной и роговой инвентарь рессетинской культуры изучен пока по двум памятникам - нижнему слою стоянки-могильника Минино 2 и слою 9 стоянки-могильника Замостье 5[63]. В состав орудий охотничьего назначения входят семь категорий – это симметричные и асимметричные массивные острия (наконечники копий и рогатин), игловидные и композитные (вкладышевые) наконечники копий и стрел, зубчатые острия, клевцы и кинжалы[64] (рис. 7.15–24; Fig. 7.15–24). Список рессетинского охотничьего вооружения далеко не окончательный, и будет, несомненно, пополняться в процессе новых изысканий.

Материалы **заднепилевской культуры,** в отличие от рессетинских, были известны с заката XIX в., и долгое время являлись своеобразной визитной карточкой Волго-Окского мезолита. Главной отличительной особенностью этих коллекций служат симметричные иволистные и черешковые наконечники стрел на пластинах, имеющие плоское вентральное ретуширование. Эти пункты последовательно интерпретировали то в качестве памятников свидерской стадии, то именовали свидерскими древностями, то волго-окской и бутовской культурами[65]. Изменение названия обычно сопрягалось с известным приростом материалов, и отражало процесс естественного развития научного знания. Появление нового названия - заднепилевская культура – вызвано тем, что был установлен факт **фальсификации** Л.В. Кольцовым и М.Г. Жилиным первичных данных. Это касается, как эпонимной стоянки Бутово 1, так и большинства наиболее крупных коллекций (Елин Бор, Тихоново 1, Соболево 5, Заборовье 2, Староконстантиновская 3, 4, Становое 4 и др.), интерпретированных ими в качестве бутовских[66].

Для каменного охотничьего вооружения заднепилевской культуры, помимо наконечников стрел иволистной и черешковой формы из пластин, обработанных на пере и черешке плоской вентральной ретушью, характерны микролиты

43 Lantsev *et al.* 1996.
44 Miretskiy 2007.
45 Zhilin *et al.* 1991.
46 Kravtsov *et al.* 2002.
47 Trusov 2004, 2006.
48 Fischer 1996; Galinski 2019; Kobusiewicz 1999; Kozlowski J., Kozlowski S. 1975; 1977; Lundstr**ö**m *et al.* 2021; Riede 2014; 2017; Rust 1937; 1943; 1962; Street, Baales *et al.* 2001; Taute 1968.
49 Sorokin 2006a, b; Voyevodskiy 1941.
50 Yershov *et al.* 2022.
51 Chubur 2016; Zavernyayev 1957.
52 Trusov 2015; 2016; 2018.
53 Sorokin 1989; 2002; 2013.
54 Zubkov 1950.
55 Sinitsyna 1996; 1997.
56 Sorokin 2002.
57 Sorokin 1989; 2013; 2022
58 Sorokin *et al.* 2014.
59 Sorokin 2011; 2014; Sorokin *et al.* 2018.
60 Miretskiy 1994.
61 Gurina 1965; 1966.
62 Amirkhanov (ed.) 1998.
63 Sorokin 2009; 2011; 2014; 2022; Sorokin *et al.* 2009; 2014; 2018.
64 Sorokin 2020.
65 Formozov 1959; 1977; Kol'tsov 1965; 1989; Kravtsov *et al.* 1991; Kraynov 1979; 1983; Kraynov *et al.* 1999; Sorokin 1990,; 2002; 2004; Voyevodskiy 1934; 1940; 1950; Voyevodskiy *et al.* 1950.
66 Sorokin 2001; 2008; 2017a; 2018a; 2022; Sorokin *et al.* 2009.

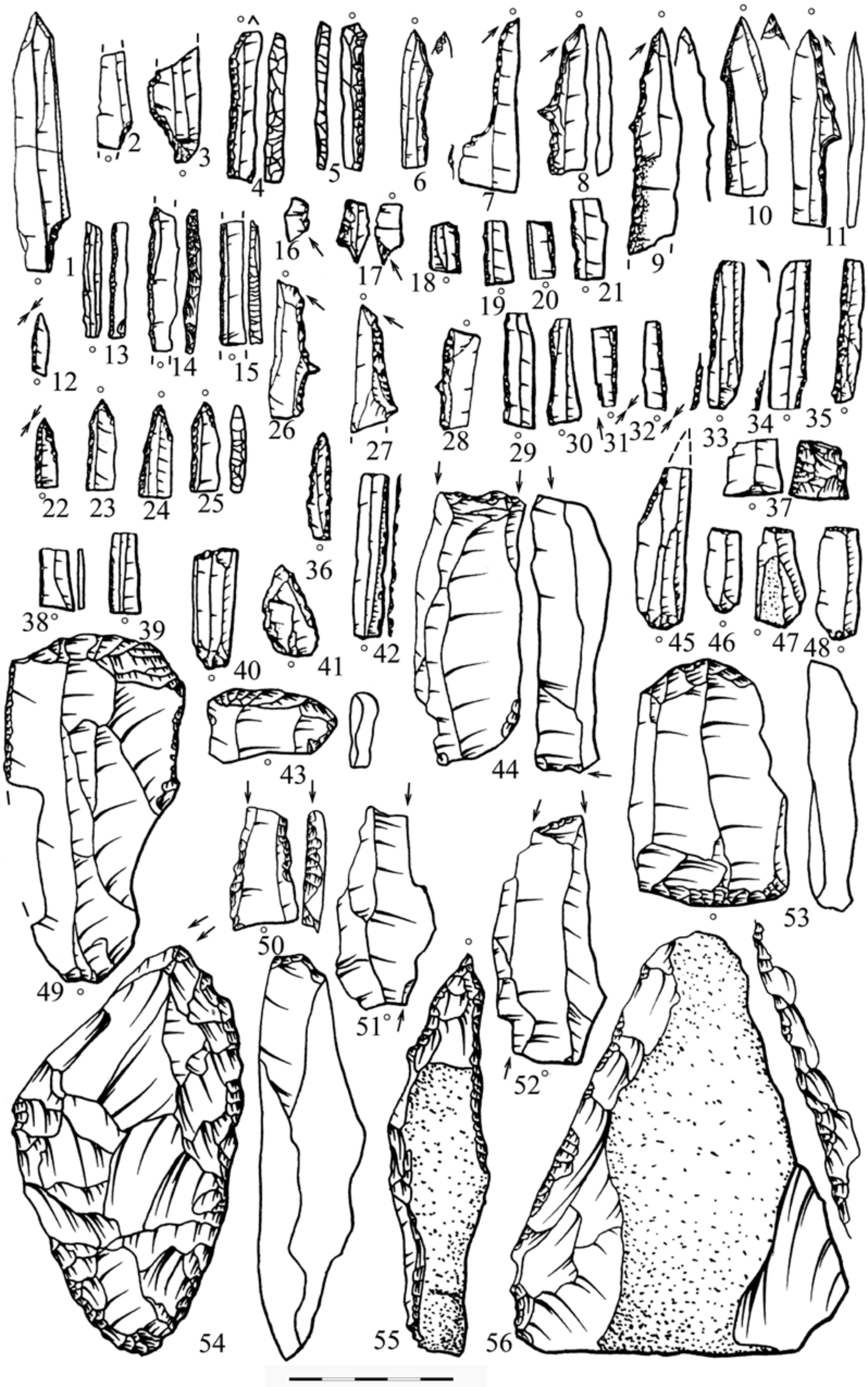

Рис. 6. Культура рессетинская – каменный инвентарь (Суконцево 8, 9, по: Сорокин 1989).

Fig. 6. Resseta culture – stone tools (Sukontsevo 8, 9, according to Sorokin 1989).

Рис. 7. Культура рессетинская – охотничье вооружение (Минино 2, по Сорокин 2014).

Fig. 7. Resseta culture – hunting weapons (Minino 2, according to Sorokin 2014).

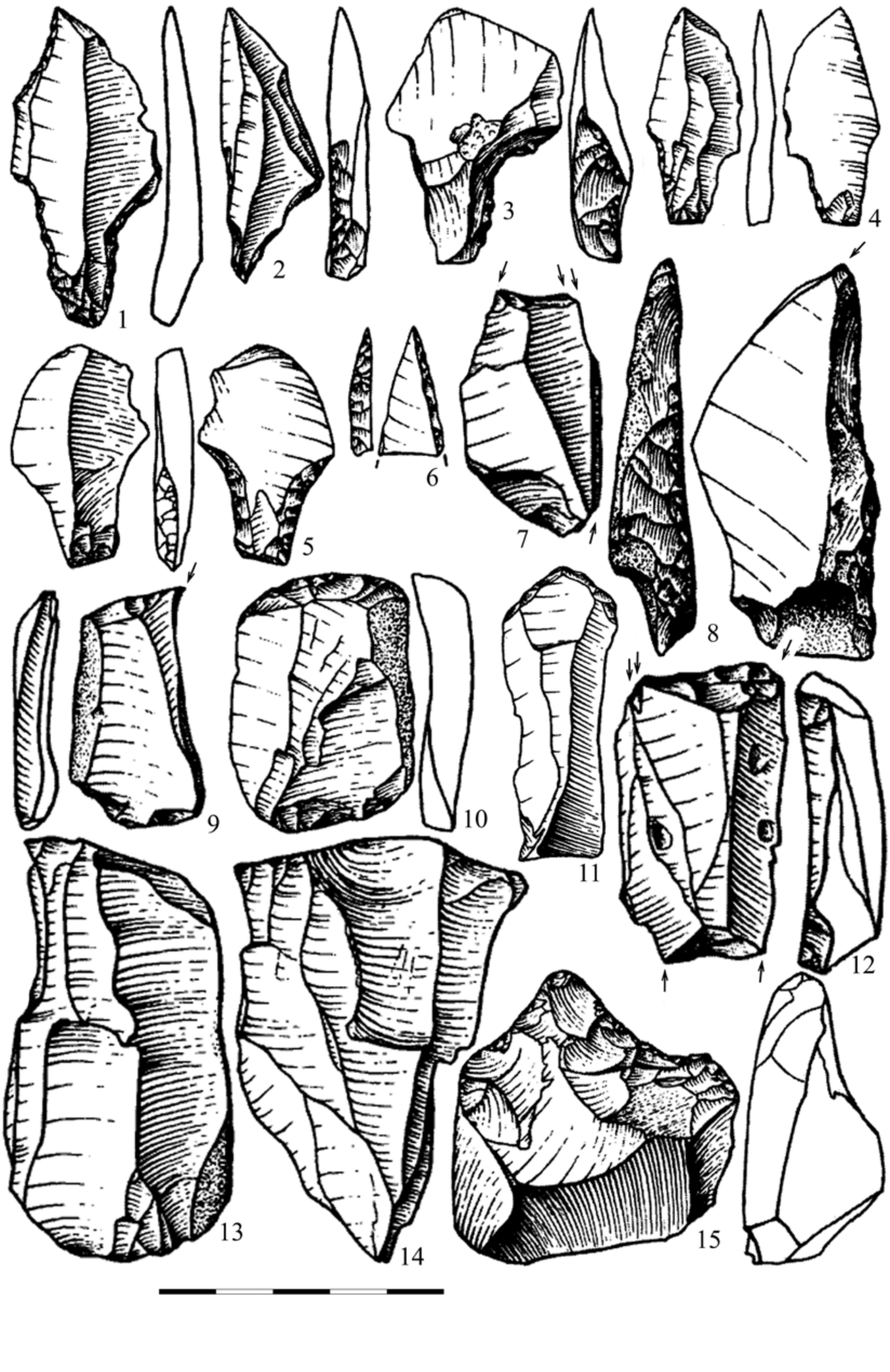

Рис. 8. Культура Бромме – каменный инвентарь (Ростиславль 1, по: Трусов 2006).

Fig. 8 Bromme culture – stone tools (Rostislavl 1, according to Trusov 2006).

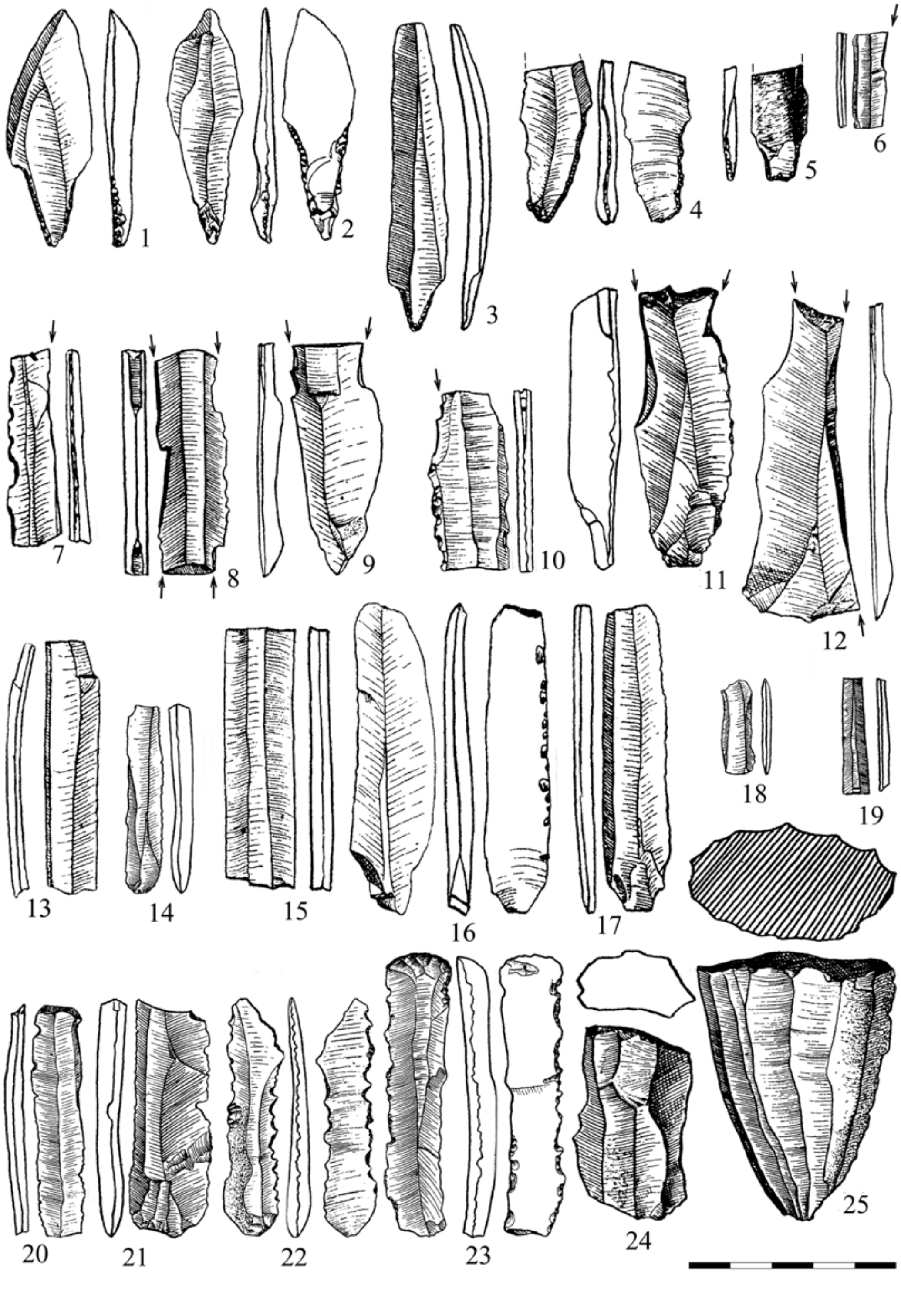

Рис. 9. Культура Аренсбург – каменный инвентарь (Гремячее 1, по: Воеводский 1941).

Fig. 9 Ahrensburg culture – stone inventory (Gremyachee 1, according to Voevodsky 1941).

с затупленным ретушью краем и фрагментированные пластинки без дополнительной обработки, служившие вкладышами в композитных орудиях (рис. 10, 11.1–14; Figs 10, 11.1–14). Набор дополняют микролиты с поперечно срезанным и скошенным ретушью боевым окончанием. Наиболее выразительные материалы происходят из Суконцево 7, Чёрной 1, Малой Ламны 3, Новошино, Замостье 5 и Минино 2. Однако территория заднепилевской культуры не замыкается Волго-Окским бассейном, и распространяется по обширным пространствам Русской равнины, где, правда, выступает под иными наименованиями.

Состав каменного инвентаря в значительной степени повторяет рессетинский набор, но отличается большим типологическим разнообразием, особенно предметов охотничьего вооружения, и присутствием ряда технологических новшеств.

Набор костяного и рогового охотничьего вооружения заднепилевской культуры включает те же категории, что и рессетинский состав, но вариабельность его существенно выше (рис. 11–13, 15; Figs 11–13, 15). Отмечается и большее технологическое разнообразие в производстве артефактов из органических материалов. К сожалению, осознанная фальсификация большинства имеющихся органосодержащих собраний (Ивановское 7, Становое 4, Озерки 5, Култино 3, Нушполы 11 и др.) не позволяет сделать это объективно[67].

На закате плейстоцена на территории Центра Русской равнины, помимо эпиграветтского рессетинского, эпимадленского броммийского и аренсбургого населения, существовали также популяции култинской культуры приуральского технокомплекса (стоянка Золоторучье 1)[68], расцвет индустрии которых пришёлся уже на мезолит (рис. 14; Fig. 14). Наиболее выразительные материалы дали стоянки Култино 1[69], Старая Пустынь[70], Спас-Седчено 2[71], Барашево 1[72]; Угольново 1[73] и Велетьминское 9[74].

Помимо заднепилевских и култинских популяций в мезолите на территории Центра Русской равнины проживали и носители пургасовской культуры (рис. 15; Fig. 15). К ней отнесены коллекции стоянок Пургасово 3[75]; Имерка 4, Шаверки 5, Клюквенный 4, Широмасово 2[76]; Шагара 4[77], Борисово 1[78], Дорки 4[79], Круглое озеро.

Выделение в мезолите Волго-Окского бассейна елиноборской, бутовской и иеневской культур[80] было произведено путём фальсификации первичных данных, о чём уже достаточно подробно изложено в литературе[81]. Дальнейшее использование этих терминов противоречит нормам научной этики и должно стать исключительно предметом историографии.

Суммируя сказанное, необходимо отметить, что представленная «мозаика» отражает современное состояние исследований, и будет, без сомнения, уточнена и дополнена в дальнейшем. К сожалению, комплексы, изученные на территории Заболотского торфяника, представлены пока исключительно рессетинскими и заднепилевскими древностями, поэтому обсуждать материалы культур, отсутствующих в границах полигона, представляется нецелесообразным.

Миграции древнего населения и «восточный импульс» в освоении Фенноскандии

Несмотря на значительное число памятников, выявленных на территории Заболотского торфяника, стационарным раскопкам подверглись всего пять пунктов, на которых изучены только рессетинские и заднепилевские древности. Установлено, что первопроходцами, осваивавшими в LGT центральную часть Восточно-Европейской (Русской) равнины, были популяции рессетинской культуры, унаследовавшие традиции населения восточного граветта, хорошо известные по материалам, предшествовавшим LGM. Важно отметить, что эпиграветтское население занимало эти территории задолго до появления эпимадленских групп, представленных материалами культур Бромме и Аренсбург.

В позднем плейстоцене и раннем голоцене не существовало современных государственных границ, и человеческая жизнь подчинялась экологии и естественным законам выживания видов. Экологические условия обязывали людей чутко реагировать на все изменения в биосфере, при-

[67] Sorokin 2001; 2008; 2017a; 2018b.
[68] Zhilin 2007.
[69] Kol'tsov *et al.* 1999.
[70] Kol'tsov *et al.* 1991.
[71] Kol'tsov *et al.* 1999.
[72] Kravtsov *et al.* 1991; Sorokin 2005.
[73] Kol'tsov *et al.* 1987.
[74] Kol'tsov *et al.* 1999.
[75] Sorokin 2002; 2005; 2006a, b; 2009.
[76] Stavitskiy *et al.* (eds) 2008.
[77] Sorokin 2016b; 2017b.
[78] Sorokin 1990.
[79] Frolov *et al.* 1991.
[80] Kol'tsov 1989; Kol'tsov *et al.* 1999; Zhilin 2004.
[81] Sorokin 2001; 2008; 2016a, b; 2017a; 2022; Sorokin *et al.* 2009.

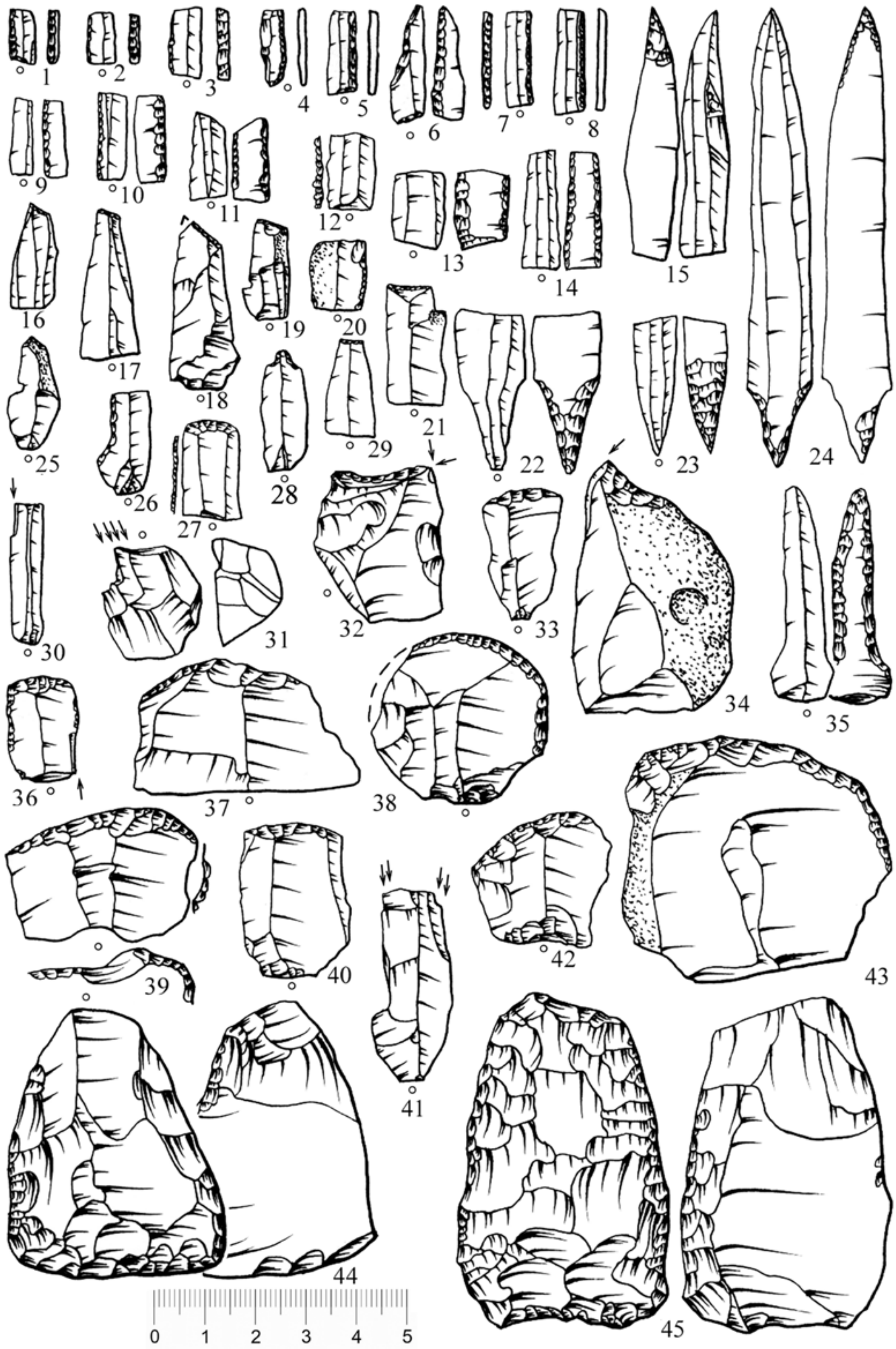

Рис. 10. Культура заднепилевская – каменный инвентарь (Заднепилево 1, по: Сорокин 1990).

Fig. 10 Zadnepilevo culture – stone tools (Zadnepilevo 1, according to Sorokin 1990).

Рис. 11. Культура заднепилевская – охотничье вооружение (Минино 2, по: Сорокин 2014).

Fig. 11. Zadnepilevo culture – hunting weapons (Minino 2, according to Sorokin 2014).

Рис. 12. Культура заднепилевская – охотничье вооружение (Минино 2, по: Сорокин 2014).

Fig. 12. Zadnepilevo culture – hunting weapons (Minino 2, according to Sorokin 2014).

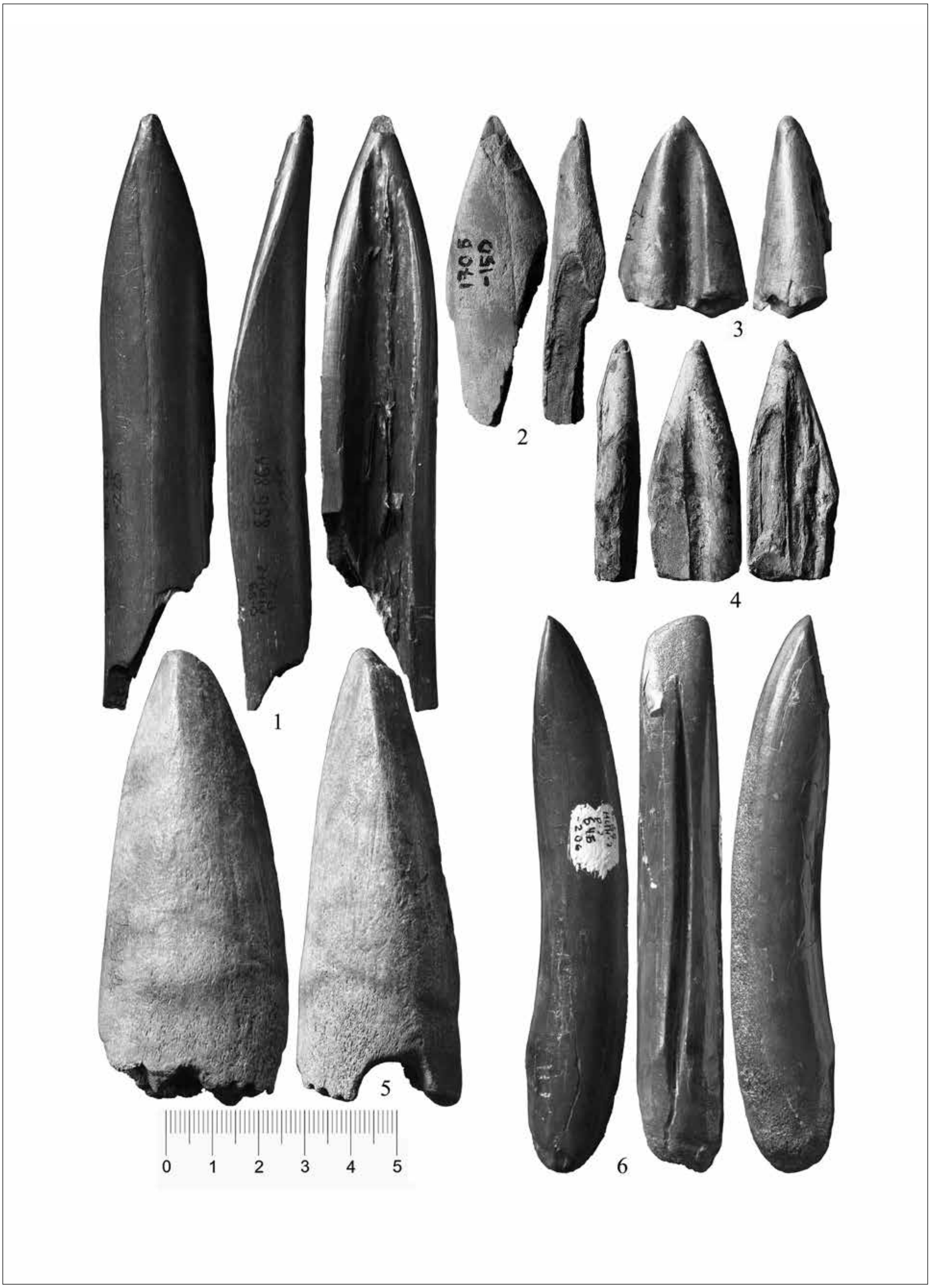

Рис. 13. Культура заднепилевская – охотничье вооружение (Минино2, по: Сорокин 2014).

Fig. 13. Zadnepilevo culture – hunting weapons (Minino 2, according to Sorokin 2014).

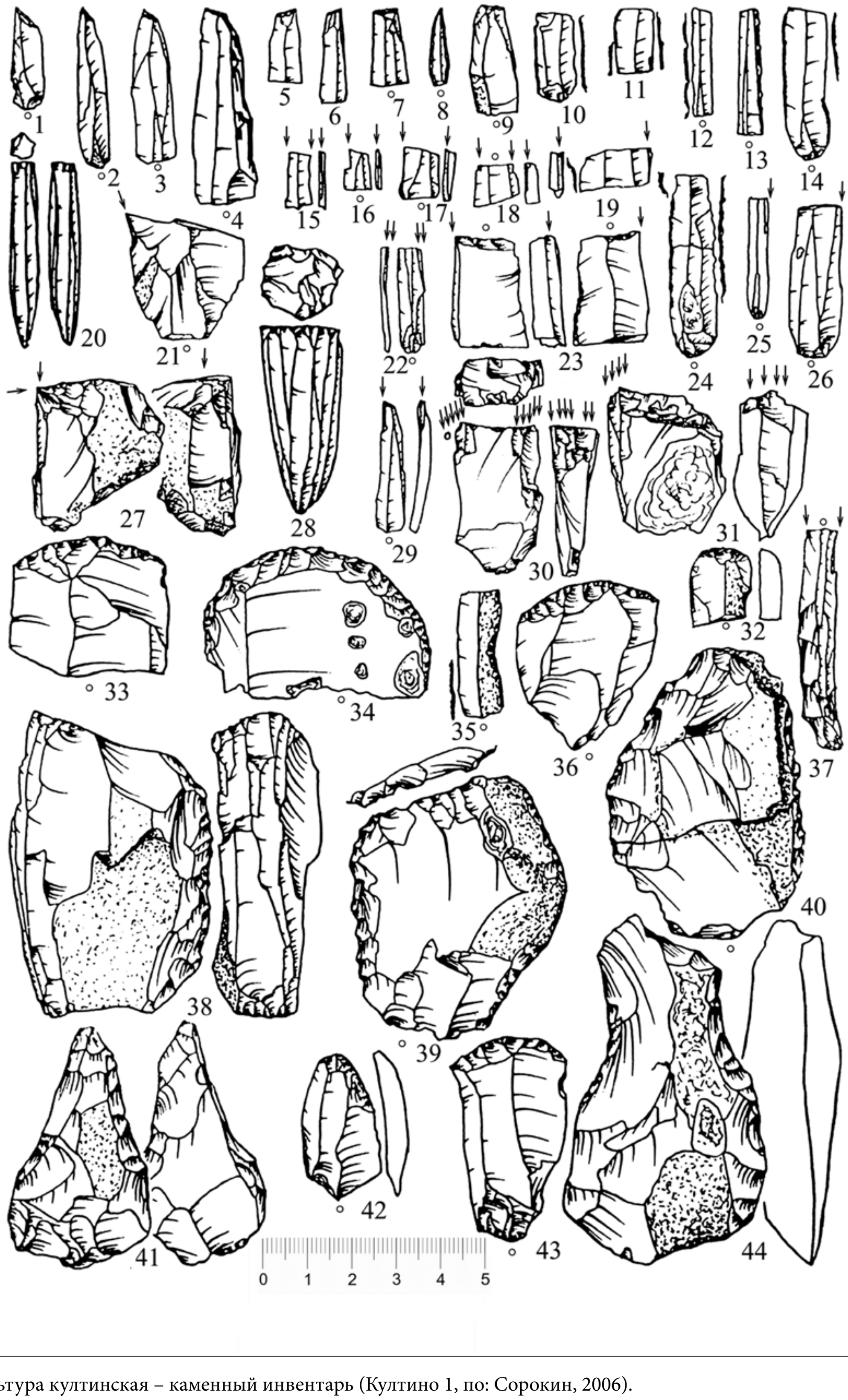

Рис. 14. Культура култинская – каменный инвентарь (Култино 1, по: Сорокин, 2006).

Fig. 14. Kultino culture – stone tools (Kultino 1, according to Sorokin, 2006).

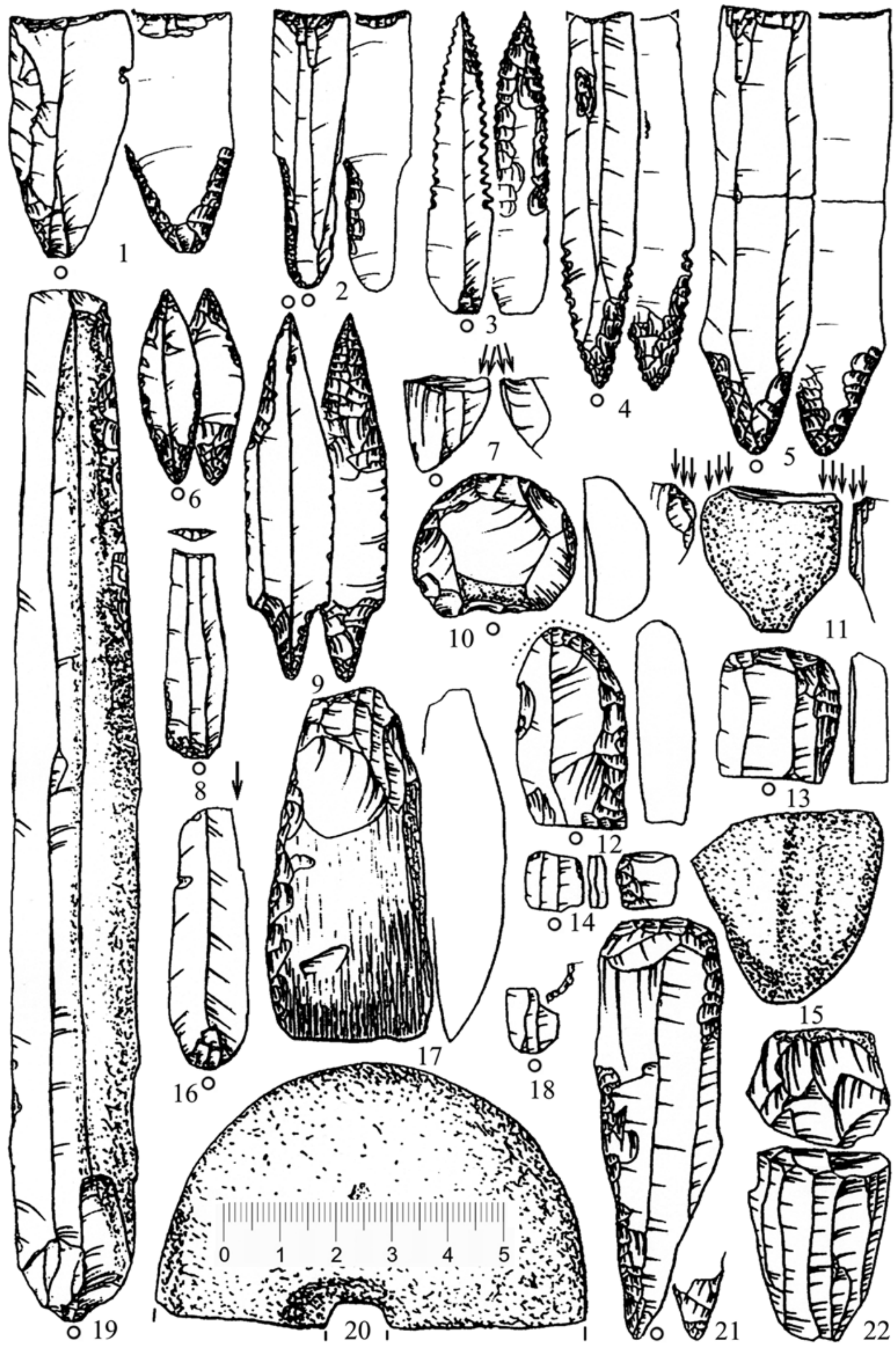

Рис. 15. Культура пургасовская – каменный инвентарь (Пургасово 3, по: Сорокин, 2005).

Fig. 15. Purgasovo culture – stone tools (Purgasovo 3, according to Sorokin, 2005).

способливаться к колебаниям среды обитания и вести подвижный (сезонно-кочевой) образ жизни. Неизбежным следствием особенностей этологии основных промысловых видов Северного полушария стало то, что небольшие популяции охотников-собирателей перемещались вслед за стадами сезонно-мигрирующих животных и неизбежно расширяли Ойкумену по мере того, как Европа очищалась от Скандинавского ледникового щита. Этот процесс, начавшийся в позднем плейстоцене, продолжался в раннем голоцене. На это указывает присутствие материалов «восточного импульса» не только на Восточно-Европейской равнине, но и на пространствах Фенноскандии[82]. Однако детальное изучение восточного маршрута в освоении Скандинавского полуострова выходит за рамки конкретного исследования.

Заключение

Комплексные изыскания 2018–2021 гг. на территории Заболотского торфяника дают весомые основания для пересмотра модели развития геоморфологии Верхне-Волжского региона и отказа от гипотезы Тверского приледникового озера в качестве основы палеоландшафтов. Полученные результаты позволяют со всей очевидностью говорить о более древнем, чем предполагалось вплоть до последнего времени, начале заселения Заболотского края и ином, не связанном с озёрными системами, характере этого процесса.

Геоморфологические данные и их палеогидрологическая интерпретация указывают на существование в Дубнинской низменности не позднее 30 тыс. л. н. древней реки Дубны - многоводного водотока, сформировавшего пойму с крупными формами флювиального палеорельфа, доступными для сезонного освоения. Потенциальная «готовность» ландшафта к заселению сдерживалась не столько палеогеографическими условиями, сколько наличием самого населения, способного освоить бескрайние пространства Русской равнины. Новейшие радиоуглеродные (AMS) даты по смоле из пазов костяных и роговых артефактов Минино 2 позволяют относить время инициального освоения Заболотского края носителями рессетинской культуры до 15500 л. н. Полученные результаты имеют принципиальное значение для разработки объективной хронологии событий и понимания реальной динамики поселенческой стратегии населения для LGT и при переходе от плейстоцена к голоцену. Результаты изысканий не только хорошо встраиваются в систему глобальных палеоэкологических событий и историю развития равнин Восточной Европы, но и подготавливают надёжную основу для уточнения ряда существующих представлений и отказа от устаревших концепций.

Технология популяций рессетинской культуры, ставших не только первопроходцами в освоении Верхне-Волжской и Дубнинской низменностей, но и многих других регионов Русской равнины, унаследовала восточно-граветтские традиции. Она служит примером их развития на протяжении LGT. В финале плейстоцена - начале голоцена, наблюдается трансформация рессетинской индустрии в заднепилевскую. Контуры этого процесса становятся всё более очевидными и осязаемыми, и геоархеологические объекты Заболотского края, изученные в новейшее время, дают конкретные сведения по его материализации.

Это были мобильные популяции, хорошо приспособленные к жизни в высоких северных широтах. Сезонные передвижения рессетинского и заднепилевского населения всё чаще фиксируются материалами не только территории Русской равнины, но и Скандинавского полуострова, где маркируются памятниками, известными в литературе под термином «восточного импульса». Таким образом, данные, полученные в ходе изучения Заболотского края, гармонично вписываются в более широкий контекст археологических проблем позднеледникового и раннеголоценового периодов Северной и Северо-Восточной Европы. Однако детализация картины требует существенного расширение изысканий, причём не только на территории Заболотского края, но и всей северной половине Русской равнины и Фенноскандии.

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[82] Bang-Andersen 2003; Blackholm 2004; Brinch Petersen 2009; Carpelan 1999; Damlien 2014; Damlien *et al.* 2018a, b; Glorstad 2016; Hertel *et al.* 2011; Kankaanpaa *et al.* 2005; Kleppe 2018; Knutsson *et al.* 2012; 2016; Larsson 1990; 1996; Manninen *et al.* 2014; 2020; 2021; Matiskainen 1989; 1996; Olofsson 2002; Sørensen *et al.* 2013; Takala 2004; Thommessen 1996.

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Experimental Cut Mark Replication as a Means for Understanding Linear Marks on Archaeological Bones from the Medzhibozh Lower Palaeolithic Sites

Abstract

The paper presents the first results of experimental modelling of a series of cut marks on bones in different states of preservation. We used experimental (quartz, flint) and technogenic (granite) flakes with sharp and blunt unretouched working edges and trimmed edges produced by the bipolar-on-anvil technique. V-, П-, and U-shaped cut marks and surface damage were obtained. The data gained are useful for the reconstruction of conditions of occurrence of cut marks on bones found in the uppermost culture-bearing horizons of the Lower Palaeolithic sites near Medzhibozh, located in the upper reaches of the Southern Bug River and dated to MIS 11. The data can also be used for differentiating between anthropogenic and natural damage and as a significant statistical point of reference.

Keywords: experiments, cut marks, V-, П- and U-shaped grooves, Lower Palaeolithic, Medzhibozh

1. Introduction

It is generally accepted that the archaeozoological aspect of studying Palaeolithic site materials is an important source for reconstructing the socio-economic behaviour of early hominins and detailing the culture-bearing layer formation processes. In particular, archaeozoological data constitutes a rare and valuable source for studying the Plio-Pleistocene Lower Palaeolithic sites.[1] Many authors have reported the high variability of taphonomic circumstances and technological and behavioural features that lead to the appearance of different types of modifications on bones found in the context of ancient sites.[2] These observations emphasise the need for including a thorough verification phase in the studies of Palaeolithic bones showing signs of any modifications. One way to perform such verification is through experimental simulation, which aims to clarify the circumstances and causes of specific damage similar to that observed on archaeological relics. The morphological patterns established by the analysis of experimental data provide a basis for a more reasoned reconstruction of the probable causes of damage on bones from archaeological contexts and reproduction of the characteristics of the tools involved as well as the resulting movements. Ideally, the study of

[1] Potts, Shipman 1981; Blumenschine 1991; Domínguez-Rodrigo *et al.* 2005; McPherron *et al.* 2010; Stepanchuk, Moigne 2016; Zutovski, Barkai 2016; Pawłowska 2017; Konidaris *et al.* 2018; Domínguez-Rodrigo *et al.* 2022.

[2] Fisher 1995; Olsen, Shipman 1988; Domínguez-Rodrigo *et al.* 2009; Manifold 2012; Dupras, Schultz 2013.

bone remains from a Lower Palaeolithic site requires an integrated approach that combines taphonomic, experimental, use-wear, and technological aspects.[3] In our case, the research focuses mainly on the experimental aspect of studying anthropogenically modified bones from the Lower Palaeolithic sites of Medzhibozh, bones with cut marks in particular. We conducted experiments using bones in various states of preservation to simulate the actions that may have occurred at the site. This was deemed justified because the materials found at the site suggest that ancient hominins may have interacted with bones in different states of preservation and the petrographic composition of the stone tools found there indicates that a wide variety of rock types were used for cutting and splitting. One of the most common finds in the Lower Palaeolithic materials of Medzhibozh 1 and, to a lesser extent, Medzhibozh A are faunal remains.[4] Frequent among them are pieces with signs of likely intentional fragmentation and, less frequently, bone fragments with cut marks, notches, percussion dents, and removal scars. The collection of bones with anthropogenic modifications is the most representative in Layer III of Medzhibozh 1.[5] Most of the modifications are related to the utilisation of animal carcasses and bones and result from breaking, cutting, chopping, and splitting. A smaller portion of the bones reflects, probably intentionally, the processing of bone fragments by knapping or retouching. Almost all of the bones were found crushed, probably due to intensive bone marrow extraction. The morphology of cut marks is diverse. There are thin cut marks, presumably left by the feathery edge of an unretouched flint flake; coarser cut marks, possibly associated with a retouched flint edge; wide cut marks, probably left by the edges of a non-flint instrument; and grooves resembling cut marks that leave burin-like edges. The inconsistency of cut marks' morphology corresponds well to the highly variable characteristics of edges of available lithic products. Hominins used various rocks for manufacturing implements in Medzhibozh 1 and A: flint, quartz, quartzite, granite, limestone, sandstone, slate, etc. The different properties of the used stone probably determined the various parameters of flakes and their edges, either unmodified or processed by retouching, knapping, or a specific trimming-on-anvil technique. It is also assumed that sharp edges of bone splinters and shell fragments were used situationally for cutting. The diversity of linear traces of anthropogenic nature in the Medzhibozh sample is supplemented by linear marks, presumably as a result of various taphonomic processes.

2. Materials and method

2.1. Archaeological context

The multilayered Lower Palaeolithic sites of Medzhibozh 1 and Medzhibozh A, located in the upper reaches of the Southern Bug (Fig. 1), contain an Oldowan-type core-and-flake archaic stone industry and date back to 1.2 to 0.4 Ma.[6]

Medzhibozh 1 and Medzhibozh A sequences comprise Lower and Middle Pleistocene sod-podzolic, meadow, and marsh soils and lake-alluvial floodplain sediments deposited on Archean granites and overlain by Upper Pleistocene loesses and buried soils. The youngest culture-bearing layers of Medzhibozh 1 (Layer III) and Medzhibozh A (II and I) are correlated with the beginning of the Zavadivian (zv1, MIS 11), the oldest Medzhibozh A layers (VI and V) are correlated with the Shirokinian stage (sh, MIS 35–21).[7] Palaeomagnetic testing of the Medzhibozh A section has not provided reliable data on the Matuyama-Bruhnes boundary in the lower part of the sequence.[8] The available biostratigraphic data on large and medium-sized mammals,[9] the micro-mammalian fauna,[10] and ESR dates[11] are in good agreement and corroborate the Holsteinian age of the uppermost layers of the Medzhibozh Lower Palaeolithic sites.

All artefact-bearing horizons contain items made of small flint and quartz pebbles, as well as other rock fragments and debris. Artefacts are accompanied by remains of proboscides, rhinoceroses, horses, deer, bears, large felines (lion or leopard), wild boar, etc., although in varying composition and variable frequency. Most numerous faunal remains are revealed in Medzhibozh Layer III.[12] In Medzhibozh A, fauna is relatively scarce, intensely fragmented, and partly fossilised, especially in the lower layers.[13]

The size and composition of bone fragments from the Holsteinian layers I and II of Medzhibozh A closely

[3] Blumenschine 1995; Domínguez-Rodrigo 1999; Domínguez-Rodrigo *et al.* 2012; Mateo-Lomba *et al.* 2020; Domínguez-Rodrigo *et al.* 2021.

[4] Stepanchuk, Moigne 2016; Stefaniak *et al.* 2021; Stepanchuk *et al.* 2019.

[5] Stepanchuk *et al.* 2021.

[6] Stepanchuk 2022.

[7] Matviishina, Karmazinenko 2014; Matviishina, Karmazinenko *in press*.

[8] Hlavatsky *et al.* 2021.

[9] Stepanchuk, Moigne 2016; Stefaniak *et al.* 2021.

[10] Rekovets 2017.

[11] Qi *et al.* 2018.

[12] Stepanchuk, Moigne 2016; Stefaniak *et al.* 2021.

[13] Stepanchuk *et al.* 2019.

Fig. 1. Location of the Lower Palaeolithic sites of Medzhibozh 1 (M1) and Medzhibozh A (MA).

resemble materials from the synchronous Layer III of Medzhibozh 1.[14] Despite the worse preservation of fauna from Medzhibozh A, fragments with various marks and evidence of intentional splitting of bones were also revealed there. Bone splinters demonstrate diverse anthropic transformations, such as intentional fragmentation, cut marks, chop marks, and percussion marks.[15]

The Holsteinian lithic industry is based on flint and quartz pebbles, supplemented by small quantities of vein quartz, quartzite, sandstone, limestone, slate, and granite. Artefacts are represented by a small number of choppers, fragmented pieces of stone, a small number of flakes and flake tools, including isolated asymmetrical points, end scrapers, and side scrapers (Fig. 2: 1–10). A characteristic feature is the predominant use of bipolar-on-anvil splitting, segmentation, and edge trimming with a minimal role for freehand knapping, flaking, and retouching. The typological and technological characteristics make attributing Medzhibozh MIS 11 assemblages to the so-called Mode I core-and-flake industries reasonable.

Periodic flooding of the area which yielded artefacts and fauna, and the resulting saturation of the sediments with moisture, has given the finds a specific type of preservation, particularly the rounded ridges on the bones and flints. Some bones have sandy cement on the surface and are stained with manganese and iron oxides.

The most representative series of bones with anthropogenic modifications are found in Layer III of Medzhibozh 1. The materials contain bone fragments with different types of linear cut marks, including thin and deep V-shaped, wide, broad, and less deep U-shaped, as well as Π-shaped with steeper laterals, which resemble burin-produced grooves. These cut marks are found mainly on fragments of the diaphysis of large bones and fragments of ribs of large and medium-sized animals, such as deer and rhinoceros, as well as on bird remains. They partly appear to be accidental damage caused during the dismembering of animal carcasses (Fig. 3: 1–2, 8a), except for a small skull fragment of an uncertain species (Fig. 3: 6) and a group of cut marks on the claw

[14] Stepanchuk *et al.* 2021.

[15] Stepanchuk, Moigne 2016, Figs. 11, 12.

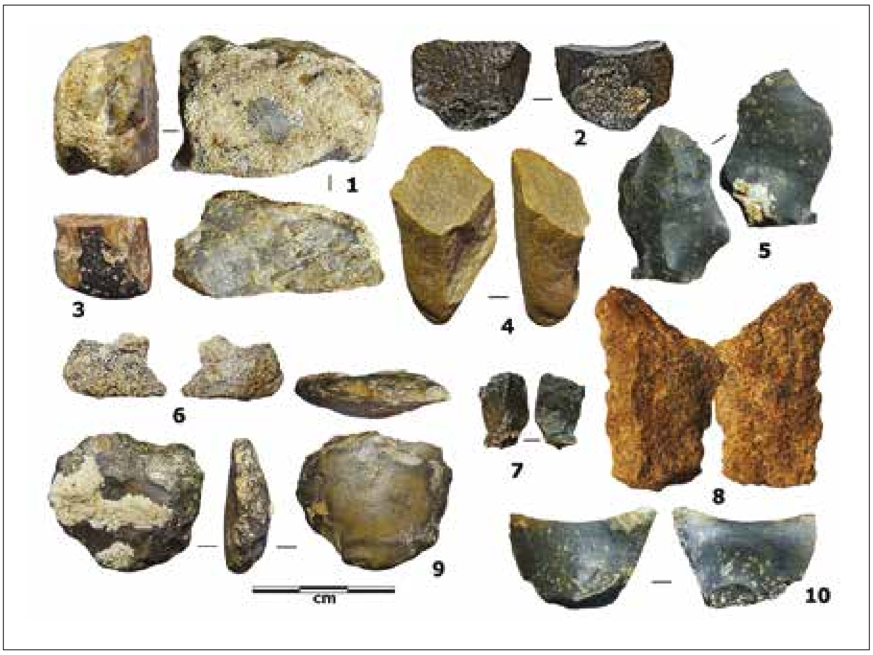

Fig. 2. Lithic artefacts from the MIS 11 layers of Medzhibozh 1 and Medzhibozh A. **Raw materials**: 1 – quartz; 2–3, 5, 7, 9–10 – flint; 4 – quartzite; 6, 8 – granite. **Type of support**: 1 – chunk; 2–4 – pebbles; 5–10 – flakes.

phalanx of a white-tailed eagle, which is rather specific (Fig. 3: 3). This last find is unique given the age of the site and demonstrates the interest of the MIS 11 hominins in predatory bird remains. The collection also contains bones with linear marks of trampling nature (Fig. 3: 4a, 7, 8b) and isolated tooth marks (Fig. 3: 4). There are also marks of, presumably, scraping (Fig. 3: 9b) and ripping (Fig. 3: 5), although the anthropogenic origin of either or both of these patterns is ambiguous and needs experimental verification. Some of the suspected cut marks have V-shaped profiles, while others are U-shaped or П-shaped with furrows. We intend to determine whether all or part of them, regardless of cross-sectional shape, may indeed be of anthropogenic origin.

2.2. Experiments: general information

The main series of experiments were conducted by the authors in July 2021 at the State Historical and Cultural Reserve "Mezhybizh", additional ones in the fall of 2021 in Kyiv at the National Museum of History of Ukraine and a field station in the Zhytomyr region in July 2022.

The purpose of the experiment. The focus of our experiments is to clarify the conditions and, to some extent, to model the circumstances of the appearance of morphologically different types of cut marks on archaeological bones. The aim was to obtain a sample of П-shaped, U-shaped, and V-shaped cut marks on bones in different states of preservation. This experimental procedure involved: *a)* the use of tools made of different rock types and organic matter (quartz, flint, granite, bone, and antler) and *b)* the use of morphologically different edges (sharp, blunt, trimmed-on-anvil edge). The applied movements' kinetics were towards oneself, from oneself, and reciprocating (i.e. sawing motion). The cut mark features that could be analysed included the shape in plain view, shape in cross-section, depth and width, and presence or absence of groove bifurcation and micro-scratches (micro-furrows).[16] The present study concentrates on showcasing specific aspects of bone damage morphology, such as the cross-sections, the entry and exit properties of cut marks, and cutting depth variations based on movement dynamics.

Protocols, recording, and laboratory processing. During the active phase, the instruments were held in the right hand (dominant for the experimenters). The bone to be treated was primarily placed on a horizontal surface and held by the left hand (less often – fixed in freehand). During the movements away from and towards oneself, a single passage of the instrument was applied; only in the case of reciprocating movements did the number of effective actions increase (7 to 8 on average). Different tools could be used to simulate damage on a particular bone, and a particular tool could be used to experiment

[16] See Domínguez-Rodrigo *et al.* 2012; López-Cisneros *et al.* 2019.

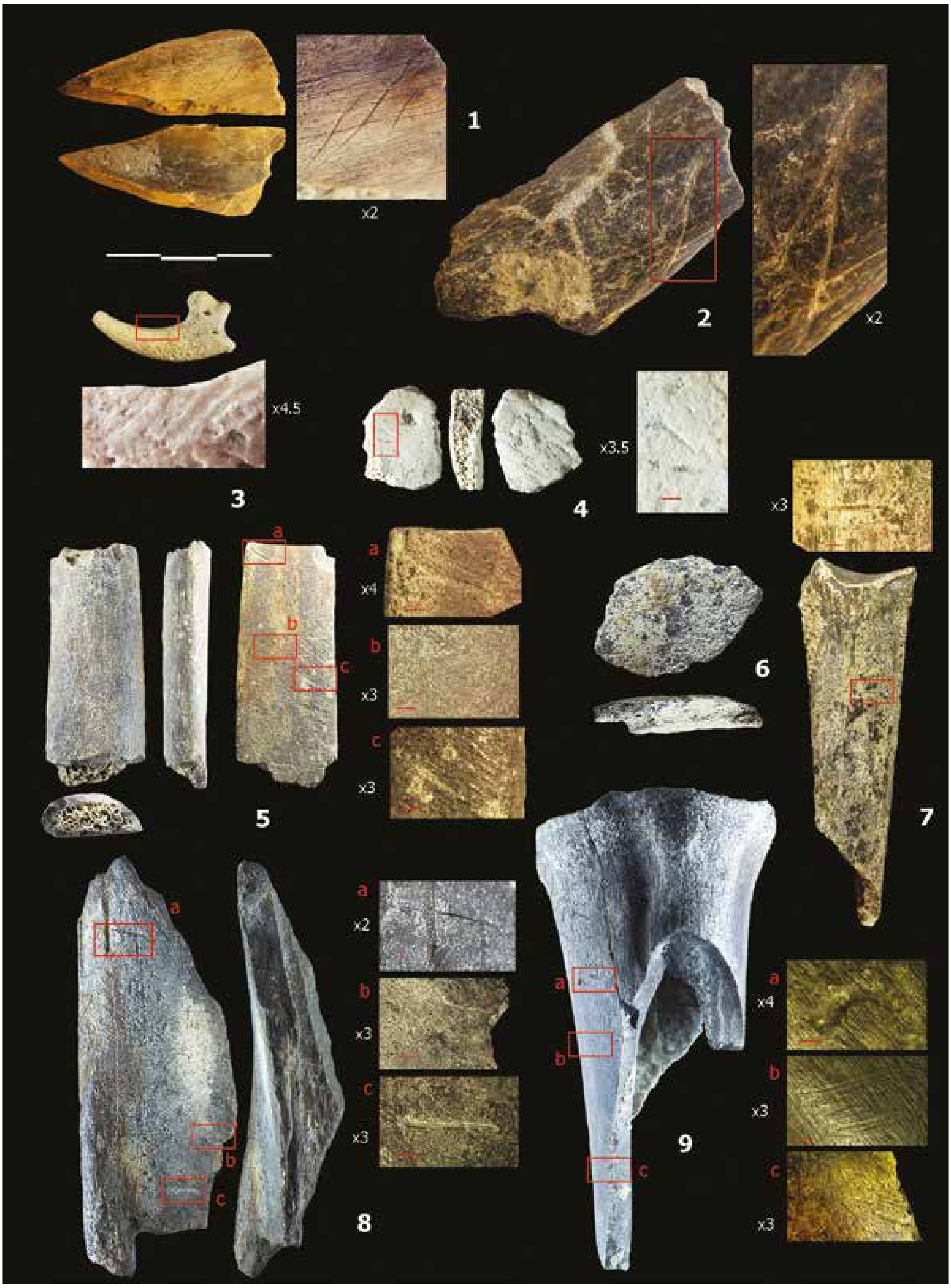

Fig. 3. Bones with linear and dent marks from MIS 11 Layer III of Medzhibozh 1. **Marks**: 1 – a group of deep and thin V-shaped marks; 2 – isolated deep and wide U-shaped marks; 3 – a group of U-shaped marks with furrows; 4 – isolated shallow U-shaped and carnivore tooth marks; 5 – numerous continuous linear U-shaped marks, mostly shallow; 6 – isolated, consisting of continuous separate deep V-shaped marks; 7 – isolated shallow U-shaped mark; 8 – isolated marks: thin and deep V-shaped (a), superficial V-shaped (b), and shallow Π-shaped with furrows; 9 – tooth mark (a), scraping mark (b), superficial V- and U-shaped marks (c). **Bones**: 1–2 – fragments of an ungulate long bone diaphysis; 3 – claw phalanx of a white-tailed eagle; 4 – flat bone fragment; 5 – rib fragment; 6 – skull fragment; 7 – fragment of a wild boar metacarpal bone; 8 – fragment of an ungulate tibia; 9 – proximal fragment of a deer metacarpal.

with different bones. The so-called "separate experiment" and "element of the experiment" were distinguished to facilitate data organisation and systematisation of results. The former denotes an act of using a specific tool on a specific bone in the same type of movement. Since the physical dimensions of the involved bone fragments differed, the number of experiments performed for different bones was not the same and had to be determined situationally. For example, the surface area of one of the dry bones (Bone B, a fragment of the diaphysis of the long bone of *Bovinae*) allowed for 15 experiments, while the small size of the fresh Bone D (fragment of the humerus of *Sus scrofa*) afforded only three experiments. Each experiment contained several elements (most often 3 to 4). An element is a discrete result of the same type of movement of a stone tool (for example, toward oneself), which resulted in a cut mark on the bone surface. For instance, in Bone B the total number of individual elements of the above-mentioned 15 experiments reached 57, while in the case of Bone D, there were only 14. The course of the experiments was recorded in protocols, accompanied by photo and, partially, video recording. The descriptive data are stored in Microsoft Excel databases. The experimental samples were processed using magnifying equipment, particularly magnifying lenses, a binocular microscope MBS-9, Bresser Advance ICD trinocular, Sigeta Expert, and Biwyily USB500xDM electron microscopes with appropriate software.

The bone sample. The experiments used predominantly fragments of long limb bones from cows, deer, pigs, and hens. A total of 10 limb bone fragments were involved, of which five were fresh (*Bovinae* and *Sus scrofa* bones), two dry (*Bovinae* and *Gallus gallus*), and three eroded (*Cervidae* and *Equidae*). Several types of raw materials were distinguished by their state of preservation: fresh bone (with remnants of meat, cartilage, and tissue, as well as boiled), dry bone (25 years old), and partially eroded bone (approximately 200 years old). This selection of objects for processing is due to the context of the Medzhibozh sites, whose culture-bearing layers could occasionally be exposed to the aquatic environment and eroded. Thus, an indefinite time could have passed between the bone being discarded and its intentional or accidental anthropogenic modification.[17] All samples, except the eroded ones, were stored in protected conditions. However, all the involved bone types showed no intense signs of change due to natural factors. The most significant difference between the "fresh" boiled and "dry" bone is the degree of hardness: over time, the bone becomes harder (and thus less elastic) and much harder to process. Greater saturation with organic matter, fat particles, the presence of periosteum, etc., characterise samples of fresh bone. These bones were boiled and cleaned of organic matter after the experiment. Samples of dry bone do not retain any organic matter or periosteum on the surface. Partially eroded bones are less tight and much easier to process.

Tools used. Flakes of flint, quartz, and granite, as well as fragments of bone and antler, were used. The experimental replicas made according to the technological model of the Medzhibozh sites, particularly Layer III of Medzhibozh 1,[18] were used as quartz and flint tools to simulate anthropogenic damage on the bones. Among such instruments were bipolar-on-anvil primary flakes (Fig. 4: 1), local Southern Bug flint and quartz pebbles (Fig. 4: 2–3), and free-hand flakes of the Dniester flint (Fig. 4: 8–11). The technogenic flakes and fragments of fine-grained pink and medium-grained dark-grey Zhytomyr granite were also used as stone tools (Fig. 4: 4–7). Apart from stone implements, fragments of tubular cow bone and antler were used as tools (Fig. 4: 12). Different types of edges were used to model the cut marks, namely: a) sharp edges without secondary processing; b) blunt edges without secondary processing; and c) edges formed by trimming-on-anvil technique.

3. Results

As noted, bones of various types of preservation were used as objects on which cut marks had formed. We distinguished between three preservation types: fresh bones (up to one year old), dry bones (several decades old), and eroded bones (several hundred years old). The effect of experimental cutting was manifested to varying degrees on bones in different states of preservation. We suggest that the softer surfaces of the more eroded bones enhance, to a certain extent, the effects of applying force during the productive movement. Note also that the cutting parameters on fresh bones were not constant. After the loss of organic components, the length, width, and depth appeared different. The disappearance of cartilage and periosteum can entail a complete disappearance of any visible damage (Fig. 8: A).

The experiment involved flint and quartz fragments produced mainly with the use of the bipolar-on-anvil technique. The raw materials were pebbles of quartz and flint from the Southern Bug Valley near Medzhibozh. The selection of potential tools was based on the morphology and metric parameters of experimental replicas of stone tools and the features of V-shaped, U-shaped, and П-shaped damage found on archaeological bones. Granite instruments were also used, namely flakes and

[17] Stepanchuk, Naumenko 2022.

[18] Ryzhov *et al.* 2019.

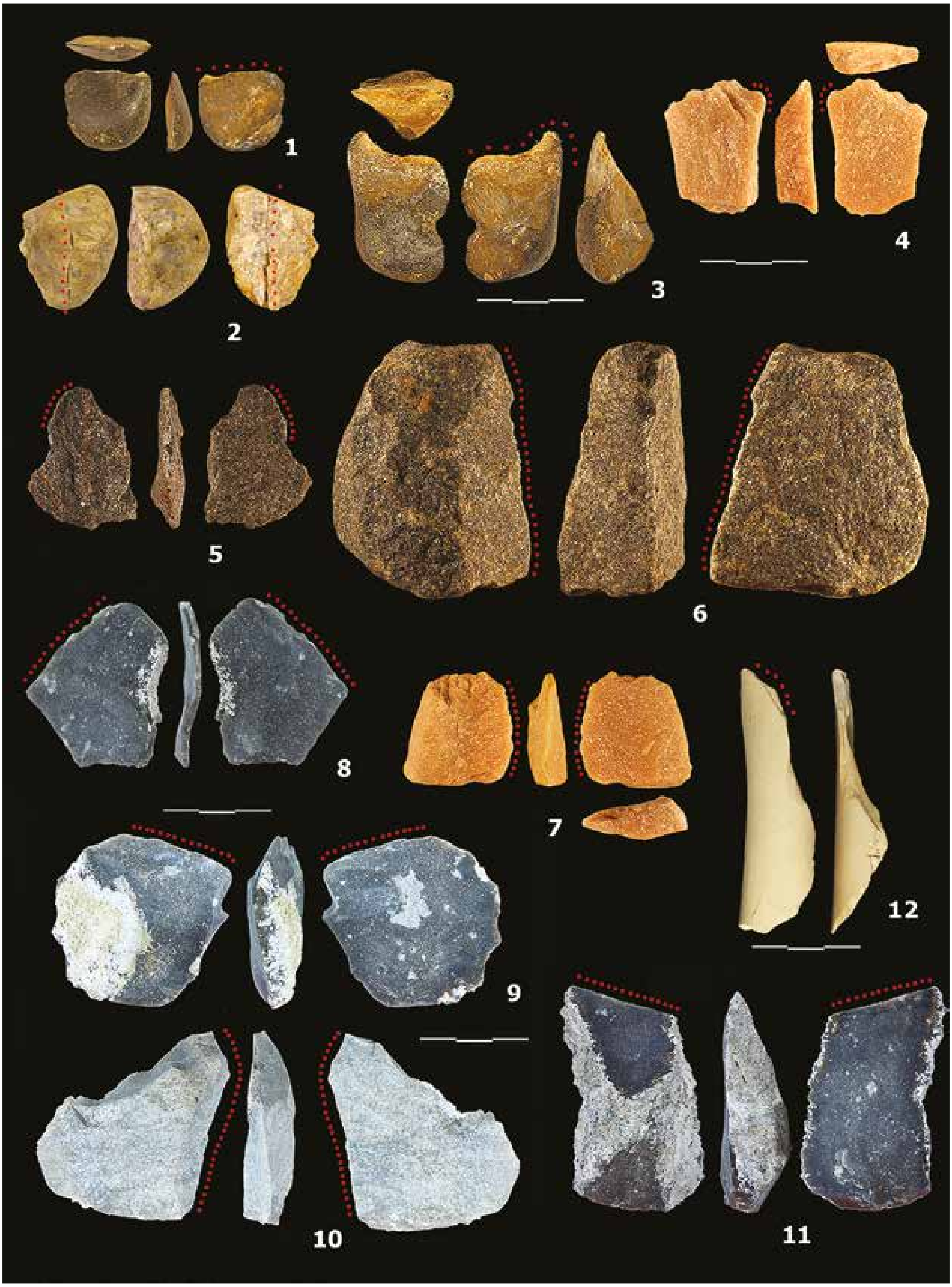

Fig. 4. Simulated bone (12) and stone tools used in the cutting experiments: bipolar-on-anvil knapping (1–3), technogenic flakes (4–7), and freehand knapping (11). Note that the profiles provide information about the morphology of working edges; dots indicate the edges' locations. **Raw materials**: 1, 3 – Medzhibozh pebble flint; 2 — Medzhibozh pebble quartz; 4, 7 – Zhytomyr pink granite; 5–6 – Zhytomyr grey granite; 8–11 – Dniester flint; 12 – long bone of cattle. **Type of support**: 1–3 – pebbles, 4–11 – flakes, 12 – bone splinter. **Type of edge**: 1–3, 5, 7, 8–12 — sharp edge; 4 – trimmed-on-anvil edge; 6 – blunt edge.

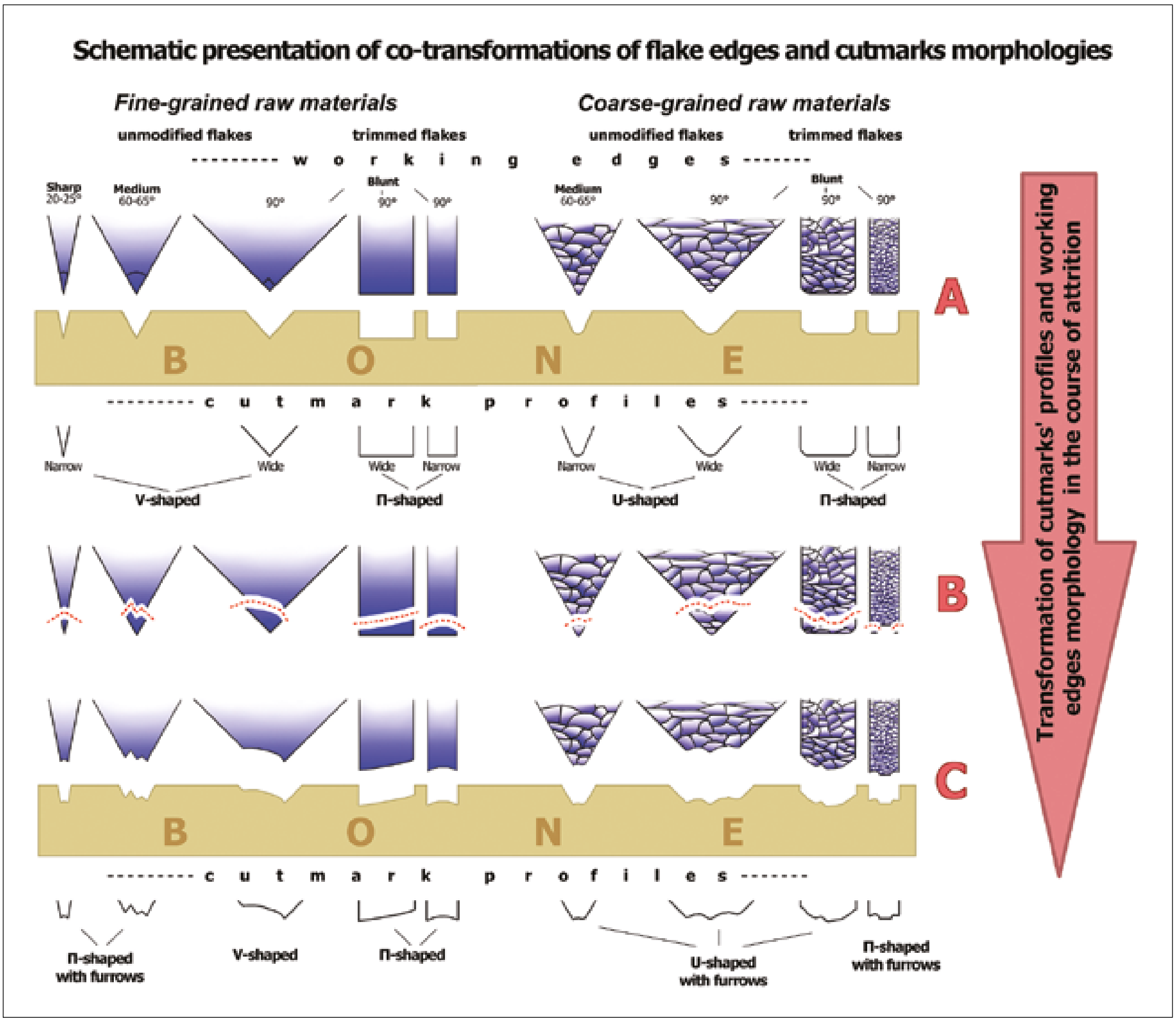

Fig. 5. Schematic presentation of co-transformation of flake edges and cut mark morphologies. Stage A – previously intact edges; stage B – initial edge destruction and stabilisation; stage C – already transformed edges.

fragments created by the industrial crushing of rocks. The thin edge areas of flakes (angle of sharpness below 25°), straight in plan and profile, were used by experimenters, as well as medium-angled blunt (angle of sharpness of ca. 40–65°) and thick blunt edges (ca. 90°) produced with the trimming-on-anvil technique. Figure 5 presents either empirically observed or predicted co-transformation of flake edges and cut marks' morphologies. Such parameters of the edges fully correspond to the morphology of the working edges of stone products observed, for example, in the assemblage from Layer III of Medzhibozh 1.[19] The bone tool involved was an elongated fragment of dry bone (2 years old) with acute longitudinal fractures but without additional treatment. A fragment of a deer antler (dry state, 25 years old) was also used as a tool, particularly its rounded tip and the sharp edge at its break. Thus, the used instruments were consistent with the parameters observed in the sample of archaeological tools.

In total, we conducted 81 experiments, which combined 281 elements, i.e., isolated cut marks (Fig. 6). This way, we generated a sufficiently representative database for a preliminary assessment of the morphology features of the cuts resulting from the experimental tools, varying by raw materials and working edge characteristics.

As soon as attention was turned to the shape of cross-sections, the cut marks' entry and exit properties,

[19] Stepanchuk *et al.* 2021.

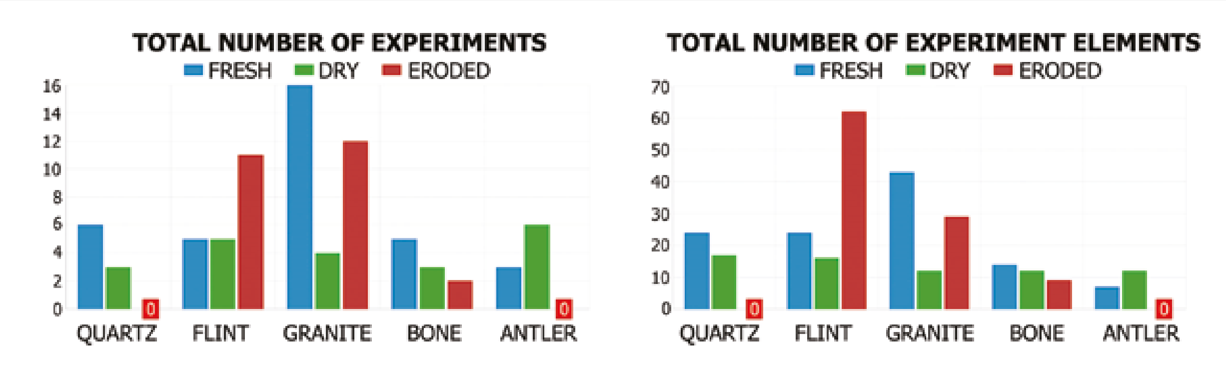

Fig. 6. Total number of experiments and their elements (i.e. isolated cut marks) in relation to the raw material of the tool and the type of preservation of the bone.

as well as cutting depth variations based on movement dynamics, we focused particularly on comparing the relevant parameters, taking into account important additional aspects, such as the instrument's material, parameters of the edge, and type of bone preservation.

We have collected as much data as possible on the various cases of correlations, although there are gaps that should be filled in the future (Tab. 1). Within the frame of the discussed experiment, the current database should be expanded by cut experiments with local limestone and quartzite flakes, unmodified and trimmed. Besides, we need to statistically assess the correlation between different tool parameters, state of preservation of bones, and cut mark metrics. Nevertheless, already at this stage, some observations provide valuable material for discussing and studying the archaeological cut marks.

Table 1. The parameters of the working edge of tools made of different raw materials concerning the type of bone and the total number of experiment elements. Bone type: "Fr" – fresh; "Dr" – dry; and "Er" – eroded.

Raw material	**Type of edge, type of bone, number of experiment elements**														
	Sharp			Blunt			Trimmed			Broken			**Total**		
	Fr	Dr	Er	Fr	Dr	Er	Fr	Dr	Er	Fr	Dr	Er	Fr	Dr	Er
Quartz	14	17	–	10	–	–	–	–	–	–	–	–	***112***	***69***	***100***
Flint	24	10	32	–	6	–	–	–	18	–	–	12			
Granite	21	6	15	12	3	7	10	3	7	–	–	–			
Bone	14	12	9	–	–	–	–	–	–	–	–	–			
Antler	7	6	–	–	6	–	–	–	–	–	–	–			
Total	80	51	56	22	15	7	10	3	25	–	–	12			
			187			***44***			***38***			***12***			**281**

There is a certain correlation between the movement of the tool and the location of the deeper and shallower sections of the cut mark. According to the data obtained, almost a third of the cuts had greater depth in the first half of the length when moving *towards oneself*. On the contrary, when moving away *from oneself*, there were half as many comparable cuts (Tab. 2). Instead when moving away *from oneself*, there were significantly more cuts with greater depth in the second half of the length (more than 25%). In comparison, during movement *towards oneself*, there were three times fewer cuts of this kind (approximately 8%). The depth of the cut reflects the degree of force applied. The observed difference is likely objective in nature and does not depend on the individual characteristics of the experimenters.

Table 2. The correlation between the depth of the cut and the kinetics of movement.
N marks the number of cuts.

Cutmark's depth features	**Kinematics of movement**							
	Towards oneself		**From oneself**		**Reciprocating**		**Total**	
	N	%	N	%	N	%	N	%
Deeper at the beginning	43	29.7	13	15.9	–	0	56	22.7
Deeper at the end	12	8.3	21	25.6	–	0	33	13.4
Same along the entire length	90	62	48	58.5	20	100	158	63.9
Total	***145***	100	***82***	100	***20***	100	***247***	***100***

When analysing the correlations between the cut mark types of entry and exit and movement kinetics (Tab. 3), we found a fundamental similarity in the distribution of all types of cuts. In general, *gradual* entry and exit of cuts prevail (more than 70% on average). Such morphology indicates a predominance of smooth penetration and gradual release of tool edge from the bone body. The exception is a series of cut marks formed in a movement *from oneself*. Here, the group of cut marks with a gradual start makes up only about 30%, while cut marks with a sharp entry prevail, reflecting intense penetration of the edge into the bone body during the initial phase of the productive movement. It should be noted that 14 cuts with the most abrupt exit were recorded for a series formed with the movement *away from oneself* performed with broken and trimmed edges of flint flakes on an eroded bone.

Table 3. The correlation between the types of cut entry and exit and the kinetics of movement.
N marks the number of cuts.

Start and end of cutmark	**Kinematics of movement**							
	Towards oneself		**From oneself**		**Reciprocating**		**Total**	
Start of cutmark:	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Gradual	33	67.3	7	29.2	6	75	46	56.8
Sharp enough	16	32.7	17	70.8	2	25	35	43.2
Total	49	100	24	100	8	100	***81***	***100***
End of cutmark:	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Gradual	93	71	56	73.7	28	80	177	73.1
Sharp enough	38	29	20	26.3	7	20	65	26.9
Total	131	100	76	100	35	100	***242***	***100***

A definite relationship between the type of working edge and morphology of the entry and exit of cut marks has been recorded. In any case, trimmed and fractured edges appear to produce a higher proportion of sharp penetration and release on the bone surface (Tab. 4). There is also a correlation between the frequency of cut marks with the above-discussed features and the state of preservation of bones. Thus, the proportion of recorded cut marks with a sharp entry and sharp exit of a lithic edge is approximately 16%, 24%, and 39% for fresh, dry, and eroded bone, respectively. These data may indicate that the cut marks in question occur more frequently when a greater physical force is exerted.

Table 4. The correlation between the type of edge and the types of entry and exit of cuts.
N marks the number of cuts.

Start and end of cutmark	**Type of edge**							
	Sharp		Blunt		Trimmed + broken		**Total**	
Start of cutmark:	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Gradual	27	69.2	5	22.7	14	70	46	56.8
Sharp enough	12	30.8	17	77.3	6	30	35	43.2
Total	39	100	22	100	20	100	***81***	***100***
End of cutmark:	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Gradual	119	78.3	31	77.5	27	54	177	73.1
Sharp enough	33	21.7	9	22.5	23	46	65	26.9
Total	152	100	40	100	50	100	***242***	***100***

The shape of a cut mark's cross-section depends on the morphology of the edge used. Statistically processed data for this parameter are shown in Table 5. We consider the cut marks with combined cross-sections as belonging simultaneously to each relevant type to simplify the perception and handling of the data. For instance, 12 cut marks with combined U/V and V/U profiles were assigned to the U and V types, 12 units to each group. Table 6 shows the information after the data was organised in this way for cut marks with combined cross-sectional profiles.

Table 5. The correlation between the edge type and the types of a cut cross-section.
N marks the number of cuts.

Type of cutmarks' profile and other damages variation		**Type of edge**									
		Sharp		**Blunt**		**Trimmed**		**Broken**		**Total**	
		N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Stone instruments	U-shaped	9	4.8	5	11.4	9	23.7	–	–	23	8.2
	U/V, V/U combined	12	6.4	10	22.7	3	7.9	–	–	25	8.9
	U/Π, combined	1	0.5	7	15.9	7	18.4	–	–	15	5.3
	U/stripes	13	7	–	–	–	–	–	–	13	4.6
	V-shaped	131	70.1	6	13.6	13	34.2	–	–	150	53.4
	V/Π, combined	–	–	–	–	3	7.9	12	100	15	5.3
	Π-shaped	–	–	10	22.7	3	7.9	–	–	13	4.6
Bone, antler	Stripes	11	5.9	2	4.6	–	–	–	–	13	4.6
	Areas	7	3.7	–	–	–	–	–	–	7	2.5
	Not visible	3	1.6	4	9.1	–	–	–	–	7	2.5
Total		***187***	100	***44***	100	***38***	100	***12***	100	***281***	100

The minimal number of Π-shaped cut marks among the sharp edges of stone tools is noteworthy (Fig. 4: B4). The number of U-shaped and, especially, Π-shaped cut marks (and proper areas of cut marks with a combined profile) is expectedly high for cuts produced by the trimmed and broken edges (Fig. 4: A1–3, 8a, 9a, 10b;

B2, 4). This distribution is in line with other observations of cut marks' profiles caused by unretouched edges and burins.[20] Worth noting is also the significant number of cuts with U-shaped and П-shaped cross-sections in the experimental series (more than 25% and 14%, respectively) (Tab. 6).

Table 6. The correlation between the type of edge and the type of a cut cross-section. N marks the number of cuts together with individual areas of the same profile in cuts, showing a combined cross-sectional shape.

Type of cutsmarks' cross-section	**Type of edge**									
	Sharp		**Blunt**		**Trimmed**		**Broken**		**Total**	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
U-shaped	35	19.6	22	40	19	37.3	–	0	76	24.6
П-shaped	1	0.5	17	30.9	13	25.4	12	50	43	13.9
V-shaped	143	79.9	16	29.1	19	37.3	12	50	190	61.5
Total	***179***	100	***55***	100	***51***	100	***24***	100	***309***	100

It is possible that two subjective reasons can simultaneously explain the increased frequency of cut marks with such cross-sections in the experimental series. Firstly, we consciously and actively used blunt and trimmed edges, which was dictated by the specificity of the archaeological stone industry of the Medzhibozh sites. Secondly, the damage caused by relatively thin edges broken at approximately 90° angle (e.g. Fig. 4: B4) was attributed to the П-shaped cut marks. In the case of cuts of considerable depth, such narrow cut marks are easy to classify as V-shaped when examined without magnification.

The type of cut mark's cross-section is related to the material used to make the tool (Tab. 7), regardless of the kinetics of movement, and the state of bone preservation. Flint and quartz flakes with thin, feather-like edges tend to produce characteristic single deep grooves with a straight (rarely arched) trajectory and a narrow V-shaped cross-section (Fig. 4: A5, 6, 8b, 9b, 10a; B3). U-shaped cut marks were often formed by the edges of granite and bone tools (Fig. 5: B). In these categories, they account for more than 40% and 50%, respectively. Fine- and medium-grained granite was used in our experiments. The edges of the former variety demonstrate greater stability, but all the used granite tools became blunt quickly. As a result of their use, V-, U-, and П-shaped cut marks appeared (Tab. 7).

Table 7. The correlation between tool material and types of cut cross-sections. N marks the number of cuts together with individual areas of the same profile in cuts, showing a combined cross-sectional shape.

Type of cutmarks' profile and other damages' variation	**Tool's raw material**											
	Quartz		**Flint**		**Granite**		**Bone**		**Antler**		**Total**	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Not visible	–	–	–	–	–	–	–	–	4	21	4	1.2
Areas	–	–	–	–	–	–	–	–	7	36.9	7	2.1
Stripes	–	–	–	–	–	–	12	27.3	8	42.1	20	5.9
U-shaped	–	–	–	–	46	41.1	23	52.3	–	–	69	20.3
П-shaped	7	17.1	26	21.1	15	13.4	1	2.3	–	–	49	14.5
V-shaped	34	82.9	97	78.9	51	45.5	8	18.2	–	–	190	56
Total	***41***	100	***123***	100	***112***	100	***44***	100	***19***	100	339	100

[20] Moretti *et al.* 2015.

Dry bone splinters with sharp edges cause slightly different damage than those left by the edges of stone flakes. Depending on the hardness of the bone being worked and the force exerted, the bone tool leaves V-, U-, or Π-shaped cut marks (but not in the same proportions as the granite edge) and also strips of surface damage and soft polishing (Tab. 7) (Fig. 4: B6). Similar results for bone tools have been obtained by other experimenters.[21] The reciprocating (sawing) motions resulted in deep and wide grooves with a considerable number of micro-scratches and furrows (Fig. 4: B5). Irrespective of the used edge sharpness, traces of work with antler, a relatively tough and viscous material, if observable at all, are represented either by strips of continuous shallow strips and irregular polish or discontinuous areas of such strips (Fig. 4: B7, 8).

Furrows correlate somewhat more frequently with the U- and Π-shaped cut marks made with trimmed edges and with the Π-shaped cuts in general (Tab. 8). The presence of furrows correlates more clearly with the texture and structure of the material used to make the tools (Tab. 9). Thus, the largest number of cut marks with visible furrows is observed in the group of quartz tools (Fig. 4: B1, 2, 4), followed by granite (Fig. 5: B), flint (Figs. 4: A2–4, 7, 9), and bone (Fig. 4: B5). The hardness of the rocks involved was almost identical on the Mohs scale and ranged between 7 and 8. In effect, there exists a correlation between the frequency of furrows and the monolithic nature of the stone tool material. The dependence of the frequency of furrows on the condition of the bone is not so clear (Tab. 10), although there are significantly more U- and Π-shaped cut marks with furrows in the group of eroded bone. Similar findings were obtained in other experimental programs.[22]

Table 8. The presence of furrows in relation to the morphology of the edge and the type of cut mark cross-section.

Type of cutmarks' profile	Type of edge and the presence of furrows N and % according to the type of cutmark's cross-section									
	Sharp, N and % in this variation		Blunt, N and % in this variation		Trimmed, N&% in this variation		Broken, N&% in this variation		Total	
	N	%	N	%	N	%	N	%	N	%
U-shaped	1 in 35	2.9	8 in 22	36.4	12 in 19	63.2	–	–	21	27.6
Π-shaped	–	–	9 in 17	52.9	11 in 13	84.6	7 in 12	58.3	27	64.3
V-shaped	73 in 143	51.8	9 in 16	56.3	6 in 19	31.6	7 in 12	58.3	95	50
N and % of cuts* with furrows in the given edge group	74 in 179	41.3	26 in 55	47.3	29 in 51	56.9	14 in 24	58.3	143	46.3

* Together with individual areas of the corresponding profile in cuts with a combined cross-sectional profile.

4. Discussion

The main purpose of the work was to develop an experimental comparative base facilitating a more objective reconstruction of some key conditions of occurrence of cuts on bones originating from the Lower Palaeolithic sites near Medzhibozh. The operation of cutting bones of different states of preservation was simulated. Not only fresh but also dry and eroded bones were used. This latter aspect was dictated by the specific natural context of the Medzhibozh sites, whose culture-bearing layers would periodically become exposed, which could draw the attention of hominins to bones in different conditions. In this case, we are talking not about dismembering carcasses or defleshing bones but about probable hominin interaction with bones discarded earlier. The species composition of the bones used in the experiments (*Bovinae, Cervidae, Equidae, Sus scrofa*, and *Gallus gallus*) was fundamentally analogous to the animal remains bearing cut marks recorded at Medzhibozh, i.e. large and medium mammals and birds. Following the peculiarities of typology and raw material structure of the Medzhibozh lithic assemblages that belong to the circle of core-and-flake industries, the instruments involved were of different rock types and characterised by different edge morphology. The tools were of experimental (quartz, flint) and

[21] Shipman, Rose 1988; Gürbüz, Lycett 2021.

[22] Fernández-Jalvo *et al.* 1999, Fig. 8.

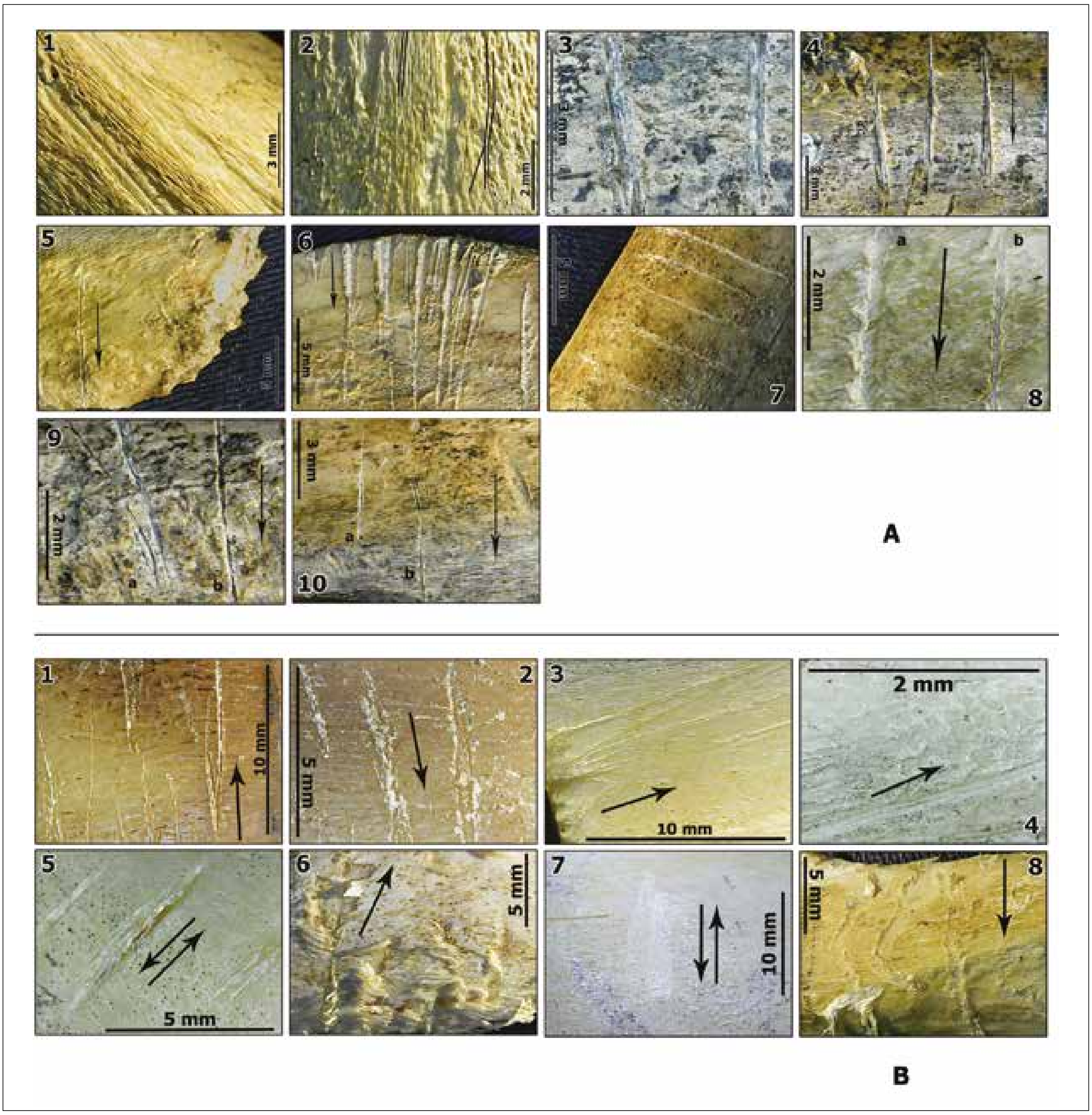

Fig. 7. Experimental cut marks on dry (A1–2; B3–5, 7), eroded (A3–4, 7, 9–10), and fresh bones (A5–6; B1–2, 6, 8). **Tool material**: A1–10 – flint; B1–4 – quartz; B5–6 – bone; B7–8 – antler. **Type of working edge**: A1–4, B1–2 – trimmed or thick (blunt); A5–6, 8b, 9b, 10a, B3 – sharp and feather-like; A7, B4 – worn (damaged) feather-like; A8a – thick blunt; A9a, 10b – trimmed; B5–6 – sharp bone edge; B7–8 – sharp antler edge. Arrows indicate the direction of cut marks; a pair of opposing arrows indicate reciprocating movement.

technogenic (granite) origin, with sharp and blunt non-retouched working edges and edges trimmed on the anvil. Thus, the used instruments were consistent with the essential features of Medzhibozh lithic artefacts. Bone and antler were also used as tools.

Quite exceptional are blunt and trimmed-on-anvil edges involved in the experimental cut mark simulations, even if unmodified flakes or natural pieces were used.[23] The use of eroded bone in such studies has also been uncommon. Note that a bone with a softer surface snaps un-

[23] See Domínguez-Rodrigo *et al.* 2012; Malassé *et al.* 2016; Boschin *et al.* 2021.

der a smaller amount of force. We used both approaches. Admittedly, a cut mark's cross-section is markedly easier to identify on an old bone. This is an obvious function of reduced bone density. While bone remains fresh, its density may essentially affect cut marks' morphology.[24] At the same time, the damage morphology on old bones does not show any new specific details and features. With this in mind, it can be assumed that cutting over a bone with an eroded surface is, in a sense, a model of cutting over a bone with a stronger surface, provided that considerable force is applied. We believe there are no special reservations about using the data obtained for such bones when comparing them with other experimental and archaeological materials.

The morphology of the experimentally formed cut marks depends on the raw material of the tool, type of edge, kinetics of movement, force of pressure, as well as bone shape. This last aspect, often resulting in a discontinuity in the straightness of a linear cut mark, has not been addressed in the article. Regularities have been observed in the distribution of U-shaped and Π-shaped cut marks when compared to the V-shaped cut marks, which are more commonly presented in archaeological and experimental studies.[25] It should be particularly emphasised that in our experiments, the U-shaped cut marks were regularly produced while working with granite and bone edges. It is important to note that this type of damage is often described not as cutting marks but either tooth marks (evidence for gnawing) or trampling marks, i.e. a result of mechanical damage of various origins.[26] More data is still necessary to distinguish between anthropogenic and natural U-shaped linear damage. Nevertheless, we believe that the extent of blunt edge use in the Lower Palaeolithic and the bone damage caused by such edges are greatly underestimated, reflected by only a few relevant references.[27] The issue is complicated by post-deposition alterations that can modify relatively shallow Π-shaped and U-shaped cut marks. For instance, rounding could lead to a significant reduction in the diagnostic potential of a cut mark, due to the degradation of sharpness of walls and profile and further loss of other anthropogenic signs. In the materials from Medzhibozh 1 (Layer III), there are bones with wide and relatively shallow grooves, which we classify as cut marks (Fig. 3: 2). In the experimental series, we obtained similar parameters of artificial damage (Fig. 8: B1, 3), which supports this interpretation.

The morphology of cut marks is linked to the parameters of the working part of the edge. In turn, the edge parameters – resistance to loads and duration of use in a stable state – depend directly on the material from which the tool was manufactured. Hard, fine-grained isotropic rocks allow the manufacture of flakes with thin edges leaving V-shaped cuts or, in the event of breakage, narrow and deep Π-shaped cut marks. The strong structure of quartz and flint ensures the durability and stability of the tool's working edge. The durability of quartz edges has been confirmed by a number of experimental studies in which tools made of this type of rock left mostly V-shaped cuts with a straight trajectory. In this case, the appearance of U- and Π-shaped cut marks, as well as furrows, is associated with the structural and textural characteristics of the raw material rather than secondary processing or damage to the edge.[28] In contrast, intrusive igneous rocks, such as granite, though capable of yielding sharp flakes while knapped, are prone to much more intense fracture during use. The rate of edge breakage depends on the composition, granularity, and strength of the stone's structure. Accordingly, over time, a tool that initially left a thin and straight cut can begin to produce rough and wider cuts, which can even be mistaken for traces of another tool.[29] The process is exacerbated by unavoidable damage to the edge during cutting. For example, Figure 7B: 3 presents a significant number of thin cut marks produced by the feather-like edge of a quartz flake. Figure 7B: 4 shows a wide cut mark with furrows formed in the same area but by a part of an edge already shattered (the breakage occurred due to the considerable strength of the dry bone surface). Shallow grooves with amorphous profiles and shapes produced by dull parts of antler and bone tools, sometimes accompanied by small indistinct scratches, may resemble trampling marks.[30]

The lithic tool-produced cut mark is often a combination of furrows, which are all formed by a single movement. A blunted or damaged sharp edge may produce a set of furrows: a central furrow, deep and extended, and accompanying furrows, shallower and interrupted, sometimes without a noticeable point of entry (Fig. 7A: 2–4, 9a, 10b; 7B: 1–2, 4–5). The trimmed-on-anvil edge is significantly more likely to result in a multiplication of the central furrow than the thin feather-like edge of a flake. This is true of secondarily treated edges in general.[31] The cut mark is less profound than those produced with

[24] Braun *et al.* 2016; Krasinski 2018.

[25] E.g., Domínguez-Rodrigo *et al.* 2005; Garcia *et al.* 2013; Roche *et al.* 2018, Fig. 6; Sahnouni *et al.* 2018, Fig. 4; Daujeard *et al.* 2020.

[26] E.g., Pineda *et al.* 2020.

[27] E.g., Echassoux 2012, 303–304.

[28] Buccheri *et al.* 2016; Moclán *et al.* 2018.

[29] E.g., Greenfield 2006; Moretti *et al.* 2015; for quartzite and limestone tools, see Fernandez-Jalvo, Andrews 2016, 42, 44, 50, Figs. A.66–67; 47–48, Figs. A.53–54, 57.

[30] Compare Fig. 3: 5 and Fernandez-Jalvo, Andrews 2016, 51, Fig. A.71; 53, Fig. A.77.

[31] Fernandez-Jalvo, Andrews 2016, 41, Fig. A. 30–31.

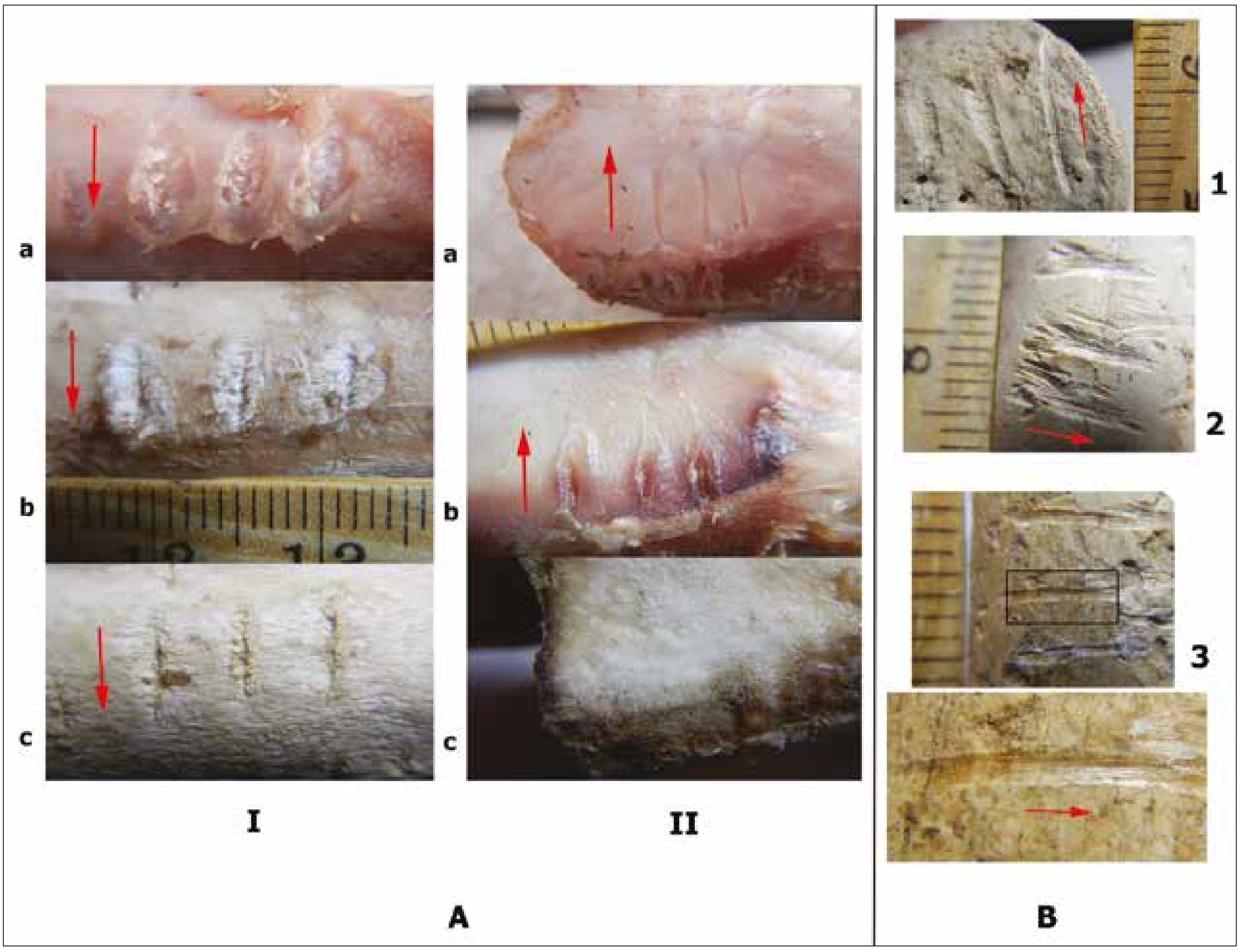

Fig. 8. Experimental cut marks. **AI** – cutting (*on oneself*) with a blunt working edge of a granite tool on a fresh bone: a) the initial appearance of cut marks; b) after boiling; c) almost no flesh remains. **AII** – cutting (*from oneself*) with a sharp working edge of a granite tool on a fresh bone: a) the initial appearance of cut marks; b) before boiling; c) without leftover meat. Particularly noticeable are either the changes in the physical parameters of the cut marks after the removal of tissue remnants (1) or their complete invisibility (2). **B.** Cutting with a granite tool on eroded bone. 1 – with a trimmed working edge *from oneself*; 2 – with a blunt working edge *on oneself*; 3 – trimmed working edge *on oneself*. The large number of furrows and the mostly U-shaped cross-section should be noted.

a sharp edge of a similar tool but wider. During the reciprocating movements (sawing), a flint flake with a sharp edge leaves the deepest cut; the trimmed edge is also effective but leaves a wider groove and modifies the bone surface more slowly. Furrows are more commonly associated with Π-shaped cut marks in general and U-shaped and Π-shaped cut marks made with the trimmed edge (Tab. 8). The presence of furrows correlates more evidently with the texture and structure properties of the involved tool's material (Tab. 9). The relationship between non-siliceous rocks and the abundance of furrows in cut marks has been observed in previous studies for limestone,[32] quartz,[33] or quartzite,[34] among other materials.

Multicluster cut marks with an X- or Y-shape attract attention. They are regularly recorded in experimental cutting studies and are associated either with the sinuous edge of the tools used[35] or with a change in edge angle during operation.[36] The irregularity of the secondary worked edge forms an X-shape when it changes the angle of inclination while passing through the bone surface.[37]

[32] Espigares *et al.* 2019.
[33] Buccheri *et al.* 2016; Moclán *et al.* 2018.
[34] Fernandez-Jalvo, Andrews 2016, 42; Malassé *et al.* 2016.
[35] Domínguez-Rodrigo *et al.* 2009; de Juana *et al.* 2010.
[36] Fernández-Jalvo *et al.* 1999, Fig. 8.
[37] Fernandez-Jalvo, Andrews 2016, 38–40, 50, Figs. A.16, 17, 23–26, 65.

Table 9. The presence of furrows in relation to the tool material and the type of cut section.

Type of cutmarks' profile	Tools' raw material and the presence of furrows N and % according to the type of cutmark's cross-section									
	Quartz, N and % in this variation		Flint, N and % in this variation		Granite, N and % in this variation		Bone, N and % in this variation		Antler, N and % in this variation	
	N	%	N	%	N	%	N	%	N	%
U-shaped	–	–	–	–	21 in 46	45.7	4 in 30	13.3	–	–
Π-shaped	5 in 7	71.4	12 in 20	60	10 in 15	66.7	0 in 1	0	–	–
V-shaped	20 in 34	58.8	44 in 97	45.4	28 in 51	52.9	4 in 8	50	–	–
N and % of cuts* with furrows in the given raw material group	25 in 41	61	56 in 117	47.9	59 in 112	52.7	8 in 44	18.2	–	–

* Together with individual areas of the corresponding profile in cuts with a combined cross-sectional profile.

Table 10. The presence of furrows according to the correlation between the bone condition and the type of cut cross-section.

Type of cutmarks' profile	Bone condition and the presence of furrows N and % according to the type of cutmark's cross-section					
	Fresh bone, N and % in this group		Dry bone, N and % in this group		Eroded bone, N and % in this group	
	N	%	N	%	N	%
U-shaped	4 in 62	6.5	7 in 25	28	14 in 42	33.3
Π-shaped	5 in 23	21.7	0 in 3	0	19 in 45	42.2
V-shaped	31 in 83	37.3	30 in 50	60	35 in 97	36.1
N and % of cuts* with furrows in the given bone group	40 in 168	23.8	37 in 78	47.4	54 in 187	28.9

* Together with individual areas of the corresponding profile in cuts with a combined cross-sectional profile.

In our experiments, such cut marks were mainly formed using tools with a trimmed working edge (Fig. 7: A2, 9a, 10b; B1, 2) or with a thick, worn edge (Fig. 8: B2). The X- or Y-shaped cut marks result from a single productive action. However, the irregular morphology of the edge (in particular damaged or sinuous), the change of pressure force, and the differences in bone morphology (Fig. 7: B1) together give the damage a multi-component structure that eventually looks like a result of several distinct, independent motions. The appearance of such cut marks is less dependent on the type of raw material used to make the tool.[38]

The relationship between the kinetics of tool movement and the location of the deepest part of the cut mark has been traced. Nearly a third of the cut marks left when moving *towards oneself* are deeper at the beginning, in the first half of the length (Tab. 2). On the other hand, the number of cut marks with greater depth in the second half of the length is more frequent among products of cutting *from oneself.* We also found a similarity in the distribution of all cut mark varieties in the relationship between the kinetics of movement and the type of start and end of the cut mark (Tab. 3). However, there is a noteworthy exception, namely a series of cut marks formed

[38] Buccheri *et al.* 2016.

by moving *from oneself*. Among them, cut marks with an abrupt entry dominate, witnessing a deep plunge of the edge into the bone body at the beginning of the productive action. Significantly, more cases were recorded for trimmed and broken edges with a sharp entry into and a sharp edge exit from the bone surface (Tab. 4).

The shape of a cut mark's cross-section predictably depends on the edge morphology. For instance, the number of П-shaped cut marks in the case of sharp edges of stone tools is minimal. On the other hand, the number of U-shaped and, especially, П-shaped cut marks (and areas in cut marks with combined cross-section) increased in the case of trimmed and broken edges. According to our data, the cut mark cross section is directly related to the tool's material (Table 7), irrespective of the kinetics of movement and the state of preservation of the bone. The differences were noted by other authors for marks left by tools made not only from different raw materials but also from the same type of material with different granularity.[39]

In general, the morphological features of the experimental cut marks produced by thin, thick, and trimmed edges of stone tools made from different types of raw materials have analogies with the archaeological materials from the Medzhibozh sites. In particular, among bones with cut marks (Fig. 1) one can distinguish: V-shaped incisions, made by three short movements of partially fragmented, thin, sinuous flint (quartz) tool edge (Fig. 3: 1); U/П-shaped cut marks, probably caused by the reciprocating motion of a dull edge of a granite (?) tool (Fig. 3: 2); thin V-shaped notches resulting from extended controlled cutting with the thin edge of a flint (quartz?) flake (Fig. 3: 6; 8a); and П-shaped notches resulting from several short movements with trimmed-on-anvil, blunt, or damaged edge of heterogeneous material (granite, quartz?) (Fig. 3: 3). The archaeological linear marks, presented, for example, in Figure 3: 5 and 9, have so far remained outside the scope of the recent experiments. These marks may witness deliberate scraping (Fig. 3: 9b) or ripping of tissue remains in a manner of abrasion on a hard and grained surface (Fig. 3: 5a-c). As long as no experimental models are available, these marks should be currently classified as trampling marks. The undoubted trampling features include minor linear grooves shown in Figure 3: 4, 7, 8c, caused by mechanical damage to the surface.

5. Concluding remarks

The experimental results and observations provide rich cognitive and comparative material for the study of cut marks on bones found in the context of the Lower Palaeolithic sites of Medzhibozh. Among the aforementioned observations and preliminary findings, the following can be emphasised. There is a direct correlation between the type of raw material, the type of edge, and the morphology of cut marks. The cut mark morphology of a stone tool depends on the raw material's structure monolithicity and texture peculiarities. As the edge wears down, the morphology of the cut marks changes: from a thin V to an overextended U. When the bone splinter operates on a fresh bone, the latter may show distinctive damage. When antler is used, whether with a blunt or sharp edge, it leaves almost no visible marks.

Thus, not all U-shaped grooves on the surface of bones are attributable to tooth marks or constitute mechanical damage. Some of the U-shaped linear marks result from using blunt edges. Similarly, anthropogenic damages produced by blunt parts of antler and bone tools may resemble trampling marks. П-shaped cut marks formed as a result of trimmed edge use, thus resembling the burin marks. In terms of the morphology of anthropogenic damage, there is no difference between fresh, dry, and eroded bones. The greater exposure of eroded bone (due to the softness of the material) to anthropogenic modifications can be used to simulate cut marks made with higher muscle effort. Cut mark parameters on fresh bones are not constant: length, width, and depth appear different after the loss of organics, and the disappearance of cartilage and periosteum may result in the inability to identify signs of anthropogenic damage.

Some criteria for the analysis of cut mark morphology seem not informative enough. Nevertheless, making use of a large set of variables to assess experimental samples is justified by providing more complete comparisons with archaeological samples. Based on the experimental data obtained and partially presented in this paper, a furthermore in-depth analysis of the Medzhibozh archaeological finds is also possible. Thus, the cognitive usefulness and scholarly perspective of experimental modelling in the archaeozoological studies on the Lower Palaeolithic sites of Ukraine are quite evident.

[39] Courtenay *et al.* 2019.

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From the West to the East. On the Transcarpathian Circulation of the Lithic Raw Materials during the Linear Pottery Culture (LBK) Development

Abstract

The article is devoted to the issue of far-reaching, Transcarpathian distribution and exchange of various flint raw materials and obsidian during the development of Linear Pottery Culture (LBK). The currently available source data suggest clear differences between the oldest (Pre-Music-Note) and the younger (Music-Note and Želiezovce) developmental phases of this culture in terms of directions and range, as well as the form and degree of distribution intensity of particular raw materials. This applies in equal measure to the raw materials of high technological importance – distributed in large quantities in the forms of concretions, pre-cores, or prepared cores – and to blades, flakes or tools, constituting only a minor quantitative supplement to the mainstream Transcarpathian distribution of raw materials, much less important in this respect and represented within particular inventories by very few specimens. Particularly significant differences are visible at the younger developmental stage of the LBK. They are closely related to the much broader context of cultural phenomena and changes that took place in the areas on the northern side of the Carpathians at the turn of the 6th and 5th millennia BC as a direct reflection of the intensity of interregional contacts, both at the intra- and intercultural level.

Keywords: Linear Pottery Culture, flint raw materials, obsidian, distribution and exchange, Carpathians

Introduction

The issue of the Transcarpathian distribution of obsidian and flint raw materials among the Linear Pottery Culture (*Linearbandkeramik*; hereafter as LBK) communities was the subject of consideration in many previous studies, focusing both on the period of this culture development,[1] as well as on the much broader chronological and cultural background, comprised of all the Danubian cultural units.[2] The attention of particular authors was drawn mainly to issues related to the character, intensity, extent, and directions of the territorial distribution of the Jurassic-Cracow and chocolate flint as well as obsidian. These raw materials were undoubtedly of greatest importance in areas located on both sides of the Carpathians, playing a key role in the overall system of distribution and exchange at the time when the communities of the Linear cultural circle were developing. Many studies emphasised that the territorial circulation of these products was of a complex, multi-stage, and far-reaching character, reflecting the intensive interregional contacts maintained by the LBK communities from southern Poland with other – sometimes very distant – settlement enclaves.[3] Attention was also paid to the non-industrial background of these phenomena, particularly clearly manifested in the case of the most distant and, at the same time, the least numerous finds.[4]

[1] E.g. Kozłowski 1970; 1985; Lech 1979; 1989; 1990; 2003; Caspar *et al.* 1989; Kaczanowska 2003; Mateiciucová 2008; Szeliga 2009; 2014; Szeliga, Zakościelna 2019.

[2] E.g. Kaczanowska 1971; 1976; 1985; Kaczanowska, Lech 1977; Lech 1987; Kaczanowska, Kozłowski 2005; Janák, Přichystal 2007; Szeliga 2007; Burgert 2018.

[3] E.g. Kozłowski 1958, 357; 1970, 74; Lech 1987, 241–243, fig. 28.1; 1989b, fig. 1; 2003, figs. 5–6; Kaczanowska, Kozłowski 2005, 79; Szeliga 2009, 298–299.

[4] E.g. Lech 1979, 131; 2003, 24–27; Małecka-Kukawka 1994, 40–43.

In the vast majority of previous studies, the research on the Transcarpathian distribution and raw material exchange concerned the whole period of the LBK development, without taking into account its particular developmental stages separately.[5] It was noted that these phenomena are documented for the entire period, since its earliest (Pre-Music-Note) phase, and that they intensified significantly in the younger (i.e. Music-Note) phase.[6] The current state of research indicates that very distinct differences existed between the earliest and the classical (Music-Note) as well as the late (Želiezovce) developmental phases of this culture. These differences are manifested both at the level of a general range of material diversification as well as in the direction, intensity, and distribution patterns of particular flint varieties and obsidian. They correspond closely to phenomena and cultural changes that occurred north of the Carpathians at the turn of the 6th and 5th millennia BC. Those issues constitute the main subject addressed in the present study.

The earliest horizon (Pre-Music-Note Phase)

The available source data related to the oldest phase of the LBK development indicate that the basic role in the Transcarpathian flint distribution system was played by the Jurassic-Cracow flint. This raw material was distributed across vast areas in relation to the region of its geological occurrence (Fig. 1), dominating the material inventories at archaeological sites located both to the north of the Carpathians[7] and in the Transcarpathian areas. However, in the latter region, its clear quantitative predominance was recorded only at certain Moravian sites (e.g. Kladníky-Záhumenky or Žopy I).[8] This flint variety flowed into the aforementioned areas mainly as pre-core forms and prepared cores, then elaborated locally, the products of which – i.e. semi-finished blanks and finished tools – were redistributed through the local circulation systems.[9]

There were also two other raw materials participating, although no doubt to a much lesser extent, in the Transcarpathian contact network formed in the Pre-Music-Note Phase and closely related exchange of the Jurassic-Cracow flint. These additional materials were the Świeciechów and Chocolate flints, geologically related to the north-eastern Mesozoic margin of the Holy Cross Mountains. The analysis of the territorial dispersion of artefacts made with the use of these flint varieties indicates the existence of clear spatial separations between their basic distribution directions. The spread of Świeciechów flint aligns precisely with the south-western direction of distribution of the Jurassic-Cracow flint, towards the Vistula River, the Moravian Gate, and then to the more distant territories of Bohemia, Moravia, and Lower Austria (Fig. 1). The morphological diversity of the Transcarpathian finds witnesses an inflow of the Świeciechów flint to these territories only in the form of blades and prepared tools. Their spread took place within a multi-stage system of intergroup exchange, pronounced especially in the distribution of Jurassic-Cracow flint.[10] The character of the finds as well as – in each case – the minimum frequency of the Świeciechów flint (<1%) indicates the non-economic background of the phenomena related to its exchange.[11]

The characteristic feature of the chocolate flint distribution in the discussed period was its similarly modest scale but also its considerably greater territorial range, especially in the areas located northwards of its geological outcrops, mainly in Kuyavia (e.g. Brześć Kujawski 3, Grabie 4, or Smólsk 4)[12] and the Chełmno Land (e.g. Boguszewo 41 or Gruta 52).[13] The penetration of this raw material to the south of its deposits is documented very poorly, confirmed so far only for the basin of the Upper Vistula (Fig. 1). Up to date, the few finds of chocolate flint artefacts known from these areas, discovered in the context of the oldest LBK pottery, are represented only by a single flake from Samborzec I,[14] a distal part of a blade from Gwoździec 2,[15] and a modest – although unspecified in terms of quantity and typology – archaeological assemblage from Kazimierza Mała Site 1,[16] The potential inflow of this material to the Transcarpathian area during this period is not sufficiently documented in

[5] E.g. Kozłowski 1970; Kaczanowska, Lech 1977; Lech 1979; 1987; 2003; Kaczanowska 1985; Caspar *et al.* 1989.

[6] E.g. Lech 2008, 198; Mateiciucová 2008, 132.

[7] The predominance of Jurassic-Cracow flint in inventories attributed to the Pre-Music-Note Phase of the LBK was recorded both in the areas located in the Upper Vistula basin (e.g. Kaczanowska 1971, 10–11; Kukułka 2001, 37; Lech 2003, fig. 6; 2008, 157–160; Mateiciucová 2008, 125; Wilczyński, Kufel-Diakowska 2021, tab. 12) and in areas located at much greater distances from its geological deposits, i.e. in Kuyavia and the Chełmno Land (e.g. Czerniak 1994, 116, fig. 43; Małecka-Kukawka 1992, 37, tab. 1; 2008, fig. 2; Grygiel 2004, 383; Domańska 2016, 32–33; Pyzel, Wąs, 2018, tab. 1).

[8] Mateiciucová 2000, tab. 2; Janák, Přichystal 2007, 7–10.

[9] Mateiciucová 2008, 126.

[10] E.g. Lech 1987, fig. 28.1; Přichystal 2007, 19; Mateiciucová 2008, 131–132.

[11] E.g. Lech 1979, 131.

[12] Kabaciński 2010, Fig. 12; Domańska 2016, tab. 8.

[13] Małecka-Kukawka 1992, tab. 1; 2008, figs. 1–2.

[14] Lech 2008, 198.

[15] Kukułka 2001, 37; Wilczyński, Kufel-Diakowska 2021, 169.

[16] Mateiciucová 2008, 133.

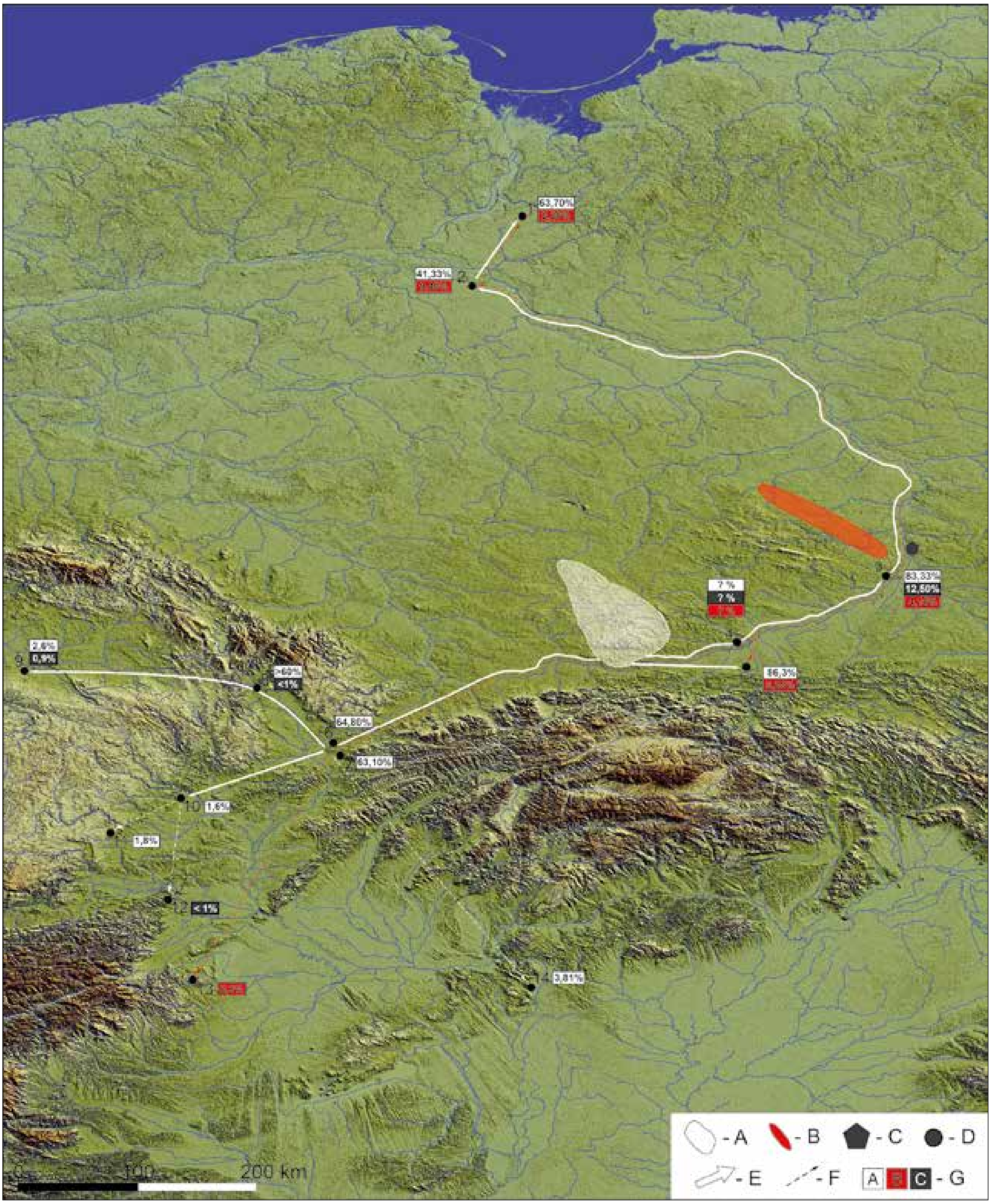

Fig. 1. General distribution directions of the most important flint raw materials from southern Poland on both sides of the Carpathians in the oldest (Pre-Music-Note) developmental phase of the LBK: A – Jurassic-Cracow flint outcrops; B – chocolate flint outcrops; C – Świeciechów flint (outcrop and mine in Świeciechów); D – distribution of prepared cores; E – distribution of blanks and retouched tool; F – frequencies of particular raw materials in inventories: G – selected LBK sites: 1 – Boguszewo 41; 2 – Grabie 4; 3 – Samborzec I; 4 – Kazimierza Mała 1; 5 – Gwoździec 2; 6 – Kladníky, "Záhumenky"; 7 – Žopy I; 8 – Mohelnice; 9 – Bylany 1; 10 – Vedrovice, "Široká u lesa" (settlement); 11 – Rosenburg I; 12 – Brunn am Gebirge IV; 13 – Neckenmarkt; 14 – Budapest-Aranyhegyi út (according to Kozłowski 1970; Czerniak 1990; Małecka-Kukawka 1992; Gronnenborn 1997; Biró 1998; Janák, Přichystal 2007; Lech 1989; 2008; Kaczanowska, Kozłowski 2005; Mateiciucová 2001a; 2008; Domańska 2016; Wilczyński, Kufel-Diakowska 2021. Compiled by M. Szeliga, based on data supplied by the *NASA Shuttle Radar Topography Mission (SRTM)(2013). Shuttle Radar Topography Mission (SRTM) Global. Distributed by OpenTopography. https://doi.org/10.5069/G9445JDF. Accessed: 20th of February 2023; see also Farr, Kobrick 2000).*

the sources. It is possible, however, that this situation reflects the current state of the research rather than the past reality. The presence of the chocolate flint in Moravia and western Slovakia is documented both in the inventories from the younger LBK developmental phases[17] as well as in older, Mesolithic materials (e.g. Smolín, Přibice, Dolní Věstonice, or Mostová).[18] Perhaps, some of the specimens from Mohelnice, which were made of this material,[19] as well as a single questionable artefact from Neckenmarkt, should be linked with the early Linear horizon.[20]

The younger horizon (Music-Note and Želiezovce phases)

Starting from the LBK Music-Note Phase, the raw material distribution system developed further intensively, extending far and wide on both sides of the Carpathians. At the same time, the inter-group exchange would also grow, including a much wider spectrum of raw materials (Fig. 2).

In this period, the most important position in the distribution and exchange system was still occupied by the Jurassic-Cracow flint.[21] Its prevalence was recorded in numerous inventories located on both sides of the Carpathians, from Lower Silesia (e.g. Niemcza)[22] and Bohemia (e.g. Bylany)[23] in the west, through Moravia (Přáslavice-Kocourovec and Žopy II)[24] and Lesser Poland (e.g. Kraków-Olszanica 4, Bolechowice-Zielona 9, or Podlesie 6),[25] to Subcarpathia (e.g. Rzeszów 3)[26] and Spiš (e.g. Poprad-Matejovce or Strané pod Tatrami)[27] in the east. Similarly, to the previous period, this raw material penetrated the aforementioned areas primarily in the form of concretions, pre-core forms, or prepared blade cores,[28] reworked there into blanks and tools and then redistributed to much more distant areas (Fig. 2).[29] In the discussed period, the distribution of Jurassic flint to the north was significantly reduced. This is clearly marked – despite the dominant frequency of this raw material in the inventory from Trzebiesławice Site 1[30] – even within the Sandomierz Upland (Fig. 2), especially its northern part (e.g. Samborzec I, Sandomierz-Kruków 20, or Tominy 6),[31] but it is most visible in Kuyavia and the Chełmno Land.[32]

In the discussed period, somewhat significant differences are apparent in the distribution of the raw materials from the Holy Cross Mountains across the Transcarpathian territories. Their inflow continued to cover the areas of Bohemia, Moravia, Lower Austria, and western Slovakia as a direct continuation of the processes initiated in the Pre-Music-Note Phase. Local discoveries are also characterised by small quantities and considerable territorial dispersion of the finds. However unlike in the oldest phase, the inflow of chocolate flint seemed to be definitely ‘dominant’. So far it has been recorded at no less than seven sites (Figs. 2, 3) associated with the younger developmental stages of the discussed culture, especially its Music-Note Phase.[33] The distribution of Świeciechów flint in these areas became less intense in the discussed period, as indicated by its occurrence only in Asparn an der Zaya-Schletz in Lower Austria.[34] According to Inna Mateiciucová, some specimens made of this material and discovered at the Mohelnice site may be attributed to the late horizon of the LBK development.[35]

Regardless of the situation recorded in the Bohemian-Moravian clusters of the LBK settlement, the dispersion analysis of all the discovered artefacts made of the Świeciechów flint in the Transcarpathian area indicates a clear eastwards expansion of the far-reaching zone of their distribution, starting in the Music-Note Phase.[36] This is illustrated well by the substantial concentration

[17] Kaczanowska 1985, 61; Mateiciucová 2001b, 216, map 3.
[18] Mateiciucová 2001a, 285–287, tabs. I–III.
[19] Mateiciucová 2008, 133.
[20] Gronenborn 1997, 20; Mateiciucová 2008, 133.
[21] For example, Kaczanowska, Lech 1977, 8–9; Lech 1979, 130–131; 2003, figs. 5–6; Balcer 1983, 57.
[22] Lech 1981b, 39.
[23] Lech 1989, tab. 1.
[24] Mateiciucová 1997, 99; 2008, 126.
[25] Milisauskas 1986, 83; Breitenfellner, Rook 1991; Przeździecki *et al.* 2020, fig. 2.
[26] Kadrow 1997, fig. 18.
[27] Novotný 1982, 185, 191; Soják 1999, 96–97, tab. 1.
[28] Lech, 1981a, 218; Mateiciucová, 2008, 126.
[29] The analysis of finds from the area of western Slovakia (e.g. Borovce) indicates the possibility that the Jurassic-Cracow flint reached this territory also in the form of blanks of blades (Kaczanowska, 1985, 55). Most likely, this material also spread to much more distant areas of the Transcarpathian zone primarily in this form (possibly also as flakes or tools), which is quite clearly documented by a few finds from Lower Austria (Asparn an der Zaya-Schletz, see Mateiciucová 2008, 127), as well as discoveries in the Transdanubia (e.g. Budapest-Aranyhegyi) and the north-eastern part of the Great Hungarian Plain (e.g. Balsa-Feckepart, see Biró 1998, 38, 46).
[30] Kaczanowska 1985, fig. 22.
[31] Michalak-Ścibior, Taras 1995, tab. V; Lech 2008, 198; Szeliga 2018a, fig. 2.
[32] Małecka-Kukawka, 1992, tab. 1, fig. 122; Kabaciński 2010, 90–94; Pyzel, Wąs, 2018, tab. 1.
[33] Lech 1989, tab. 1; 2003, fig. 6; Mateiciucová 2001b, 216, map 3.
[34] Kaczanowska, Kozłowski 2005, 79.
[35] Mateiciucová 2008, 132.
[36] Szeliga 2014, figs. 6, 8.

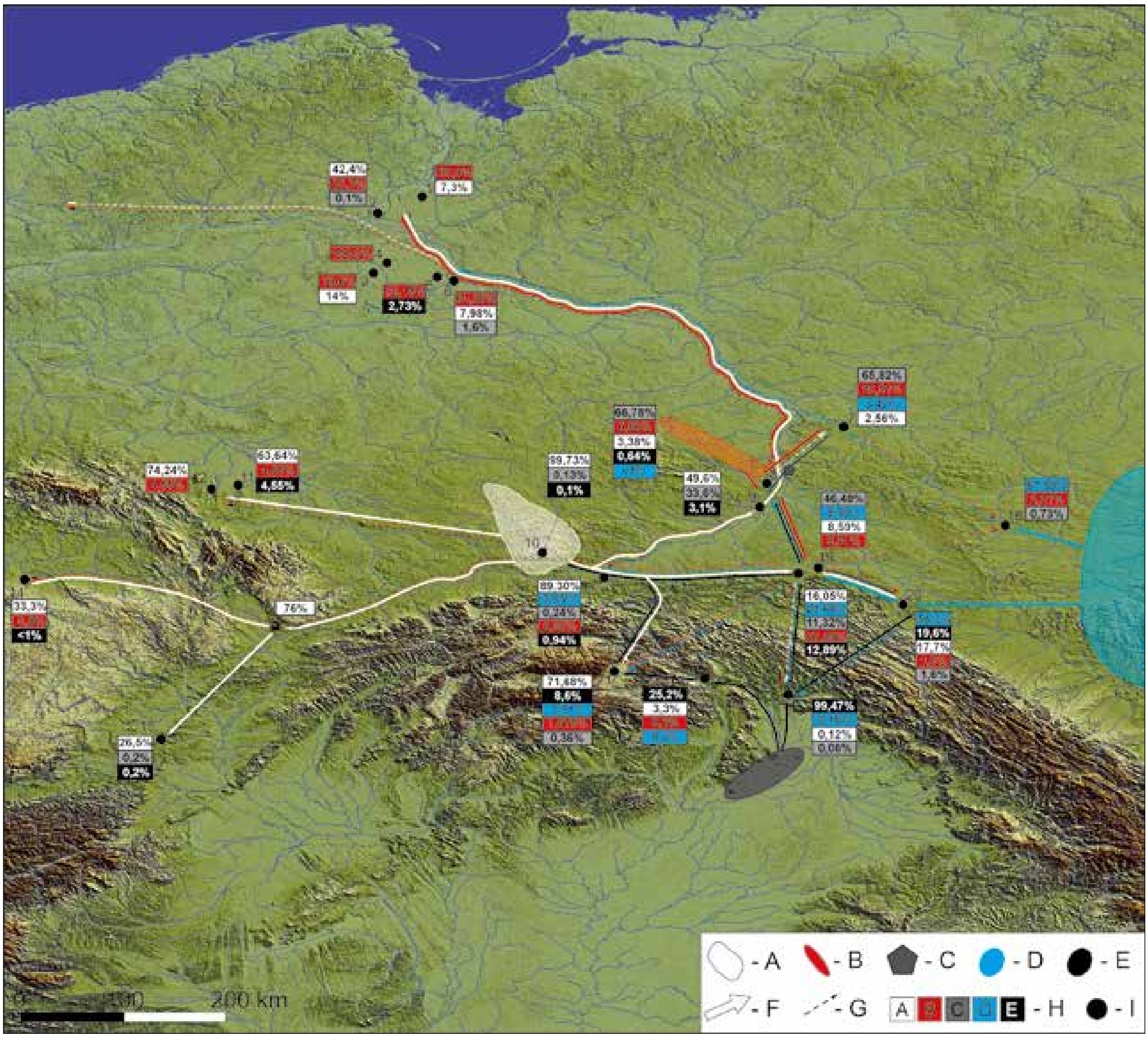

Fig. 2. General distribution directions of the most important flint varieties and obsidian on both sides of the Carpathians in the classical and late developmental stages of the LBK: A–C – see Figure 1; D – Volhynian flint outcrops; E – obsidian outcrops; F – distribution of concretions, pre-cores, or prepared cores; G – distribution of blanks and retouched tools; H – frequencies of particular raw materials in inventories; I – selected LBK sites: 1 – Lisewo 31; 2 – Nowy Dwór 9; 3 – Bożejewice 22/23; 4 – Łojewo 1; 5 – Zagajewice 1; 6 – Brześć Kujawski 4; 7 – Bogucin 6; 8 – Tominy 6; 9 – Trzebiesławice 1; 10 – Bolechowice-Zielona 9; 11 – Strzelin 19; 12 – Niemcza 4; 13 – Přáslavice-Kocourovec; 14 – Bylany 1 (Phase IIa of the LBK); 15 – Asparn an der Zaya-Schletz (end of Phase II and Phase III of the LBK); 16 – Tarnoszyn 1; 17 – Brzezie 17; 18 – Zwięczyca 3; 19 – Łańcut 3; 20 – Kormanice 1; 21 – Strané pod Tatrami; 22 – Šarišské Michal'any; 23 – Humenné, "Pod Sokolom" (according to Kozłowski 1970; Kulczycka-Leciejewiczowa 1979; Lech 1981b; 1989; Zakościelna 1981; Breitenfellner, Rook 1991; Gruszczyńska 1992; Małecka-Kukawka 1992; 2008; Kaczanowska *et al.* 1993; Mateiciucová 1997; 2008; Soják 1999; Wojciechowski, Cholewa 2000; Kaczanowska, Kozłowski 2002; Grygiel 2004; Janák, Přichystal 2007; Kabaciński 2010; Pelisiak 2014; Wilczyński 2014; Burgert *et al.* 2016; Furmanek, Masojć 2016; Szeliga 2018; 2023. Compiled by M. Szeliga, based on data supplied by the *NASA Shuttle Radar Topography Mission (SRTM)(2013). Shuttle Radar Topography Mission (SRTM) Global. Distributed by OpenTopography https://doi.org/10.5069/G9445JDF. Accessed: 20th of February 2023; see also Farr, Kobrick 2000*).

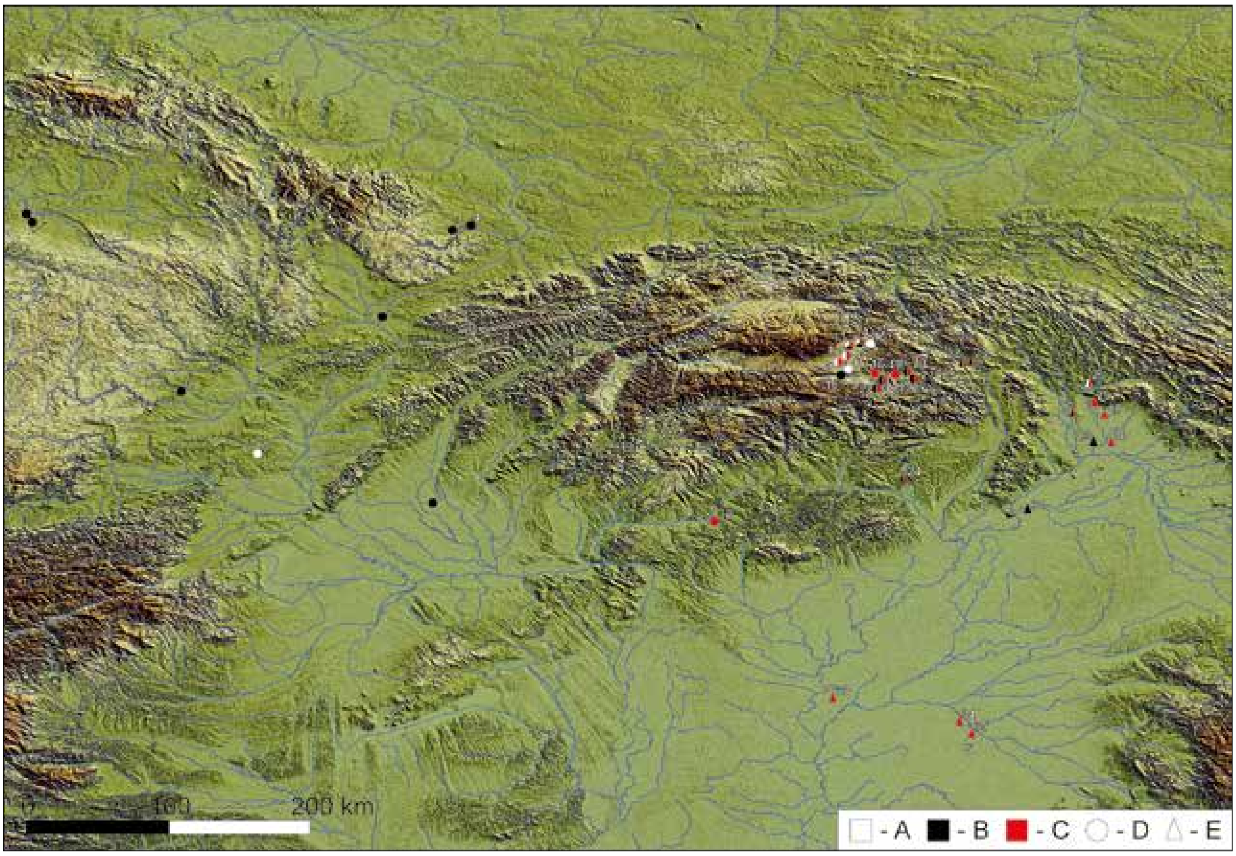

Fig. 3. Distribution of artefacts made of the Świeciechów flint (A), chocolate flint (B), and Volhynian flint (C) in inventories of the classical and late developmental stages of the LBK (D) as well as in materials of the Eastern-Linear cultural groups (E): 1 – Kolín X ; 2 – Bylany 1; 3 – Otice; 4 – Bolatice; 5 – Prusinovice; 6 – Bojanovice; 7 – Asparn an der Zaya-Schletz; 8 – Veľký Grob; 9 – Poprad-Matejovce, Nad kopčekom I; 10 – Spišský Štiavnik, Sedliská I; 11 – Spišský Štiavnik, Nad Rybníkom; 12 – Veľká Lomnica, Na kopci (Šibeničná hora); 13 – Strané pod Tatrami, Pod Kamenným vrchom I; 14 – Rakúsy/Spišská Belá, Kahlenberg (Stirn); 15 – Krížová Ves, Družstevné lúky; 16 – Iliašovce, Za hostincom; 17 – Spišská Nová Ves/ Smižany, Smižianska roveň; 18 – Spišská Nová Ves, Rittenberg; 19 – Spišský Hrhov-Kaštieľ; 20 – Jablonov, Rybník; 21 – Žehra, Hlinky I; 22 – Ražňany, Feature 1/12; 23 – Šarišské Michaľany; 24 – Borsod (Edelen); 25 – Humenné, "Pod Sokolom"; 26 – Zbudza; 27 – Moravany; 28 – Zalužice; 29 – Malè Raškovce; 30 – Čierne Pole; 31 – Balsa-Fecskepart; 32 – Szécsény-Ültetes; 33 – Tiszaföldvár-Téglagyár; 34 – Mezőberény-Bódishát; 35 – Gerla-Kászmán (according to Kozłowski 1958; 1970; Novotný 1982; 1983; Kaczanowska 1985; Lech 1989b, 2003; Soják 1999; 2000; 2002; Kaczanowska *et al.* 1993; Biró 1998; Javorský, Soják 1999; Mateiciucová 2001b; 2008; Kaczanowska, Kozłowski 1997; 2002; 2005; Nowak *et al.* 2010; Burgert 2018; Karabinoš *et al.* 2018. Compiled by M. Szeliga, based on data supplied by *NASA Shuttle Radar Topography Mission (SRTM)(2013). Shuttle Radar Topography Mission (SRTM) Global. Distributed by OpenTopography https://doi.org/10.5069/G9445JDF. Accessed: 20th of February 2023; see also Farr, Kobrick 2000*).

of finds in north-eastern and eastern Slovakia and, to a lesser extent, also in northern Hungary (Fig. 3), both in the area inhabited by the LBK community (Spiš) and the areas occupied by the Eastern-Linear communities (East Slovak Lowland).

The territorial expansion of the materials from the Holy Cross Mountains across the Transcarpathian areas and a clear intensification of this distribution were not accompanied by a change in its form. Still, only single products reached the most distant settlements, constituting but a minimal share in the raw material structure of particular inventories (Fig. 2). It is visible in both the western and eastern distribution areas. In the first case, a good example is the settlement in Bylany, where the inflow of chocolate flint in the beginning of the second (IIa) and the third (III) settlement phases is documented by only a single artefact for each period, constituting 0.80% and 0.40%, respectively, of all flint materials chronologically associated with them[37]. A similar situation is also illustrated by the raw material structure of the LBK inventories

[37] Lech 1989, tab. I.

from the eastern part of the Transcarpathian zone (Fig. 3), revealing a somewhat higher, but still only incidental, content of the Holy Cross Mountains flints. In the case of the chocolate flint, it amounted to between 1.08% (Strané pod Tatrami, the site known as *Pod Kamenným vrchom* I) and 1.90% (Rakúsy/Spišská Belá, the site known as *Kahlenberg [Stirn]*), whereas the Świeciechów flint at the same sites constituted, respectively, 0.36% and 0.90%.[38] Slightly larger, although also minimal, frequency in these areas was enjoyed by the Volhynian flint, whose share in Strané pod Tatrami was estimated at 2.53%,[39] while in Rakúsy/Spišská Belá at 2.00%.[40] The Jurassic-Cracow flint – whose share sometimes exceeds 60.00% or even 70.00% – was of strategic significance in the lithic manufacturing of the Spiš cluster of the LBK settlement.[41]

A different situation can be observed in the neighbouring areas of the East Slovak Lowland and in the north-eastern part of the Great Hungarian Plain inhabited by the Eastern-Linear cultural groups. In these areas, local raw materials, in particular obsidian, as well as hornstones and radiolarites, were of vital importance.[42] The presence of particular products made of the flints from the Holly-Cross Mountains has been recorded so far only in a few inventories attributed to the Eastern-Linear Pottery Culture and the Bükk Culture (Fig. 3), and their share generally did not exceed 0.50% (e.g. Humenné, site *Pod sokolom*: Świeciechów flint – 0.06%; Šarišské Michaľany: Chocolate flint – 0.20%).[43] The inventory discovered in Feature 1/12 in Ražňany, and attributed to the Bükk-Mountain Culture, should be considered exceptional. It was estimated that the share of chocolate flint in this collection was 6.80%.[44] Currently, it is the highest share of this raw material recorded in the Eastern Linear context. The Jurassic-Cracow flint is also represented by modest shares and has been noted in particular inventories mainly in the form of single artefacts (only sometimes as groups of several items), represented mainly by tools (e.g. Borsod-Edeleny, Humenné, or Šarišské Michaľany).[45] Similarly, the Volhynian flint occurred only occasionally and was represented by very few or even single specimens of blanks or retouched tools (e.g. Zalužice – 2 pcs.; Borsod – 2 pcs.; Ražňany – 1 pcs.; Šarišské Michaľany – 1 pcs.),[46] recorded in just a few inventories of the Eastern-Linear cultural groups (Fig. 3). This situation indicates a completely non-economic reason behind the inflow of the Volhynian and southern-Polish flint materials into the Eastern-Linear communities.

Contrary to the previous period, the distribution of raw materials between the areas located on both sides of the Carpathians during the younger horizon of the LBK development was bilateral. On the one hand, it manifested itself by the inflow of various flint varieties into the Transcarpathian areas from southern and central Poland as well as Ukraine, whereas on the other by importation of obsidian – whose deposits are located in the Slanské Hills and Zemplén Mountains, on the border between Slovakia and Hungary – into the northern foreland of the Carpathians (Fig. 2).[47] Currently, several dozen sites of this culture – with artefacts made of this material – are known from Poland. They concentrate mainly in the loess upland areas of southern and south-eastern Poland and occur in several distinct clusters. Much less numerous findings are known from areas located to the north of the upland zone.[48]

The earliest known obsidian finds are associated with the Music-Note Phase of the LBK.[49] Despite its vast territorial distribution, the modest share of this raw material

[38] Soják 1999, 96–97, tab. 1; 2000, 211, Diagram 9.
[39] Soják, 1999, 96.
[40] Soják 2000, 211, Diagram 9.
[41] Novotný 1982, 191; Kaczanowska 1985, 64–65; Soják 1999, 96, tab. 1; 2004, 75.
[42] Šiška 1979, 266–267; Kaczanowska 1985, 47; Kozłowski 1989, 377, 384, 390–391, tabs 1, 5, 8; Kaczanowska, Kozłowski 1997, 178, 186–187, 192–193, 210–211.
[43] Kaczanowska *et al.* 1993, 41–42, tabs 8–9; Kaczanowska, Kozłowski 2002, 67, tab. 2.
[44] Karabinoš *et al.* 2018, 343.
[45] Kaczanowska 1985, 57, 59; 2003, 8; Kaczanowska *et al.* 1993, 60, tab. 17; Biró 1998, 49; Kaczanowska, Kozłowski 2002, 67, tab. 2.
[46] Kaczanowska 1985, 59, fig. 13; Kaczanowska *et al.* 1993, tab. 8–9; Kaczanowska, Kozłowski 1997, 211; Karabinoš *et al.* 2018, tab. 2.
[47] The newest discoveries of A. Přichystal and P. Škrdla allow for inferring the location of the main Carpathian obsidian prehistoric outcrop in the area between Brehov, Cejkov, and Zemplén in south-eastern Slovakia (Přichystal, Škrdla, 2014, 224), related to the occurrence of the *Carpathian 1* variety. The results of the latest geochemical analyses conducted for a series of Neolithic obsidian artefacts from Poland (Kabaciński *et al.,* 2015, 10–12; Szeliga *et al.* 2021, 35) and Bohemia (Burgert *et al.* 2016, 234) corroborate this interpretation.
[48] Szeliga, 2009, fig. 2, tab. I.
[49] This view remains predominant in the archaeological literature (e.g. Kaczanowska 1971, 12; 1976, 37–38; Godłowska 1982, 151; Kulczycka-Leciejewiczowa 1979, 85; Kadrow 1990a, fig. 26: c; Szeliga 2009, 299–301, fig. 3). The suggestion – presented in certain studies – that the beginning of the obsidian inflow to the areas located on the northern side of the Carpathians started as early as in the Pre-Music-Note Phase of the LBK (e.g. Mateiciucová 2008, 126) is still not sufficiently supported by the available source data. Despite sporadic discoveries of artefacts made of this raw material in inventories linked with Phase I of the LBK (Gwoździec 2, Feature 29), they are interpreted as later elements, associated with the Music-Note or Želiezovce Phase of this culture (Wilczyński, Kufel-Diakowska 2021, 167).

among the Music-Note assemblages indicates a somewhat negligible scale of obsidian importation at that time. This observation does not apply to the Carpathian foothills – more precisely to the Rzeszów and Przemyśl settlement concentrations of the LBK – where the share of obsidian in some assemblages linked with this phase was several times greater than in other areas (Fig. 2). The increase in the inflow of obsidian took place in the Želiezovce Phase of the LBK. In comparison to the earlier period, we can see that it was limited to two regions of concentration: Rzeszów and Cracow, with the Rzeszów cluster still maintaining its dominant position. The percentages presented for this region indicate significantly higher importance of obsidian in the local production – similar to the share of flint.[50] The present state of research allows us to suspect that obsidian was brought to the Rzeszów, Cracow, and Sandomierz settlement clusters of the LBK in the form of small natural concretions and possibly blade cores, which were considerably processed at particular sites.[51] The products of this procedure (blades, flakes and retouched tools) were distributed from these regions to much more distant areas, located mainly on the northern side of the Carpathians and the Sudetes,[52] as well as, probably, in Bohemia, Moravia, and Lower Austria (Fig. 2).[53]

Conclusions

The distinct differences in the raw material distribution between the LBK Pre-Music-Note (Fig. 1), Music-Note, and Želiezovce phases (Fig. 2) correspond to the much broader context of cultural phenomena and changes that took place in the Upper Vistula basin at the turn of the 6th and 5th millennia BC. These transformations consisted of a gradual weakening and, consequently, a complete disappearance of the influences from the previous cultural centre in south-western Slovakia (leading to a gradual decline of the Linear stylistic development in these areas) along with the substantial increase in the influence of the Eastern-Linear circle.[54] One of the most important indications and consequences of these processes was the further and very intensive development of the Transcarpathian system of distribution of various flint varieties and obsidian, combined with shifting of its centre towards the east – to the settlement centres in south-eastern Poland as well as to northern and eastern Slovakia and north-eastern Hungary (Fig. 2). Among the areas located northwards of the Carpathians, the most important role in this system was played most likely by the Rzeszów settlement cluster. On the one hand, the available data from this region indicate a significant position of the Jurassic-Cracow flint in the local processing (although it was much less significant than in many other areas). On the other, it suggests a considerable – sometimes even strategic – economic importance of the flints from the Holly-Cross Mountains (especially Świeciechów flint) and obsidian.[55] This indicates that the local LBK communities were the most important receivers and users of these raw materials, controlling and intermediating in their further distribution to more distant areas. On the one hand, this fact pertains to the distribution of obsidian across territories located to the north of the Carpathians, but on the other, to the southward transportation of other flint goods,[56] mainly the chocolate and Świeciechów varieties but also – to a much lesser extent – the Jurassic-Cracow flint.[57] Presumably, this observation also applies to the redistribution of goods made of the Volhynian flint – although its distribution was much more modest – imported to the Rzeszów cluster most probably through the intermediation of communities settled by the upper San.[58] In this case, the possibility that this raw material arrived in the areas of eastern Slovakia and north-eastern Hungary directly from the Przemyśl cluster communities should be considered as highly probable.[59]

[50] Kozłowski 1970, tab. I; Kaczanowska 1985, fig. 22; Kadrow 1990a, fig. 24: a–i; 1990b, fig. 14: b; Szeliga 2009, 299; Pelisiak 2014, tab. 14.

[51] Kozłowski 1970, 89; Kaczanowska 1985, 14; Kulczycka-Leciejewiczowa 1979, 85; Michlak-Ścibior 1992, 44; Szeliga *et al* 2021, 35.

[52] Szeliga 2009, 299.

[53] So far, obsidian artefacts have been only sporadically discovered across these territories, recorded at the LBK sites in Asparn an der Zaya-Schletz, Buchlovice, Bylany, Dobřany, Količín, Mezice, and Úhřetice, (Mateiciucová 2008, 136–137, tab. 15; Burgert 2015, tab. 7; Burgert *et al.* 2016, tab. 1). It is highly probable that they were brought there through the Moravian Gate – with the participation of people inhabiting the LBK settlement clusters in western Lesser Poland – as an addition to the main distribution of the Jurassic-Cracow flint (analogically to products made of the chocolate and Świeciechów flints).

[54] Kozłowski 1985, 69; Kadrow, Zakościelna 2002, 190–192, figs. 2–3.

[55] E.g., Kozłowski 1970, fig. 2, tab. I; Kaczanowska 1985, fig. 22; Caspar *et al.* 1989, 172; Kadrow 1990a, fig. 24: a–e; 1997, fig. 18; Gruszczyńska 1992, 123; Pelisiak 2014, 122, tab. 14.

[56] Szeliga 2014, 98, fig. 8.

[57] The redistribution of this raw material in eastern Slovakia seems to be related primarily to the Spiš cluster of the LBK settlement (Soják 2000, 218–219), due to its definitely larger frequencies in the particular inventories than in the Rzeszów region (Fig. 2).

[58] Lech 1987, fig. 28.1; 2003, fig. 6.

[59] Kozłowski 1974; 52–53; Kaczanowska 1985, 59; Kaczanowska *et al.* 1993, 44.

Each time, small – usually even minimal – frequencies of the Świeciechów, chocolate, and Volhynian flints in the Transcarpathian inventories (as well as the modest share of the Jurassic-Cracow flint at the Eastern-Linear sites) allow us to rule out the practical/economic reasons behind their importation to these areas. Products made of these raw materials could have served as symbolic and prestigious goods, whose possession guaranteed maintaining a high social status in the group. It is possible that their distribution and exchange took place only between the highest-ranked leaders or was meant for their exclusive use.[60] Apart from individual benefits, the circulation of goods undoubtedly had a major impact on maintaining and intensifying interregional contacts and strengthening intergroup ties. This observation is confirmed both by the largest concentration of the 'northern-Carpathian' flint products only in eastern and north-eastern Slovakia and by shifting of the Świeciechów flint towards these areas of long-range distribution, due to the extremely strong cultural links with south-eastern Poland (including mainly the Rzeszów cluster) since the Music-Note Phase of the LBK.

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[60] Kruk, Milisauskas 1999, 57.

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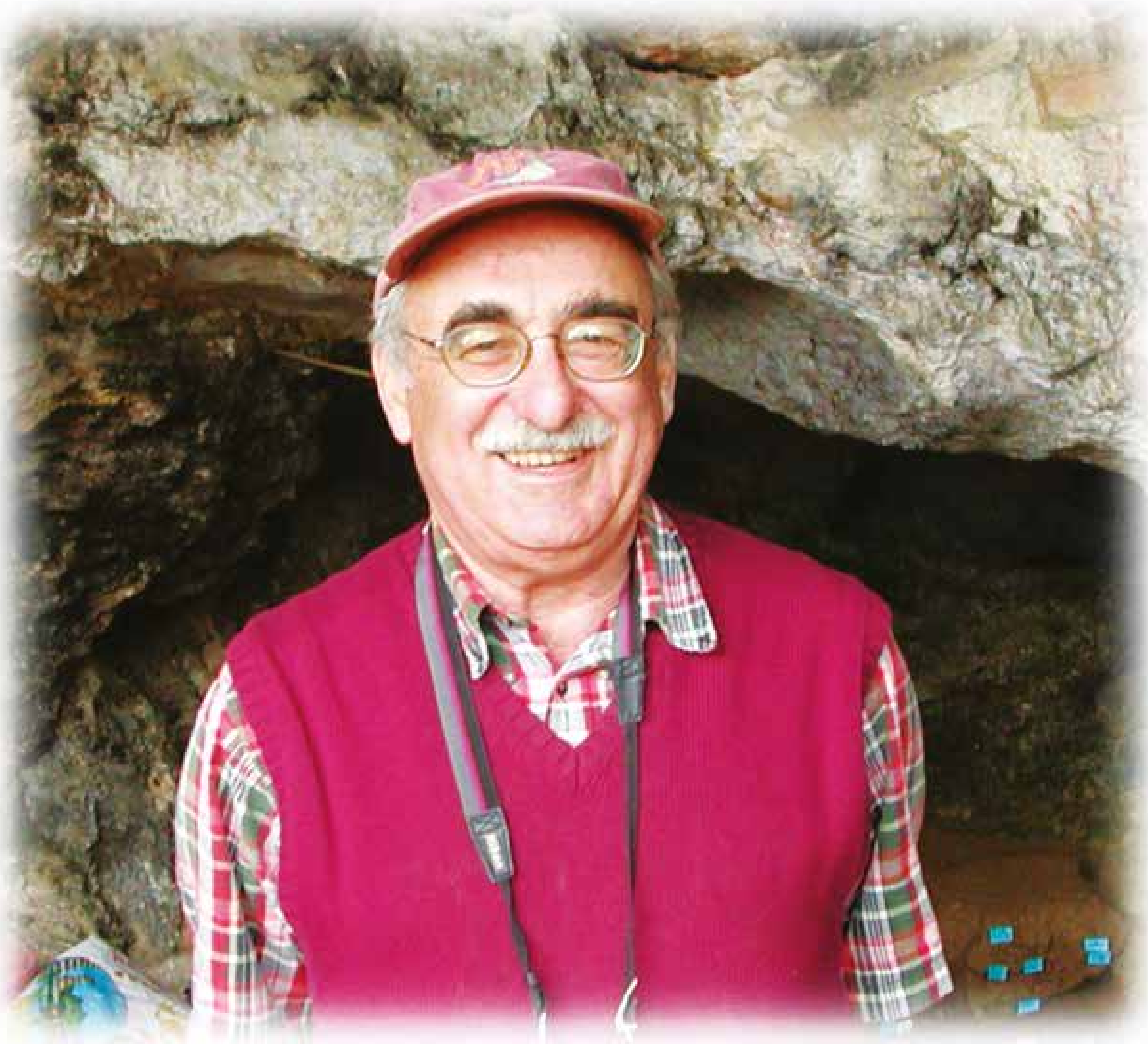

Ofer Bar-Yosef (1937–2020)
in Memoriam

Ofer Bar-Yosef
29th of August 1937 – 14th of March 2020

We still cannot agree with a fact that Ofer Bar-Yosef has passed away. An outstanding scholar, master in the world's Stone Age archaeology, and at the same time a warm-hearted colleague, and a friend.

Born in Jerusalem, after his military service he studied archaeology/prehistory at the Jerusalem's Hebrew University where he has worked worked since 1967. In 1970, he defended his PhD to become a professor of prehistoric archaeology in 1979. In 1988, he moved to the United States to Harvard University, where, besides being the Professor of Prehistory, he accepted the duties of the Curator of the Department of Palaeolithic Archaeology at Peabody Museum of Archaeology and Ethnology. During his career, he also obtained honourary degrees at the Ben Gurion University of the Negev and the University of Bordeaux. In America, he was a member of the US National Academy of Science and the Society for American Archaeology.

Ofer's professional interests concentrated on the crucial problems of the whole Stone Age, covering the time span from the Lower Palaeolithic up to the Neolithic periods. Along with his team, he excavated the Ubeidiya site which yielded one of the oldest out of Africa hominin remains in an archaeological context, dating from *ca* 1.4 million years. During the 1970s, 1980s, and 1990s of the 20th century he was a leader of numerous teams excavating the key Palaeolithic cave sites of the Near East: Kebara, Quafzeh, and Hayonim, among others. These works made it possible to establish detailed sequences regarding the Modern Man – Neanderthal relationships. Then he extended his fieldwork on the same subject to Turkey, Georgia, the Czech Republic, and finally China. Parallelly, he conducted a great many expeditions excavating the Near Eastern Early Neolithic sites. The number of his collaborators is uncountable.

He is the author of many more than 400 publications, including some 25 books he wrote or edited. Always calm but ready to discuss. With a special sense of humour.

Karol Szymczak reminisces: 'I knew Ofer personally already for some time when I met him during some big conference. To show him my respect and pleasure, I said to him: "Oh, Professor Bar-Yosef, it is so nice to see you!". He looked at me with his firmly peaceful, slightly ironical glance, and said: "Karol, do not call me Professor. Call me Ofer. Even my students do that."

He died at his home in Kefar Sava, Israel.

Ofer, thank you for being with us, though it was too short. We miss you.

Stefan Karol Kozłowski, *Karol Szymczak*
24th of October 2021

Ofer Bar-Yosef
29 sierpnia 1937 – 14 marca 2020

Wciąż nie możemy pogodzić się z odejściem od nas Ofera Bar-Yosefa. Ponadprzeciętnego, wybitnego naukowca, archeologa zajmującego się głównie światową epoką kamienia, jednocześnie serdecznego kolegi, przyjaciela.

Urodzony w Jerozolimie, po odbyciu służby wojskowej rozpoczął studia archeologiczne na miejscowym Uniwersytecie Hebrajskim, gdzie od 1967 podjął pracę. Doktorat obronił tam w 1970, a w 1979 otrzymał mianowanie na profesora archeologii prehistorycznej. W 1988 przeniósł się do Stanów Zjednoczonych, gdzie na Uniwersytecie Harvarda przyjął posadę profesora prehistorii, a także kuratora Działu Paleolitu uniwersyteckiego Peabody Museum of Archaeology and Ethnology. W czasie dalszej kariery otrzymał doktoraty honorowe na Uniwersytecie Ben Guriona oraz Uniwersytecie w Bordeaux. W Stanach Zjednoczonych był m.in. członkiem US National Academy of Science i Society for American Archaeology.

Jego zainteresowania zawodowe skoncentrowane były na kluczowych zagadnieniach związanych z całą epoką kamienia, obejmując okres od najwcześniejszego paleolitu aż po neolit. Wraz z prowadzonym przez siebie zespołem eksplorował stanowisko Ubeidiya, które dostarczyło jednych z najstarszych znanych spoza Afryki szczątków wczesnych hominidów w kontekście archeologicznym, datowanych na ok. 1,4 miliona lat. W latach siedemdziesiątych, osiemdziesiątych i dziewięćdziesiątych XX w. kierował licznymi ekspedycjami badającymi kluczowe stanowiska jaskiniowe Bliskiego Wschodu, m.in. Kebarę, Quafzeh czy Hayonim. Prace te pozwoliły na ustalenie szczegółowej sekwencji chronologicznej dotyczącej koegzystencji człowieka współczesnego i neandertalczyka. Potem badania nad podobną problematyką rozszerzył na Turcję, Gruzję, Czechy, a w końcu Chiny. Równolegle prowadził szereg ekspedycji badających bliskowschodnie stanowiska wczesnoneolityczne. Liczby badaczy, z którymi bezpośrednio współpracował, nie da się oszacować.

Jest autorem ponad 400 publikacji, w tym około 25 książek, które napisał lub zredagował. Zawsze spokojny, lecz gotów do dyskusji. O charakterystycznym poczuciu humoru.

Jak wspomina Karol Szymczak: *Poznałem Ofera osobiście już nieco wcześniej, kiedy zobaczyłem go znów podczas jakiejś większej konferencji. By okazać mu szacunek i radość ze spotkania, zawołałem: – Profesorze Bar-Yosef, to wielka przyjemność spotkać tu pana! Odpowiedział mi ze swym zwykłym, niezachwianie spokojnym, jednak lekko ironicznym spojrzeniem: – Karol, nie nazywaj mnie profesorem. Mów mi Ofer, jak wszyscy, nawet studenci.*

Zmarł w swoim izraelskim domu w Kefar Sava.

Ofer, dzięki, że byłeś z nami, choć szkoda, że tak krótko. Tęsknimy.

Stefan Karol Kozłowski, *Karol Szymczak*
24 października 2021

WYDZIAŁ
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