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Stielspitzen Technokomplexe – Swiderien, aber was noch? Neue Entdeckungen aus der Krakauer Region, Süd-Polen

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Abstract - This paper aims to give an overview of the Tanged Point Technocomplex (TPT) settlement in the western part of the Northern Subcarpathian region and to put it in a broader perspective of the cultural processes in northern Europe during the very end of the Pleistocene and the beginning of the Holocene. It intends to synthesize the available data focusing mostly on cultural differentiation and on the chronology of the TPT. The numerous remains of the TPT settlements were mostly discovered by antiquaries, although several assemblages were acquired during modern excavations, providing valuable data. The new data allows definition of several technologically and typologically distinct facies of TPT. Most of them represent an extremely consistent industry, which is paralleled with the Swiderian (Mazovian) and dated to the Younger Dryas/Holocene transition. However, according to these data, tanged points seem to have lasted from the end of Allerød until the Boreal period, which challenges the paradigmatic framing of them solely as a palaeolithic unit in the Kraków region. These chronologically late assemblages reflect the cultural processes of the early Holocene in eastern and northern Europe where post-Swiderian and post-Ahrensburgian settlements developed. Nevertheless, an independent local development of tanged point, linked with an Ahrensburgian tradition, could also be indicated. The attempt to construct a perspective for this local issue resulted in several maps and radiocarbon charts of TPT. On this basis a nomenclature for particular stages of TPT, as well as cultural events, was proposed.

Zusammenfassung - *Diese Arbeit soll einen Überblick über die Siedlung des Stielspitzen Technokomplexes (Tanged Point Technocomplex – TPT) im westlichen Teil des nördlichen Karpatenvorlandes geben und sie in eine breitere Perspektive der kulturellen Prozesse in Nordeuropa, während des Endes des Pleistozäns und des Beginns des Holozäns bringen. Sie beabsichtigt, verfügbare Daten zu synthetisieren, die sich hauptsächlich auf die kulturelle Differenzierung und die Chronologie des TPT konzentrieren. Die zahlreichen Überreste der TPT-Siedlungen wurden größtenteils von Antiquaren entdeckt, obwohl bei modernen Grabungen mehrere Sammlungen erworben wurden, die wertvolle Daten lieferten. Die neuen Daten erlauben die Definition verschiedener technologisch und typologisch getrennter Fazies von TPT. Die meisten von ihnen repräsentieren eine extrem einheitliche Industrie, die parallel zum Swiderien (Mazovien) verläuft und auf den Übergang von der Jüngeren Dryas zum Holozän datiert wird. Nach diesen Daten scheint es jedoch seit dem Ende des Allerød-Interstadials bis zum Boreal Stielspitzen gegeben zu haben, was die paradigmatische Gestaltung dieser Gebiete als eine lediglich paläolithische Einheit in der Krakauer Region herausfordert. Diese zeitlich späten Sammlungen spiegeln die kulturellen Prozesse des frühen Holozäns in Ost- und Nordeuropa wider, wo post-Swiderien und post-Ahrensburgien Siedlungen entstanden sind. Nichtsdestotrotz könnte auch eine eigenständige, lokale Entwicklung des TPT, verbunden mit einer ahrensburgischen Tradition, angedeutet werden. Der Versuch, eine Perspektive für dieses lokale Problem zu konstruieren, führte zu mehreren Karten und Radiokarbondiagrammen des TPT. Auf dieser Grundlage wurde eine Nomenklatur für bestimmte Phasen des TPT, sowie für kulturelle Ereignisse vorgeschlagen.*

Keywords - Late Palaeolithic, Early Mesolithic, Ahrensburgian, Bromme, Lyngby, Subcarpathia
Spätpaläolithikum, Frühmesolithikum, Ahrensburgien, Bromme, Lyngby, Subcarpathia

Introduction

Distinctive tanged points have been recognized and described since the second half of the XIXth century during the so-called "collector's period" (Szymczak 1992). Only a few decades later, at the beginning of the XXth century, they were being acquired in a more methodical way in association with other lithics. This led to increasing interest in the subject matter among scientists but also enthusiasts who became professional archaeologists. Significant conclusions were drawn by G. Schwantes who defined the

*corresponding author

Ahrensburgian and Lyngby cultures and A. Nummerdal, an explorer of the Fosna and Komsa cultures on the west coast of the Scandinavian Peninsula. Dynamic, sometimes emotional, discussion took place particularly among Polish scientists who investigated the Swiderian culture (S. Krukowski, L. Sawicki, L. Kozłowski). These results were collected by G. Clark, who introduced the concept of Tanged-point Cultures (TPC) (Clark 1936). In the introductory chapter Clark synthesised environmental data concerning the Late Glacial and Holocene, which was the basis for the periodization of these cultures. Interestingly, according to the level of knowledge at that time, he dated them to post-glacial times associating them with the Preboreal. His TPC included Ahrensburg-Levenstadt, Remouchamps and Swiderian, but also Komsa and Fosna whereas the Lyngby group, because of flake axes, was linked with the forest environment and treated as a predecessor of mesolithic industries (Maglemose, Ertebølle). He considered the roots of TPC in the Upper Palaeolithic industries, i.e. the Gravettian (Font-Robert) or the Aurignacian, as well as in the latter Magdalenian (Hamburg culture). For the Komsa culture, he quoted A. Bjørn's hypothesis for its Asian connection. This substantial concept was reintroduced by W. Taute (1968) in his monumental book "*Die Stielspitzen-Gruppen im nördlichen Mitteleuropa*". In his view "The Tanged Groups" consist of several industries organized into groups (*Gruppe*) which form circles (*Kreis*). These circles are represented by Lyngby together with Federmesser (characterized by the presence of tanged points), Ahrenburg and Swidry. Tanged Point Culture or Technokomplex (TPT) as a general term for distinct industries characterized by tanged and related points was repeated in further publications (Kozłowski & Kozłowski 1975, 1977; Kozłowski S. K. 1999; Burdukiewicz 2011)

The tanged or shouldered points seem to have adhered to human culture especially during significant coolings and correlate mostly with the north margin of the European oecumene. One can mention upper palaeolithic examples of tanged points like Font-Robert or even some Jerzmanowice points which resemble Swiderian ones (comp. Sawicki 1935; Krukowski 1939-1948), but also shouldered points known from Gravettian and Solutrean context. During the postglacial period, these tools were crucial implements for the Hamburgian and Havelte societies. However, since the end of the Allerød an almost uninterrupted presence of a great variety of these tools can be observed. From that time, the variety of tanged points and some related geometric implements which seem to be derived from this tradition (margin-retouched points – transverse or oblique points – high trapezes – Luta type – heavy trapezes; single-edged points – shouldered points – *nakonečnik s bokovoj vyemkoj*; comp. Schild 1990; Więckowska & Chmielewska 2007; Lozovskij et al. 2009; Manninen & Knutsson 2011) continued in North and North-East Europe until the neolithisation of that territory (Petersen 2001; Sørensen 2017). This makes it difficult to determine sharp borders between cultural units. Additionally, the TPT crossed the border between the Pleistocene and Holocene – an important caesura in the research of the Stone Age. This boundary marked the beginning of warming, which finally returned after tens of thousands of years of cold climate domination triggering important transformations in the economic model of local societies adapting to new conditions. In European archaeology, this border separates the Palaeolithic and Mesolithic and in general opinion marks the beginning of a gathering- instead of hunting-based economy, which is traditionally perceived as determining palaeolithic societies, although available data may oppose such a conclusion (Eriksen 1996; Kabaciński & Sobkowiak-Tabaka 2010). This division, although seemingly trivial, had a significant impact on the research, often leaving a *terra incognita* on the border between the two research perspectives.

This investigation assumes that human culture was quite dynamic during the very end of the Pleistocene and the beginning of the Holocene and seasonal relocations were an integral part. This claim is supported by ethnographic and palaeofaunal studies which underline the role of migrating reindeer as its main factor (comp. Baales 1999). In this paper, another example is quoted which is the annual migration route of the Nganasans – the "last reindeer hunters" from the Taimyr Peninsula. In this case a map published by Chard (1963) is vectorised (Fig. 1). It gives a striking example of such mobility when compared with the full geographic span of TPT during the Younger Dryas (YD). All these data suggest that a multi-perspective approach is needed as local studies by themselves produce only a partial picture. A more complete image may be obtained from a regional perspective (extra-local studies). Unfortunately, due to political and language barriers, these attempts often operate with their own definitions and notions. The best example of this is a discrepancy in the widely disputed range of the Bromme culture. Another example is the diversified nomenclature of Ienevo (Zhilin 2007), Pisochny Riv (Zaliznyak 1999), Grensk (Kolosov 2013a, b) and Desna (Schild 1990; Kozłowski S. K. 2006) industries of Central and Eastern Europe which, basing on typology, seem to represent a similar tradition. If a basic background could be agreed upon it would provide a useful tool to frame local and extra-local data within the geographical and chronological distribution of TPT.

Since the beginning of XXth century the numerous finds of tanged points in the Oder and Vistula basins have usually been labelled as Swiderian. This term was proposed by S. Krukowski, who – after the exploration of the Górki site (Świdry Wielkie II) – outlined its definition in a short overview (Krukowski 1921). Since

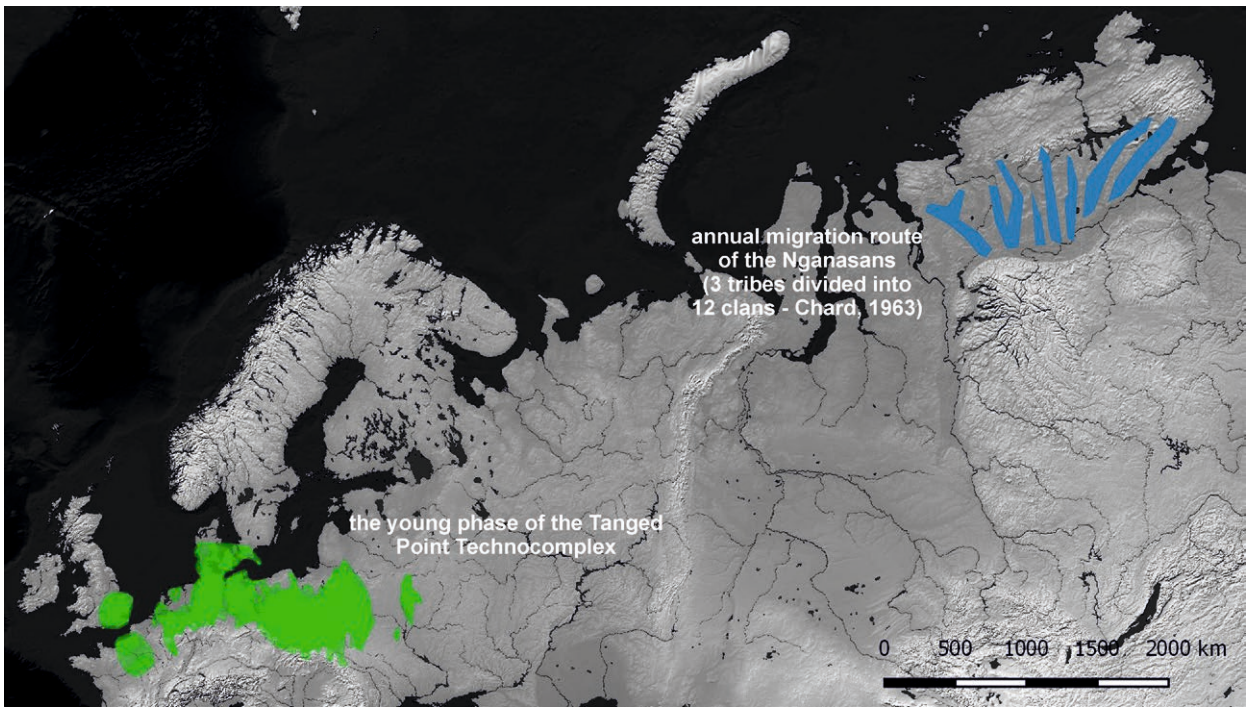

Fig. 1. A comparison between Nganasans annual migration and the extent of the Tanged Point Technocomplex during the second half of the Younger Dryas and the beginning of the Holocene.

Abb. 1. *Ein Vergleich zwischen Nganasans jährlicher Migration und dem Ausmaß des Stielspitzen Technokomplexes während der zweiten Hälfte der Jüngeren Dryas und dem Beginn des Holozäns.*

that time many studies have been devoted to the chronology and internal differentiation of Swiderian culture, as well as to some "outstanding" industries linked with "the Lowland Palaeolithic". As early as 1921 L. Kozłowski introduced the Chwalibogowician which according to his description was characterized by a variety of tanged points. The Chalibogowician was criticized by S. Krukowski and L. Sawicki who pointed out the dishomogenity of the described assemblages. However, some of the quoted characteristic points with distinct tang and retouched tip were clustered as the Chwalibogowice type (comp. Sawicki 1935; Taute 1968). L. Sawicki, who used Swidry Wielkie I as his starting point, was the first to propose chronological divisions within the Swiderian. According to him Swiderian splits into three stages (I, II, III). He also readdressed the Chalibogowician issue, including it in the youngest phase (Sawicki 1930, 1935). He also pointed out Nowy Młyn industry (a typical Bromme assemblage) as related to the Swiderian. A few years later S. Krukowski introduced the Mazovian circle concept (after the name of Mazovia – *Mazowsze* in Polish – a historical region in eastern central Poland) comprising many distinctive industries including Swiderian just as its oldest part. Many of these concepts were refuted during the 1960s and 1970s when excavations at Witów (Chmielewski 1962; Chmielewska 1978) and Całowanie (Schild 1975) documented unique geological and cultural sequences. These sequences, together with the first radiocarbon dates, established ultimately a reliable framework. R. Schild, who followed much of Krukowski`s conception, tried to define particular elements of the Mazovian based on numerical association between tools (Schild 1975). Finally, he rejected the possibility of its detailed division. According to a new interpretation of Całowanie, Schild (2014a) states that in his view, TPT consisted of Older Tanged Points (Bromme) – layer IVa, and Young TP with Early Masovian – layer V and Classic Mazovian phases – layer VI. He also noted the Grochale industry with its outstanding character, although its chronological position was not well established. In the 1980s, R. Schild also published the small assemblages II and IX from the Rydno site, which had already been excavated in 1947 by S. Krukowski (Rydno II/1947 and IX/1947). Both of them contain unique shouldered points and asymmetrical trapezes (Schild 1990). According to the author, L. Sawicki already identified these finds in the early 1920s, but he never published and eventually the artefacts were lost (some of the artefacts are reproduced in Schild et al. 2011). Worth mentioning is that similar points were also included in L. Kozlowski`s Chwalibogowician. According to R. Schild, a typological similarity of these points with those reported from Pioschnyi Riv make an analogy with Desnenian – a cultural term proposed by M. V. Voievodski to describe a group of characteristic assemblages which were found along Desna River. R. Schild also pointed out the typological correlation of both assemblages with points known from Komsa or Fosna context. The radiocarbon dates he published

confirmed the Holocene datings (Boreral period), challenging its earlier linking with the Palaeolithic (Kozłowski & Kozłowski 1977) and clearly point out a presence of this assemblage in Poland. He also underlined a distinctive technology differentiating it from typical Mesolithic industries. The Desnenian was also reworked by S. K. Kozłowski (2006), who gave a short overview. As stated above, similar cultural elements are labelled as Grensk, Pisochny Riv or Ienevo culture. A separate, interesting issue is a presence of Ahrenburgian in Oder, Vistula, Neman, Dniester and Desna basins (Kobusiewicz 1970; Burdukiewicz 1987; Sulgostowska 1989; Libera 1995; Zaliznyak 1999; Girininkas 2009; Sobkowiak-Tabaka 2011)

This paper is a critical attempt to recognize phases of TPT in the western part of Northern Subcarpathia in southern Poland. The area in question is a narrow corridor between a Jurassic plateau and the Carpathians which constitute part of the upper Vistula valley. It is known for its diversified landscape and milder climate but also for an abundance of good quality raw material (Valde-Nowak et al. 2015). The favourable conditions there produced a quite dense settlement pattern of TPT documented by roughly 100 archaeological sites. Most of them, however, are collection and surface finds which have been acquired there since the 2nd half of the XIXth century mostly from palimpsest dune sites (Kozłowski J. K. 1960; Dagnan-Ginter & Drobniewicz 1974). Despite the fact that this material was mostly mixed, it fuelled discussion of its character, sometimes resulting in a misleading conclusion, i.e. Zakrzów culture (Kozłowski 1965), Kobierzyn (Sachse-Kozłowska 1972) or Podgórze industry (Kozłowski J. K. 1960). Since the 1990s over a dozen assemblages have been excavated giving reliable arguments to challenge established opinions. In this paper, a few assemblages are presented to underline a reliable differentiation of "the Late Palaeolithic" in this area, which seems to be more complex than what falls under the term Swiderian. Another conclusion is that these local issues seem to fit well with the regional background giving another piece of the puzzle to reconstruct a cultural process at the very end of the Pleistocene and at the beginning of the Holocene in northern Europe.

Methods

This investigation is designed to place the local study in a broader perspective. First of all, it attempts to sketch the geographical extent and the chronological interval of particular TPT cultural units by using a database of archaeological sites and radiocarbon dates collected from literature – Great Britain (Barton 1999; Barton et al. 2003), Northern France (Coudret & Fagnart 1997; Fagnart 1997; Naudinot 2013), Benelux (Crombé et al. 2011), Scandinavia (Larsson 1994; Johannessen 2009; Rankama & Kankaanpää 2011; Bang-Andersen 2012), Germany (Taute 1968; Baales 1999; Weber et al. 2011), Poland (Kobusiewicz 1970; Ginter 1974; Schild 1975; Sulgostowska 1989; Libera 1995; Bagniewski 1999; Cyrek 2006; Sobkowiak-Tabaka 2011; Valde-Nowak et al. 2015), the Baltic states (Sulgostowska 1989; Ostrauskas 1999; Šatavičius 2004, 2005a, b; Girininkas 2009; Druzhinina 2010), Belarus (Sulgostowska 1989; Ksenzov 1997; Obuchowski 2003; Kolosov 2010a, b), Ukraine (Zaliznyak 1999; Zalìznâk 2009) and Russia (Oshibkina 1997; Sorokin 2006; Zhilin 2007; Kravcov 2009), as well as an online database (Lateglacial.org). To avoid a detailed discussion concerning individual cases of cultural affiliation, which is needed in a local and regional approach, and to look for certain generalizations, the geographical maps are created based on density function (Voronoi partition) to determine the most vital areas. However, this is done only for the initial stage as the data representing the latter phase (the Holocene) are less numerous and in this case the map shows just the distribution of the sites with supposed ranges of cultural units. Similarly, the chronological attempt is based on calculating the likelihood of radiocarbon distribution offered by OxCal software as its integrated function (sum) collected from literature as well as online databases (Radiocarbon Palaeolithic Europe Database). This reduced the uncertainty related to the context of the find, as well as the dated material or standard deviation. Altogether 207 datings were collected: Bromme – 4 datings (Fischer & Tauber 1986; Fischer et al. 2013); Ahrensburgian – 28 datings (Fischer & Tauber 1986; Gob 1990; Hedges et al. 1993, 1995; Baales 1996, 2004; Lanting & van der Plicht 1996; Ramsey et al. 2002; Kaiser & Clausen 2005, Weber et al. 2011); Swiderian – 9 dates (Kanwiszer & Trzeciak 1984; Cyrek 1996; Schild 2014b); Belloisian – 12 dates (Gowlett et al. 1986; Street 1989; Granai & Limondin-Lozouet 2014); Kunda culture – 24 datings (Kessel & Punning 1969; Liiva & Loze 1993; Åkerlund et al. 1996; Kriiska & Lõugas 2009; Rankama & Kankaanpää 2011); Butovo culture – 35 datings (Zhilin 1999; Hartz et al. 2010); Veretye culture – 26 datings (Oshibkina 1997); Fosna, Komsa, Hensbacka cultures – 79 datings (Hesjedal et al. 1996; Grydeland 2005; Bang-Andersen 2006, 2012; Bjerck 2008; Blankholm 2008; Henriksen 2010; Nilsen & Skandfer 2010; Manninen 2014); Desnenian – 2 datings (Schild 1990). Only a single example from the Lenevo culture was found. This was at the site of Stanovoje 4/IIIa (Zaretskaya et al. 2005; Hartz et al. 2010), where a single point was found between two radiocarbon-dated layers containing Butovo culture material (layers IV and III).

The essential question for this study is to establish which TPT cultural components were present in the area in question. Although there is an abundance of lithic materials, these are affected by well-known problems concerning the Late

Palaeolithic and Mesolithic collections which, especially in the southern zone, are surface finds acquired from palimpsest sites – mostly dunes. Additionally, the lack of organics, in most cases, makes it impossible to build a radiocarbon chronology of events, as well as to embed these in an environmental context. To gather reliable arguments it was decided to browse and evaluate all available material and to choose only the assemblages assumed to be the remains of single occupational episodes. These assemblages were tested for their technology and typology to define potential cultural units. Another step was to make comparisons between these units and those well-defined for particular phases of TPT to place them in a cultural process, as radiocarbon determinations, except in the cases of Kraków-Kurdwanów site 10 and Zagacie site 2, were unsuccessful.

Results

Chronological stages and geographical extensions of the TPT

As the results of the study, the following maps (Figs. 2, 3 & 4) showing the geographical extent of cultural units of TPT as well as chronological charts (Fig. 5) were produced. According to radiocarbon dating, tanged points seem to be a complex and long-lasting unit spreading all over northern Europe during the late Pleistocene and early Holocene. Because of climate change, it intermittently fluctuated, especially at the beginning of the YD and at the beginning of the Holocene when huge shifts took place. From this perspective the TPT lasted for nearly 5'000 years assuming that it started at the end of the Allerød period with the Bromme culture and ended at the beginning of the Atlantic period with the Veretye culture. Such a long time span, when accepted, calls for further divisions. It seems reasonable to link it with

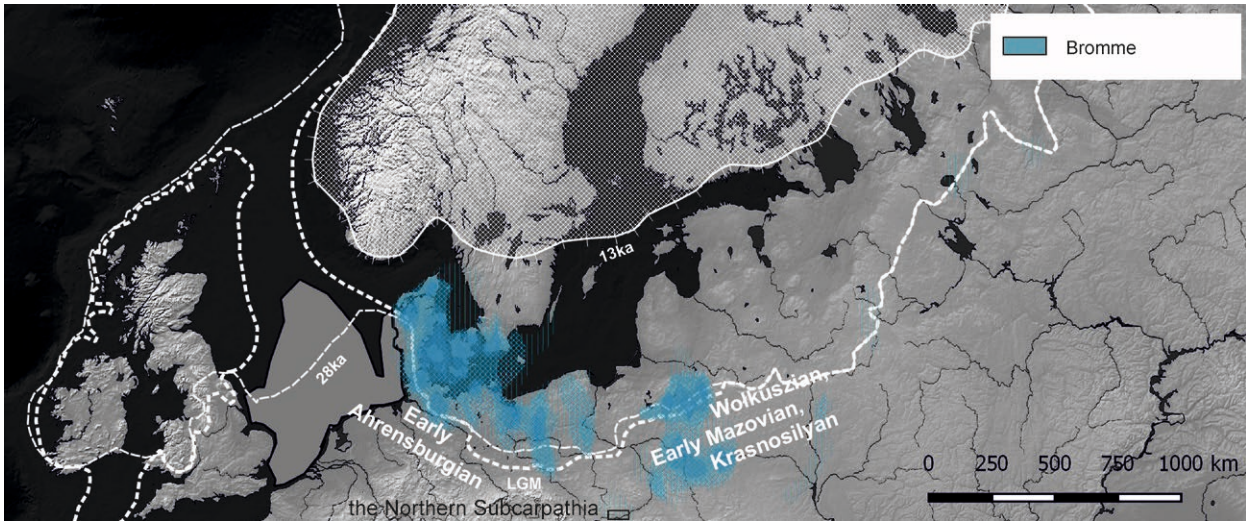

Fig. 2. The old phase of the Tanged Point Technocomplex.
Abb. 2. *Die ältere Phase des Stielspitzen-Technokomplexes.*

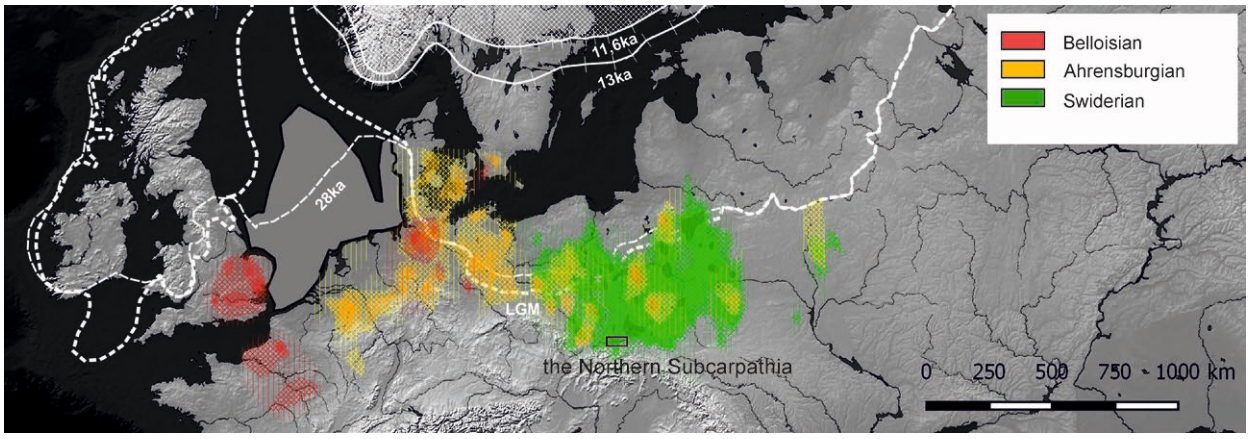

Fig. 3. The young phase of the Tanged Point Technocomplex.
Abb. 3. *Die jüngere Phase des Stielspitzen-Technokomplexes.*

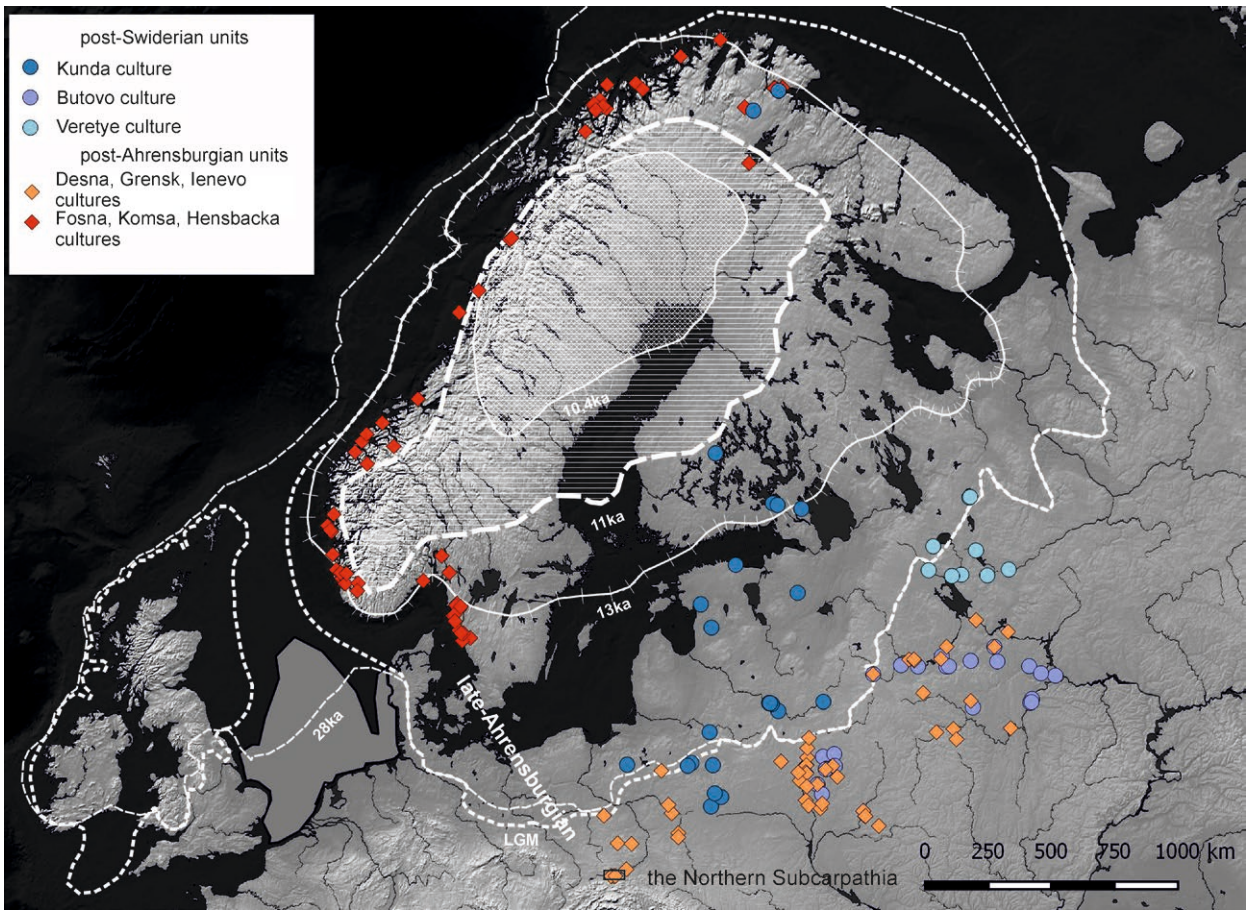

Fig. 4. The late phase of the Tanged Point Technocomplex.
Abb. 4. *Die späte Phase des Stielspitzen-Technokomplexes.*

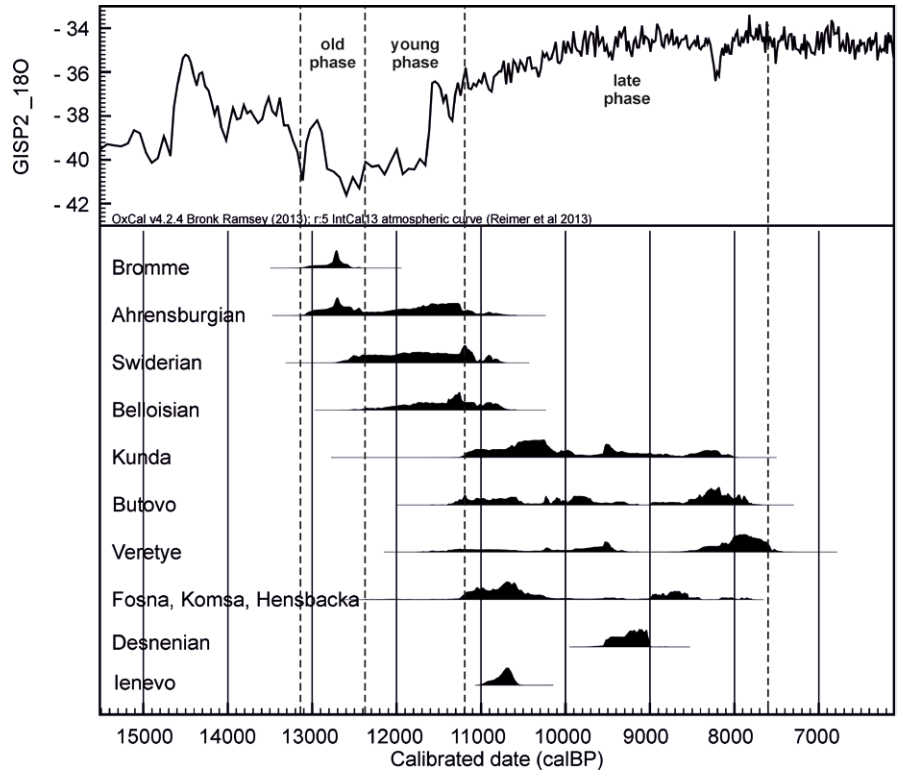

Fig. 5. The radiocarbon framework of the Tanged Point Technocomplex.
Abb. 5. *Das Radiokarbon-Gerüst des Stielspitzen-Technokomplexes.*

climatic change, although the evident time lapse should be considered when comparing it with the climatic curve. Three essential stages could be proposed: the old phase, the young phase and the late phase.

The old phase of TPT (Fig. 2) was represented by cultural units which developed at the end of the Allerød and the beginning of the YD. These were represented by the Bromme culture as well as the early-Ahrensburgian and other industries considered to be precedents of Swiderian. According to the map (Fig.2), the first-mentioned unit evidently settled the circum-Baltic area and appear to have almost exclusively occupied the early post-glacial landscape. The key question in this case is the nature of the relation between its western (i.e. Bromme *sensu stricto*) and eastern range (i.e. Perstunian according to Szymczak (1987, 1991)) which together comprise the Brommean *sensu largo*. However, distant finds of characteristic Lyngby (or Bromme) points are reported, which encouraged arguments denying the existence of the Bromme as an independent unit (Kobusiewicz 2009) or doubting its chronological value (Serwatka & Riede 2016). These finds were documented in central Britain (Latepaleolithic.org), Poland (Kobusiewicz 2009), Slovakia (Kaminská 2015) and in northern Russia (Sinitsyna 2002). The second unit is less-documented, although it is known from a well-recognized context. This is the early–Ahrensburgian known from Alt Duvenstedt LA 123 (Kaiser & Clausen 2005) or Remouchamps (Dewez et al. 1974). Industries characterized by a co-occurrence of Swiderian, Ahrensburgian and small Bromme points known from central (Early Swiderian – Schild 2014a) and north-east Poland, Lithuania (Wołkuszian – Przeździecki 2014), as well as Belarus and Ukraine (Krasnosilyan – Zaliznyak 1999) seem to share the same chronological position. The latter units could explain the enigmatic density of sites with Lyngby points between the middle Bug and upper Pripyat Rivers, instead of including it in the Bromme core area.

During the young phase (Fig. 3), settlement shifted to the south. It spanned from Britain to Belarus, settled the western and central part of the Great European Plain and the adjoining uplands. This was the time of "classic" assemblages of Ahrensburgian (Vermeersch 2011; Weber et al. 2011; Crombé et al. 2014), Belloisian-The Long Blades industry (Fagnart 1997; Barton et al. 2003; Naudinot 2013) and Swiderian (Kozłowski S. K. 1999; Schild et al. 1999; Burdukiewicz 2011). Chronologically, it covered the second half of the YD and the beginning of the Preboreal period. The key question concerns the common relation between these cultural entities. There is also a question of the presence of "long blades" (*Riesenklingen*) in the Ahrensburgian context (Taute 1968) or the assumed zone of Ahrensburgian and Swiderian overlap – the Wojnowo group (Kobusiewicz 1970).

During the late phase (Fig. 4), because of rapid Holocene warming, the TPT settlement shifted north and north-east. This phase is defined by two great traditions – the post-Swiderian and post-Ahrensburgian which both pioneered the ice-free areas of Scandinavia and the Kola Peninsula. In western Europe, the Belloisian was relatively quickly replaced by typical Mesolithic industries (Sørensen & Sternke 2004) but to the north and to the north-east post-Palaeolithic tradition persisted. However, and according to new findings from Kraków-Kurdwanów 10, the late-Ahrensburgian seems to have continued in a limited area of former TPT territory. Despite a lack of unequivocal data, industries similar to Kraków-Kurdwanów 10 could be indicated also from southern Scandinavia - Sølbjerg I (Petersen & Johansen 1993) or the southern circum-Baltic area – Buniewice 7 (Adamczyk 2014). In this context, a group of Ahrensburgian traces marked within the Swiderian range is particularly interesting (Fig. 3), as the presence of Ahrensburgian elements east of their nominal territory is still not fully explained. Besides the late-Ahrensburgian, these elements were part of assemblages dated to the old phase of TPT. They are known also from the upper Oder basin – Krzekotówek 8A, Potasznia III, Strumienno 1 and Węgliny 2, where according to J. M. Burdukiewicz (1987) they constitute an eastern border of core area. These elements are known also from Szczerba 14 (Siemaszko 2000), Kocierz (Galiński 1999), Klonówka 47 (Dzięgielewski & Klimek 2005) and Grochale (Schild 1975) but their position remains unknown. Typological hybrids, like the Wojnowo group (Kobusiewicz 1970), was the basis of the assumption of the existence of a common Swidero-Ahrensburgian tradition. The-post Swiderian is represented by Kunda, Butovo and Veretye units. These industries occupied the Baltic Countries, Belarus, Finland, and north-west Russia. They reached the northern margin of the oecumene relatively fast (Rankama & Kankaanpää 2011). The technological innovation was the presence of the pressure technique. The post-Ahrensburgian units are best characterized by their typological contents. These are represented by tanged points (mostly geometric), as well as by differently shaped margin points (high, asymmetrical trapezes). They generally constituted two geographically separated groups. In Scandinavia it was Hansbacka, Komsa and Fosna cultures. In Poland, Belarus, Ukraine and Russia it was represented by Pisochny Riv, Desna, Grensk and Ienevo traditions. The post-Ahrensburgian ended with the Atlantic period when the late mesolithic phase appeared. Both the post-Swiderian and the post-Ahrensburgian seem to contribute to the development of the local late Mesolithic and para-Neolithic units.

The TPT in the Northern Subcarpathia

Although about 100 archaeological sites from the western part of the Northern Subcarpathia were tested. Only a few of them delivered lithic

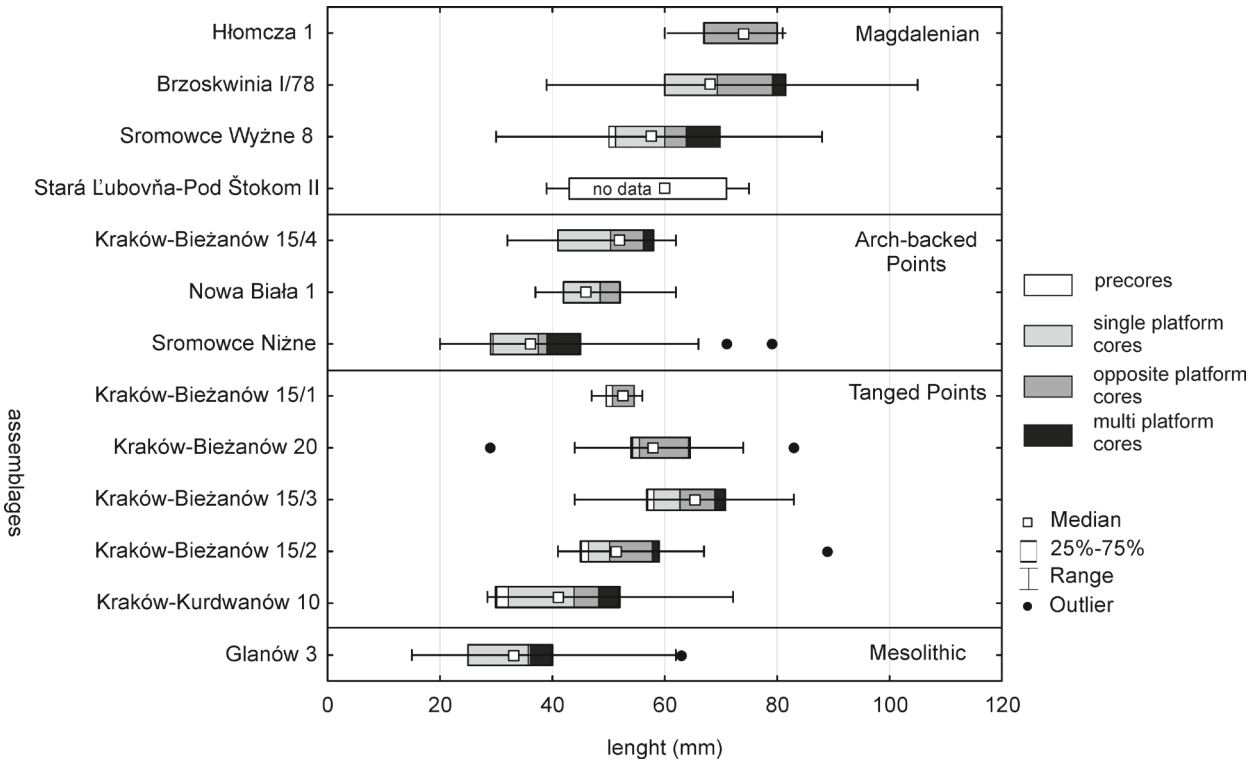

Fig. 6. A comparison of the length and types of cores from different assemblages representing the Late Palaeolithic technocomplexes.

Abb. 6. *Ein Vergleich der Länge und Typen von Kernen zwischen verschiedenen Inventaren, die die späten paläolithischen Technokomplexe repräsentieren.*

assemblages which were consistent with the assumptions of the methodology. Based on an overview of the technology (Fig. 6) and typology these assemblages were subjectively clustered into four facies. This term is used only tentatively until a cultural description can be proposed.

Facies 1

This facies is the most frequent type which has been recorded during recent research. There are several assemblages representing different settlements like large camps (Kraków-Bieżanów 20, Figs. 7 & 8 – Klimek et al. 2012), small camps or even just clusters of artefacts (Zakrzów 1 – Klimek & Peschel 2009; Zakrzów 28 – Kaminski 2012; Kraków-Bieżanów 15, Fig. 9 – Stefański 2012a; Kraków-Bieżanów 11, 30 – Wilczyński 2015). This facies is characterized by consistent technology based on almost exclusively opposite platform cores. They are quite slender and well prepared. These cores are highly standardized for the manner they were used and discarded. They were treated as exhausted when they fell below a standard length, which is seen especially in the case of the Kraków-Bieżanów 15/1 assemblage. Tanged points are the most frequent typological tool. They are represented almost exclusively by willow-leaf shaped points, known as a "Swiderian points" – term introduced by L. Sawicki or "double-angled points" in the Polish literature. Beside the Swiderian points there are also a number of burins. Endscrapers are less frequent. The attempt to directly date this facies failed as the charcoal from Kraków-Bieżanów 20 produced a Neolithic date. However, this industry has a strict analogy in the Całowanie sequence where it was found in layer VI. The chronological framework of this sequence allows dating to the second half of the YD and the early Preboreal age. It is worth mentioning that local mining and processing of flint has been confirmed by technology and typology and, as well as, in the case of Wołowice 4/90, by a single radiocarbon date (Gd-4612 9'780 ± 230 BP), which despite the large standard error confirms the above-mentioned framework. From the perspective of the author of this paper, only this facies truly represents the Swiderian culture.

Facies 2

This facies is represented by assemblage 3 from Kraków-Bieżanów 15 (Figs. 10, 11 & 12). This is a quite large *kshemenitsa*, which is the remains of a base camp with inner spatial organizations. It was found in the neighbourhood of the small *kshemenitsa* 2, representing another facies. Although both spots seem to be spatially well separated, some mixing may have occurred. The cores are represented by single platform, as well as by opposite platform cores. Generally, they are less regular or even irregular. They are relatively large when compared to those of facies 1. In case of core types, their dimension and range of reduction, they resemble to some extent Magdalenian

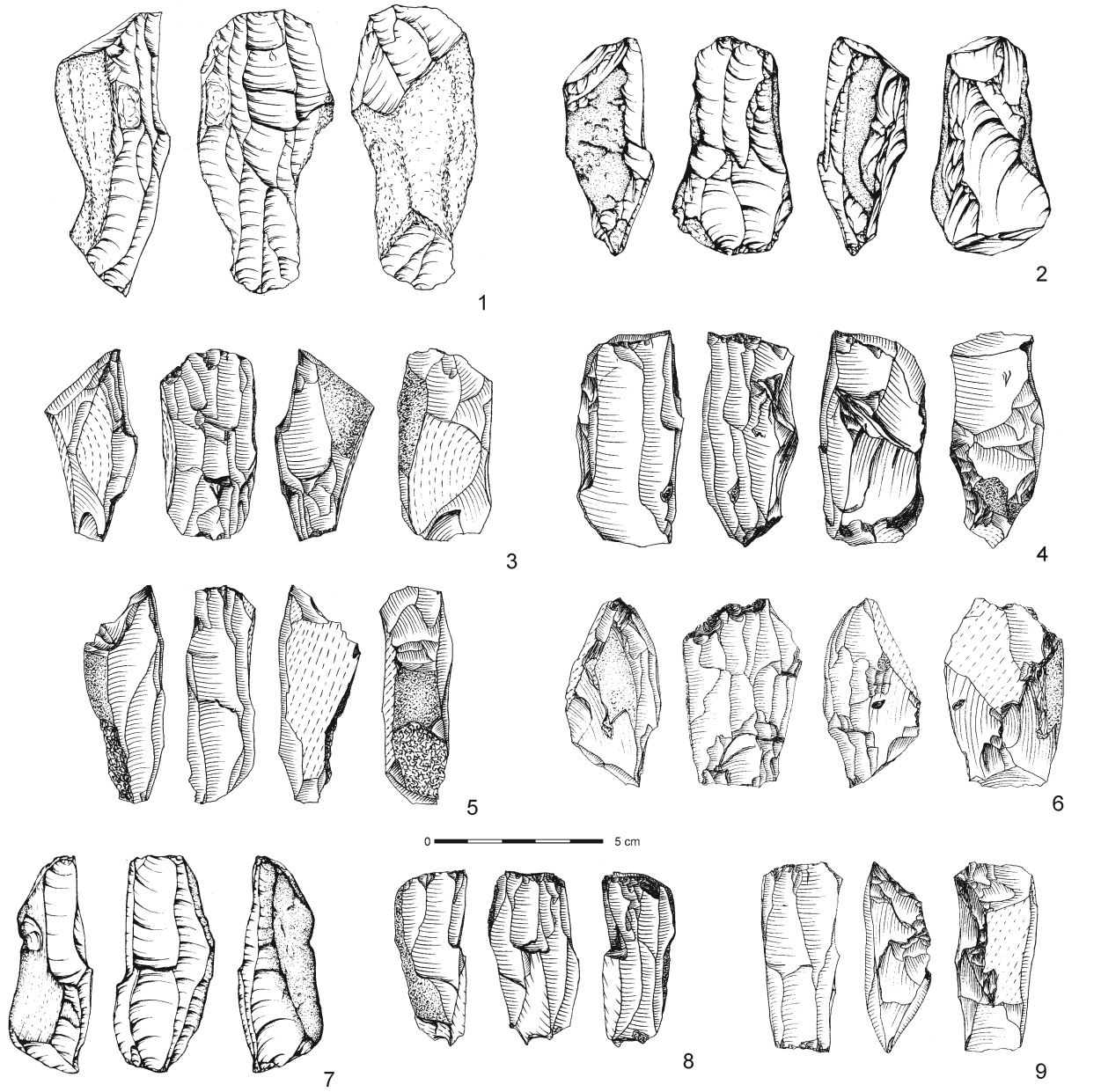

Fig. 7. Kraków-Bieżanów 20, *kshemenitsa*. Opposite platform cores (Klimek et al. 2012).
Abb. 7. *Kraków-Bieżanów 20, kshemenitsa. Kerne mit gegenüberliegenden Schlagflächen (Klimek et al. 2012).*

cores from Brzoskwinia. Single platform cores often conform very strictly to a conical shape with a consistent focus on tip correction. Opposite platform cores are usually wide with flat, prepared backs. The tools are relatively rare. Endscrapers are the most numerous of the categories. They are large, sometimes unusual in shape. Other tools are represented by two Swiderian points and a few microliths including tanged ones. Dating of that industry remains open. The presence of endscrapers and microliths may be a clue pointing to an early Holocene age. Worth mentioning are also large conical cores which to some extent are reminiscent of those for long blade production (Sørensen & Sternke 2004). In addition to the Kraków-Bieżanów 15/3 assemblage, there are others, like the Zakrzów site 28 or the Zagacie site 2, which could be linked to this tradition. Especially interesting is the Zagacie site 2 (Fig. 13). Although this is a palimpsest site linked with flint mining and processing, in addition there is a limited amount of Magdalenian, as well as a few traces of Mesolithic admixture, the TPT inventory seems coherent. It consists of single and opposite platform cores which are visibly different from those characteristic of facies 1. It also contains a few tanged points including half-products and wastes, Swiderian points but also some atypical ones (Pawłowska 2003). Radiocarbon dating of charcoal (*Pinus sylvestris* Poz-94374 9'490 ± 50 BP) points to the middle Preboreal (Fig. 14). An analogy to Kraków-Bieżanów 15/3 would be the Mucharz 12 site which is located not

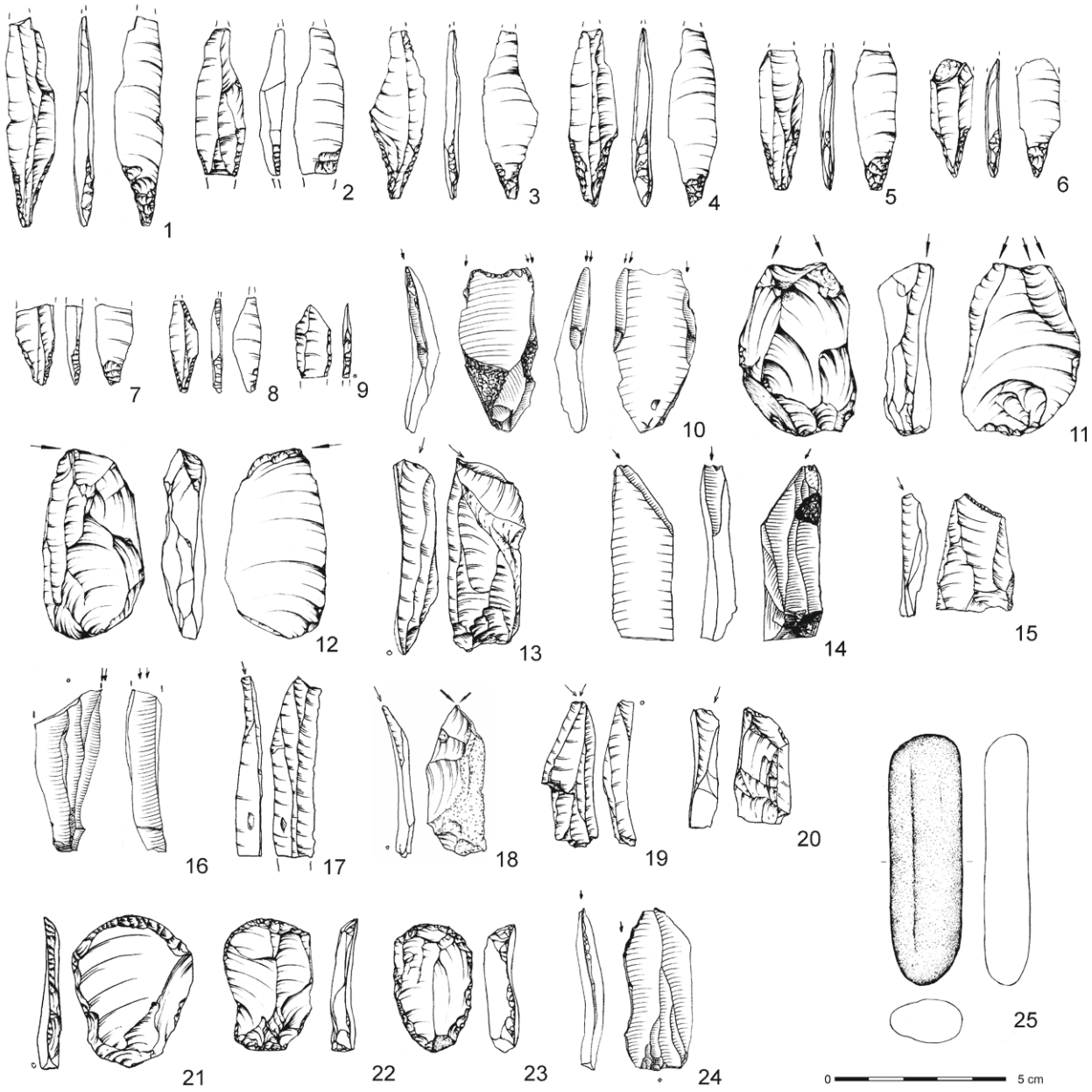

Fig. 8. Kraków-Bieżanów 20, *kshemenitsa*. Tools: 1-9 – points, 10-20 – burins, 21-24 – endscrapers, 25 – arrow-straightener (Klimek et al. 2012).
Abb. 8. *Kraków-Bieżanów 20, kshemenitsa. Geräten: 1-9 – Spitzen, 10-20 – Stichel, 21-24 – Kratzer, 25 – Pfeilschaftglätter (Klimek et al. 2012).*

far away in the Carpathian foreland. The relatively large opposite platform cores were found there in feature 717. This feature is dated by the TL method to the Preboreal age (Valde-Nowak & Łanczont 2008).

Facies 3

It is represented exclusively by assemblage 2 which was found at Kraków-Bieżanów site 15 (Fig. 15). This is a small *kshemenitsa* with just a few tools and cores. Additionally, it could have been mixed to some extent with *kshemenitsa* 3 representing facies 2. It was also partly damaged by a later Bronze Age settlement. The cores are diversified. Most of them are rather small and irregular, with single or opposite platforms. The large, unusual, core(admixture?) is shown in Figure 13: 1. Examples of a splinter core and a cubic multiplatformed core (Fig. 13: 7) seem to be remnants from the Bronze Age. The most significant element is an asymmetrical point which compares to those known from Desnenian contexts (Fig. 13: 6). Besides that, a few other tools were found including two burins. The best analogy is the site of Rydno, quoted above, which has been dated by the radiocarbon method to the Boreal period.

Facies 4

Facies 4 is represented exclusively by an assemblage from Kraków-Kurdwanów 10 (Figs. 16, 17 & 18), the remains of a big camp. The assemblage is rich, comprising approximately 6'000 pieces (Roczkalski &

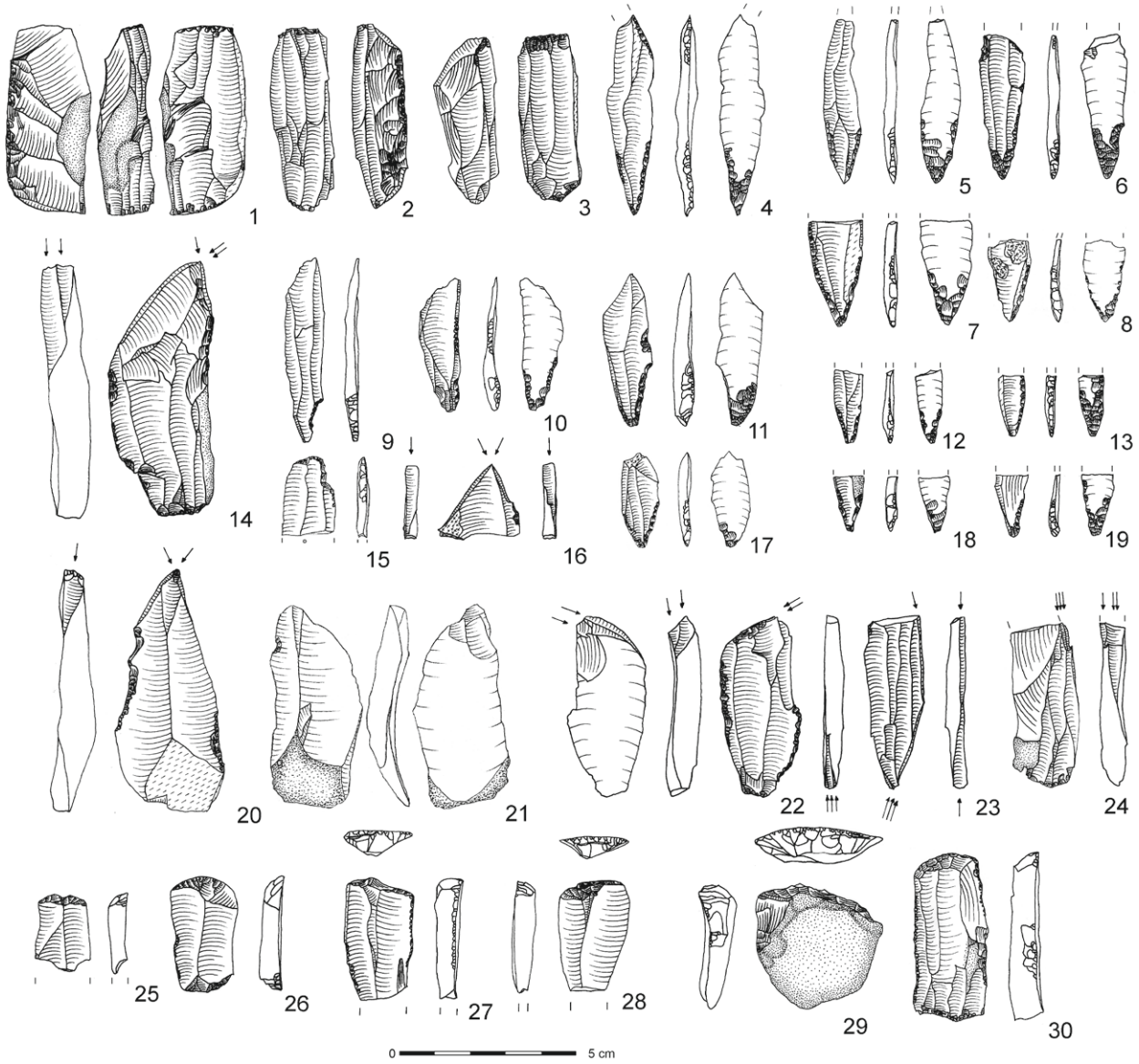

Fig. 9. Kraków-Bieżanów 15/1. Cores: 1-3 opposite platform; tools: 4-13, 18, 19 – points, 14-17, 20-24 – burins, 25-30 – endscrapers (Stefański 2012a).
Abb. 9. *Kraków-Bieżanów 15/1. Kerne: 1-3 mit gegenüberliegenden Schlagflächen; Geräte: 4-13, 18, 19 – Spitzen, 14-17, 20-24 – Stichel, 25-30 – Kratzer (Stefański 2012a).*

Włodarczak 2002). The technology is rather unusual. The cores are rather small and they were reduced until they were completely exhausted. The smallest ones do not exceed 3 cm. Single platform cores are more numerous than opposite platform ones. They frequently conform very strictly to a conical shape. The opposite platform cores are often cubic in shape with angled striking platforms. Multiplatform cores were not observed by the authors, however some of the opposite platform cores could be interpreted as such. The toolkit is dominated by roughly more than 100 endscrapers. It is worth mentioning that they were analysed by the use-wear method (Winiarska-Kabacińska 2002). Several tanged points were also recognized. These are rather small or even microlithic, asymmetrical, with (Wojnowo type?) or without (Ahrensburgian type?) flat retouch on the ventral side of tangs. Unfortunately, they are often fragmented. The toolkit also includes several burins and other tools like drills and perforators. In some cases, the retouched flakes and Kostienki truncations could be interpreted as a kind of flake axe. In a preliminary report, this facies was dated to the old phase of TPT (Valde-Nowak et al. 2015) due to the variety of tanged points, but radiocarbon dating of charcoals (*Pinus sylvestris*) from feature 1 (Poz-94377 8'410 ± 50 BP) and 5 (Poz-81944 8'850 ± 40 BP) shows, surprisingly, Boreal chronology for that industry (Fig. 14). This would be the first example of a so-far unknown method of TPT adaptation to the Holocene condition. Additionally, it seems reasonable, on the basis on technology and typology, to link it with the Ahrensburgian culture rather than the Swiderian, so it would represent its late stage in the region (discussion

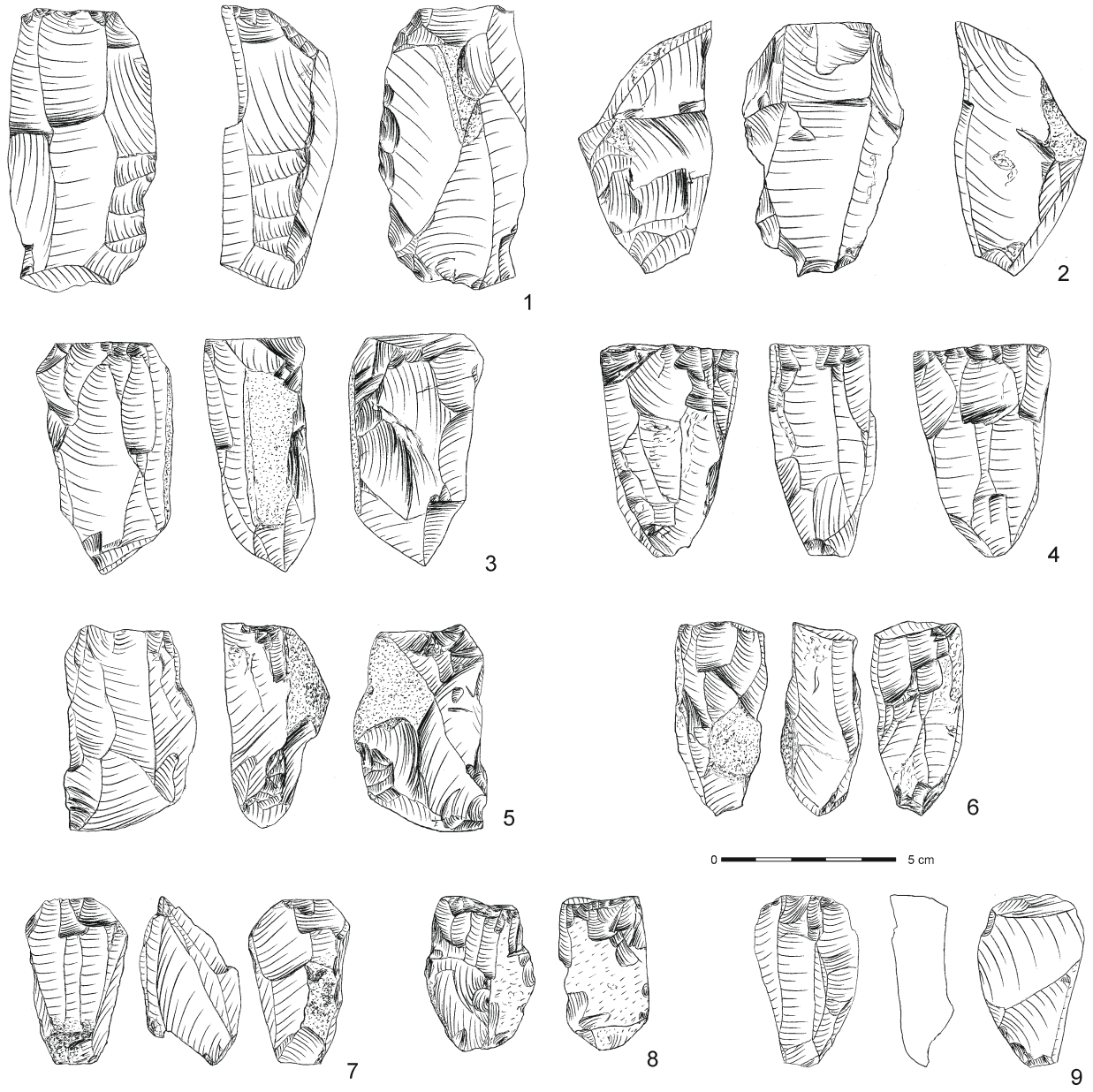

Fig. 10. Kraków-Bieżanów 15/3. Single platform cores (Stefański 2012a).
Abb. 10. *Kraków-Bieżanów 15/3. Kerne mit einziger Schlagfläche (Stefański 2012a).*

above). It also sheds new light on the origin of Komornica culture as some of the cores' dimensions or technological features, like conical shape or a characteristic way of core reorientation, seems to have contributed to Mesolithic technology. The similar position in the area could have rich assemblages from the Przeginia Narodowa site 1, where similar tanged points were documented (Valde-Nowak et al. 2015). However, the lack of radiometric determination does not allow unambiguous conclusions to be drawn.

Other tanged point assemblages

Beside the above-presented facies, many types of diversified tanged points were found without a clear archaeological context (Fig. 19). Some of them were interpreted as Lyngby points (Fig. 19: 1-11). These were reported from several sites but almost never have a typical form. Additionally, the shortage of other elements like characteristic cores brings this opinion into question. In this case only a few of them could be surely interpreted as Lyngby points. It suggests rather a temporary presence of societies representing the old phase of TPT unit in the region. Other points are an example of hybridization of the arch-backed point and tanged points (Fig. 19: 12-14). L. Sawicki pointed out this in his work and called them Grimaldi points (Sawicki 1935). The context is unclear, but identical points were reported from Stoksbjerg Vest (Johansson 2003) where a Bromme settlement with a small arch-backed industry intrusion was reported. Outstanding is a cluster of macro-tools from Kokotów 18 (Wąs 2012). They seem to be a coherent

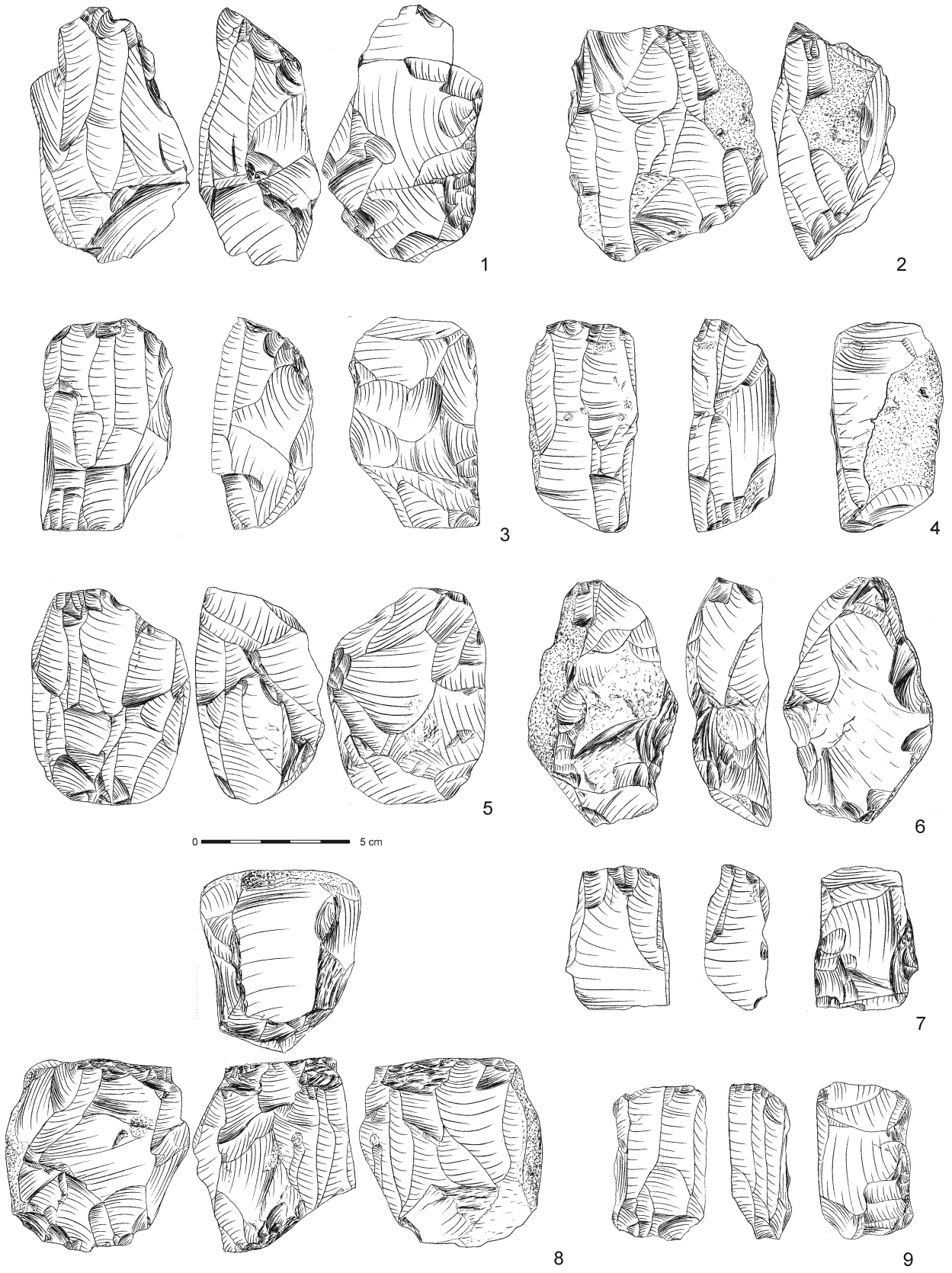

Fig. 11. Kraków-Bieżanów 15/3. Opposite platform cores (Stefański 2012a).
Abb. 11. *Kraków-Bieżanów 15/3. Kerne mit gegenüberliegenden Schlagflächen (Stefański 2012a).*

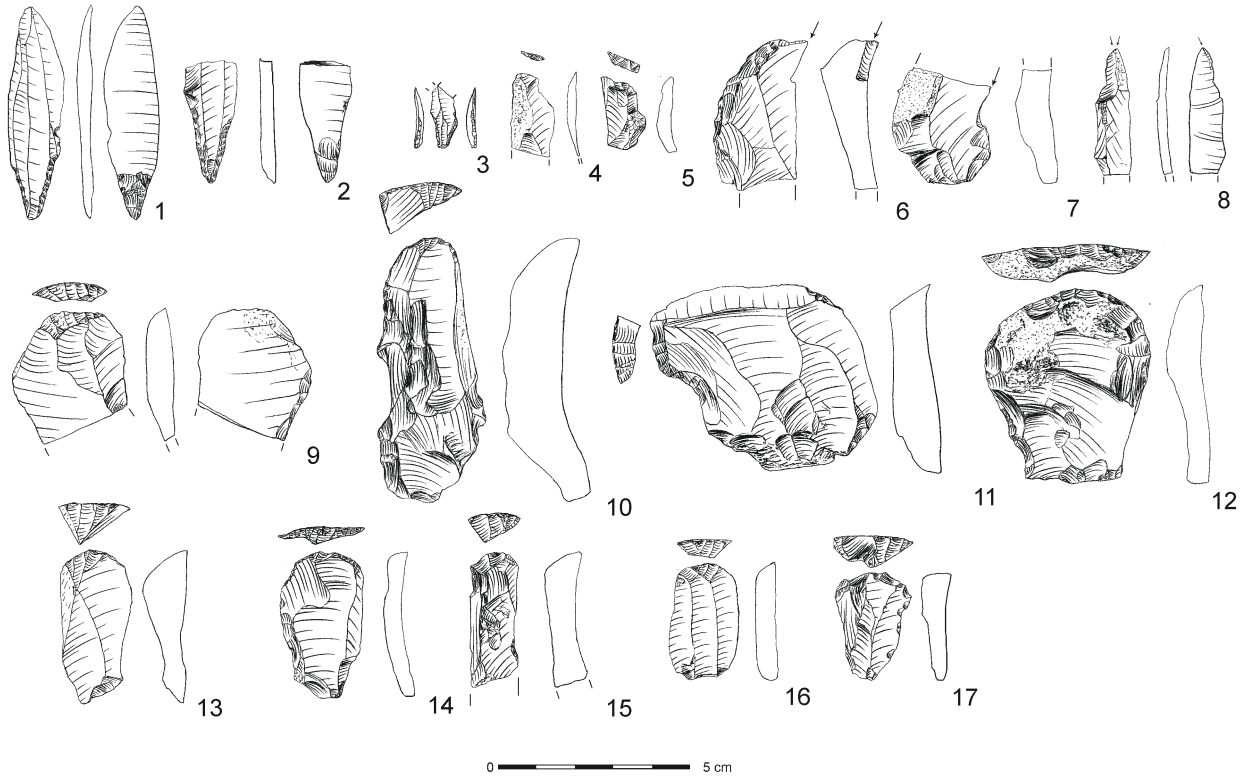

Fig. 12. Kraków-Bieżanów 15/3. Tools: 1-2 – points; 3-5 – microliths. 6-8 – burins, 9-17 – endscrapers (Stefański 2012a).
Abb. 12. *Kraków-Bieżanów 15/3. Geräte: 1-2 – Spitzen; 3-5 – Mikrolithen. 6-8 – Stichel, 9-17 – Kratzer (Stefański 2012a).*

group of tanged points, although according to the author, part of them have to be classified as retouched blades or perforators (Fig. 19: 15-21). These tools are, to some extent, similar to Lyngby points – especially the one in Figure 18: 21. They resemble also the ones known from the long blade context. Such tools were also reported from the post-Swiderian context of Veretye culture (Oshibkina 1997), however such a connection seems to be distant. Another example is a point with a distinctly well-shaped tang (Fig. 19: 23 & 24). These are sporadically known from the Swiderian context, as well as the points pictured in Figure 18: 25 & 26. Another interesting group of artefacts is a handful of points resembling ones characteristic of the post-Ahrensburgian world (Fig. 19: 27-33). These are known for instance from Stanovoje 4/IIIa where they are dated to the middle of the Preboreal period (Zhilin 2003; Hartz et al. 2010) or Rydno 1947/II and IX , dated to the Boreal period (Schild 1990). There are also analogies at Scandinavian sites like Tosskärr (Kindgren 2002). The last finding is the presence of tanged points in Mesolithic assemblages. These were usually treated as intrusive finds at sandy, palimpsest sites. However, some of them were found in Mesolithic assemblages acquired during methodological excavations. In both cases, blanks used to manufacture points were technologically similar to those used in the Mesolithic. Nevertheless, in the case of Kraków-Bieżanów 34 (Fig. 19: 40), which was dated by the radiocarbon method to the beginning of the Atlantic period (Poz-39444 7'570 ± 50 BP), this suggestion was initially rejected (Klimek & Stefański 2012). In the case of a small tanged point resembling the Chalibogowice type (Fig. 19: 41) reported from Kokotów 20 (Czerniak et al. 2015), it was confidently included with the Mesolithic assemblage as its integral part. The late phase of the TPT or even the Mesolithic age seems a justifiable dating for a series of small, sometimes geometric, tanged points (Fig. 19: 34-39, 42-50). The echo of that tradition was still visible in the region during the Atlantic period as shown by the presence of high trapezes (Fig. 19: 51-61). These resemble margin-retouched points known from the late mesolithic of Scandinavia (Manninen & Tallavaara 2011).

Discussion

The maps presented here are the results of plotting and dating the units which are recognized to be within TPT. These pictures are very simplified as they are only intended to indicate substantial stages and to launch a general framework of TPT rather than to participate in a detailed discussion concerning local issues. To clarify this view, in the case of the following phases as well the individual cultural units, a terminology was proposed. The radiocarbon charts allow separation into three stages of TPT: the old, the young (both dated to the Pleistocene), and the late phase (which started in the middle of the Preboreal). The late stage, according to

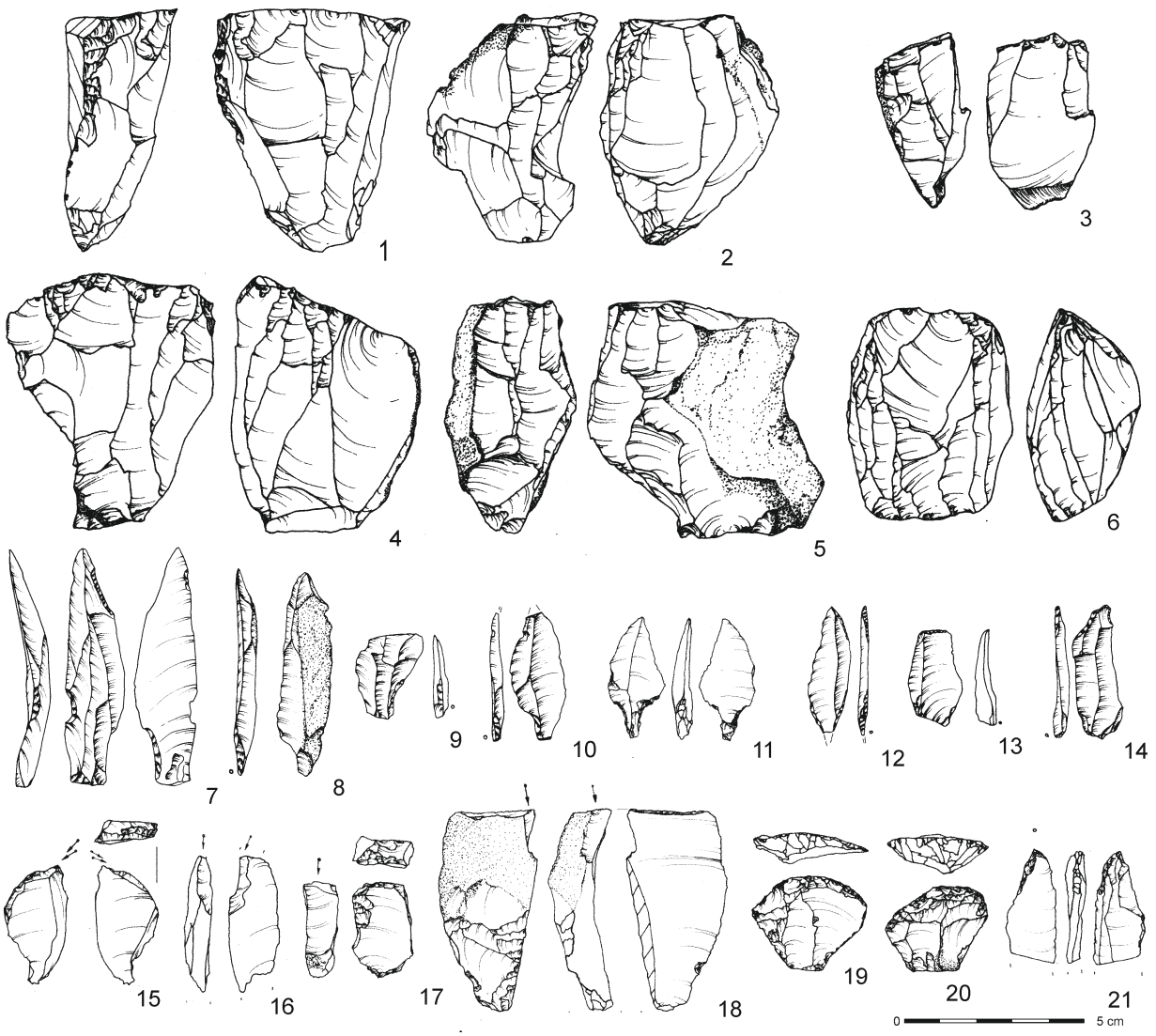

Fig. 13. Zagacie 2. Cores: 1-3 – single platform, 4-6 – opposite platform; tools: 7-12 – points; 13,14 – truncations, 15-18 – burins; 19, 20 – endscrapers, 21 – drill (1-6, 11, 15-21 – Pawłowska 2003).

Abb. 13. *Zaganie 2. Kerne: 1-3 – mit einziger Sclagfläche, 4-6 – mit gegenüberliegenden Schlagflächen; Geräte: 7-12 – Spitzen, 13,14 – Endretouchen, 15-18 – Stichel; 19, 20 – Kratzer, 21 – Bohrer (1-6, 11, 15-21 – Pawłowska 2003).*

established definition, should be labelled as Mesolithic. However, taking into consideration its clear palaeolithic roots, a further discussion is needed. As marked in the introduction, changes in subsistence patterns were rather slow. From this point of view a return to the Epipalaeolithic term seems reasonable. In the case of cultural differentiation, the most disputable seems to be the Ahrensburgian culture. This complex unit lasted through all stages of TPT keeping its basic techno-and typological structure, implicating an obvious problem when dating a single find or small assemblages. However, in the case of well-dated assemblages, some suffixes are necessary – epi-Ahrensburgian, Ahrensburgian and late-Ahrensburgian. Conversely the Swiderian culture, with its consistent technology and typology, seems to be an episode within TPT, but this phenomenon also needs further study.

The presented facies surely do not cover all aspects of the Tanged Point Technocomplex variety in the Northern Subcarpathia. Nevertheless, they point to a much more complex dynamic of the TPT in the region. It reflects the current state of knowledge but generates a range of questions for further study. There is no clear evidence of the early phase of TPT in the region. Some data from palimpsest workshops like Wołowice S1/74 (Gd-4654 10'920 ± 200 BP; Bańdo et al. 1993) or Zagacie 2 (Ki-7044 11'260 ± 80 BP; Pawłowska 2003) would appear to suggest the contrary, but it refers instead to the epigones of Magdalenian tradition in the area rather than representing the early phase of TPT or the Arch-backed Point Technokomplex, which are technologically different, especially the last one. Only some of the tanged points seem to indicate a penetration of this region during this phase by the Bromme culture. Evidence shows the Kraków region was occupied mostly in the young phase of TPT. This is supported by numerous assemblages representing facies 1 which should be paralleled with the Swiderian

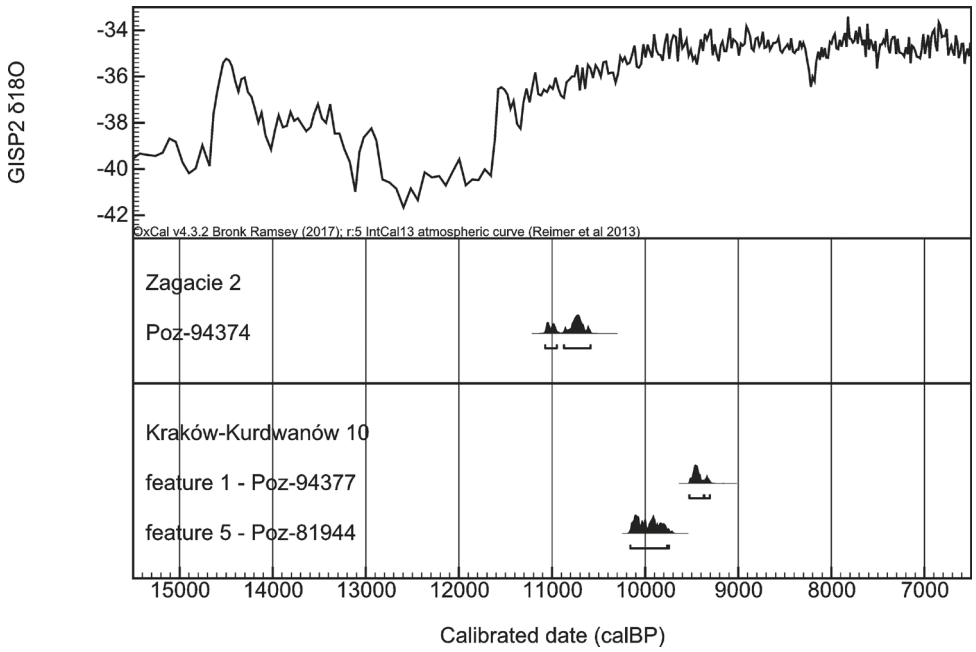

Fig. 14. New radiocarbon datings from the western part of the Northern Subcarpathia. All determinations made on charcoal (*Pinus sylvestris*).

Abb. 14. *Neue Radiokarbondatierungen aus dem westlichen Teil der nördlichen Karpatenvorland. Alle Bestimmungen erfolgen an Holzkohle (Pinus sylvestris).*

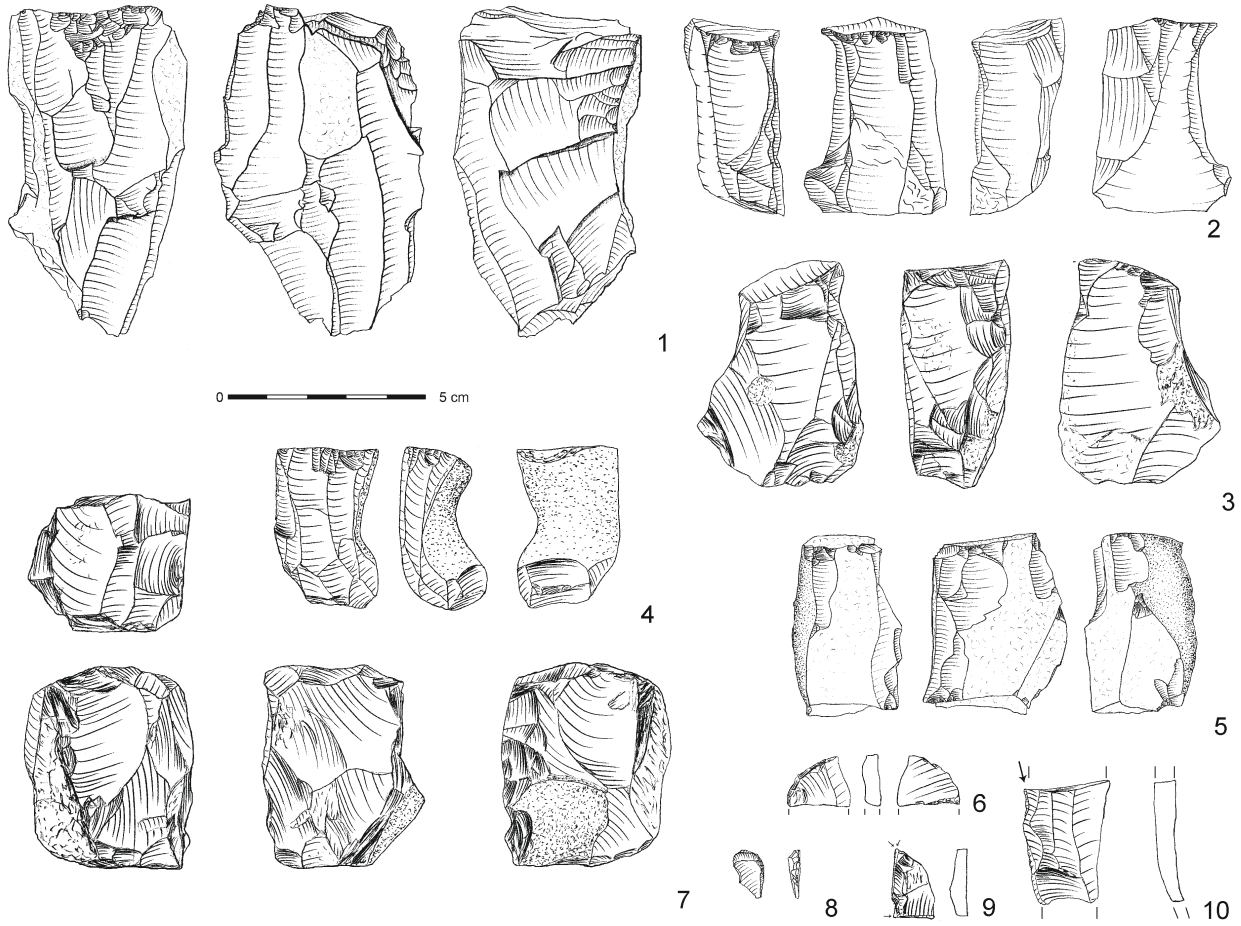

Fig. 15. Kraków-Bieżanów 15/2. Cores: 2, 4 – single platform, 1, 3, 5 – opposite platform, 7 – multiplatform; tools: 6 – point, 8 – microliths; 9, 10 – burins (Stefański 2012a).

Abb. 15. *Kraków-Bieżanów 15/2. Kerne: 2, 4 – mit einer Schlagfläche, 1, 3, 5 – mit gegenüberliegenden Schlagflächen, 7 – mit mehreren Schlagflächen; Geräte: 6 – Spitze, 8 – Mikrolith; 9, 10 – Stichel (Stefański 2012a).*

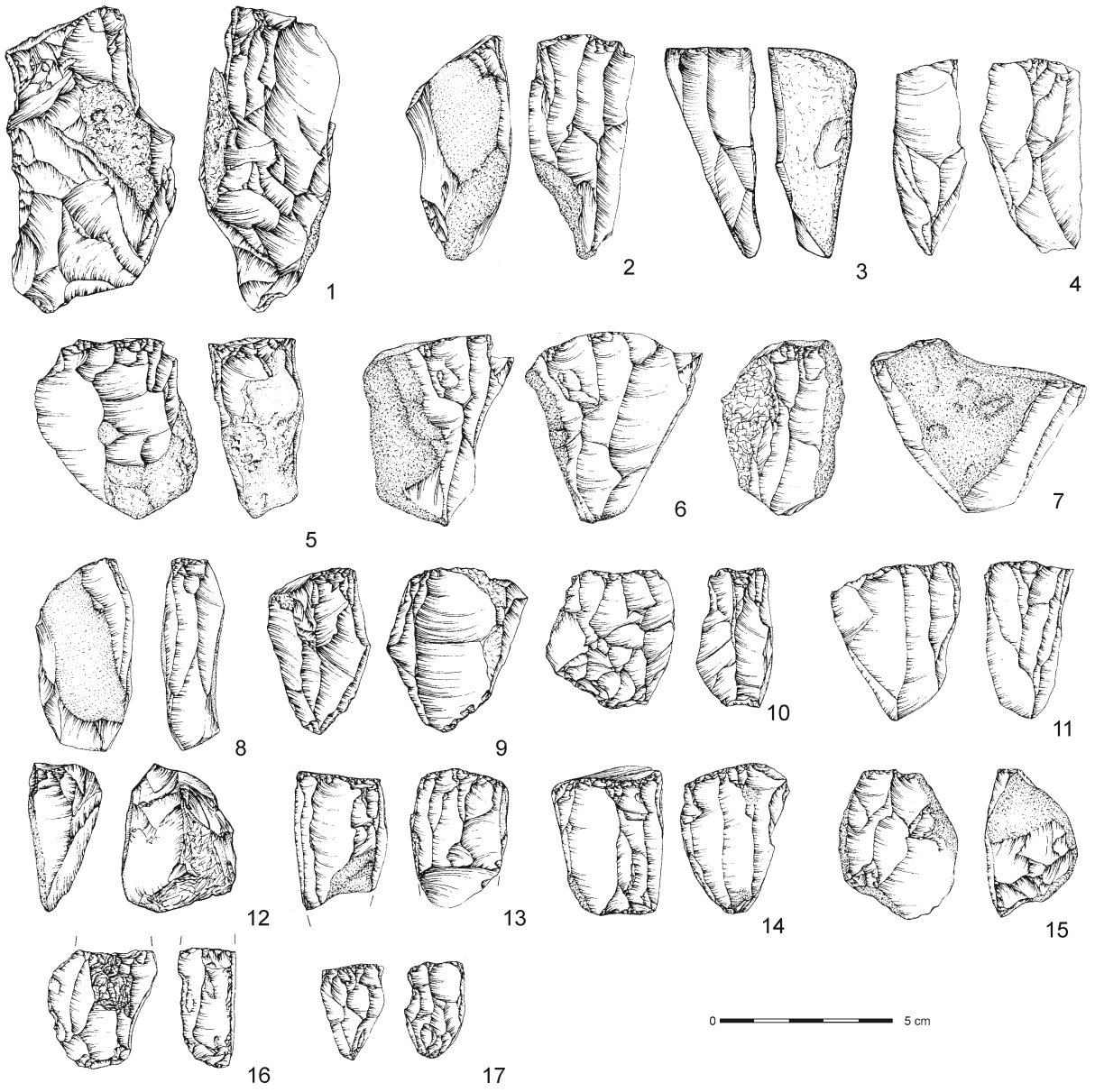

Fig. 16. Kraków-Kurdwanów 10. Single platform cores (Roczkalski & Włodarczak 2002).
Abb. 16. *Kraków-Kurdwanów 10. Kerne mit einer Schlagfläche (Roczkalski & Włodarczak 2002).*

culture. Additionally, numerous Swiderian points known from many sites as single finds support this statement. Although there is not much radiocarbon dating of Swiderian settlements, the second part of the YD and the beginning of the Preboreal, seems highly probable. Facies III and IV prove that the Kraków region was occupied also by TPT during its late stage. Although the main centres of this period were located more to the north and the north-east, Northern Subcarpathia seems to be fully involved in this world. This is proven by the late-Ahrensburgian assemblage of Kraków-Kurdwanów 10, which seems to mark an important shift of this unit east- and northwards during the early Holocene. Facies III represents a typical post-Ahrensburgian tradition, so far documented mainly in eastern Poland, Belarus, Ukraine, Russia and Scandinavia. Thus far there are no traits of typical post-Swiderian tradition which differ from Kunda and related units. Some answers may be found in facies II, but this needs better confirmation.

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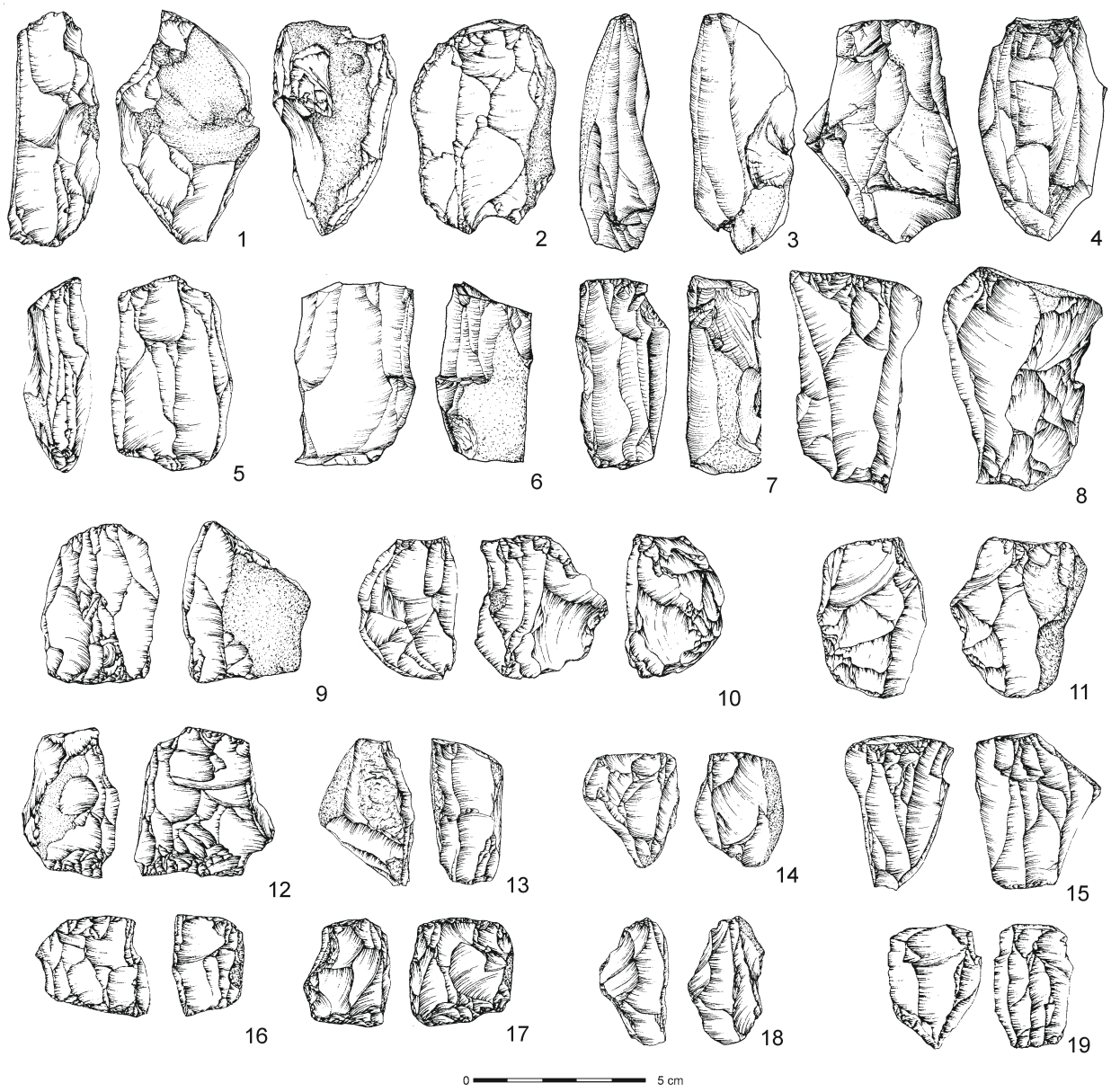

Fig. 17. Kraków-Kurdwanów 10. Opposite platform cores (Roczkalski & Włodarczak 2002).
Abb. 17. *Kraków-Kurdwanów 10. Kerne mit gegenüberliegenden Schlagflächen (Roczkalski & Włodarczak 2002).*

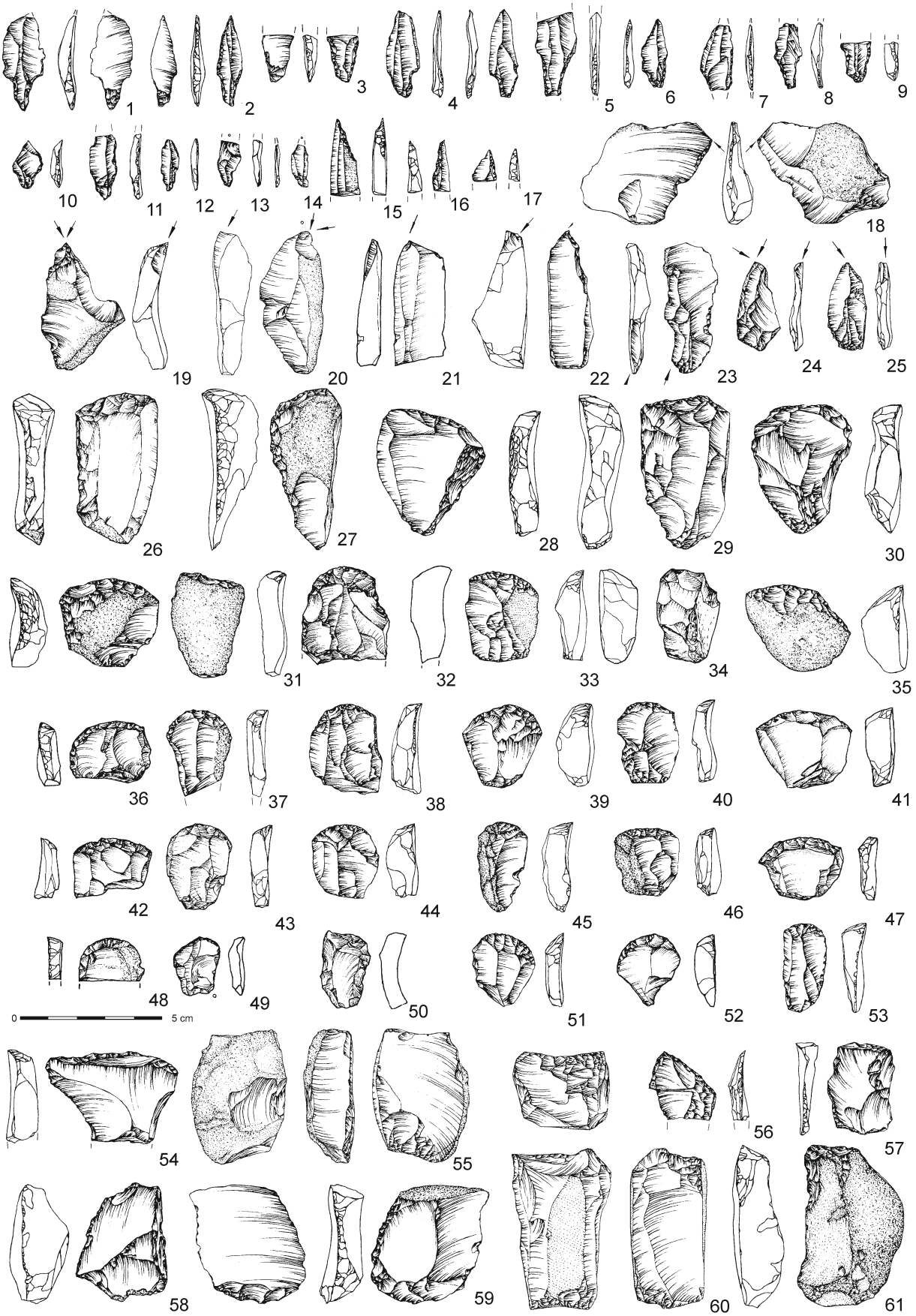

Fig. 18. Kraków-Kurdwanów 10. Tools: 1-17 – points, 18-25 – burins, 26-53 – endscrapers, 54, 55, 58, 59, 60 – retouched flakes, 56, 57, 61 – perforators and drills (Roczkalski & Włodarczak 2002).

Abb. 18. *Kraków-Kurdwanów 10. Geräte: 1-17 – Spitzen, 18-25 – Stichel, 26-53 – Kratzer, 54, 55, 58, 59, 60 – retuschierte Abschläge, 56, 57, 61 – Bohrer (Roczkalski & Włodarczak 2002).*

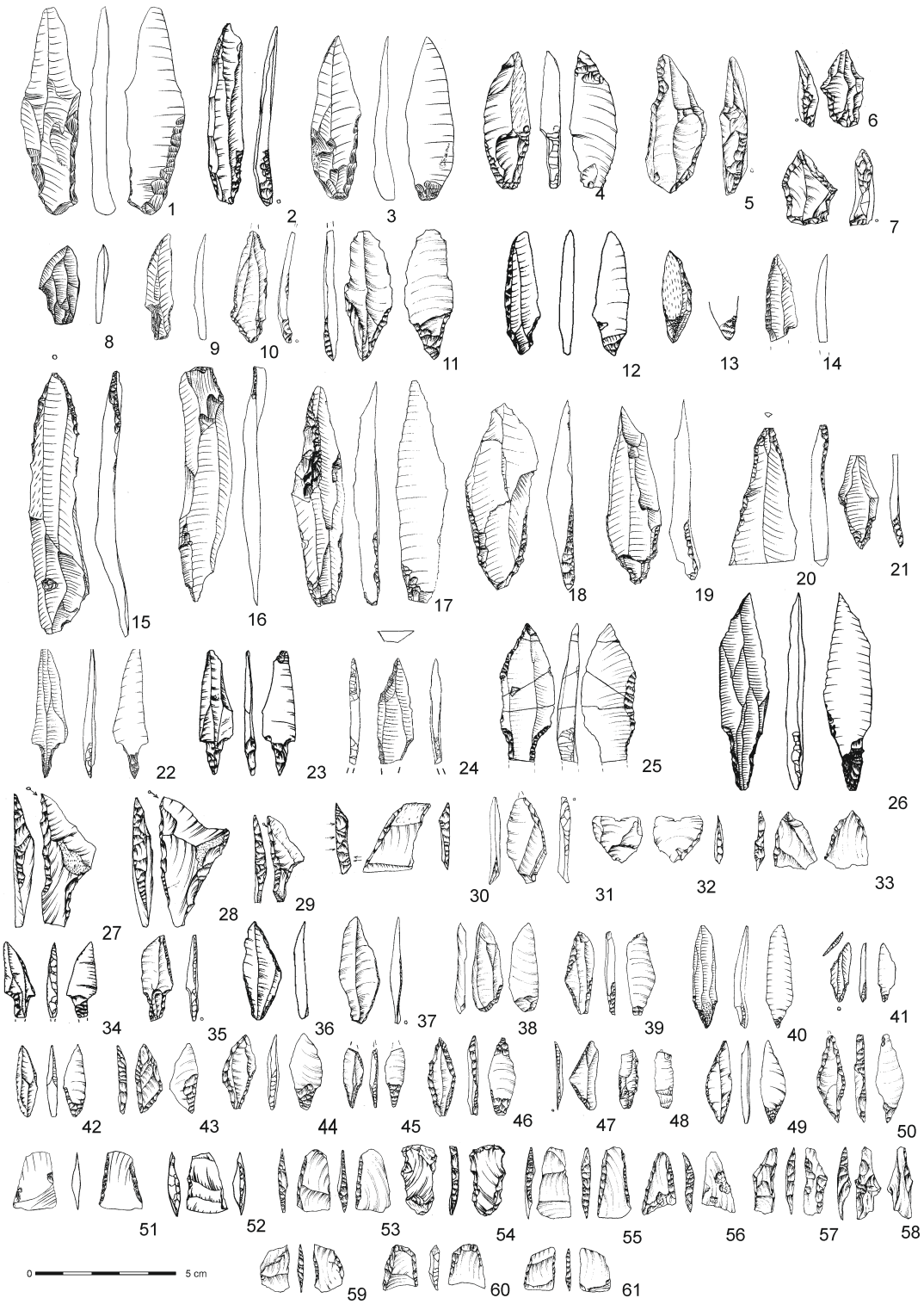

Fig. 19. Tanged Points and related tools from the western part of the Northern Subcarpathia. Kobierzyn, 2 – Kraków-Bieżanów 8 (Stefański 2012b); 34 – Kraków-Bieżanów 11 (Wilczyński 2015); 1, 3, 9, 22 – Kraków-Bieżanów 15 (Stefański 2012a); 4, 23, 26 – Kraków-Bieżanów 20 (Klimek et al. 2012); 13, 48 – Kraków-Bieżanów 21 (Bober 2012), 14, 51 – Kraków-Bieżanów 33 (Jarosz et al. 2011); 40 – Kraków-Bieżanów 34 (Klimek & Stefański 2012); 6, 7, 11, 27, 28, 29-32, 35, 37, 42, 54, 58 – the Kraków-Borek Fałęcki and Kobierzyn sites; 15-21 – Kokotów 18 (Wąs 2012), 49 – Kokotów 19 (Drobniewicz 2012), 41 – Kokotów 20 (Czerniak et al. 2015), 36 – Podłęże 22 (Nowak 2012a), 8, 24 – Stanisławice 9 (Nowak & Rodak 2015), 25 – Stanisławice 13 (Włodarczak & Włodarczak 2012); 5, 10, 33, 38, 39, 43-47, 50, 53, 55-57, 59, 60, 61 – Zakrzów 1, 12 – Zakrzów 13 (Nowak 2012b).

Abb. 19. *Stielspitzen und verwandte Geräte aus dem westlichen Teil des nördlichen Karpatenvorlands. Kobierzyn, 2 – Kraków-Bieżanów 8 (Stefański 2012b); 34 – Kraków-Bieżanów 11 (Wilczyński 2015); 1, 3, 9, 22 – Kraków-Bieżanów 15 (Stefański 2012a); 4, 23, 26 – Kraków-Bieżanów 20 (Klimek et al. 2012); 13, 48 – Kraków-Bieżanów 21 (Bober 2012), 14, 51 – Kraków-Bieżanów 33 (Jarosz et al. 2011); 40 – Kraków-Bieżanów 34 (Klimek & Stefański 2012); 6, 7, 11, 27, 28, 29-32, 35, 37, 42, 54, 58 – the Kraków-Borek Fałęcki and Kobierzyn sites; 15-21 – Kokotów 18 (Wąs 2012), 49 – Kokotów 19 (Drobniewicz 2012), 41 – Kokotów 20 (Czerniak et al. 2015), 36 – Podłęże 22 (Nowak 2012a), 8, 24 – Stanisławice 9 (Nowak & Rodak 2015), 25 – Stanisławice 13 (Włodarczak & Włodarczak 2012); 5, 10, 33, 38, 39, 43-47, 50, 53, 55-57, 59, 60, 61 – Zakrzów 1, 12 – Zakrzów 13 (Nowak 2012b).*

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