



Research Article

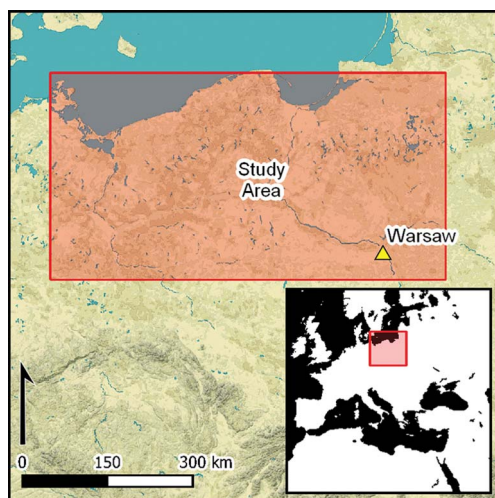
New radiocarbon dates for ornamented Mesolithic objects from north-west Poland: chronology and regional connections in the western Baltic region

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During the northern European Mesolithic, new types of objects were ornamented with different geometric motifs. Many examples, however, are stray finds and their dating is poorly understood. The authors present new AMS radiocarbon dates for ornamented artefacts from Pomerania that contribute to an absolute chronology of Mesolithic art and allow for new consideration of connections between cultural groups in the western Baltic region. A baton, featuring an anthropomorphic figure, dates to the end of the Boreal period; three other objects date to the early Atlantic period, revealing a combination of regional and local innovations. The results demonstrate the value of absolute dating of stray finds for refining knowledge of wider cultural trends.

Keywords: Poland, Mesolithic, Maglemose, Kongemose, Ertebølle, ornamented objects, geometric motifs, radiocarbon dating

Introduction

The Mesolithic of northern Europe comprised a range of successive and inter-connected regional cultures characterised, in part, by the use of new artistic and symbolic expressions. In recent years, growing numbers of ornamented objects, or portable art, have been recovered from site contexts with secure radiocarbon chronologies (Płonka *in press*). These objects, however, derive mostly from rubbish deposits into water on the peripheral areas of campsites and are usually far from intact. Currently, therefore, the best-preserved examples of such artefacts are often stray finds, some of them perhaps representing artefacts intentionally deposited into bodies of water. Many of these finds were made during the late nineteenth and early

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twentieth centuries and are dated largely on stylistic grounds. Advances in radiocarbon dating allowing for chronometric determinations on very small samples of antler or bone—the most common material used to produce these objects—now enable us to establish an absolute chronological framework for such finds and to understand their development and distribution.

Here, we present new radiocarbon dates for four Mesolithic decorated objects—all of which are undated stray finds from north-western Poland (Pomerania)—and discuss them in the wider context of the Mesolithic of northern Central Europe and southern Scandinavia. The dates help to establish a more accurate chronology for regional art and shed light on the transmission of ornamental patterns and motifs between Mesolithic societies in the western Baltic region.

Mesolithic art of northern Central Europe and southern Scandinavia

Our discussion of the northern Central European and southern Scandinavian Mesolithic follows the chronology of the Danish tradition, with three major cultures originally defined on the basis of lithic typology and technology (Brinch Petersen 1973; Sørensen 2012): the Maglemose (*c.* 9600–6500 BC), Kongemose (*c.* 6500–5400 BC) and Ertebølle (*c.* 5400–4100 BC). These cultures, often referred to as the Early, Middle and Late Mesolithic, respectively, flourished in the early Holocene. The Maglemose Culture occurred in the Preboreal and Boreal periods, while the Kongemose Culture dates to the early Atlantic period and the Ertebølle Culture is characteristic of the middle and late Atlantic periods. The archaeological evidence from the area of north-western Poland, on which we focus here, indicates strong connections with the western Baltic throughout the Mesolithic (Galiński 1992). There was, however, one notable influence from the eastern Baltic: the introduction of punch blade and pressure blade technology during the middle Maglemose Culture (Sørensen 2012; Adamczyk 2018). The exact timing of this is unclear but should probably be set *c.* 7800–7700 BC. Other notable Mesolithic traditions found within the territory of Poland are the Kunda, Narva and Zedmar cultures in north-eastern Poland (reflecting the Early, Middle and Late Mesolithic, respectively), and the Middle to Late Mesolithic Janisławice Culture in central and eastern Poland (Adamczyk 2018).

European Mesolithic art can be grouped into three categories: portable art, rock art and monumental sculpture. Northern Central Europe and southern Scandinavia form part of the north-western province of Mesolithic art, which is characterised by similarities in ornamental motifs and the categories of artefacts selected for ornamentation (Płonka 2003). In north-western Europe, rock art is attested only in Norway and Sweden, the rest of the region producing evidence for only portable art objects. During the Early Mesolithic, the north-western province included parts of Britain (England), Scandinavia (southern and central Norway and Sweden, and Denmark), and central Germany and northern Poland (Płonka 2003). Decorated objects from this period include batons made from red deer antler, mattock heads made using aurochs bone, daggers made from red deer metapodials, and amber pendants. These artefacts are ornamented with geometric, engraved patterns: barbed lines, triangles on lines, zigzag lines, rows of strokes (lines shorter than 10mm), dots and drilled holes. Figural

depictions on portable artefacts are rare and, where known, are expressed geometrically, with the bodies and heads of humans and animals rendered in the form of triangles, lozenges, rectangles and ovals. Although the north-western province encompassed a large region, many forms of decorated objects display stylistic traditions confined to specific sub-regions, such as batons from southern Scandinavia, northern Germany and Poland.

During the Middle and Late Mesolithic, more complex ornamental motifs developed, including bands, as well as net and chequer patterns (Płonka 2003). Simultaneously, simple motifs of parallel lines and strokes, drilled holes forming complex patterns, and criss-cross designs also became prevalent. Figural depictions, however, remain rare. Commonly ornamented objects include red deer antler axes and batons, and bone daggers and knives. Additionally, several types of ornamented harpoon heads, points and other tools have also been found (Andersen 1981; Płonka 2003).

Chronology remains a fundamental problem concerning the Mesolithic art of North-west Europe. A significant number of the current corpus of decorated artefacts was collected either as stray finds or from early excavations. Consequently, very few have been directly dated and most, at best, only indirectly by radiocarbon dating of associated deposits. Given the potential for post-depositional displacement, the latter do not necessarily reflect the date of the artefacts and, in the light of recent research, it is becoming clear that some of these dates are no longer tenable. At Hohen Viecheln (Groß *et al.* 2019), for example, the complicated stratigraphy, in combination with the natural processes that redeposited the artefacts, result in highly variable direct radiocarbon dates for bone and antler objects: they can be older, younger or consistent with radiocarbon dates for samples taken from the associated layers.

Therefore, while a general framework for Mesolithic art has been established (Płonka *in press*), the exact chronology of individual motifs, including figural depictions, remains unclear. On the basis of current data, for example, it is difficult to differentiate definitively between objects and motifs of the late Kongemose and early Ertebølle. Presently, only three and a half per cent of known Early Mesolithic ornamented bone and antler objects and one per cent from the Middle and Late Mesolithic examples have been directly radiocarbon dated. Further direct dating of such artefacts therefore promises a better understanding of the evolution of individual motifs and their relationship both to individual cultures and with the wider Mesolithic of north-western Europe.

Dating the ornamented objects

Four ornamented objects were selected for radiocarbon dating as part of this study: 1) a baton from Szczecin-Podjuchy; 2) an awl from Stolec; 3) a flesher (a form of scraping tool) from Niezabyszewo; and 4) a harpoon from Police (Figures 1 & 2). All these objects were discovered during the late nineteenth or first half of the twentieth century and are now housed in the National Museum in Szczecin, Poland. Apart from a mattock head found at Trudna, these are the only stray finds of Mesolithic art in Pomerania.

Samples for radiocarbon dating were extracted in the Laboratory of Archaeometry and Archaeological Conservation at the University of Wrocław. Radiocarbon dating was conducted at the Oxford Radiocarbon Accelerator Unit. Correction for isotopic fractionation was based on $\delta^{13}\text{C}$ values measured by the accelerator mass spectrometer. Quoted $\delta^{13}\text{C}$

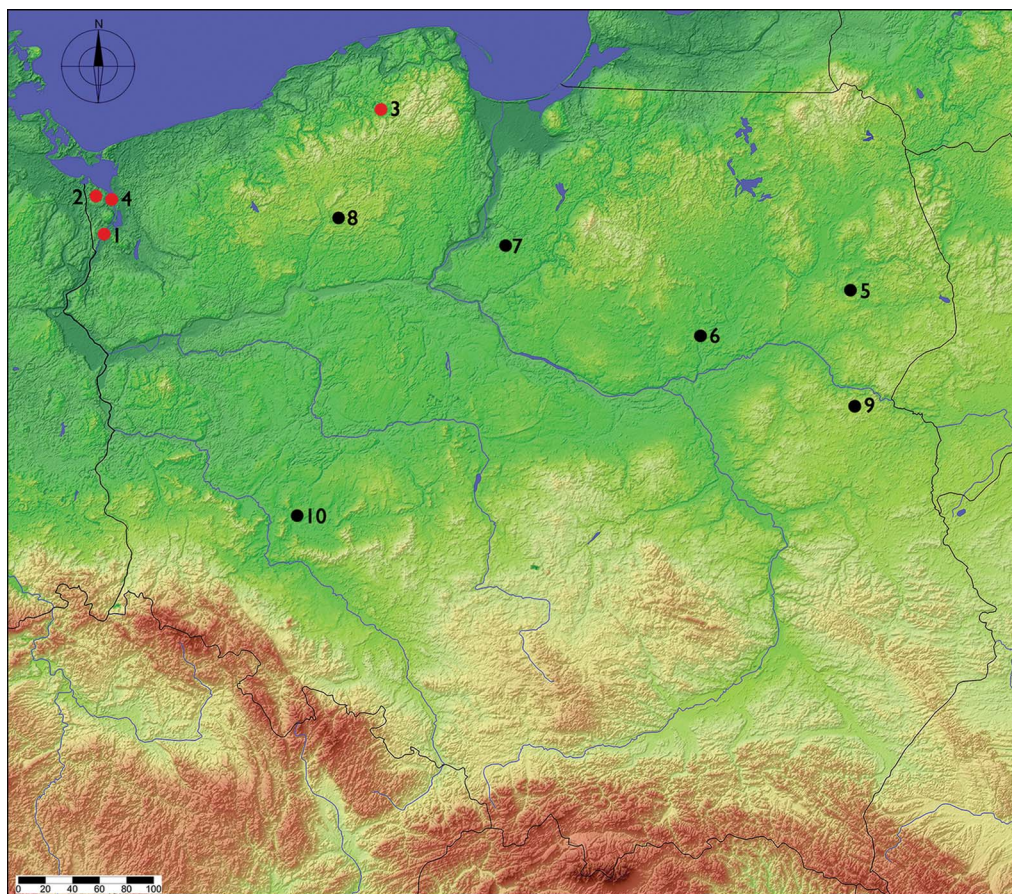


Figure 1. Polish Mesolithic sites with ornamented artefacts that have direct radiocarbon dates: 1) Szczecin-Podjuchy; 2) Stolec; 3) Niezabyszewo; 4) Police; 5) Lupianka Nowa (site known as Nowa Lupianka); 6) Pułtusk; 7) Gołębiewo 47; 8) Trudna; 9) Woźniki; 10) Pobiel 10. New dates in red; scale in km (prepared by T. Płonka; computer processing by N. Lenkow).

values were measured independently using a stable isotope mass spectrometer (to ± 0.3 per mil relative to VPDB). The chemical pre-treatment, target preparation and AMS measurement followed Bronk Ramsey and colleagues (2004) and Brock and colleagues (2010). The calibration plots, showing calendar age ranges, were generated with OxCal (v4.4; Bronk Ramsey 2009) and calibrated using the IntCal20 dataset (Reimer *et al.* 2020).

The Szczecin-Podjuchy baton

The baton was discovered in 1934 among material dredged from the Regalica (East Oder) River (Kunkel 1935). It is made of unshed red deer antler and is notable on account of the depiction of an anthropomorphic figure (Figure 2, no. 1; Figure 3). The wider ornamental scheme is incomplete due to a break at the distal end, which occurred during antiquity. The ornamentation consists primarily of barbed lines, zigzags, criss-cross patterns and



Figure 2. Recently dated artefacts from north-west Poland: 1) baton from Szczecin-Podjuchy; 2) aul from Stolec; 3) flesher from Niezabyszewo; 4) harpoon from Police; scale in cm (photograph by T. Gąsior, computer processing by N. Lenkow).

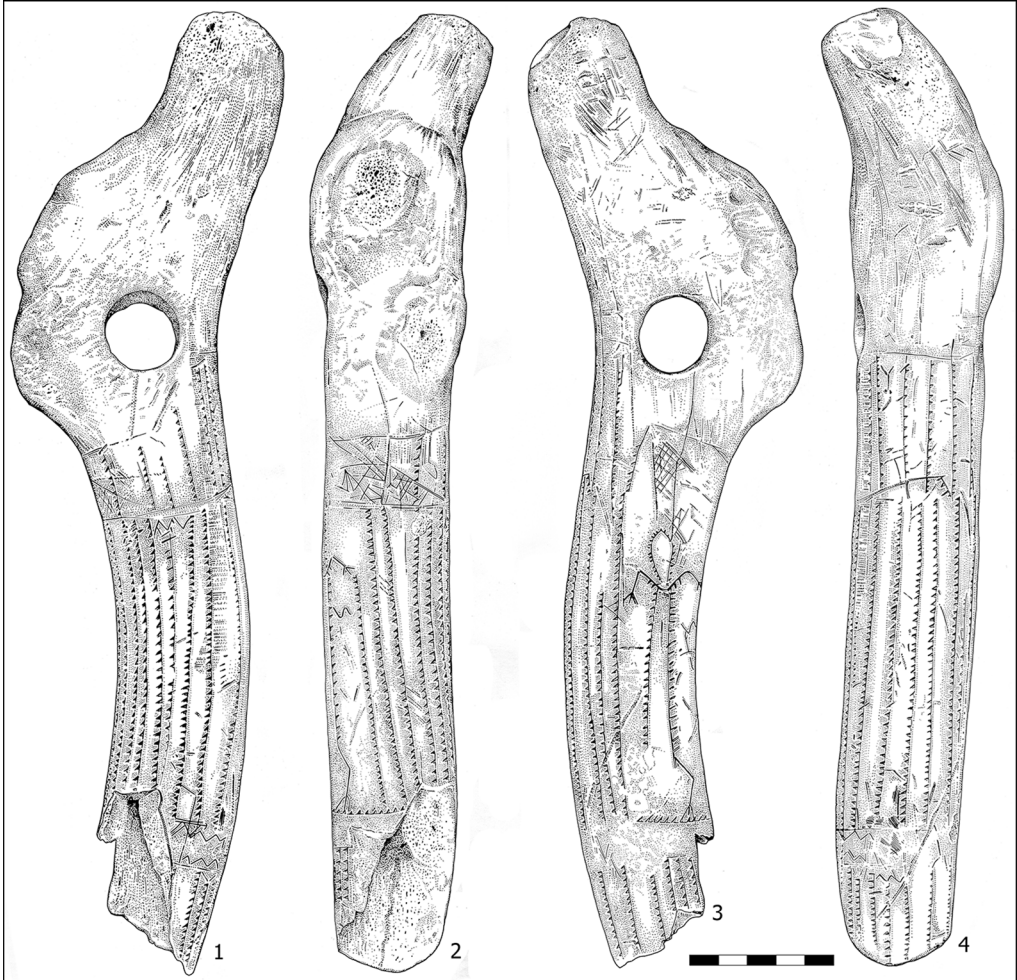


Figure 3. Szczecin-Podjuchy: ornamental baton; scale in cm (illustration by T. Demidziuk; computer processing by N. Lenkow).

chevrons. The barbed lines run parallel to the baton's long axis and are arranged in three zones, divided by perpendicular straight and zigzag lines. A fourth panel contains the anthropomorphic figure, which is simplified into geometric shapes: one leg is bent at the knee (the other leg is not preserved), and both arms are flexed at the elbow, with the elbows pointing down (Figure 3, no. 3). The head of the figure and the perforation of the baton are connected by an engraved line that runs to the hole in the baton through two areas of cross-hatching. These features may indicate a narrative: the bent leg suggesting dance and the line signifying a trance journey to another world. In the middle section of the baton, there are signs of use-wear where the object was gripped. A microscopic examination of the engraved lines reveals that they were not all made at the same time, with lines being added (and erased by cutting) gradually throughout the object's use-life (Płonka *et al.* in

Table 1. New radiocarbon dates of Mesolithic ornamented artefacts from northern Poland (Pomerania). Dates generated with OxCal (v4.4; Bronk Ramsey 2009) and calibrated using the IntCal20 dataset (Reimer *et al.* 2020).

Site	Object	Material	Lab number	$\delta^{13}\text{C}$	Date BP	Calibrated BC
Szczecin-Podjuchy	Baton	Red deer antler	OxA-40218	-21.13	8115±29	7179–7045
Stolec	Awl	Red deer bone	OxA-40164	-20.62	7307±33	6229–6078
Niezabyszewo	Flesher	Red deer bone	OxA-40165	-21.23	7228±33	6220–6122 (31.4%) 6105–6016 (64%)
Police	Harpoon	Roe deer antler	OxA-40166	-22.86	6736±32	5716–5619 (89%) 5583–5569 (6.5%)

press). Unfortunately, we are not able to relate these phases of ornamentation with the anthropomorphic depiction. The radiocarbon dating of the baton gives a date of 7179–7045 cal BC (8115±29 BP; OxA-40218) (Table 1), at the end of the Boreal period. In the western Baltic, this corresponds with the middle Maglemose Culture.

The Stolec awl

This object, which was apparently discovered under a pile of pebbles in 1913, was presented to the Gesellschaft für Pommersche Geschichte und Altertumskunde in Stettin (Stubenrauch 1913). It is an intact awl made from a fragment of a proximal foramen and part of the shaft of a red deer metatarsal (Figure 2, no. 2; Figure 4). The ornamentation consists of two rows of short grooves cut on both sides of the anterior midline groove, and engraved lines on both sides of the tool. Microscopic assessment of the preservation and morphology of the lines suggests that the ornamentation was not all added at the same time (Płonka *et al.* in press). Intensive use of the object is indicated also by the presence of a highly polished surface. The awl returns a date of 6229–6078 cal BC (7307±33 BP; OxA-40164) (Table 1), during the early Atlantic period. In the western Baltic, this corresponds with the Kongemose Culture.

The Niezabyszewo flesher

This object was discovered during the digging of a marl deposit. In 1895, a local teacher sent the object to the Gesellschaft für Pommersche Geschichte und Altertumskunde (Anon. 1895). The artefact, which survives intact, is made from a fragment of red deer left metatarsal (Figure 2, no. 3; Figure 5). A perforation for a haft, which runs the length of the bone, was made in the proximal epiphysis, and a semi-circular cutting edge was created at the distal end. The surface displays five panels comprising engraved lines. A series of criss-cross lines and strokes on the side is the most complex form of decoration and would have been visible when the object was in use (Figure 5, no. 1). Observation of the morphology of the engraved lines under microscope indicates that the motifs were added at different times (Płonka *et al.* in press). This cumulative marking, along with the pronounced polish on the surface and evidence of repair to its working edge, suggests that the object was used over an extended period of time. Radiocarbon dating of the flesher gives a date of 6220–6122 (31.4% probability) or



Figure 4. *Stolec*: ornamented awl; scale in cm (illustration by T. Demidziuk; computer processing by N. Lenkow).

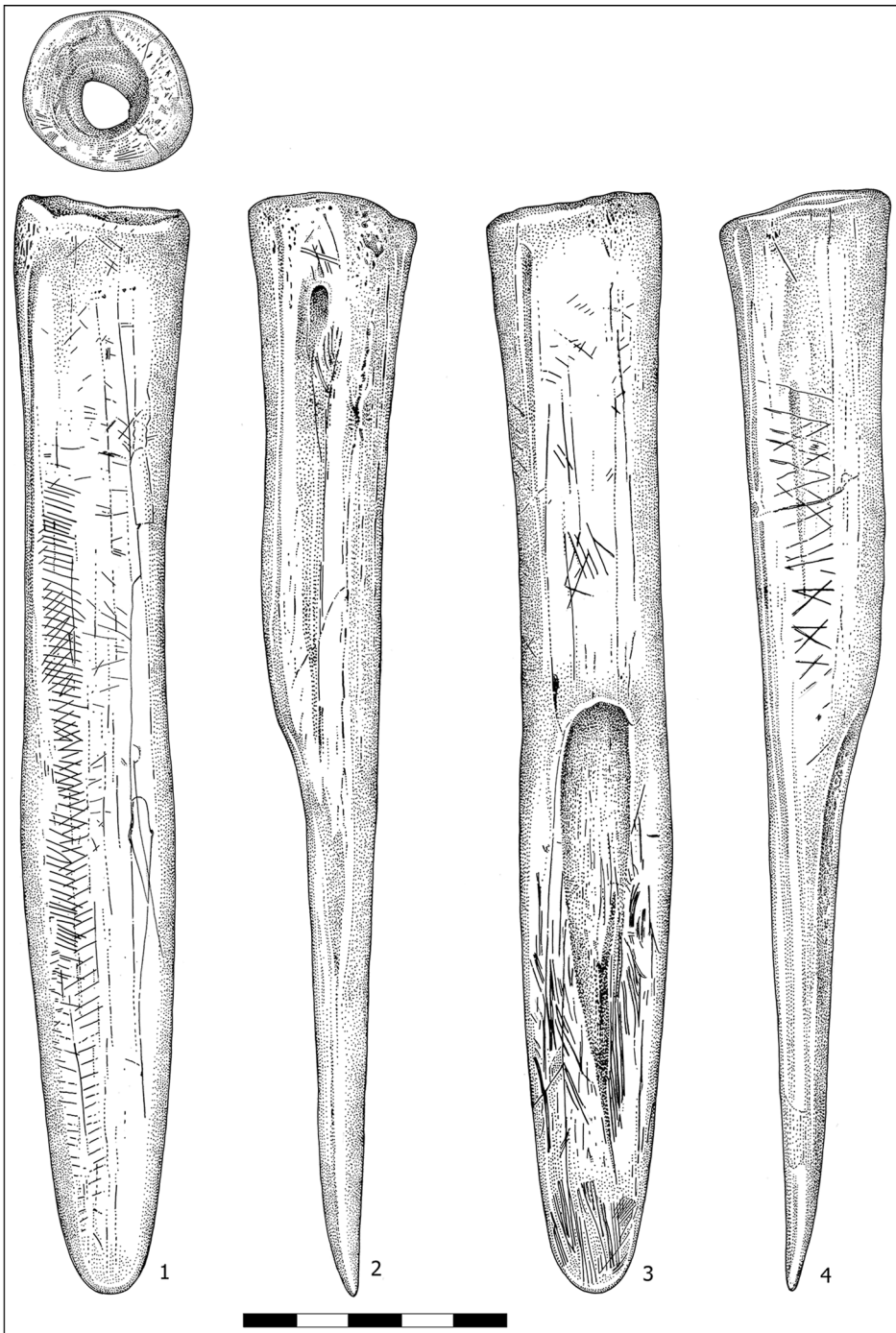


Figure 5. Niezabyszewo: ornamented flesher; scale in cm (illustration by T. Demidziuk; computer processing by N. Lenkow).

6105–6016 (64% probability) cal BC (7228±33 BP; OxA-40165) (Table 1), indicating that the object was made at around the same time as the Stolec awl.

The Police harpoon

This harpoon was discovered during dredging of the Oder River at the town Police in 1934, and was published by Eggers (1934), although he mistakenly identified the place of discovery as Szczecin-Podjuchy (Czarnecki 1972; Galiński 1992). The intact object is made from a large, unshed roe deer antler (Figure 2, no. 4; Figure 6) and is comparable to Type C examples (Andersen 1976) in that the barb was carved out of the back tine and two ridges were cut in the burr to hold the cord that would have connected the harpoon-head to the shaft. The antler surface had been thoroughly scraped. There are five ornamental panels, including two featuring a criss-cross pattern, two with notches and one with small dots (Figure 6, no. 2). The tip of the harpoon and the barb show signs of use-wear. The harpoon yields a radiocarbon date of 5716–5619 (89% probability) or 5583–5569 (6.5% probability) cal BC (6736±32 BP; OxA-40166) (Table 1). This corresponds to the early Atlantic period but is younger than the objects from Stolec and Niezabyszewo.

The chronology of the ornamented objects

The radiocarbon dates for these four objects not only advance our understanding of the chronology of art in the north-western Mesolithic province, but also permit some observations concerning relationships between cultural groups in northern Central Europe. Regarding the earliest of the four objects, the baton from Szczecin-Podjuchy, some researchers have pointed out the significant similarity between the geometric ornamentation of this artefact, including the anthropomorphic figure, and that of Maglemose batons from southern Scandinavia (e.g. Bagniewski 1990). None of the southern Scandinavian artefacts have been subjected to radiocarbon analysis, however. Therefore, the chronology of such figural depictions is uncertain. Several objects that have a deep connection to the Maglemose Culture have been found in Pomerania, including another—now lost—baton from Szczecin-Grabowo, which featured zoomorphic and geometric motifs, as well as a mattock from Trudna (Figure 7; Table 2). Similar forms are also known from the Duvensee sites in northern Germany (e.g. Hohen Viecheln, Friesack 4, Verchen; Terberger 2001, 2003), but the use of lozenges (Trudna) and anthropomorphic figures (Szczecin-Podjuchy) is more readily comparable with motifs from Zealand. Nonetheless, some forms of zonal ornamentation (motifs in panels separated by straight, barbed or zigzag lines) and barbed line motifs are found on objects from Zealand, northern Germany and north-western Poland, such as the batons from Holmegård, Friesack 4 and Szczecin-Podjuchy (Terberger 2006). The bone- and antler-working industry of the Maglemose Culture in these areas also demonstrates similarity in manufacturing techniques (David 2004, 2019; Kabaciński *et al.* 2008).

The middle Maglemose in western Pomerania is archaeologically attested by the presence of sites with distinctive lithic artefacts and reduction techniques, including conical cores, punch blade and pressure microblade production, and characteristic microliths (Sørensen 2006, 2012). The Pomeranian middle Maglemose Culture is at least as old as the

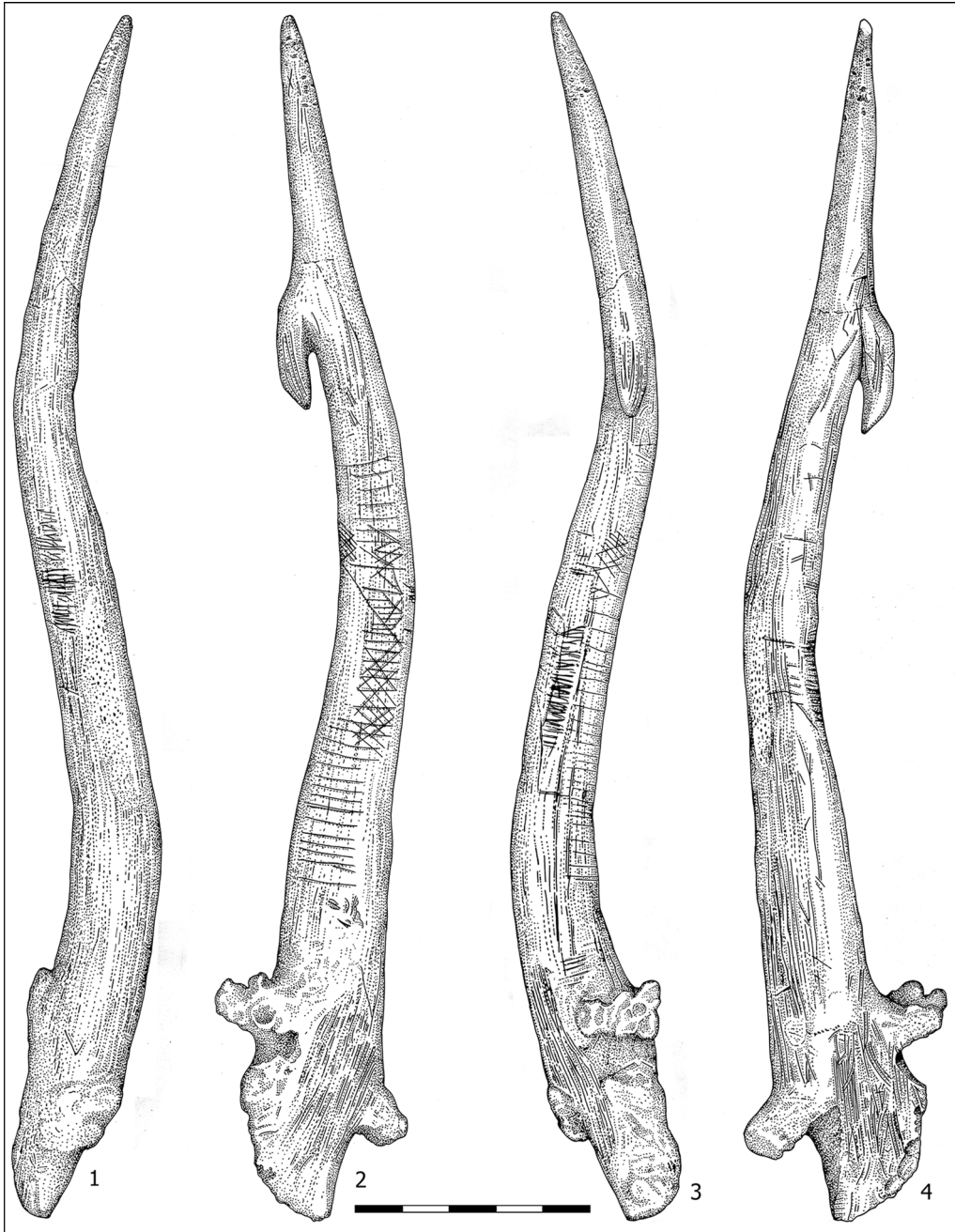


Figure 6. Police: ornamented harpoon; scale in cm (illustration by T. Demidziuk; computer processing by N. Lenkow).

Bornholmian middle Maglemose Culture—the earliest presence in Denmark—as indicated by a radiocarbon date on charcoal from a hearth at Nowe Warpno, located on the modern-day Polish coastline (7871–7594 cal BC; 8700±50 BP, Poz-44489) (Krajewski *et al.* 2015: 240).



Figure 7. *Trudna*: ornamental mattock; scale in cm (photograph by T. Gąsior).

Maglemose sites with microblades have been discovered across Pomerania (Bagniewski 1990; Galiński 1992), with the largest concentration centred on the Płonia River Valley, where 21 middle Maglemose sites have been recorded (Galiński 1992). This group of sites is located approximately 9km east of Szczecin-Podjuchy and possibly formed part of the territory occupied by the Mesolithic people that could have manufactured the Szczecin-Podjuchy baton.

Our dating of the Szczecin-Podjuchy baton clarifies the chronology of anthropomorphic representations in the Maglemose Culture. We now know that at least some of the figural depictions in the geometric style may date to the later phases of the Maglemose. The potential narrative nature of the depiction on the Szczecin-Podjuchy baton is also worth noting, as it is reminiscent of another object from the Maglemose cultural repertoire: a baton from Aamose (Denmark) that displays a human figure and a deer surrounded by geometric

Table 2. Radiocarbon dates of other Mesolithic ornamented artefacts from Poland (after Diakowski & Płonka 2010; Osipowicz *et al.* 2017; Sulgostowska 2019). Dates generated with OxCal (v4.4; Bronk Ramsey 2009) and calibrated using the IntCal20 dataset (Reimer *et al.* 2020).

Site	Object	Material	Lab number	$\delta^{13}\text{C}$	Date BP	Calibrated BC
Łupianka Nowa	Ornamented antler beam	Red deer antler	OxA-26261	−18.9	10 015±45	9789–9358 (94.3%)
						9346–9332 (1.2%)
Pułtusk	Baton	Red deer antler	OxA-25759	−21.1	9370±45	8765–8543 (92.4%)
						8511–8484 (3.1%)
Gołębiewo 47	Baton	Reindeer antler	Poz-73613	−20.6	8790±50	8176–8113 (8.2%)
						8092–8074 (1.2%)
						8064–8039 (2.2%)
						8013–7648 (82.5%)
						7627–7608 (1.4%)
Trudna Woźniki	Mattock Baton	Aurochs	OxA-25763	−22.5	8640±40	7741–7586
		Red deer antler	OxA-25760	−21.4	8117±40	7316–7271 (3.8%)
						7256–7227 (3.1%)
						7192–7038 (88.5%)
			OxA-25761	−20.9	8152±40	7317–7226 (18.6%)
Pobiel 10	Ornamented antler tine	Red deer antler	Poz-20157	–	7800±50	7194–7054 (76.8%)
						6771–6718 (5.2%)
						6705–6476 (90.2%)

patterns (Brinch Petersen 1982). While they share a geometric style, each of these examples demonstrate individual elements—for example, the representation on the batons from Groß Rönnau (north Germany) and Viksø Mose (Denmark) (Płonka 2021). Dating of the Szczecin-Podjuchy baton also demonstrates that zonal ornamentation, seen on Preboreal objects from Friesack 4, Germany, continued into the later phases of the Boreal period in the western Baltic region.

Other batons, found in north-east Poland, are also ornamented with engraved geometric patterns (Werner 1917; Sawicki 1921; Gaerte 1931; Sulgostowska & Polak 1989; Sulgostowska 1992; Osipowicz *et al.* 2017). These objects demonstrate a propensity for barbed



Figure 8. Pułtusk: ornmented baton; scale in cm (photo by T. Gąsior).

lines, chevrons (at Nitki and Pułtusk) and hatched triangles (at Gołębiewo 47, Ostrołęka and Pułtusk) (Figures 8 & 9; for locations, see Figure 1). The use of chevrons is a distinctly local stylistic feature. While the batons from Nitki and Ostrołęka no longer survive, the remaining



Figure 9. Wóźniki: ornamented baton; scale in cm (photo by T. Gąsior).

examples have been directly radiocarbon dated (Table 2). The results indicate that batons appeared in northern Poland as early as 8765–8500 cal BC (the Pułtusk baton), at the transition from the Preboreal to Boreal. Along with the dates from Friesack 4, this indicates the early appearance of this type of object on the North European Plain (Gramsch 2018).

The Łupianka Nowa artefact is an ornamented red deer main beam that lacks any perforation (Gieysztor-Szymczak 2001; Sulgostowska 2019). Its ornamentation (zigzags and other motifs built from strokes) and character (a ceremonial object with no traces of use-wear) might be considered Late Palaeolithic; however, the use of deer antler is surprising, as one might expect the use of reindeer antler in north-eastern Poland at this time (c. 9800–9300 cal BC) (Philippsen *et al.* 2019). The baton from Szczecin-Podjuchy—similar to a baton from Wóźniki—belongs to the late horizon of such objects. The differences between these two batons notwithstanding (an anthropomorphic figure and criss-cross pattern on the Szczecin-Podjuchy baton compared with a narrative character of human representation),

these objects share two features: the extensive use of barbed line motifs and the division of the decoration into zones using straight and zigzag lines. These two features seem to be characteristic of batons from this period (*c.* 7300–7050 cal BC).

The other three ornamented objects all date to the early Atlantic period: the bone artefacts to *c.* 6200–6000 BC and the antler harpoon to *c.* 5700–5600 BC. Here, we discuss them in the context of the cultural situation on the southern Baltic coast during this period. The forms of the artefacts from Niezabyszewo and Stolec find no close analogies in the Kongemose or Ertebølle assemblages of southern Scandinavia. Nor can their ornamentation be easily identified as belonging to either of the two traditions because the art of both features chequer patterns, strokes, lines and zigzags (Płonka 2003). A tool identical to the flesher from Niezabyszewo, albeit unornamented, was found at Torgelow 2 in German Pomerania, along with faunal remains and an antler haft. These finds were broadly dated to the Mesolithic (Hellmundt 1964).

Strokes and multidirectional lines, similar to those seen on the Stolec awl, can also be observed on a point/knife fragment from Tågerup in western Scania; however, unlike the Stolec awl, the lines on the Tågerup point/knife had been engraved on the edge of the object. Ornamentation composed of strokes appears to have become popular on Kongemose artefacts, for example on two bone knives from Roskilde Fjord (Sørensen 2017: 64, fig. 45). Rows of strokes and multidirectional lines of criss-cross patterns—comparable to the flesher from Niezabyszewo—can also be observed on bone points from Hjarnø, Øgård and Kongemose (all of which are in Denmark), which are made from aurochs scapulae (Płonka 2003: figs 235–237). Motifs of this type are also found on other Kongemose objects, for example, a knife from the eponymous site (Płonka 2003: fig. 222.5) or the swordfish jawbone harpoon from Bloksbjerg, level E (Denmark) (Westerby 1927; see also the National Museum in Copenhagen, catalogue number A 51047, WE251: 11127).

An important feature of the two objects from Stolec and Niezabyszewo is the gradual accumulation of motifs, which were not completed in one go, but rather added to incrementally over time during the objects' use-lives. This is indicated by the inconsistent character of the engraved lines and their varying degrees of wear. According to our studies at the National Museum in Copenhagen, a similar process of adding new marks to decorated objects can be observed on artefacts made from aurochs scapulae found in Zealand (catalogue numbers: A 52068, KS 20188 LØSF and A 52068, KS 16977).

The subtle ornamentation on the harpoon from Police comprises long and short lines and criss-cross patterns. Harpoons of this type are rarely ornamented and have, until now, been considered characteristic of the early phase of the Ertebølle Culture, starting *c.* 5400 BC (Andersen 1997). A similar type of ornamented harpoon, albeit with a later date, has been found on the island of Rügen (Ralswiek-Augustenhof) in a layer dated to *c.* 4200–4000 BC, corresponding to the late Ertebølle (Terberger 2007).

Meanwhile, the date for the Police harpoon is approximately 200–300 years older than the earliest Ertebølle Culture. Assuming the radiocarbon date is correct, we suggest three possible explanations for this apparent inconsistency: 1) the harpoon was made from fossil antler during the early Ertebølle; 2) Ertebølle assemblages on the southern Baltic coast are earlier than those in southern Scandinavia, including roe deer antler harpoons; 3) deer antler harpoons first appeared earlier, in the Kongemose Culture, and then spread during the Ertebølle Culture.

It is our view that the first of these hypotheses is unlikely, because fossil antler would begin to weather after deposition and become too brittle for the manufacture of weapons. The second hypothesis must take into consideration the dating of the earliest finds of the Ertebølle Culture on the southern Baltic coast. In this area, on the Bay of Wismar, the earliest evidence for the Ertebølle Culture (Jäckelberg Phase) dates to *c.* 5450 BC (Lübke *et al.* 2011). The earliest sites in the Oder estuary, to the east, however, date only to *c.* 5000 BC (Galiński 2012), and almost all of the early Ertebølle sites on the island of Rügen date to *c.* 5100 BC or later (Jöns *et al.* 2007: 177, fig. 20). Therefore, apart from the Bay of Wismar, the south Baltic coastal sites are 300–400 years later than those of Scandinavia, suggesting that the second hypothesis should be ruled out.

The radiocarbon date for the Police harpoon (5700–5600 cal BC) places the object in a period of time that is insufficiently researched in the southern Baltic region. Villingebæk-phase (the middle phase of the Kongemose Culture) materials from the Bay of Wismar date to 6000–5700 BC, but the period of 5700–5450 BC (corresponding to the late Kongemose Culture) is poorly represented in the source material (Hartz & Lübke 2005: 123–25; Lübke 2005; Lübke *et al.* 2011). Similar finds have been recovered from sites located in the north of Rügen, which is now partially submerged beneath sea level (Jöns *et al.* 2007). Kongemose-type assemblages are also present in the Lower Oder area, with distinct handle and conical cores for pressure and punch blade production, respectively (Adamczyk 2018). In this context, it is also worth noting the ornamented roe deer antler harpoon from Horsens Fjord in Jutland (also a stray find). The decoration of this object is uncommonly rich for a harpoon. The cross-hatching and hourglass motifs are especially noteworthy, with the latter characteristic of the Kongemose Culture. Roe deer antlers have been found in the occupational layers of Kongemose sunken floor houses in Zealand and may have played a significant role in the life of these communities (Sørensen 2017). In summary then, the third of these hypotheses seems to be the most likely. The combination of radiocarbon dating, the ornamentation on the Horsens Fjord harpoon and the role of roe deer antler in the Kongemose Culture provide a sound argument for dating the Police harpoon to the late Kongemose Culture.

Conclusion

The four newly dated artefacts from north-western Poland have allowed us to contribute not only to a better understanding of the chronology of art in the Mesolithic north-western province (Figure 10), but also to observe aspects of the development of figurative depictions and the relationships between hunter-gatherer groups in the western Baltic region. While the date of the baton from Szczecin-Podjuchy was in line with prior expectations, the dating of the other three artefacts was unexpected.

The baton from Szczecin-Podjuchy has a clear connection to Maglemose art of southern Scandinavia, especially in terms of anthropomorphic depictions, but also shares some features, such as zonal decoration, with batons from the North European Plain. Its date is comparable with the baton from Woźniki in north-eastern Poland and represents the most recent horizon for the occurrence of this type of artefact. Based on the radiocarbon dates, we can also determine that at least some of the known geometric anthropomorphic depictions on objects relate to the middle Maglemose Culture. Anthropomorphic and zoomorphic representations are rare in

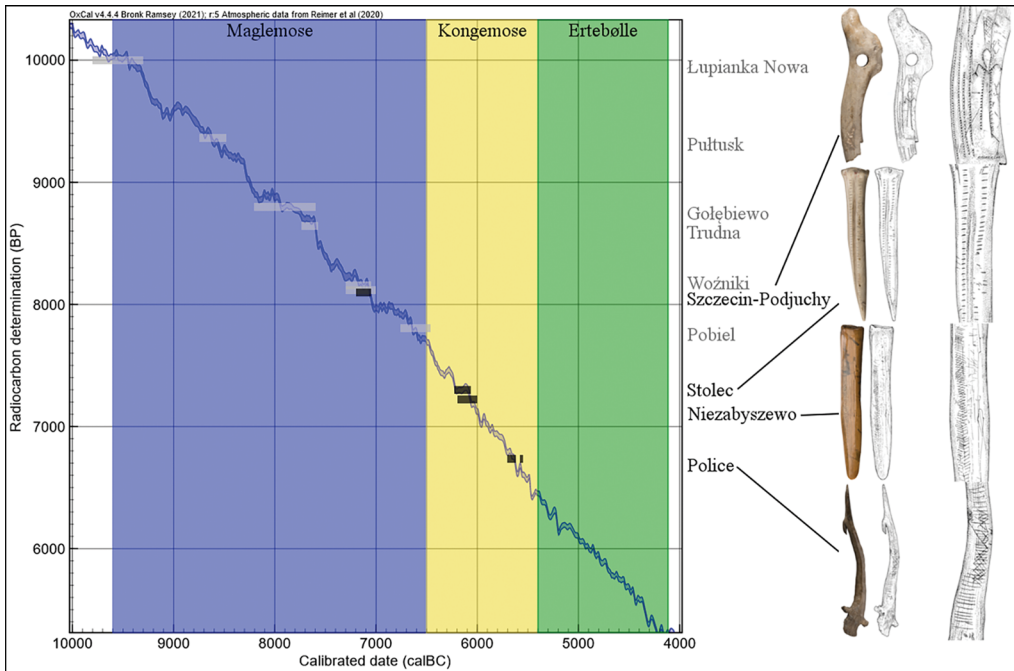


Figure 10. Chronology of Mesolithic art in Poland according to direct radiocarbon dates. Newly dated objects in black (dates generated with OxCal v4.4.4 and calibrated using the IntCal20 dataset (Reimer et al. 2020; Bronk Ramsey 2021) (prepared by M. Adamczyk).

Maglemose portable art but have been identified on batons, flint nodules, amber pendants and other objects (Płonka 2021). Another feature common to all human depictions is the involvement of these representations in various activities, such as dancing, hunting (?) and communal gatherings. Some of these activities could refer to mythical events of ritual situations.

The ornamentation of the three other objects displays stylistic connections with Kongemose art of the western Baltic region. The forms of the objects from Niezabyszewo and Stolec, however, are local. The dating of the harpoon from Police, which corresponds to the Kongemose Culture, is unexpected. So far, this type of tool has only been found within Ertebølle contexts. These discoveries shed new light on the mechanisms of cultural development of hunter-gatherers in the western Baltic region. The new dates suggest that the idea of simple, geometric art comprising lines, strokes and criss-crossing that were added successively during the use-life of objects, was deeply rooted in the traditions of the Middle Mesolithic (Kongemose Culture) and developed continuously into the Late Mesolithic (Ertebølle Culture). Presumably, this phenomenon was underlain by the functionality of these objects—their efficacy, lost during use or due to wear, was restored by adding new ornamentation. This continuity of traditions is additionally confirmed by individual objects' forms, such as harpoons fashioned from roe deer antler that, contrary to earlier conclusions, developed first amongst groups identified with the Kongemose rather than with the Ertebølle Culture. Throughout, stylistic developments display a combination of general tendencies and local characteristics.

Our reanalysis of these four Mesolithic ornamented artefacts helps us to understand further the general processes that occurred in the Mesolithic west Baltic region. Stylistic and chronological data clearly indicate that the Mesolithic hunter-gatherers of the region did not live in closed groups but within active societies, with numerous contacts and webs of relationships that spread over a huge area, which today includes Denmark, northern Germany and north-western Poland. These contacts and relationships were maintained by considerable mobility of people, which enabled the exchange of ornamental motifs, artefacts and ideas. Direct radiocarbon dating of ornamented Mesolithic objects from the west Baltic region clearly shows that new archaeometric analyses of old stray finds can result in useful new data for these objects, enabling us to reconsider both their chronology and the cultural relationships that they formed a part of, and contributes to discussion of the broader cultural trends underpinning them.

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