Research Article

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The Site Groß Fredenwalde, NE-Germany, and the Early Cemeteries of Northern Europe

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Abstract: The Mesolithic burial site Groß Fredenwalde, NE-Germany, discovered in 1962, had remained a poorly understood part of the Mesolithic burial record for decades. Since 2012, the site has been under re-investigation. New discoveries confirm the presence of several single and multiple inhumation graves. Groß Fredenwalde stands out as the largest and one of the oldest Mesolithic cemeteries in North-central Europe. Its use period can be separated into two phases: a main phase in the late seventh millennium cal BC to the early sixth millennium cal BC and a later single burial c. 4900 cal BC. Here the state of research on the site is presented and selected characteristics are discussed in the context of early cemeteries of Northern and North-eastern Europe.

Keywords: Mesolithic burials, early cemetery, inhumation burials, grave goods, Northern Europe

1 Introduction

Human burials from the European Mesolithic display a broad range of different ritual practices. Primary inhumations, secondary interments, partial burials (including skull depositions), and loose human bones as well as ossuaries and cremations are known (Grünberg, 2000; 2016). Remains can be found as single finds, scattered or as interments, in settlements and features without adjacent settlement. With the record of Mesolithic human bone data from all over Europe growing in the second half of the twentieth century (Newell, Constandse-Westermann, & Meiklejohn, 1979), supra-regional comparison was promoted, and subsequently a general development from single to multiple burials was suggested, underlined by then available radiocarbon data (Clark & Neeley, 1987). A more recent analysis of available radiocarbon data questioned the development from single burials to cemetery sites (Meiklejohn, Brinch Petersen, & Babb, 2009), but there is a general agreement that sites with several (often primarily) interred individuals became more numerous in the Late

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Mesolithic (e.g. Tõrv, 2018, 245f.). Re-examination of existing material from archives and magazines has helped to gain fresh insights into the understanding of Mesolithic burial practices (e.g. Nielsson Stutz, 2003; Tõrv, 2018). New evidence can also be presented from the site of Groß Fredenwalde in North-eastern Germany. Since 2012, new research provided better insight into the structure and dimension of this site (e.g. Jungklaus, Kotula, & Terberger, 2016; Kotula, Piezonka, & Terberger, 2020; Terberger et al., 2015). Re-examination of old materials and new evidence from fieldwork revealed the largest and likewise one of the earliest Mesolithic cemeteries in North-central Europe. Here we present a concise overview on the site including ongoing research and discuss the evidence in the context of early cemeteries of the larger region.

2 Materials and Problems

For the site, general affiliations to more northern and northeastern regions have already been pointed out (Kotula et al., 2020). To investigate on the broader context and connections of Groß Fredenwalde in more detail, selected aspects of the site will be compared with early cemetery sites of Northern and Northeastern Europe. Broadly defined, a cemetery is a place which is recognized by a group to bury all or parts of its community (cp. Gibaja et al., 2015). A minimum number of three individuals (primarily or secondarily interred) and two grave structures are used here to define a cemetery; this represents a common approach, as it more or less excludes a single burial event (cp. e.g. Brinch Petersen, 2015; Larsson, 2004; Meiklejohn & Babb, 2009; Pettitt, 2011). Loose human bones are a problematic category, as they may represent the outcome of different processes (e.g. Brinch Petersen, 2016; Sørensen, 2016) and they are not included in the discussion here. Sites which produced at least one direct or reliable contextual radiocarbon date earlier than 6000 cal BC from Northern Germany, Scandinavia, North-eastern Europe, and western Russia will be primarily focused on in the discussion (15 sites) to provide a more detailed comparison for the time frame in which Groß Fredenwalde emerged. The record of Mesolithic cemetery sites in the Western Baltic area is especially affected by the sea level rise of the Littorina Transgression, as large parts of the Mesolithic landscape including burial sites were submerged (e.g. Amkreutz, 2022; Hartz et al., 2014; Stattegger & Leszczyńska, 2023). Most of the radiocarbon dates from the burials originate from human bones, and considering the expected Mesolithic diet and location of many of the sites close to water bodies (e.g. Sørensen, 2016, 67f.), a reservoir effect can be expected. The problem has been discussed for several sites (e.g. Meadows et al., 2018; Olsen, Heinemeier, Lübke, Lüth, & Terberger, 2010; Schulting et al., 2022; Terberger, Burger, Lüth, Müller, & Piezonka, 2018). Reservoir ages for humans have been calculated e.g. at the Friesack 4 site, NE-Germany, differing widely between 60 and 600 years (Meadows et al., 2018). In some of the discussed cemeteries, bones were in unfavourable preservation condition, and therefore data were obtained from related context, e.g. charcoal from features (e.g. Karsten & Knarrström, 2001; Marciniak, 2001). However, there have been cases where context data contradicted the burial data (e.g. Karsten & Knarrström, 2001; see also Grote & Terberger, 2011), and caution is generally advised.

3 The Site of Groß Fredenwalde

The site of Groß Fredenwalde is located about 80 km NE of Berlin in an upper moraine landscape on top of a prominent hill (111 m a.s.l.) (Figure 1). During construction work for a sign post in 1962, human skeletal remains were detected on top of the hill (Gramsch & Schoknecht, 2003; Schoknecht, 1963) and partly recovered by an amateur (complex I), before two further individuals were excavated by archaeologist Schoknecht on the next day (complex II) (Terberger, Kotula, Jungklaus, & Piezonka, 2021a). The ochre-stained human remains were accompanied by flint blades, animal tooth pendants, and other grave goods. In the 1990s, radiocarbon dating confirmed the Mesolithic age of the assemblage, and in the early 2000s, the then known evidence was presented in a paper, suggesting a multiple burial of 6–8 persons, based on the documentation and a preliminary anthropological analysis (Gramsch & Schoknecht, 2003).

Since 2012, the site has been targeted for new investigation. The human remains of the 1962 findings were thoroughly anthropologically examined for the first time, allowing for the identification of six individuals. In

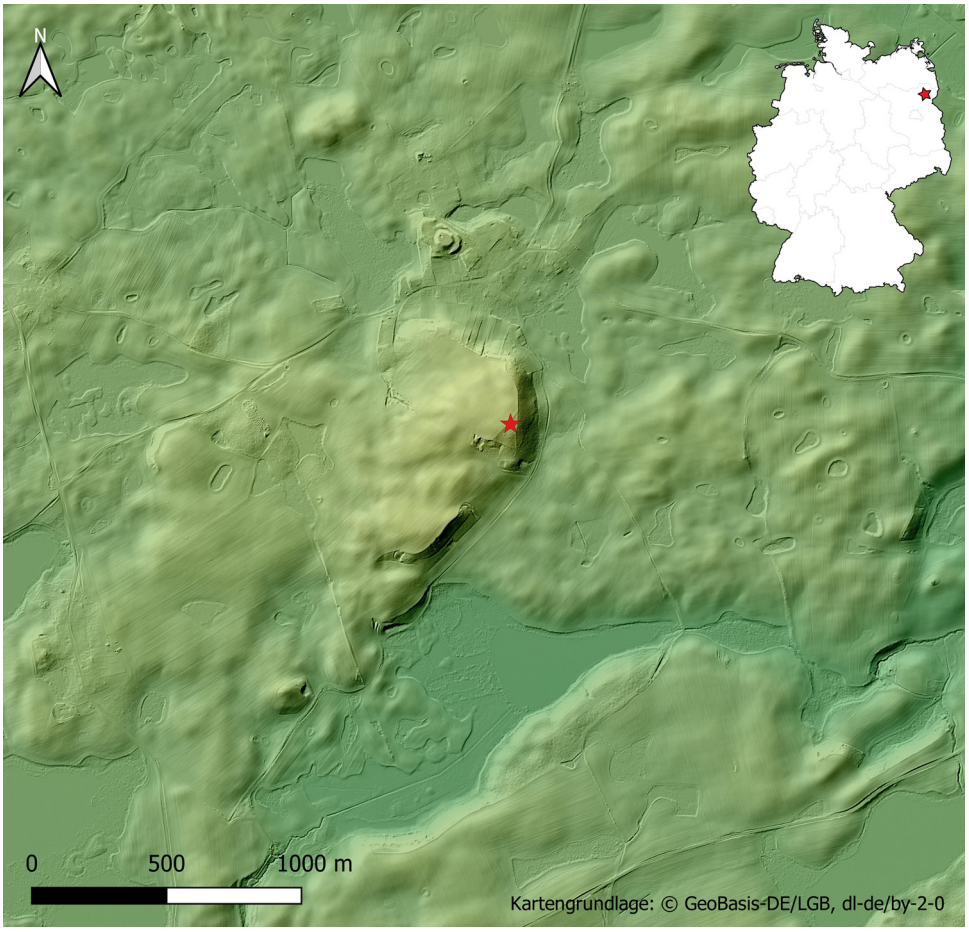

Figure 1: Groß Fredenwalde. Location of the site.

1962, the findings had been poorly documented with only a sketch drawing of complex II and a few photographs of complex I. Newly discovered archive materials made it possible to reconstruct the position and orientation of the individuals in complex I (Kotula et al., 2020; Terberger et al., 2021a). New fieldwork was carried out at the site to relocate the 1962 construction pit (feature 3) and recover materials overlooked during the rescue excavation. The pit was successfully identified and yielded hundreds of small bone fragments as well as many further grave goods. In the course of these excavations, new burial pits were discovered in close vicinity; they were also targeted for excavation. Interdisciplinary research is ongoing, including palaeogenetics, pollen analysis, and detailed analysis of the grave goods. No Mesolithic settlement traces were uncovered on the hill in the direct vicinity of the burials. The surrounding landscape is characterized by fresh water lakes and provides generally favourable conditions for Mesolithic occupation. Surveys at lake Behrendsee located ca. 500 m south of the site have not provided evidence of Mesolithic settlement activities so far. The closest surface assemblages of Late Mesolithic character are located c. 3–4 km to the southwest. The burial site can therefore be considered a ritual place on a prominent landmark.

3.1 Burials

Until today, 12 individuals in at least 8 graves have been recognized at the site (Table 1), but the area is not fully investigated yet and further graves may be present especially to the southwest of the so far excavated area (Figure 2). The graves are distributed over a small area of c. 5 m × 5 m and do not disturb each other, with the

Table 1: Overview of graves and individuals of Groß Fredenwalde including anthropological information, radiocarbon dates, isotopes, grave goods, and use of ochre (feature 5: preliminary information)

Individual/feature	Anthropological analysis				^{14}C age BP (calBC 95.4 %) human bone	δ15N (‰)	δ13C (‰)	^{14}C age BP (calBC 95.4 %) other materials	Grave goods	Ochre
	Gender	Age	Height	Pathology						
Individual 1, **complex I** (excavation 1962)	Male	30-39 years	161.0 ± 4.0 cm (Pearson 1899) / 166.9 ± 5.0 cm (Trotter & Gleser 1952)	No evidence of disease	AAR-18021: 6944 ± 37 (5966 - 5733)	11.37 ± 0.29	-19.58 ± 0.14	Animal tooth pendants: AAR 18343: 7085 ± 32 (6020 - 5898); AAR-18344: 7094 ± 28 (6025 - 5904)	1 slotted bone dagger, 27 flint blades, 3 flakes, 2 microliths, 3 bone points, 76 animal tooth pendants (assignement to individuals not possible)	Yes
Individual 2, **complex I** (excavation 1962)	Male	40-49 years	161.8 ± 4.0 cm (Pearson 1899) / 168.1 ± 5.0 cm (Trotter & Gleser 1952)	Femur and shafts of radius and ulna bent outwards (suspected Osteomalacia)	AAR-18022: 7177 ± 40 (6203 - 5983)	11.25 ± 0.17	-20.48 ± 0.1			Yes
Individual 5, **complex I** (excavation 1962)	Male	7-8 years	Not determinable	No evidence of disease	AAR-18025: 7161 ± 44 (6199 - 5920)	11.25 ± 0.29	-19.42 ± 0.14			Yes
Individual 6, **complex I** (excavation 1962)	Male	3-4 years	Not determinable	Porosity of teeth at gum edge, some evidence of cribra orbitalia (suspected scurvy)	AAR-18026: 7272 ± 42 (6226 - 6056)	11.74 ± 0.17	-20.02 ± 0.1		7 animal tooth pendants around head	Yes
Individual 3, **complex II** (excavation 1962)	Female	40-49 years	152.0 ± 4.0 cm (Pearson 1899) / 156.4 ± 4.3 cm (Trotter & Gleser 1952)	Medium severe arthritis of the right elbow, severe tooth attrition, periodontosis	AAR-18023: 7187 ± 35 (6201 - 5989)	11.37 ± 0.29	-19.73 ± 0.14		Maximum 7 animal tooth pendants (see text), 1 bone point	Yes
Individual 4, **complex II** (excavation 1962)	Male	4-5 years	Not determinable	No evidence of disease	AAR-18024: 7051 ± 45 (6017 - 5842)	11.62 ± 0.29	-19.33 ± 0.14		Maximum 4 animal tooth pendants (see text)	Yes
Upright standing man, **feature 1/4**	Male	24-27 years	156,6 ± 3,5 cm (Pearson 1899) / 159,9 ± 4,1 cm (Trotter & Gleser 1952)	Dentacalculus, weak periodontosis, marked muscle attachments at the inner side of the jaw, tooth abrasion of the upper incisors, open bite, minor damages of tooth enamel on first left upper molar, gnawing marks at right humerus (proximal), left humerus (proximal and distal), left metacarpus IV and V (proximal), small depression on skull due to carrying load	MAMS-21437: 6137±22 (5208 - 5001)	11.3	-19.9	Charcoal: Poz-67909: 6030 ± 40 (5034 - 4806);Poz-67910: 6010 ± 40 (5000 - 4796)	33 flint blades, 1 hammer stone, 1 bone point, 1 bone awl	No
Feature 5	Female	Adult	-	-	MAMS-41400: 7181±25 (6075 - 5995)	10.94	-19.98		Flint blades, animal tooth pendants	Yes
Infant burial, **feature 8**	Female	6-12 months	Preserved height 56 cm	No evidence of disease	AAR-21095: 7569 ± 37 (6475 - 6384)	12.3	-21.1		None	Yes
Destroyed child burial, **feature 9**	Not determinable	7-10 years	Not determinable	Not determinable	AAR-21380.1: 7040 ± 28 (5996 - 5849); AAR-21380.2: 7067 ± 28 (6007 - 5896) AAR-21380.3: 7108 ± 31 (6052 - 5913)		-19.47 ± 0.05 -20.82 ± 0.57 -20.92 ± 0.64		Unknown	Yes
Feature 41	Female	25-35 years	149,8 cm (Pearson 1899) / 152,1 cm (Trotter & Gleser 1952)	No evidence of disease	MAMS-50979: 7588 ± 25 (6471 - 6413)	11.3	-20.81		2 animal tooth pendants	Yes
Feature 10	-	-	-	-	-	-	-	-	-	-

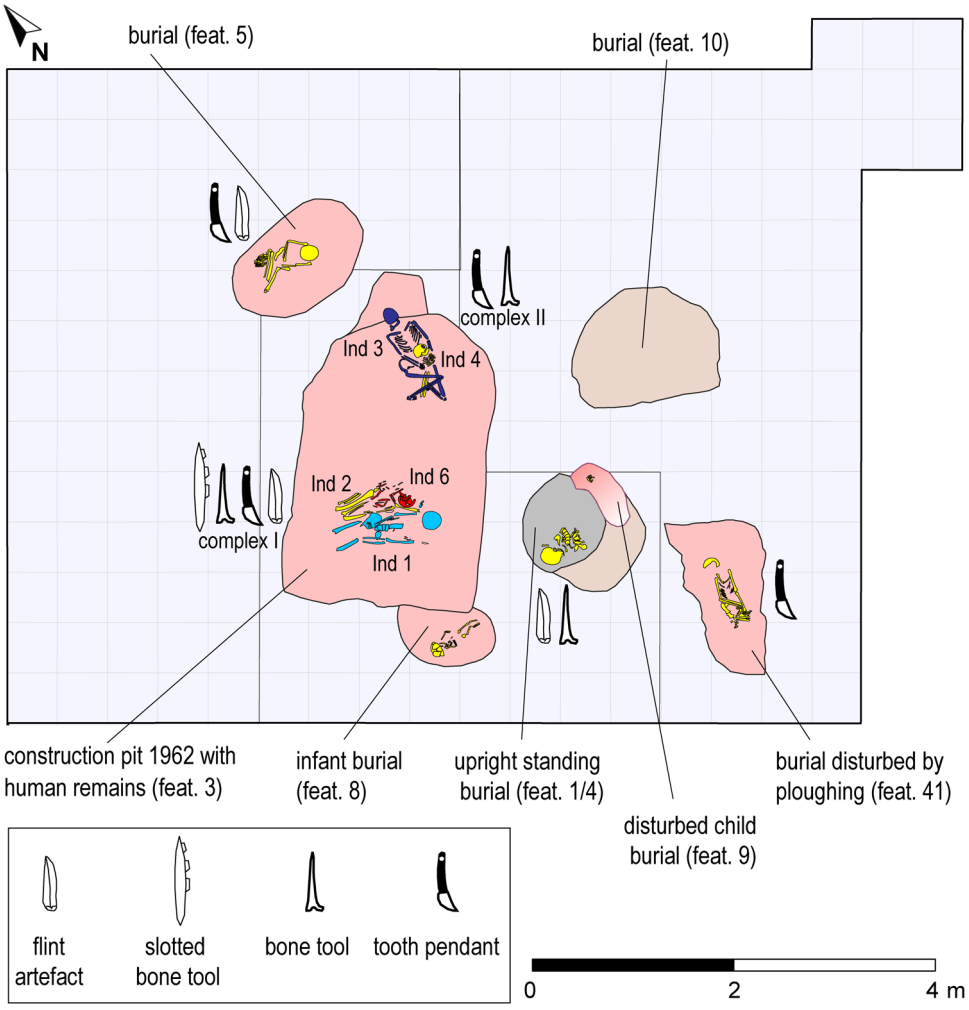

Figure 2: Groß Fredenwalde. Plan of excavated area with different features and positions of skeletons in the features. The location of the burials discovered in 1962 (complex I and II) is reconstructed and the different individuals are emphasized by different colours. Next to the features, the types of grave goods present in each respective grave are symbolized. Burials with confirmed use of ochre coloured red.

exception of the grave from the more recent phase (feature 1/4, see below), the digging of which destroyed most parts of an older interment (feature 9).

The six individuals from 1962 can now be assigned to at least two separate burials (Figure 2; Terberger et al., 2021a): a double burial of a woman (individual 3) and a child (individual 4) (complex II), and a burial of a minimum of two individuals (complex I, a man [individual 2] with a child [individual 6] on his chest) (Figure 3). Another adult male (individual 1) was found by the side of individuals 2 and 6. His orientation would suggest a direct connection to the neighbouring individuals, but the radiocarbon date for this individual indicates a somewhat younger context. If methodological problems are not responsible for the offset, it is possible that the person was interred in the grave on a later occasion (Terberger et al., 2021a). One child that was identified by anthropological analysis (individual 5) could not be detected in the 1962 documentation; these remains may originate from a separate single burial.

Next to the re-excavated construction pit, in 2014 an unusual feature could be identified as a single burial of a man interred standing upright (feature 1/4) with an associated fireplace above the interment (Kotula, Jungklaus, Lüdemann, Piezonka, & Terberger, 2022; Terberger et al., 2015). The digging of this burial pit almost completely destroyed an earlier child's grave (feature 9); only some feet bones of this child covered in ochre were documented in their original position.

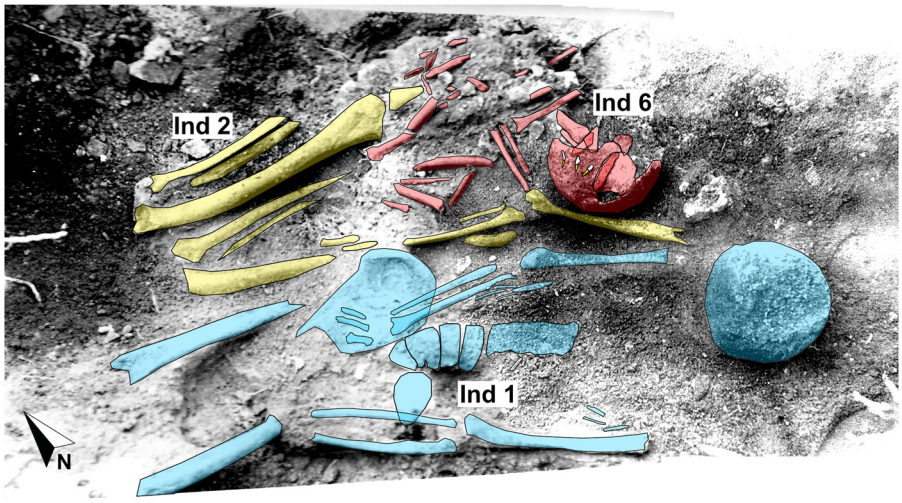

Figure 3: Groß Fredenwalde. Refitted photos of the situation of 1962, excavated on the first day (complex I) with identified individuals no. 1 (blue, male adult), no. 2 (yellow, male adult), and no. 6 (red, 3–4-year-old child) (photo: BLDAM/police Templin).

Figure 4: Groß Fredenwalde. Infant burial with ochre (feature 8).

To the southwest of feature 3 (construction pit), a small reddish discolouration was discovered in the same year (feature 8). The burial was extracted en-bloc and careful investigation in the laboratory revealed a well preserved infant burial (<1 year) (Figure 4).

Three more features were explored during recent fieldwork (2019–2020) at the site (features 5, 10, and 41). Feature 5 was an oval pit stained with ochre, located directly north of feature 3. It was recovered as a block and is currently under excavation at *Hochschule für Technik und Wirtschaft* Berlin. The feature contains a single

burial. Another grave (feature 10) was discovered during the excavation in 2019. Below the topsoil, an oval discolouration was documented, with some human bones visible on the surface of the feature directly below the humus layer. The burial remains on site for now. Another burial (feature 41) had been disturbed by ploughing in the twentieth century, and some bones were damaged and relocated in the topsoil. The burial was uncovered as block and excavated under controlled laboratory conditions and accompanying preservation measures. This single inhumation burial was stained with ochre.

Almost all excavated burials were primary inhumations. The complex archaeological situation of feature 1/4 is interpreted as multi-step burial, and 3D modelling is in progress to help to better understand the details of taphonomy. Feature 9 (destroyed child burial) cannot be securely determined, but we suggest a primary inhumation due to the anatomical position of the remaining feet bones. The existing documentation of the material recovered in 1962 also indicates primary inhumation burial of these individuals.

Four adult individuals (individuals 2 and 3 from the 1962 assemblage and individuals from features 5 and 41) were buried lying on their backs or half-sitting (feature 5) with flexed legs. The infant (feature 8) was buried in a supine position with outstretched legs. The position of the child from complex II (individual 4) may also be interpreted as supine or slightly lateral with outstretched legs, but the sketch drawing is somewhat unclear. Individual 1 was buried on his back, but it is unclear, if the legs were stretched or flexed. The young man in feature 1/4 (later burial phase) was put into his grave pit standing upright. The position of the other individuals from the 1962 assemblage and the child from feature 9 remains unclear, while for feature 10, information is not available.

Isotope values of all individuals indicate an aquatic component in the nutrition, matching a hunter-gatherer-fisher lifestyle (Table 1). The lack of evidence for dental caries indicates a low proportion of carbohydrates in the diet. Anthropological analysis shows few signs of diseases and no traces of violence. The right arm of individual 3 shows signs of arthritis. The bent upper legs of individual 2 indicate osteomalacia (weak bones), likely caused by vitamin D deficiency. The infant (feature 8) shows low C13 values compared to the other individuals, hinting (too) early weaning. Another child (individual 6) displays cribra orbitalia (porous bone in the eye socket), possibly caused by scurvy (Jungklaus et al., 2016). Most of the individuals from the 1962 recovery (individual 2 was excluded due to bad preservation) as well as the individuals from feature 1/4 and 8 were targeted for palaeogenetic analysis. All individuals belong to the so-called Oberkassel ancestry cluster with U5 mtDNA haplogroup (Posth et al., 2023). Groß Fredenwalde is the earliest central European site known so far to display influence/admixture from eastern hunter-gatherers (Sidelkino ancestry). The more recent individual from feature 1/4, who was a contemporary neighbour of early farming groups in the Uckermark region (see below), does not show any signs of admixture with the immigrant farmers.

3.2 Chronology

According to the present radiocarbon data (11 individuals), the burials can be divided into two phases: phase 1 c. 6450/6400 (6300/6200)–5800 cal BC (10 individuals) and phase 2 c. 4900 cal BC (1 individual) (Figure 5).

The single burials of an infant (feature 8) and an adult (feature 41) are the earliest interments and date to c. 6450–6400 cal BC, but a reservoir effect has to be taken into consideration. The feature 5 single burial dates into the latest centuries of the seventh millennium cal BC. The double interment of the adult individual with flexed legs (individual 2) and a child (individual 6) on his chest from complex I provides data c. 6150–6050 cal BC. The adult individual positioned directly next to it in supine position (individual 1) dates somewhat later, at c. 5950–5750 cal BC (see above). The other child from complex I (individual 5) is dated to c. 6000 cal BC. Two animal tooth pendants from the re-excavated construction pit are certainly grave goods from complex I and date to 6000–5900 cal BC. If we consider the dated pendants to provide the most reliable dates, we can place complex I into the very early sixth millennium cal BC. In this case, the AMS-dates of the human individuals from the same context (complex I) show a reservoir effect of up to 200 years. The double burial of complex II (individuals 3 and 4) similarly dates to c. 6000 cal BC, as well as the disturbed child burial (feature 9,

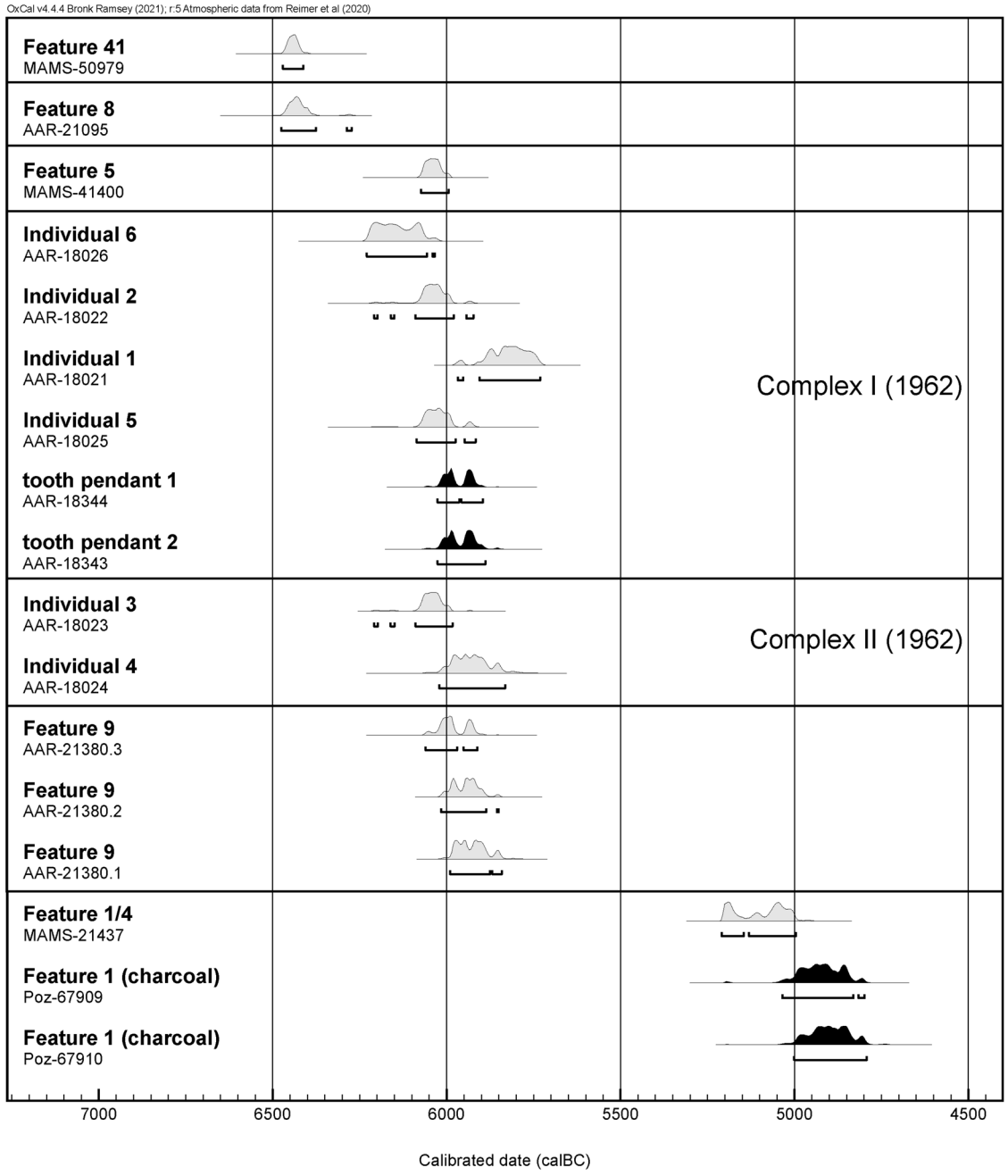

Figure 5: Groß Fredenwalde. Calibrated radiocarbon dates. Black: terrestrial data.

c. 6000–5900 cal BC). These burials are also likely to be affected by a reservoir effect. In conclusion, the period from c. 6300/6200–5800 cal BC probably marks the first phase of use of the cemetery according to the present data.

After a gap of c. 900 years, the place was used again as a cemetery (feature 1/4). Here the human bone data suggest an age of c. 5200–5000 cal BC, while charcoal from the fireplace on top of the burial pit provides a date c. 4900 cal BC; the latter is considered to be directly connected to the burial rite and as more reliable for dating the event. A reservoir effect of up to 300 years can therefore be expected for the human bone data. At that time, Neolithic Linearband pottery culture farmers had already established in the Uckermark region only a few kilometres away (Terberger, Kabaciński, & Kotula, 2021b).

Figure 6: Groß Fredenwalde. Large truncated blade from complex I (drawing after Gramsch & Schoknecht, 2003).

3.3 Grave Goods

From the 1962 recovery, 17 flint artefacts are known, all of them connected with complex I. The new excavations yielded more flint artefacts in the construction pit, of which 15 can probably be connected to complex I (individuals 1, 2, 5, and 6). The materials connected to this grave(s) therefore consist of 27 blades, including two truncated blades, one of them very large (length: 111 mm) (Figure 6), and two trapeze microliths as well as some flakes. Two fragments of a slotted bone dagger with decoration were also found in 1962 (complex I) and they can be supplemented with another, newly discovered fragment (Figure 7).

Overall, 90 tooth pendants can be assigned to complexes I and II, but for only a few of them detailed information is available. Almost all tooth pendants were made of red deer teeth. Seven specimens can be connected with the double burial of individuals 3 and 4 (complex II). Three of them were found close to the skull of individual 3; four more were located near the leg bones and (some) may be connected to the child (individual 4) (Schoknecht, 1963). This leaves 83 pendants for complex I, indicating c. 20 pendants on average per individual, thus signalling richly equipped burials. Seven pendants are considered to belong to the

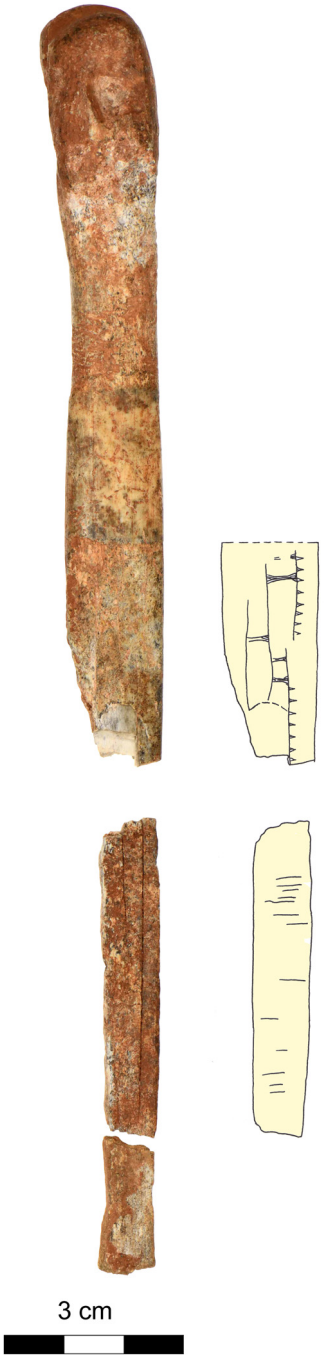

Figure 7: Groß Fredenwalde. Slotted bone dagger with decoration (photo: BLDAM/Brather; drawing after Gramsch & Schoknecht, 2003).

headgear of a child (individual 6; five of them visible in Figure 8; cp. Gramsch & Schoknecht, 2003, p. 17). It is well possible that one of the individuals of complex I was more richly equipped than the others. One richly furnished male individual (no. 1 or 2) might well be suggested by the large truncated blade (knife) and the slotted bone dagger. Other artefacts include a bone point that was found at the side of individual 3 (complex II); three more bone points are connected with complex I. Some loam pieces found in 1962 and during recent field work (feature 3) remain enigmatic (Gramsch & Schoknecht, 2003). The newly discovered feature 41 contained two tooth pendants next to the individual. Preliminary information is available for feature 5, where tooth pendants in the skull area and few flint blades were recorded.

Figure 8: Groß Fredenwalde. Skull of child (individual 6) recovered in 1962 with animal tooth pendants (BLDAM/police Templin).

Figure 9: Groß Fredenwalde. Large truncated blades from feature 1/4.

The grave goods of the later grave (feature 1/4) include 33 flint blades, a small flint core later re-used as a hammerstone, a bone awl, and a bone point (Kotula et al., 2022). The flint material includes two large blades with truncation (Figure 9). For feature 10, no information on grave goods is available. All burials at Groß Fredenwalde, except the more recent grave (feature 1/4), contained ochre (feature 10: no information).

4 Groß Fredenwalde in the Context of Early Cemeteries of Northern Europe

4.1 Chronology

Groß Fredenwalde is one of the earliest cemeteries in North-central Europe. Older Mesolithic human remains in NE-Germany are only represented by loose human bones discovered at Friesack (Terberger et al., 2018). A very early cemetery with primary inhumations is present at the Popovo site in Russia in North-eastern Europe (Figure 10), besides other cemetery sites with secondary interments of human remains in the Northeast of Europe (Peschanitsa and Minino I) (Oshibkina, 2008, 2016). During the Boreal, the possible primary inhumation cemetery Hummervikholmen, Norway, with remains of three to five individuals in secondary sediments (Skar, Lidén, Eriksson, & Sellevold, 2016) and the site Mszano in eastern Poland with burnt primary inhumations (Marciniak, 2001) testify to the presence of (primary) inhumation burial grounds in different regions of North-central and Northern Europe far-away from each other. In the more numerous evidence of cemeteries in the early Atlantic, primary inhumations are by far the dominant burial type (Figure 11). Cremations are rarely present at the early cemeteries in Northern and North-eastern Europe, but they are known from large areas of Europe since the early Mesolithic before becoming rather marginal from the Late Mesolithic onwards (Bugajska, 2020). Recently, a possible early Mesolithic cremation was reported from Duvensee, Schleswig-Holstein, representing the first discovery of a Mesolithic grave in North-western Germany, if the burial character of the assemblage can be verified (https://www.uni-kiel.de/de/detailansicht/news/20221310-grabfund-duvensee). However, sites like the unique cemetery at Dudka, Poland, testify to highly variable burial rituals (including

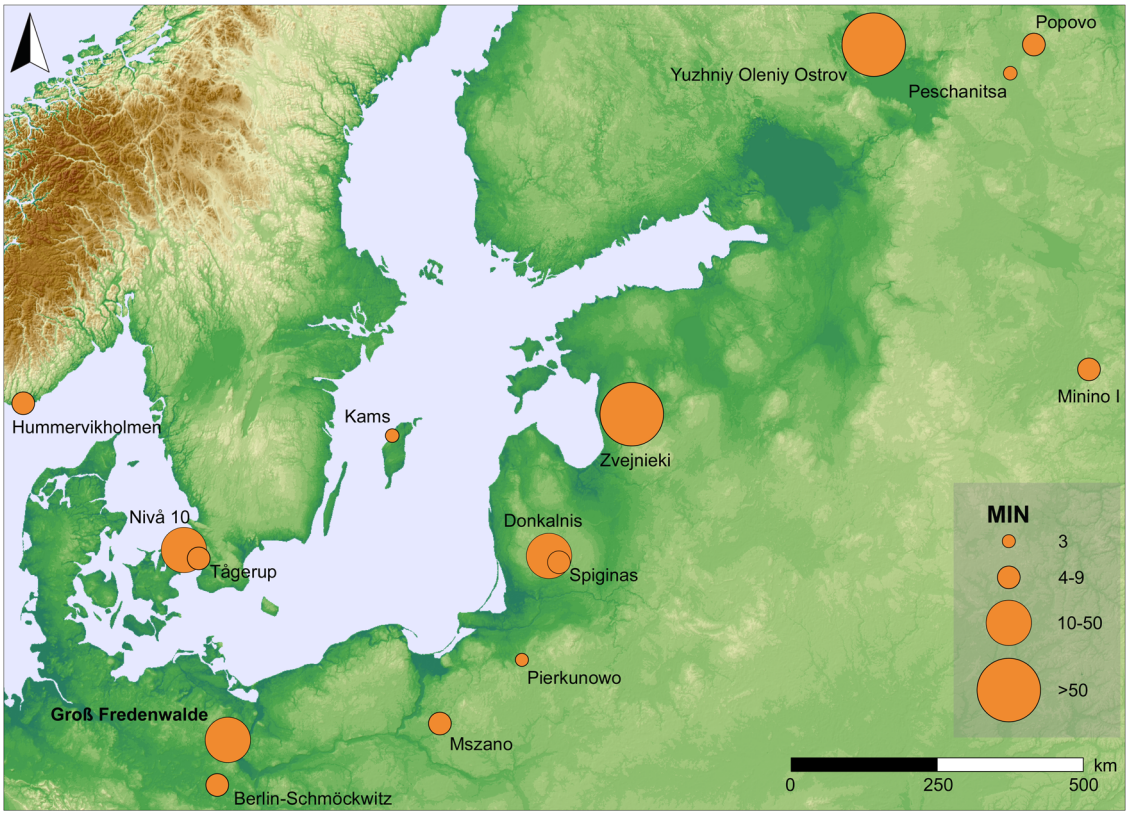

Figure 10: Mesolithic cemetery sites (MIN > 2) in Northern and North-eastern Europe with radiocarbon evidence older than 6000 cal BC (data after Butrimas, 2016; Grünberg, 2000; Jensen, 2016; Karsten & Knarrström, 2001; Larsson & Zagorska, 2006; Marciniak, 2001; Oshibkina, 2016; Piotrowska et al., 2019; Schulting et al., 2022; Skar et al., 2016; Wood et al., 2013).

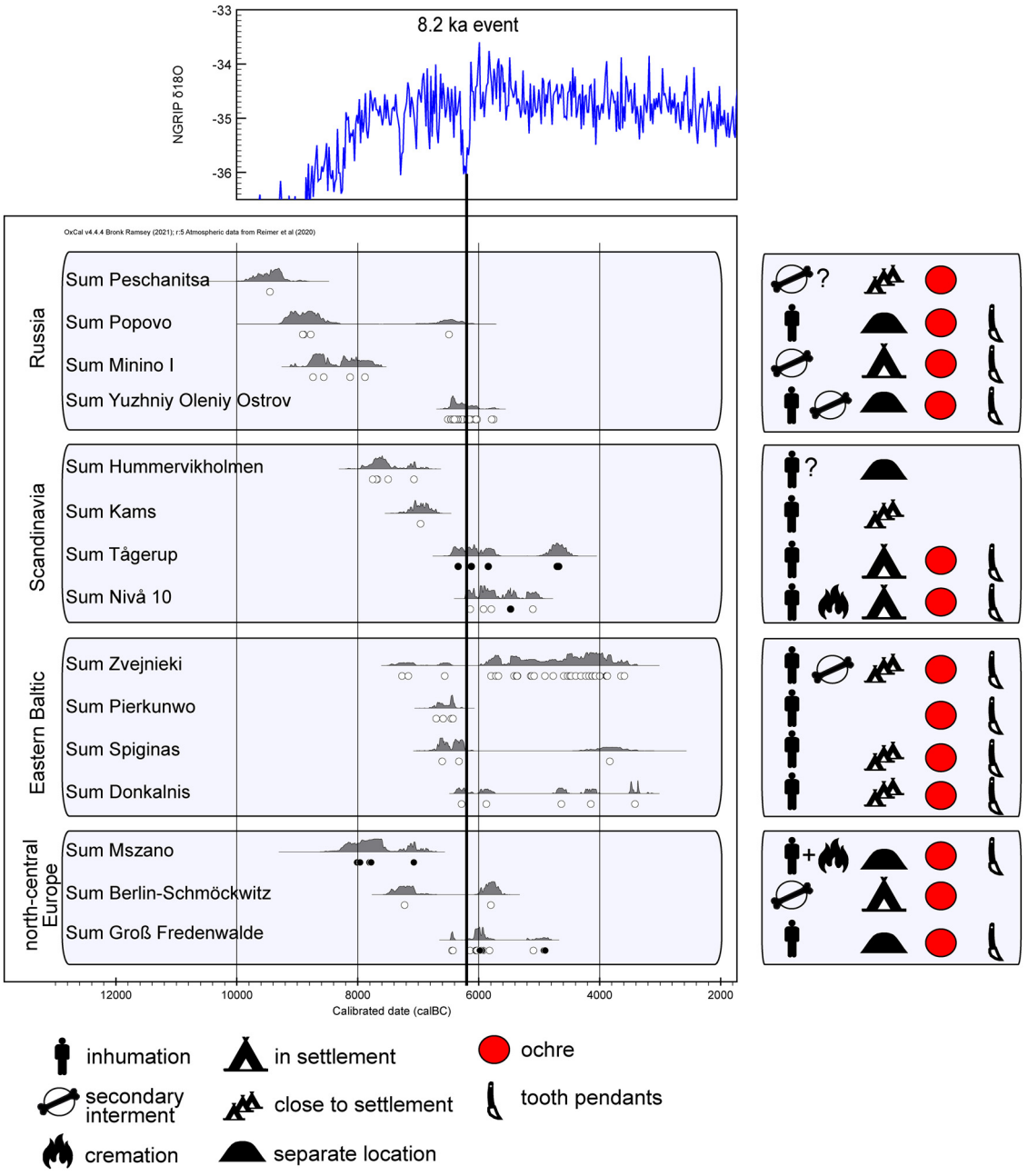

Figure 11: Radiocarbon data of Mesolithic cemetery sites in Northern and North-eastern Europe with radiocarbon evidence older than 6000 cal BC with information on selected ritual aspects. White dot: human bone data, black dot: other contextual data. For Peschanitsa and Hummervikholmen, the type of interment is not entirely clear. The large cemetery sites Zvejnieki and Yuzhniy Oleniy Ostrov represent mostly primary inhumations and very few secondary interments. At Mszano, primary inhumation burials were burned (data after Butrimas, 2016; Grünberg, 2000; Jensen, 2016; Karsten & Knarrström, 2001; Larsson & Zagorska, 2006; Marciniak, 2001; Oshibkina, 2016; Piotrowska et al., 2019; Schulting et al., 2022; Skar et al., 2016; Wood et al., 2013).

cremation) in the Late Mesolithic and para-Neolithic (Bugajska, 2020; Bugajska & Gumiński, 2016; Gumiński & Bugajska, 2016). The emergence of more cemetery sites with primary inhumation burials in the course of the early Atlantic hints at an increasing unification of burial customs on a more general scale at this time, and the radiocarbon data place Groß Fredenwalde into this context.

The number of individuals interred and the period of use of the cemeteries vary widely (Figures 10 and 11). The duration or time of use of the discussed sites with more than one radiocarbon date displays a considerable

chronological variation, ranging from c. 280 years (Pierkunowo, Poland) to c. 3700 years (Zvejnieki, Latvia) with a mean of c. 1600 years (oldest and youngest date mean cal BC considered) (Larsson & Zagorska, 2006; Piotrowska, Tomczyk, Pawełczyk, & Stanaczek, 2019). The largest time span of use is present in the eastern Baltic, where the sites Spiginas and Donkalnis span almost three millennia (Butrimas, 2016), and Zvejnieki even more. Groß Fredenwalde covers very much the middle ground with a duration of c. 1400 years, but the main phase was considerably shorter (c. 400/500 years). At Yuzhniy Oleniy Ostrov, recent modelling of the data indicates a time span of 300 years or less for the interments (Schulting et al., 2022). From this site, 177 graves are known, but it is suspected that originally c. 400 graves were present (Schulting et al., 2022). This would hint at an extraordinary number of 59 (n = 177 graves) or even 133 (n = 400 graves) burials per century for this site. The Popovo site, too, shows high activity within a very restricted time frame, if one outlier grave date is excluded. It is calculated that four individuals per century were interred at the large Zvejnieki cemetery over a long period of time. Contrarily, at the site Spiginas, only four individuals were uncovered, buried over a time of c. 2800 years but with a long hiatus in between. In the main burial phase of Groß Fredenwalde c. 6300/6200–5800 cal BC, c. two to three individuals per century were buried there. Estimations may considerably change with a re-assessment of site chronology. However, sites not fully investigated may not generally contradict robust chronology (Schulting et al., 2022 suppl.).

One characteristic of the Groß Fredenwalde burial site is a hiatus. The “standing man burial” is c. 900 years younger than the latest graves from the earlier phase of the cemetery, and it is also the only grave disturbing an earlier interment, indicating that the group performing this burial ritual was not aware of and/or did not care about the earlier grave(s). Similarly, a significant share of the sites under consideration here is characterized by younger outlier data, hinting at a main phase of use and a later resumption, if it is not data contamination or incomplete site information that is responsible for the hiatus. A hiatus may also reflect changing environmental conditions at a site, e.g. displayed at Nivå 10 (Jensen, 2016). There seems to have been a regular resumption of burial(s) on sites after long gaps. At Mszano, the unique type of bi-ritual burial only known from this site was again carried out after a break of c. 700 years without disturbing the older graves (Marciniak, 2001), indicating knowledge handed down and a vitality of this tradition, in contrast to the more recent Groß Fredenwalde grave. This may also be true for Tågerup, where grave 4 was located amidst other graves respecting their borders, despite being c. 1,000 years younger (Karsten & Knarrström, 2001). Another grave from the site is typologically also dated to around the same young age, but is located c. 100 m to the east, clearly separated from the other graves. In Lithuania, Spiginas grave 1 is dated more than 2,000 years later than the other two Mesolithic graves, but located c. 1 m away from an older grave without disturbing it (Butrimas, 2016); the same accounts for Popovo grave VI (Oshibkina, 2016). In a few cases, graves were disturbed by later interments at the large cemeteries Zvejnieki and Yuzhniy Oleniy Ostrov (Gurina, 1956; Zagorskis, 2004). For the extensively studied Vedbaek and Skateholm cemeteries, most graves appear to have been remembered and respected (Nielsson Stutz, 2003). Being aware of existing graves is also reported from other regions (Tõrv, 2018, 249f.). The Groß Fredenwalde case is especially interesting, as it is contemporaneous with the presence of early Neolithic settlers in the region and may therefore represent a specific local response/reaction.

The data indicate that the early burial phase at Groß Fredenwalde took place in the late seventh and earliest sixth millennium cal BC, placing this phase chronologically close to/soon after the 8.2 ka cooling event. Some indications in the archaeological record of Europe and other areas hint at societal and technological changes connected with this event (e.g. Clare, Rohling, Weninger, & Hilpert, 2008; Gehlen & Schön, 2005; Schulting et al., 2022). The re-assessment of the Yuzhniy Oleniy Ostrov cemetery confirms a narrow time frame of use of the site around the mentioned cold phase, probably connected with the competition for resources (Schulting et al., 2022). At Groß Fredenwalde, the isotope values of the infant burial indicate early weaning or breastfeeding disorders. For two other individuals of the main burial phase, anthropological analysis indicates scurvy and vitamin D deficiency. Five of the nine individuals dated to that phase are children, which can indicate unfavourable conditions for more vulnerable individuals. The proportion of children in Groß Fredenwalde is significantly higher than the average from Mesolithic burial grounds in Europe (Grünberg, 2000). However, the age distribution at the cemetery may generally reflect a rather realistic hunter-gatherer mortality pattern without age-related selection (Volk & Atkinson, 2013; cf. Schulting, 1996).

The anthropological evidence does not provide strong support for unfavourable living conditions. A possible causal relation of the 8.2 ka event and the Groß Fredenwalde cemetery needs to be investigated in more detail.

4.2 Location and Ritual

One outstanding characteristic of the Groß Fredenwalde site is the location on top of a prominent hill without adjacent settlement known so far. The occurrence of cemeteries has been interpreted as a sign of symbolic territorial claims in a competition about resources and underlying sedentism (e.g. Saxe, 1970; cf. Conneller, 2013). A connection of socio-ecological stress during the 8.2 ka cooling event with burial activity at Yuzhniy Oleniy Ostrov has already been mentioned (Schulting et al., 2022). In Scandinavia, a connection of burial sites to water has been suggested, and is interpreted as part of the cosmology (Sørensen, 2016). Some of the large Mesolithic burial sites in Scandinavia are situated inside settlement areas (e.g. Brinch Petersen, 2015), and two of the early cemeteries show burials in settlements, too (Figure 11). However, some burial grounds form separated localities like Groß Fredenwalde. The Yuzhniy Oleniy Ostrov burial site is situated on an island, and no settlement traces could be found closely related to the site (Jacobs, 1995); a comparable local situation has been suggested for Popovo (Oshibkina, 2016). The Hummervikholmen burials were located at a sheltered beach in a lagoon environment without adjacent settlement traces (Skar et al., 2016). In the Mszano burial area, some Mesolithic settlement finds are present, but the location is thought to be of exclusively ritual character during its use as cemetery site (Marciniak, 2001). A rather typical location can be stated for the Spiginas and Donkalnis cemeteries, which were located on islands, thus separated but not far from settlement areas (Butrimas, 2016). Zvejnieki, too, was located on an island, with the burial areas at the highest point and adjacent settlement areas at the slopes (Zagorska, 2016). Kams was located close to Stone Age settlement remains, but their relation to the graves remains somewhat unclear (Arwidsson, 1949; Grünberg, 2000). The lack of settlement traces probably indicates that the Groß Fredenwalde location was chosen as a specific landmark to communicate identity/territory by a certain group.

Identity and group tradition can also be expressed in the treatment of the dead. A typical burial treatment connected with the Mesolithic is the use of ochre, which is more common in Northern and North-eastern Europe (Grünberg, 2013a) and is also present in Groß Fredenwalde. It is often connected with the primary inhumation burial practice, but one cremation from Nivå (grave A124) was also covered with ochre (Jensen, 2016). Among the discussed sites, only the Kams' individuals and the re-located underwater finds from Hummervikholmen did not show any ochre at all (Figure 11). At Zvejnieki, ochre is abundantly used in the Mesolithic period; its use decreases in the later graves (Zagorska, 2008). It was also present in all graves at other eastern European burial sites like Spiginas and Donkalnis, Pierkunowo, and Mszano, while only some of the graves at the Scandinavian sites Tågerup and Nivå were covered with the red dye. Similar to Groß Fredenwalde, many eastern German burial sites display the use of ochre, like Bad Dürrenberg, Schöpsdorf, Criewen, and Rathsdorf (Geisler & Wetzel, 1999; Grünberg, 2016; Ismail-Weber, 2017; Wechler, 1989). The last interment in Groß Fredenwalde was not equipped with the red dye, underlining a hiatus of tradition.

In this later grave also no tooth pendants were found, but they are present in some of the older burials at the site. With more than 90 tooth pendants, Groß Fredenwalde is rich in these ornaments of animal origin. They were almost exclusively made of red deer teeth. Remains of this species were widely distributed in Mesolithic burials and prevail in western Europe, while grave furnishings in Northern and North-eastern Europe display more diverse choices (Grünberg, 2013b). The species of tooth pendants is determined by the regional environment. Among the investigated sites, animal tooth pendants are present in most cases, except the secondary burial sites of Peschanitsa and Berlin-Schmöckwitz as well as the re-located bones from Hummervikholmen, and the Kams interments (Figure 11). They are especially abundant at the northeastern and eastern sites. At Groß Fredenwalde, most of the tooth pendants cannot be connected with specific individuals (see above). However, one child (complex I, individual 6) was adorned with a row of tooth pendants around the head. Equally some pendants were recorded in the head area of the woman from complex II (individual 3) and

feature 5. This indicates decorated headgear, and parallels can be found e.g. further east at Mszano, Donkalnis, Zvejnieki, and Yuzhniy Oleniy Ostrov as well as at later cemeteries in southern Scandinavia like Skateholm (Butrimas, 2016; Gurina, 1956; Larsson, 2006; Marciniak, 2001; cp. Grünberg, 2013b).

The slotted dagger finds parallels especially in Denmark (Voss, 1960). The type is rare in Mesolithic graves (Kotula et al., 2020). A close connection between the Danish and the Northwest German territory at that time is confirmed by the wheatsheaf decoration on the slotted dagger (Gramsch & Schoknecht, 2003; Terberger, 2006). Recent analysis of radiocarbon dates has pointed to a connection of the appearance of implemented tools in Eastern Europe with the onset of the Holocene, and a later peak of use in Scandinavia c. 6500–5500 cal BC (Manninen et al., 2021). The Groß Fredenwalde specimen is the south-westernmost find in Mesolithic burial context of this type (cp. Manninen et al., 2021, Figure 1). According to the radiocarbon data, the type appears in burials more frequently only with its peak appearance in Scandinavia (Figure 12). The Groß Fredenwalde specimen is part of this cluster, emphasizing northern connections of the site at that time.

This is also underlined by the flint artefacts from the site. They consist mostly of blades, some of them of extraordinary size. It is very likely that the raw material or the tools of the large specimens originate from areas with better raw material availability further north. Large blades were present in both burial phases at the site and were possibly a prestigious part of the grave goods. Very large blades are considered part of male equipment in the Mesolithic burial record of Northern Germany and Southern Scandinavia (cp. Kotula et al., 2022). The blades from the older phase cannot be reliably connected to a specific individual. They consist of a very long truncated blade (111 mm) as well as other blades (mean length 33 mm), which are above average size compared to northeastern German inland inventories of this Mesolithic phase (Kotula et al., 2022). The grave goods of the more recent burial include bone tools and a set of flint blades, suggesting that the individual was a (flint) craftsman. Two truncations from the same burial are of extraordinary size and indicate a northern

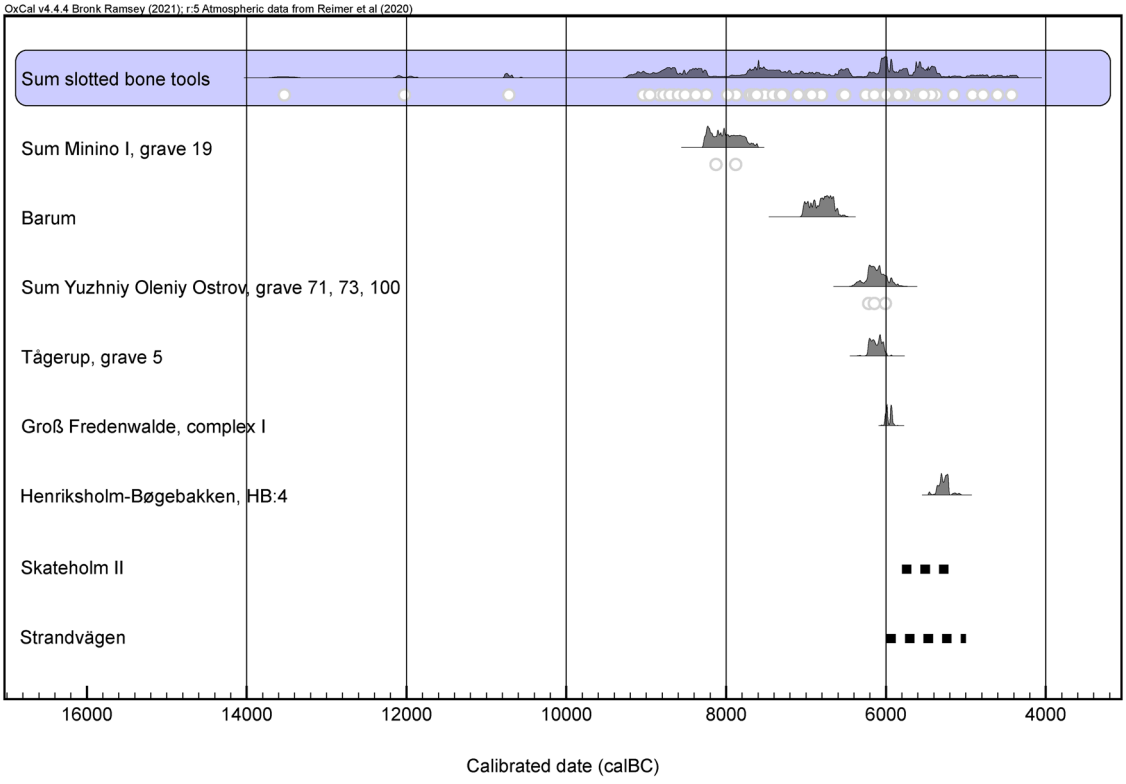

Figure 12: Radiocarbon data of slotted bone tools in Northern and Northeastern Europe and radiocarbon data from Mesolithic burials with slotted bone tools interpreted as grave goods. Minino I: terrestrial data (fauna); Yuzhniy Oleniy Ostrov: modelled data; Groß Fredenwalde: terrestrial data (tooth pendant). Graves with slotted bone tools without radiocarbon data: Strandvägen burial 03 and Skateholm II grave IV (estimated use of cemetery: dotted line) (data after Gummesson & Molin, 2016; Larsson, 2016; Manninen et al., 2021; Schulting et al., 2022).

origin (Figure 9). It has been suggested that flint artefact sizes in burials exceed the sizes of settlement material (Grünberg, 2000, p. 114) and the Groß Fredenwalde site can provide supporting evidence for this. The flint artefacts underline the northern connections of the site in both phases. The size and quality of flint artefacts is connected to good raw materials availability, and larger tools therefore prevail in Southern Scandinavia. Truncated blades are regularly present in the Northeastern German Mesolithic burial record, and a truncation was also uncovered at Berlin-Schmöckwitz (Gramsch, 2016). A large flint knife is also known from grave A162 at the Nivå 10 site, but large blades are especially present at the younger Scandinavian burial sites like Strøby Egede and Henriksholm-Bøgebakken in Denmark (Brinch Petersen, 1988; Grünberg, 2000). The character of the flint artefacts emphasizes the long-lasting northern connections of the Groß Fredenwalde people.

5 Conclusion

Groß Fredenwalde is the largest Mesolithic cemetery in North-central Europe and the earliest cemetery with primary inhumations in Germany. Its appearance coincides with an increase in inhumation cemetery sites in Northern and North-eastern Europe in the early Atlantic. In the earlier phase, the site is characterized by a high burial activity around c. 6300/6200–5800 cal BC. Radiocarbon dates from the site and some pathological markers on the human remains as well as a high proportion of children may hint at a connection of the earlier burial phase of Groß Fredenwalde with the sudden climatic downfall of the 8.2 ka event, but a possible connection needs to be investigated further. The prominent hill without settlement traces nearby was probably chosen as a specific location related to resources/territory and is comparable to some other cemeteries in the investigated period. Groß Fredenwalde is characterized by a high burial activity within a restricted time frame and a younger, less active phase of use, which also finds parallels at other sites in Northern Europe. In the investigated area, burial places regularly appear to be remembered and resumed. In the case of Groß Fredenwalde, a unique territorial situation with the local presence of early farmers may be connected to the resumption.

Especially the slotted bone dagger as well as the flint blades probably made of non-local raw material indicate strong and long-lasting northern connections. Groß Fredenwalde was part of a Northern European area where slotted technology was introduced from the east and subsequently became more widespread in the early Atlantic. The wheatsheaf-motif on the dagger generally links it to the Scandinavian Kongemose culture. Ochre and tooth pendants from the graves find parallels in Southern Scandinavia and Eastern Europe. The flint artefacts indicate more immediate northern connections to areas with good raw material availability, possibly Rügen island or even Southern Denmark. These northern connections are visible in both phases of the cemetery and display a network upheld independently through the hiatus of burial tradition.

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