Proceedings of the Prehistoric Society 88, 2022, pp. 1–23 doi:10.1017/ppr.2022.7 First published online 15 September 2022

Sex and Gender in the Mesolithic: Adults and Children from the Strøby Egede Burial, Køge Bugt, Denmark

By KURT J. GRON[1], CHRISTOPHER MEIKLEJOHN[2], KRISTOFFER BUCK PEDERSEN[3], NICOLAS A. STEWART[4], VERNER ALEXANDERSEN[5], LASSE SØRENSEN[6] *and* JANET MONTGOMERY[1]

In the summer of 1986 a mass grave was discovered along the bank of the river Tryggevælde Å where it empties into Køge Bugt, the bay south of modern Copenhagen, Denmark. The human remains, dating to the late Mesolithic Ertebølle culture, consisted of eight individuals of multiple ages, ranging c. *35–45 years old to newborn children. Four were arranged on one side of the grave, with four on the other, placed head to foot. How they were related and what befell them is a mystery. Herein, we present a bioarchaeological assessment of these individuals for the first time and apply an acid etch-based analysis of dimorphic sex chromosome-linked tooth enamel peptides to confirm their biological sex. Our results allow a direct connection between engendered grave treatment and biological sex in non-adult individuals as young as* c. *4 years of age. We conclude with a discussion of the possible circumstances of their deaths and their possible relationships to one another.*

Keywords: Mesolithic, human remains, sex and gender, Denmark, tooth enamel, peptides, bioarchaeology

INTRODUCTION

The hunter-gatherer-fisher Ertebølle culture of southern Scandinavia (EBK), *c*. 5400–4000 cal BC, is one of Europe's best-known Mesolithic societies. Much of this owes to a long history of research (eg, Madsen *et al*. 1900; Mathiassen 1943; Troels-Smith 1967; Brinch Petersen 2015; Gron & Rowley-Conwy 2018), which has uncovered a substantial and well-studied record of late Mesolithic life. Part and parcel to this are the substantial numbers of known burials (eg, Larsson 1988; Brinch Petersen 2015). As such, the EBK archaeological and bioarchaeological record represents one of the best opportunities for understanding Mesolithic society, its structure, variability, and whether functional social differentiation was present.

Conventional perspectives paint EBK groups as territorial and as delayed-return foragers (Woodburn 1980; 1982). Several burial aggregations, possibly cemeteries, are known and, if understood in the framework of the Saxe-Goldstein hypothesis (Saxe 1970; Goldstein 1981), represent unilineal descent groups and ownership of estates. However, application of the model to the European Mesolithic may be questionable. In particular, it is primarily directed to the issue of formal cemeteries (Morris 1991), a concept yet to be demonstrated in Scandinavia. Critical to defining formal cemeteries is spatial separation of the living and the dead, which does not appear to apply to either site central to this paper, Strøby Egede or Vedbæk-Bøgebakken

[1]Department of Archaeology, Durham University, South Road, Durham, DH1 3LE, UK Email: k.j.gron@durham.ac.uk
[2]Department of Anthropology, University of Winnipeg, 515 Portage Avenue, Winnipeg, MB, R3B 2E9, Canada
[3]Museum Sydøstdanmark, Algade 97, DK-4760, Vordingborg, Denmark
[4]School of Applied Sciences, University of Brighton, Brighton, BN2 4AT, UK
[5]Laboratory of Biological Anthropology, Department of Forensic Medicine, University of Copenhagen, Frederik V's Vej 11, 2100, Copenhagen, Denmark
[6]The National Museum of Denmark, Frederiksholms Kanal 12, 1220, Copenhagen K, Denmark

(see Meiklejohn *et al.* 1998). In both cases, the burials lay within the primary occupation (see, for instance, Brinch Petersen 2015).

While lithic evidence (Vang Petersen 1984) suggests territoriality or some similar form of land tenure, social *hierarchy* is far from clear and differentiation is probably horizontal. Recent work in boreal forest areas shows sites with multiple burials and rich burial goods are anything but restricted to groups with tightly defined territoriality (Wood *et al.* 2013). Therefore, there are no *a priori* reasons to assume that differences in burial practices reflect differences in station.

The pattern of Danish Mesolithic burials allowing the study of these themes is broad, ranging from classic inhumation burials to partial burials, bone scatters, and cremation deposits. Meiklejohn *et al.* (2016) list 26 sites with securely dated Mesolithic burials in Denmark.[1] With few exceptions, the burial units involve one or two persons, with only two containing more: burial 19 at Vedbæk-Bøgebakken, with two adults and a child, and Gøngehusvej 7, feature N, a multiple cremation deposit with five individuals. The Dyrholmen bone scatter has at least ten individuals but without current evidence that it was intentional. In looking at children's skeletons, the clear majority accompany an adult. In aggregate, these provide little evidence regarding the living structure of EBK residential bands and, in particular, no information regarding the daily collective activities of these Stone Age foragers.

The Strøby Egede burial is an exceptional find, an inhumation with eight individuals ranging from a 35–45 year old adult to four children aged 6 or less, of which two may be newborns. Buried together, they almost certainly died at roughly the same time and potentially from the same event. The feature is therefore an apparent 'snapshot' of the past, ostensibly recording with whom the individuals were at death, their relationships with one another, if there was social differentiation in how they were memorialised within the grave, and whether sex and gender were recognised consistently or independently across the age range.[2]

Unfortunately, poor organic preservation has, to date, precluded successful direct radiocarbon dating, light isotope analyses of bone and dentine collagen, or aDNA analysis. Previous conclusions regarding adolescent and sub-adult biological sex were therefore presumptive. In this paper, we apply a novel acid etch-based analysis of dimorphic sex chromosome-linked tooth enamel peptides to fully resolve the sex of individuals in the grave. This is the only available method, other than aDNA, which can determine accurately biological sex in non-adults. We also, for the first time, present bioarchaeological information gathered in the 1980s and 1990s by two of us (VA and CM). We neither attempt to unpick social hierarchies within the grave, nor identification of a 'main' person. Instead, we investigate the relationship between age, sex, and gender in this EBK group, the relationships between those interred and, ultimately, the circumstances of their deaths. We do so by contextualising the grave within the ethnographic, archaeological, and anthropological records. By revisiting this burial, we demonstrate that an integrated approach with interdisciplinary interpretive frameworks including archaeology, anthropology, and biology permits a deeper understanding of EBK society.

THE ERTEBØLLE SOCIAL SETTING

Land tenure and sedentism

The Ertebølle is the last phase of the southern Scandinavian Mesolithic (*c.* 5400–4000 cal BC). Starting in the early Atlantic period, the landscape had already changed dramatically from that of the early Mesolithic. Eustatic sea-level rise (Christensen 1995; Bailey *et al.* 2020) resulted in the submergence of Doggerland and formation of a landscape roughly approximating that seen today in the region. While not uniform, the resulting resource spaces created a highly productive habitat mix, with distribution of a large variety of resources in concentrated areas (Paludan-Müller 1978) available in a predictable sequence throughout the annual cycle (Rowley-Conwy 1983). These resources could be exploited from regions occupied year-round (Andersen 2007). Such developments set the stage for what Rowley-Conwy (1983) identified as probable sedentism but which more likely amounts to habitual regional estates. Associated developments include evidence of land tenure, seen in regional styles probably indicating group areas (Vang Petersen 1984; 2001), and logistic resource exploitation (Rowley-Conwy 1983; Price & Gebauer 2005) underpinned by storage technology including ceramics (Hallgren 2004).

The arguments for year-round site occupation or sedentism (Andersen 2007), or probable sedentism (Rowley-Conwy 1983), are not definitive and are, ultimately, a question of degree. In fact, Andersen, while discussing larger shell middens, primarily on Jutland, writes that '(t)he larger sites have been visited several times during the annual cycle, but we *still* lack convincing proof of permanent and continuous whole year

https://doi.org/10.1017/ppr.2022.7 Published online by Cambridge University Press

occupation' (2007, 37; italics in original). This ultimately means that one of the more problematic aspects of the Saxe-Goldstein model (Saxe 1970; Goldstein 1981), linked to sedentism and burial, is the striking absence of burial concentrations on larger shell midden sites.

Johansen (2006) and Brinch Petersen (2015) both query the evidence and model of sedentism and, for Danish sites on the Øresund, the pattern of sites suggests overlying evidence of repeated short occupations while the presence of multiple sites around fjords and minimal evidence for permanent structures, as at Vedbæk and Nivå, supports a model of group movement. Additionally, burials are not spatially organised in obvious fashion. At Vedbæk-Bøgebakken and Gøngehusvej 7, both in the Vedbæk fjord, distribution of burials and hearths are highly similar (Meiklejohn *et al.* 1998). The pattern of sites could therefore fit the fission-fusion settlement pattern of hunter-gatherer groups (see, for instance, Turnbull 1972); larger, more visible, sites represent group fusion of several smaller bands. Motivation for group fusion includes exploitation of periods of resource abundance, related feasting, and/or the opportunity for meeting potential marriage partners (see, for instance, Meiklejohn 1977; 1978).

While often discussed in relationship to low density hunter-gatherers, such scattered groups can produce some of the features central to the Saxe-Goldstein model, including large sites with associated burial concentrations of cemetery proportions. One example, Oleni Ostrov in Russian Karelia, provides one of the few European Mesolithic cases for a cemetery in the technical sense of a place set aside for burial, with little to no obvious evidence for the theoretically expected hierarchal social structure. The conundrum is clearly seen in the debate over the nature of this site between O'Shea and Zvelebil (1984) and Jacobs (1995).

Finally, a seldom discussed issue is the population size needed to sustain a genetically boundaried group (or biological deme) and, in anthropological/demographic terms, a marriage universe. Simulation studies by Wobst (1976; see also Dyke & MacCluer 1973; MacCluer & Dyke 1976; Meiklejohn 1978) see 'self-sufficient mating networks' requiring a population of *at least* 475 people. In practical terms, this means that, over any extended period, smaller groups tend to run out of potential mates of both opposite sex and appropriate age, in consideration of acceptable kinship categories (eg, not close relations[3]). To date no model has been put forward that clearly encompasses both the archaeological evidence and the biological constraints stemming from the nature of extended kinship systems.

Social differentiation

Since the 1970s, the number of known Ertebølle burials has expanded substantially, particularly those variously referred to as cemeteries or burial grounds. The two largest, potentially best-suited for understanding Ertebølle social roles are Skateholm, in Skåne (Scania) southern Sweden, where work began in 1979/80 (Larsson 1988) and Vedbæk-Bøgebakken,[4] Sjælland (Zealand), Denmark, where work began in late 1974 (Brinch Petersen 2015). Vedbæk-Bøgebakken (Brinch Petersen 2015; Fig. 1), with 17 burial features and 22 individuals, is the best-studied Mesolithic site surrounding the Vedbæk fjord, with better organic preservation than Skateholm (eg, Eriksson & Lidén 2002). Of 12 excavated sites at Vedbæk eight have yielded human bone (Brinch Petersen 2015, figs 10:1 & 26:1).

Known Ertebølle burials range in age from children and infants though mature adults and, among these, there are discernible differences in burial treatment. Fahlander (2012) identified differences between age classes from analysis of grave-goods and spatial distribution of burials at Skateholm. At *c.* 7 or 8 years children started to engage with the adult world and, by puberty, their graves were indistinguishable from those of adults. One element at Skateholm, but not consistent across Mesolithic Europe, was lack of evidence for infants buried individually; most are accompanied by an adult. To our knowledge, a full survey of Mesolithic infant burials is not available. Multiple examples are known at, for instance, Vlasac and Lepenski Vir in the Djerdap (Borić & Stefanović 2004) and Moita do Sebastião in Portugal (Ferembach 1974). However, in Denmark the number is very limited when compared to total number of burials. Besides sites with dated burials mentioned above (Vedbæk-Bøgebakken, Gøngehusvej 7), contextually dated cases are from Maglemosegård in the Vedbæk fjord (Alexandersen 1979), Nivågård in the Nivå fjord (Alexandersen *et al.* 1999), Ertebølle on the Limfjord in northern Jylland (Madsen *et al.* 1900), and Nederst on the now dry Kolindsund in east-central Jylland (Kannegaard 2016).

Using this material, some initial discussion of EBK sex, gender, and social differentiation has occurred

https://doi.org/10.1017/ppr.2022.7 Published online by Cambridge University Press

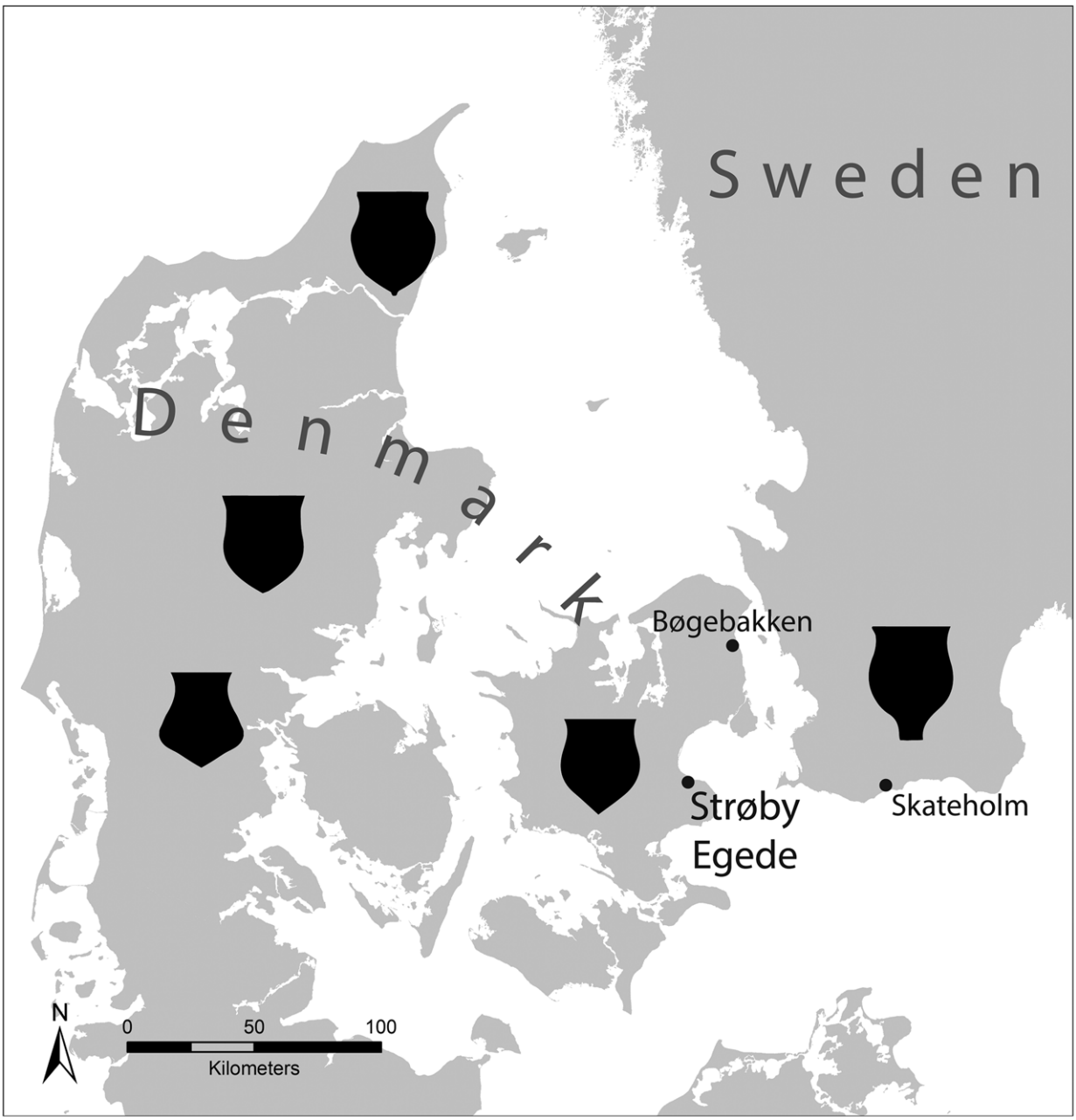

Fig. 1.
Southern Scandinavia showing the location of key sites mentioned in the text, with approximate areas of Ertebølle ceramic style differences shown (after Sørensen 2015 but see Jennbert 2011 for more detail). Basemap data extracted from the GADM database (www.gadm.org), version 4.0.4

(Meiklejohn *et al.* 2000) resulting in attempts to define male and female burial characteristics. Early work at Vedbæk-Bøgebakken saw the suggestion that females were buried with belts, sometimes termed girdles, adorned with teeth from multiple taxa (Albrethsen & Brinch Petersen 1977; Brinch Petersen 1979; see also Price *et al.* 2007). However, more broad-scale studies of EBK sex and gender based on burial goods

https://doi.org/10.1017/ppr.2022.7 Published online by Cambridge University Press

demonstrate that exceptions to perceived patterns (Schmidt 2005) are very common and probably belie far more complex cultural attitudes than are easily characterised. Not the least of the questions is whether some burial goods may mimic those normally identified as related to sex/gender. As a clear example, Meiklejohn *et al.* (2000) raised the issue of whether the linkage could reflect lineage which, of course, manifests itself through sex/gender in both matrilineal and patrilineal societies, though not intrinsically based on the sex/gender separation.

In a cross-cutting analysis of burial goods and attempting to identify social differentiation on the basis of gender, investigations found almost certain horizontal (age, sex, achievement-based) differentiation among EBK individuals (Clark & Neeley 1987; Meiklejohn *et al.* 2000). If anything, this complicates things further because if achievement-based differentiation in grave-goods was common in the EBK, then differences in grave furnishing may reflect neither gender nor sex. Furthermore, Meiklejohn *et al.* (2000) discuss explicitly difficulties in determining whether burial equipment marks ascribed or prescribed status. The potential for prescribed status is certainly present, as the delayed-return character of the EBK makes establishment of social hierarchies likely despite the relative dearth of evidence to its effect (Layton & Rowley-Conwy 2013). Therefore, evidence of particular artefact types, artefact categories, and their abundance, even with young children including infants, cannot be definitively linked, in whole or in part, to sex and/or gender.

Additionally, sex and gender are not the same; Deaux (1985, 51) provides useful definitions. Sex is biologically defined, with male and female categories based on chromosomal X and Y allele combinations, while gender is psychological and usually, but not exclusively, associated with the biological categories. The two are correlated but not mutually dependent. Gender is, at least in part, culturally constructed, being the sum total of cultural, social, and psychological human interpretations of the meaning of biological sex (Shapiro 1981). Society constructs a degree of implicit and explicit, intentional and unintentional, and cultural normative attitudes towards gender. Modern North American populations publicly engender even foetuses *in utero* (Guignard 2015) and, in so doing, intrinsically confuse the gender/sex boundary by assuming that cultural construction occurs *in utero*. Therefore, while children are not born with gender, they must learn these attitudes, which may start at birth. Moreover, no societies are genderless. All languages include words separating boys/men and girls/women (Maccoby 1988); gender is a cultural universal.

Children will self-segregate by gender (or by sex?) by age three (Maccoby 1988) in modern industrialised societies, although there is no reason to suspect this will be the case everywhere. The more settled a hunting and gathering people the earlier in life gender roles develop and become entrenched, at least in part due to the fact that, with increasing sedentism, gender roles are learned more through explicit teaching by adults than through imitation of adults (Lew-Levy *et al.* 2018). Among Kipsigis pastoralists of Kenya for example, despite strong gender differentiation among adults no clear preferences for gender segregation occur in children's peer groups until middle childhood, around the age of six (Harkness & Super 1985). Given this base, no *a priori* assumptions can be made about the age when gender would have been reified among EBK foragers.

A central theme in the number of studies aimed at understanding the intersection between age, sex, and social status during the Ertebølle, is the fundamental persistent difficulty with geography; comparisons are separated widely in space (Fahlander 2012). This is problematic because of land tenure (see above) and strong indications that the Ertebølle was characterised by estates of varying scales (Vang Petersen 1984; Sørensen 2007; Grøn 2020). Their presence is implied by the wealth of data clearly suggesting a degree of geographic variation in material culture across the landscape but the situation is complex and not straightforward to interpret. One indicator of differences between adjacent estates is seen in flake axe styles, which can vary by location in eastern Sjælland (Vang Petersen 1984). Another is the eastern–western divide across the Storebælt over the presence and absence of particular artefact types, especially t-shaped antler axes which are rare in the east (Vang Petersen 1984). Similarly, Limhamn axes seem not to have been characteristic of the west (Sørensen 2007). There is also some suggestion that anthropomorphic figure styles show regional variation (Płonka 2021). However, perhaps the clearest indicator is the variation in ceramic styles across the landscape (Jennbert 2011; Sørensen 2015; Fig. 1) which can be best described as variations on a common theme.

It therefore stands to reason that if there are regional differences in artefact types and styles, then

https://doi.org/10.1017/ppr.2022.7 Published online by Cambridge University Press

there may also be regional differences in treatment of the dead (see, for instance, Drucker 1950), borne out by the EBK record. Grave-goods vary by location and composition and cannot be reliably correlated with specific gender in a broad sense (Meiklejohn *et al.* 2000). We also might expect different populations. As an example, Meiklejohn *et al.* (1998; Meiklejohn *et al.* in prep.) postulated, based on statistical analysis of cranial measurements, that flake axe style zones might imply biologically separated groups on Sjælland, though population size would play a role, as noted above. A possible solution to the dilemma of how style zones and distinct populations might interact is seen in ethnographic evidence showing hunter-gatherer marriage exchange networks linking across strong cultural and linguistic boundaries; a classic example (Burch & Correll 1972) showed long lasting marriage networks linking Athapaskan and Inuit groups in northern Alaska.

Ertebølle land tenure therefore imbues a wrinkle of doubt into discussions of larger scale patterns or commonality in cultural practice, including how gender was recognised in life and death and discussions of burial practice. This relates to clear differences in material culture and economic practices at nested scales within the Ertebølle culture area. While both are, at least in part, tied to factors over which foragers have no control (eg, availability of raw material; Vang Petersen 1984) and environmental factors such as presence or absence of a particular species (eg, Aaris-Sørensen 1999), many are explainable only through the lens of human decision-making within the limits of culturally-constructed frameworks of propriety and habitus. Furthermore, we would expect to see more group insularity in highly productive environments, as clearly provided in many areas of southern Scandinavia, and in particular Sjælland (Paludan-Müller 1978; Fitzhugh *et al.* 2011). An argument can therefore be made that the only scale at which gender, group structure, and cultural practice should be investigated is at the most insular, within-group, scale. Cultural attitudes about these practices differ between populations, even in infancy (Drucker 1950).

The southern Scandinavian archaeological record therefore presents a plethora of possible avenues for analysis of burials in the context of studies regarding sex and gender (Schmidt 2005) and should theoretically represent an opportunity for understanding cultural patterns relating to these. However, evidence for regional group land tenure, and the likely fluid dynamics of any social or perimeter defense mechanisms for their maintenance, means broad-scale comparisons may, at their core, be faulty, with different cultural groups having different traditions. Added to the variation will be leakage of individuals across identified group boundaries resulting from marriage exchange, producing what Lee (1972) called the half-life of a population. A more insular approach would focus on individual graves, providing snapshot views of the largest number of individuals possible. Strøby Egede has, arguably, one of the best opportunities to do so in a Mesolithic setting.

MATERIALS AND METHODS

Strøby Egede

In the summer of 1986 a mass grave was discovered during construction of a carp pond along the bank of the river Tryggevælde Å, *c.* 2 km south-east of where it currently empties into Køge Bugt, the embayment south of modern Copenhagen (Brinch Petersen 1987; 1988; 1990a; 1990b; Fig. 1). Ultimately, eight individuals were identified, four on each side of the grave when oriented north to south, placed head to foot. Initial analyses, centred on burial arrangement and grave-goods (Brinch Petersen 1988; 1990b) interpreted the burial as with four females arranged on the southern end, four males to the north. The number of individuals, their age range, and what must have been the uncommon circumstance(s) under which they died, make this an exceptional find in Mesolithic Europe. Unfortunately, as noted above, collagen preservation issues prevented direct radiocarbon dating. Some years later, a single grave containing a male individual was discovered only a few metres from the mass grave, confirming rumours about more graves in the area.[5] The associated settlement has characteristic middle EBK artefact types (Stationsvej projectile points), and an archaeological date estimate of *c.* 4700 BC (Brinch Petersen 1990a; 1990b). To address sex, gender, relationships, and cause of death it is necessary to know the ages and biological sexes of those interred.

Skeletal assessment

To unpack various aspects of the Strøby Egede burial, it is pivotal to estimate the age at death of the individuals. A primary issue for analysis was the lifting of the feature *en bloc*, with a view towards museum display, following initial *in situ* excavation (Brinch Petersen

https://doi.org/10.1017/ppr.2022.7 Published online by Cambridge University Press

1990b). Other than the crania and mandibles of the older individuals the remains could neither be manipulated nor removed from the block for close examination. This prevented full analysis, including inspection of bone surfaces, especially of the pelvic and vertebral regions, and prevented a full biometric study. In retrospect, Strøby Egede epitomises a dilemma of modern archaeology, pitting the scientific against the public side.

Four individuals were initially identified, a number that expanded to eight following additional work at the site and after transportation to the Preservation Laboratory, Nationalmuseet, Copenhagen, where further work included examining the burial unit from below by inverting it. Following this the burial, *in toto*, was moved to Køge Museum for permanent display (Brinch Petersen 1987). Initial descriptions were based on observations by Verner Alexandersen and J. Balslev Jørgensen during excavation and cleaning of the material (Brinch Petersen 1988; 1990a; 1990b), when the bones, other than crania and mandibles, were uncovered but not removed from their matrix. The discussion below centres on later work, in 1992, by one of us (CM), assisted by Jeffrey M. Wyman (University of Winnipeg), made within the confines of the exhibit case at Køge Museum (further recent input was by VA; see supplementary information SI). Given limitations of working in the exhibit case, the inventories in the SI are incomplete; much of the material could not be fully observed.

Peptide-based sex determination

To fully confirm the biological sex of the individuals we applied a tooth-enamel acid etch-based sex determination procedure (Stewart *et al.* 2017). This involves a less-destructive acid-based etch to recover chromosome-linked dimorphic peptides from tooth enamel useful in determining the biological sex of human skeletal remains.

RESULTS

The Strøby Egede individuals

The burial, enclosed within a *c.* 1 × 2 m pit, has bodies aligned in two directions. The southern group, A, B, C, and F, comprise an adult, an adolescent, and two children, while the northern group, D, E, G, and H, are an adult and three children (Fig. 2). The adults and the adolescent were better preserved than the children. The information below has four sources, the initial papers written after excavation (Brinch Petersen 1987; 1988; 1990a; 1990b), work by CM (with J.M. Wyman) at the Køge Museum in 1992, an unpublished paper on the dentition written by VA in 1997, and further analysis by VA for this paper, based on photos taken by staff at the Køge Museum. We stress again the limited possibilities for analysis that followed lifting of the burial *en bloc* and its installation at the Køge Museum following preservation.

The summaries below, given in order of letter identification (see Fig. 2), are to provide context for the tooth-etching described below, the primary focus of this paper. Fuller descriptions of the material and associated data are found in the supplementary Appendix (SI) to this paper.

Strøby Egede A

The only adult and most complete individual in the southern group had a single associated flint blade. Skull and postcranial skeleton are largely complete with most bones preserved. Initial identification as female is confirmed by dental etching. Age evaluation, including dental markers, suggests a range of 35–45 years. Estimated stature from humerus, femur, and tibia is 146–160 cm, consistent with the sex diagnosis. The thick cranial vault, reaching 10 mm in places, is noted in other Danish Mesolithic samples, including Bøgebakken. The dentition shows features associated with heavy attrition and age (for further information here and for further individuals see supplementary Appendix SI).

Strøby Egede B

The only older child, also from the southern group, was associated with ten red deer tooth pendants. It includes a partial skull, mandible, and largely complete postcranial skeleton. Given the age, no skeletal sex assessment was possible, though identified as female from grave-goods (Brinch Petersen 1987), confirmed by dental etching. Dental eruption and long bone length suggest an age of 7–8 years.

Strøby Egede C

The only adolescent, and from the southern group, was associated with a single bone hairpin and ten red deer tooth pendants. Parts of the vault and face

https://doi.org/10.1017/ppr.2022.7 Published online by Cambridge University Press

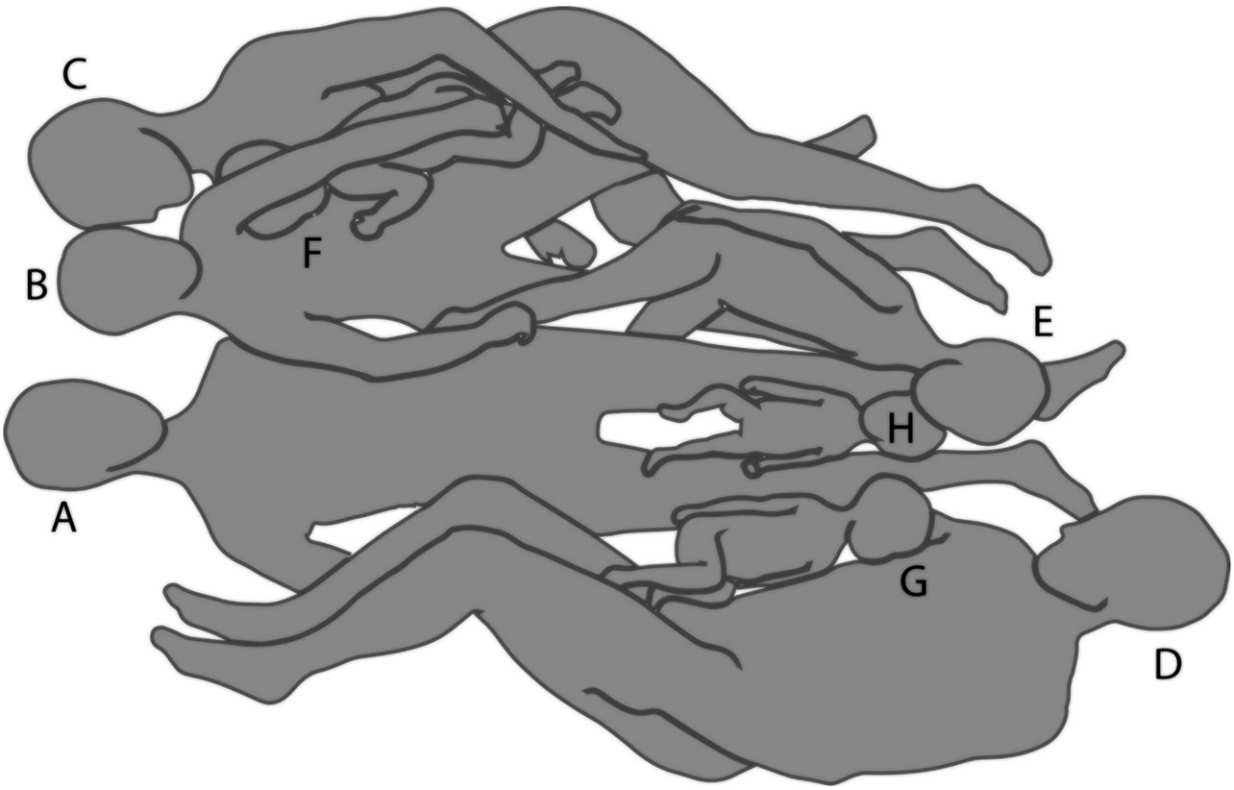

Fig. 2.
The Strøby Egede burial. Throughout the text individuals are referred to by their letter designation. North to the right. See Brinch Petersen (1990b)

of a partial skull, a mandible, and most of the postcranial skeleton were identified. Though identified as female by Brinch Petersen (1987), age made that diagnosis suspect, though now confirmed by dental etching. Initially assessed as *c.* 18 years old (*ibid.*), work in 1992, focused on dental eruption and other markers, gives a range of 14–17 years. Stature, consistent with age and sex, is estimated at *c.* 150 cm.

Strøby Egede D

The only northern group adult and best-preserved individual had seven associated flint blades, one red deer antler axe, and a bone knife. Visible are a largely complete skull and postcranial skeleton (parts of the left side are obscured in the display). Initially identified as male (Brinch Petersen 1987; 1990a), this is confirmed by dental etching. Initially assessed as *c.* 30 years old (Brinch Petersen 1987; 1990a), more recent work suggests a range of 20–25 years. Long bone stature is estimated at 165–175 cm, similar to taller males at Bøgebakken.

Strøby Egede E

The oldest of three children in the northern group was accompanied by a flint knife in two pieces. Though identified in Brinch Petersen (1988), the cranium was not visible in 1992. The 1988 figure shows this as the largest and, by extension, oldest of the younger children (see Figs 2 & 5). The postcranial skeleton was reasonably complete though partially obscured in the display.

Strøby Egede F

The only younger child in the southern group, accompanied by a pendant from the anterior tooth of a boar and a roe deer foot. Few remains were recovered. Sex identification of this and the next two individuals was inferred from position; no tooth etching was possible from the three.

https://doi.org/10.1017/ppr.2022.7 Published online by Cambridge University Press

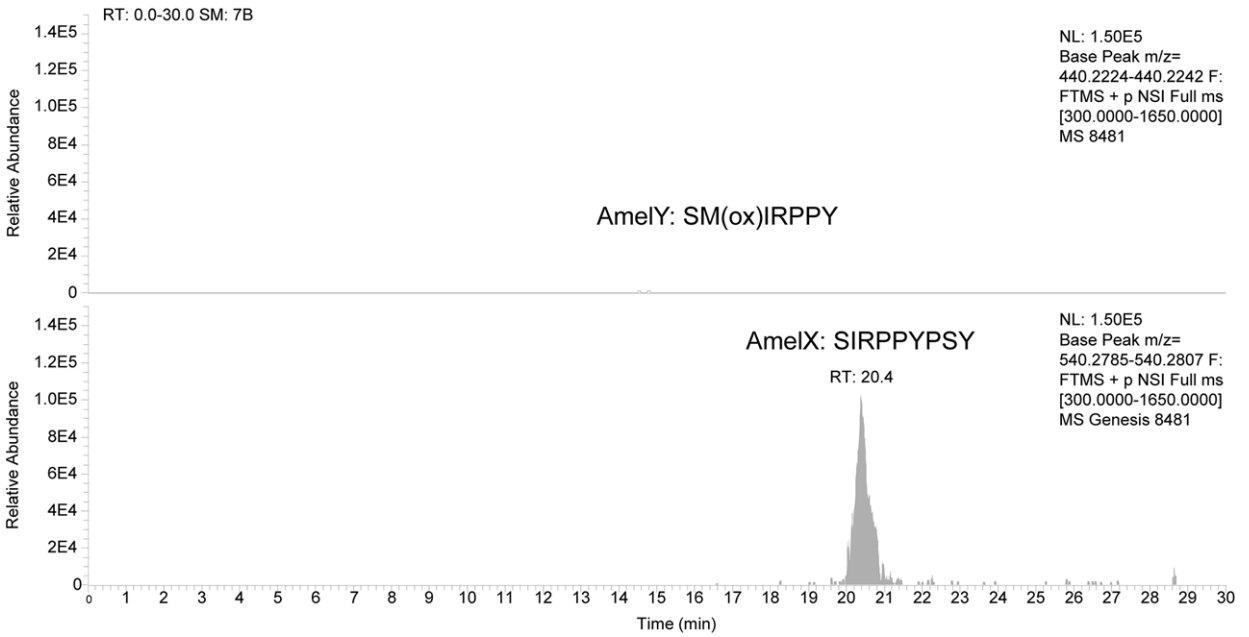

Fig. 3.
Reconstructed ion chromatograms at 2 ppm mass accuracy for the m/z of 440.2231 and 540.2796 for the peptides SM(ox) IRPPY ([M+2H]+2, AmelY) and SIRPPYPSY ([M+2H]+2, AmelX), respectively from Individual A. The presence of only the AmelX isoform confirms this individual as female

Strøby Egede G

One of two infants in the northern group and the least complete individual from the site, with two truncated flint blades in association. A limited set of postcranial remains were identified.

Strøby Egede H

The second infant from the northern group had an associated boar tooth pendant and seven red deer tooth pendants. In slightly better condition than G, there are postcranial remains but only tooth germs were found from the cranium.

Tooth etch-based sex determination

Enamel from five teeth was etched (Table 1), for individuals A–E. We were unable to etch the infants, F–H; no tooth remains were recovered from G and the tooth germs from F and H could not be etched.

The etch procedure followed a slightly modified version of Stewart *et al.* (2017), with two etches per tooth, at the same location. However, unlike Stewart *et al.* (2017), the first etch was not discarded but processed as below, in case the enamel thickness was breached, reaching the dentine. This proved unnecessary and ultimately the first etches were not analysed. Teeth were first cleaned of obvious surface contamination using a dental tool, to identify a surface suitable for etching (eg, free of cracks, fully mineralised, etc). Approximately 60µL of 0.5M HCl was placed in the open cap of a 0.2 mL Eppendorf tube, forming a convex meniscus protruding above the cap surface. The first etch was performed by lowering the enamel surface onto the acid, maintaining contact for two minutes. A C18 resin ziptip pipette tip (EMD Millipore ZTC18S096) attached to a 4–10µL pipette set to 10µL was first conditioned 3× with 100% acetonitrile, and 3× with 0.1% formic acid. The etch solution was pipetted 10× through the conditioned ZipTip binding the enamel proteins to the resin. The ZipTip was then washed six times in 0.1% formic acid. The peptides were then eluted by setting the adjustable pipette to 4µL and drawing a 4µl 60% acetonitrile/0.1% formic acid buffer through the ZipTip 10×, leaving the last draw in a 0.2 mL Eppendorf tube, which was lyophilised.

The second etch from each tooth was analysed, with the exception of individual A, etched three times with only the third giving a result (Fig. 3). The nanoLC-MS method is as described in Stewart *et al.* (2017), with

https://doi.org/10.1017/ppr.2022.7 Published online by Cambridge University Press

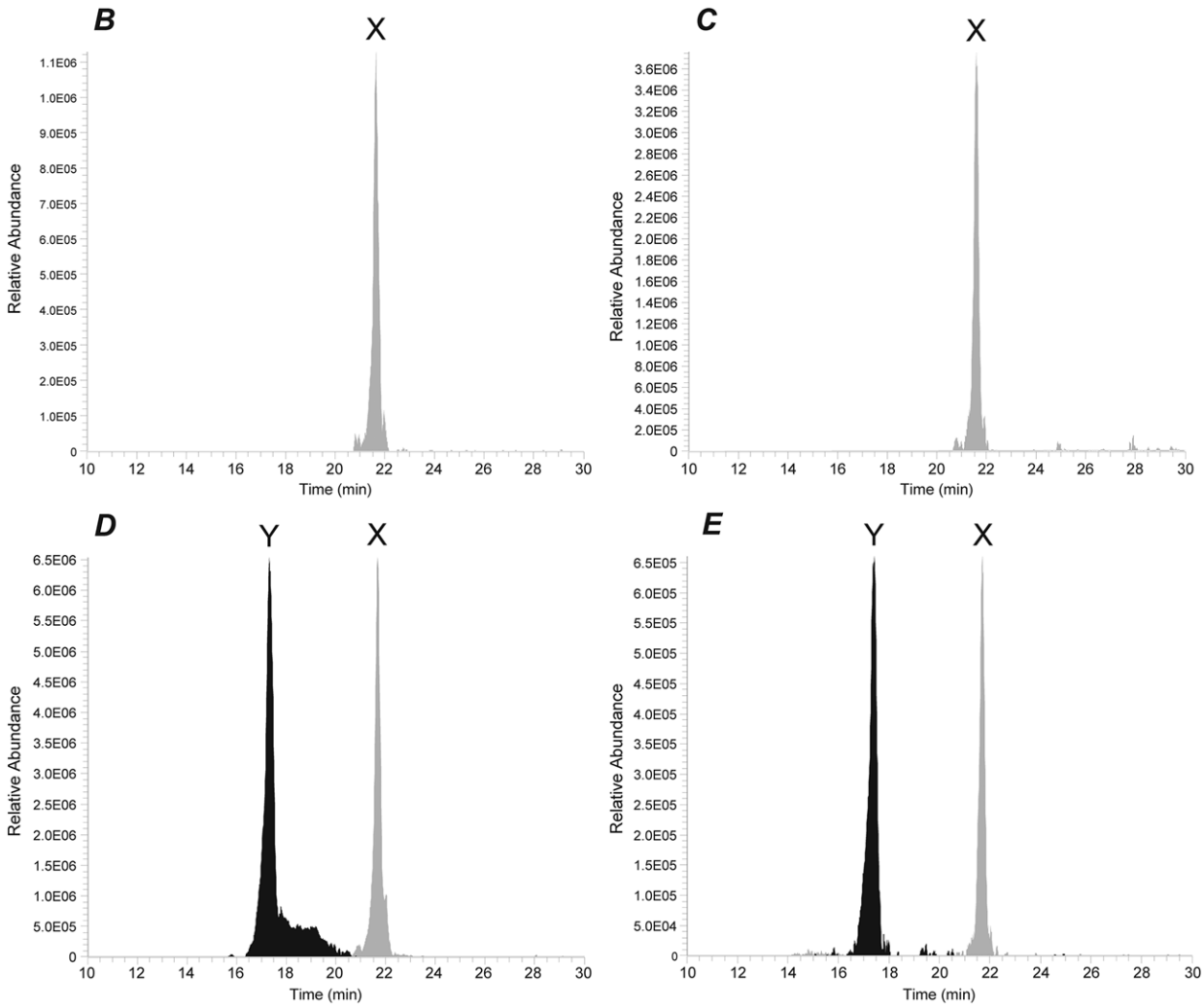

Fig. 4.
Tooth etch-based sex determination for individuals B, C, D, E. Italicised letters indicate the individual from which the data derive

addition of an inclusion list for masses 440.2233 m/z and 540.2796 m/z; corresponding to Ser-Met(oxidised)-Ile-Arg-Pro-Pro-Tyr (from AMELY) and Ser-Ile-Arg-Pro-Pro-Tyr-Pro-Ser-Tyr (from AMELX), respectively. Sex was determined by visualising the reconstructed ion chromatogram at 1 PPM mass accuracy for these two peptides and confirmed with correct retention time, a correct charge state of 2 in the full MS and an accompanying MS/MS spectrum matching predicted fragment ions. All samples were anonymised and analysed blind.

Given the presence of only the X chromosome-linked isoform of amelogenin, individuals A, B, and C are identified as female (Figs 3 & 4), and those with both X and Y chromosome-linked isoforms of amelogenin, D and E, as male (Fig. 4). Summary results are given in Table 1.

LESSONS FROM A SINGLE GRAVE

How do we tie these results and the archaeological record to anthropological theory, particularly in a

https://doi.org/10.1017/ppr.2022.7 Published online by Cambridge University Press

TABLE 1: DETAILS OF TEETH ETCHED AND RESULTS

Durham lab. no.	*Individual*	*Tooth*	*Result*
7521	C	mandibular right deciduous m1	female
7523	B	mandibular left M2	female
7525	D	mandibular left M1	male
7527	E	mandibular right deciduous m1	male
8481	A	mandibular left M2	female

Stone Age context? Because gender, status, and relationships are culturally constructed we can only access these aspects of culture through decision-making, found in evidence such as what to include with a buried child, what to feed the child, and with whom to bury the child in death. The key is in recognising when and how society perceives gender, status, and social relationships and the age when these become reified in material culture. This requires determination of the age categories that EBK groups and, in particular, *this* EBK group, recognised as significant. The Strøby Egede multiple inhumation is remarkable in its ability to provide information, given the number of individuals, their spread of ages at death, their biological sex, their grave-goods (Table 2), and the likelihood they were bound by a particular set of cultural norms through a discrete time-period (or the norms of whoever buried them). In so doing, its analysis minimises potential misinterpretation arising from ongoing changes in human culture (see Eerkens & Lipo 2005).

The Strøby Egede burial contains eight individuals, oriented roughly on a north–south axis (Brinch Petersen 1988; Fig. 5). Based on tooth etches and bioarchaeological assessment, the males were placed head to toe from north to south in the grave, the females south to north (Fig. 5). All had at least one type of grave-good or tool (Table 2). Individuals of both sexes had associated blade knives. Two females had tooth belts, males did not. Two infants had a tooth at their head, probably attached to a hood, one did not. Infant G, without the tooth bead, was buried with two knives. Both adults had blade knives, individual A with one, individual D with seven (Brinch Petersen 1988).

The three infants have no sex diagnosis derived from direct analysis. Those with tooth pendants at their heads (F & H) that were probably affixed to a hood, are presumptively male and female, based on burial arrangement. No clearly engendered goods were with them. But were they arranged with those of the same sex? Which was more important, burial with close kin or with one's own sex? Placement of individual H, not being held, suggests association with individual A, placed between her legs. Therefore, not holding them is an argument for individual H being male given the burial arrangement. Or is the relationship with individual E, with their heads closely together? The other two infants were clearly being held by individuals D and B/C respectively.

Therefore, in this EBK band, burial with a knife was not restricted to a single sex and burial with knives was not related to gender. Burying an infant with a tooth at their head related to neither sex nor gender; the burial arrangement suggests this was done for both sexes. Given the presence of only one adult male, his burial with a stippled antler axe could easily be related to other types of horizontal differentiation, with no other male buried with this type of artefact. Individuals B and C, both female, were buried with a tooth belt (or girdle), seen in other female burials on Sjælland (Albrethsen & Brinch Petersen 1977; Brinch Petersen *et al.* 1979; Price *et al.* 2007). No Strøby Egede males were buried with similar adornment, nor was the infant in the south, found with the other females. Tooth belts were likely engendered in this instance with individual F not having one, though both B and C did. None of the sex-determined males nor those arranged as male had this adornment. Given her determined sex, possession of a tooth belt by a 6–9 year old (B) shows enculturation of gender-identity by as early as 6 years old in girls of this EBK band.

So, at what age was gender recognised in this Ertebølle group? The evidence suggests that, at birth, gender was probably not recognised though sex was, and that, by 6 years of age, a gender associated primarily with female biological sex was recognised. With biological sex clearly known and important since birth, and despite it not being possible to determine the sex of the infants, juveniles were arranged with adults of the same sex. But sex is not gender. Individual E, a 4–6 year old boy, was arranged with the males, but not associated with apparently engendered grave-goods, making it unclear whether this individual was perceived as a boy, a male, both, or neither. These subtle differences reflect the intersection of culture and biology. Given the clear evidence of engendered grave-goods associated with individual B and lack of clear gender difference among infants, gender

https://doi.org/10.1017/ppr.2022.7 Published online by Cambridge University Press

TABLE 2: SUMMARY DATA REGARDING THE STRØBY EGEDE BURIAL (PARTIALLY FROM BRINCH PETERSEN 1988). * COLUMNS REFLECT WORK UNDERTAKEN IN 1992

Individual	*Ontogenetic age**	*Arrangement*	*Anthropological sex**	*Sex (etch)*	*Presumptive sex from arrangement*	*Grave-goods*
A	35–45 yrs	south	female	female	female	truncated flake blade
B	6–9 yrs	south	?	female	female	10 red deer tooth pendants
C	14–17 yrs	south	female?	female	female	10 red deer tooth pendants, bone hairpin
D	20–25 yrs	north	male?	male	male	7 flint blades, red deer antler axe, bone knife
E	4–6 yrs	north	?	male	male	flint knife in 2 pieces
F	5–8 mths	south	?		female	boar tooth pendant, red deer hoof
G	Newborn?	north	?		male	2 truncated flint blades
H	Newborn	north	?		male	boar tooth pendant, 7 red deer tooth pendants

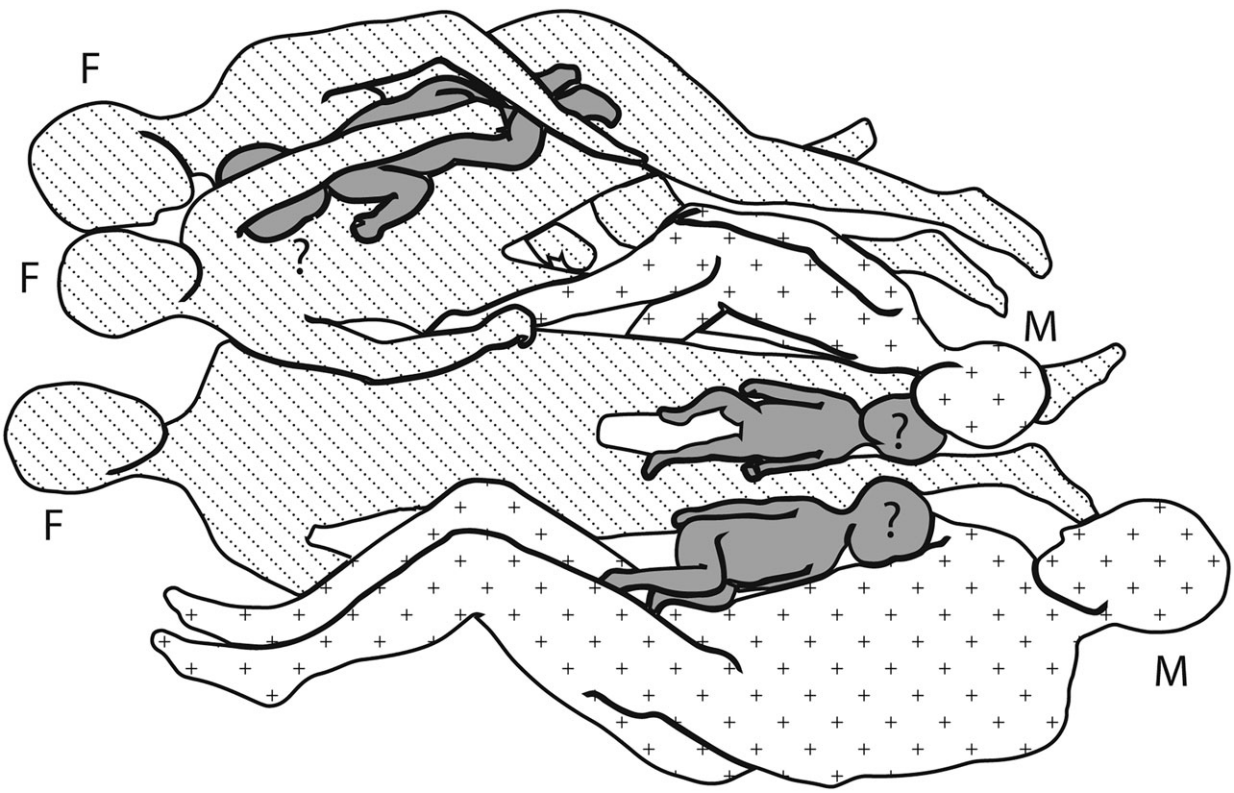

Fig. 5.
The biological sex of the Strøby Egede interment. Hatching: female; crosses: male; grey: unknown. North to the right. See Brinch Petersen (1990b)

https://doi.org/10.1017/ppr.2022.7 Published online by Cambridge University Press

enculturation in this EBK band therefore appears to have taken place between birth and *c.* 6 years of age.

WHAT HAPPENED?

Did everyone die at the same time for the same reason? In modern hunter-gatherer societies, childhood mortality rates are around 50% (Volk & Atkinson 2013), similar to that of archaeological hunter-gatherers (Johnston & Snow 1961). Childhood deaths are therefore not exceptional. But it is not strictly necessary that the infant deaths were for the same reasons as the adults. The adults may have died together with the infants killed or dying as a result. For example, after death of a mother in Greenlandic Inuit society, infants would often be killed and buried with them (Ammitzbøll *et al.* 1991). This would still place infant deaths soon after the older individuals but means that the aetiology need not be identical. However, this does not explain the deaths of the non-adults older than infancy, possibly suggesting a cause of death similar to the adults.

Comment is needed here on Terberger *et al.* (2021, 685), arising from discussion of the positioning of grave 1 at Groß Fredenwalde in Brandenburg, discovered in 1962 and referred to by Brinch Petersen (1988). They ask whether Strøby Egede 'might be the result of more than one event', comparing it to work since 2012 on the Groß Fredenwalde material. Given that our discussion below accepts the Strøby Egede burial as a single event, some justification is necessary.

While recognising the issue raised above, we feel that its direction to Strøby Egede is incorrect. Similarities exist between the sites, most clearly that both were discovered accidentally, during construction. However, the work immediately after differs substantially in the two. Neither the work at Groß Fredenwalde in 1962, nor that at Neuwied-Irlich discovered in 1953 and also noted by Terberger, resemble that undertaken at Strøby Egede in 1986. Though a first-order resemblance exists between figures 7a and 7b of Terberger *et al.* (2021, 682, 683) and portions of the Strøby Egede find, resemblance of the cleaned version of the latter, after work at the Nationalmuseet, is not to the work in 1962 at Groß Fredenwalde, but to that after 2012, when the true nature of the site became clear. The situation at Strøby Egede shown in Brinch Petersen (1988) differs profoundly from the Groß Fredenwalde pattern in Terberger *et al.* (2021), figure 8. The intricate interlaying of individuals and lithics at Strøby Egede may not represent burial of all eight individuals in a single day but is certainly consistent with placing them into an open pit over a period measured in days rather than weeks or months, let alone the years as now understood for Groß Fredenwalde. Three items from Strøby Egede provide clear support for a single, even if extended, event. First, no evidence for more than one pit being dug was found during the work prior to lifting the structure *en bloc*. Secondly, and supporting this, individual D, apparently the last interred individual, was pressed up on the side of the pit rather than on top of the others, as would be the case in a later burial. In other words, the individual was fit into an existing pit with the others. Thirdly, individual E, the 4–6 year old child, lies with parts both overlying and underlying its neighbours, A, B, C, and H, a complex interlayering of individuals rather than the layered 'pack of cards' pattern seen in separate but overlapping burials in one location.

Finally, we emphasise that this is not an isolated burial but lies within an extended site including other burials, not unlike the pattern at Vedbæk and other inlets on the Øresund. A second, clearly unrelated, Ertebølle burial with grave-goods was later found within a few metres during clearing of land prior to building a neighbouring house. It remains unstudied. The overall site lies below the current suburban development.

Depending on the society, the most likely cause of death in modern hunter-gatherers is illness or, more rarely, violence (Gurven & Kaplan 2007; Hill *et al.* 2007). The age and sex composition at Strøby Egede, if due to violence, is in line with raiding (Keeley 1996). Such attacks, often while victims are vulnerable as while sleeping, result in the death of mixed sex and age groups. In contrast, deaths are disproportionately male in warfare (Keeley 1996). However, no evidence of fatal trauma was found at Strøby Egede at any stage of analysis. The cranial lesion of Individual D is clearly healed and from an earlier event, comparable with the healed cranial injury on the Gøngehusvej 7 adult female, feature CÆ (Brinch Petersen *et al.* 1993). The evidence is not similar to that seen at, for example, LBK Herxheim (Orschiedt *et al.* 2003) or Globular Amphora Koszyce (Schroeder *et al.* 2019). What other possibilities are there? Prehistoric hunter-gatherer population numbers were likely too low to sustain endemic infectious pathogens (Inhorn & Brown 1990). Diseases persisting in small modern hunter-gatherer populations were

https://doi.org/10.1017/ppr.2022.7 Published online by Cambridge University Press

introduced recently (Wirsing *et al.* 1985). This point, reinforced by biomedical and ethnographic literature (Weiss 2001), attests to the linkage of epidemic diseases to agriculture and especially animal domestication. The earliest evidence for the plague in Scandinavia, for example, falls in the late Neolithic (Rascovan *et al.* 2019).

So, could disease have come from adjacent groups? Contact between Ertebølle groups and LBK farmers to the south is clear (eg, Fischer 1982), and Strøby Egede, dated to *c.* 4700 cal BC, clearly post-dates the earliest LBK in north-central Germany. Moreover, where widespread deaths from infectious disease occur in modern hunter-gatherers they tend to involve frequent and habitual interactions with much larger populations (Gurven & Kaplan 2007), an unlikely scenario. Nevertheless, there is the possibility of a virgin soil epidemic, exposure to a previously unknown infectious disease. Historical examples include depopulation of North America and Australia after first contact (Crosby 1976; Campbell 1983). However, our understanding of EBK/LBK contact limits this possibility at Strøby Egede.

We might also imagine sporadic zoonotic infection from close interactions with hunted animals (Weiss 2001) or implicate microbial pathogens that evolved with humans. However, these are typically low-morbidity illnesses where individuals live for some time and infection rates are limited. Here, we have eight dead individuals of all ages who apparently died at roughly the same time. Furthermore, many communicable diseases disproportionally affect the very young and/or very old (Hamborsky *et al.* 2015), which, despite some exceptions, again makes disease unlikely. Residential groups of hunter-gatherers dependent on aquatic resources usually involve *c.* 18 individuals (Binford 2001; Kelly 2013). If correct, a disease killing nearly half of the group would exceed the morbidity of smallpox in historical periods (Blake 1953) and be simultaneous. Infectious disease is therefore unlikely.

Other possibilities include the debilitating effect of intractable or habitual diarrhoea. Non-exclusive breastfeeding can cause gastrointestinal distress in very young children (GBD 2018), and allo-mothering is known to represent a significant proportion of early infant nursing ethnographically (Hewlett 2014). Also possible is *Salmonella* or *Giardia* infection, known in hunter-gatherers who had dogs and hunted wild game (Gracey 1992). However, presence of several adults plus the infants renders this unlikely. Mortality in these cases is usually substantially higher in adults than in children (*ibid.*).

Could poisoning have occurred? Many foods can poison, including shellfish, but ethnographically recorded populations were usually well aware of this and avoided dangerous taxa (Moss 1993). However rare, paralytic shellfish poisoning can happen with regularity in northern waters, including Europe (McCollum *et al.* 1968; Prakash *et al.* 1971), and 'red tide' has been mentioned in the Mesolithic literature (eg, Fontanals-Coll *et al.* 2014). There is no reason to suspect species commonly consumed in the Mesolithic (eg, *Mytilus sp.*) (Andersen 2007) and present in the Øresund (Strelkov *et al.* 2017). Vectors of toxins (Burrell *et al.* 2013) might not be to blame. Poisoning is rapid in onset (Backer *et al.* 2003) and can be fatal (2–14% with no medical care; Kao 1993). Even higher morbidity (up to 50%) can occur in children (Rodrigue *et al.* 1990). Toxins causing this type of poisoning are concentrated most often in bivalve shellfish and not affected by food preparation methods including cooking (Backer *et al.* 2003). This is a possibility, particularly if the Strøby Egede burial represents a small proportion of attendees at, for example, a large feast.

Could a toxin be to blame? Botulism is profoundly deadly (Dolman 1960), and well known ethnographically, ethnohistorically, and historically in the northern hemisphere. The British Columbia coast, whose pre-contact coastal populations have been compared to the Scandinavian late Mesolithic (eg, Layton & Rowley-Conwy 2013) is a North American hotspot. Caused by an anaerobic bacterium normally present in many basic food sources exploited during the late Mesolithic, including seals and salmon, its growth to toxic levels is found in various traditional foods, including smoked salmon, other types of preserved fish, and preserved seal flippers. Most relevantly, fatal outbreaks from fish consumption are recorded from early 20th century Denmark (Jensen & Hahnemann 1959), usually from consuming fish and marine mammal products stored incorrectly in anaerobic conditions. Without modern medical treatment it is one of the most lethal toxins known, with a morbidity rate of 50–60% (Dembek *et al.* 2007). In addition, being a toxin, it is unaffected by cooking or processing. Ethnographically, these types of poisoning (albeit unconfirmed as botulism) have occurred and have killed groups of eight individuals (Stefansson 1913, 32) and whole families (Parnell 1934).

https://doi.org/10.1017/ppr.2022.7 Published online by Cambridge University Press

An accident is also possible and, most obviously, a boating accident. Other examples exist for Strøby Egede type demographic profiles including ethnohistoric cases. A 1909 case from western Greenland recorded a probable *umiaq* (skin boat) accident with seven dead: two adult males, an adult female, and four female children (Hansen 2008). A better-known example involves the eight Thule-Inuit buried in 15th century AD rock tombs at Qilakitsoq in western Greenland (Andreasen *et al.* 1991; Hart Hansen *et al.* 1991); aDNA analyses revealed six female adults and two male infants representing three maternally unrelated lineages (Gilbert *et al.* 2007). EBK boats were certainly large enough to carry eight, especially with several infants. The larger canoe at Tybrind Vig is estimated to have accommodated 6–8 individuals (Andersen 1987).

Falling through ice on a frozen waterway is another possibility. In modern-day Alaska falling-through-the-ice accidents are common and, in about a third of occurrences, are fatal. Essentially all ages are affected by this type of accident, with up to a half-dozen people recorded in single incidents. The most common location for these sorts of incidents was while crossing rivers (Fleischer *et al.* 2013).

From the above, the most likely scenarios appear to be accident or poisoning, with violence apparently excluded and infectious disease unlikely. No matter what killed those interred, it appears to have happened quickly and been unrelated to age, health, or sex. The above presents an opportunity for understanding those that died, allowing the application of anthropological models of with whom hunter-gatherers spend their time, live and/or travel, and the relationships they share with those around them.

HYPOTHETICAL RELATIONSHIPS

Unpacking Strøby Egede group relationships in the absence of aDNA data is a hypothetical exercise. However, even with good preservation (Gilbert *et al.* 2007), aDNA cannot fully rectify the relationships between non-related individuals. This is where anthropology and the ethnographic record can help. Interpretation also relies on thorough consideration of what might have befallen those interred (see above). If, for example, the burial resulted from an accident, we may be looking at a travelling family group. A poisoning event, however, may contain members of a larger residential group or even the larger local group if poisoning took place during, for example, a feast.

Were the individuals related, and how? Bioanthropology, cultural anthropology, and archaeology can offer possibilities. Question one is whether and how they could have been related. Ethnographic evidence shows that any given hunter-gatherer will be genetically related to *c.* one quarter of those in their band, by marriage to *c.* one half, and will have no relationship to the remaining quarter (Hill *et al.* 2011).

The Strøby Egede individuals have a broad age spread, from infants to *c.* 40. Of the infants, two appear to be newborns, G and H, interestingly both in the northern burial group. The third, F in the southern group, is apparently *c.* six months older, ruling out triplets but not twins. There are two possible maternal combinations: of three mothers with one child each or one with twins G and H, the other with the older F. In modern populations, age at menarche is *c.* 12–13 years (Parent *et al.* 2003), so individuals A, C, and/or D could have been parents of the infants. The children could have been unrelated, cousins, or half-siblings.

Question two is how these individuals could have been related. Even without aDNA it may be possible to infer relationships based on age, sex, and expected group composition, based on the ethnographic record. Should we expect a single family to have the observed age distribution? Ethnographic-based hunter-gatherer demographic data need viewing with caution because of biases introduced by short-term observation of long-term and dynamic social processes (Kelly 2013). A residential group size of *c.* 18 individuals for hunter-gatherers dependent on aquatic resources has been suggested (Binford 2001; Kelly 2013), meaning 3–4 families of 4–5 individuals (Kelly 2013). It is therefore reasonable to posit that the Strøby Egede group could fit more than one pattern. While possibly members of the same immediate family, they could also represent individuals from three unrelated families of the same residential group. Under this framework, however, at least some individuals *must* be kin-related.

Age uncertainty in the adults makes understanding relationships harder. It matters greatly if individual A was 35 years of age, 45, or somewhere in-between. The situation for individual D seems different, since the range appears to be only half a decade. However, and regardless of age, individuals A and D could have been partners, though an older female

https://doi.org/10.1017/ppr.2022.7 Published online by Cambridge University Press

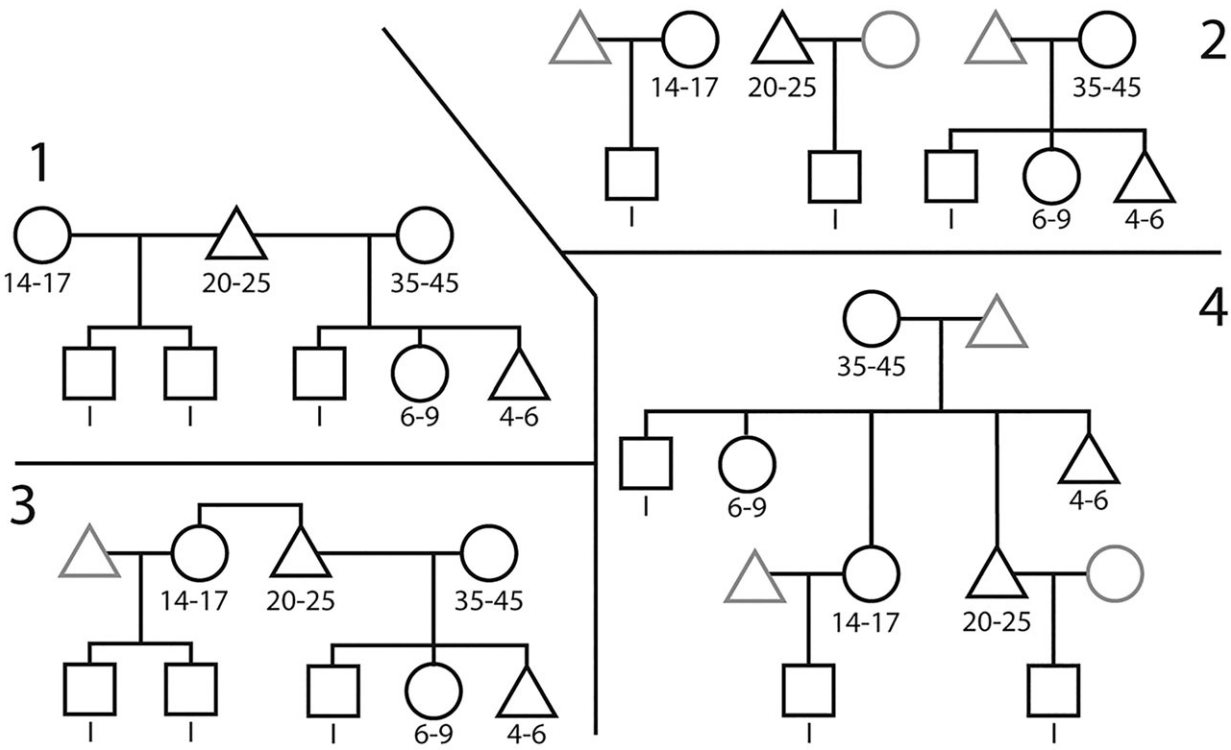

Fig. 6.
Kinship diagrams illustrating possible relationships between the Strøby Egede individuals. Individual scenarios are numbered. Grey individuals represent absent mating partners. The infant Individual F is *c.* 6 months older than the other two infants and therefore cannot be their sibling

raises significant questions. However, if A was 45, she could easily have been D's mother. The question of whether she could also be the mother of one of the infants depends on her actual age within the posited range. With the birth of a last child in natural human populations occurring at *c.* 40 years old in available ethnographic hunter-gatherer records (te Velde & Pearson 2002; Kelly 2013), the probability is much higher at 35 than at 45.

Figure 6 synthesises the above and attempts to unravel possible relationships. Polygamy is possible as, ethnographically, the practice ranges from rare to common in hunters and gatherers (Layton *et al.* 2012). Such a potential situation is illustrated by (1). It is also possible that three families from a residential group are represented, illustrated by (2). We must also consider how many generations are represented if the burial represents an extended family. Relationships (1) and (3) posit two generations, as does (2). Relationship (4) posits three.

There are no easy answers but understanding the relationships between individuals is key to unlocking what befell them. Throughout life, hunter-gatherers share most social interactions with kin, though this decreases with age (Migliano *et al.* 2017). Only in adulthood could interactions with non-kin exceed those with kin and, even then, would focus on a few non-kin individuals or friends. Infants are held for most of the day in hunter-gatherer groups (Hewlett *et al.* 2000) so, whatever occurred, if accidental, happened when the infants were probably being held. In some ethnographic instances a variety of carers may look after an infant but in most hunter-gatherers infants are carried by a parent or close relative (Kelly 2013). However, available data indicate that individuals other than an infant's mother only carry them 20–50% of the time (Hewlett 1991). If the higher end was typical for Strøby Egede, then it is statistically possible that none of the infants was being held by their mother when they died.

https://doi.org/10.1017/ppr.2022.7 Published online by Cambridge University Press

Ethnographic time allocation studies also provide indication of when mixed-sex and mixed-age groups might be together (Johnson 1975; Munroe *et al.* 1983) but underscore the fact that the proportion of time spent on a specific activity may or may not differ between sexes, depending on the activity. The age of individuals also affects time spent in particular activities. Answering questions regarding whether there were engendered differences in these activities in EBK society is in its early stages but evidence from dentition, for example, shows some tasks primarily undertaken by women, evidenced in tooth wear, with others undertaken by men (Alexandersen 1988). Given the age and sex spread, it is unlikely that the Strøby Egede individuals died during a gender-specific activity.

So why were the Strøby Egede individuals apparently arranged by sex? The obvious question relates to the infants, with no assigned sex independent of associated grave-goods. Binary arrangements are not uncommon in prehistory. Corded Ware and early Bronze Age cemeteries in central Europe typically placed individuals on their sides facing south, with females oriented to the east and males to the west (Strouhal 1978; Turek 2017). However, such arrangements are not typical of the Scandinavian Mesolithic (eg, Larsson 1988; Brinch Petersen 2015). Ethnographic evidence also shows clear-cut distinctions are not always the rule, even where some differences occur. For example, Inuit burials, though not clearly binary in burial orientation, show some male/female differences (Crass 2000). These examples illustrate that differentiation between sexes, and likely between genders, lies on a spectrum and a potentially fluid spectrum at that. The fact that the individuals were apparently arranged by sex, despite dying most probably in a non-gender specific cultural context, underscores that sex and gender were meaningful categories of social differentiation within this group, even in childhood.

CONCLUSION

The Strøby Egede burial is exceptional in Mesolithic Europe and has not been afforded the comprehensive treatment deserved. This paper centres on applying one of the latest techniques of sex determination for understanding the burial, while working within the preservation limitations at the site. If anything, the aggregate data underscore the complexity of the human culture at Strøby Egede. In this case knowing more shows how little we actually know. The very presence of conflicting lines of information shows that there are both concrete differences in treatment of individuals based on sex but lack of engendered grave-goods for all cases, showing that the relationship between gender, sex, status, kin relationships, and age is not clear-cut. This is to be expected because these relationships largely encompass the breadth of inter-group social differentiation in human cultures (Sorokin 1968).

If anything, the eight individuals placed within the grave show the diversity of EBK methods of intra-group social differentiation and extend the diversity of burial practice found in the EBK and, to a degree, in the preceding Kongemose (Meiklejohn *et al.* 1998). They also show the nested hierarchy of social differentiation seen in other forms of material culture across the Ertebølle (eg, Vang Petersen 1984; Jennbert 2011) extended to the day-to-day social interactions within individual residential groups. This underscores the fact that simple bifurcation of social roles, as evidenced by grave-goods, does little to advance our understanding of what is an alien social milieu. It is only through interdisciplinary considerations of the possibilities that human cultural complexity can be recognised.

Acknowledgements Funding for this research was provided by the Leverhulme Trust (Grant RPG RPG-2019-253). Work on the Strøby Egede material by Christopher Meiklejohn occurred during work with the Vedbæk Project, directed by Erik Brinch Petersen, with funding from 1987 to 1999 supported by a series of research grants from the Social Sciences and Humanities Research Council of Canada (SSHRCC). Support for Jeffrey Wyman fell within these grants to CM. CM would like to thank Erik Brinch Petersen and Niels Lynnerup for assistance in checking details during the writing of this paper. Lastly, thanks are owed to Kristen Hopper for help with the map.

SUPPLEMENTARY MATERIAL

To view supplementary material for this article, please visit https://doi.org/10.1017/ppr.2022.7

NOTES

[1]Strøby Egede was not included as it had not been directly dated.
[2]We were tempted to refer to this site as unique to Mesolithic Europe. However, that is probably not appropriate, given the case of Dudka in north-east Poland (Guminski & Bugajska 2016). Previously reported as 18 graves and 79 individuals, this has been

recently raised to 27 graves with 114 individuals (Bugajska 2020). Graves with seven (VI-2), eight (VI-13), and 11 individuals (VI-4 and VI-16) have been reported (Guminski & Bugajska 2016, appx, 506–7).

[3]We note that 'close relationship' is culturally defined. In groups where cross-cousins are seen as ideal marriage partners, parallel-cousins are often in a category viewed as incestual, even though the genetic distances are identical in both.

[4]The full name is Henriksholm-Bøgebakken, based on the names of the original promontory where the site was located (Bøgebakken) and the estate on which it lay (Henriksholm) (Brinch Petersen 2015). The term Vedbæk, in an archaeological framework, refers to the fjord system on which Bøgebakken originally stood, and the modern bog that filled the ancient fjord when mapped in the 18th century. Work since 1974 has found over 40 Mesolithic sites on the fjord.

[5]This individual has not been studied by any of us and is not further discussed here.

[6]Condition identifiers follow Newell *et al.* (1979, 23); intact (i), damaged (d), fragmentary (f) and very fragmentary (ff).

[7]Standard formatting uses capital letters for permanent teeth (I, C, PM, M) and small letters for deciduous (milk) teeth (i, c, m).

[8]Though sometimes noted in later literature as newborn (*nyfødt*), the term in Brinch Petersen (1990a, 22) is infant (*spædbørn*).

[9]It should be noted that the lesion in Gøngehusvej 7 CÆ was also healed.

BIBLIOGRAPHY

Aaris-Sørensen, K. 1999. The Holocene history of the Scandinavian aurochs (*Bos prinigenius* Bojanus, 1827). *Wissenschaftliche Schriften des Neanderthal Museums* 1, 49–57

Albrethsen, S.E. & Brinch Petersen, E. 1977. Excavation of a Mesolithic cemetery at Vedbæk, Denmark. *Acta Archaeologica* 47, 1–28

Alexandersen, V. 1979. Beskrivelse af et barn – ud fra 23 tænder. *Søllerødbogen* 1979, 30–9

Alexandersen, V. 1988. The late-Mesolithic dentition in southern Scandinavia. *Rivista di Antropologia Supplement* 56, 191–204

Alexandersen, V.A., Meiklejohn, C. & Brinch Petersen, E. 1999. Nivågård-barnet. *Hørsholm Egns Museum Årbog* 1998, 22–8

Ammitzbøll, T., Ry Andersen, S., Andersson, H.P., Bodenhoff, J., Eiken, M., Eriksen, B., Foged, N., Ghisler, M., Gotfredsen, A., Hansen, H.E., Hart Hansen, J.P., Jakobsen, J., Jørgensen, J.B., Kobayasi, T., Kromann, N., Lyberth, K.J., Lyneborg, L., Mikkelsen, F., Møhl, J., Møller, R., Myhre, J., Pedersen, P.O., Prause, J.U., Sebbesen, O., Svejgaard, E., Thompson, D.D., Frølund Thomsen, V. & Vanggaard, L. 1991. The people. In Hart Hansen *et al.* (eds) 1991, 65–101

Andersen, S.H. 1987. Mesolithic dug-outs and paddles from Tybrind Vig, Denmark. *Acta Archaeologica* 57, 87–106

Andersen, S.H. 2007. Shell middens ('køkkenmøddinger') in Danish prehistory as a reflection of the marine environment. In N. Milner, O.E. Craig & G.N. Bailey (eds), *Shell Middens in Atlantic Europe*, 31–45. Oxford: Oxbow Books

Andreasen, C., Gulløv, H.C., Hart Hansen, J.P., Lyberth, J. & Tauber, H. 1991. The find. In Hart Hansen *et al.* (eds) 1991, 38–52

Backer, L.C., Fleming, L.E., Rowan, A.D. & Baden, D.G. 2003. Epidemiology, public health and human diseases associated with harmful marine algae. In G.M. Hallegraeff, D.M. Anderson & A.D. Cembella (eds), *Manual on Harmful Marine Microalgae*, 723–49. Paris: UNESCO

Bailey, G., Andersen, S.H. & Maarleveld, T.J. 2020. Denmark: Coastal landscapes submerged. In G. Bailey, N. Galanidou, H. Peeters, H. Jöns & M. Mennenga (eds), *The Archaeology of Europe's Drowned Landscapes*, 39–76. Cham: Springer Open

Binford, L.R. 2001. *Constructing Frames of Reference*. Berkeley CA: University of California Press

Blake, J.B. 1953. Smallpox inoculation in colonial Boston. *Journal of the History of Medicine and Allied Sciences* 8, 284–300

Borić, D. & Stefanović, S. 2004. Birth and death: Infant burials from Vlasac and Lepenski Vir. *Antiquity* 78, 526–46

Brinch Petersen, E. 1979. Kvindernes smykker. In Brinch Petersen *et al.* (eds) 1979, 39–56

Brinch Petersen, E. 1987. Otte personer i samme grave – fra jægerstenalderen. *Nyt fra Nationalmuseet* 34, 2–3

Brinch Petersen, E. 1988. Ein Mesolithisches grab mit acht personen von Strøby Egede, Seeland. *Archäologisches Korrespondenzblatt* 18, 121–5

Brinch Petersen, E. 1990a. Nye grave fra jægerstenalderen: Strøby Egede og Vedbæk. *Nationalmuseets Arbejdsmark* 1990, 19–33

Brinch Petersen, E. 1990b. Graven fra Strøby Egede. *Årbog for Køge Museum 1983–89*, 5–16

Brinch Petersen, E. 2015. Diversity of Mesolithic Vedbæk. *Acta Archaeologica* 86, 1–202

Brinch Petersen, E., Alexandersen, V. & Meiklejohn, C. 1993. Vedbæk, graven midt i byen. *Nationalmuseets Arbejdsmark* 1993, 61–9

Brinch Petersen, E., Alexandersen, V., Vang Petersen, P. & Christensen, C. 1979. Vedbækprojektet: Ny og gammel forskning. *Søllerødbogen* 1979, 21–97

Bugajska, K. 2020. One by one. A case study of the multiple grave VI-2 at Dudka cemetery, Masuria, NE-Poland. Unpublished poster for session Death and the Dead. Tenth International Conference on the Mesolithic in Europe, Toulouse

Burch, E.S., Jr & Correll, T.C. 1972. Alliance and conflict: inter-regional relations in north Alaska. In D.L. Guemple (ed.), *Alliance in Eskimo Society*, 17–39. *Proceedings of the American Ethnological Society* 1971, Supplement

Burrell, S., Gunnarsson, T., Gunnarsson, K., Clarke, D. & Turner, A.D. 2013. First detection of paralytic shellfish poisoning (PSP) toxins in Icelandic mussels (*Mytilus edulis*): Links to causative phytoplankton species. *Food Control* 31, 295–301

Campbell, J. 1983. Smallpox in Aboriginal Australia, 1829–1831. *Historical Studies* 20, 536–56

https://doi.org/10.1017/ppr.2022.7 Published online by Cambridge University Press

Christensen, C. 1995. The littorina transgressions in Denmark. In A. Fischer (ed.), *Man and Sea in the Mesolithic: coastal settlements above and below present sea level*, 15–22. Oxford: Oxbow Books

Clark, G.A. & Neeley, M. 1987. Social differentiation in European Mesolithic burial data. In P. Rowley-Conwy, M. Zvelebil & H.P. Blankholm (eds), *Mesolithic Northwest Europe: recent trends*, 121–7. Sheffield: John R. Collis

Crass, B. 2000. Gender in Inuit burial practices. In A.E. Rautman (ed.), *Reading the Body: representations and remains in the archaeological record*, 68–76. Philadelphia PA: University of Pennsylvania Press

Crosby, A.W. 1976. Virgin soil epidemics as a factor in the aboriginal depopulation in America. *William and Mary Quarterly* 33, 289–99

Deaux, K. 1985. Sex and gender. *Annual Review of Psychology* 36, 49–81

Dembek, Z.F., Smith, L.A. & Rusnak, J.M. 2007. Botulism: cause, effects, diagnosis, clinical and laboratory identification, and treatment modalities. *Disaster Medicine and Public Health Preparedness* 1, 122–34

Dolman, C.E. 1960. Type E botulism: a hazard of the north. *Arctic* 13, 230–56

Drucker, P. 1950. *Culture Element Distributions: XXVI, Northwest Coast*. Berkeley CA: Anthropological Records 9 (3)

Dyke, B. & MacCluer J.W. (eds). 1973. *Computer Simulations in Human Population Studies*. New York: Academic Press

Eerkens, J.W. & Lipo, C.P. 2005. Cultural transmission, copying errors, and the generation of variation in material culture and the archaeological record. *Journal of Anthropological Archaeology* 24, 316–34

Eriksson, G. & Lidén, K. 2002. Mammalian stable isotope ecology in a Mesolithic lagoon at Skateholm. *Journal of Nordic Archaeological Science* 13, 5–10

Fahlander, F. 2012. Mesolithic childhoods: changing life-courses of young hunter-fishers in the Stone Age of southern Scandinavia. *Childhood in the Past* 5, 20–34

Ferembach, D. 1974. *Le gisement Mésolithique de Moita do Sebastião, Muge, Portugal. II Anthropologie*. Lisboa: Instituto de Alta Cultura

Fischer, A. 1982. Trade in Danubian shaft-hole axes and the introduction of Neolithic economy in Denmark. *Journal of Danish Archaeology* 1, 7–12

Fitzhugh, B., Phillips, S.C. & Gjesfjeld, E. 2011. Modeling hunter-gatherer information networks: an archaeological case study from the Kuril Islands. In R. Whallon, W. Lovis & R. Hitchcock (eds), *The Role of Information in Hunter-gatherer Band Adaptations*, 85–115. Los Angeles CA: Costen Institute of Archaeology

Fleischer, N.L., Melstrom, P., Yard, E., Brubaker, M. & Thomas, T. 2013. The epidemiology of falling-through-the-ice in Alaska, 1990–2010. *Journal of Public Health* 36, 235–42

Fontanals-Coll, M., Subirá, M.A., Marín-Moratalla, N., Ruiz Ventura, J. & Gibaja Bao, J.F. 2014. From Sado Valley to Europe: Mesolithic dietary practices through different geographic distributions. *Journal of Archaeological Science* 50, 539–50

GBD (Diarrhoeal Disease Collaborators 2016). 2018. Estimates of the global, regional, and national morbidity, mortality, and aetiologies of diarrhoea in 195 countries: a systematic analysis for the global burden of disease study 2016. *Lancet Infectious Diseases* 18, 1211–28

Gilbert, M.T.P., Djurhuus, D., Melchior, L., Lynnerup, N., Worobey, M., Wilson, A.S., Andreasen, C. & Dissing, J. 2007. mtDNA from hair and nail clarifies the genetic relationship of the 15th century Qilakitsoq Inuit Mummies. *American Journal of Physical Anthropology* 133, 847–53

Goldstein, L.G. 1981. One-dimensional archaeology and multi-dimensional people: spatial organization and mortuary analysis. In R. Chapman, I. Kinnes & K. Randsborg (eds), *The Archaeology of Death*, 53–70. Cambridge: Cambridge University Press

Gracey, M. 1992. Diarrhoea in Australian Aborigines. *Australian Journal of Public Health* 16, 216–25

Grøn, O. 2020. Late Mesolithic marine territoriality in coastal southern Scandinavia. *Archäologische Informationen* 43, 277–88

Gron, K.J. & Rowley-Conwy, P. 2018. Environmental archaeology in southern Scandinavia. In E. Piskin, A. Marciniak & M. Barkowiak (eds), *Environmental Archaeology – Current Theoretical and Methodological Stances*, 35–74. New York: Springer

Grünberg, J.M., Gramsch, B., Larsson, L., Orschiedt, J. & Meller, H. (eds) 2016. *Mesolithic Burials – Rites, Symbols and Social Organisation of Early Postglacial Communities*. Halle: *Tagungen des Landesmuseums für Vorgeschichte Halle/Congresses of the State Museum for Prehistory* 13(2)

Guignard, F.P. 2015. A gendered bun in the oven. The gender-reveal party as a new ritualization during pregnancy. *Studies in Religion/Sciences Religieuses* 44, 479–500

Guminski, W. & Bugajska, K. 2016. Exception as a rule. Unusual Mesolithic cemetery and other graves at Dudka and Szczepanki, Masuria, Poland. In Grünberg *et al.* (eds) 2016, 465–510

Gurven, M. & Kaplan, H. 2007. Longevity among hunter-gatherers: A cross-cultural examination. *Population and Development Review* 33, 321–65

Hallgren, F. 2004. The introduction of ceramic technology around the Baltic Sea in the 6th millennium. In H. Knutsson (ed.), *Coast to Coast – Arrival: results and reflections: proceedings of the final coast to coast conference, 1–5 October 2002 in Falköping, Sweden*, 123–42. Uppsala: Department of Archaeology and Ancient History, Uppsala University

Hamborsky, J., Kroger, A. & Wolfe, C. 2015. *Epidemiology and Prevention of Vaccine-preventable Diseases*. Atlanta GA: Centers for Disease Control and Prevention

Hansen, K. 2008. *Nuussuarmiut – Hunting Families on the Big Headland*. Copenhagen: Meddelelser om Grønland – Man & Society 35

Harkness, S. & Super, C.M. 1985. The cultural context of gender segregation in children's peer groups. *Child Development* 56, 219–24

https://doi.org/10.1017/ppr.2022.7 Published online by Cambridge University Press

Hart Hansen, J., Meldgaard, J. & Nordqvist, J. (eds). 1991. *The Greenland Mummies*. London: British Museum

Hewlett, B.S. 1991. Demography and childcare in preindustrial societies. *Journal of Anthropological Research* 47, 1–37

Hewlett, B.S. 2014. Hunter-gatherer childhoods in the Congo Basin. In B.S. Hewlett (ed.), *Hunter-gatherers of the Congo Basin: Cultures, histories and biology of African Pygmies*, 245–75. New Brunswick NJ: Transaction Publishers

Hewlett, B.S., Lamb, M.E., Leyendecker, B. & Schölmerich, A. 2000. Internal working models, trust, and sharing among foragers. *Current Anthropology* 41, 287–97

Hill, K., Hurtado, A.M. & Walker, R.S. 2007. High adult mortality among Hiwi hunter-gatherers: implications for human evolution. *Journal of Human Evolution* 52, 443–54

Hill, K.R., Walker, R.S., Božičević, M., Eder, J., Headland, T., Hewlett, B., Hurtado, A.M., Marlowe, F., Wiessner, P. & Wood, B. 2011. Co-residence patterns in hunter-gatherer societies show unique human social structure. *Science* 331, 1286–9

Inhorn, M.C. & Brown, P.J. 1990. The anthropology of infectious disease. *Annual Review of Anthropology* 19, 89–117

Jacobs, K. 1995. Returning to Oleni' ostrov: social, economic and skeletal dimensions of a boreal forest Mesolithic cemetery. *Journal of Anthropological Archaeology* 14, 359–403

Jennbert, K. 2011. Ertebølle pottery in southern Sweden – a question of handicraft, networks and creolisation in a period of neolithisation. *Bericht der Römisch-Germanischen Kommission* 89, 89–110

Jensen, B.B. & Hahnemann, F. 1959. Botulism. 2 outbreaks in similar source. *Ugeskrift for Læger* 121, 1363–8

Johansen, K.L. 2006. Settlement and land use at the Mesolithic–Neolithic transition in southern Scandinavia. *Journal of Danish Archaeology* 14, 203–25

Johnson, A. 1975. Time allocation in a Machiguenga community. *Ethnology* 14, 301–10

Johnston, F.E. & Snow, C.E. 1961. The reassessment of the age and sex of the Indian Knoll skeletal population: demographic and methodological aspects. *American Journal of Physical Anthropology* 19: 237–44

Kannegaard, E. 2016. Late Mesolithic ochre graves at Nederst, Denmark: ochre rituals and customs of personal adornment. In Grünberg *et al.* (eds) 2016, 81–93

Kao, C.Y. 1993. Paralytic shellfish poisoning. In I.R. Falconer (ed.), *Algal Toxins in Seafood and Drinking Water*, 75–86. London: Academic Press

Keeley, L. 1996. *War Before Civilization*. Oxford: Oxford University Press

Kelly, R.L. 2013. *The Lifeways of Hunter-Gatherers: The Foraging Spectrum*. Cambridge: Cambridge University Press

Larsson, L. 1988. *The Skateholm Project. 1, Man and Environment*. Stockholm: Almqvist & Wiksell

Layton, R., O'Hara, S. & Bilsborough, A. 2012. Antiquity and social functions of multilevel social organization among human hunter-gatherers. *International Journal of Primatology* 33, 1215–45

Layton, R. & Rowley-Conwy, P. 2013. Wild things in the north? Hunter-gatherers and the tyranny of the colonial perspective. *Anthropologie* 51, 213–30

Lee, R.B. 1972. !Kung spatial organization: An ecological and historical perspective. *Human Ecology* 1, 125–47

Lew-Levy, S., Lavi, N., Reckin, R., Cristóbal-Azkarate, J. & Ellis-Davies, K. 2018. How do hunter-gatherer children learn social and gender norms? A meta-ethnographic review. *Cross-Cultural Research* 52, 213–55

MacCluer, J.W. & Dyke, B. 1976. On the minimum size of endogamous populations. *Social Biology* 23(1), 1–12

Maccoby, E.E. 1988. Gender as a social category. *Developmental Psychology* 24, 755–65

Madsen, A.P., Müller, S., Neergård, C., Petersen, C., Rostrup, E., Steenstrup, K. & Winge, H. 1900. *Affaldsdynger fra Stenalderen i Danmark*. Copenhagen: Nationalmuseet

Mathiassen, T. 1943. *Stenalderbopladser i Åmosen*. Copenhagen: Nordiske Fortidsminder 3(3)

McCollum, J.P.K., Pearson, R.C.M., Ingham, H.R., Wood, P.C. & Dewar, H.A. 1968. An epidemic of mussel poisoning in north-east England. *The Lancet* 292, 767–70

Meiklejohn, C. 1977. Genetic differentiation and deme structure: considerations for an understanding of the Athapaskan/Algonkian continuum. In J.W. Helmer, S. van Dyke & F.J. Kense (eds), *Problems in the Prehistory of the North American Subarctic: the Athapaskan question*, 10–106. Calgary: University of Calgary Press

Meiklejohn, C. 1978. Ecological aspects of population size and growth in late-glacial and early postglacial North-Western Europe. In P.A. Mellars (ed.), *The Early Postglacial Settlement of Northern Europe: an ecological perspective*, 65–79. London: Duckworth

Meiklejohn, C., Brinch Petersen, E. & Alexandersen, V. 1998. The later Mesolithic population of Sjælland, Denmark, and the Neolithic transition. In M. Zvelebil, R. Dennell & L. Domańska (eds), *Harvesting the Sea, Farming the Forest*, 203–12. Sheffield: Sheffield Academic Press

Meiklejohn, C., Brinch Petersen, E. & Alexandersen, V. 2000. The anthropology and archaeology of Mesolithic gender in the western Baltic. In M. Donald & L. Hurcombe (eds), *Gender and Material Culture in Archaeological Perspective*, 222–37. Gordonsville VA: Palgrave MacMillan

Meiklejohn, C., Babb, J. & Hiebert, W. 2016. A chrono-geographic look at Mesolithic burials: An initial study. In Grünberg *et al.* (eds) 2016, 25–45

Migliano, A.B., Page, A.E., Gómez-Gardeñes, J., Viguier, S., Dyble, M., Thompson, J., Chaudhary, N., Smith, D., Strods, J., Mace, R., Thomas, M.G., Latora, V. & Vinicius, L. 2017. Characterization of hunter-gatherer networks and implications for cumulative culture. *Nature Human Behaviour* 1, 0043 [https://doi.org/10.1038/s41562-016-0043]

Morris, I. 1991. The archaeology of ancestors: The Saxe-Goldstein hypothesis revisited. *Cambridge Archaeological Journal* 1, 147–69

Moss, M.L. 1993. Shellfish, gender, and status on the Northwest Coast: Reconciling archaeological, ethnographic, and ethnohistorical records of the Tlingit. *American Anthropologist* 95, 631–52

Munroe, R.H., Munroe, R.L., Michelson, C., Koel, A., Bolton, R. & Bolton, C. 1983. Time allocation in four societies. *Ethnology* 22(4), 355–70

Newell R.R., Constandse-Westermann, T.S. & Meiklejohn, C. (1979) The skeletal remains of Mesolithic man in Western Europe: an evaluative catalogue. *Journal of Human Evolution* 8(1), 1–228 + v.

Orschiedt, J., Häußer, A., Haidle, M.N., Alt, K.W. & Buitrago-Téllez, C.H. 2003. Survival of a multiple skull trauma: The case of an Early Neolithic individual from the LBK enclosure at Herxheim (Southwest Germany). *International Journal of Osteoarchaeology* 13, 375–83

O'Shea, J. & Zvelebil, M. 1984. Oleneostrovski mogilnik: reconstructing the social and economic organization of prehistoric foragers in Northern Russia. *Journal of Anthropological Archaeology* 3, 1–40

Paludan-Müller, K. 1978. High Atlantic food gathering in northwestern Zealand: Ecological conditions and spatial representation. *New Directions in Scandinavian Archaeology* 1, 120–57

Parent, A.-S., Teilmann, G., Juul, A., Skakkebaek, N.E., Toppari, J. & Bourguignon, J.-P. 2003. The timing of normal puberty and the age limits of sexual precocity: variations around the world, secular trends, and changes after migration. *Endocrine Reviews* 24, 668–93

Parnell, I.W. 1934. Animal parasites of north-east Canada. *Canadian Field-Naturalist* 48, 111–5

Płonka, T. 2021. Human representations in the Late Palaeolithic and Mesolithic art of north-western Europe. *Quaternary International* 573, 92–103

Prakash, A., Medcof, J.C. & Tennant, A.D. 1971. Paralytic shellfish poisoning in eastern Canada. Ottawa: *Bulletins of the Fisheries Research Board of Canada* 177

Price, T.D. & Gebauer, A.B. (eds) 2005. *Smakkerup Huse: A late Mesolithic coastal site in northwest Zealand, Denmark*. Aarhus: Aarhus University Press

Price, T.D., Ambrose, S.H., Bennike, P., Heinemeier, J., Noe-Nygaard, N., Brinch Petersen, E., Vang Petersen, P. & Richards, M.P. 2007. New information on the Stone Age graves at Dragsholm, Denmark. *Acta Archaeologica* 78, 193–219

Rascovan, N., Sjögren, K.-G., Kristiansen, K., Nielsen, R., Willerslev, E., Desnues, C. & Rasmussen, S. 2019. Emergence and spread of basal lineages of *Yersinia pestis* during the Neolithic decline. *Cell* 176, 295–305

Rodrigue, D.C., Etzel, R.A., Hall, S., De Porras, E., Velasquez, O.H., Tauxe, R.V., Kilbourne, E.M. & Blake, P.A. 1990. Lethal paralytic shellfish poisoning in Guatemala. *American Journal of Tropical Medicine and Hygiene* 42, 267–71

Rowley-Conwy, P. 1983. Sedentary hunters: the Ertebølle example. In G. Bailey (ed.), *Hunter-gatherer Economy in Prehistory*, 111–26. Cambridge: Cambridge University Press

Saxe, A.A. 1970. Social dimensions of mortuary practices. Unpublished PhD thesis, University of Michigan

Schmidt, R.A. 2005. The contribution of gender to personal identity in the southern Scandinavian Mesolithic. In E.C. Casella & C. Fowler (eds), *The Archaeology of Plural and Changing Identities: beyond identification*, 79–108. New York: Kluwer Academic/Plenum Publishers

Schroeder, H., Margaryan, A., Szmyt, M., Theulot, B., Włodarczak, P., Rasmussen, S., Gopalakrishnan, S., Szczepanek, A., Knopka, T., Jensen, T.Z.T., Witkowska, B., Wilk, S., Przybyła, M.M., Pospieszny, Ł., Sjögren, K.-G., Belka, Z., Olsen, J., Kristiansen, K., Willerslev, E., Frei, K.M., Sikora, M., Johannsen, N.N. & Allentoft, M.E. 2019. Unravelling ancestry, kinship, and violence in a Late Neolithic mass grave. *Proceedings of the National Academy of Sciences* 116, 10705–10

Shapiro, J. 1981. Anthropology and the study of gender. *Soundings: An Interdisciplinary Journal* 64, 446–65

Sørensen, L. 2015. Hunters and farmers in the north – the transformation of pottery traditions and the distribution patterns of key artefacts during the Mesolithic and Neolithic transition in southern Scandinavia. In J. Kabaciński, S. Hartz, D.C.M. Raemaekers & T. Terberger (eds), *The Dąbki Site in Pomerania and the Neolithization of the North European Lowlands (c. 5000–3000 cal BC)*, 385–432. Rahden/Westfalia: Marie Leidorf.

Sørensen, S.A. 2007. Limhamn axes in Denmark. In B. Hårdh, K. Jennbert & D. Olausson (eds), *On the Road: studies in honour of Lars Larsson*, 184–7. Stockholm: Almqvist & Wiksell

Sorokin, P.A. 1968. Social differentiation. In D.L. Stills (ed.), *International Encyclopedia of the Social Sciences*, 406–9. New York: Macmillan

Stefánsson, V. 1913. *My Life with the Eskimo*. New York: Macmillan

Stewart, N.A., Gerlach, R.F., Gowland, R.L., Gron, K.J. & Montgomery, J. 2017. Sex determination of human remains from peptides in tooth enamel. *Proceedings of the National Academy of Sciences* 114, 13649–54

Strelkov, P., Katolikova, M. & Väinolä, R. 2017. Temporal change of the Baltic Sea–North Sea blue mussel hybrid zone over two decades. *Marine Biology* 164 (214) [https://doi.org/10.1007/s00227-017-3249-z]

Strouhal, E. 1978. Demography of the early Bronze Age cemetery at Výčapy-Opatovce (southwest Slovakia). *Anthropology* 16, 131–5

Terberger, T., Kotula, A., Jungklaus, B. & Piezonka, H. 2021. The Mesolithic 'multiple burial' of Gross Fredenwalde revisited. In S. Gaudzinski-Windheuser & O. Jöris (eds), *The Beef Behind all Possible Pasts. The Tandem-Festschrift in Honour of Elaine Turner and Martin Street*, 671–88. Mainz: Monographien des RGZM 157

te Velde, E.R. & Pearson, P.L. 2002. The variability of female reproductive ageing. *Human Reproduction Update* 8, 141–54

Troels-Smith, J. 1967. The Ertebølle Culture and its background. *Palaeohistoria* 12, 505–28

https://doi.org/10.1017/ppr.2022.7 Published online by Cambridge University Press

Turek, J. 2017. Sex, transsexuality and archaeological perception of gender identities. *Archaeologies: Journal of the World Archaeological Congress* 12, 340–58
Turnbull, C.M. 1972. The demography of small scale societies. In G.A. Harrison & A.J. Boyce (eds), *The Structure of Human Populations*, 283–312. Oxford: Clarendon Press
Vang Petersen, P. 1984. Chronological and regional variation in the Late Mesolithic of Eastern Denmark. *Journal of Danish Archaeology* 3, 7–18
Vang Petersen, P. 2001. Grisby-en fangstboplads fra Ertebølletid på Bornholm. In O.L Jensen, S.A. Sørensen & K.M. Hansen (eds), *Danmarks Jægerstenalder-Status og Perspektiver*, 161–74. Hørsholm: Hørsholm Egns Museum
Volk, A.A. & Atkinson, J.A. 2013. Infant and child death in the human environment of evolutionary adaptation. *Evolution and Human Behavior* 34, 182–92
Weiss, R.A. 2001. The Leeuwenhoek lecture 2001. Animal origins of human infectious disease. *Philosophical Transactions of the Royal Society* B356, 957–77
Wirsing, R.L., Logan, M.H., Micozzi, M.S., Nyamwaya, D.O., Pearce, T.O., Renshaw, D.C. & Schaefer, O. 1985. The health of traditional societies and the effects of acculturation [and comments and replies]. *Current Anthropology* 26, 303–22
Wobst, M. (1976) Locational relationships in Palaeolithic society. *Journal of Human Evolution* 5, 49–58
Wood, R.E., Higham, T.F.G., Buzilhova, A., Suvorov, A., Heinemeier, J. & Olsen, J. 2013. Freshwater radiocarbon reservoir effects at the burial ground of Minino, Northwest Russia. *Radiocarbon* 55, 163–77
Woodburn, J. 1980. Hunters and gatherers today and reconstruction of the past. In A. Gellner (ed.), *Soviet and Western Anthropology*, 95–117. New York: Columbia University Press.
Woodburn, J. 1982. Egalitarian societies. *Man* 17, 431–51.

RÉSUMÉ

Sexe et genre au Mésolithique: adultes et enfants de la sépulture de Strøby Egede, Køge Bugt, Danemark, par Kurt J. Gron, Christopher Meiklejohn, Kristoffer Buck Pedersen, Nicolas A. Stewart, Verner Alexandersen, Lasse Sørensen et Janet Montgomery

Au cours de l'été 1986, une fosse commune a été découvert sur la rive de la rivière Tryggevælde Å, à l'endroit où elle se jette dans Køge Bugt, la baie située au sud de l'actuelle Copenhague au Danemark. Les restes humains, datant de la culture d'Ertebølle du Mésolithique final, se composaient de huit individus d'âges divers, allant d'individus de *c.* 35–45 ans à des nouveau-nés. Quatre étaient disposés d'un côté de la tombe, et quatre de l'autre, placés tête-bêche. La façon dont ils étaient apparentés et ce qui leur est arrivé est un mystère. Dans cet article, nous présentons pour la première fois une évaluation bioarchéologique de ces individus et appliquons une analyse basée sur le mordançage à l'acide des peptides de l'émail dentaire liés au chromosome sexuel dimorphe pour confirmer leur sexe biologique. Nos résultats permettent d'établir un lien direct entre le traitement genré des sépultures et le sexe biologique chez des individus non adultes âgés d'environ 4 ans. Nous concluons par une discussion des circonstances possibles de leur mort et de leurs relations éventuelles les unes avec les autres.

ZUSAMMENFASSUNG

Geschlecht und Gender im Mesolithikum: Erwachsene und Kinder der Bestattung von Strøby Egede, Køge Bugt, Dänemark, von Kurt J. Gron, Christopher Meiklejohn, Kristoffer Buck Pedersen, Nicolas A. Stewart, Verner Alexandersen, Lasse Sørensen und Janet Montgomery

An der Einmündung des Flusses Tryggevælde Å in die Køge Bugt, die Bucht südlich des heutigen Kopenhagen, Dänemark, wurde im Sommer 1986 ein Massengrab entdeckt. Die menschlichen Überreste datieren in die spätmesolithische Ertebølle-Kultur und umfassen acht Individuen verschiedenen Alters in der Spanne von *c.* 35–45 Jahren bis zu Neugeborenen. Vier Individuen lagen an der einen Seite des Grabes, die vier anderen an der anderen Seite, Kopf an Fuß. Wie ihre sozialen Beziehungen waren und was mit ihnen geschehen war, bleibt rätselhaft. In diesem Beitrag legen wir erstmals eine bioarchäologische Untersuchung dieser Individuen aufgrund von geschlechtsdimorphen Peptiden im Zahnschmelz vor, die durch Säureätzung gewonnen werden, um das biologische Geschlecht zu bestimmen. Unsere Ergebnisse ermöglichen es, eine direkte Verbindung zu ziehen zwischen genderbasierter Grabbehandlung und biologischem Geschlecht für nicht-adulte Individuen ab einem Alter von *c.* 4 Jahren. Wir beschließen den Beitrag mit einer Diskussion der möglichen Todesumstände und den möglichen Beziehungen der Individuen zueinander.

https://doi.org/10.1017/ppr.2022.7 Published online by Cambridge University Press

RESUMEN

Sexo y género en el Mesolítico: adultos y niños del enterramiento de Strøby Egede, *Køge Bugt*, *Dinamarca*, por Kurt J. Gron, Christopher Meiklejohn, Kristoffer Buck Pedersen, Nicolas A. Stewart, Verner Alexandersen, Lasse Sørensen y Janet Montgomery

En el verano de 1986 se descubrió una fosa común a lo largo de la orilla del río Tryggevælde Å que desemboca en Køge Bugt, la bahía al sur de la moderna Copenhague, Dinamarca. Los restos humanos, se adscriben a la cultura Ertebølle datada en el Mesolítico final, y pertenecen a ocho individuos de distintas edades, que van desde *c*. 35–45 años hasta niños recién nacidos. Cuatro de ellos estaban dispuestos a un lado de la tumba, con los otros cuatro organizados en el lado opuesto, colocados de pies a cabeza. Cómo estaban relacionados y qué les sucedió es una incógnita. En este estudio, presentamos, por primera vez, una evaluación bioarqueológica de estos individuos y aplicamos un análisis de péptidos del esmalte dental ligado a los cromosomas sexuales dimórficos para confirmar su sexo biológico. Nuestros resultados permiten establecer una conexión directa entre el tratamiento funerario y el sexo biológico en individuos no adultos en torno a los 4 años de edad. Concluimos con una discusión de las posibles circunstancias de su muerte y las posibles relaciones entre ellos.

https://doi.org/10.1017/ppr.2022.7 Published online by Cambridge University Press