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The stone cist conundrum: A multidisciplinary approach to investigate Late Neolithic/Early Bronze Age population demography on the island of Gotland

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ABSTRACT

The Late Neolithic period in Scandinavia [LN, c. 2350–1700 cal BCE] marks a time of considerable changes in settlement patterns, economy, and material culture. This shift also lays the foundation for the demographic developments in the Early Bronze Age [EBA, c. 1700–1100 cal BCE]. However, little is presently known regarding the developments from these time-periods on the island of Gotland in the Baltic Sea. During the Middle Neolithic period [MN, c. 3300–2350 cal BCE], Gotland was inhabited by groups associated with the Funnel Beaker culture [TRB, c. 4000–2700 cal BCE], and the sub-Neolithic Pitted Ware culture [PWC, c. 3300–2300 cal BCE]. Some indications of connections with the Battle Axe/Corded Ware cultures [BAC/CWC, c. 2800–2300 cal BCE] have also been found, but no typical BAC/CWC burials have been located on the island to date.

Here, we investigate the chronological and internal relationship of twenty-three individuals buried in four LN/EBA stone cist burials; Häffinds, Hägur, Suderkvie, and Utalskog on Gotland. We present eleven mitochondrial genomes [from 23 X to 1271 X coverage], and twenty-three new radiocarbon dates, as well as stable isotope data for diet. We examine the local Sr-baseline range for Gotland, and present new Sr-data to discuss mobility patterns of the individuals. The genetic results are compared and discussed in light of earlier cultural periods from Gotland [TRB and PWC], and CWC from the European continent, as well as contemporaneous LN secondary burials in the MN Ansarve dolmen.

We find that all burials were used into the EBA, but only two of the cists showed activity already during the LN. We also see some mobility to Gotland during the LN/EBA period based on Strontium and mitochondrial data. We see a shift in the dietary pattern compared to the preceding period on the island [TRB and PWC], and the two LN individuals from the Ansarve dolmen exhibited different dietary and mobility patterns compared to the individuals from the LN/EBA stone cist burials. We find that most of the cist burials were used by individuals local to the area of the burials, with the exception of the large LN/EBA Häffinds cist burial which showed higher levels of mobility.

Our modeling of ancestral mitochondrial contribution from chronologically older individuals recovered in the cultural contexts of TRB, PWC and CWC show that the best model is a 55/45 mix of CWC and TRB individuals. A 3-way model with a slight influx from PWC [5%] also had a good fit. This is difficult to reconcile with the current archaeological evidence on the island. We suggest that the maternal CWC/TRB contribution we see in the local LN/EBA individuals derives from migrants after the Scandinavian MN period, which possible also admixed with smaller local groups connected with the PWC. Further genomic analyses of these groups on Gotland will help to clarify the demographic history during the MN to EBA time periods.

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1. Introduction

The island of Gotland was first populated around c. 7200 cal BCE by Mesolithic hunter-gatherers [HG's] (Fig. 1A) (Apel et al., 2018; Lindqvist and Possnert, 1999, 1997). During the Scandinavian Early- and Middle Neolithic periods [EN-MN] (Fig. 1B) there is evidence from the Funnel Beaker culture [Trichterbecherkultur, TRB], in form of settlement sites, pottery, and domesticated animal remains. As well as, at least one megalithic burial construction; the Ansarve dolmen which is the only confirmed TRB burial on the island to date (Fig. 2B) (e.g. Andersson, 2016; Bägerfeldt, 1992; Lindqvist, 1997; Lithberg, 1914; Österholm, 1989). New radiocarbon analyses of three previously dated (Lindqvist, 1997), plus fourteen additional individuals from the dolmen showed that this burial was used continuously from c. 3300 to 2700 cal BCE (3500–2580 cal BCE, 95% CI) (Fraser et al., 2018). These results make the starting point slightly later than previously estimated (Schulz Paulsson, 2017, 2010), but also extends the main period of usage with > 300 years. Two additional secondary burials during the Late Neolithic period [LN] were also identified (Fig. 1A) (Fraser et al., 2018).

Starting from c. 3200 cal BCE, during the beginning of the MN period, Gotland was also inhabited by sub-Neolithic groups from the Pitted Ware culture [PWC, c. 3300 to 2300 cal BCE] (Fig. 2B) (e.g. Janzon, 1974; Lithberg, 1914; Nihlén, 1927; Wallin, 2016; Wallin and Martinsson-Wallin, 2016; Österholm, 1989). Although, slightly older PWC dates are found in coastal eastern central Sweden (Björck, 2003). Recent genetic analyses of individuals from these contexts [TRB and PWC] from Gotland have shown that the PWC groups show genetic continuity with Mesolithic HG's, but with slight admixture from Neolithic farmers (Günther et al., 2018; Malmström et al., 2015, 2009; Skoglund et al., 2014, 2012). In contrast, the mitochondrial haplogroup composition in the TRB group from the dolmen (Fraser et al., 2018) was most similar to contemporaneous individuals from megalithic burials on the Swedish mainland (Malmström et al., 2015, 2009; Skoglund et al., 2014, 2012), and also showed maternal continuity with EN farmer groups from the continent. Thus, these two contemporaneous but culturally different groups [TRB and PWC] coexisted on the island of Gotland for half a millennium but still maintained their distinct cultural identities and economy (Fraser et al., 2018). The transition following these cultures on the island has remained largely unknown as TRB and PWC disappear from the archaeological record after c. 2700, and c. 2300 cal BCE, respectively.

The second part of the Scandinavian MN period [MNB] (Fig. 1B) marks the introduction and expansion of the Battle Axe culture, a local development of the pan-European Corded Ware culture [BAC/CWC, c. 2800–2300 cal BCE], in Scandinavia and the Baltic Sea area (e.g. Kriiska, 2003; Malmer, 1975). However, the same cultural transformation is not seen on Gotland as the typical hocker style inhumation burials, and/or cist burials, with BAC artefacts and pottery are absent. A few stray finds of battle axes and some BAC pottery have been found on the island (e.g. Andersson, 2016; Bägerfeldt, 1992; Janzon, 1974; Lithberg, 1914; Malmer, 1975; Rundkvist et al., 2004; Österholm, 1989), suggesting some presence of BAC, or connections with BAC populations on the mainland. Interestingly, the only burials associated with BAC artefacts on Gotland have been found within contemporaneous PWC cemeteries (e.g. Janzon, 1974; Malmer, 1962; Martinsson-Wallin et al., 2015). Moreover, even though secondary BAC reuse of MN megalithic tombs have been noticed in Scandinavia (e.g. Edenmo, 2008; Iversen, 2016; Malmer, 2002, 1975; Sjögren, 2003), no BAC artefacts or pottery has been found in the Ansarve dolmen on Gotland (Bägerfeldt, 1992). Thus, the demographic history and social interactions between the culturally distinct groups [TRB and PWC], as well as to which extent BAC/CWC was present on Gotland, is currently not understood (Fig. 1B). This also has significance for the understanding of the demographic development in the subsequent LN period.

The LN in Scandinavia marks a time with considerable changes in material culture patterns and lifeways. In Jutland, present day Denmark, there is evidence of Bell Beaker Culture [BBC] influence from around c. 2350 to 1950 cal BCE, based on single inhumation burials and settlement sites with BBC pottery and typical BBC stone artefacts (Apel, 2001; Vandkilde, 2005). A similar interpretation has been suggested for southwestern and coastal western Norway (e.g. Prescott and Glørstad, 2015). However, to date, no BBC pottery has been found on Gotland, and single inhumation burials are scarce during this time period. Even though some finds of typical shaft-hole axes and imported flint artefacts such as arrow heads, daggers and scrapers have been located in some LN graves, as well as loose stray finds across the island (e.g. Bägerfeldt, 1992; Wallin, 2010; Österholm, 1989). Their direct or indirect association with the BBC complex remains unknown, indicating the complexity of the LN transformations in different parts of Scandinavia.

A new type of communal megalithic burial is also introduced during this period in Scandinavia, the stone cist burials; a type of gallery grave which also is commonly found on Gotland. More than 1500 cist burials have been found in present day Sweden (Hyenstrand, 1979; Johansson, 1961), and although they are grouped into the same category there are local differences in shape and size (Heimann, 2000). On the Scandinavian mainland they tend to be large, often with several chambers, and sometimes with a gavel stone with a porthole (e.g. Stenberger, 1964; Stensköld, 2004; Vandkilde, 2005). While on Gotland the stone cist burials are smaller and consist mainly of a single rectangular cist [between 0.60 and 3.10 m × 0.35–1.50 m] (Lithberg, 1914; Luthander, 1988; Sjöstrand, 2012; Wallin, 2010). The smaller cist burials across Scandinavia have been suggested to be a continuation of the earlier individual BAC stone cist, or wood coffin burials, whereas the larger cist burials with portholes in western Sweden are similar to those found within the SOM-culture [Seine-Oise-Marne culture, c.

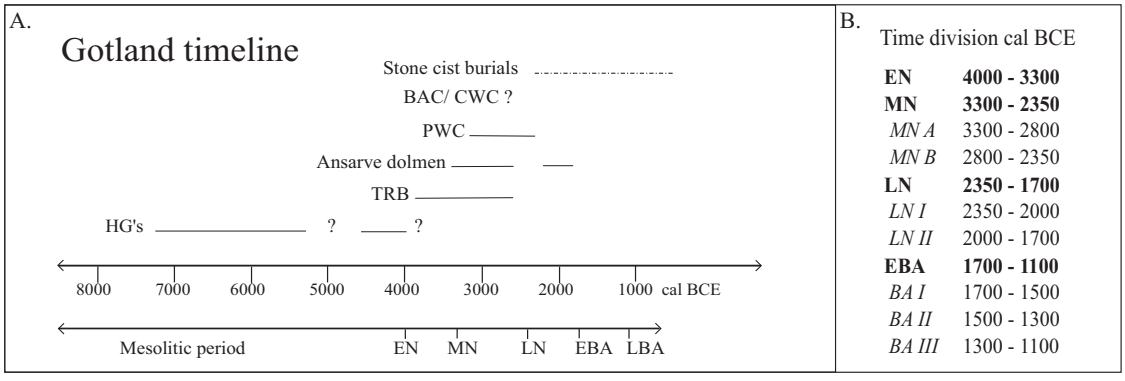

Fig. 1. A. Gotland cultural timelines (Apel et al., 2018; Fraser et al., 2018). B: Approximate dates for the Scandinavian Early Neolithic to Early Bronze Age time divisions; EN: onset of TRB, MN A: onset of PWC, MN B: onset of BAC, LN-EBA time division from Vankilde (1996).

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