





Groundbreakers

Human Remains and Radiocarbon Dates from the First Burials in Churchyards on Gotland

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Abstract

This paper presents osteological analyses and radiocarbon dates from human remains found in early churchyards on the Baltic island of Gotland. Graves from the first phases of burial have been discovered beside churches on Gotland on many occasions since the late nineteenth century, usually during preparations for new interments. Previous work has focused on the artefacts found with many of them, which suggest that the early churchyard dead were buried in costume closely resembling that worn in the last phases of the traditional grave fields. These finds have been a key source for research into the chronology and process of the Christianization of Gotland during the late Viking Age and early medieval period. Neglected, however, are the human remains which were sometimes recovered alongside the artefacts, but until now escaped research attention. Here we present analyses of the remains of 26 individuals recovered from Garda churchyard, with smaller numbers from Stånga, Havdhem and Fardhem. The results contribute osteological characterization of the early adopters of churchyard burial, along with new absolute dates for the establishment and use of the new Christian burial sites, and demonstrate that the practice of furnished burial was maintained in churchyards for an extended period.

Keywords: Christianization, bioarchaeology, osteology, Viking Age, Middle Ages, churchyard finds, radiocarbon, reservoir effects, early churches

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Introduction

Artefacts thought to belong to the first phase of burial in churchyards on Gotland have been recorded on numerous occasions since the late nineteenth century. Over the decades ‘churchyard finds’ (Sw. *kyrkogårdsfynd*) have become a well-recognized category in the island’s archaeological record (Thunmark-Nylén 1995:161; Westholm 1926). The artefacts, mainly dress accessories, show that many of those who were first to be placed beside churches went to their graves in full costume, in a manner better known from traditional grave fields elsewhere in the landscape (Thunmark-Nylén 1989, 1991, 1995; Trotzig 1969; Westholm 1926). In Scandinavia, furnished graves in churchyards are almost unique to Gotland and have been linked to influence from eastern European missions (Rundkvist 2003:75–83; Staecker 1997a, 1997b, 2001). The artefacts from the churchyards have been a key archaeological source for discussing the chronology and process of the island’s conversion to Christianity, especially the timing of the establishment of the first churches and the shift of burial to these new sites.

The bodily remains of the early adopters of churchyard burials have, however, been missing from the archaeological discussion. Although skeletal parts are mentioned alongside artefacts in many of the records of find incidents, it seems to have been assumed that these were not retrieved or stored. As this paper will demonstrate, this is far from the case: several boxes of skeletal material labelled as deriving from churchyard finds are housed in the Gotland Museum store in Visby and more have been accessioned by the Swedish History Museum in Stockholm. Until recently these would have represented an unpromising archaeological resource, as their contextual information is limited and the remains of each individual incomplete. However, the range of biomolecular analyses now regularly carried out on archaeological skeletal material greatly increases the information to be gained from even fragmentary and poorly documented remains, so that this collection is now an important source. Moreover, there is potential to link some of the skeletal material to specific find events through documentation, and much of it shows metal staining which associates it with the artefacts, providing indications of how objects were worn in the grave.

In this paper we bring forward this previously unstudied archaeological resource: the newly (re)discovered bodies of the first generations of Gotlanders buried beside churches. The aim is to broaden discussion of the Christianization of Gotland by characterizing and dating the human skeletal remains. In particular, we investigate the timing of the introduction of churchyard burial and ask how long furnished burial lasted in ecclesiastical settings.

First, we present an overview of the background of the churchyard finds and current knowledge of the chronology and process of the establishment of early churches on Gotland, with a focus on how the artefact finds have contributed to questions about the shift of burial location. Then we present the first osteological characterization of the early adopters of churchyard burial, in terms of their age, sex and health status, along with indications of activity patterns in life and costume worn in death. In total, 26 individuals from the churchyard at Garda are analysed, together with three from Stånga, two from Fardhem and one from Havdhem. Next, radiocarbon results from 31 individuals are set out, providing new information on the timing of the shift of funerary practice to churchyards and how long artefacts continued to be placed with the dead. In the closing section we discuss what is now known about the nature of the first churchyard burials and place the new dates against the wider historical and archaeological picture of the chronology and development of churchyard burial on Gotland.

History of discovery and interpretation

Most of the churchyard finds came to light through the digging of graves in the late nineteenth to mid-twentieth centuries. During the first phases of burial around churches, interments seem to have fully encircled early wooden churches (Staecker 1997a:67–70, 1997b:207–209, 2001:198–201). The zones in active use then contracted, leading to a hiatus in burial in the traditionally less desirable northern side of churchyards (Staecker 1997a:78, 1997b:217, 2001:248; Thunmark-Nylén 1995:161–162, 2006:608). This meant that when more space was once again needed from the late nineteenth century, gravediggers frequently encountered remains from the earliest phases, usually on the north sides of the churches.

The distributions of the artefacts around the churches indicate that the north sides were reserved for the burial of women, since the finds are overwhelmingly female-linked artefacts such as brooches, beads, pendants and armlets, as well as small personal items that were attached to the dress such as knives, combs and keys (figure 1). Male-linked finds are scarce, mainly comprising belt fittings and penannular brooches (Thunmark-Nylén 1989, 1995; Trotzig 1969:23–24), which is presumed to suggest that male burials were placed in the southern parts of the churchyards. These areas did not see the same gap in use, so that early graves south of the churches would have been thoroughly disturbed by centuries of subsequent interments. Thus the first Gotlandic churchyards seem to have been spatially segregated by gender, a division of space that is also known from early church sites in other



Figure 1. Female grave assemblage from Garda churchyard, SHM 12281, including characteristic animal-head brooches. Photo B98:39 from the photography collection in Antikvarisk-topografiska arkivet, Stockholm (SE/ATA/ARK3_2-19/K1E).

Nordic regions (figure 2) (Mejsholm 2017; Staecker 1997a, 1997b, 2001; Thunmark-Nyhlén 1989:214, 1995).

The informal nature of most discoveries means that records are generally limited. Naturally, gravediggers were untrained in archaeological observation as well as under time pressure to prepare the ground for funerals. The many archived letters concerning the fates of retrieved artefacts show that objects were sometimes retained in private hands (e.g. ATA 5548/48, 4864/64). It is also likely that retrieval was biased to the most distinctive and ornamented objects, while local circumstances dictated how many finds came to official attention. Yet as early as 1903, the first targeted excavation was carried out by schoolmaster Hans Hansson in the churchyard at Stånga, resulting in descriptions and a plan detailing four burials of one child and three adults (figure 3) (report in ATA from 1908; SHM 13436).

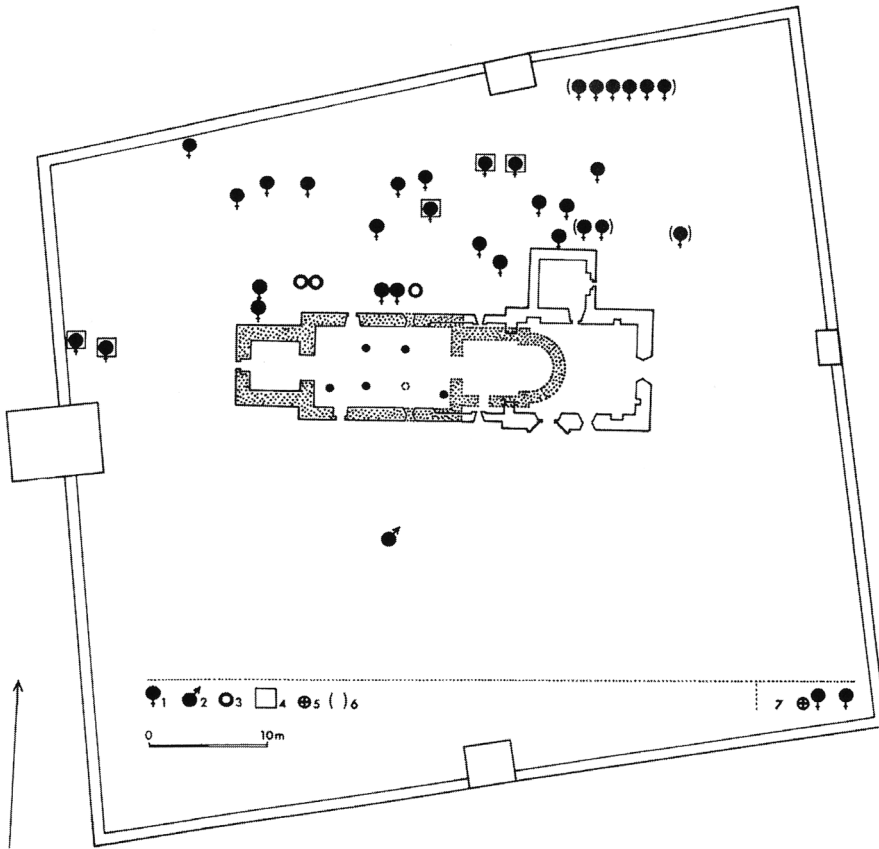


Figure 2. Plan of Garda church with distribution of registered churchyard finds. The post holes of the excavated wooden church and the foundations of the Romanesque church are marked. 1. Furnished female grave. 2. Furnished male grave. 3. Non-furnished grave. 4. Coffin. 5. Cross pendant. 6. Unknown location. Plan from Staecker 2001:200, Abb 7.

Two of these graves had dress accessories and the rest were without, a point which has tended to be obscured by the weight given to the artefacts: as in the last phases of the old grave fields, by no means all the early burials in the churchyards were furnished (see also distribution plans in Staecker 1997a, 1997b, 2001).

By 1926 sufficient artefacts had been recovered from a growing number of churchyards for Alfred Westholm to characterize their types and argue that they belonged to a transitional period between paganism and Christianity. Then where archaeologists established good working relationships with those responsible for churchyards, notably at Garda through the efforts of Greta Arwidsson in the mid-twentieth century, large numbers of finds entered museum collections, often with quite precise details of their

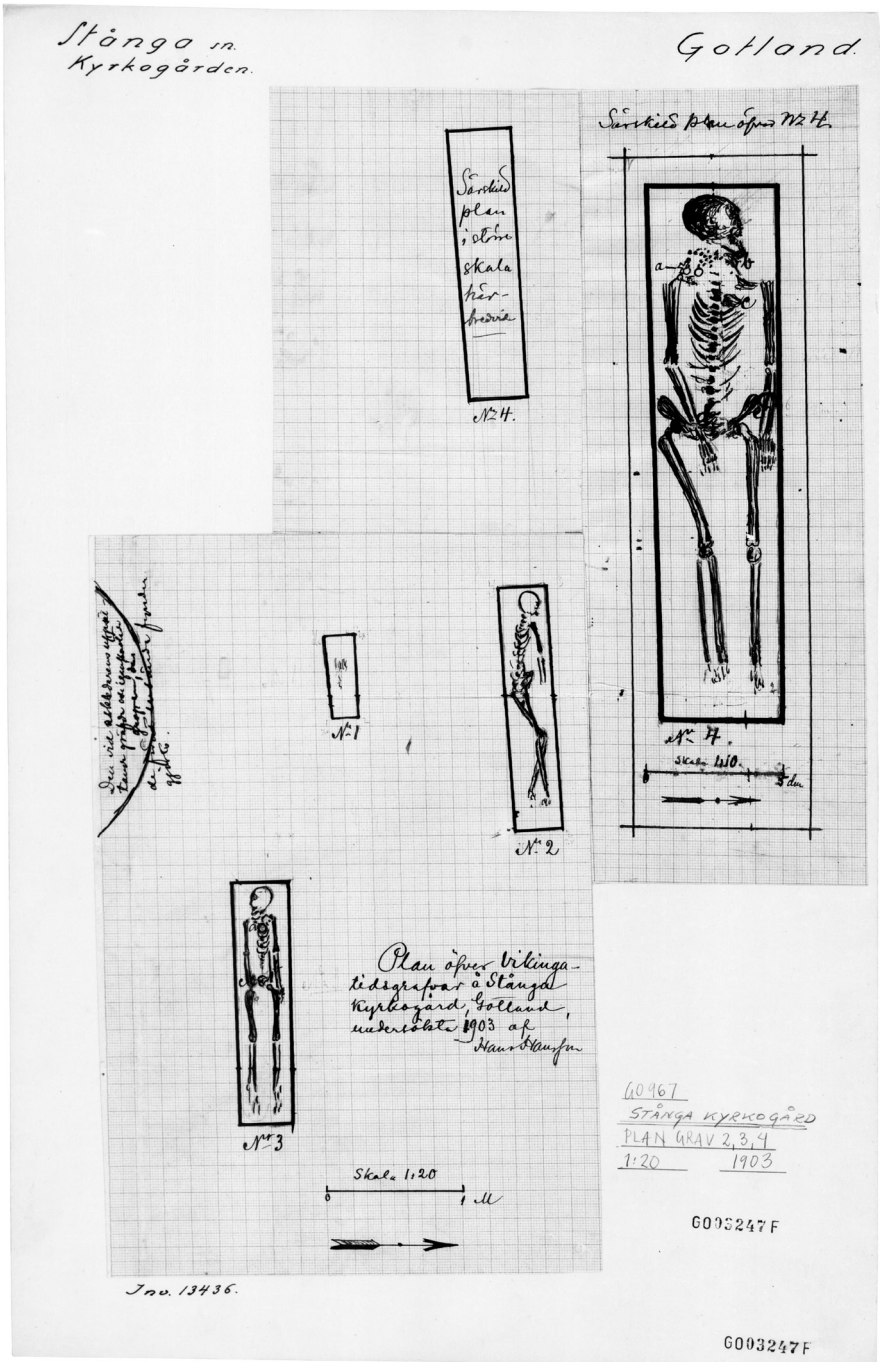


Figure 3. Hans Hanssons's plan from the 1903 excavation in the churchyard at Stånga showing four early graves. Drawing G 3247F from the map and drawing collection in Antikvarisk-topografiska arkivet, Stockholm (SE/ATA/ARK3_2-19/J1).

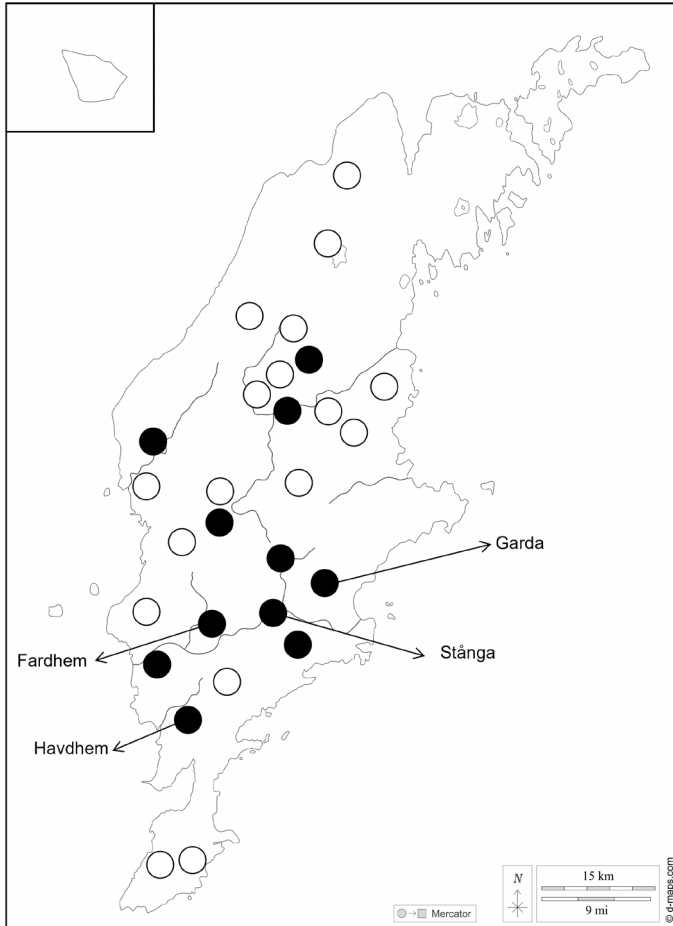


Figure 4. Distribution map of churchyard finds with sites mentioned in the text marked. Black dots: sites with recorded or highly probable churchyard finds. Unfilled dots: sites with indications of churchyard finds. Adapted from Thunmark-Nylén 1995:161, Fig. 1.

locations and associations with skeletal remains and grave structures (e.g. ATA 2858/56). Rescue excavations were sometimes conducted at sites of known interest (e.g. ATA 1949/51; Thunmark-Nylén 2000:214–221). By the 1990s artefacts had been discovered in the vicinity of 28 of Gotland's more than 90 medieval churches (figure 4) (Kyhllberg 1991:166 fig. 26; updated by Thunmark-Nylén 1995:161 fig. 1; for source critical discussion and critique of the number of listed sites see Rundkvist 2003:78; Staecker 1997b:205–206, 2001:236–238).

It was recognized early on that the same types of dress ornaments and small items found in churchyards are also present in graves in traditional burial grounds, implying contemporaneity. At the same time researchers

have stressed that there are general differences between churchyard burials and those in non-ecclesiastical settings. From churchyards there are no reports of the weapons, vessels or animal remains which occur in cemeteries in other locations. Burial grounds elsewhere in the landscape were gender-mixed, with inhumation graves mainly oriented north–south, and during the Viking Age they included varying numbers of cremation graves (Thunmark-Nyhlén 1989, 1995, 2006:608–610; Trotzig 1969; Westholm 1926), even if it is ever more apparent that customs shifted during their later phases (e.g. Toplak 2023). The alignment of the churchyard inhumations is west–east, and interments in wooden containers seem to have been common (Thunmark-Nyhlén 1989:214, 2006:608–610; Westholm 1926). In combination with these variances in customs, the evident temporal overlap has meant that the artefacts recovered from churchyards have become central to discussions on the Christianization of Gotland, and especially how different mortuary practices related to each other during the time of transition.

Churchyard finds and the Christianization of Gotland

At the broadest level, the late Viking Age in Scandinavia saw falls in the use of cremation, grave goods and then the old grave fields, along with the establishment of an early ecclesiastical landscape. Over time, death, burial and the commemoration of the dead would come to be regulated by Christian norms and centralized to church sites, a marked contraction from the more dispersed and diverse commemorative landscape of the preceding centuries. However, the transformations were not uniform, but comprised a number of processes in different regions, with varied histories, tempos and local trajectories (Andrén 2013; see also e.g. Svanberg 2003:147–150; Ljungkvist 2015; Norstein 2024). Gotland in particular stands out in various ways, including both the furnished churchyard burials and late use of traditional grave fields. The shift to new ecclesiastical sites on the island embodied a break with centuries of tradition, since use of some old grave fields stretches back to the Pre-Roman Iron Age or even Bronze Age (see Thunmark-Nyhlén 2006:596). Elsewhere in Scandinavia, a sense of continuity with the past was at times maintained by the placing of churches at existing burial places (Andrén 2013), but on Gotland the churches are instead mainly on new sites close to major farms (Andrén 2009; see also Trotzig 1969:24).

Despite recognition of varying experiences of change across Scandinavia, the overriding explanatory model remains that of a top-down conversion, driven by royal and elite interests and imposed on populations (e.g. Berend 2007; Sundqvist 2024). Recent work, however, has shown that

regional variation was closely linked to variances in power structures (Gelting 2020; Ljung 2016, 2019; Nordeide 2011). The top-down model helps to explain regions with fast and thorough changes in mortuary customs, notably in southern Scandinavia, where newly established churchyards quickly became the only spaces for burial and commemoration (Ljung 2016, 2019). But it does not account for the processes of change in other areas, notably in Gotland and also the Lake Mälaren region of mainland Sweden, where a greater diversity of ways of caring for and remembering the dead is seen, and the Christianization period was more protracted. There, many examples can be found of old grave fields, churchyards and new sites elsewhere in the landscape being used in parallel (Ljung 2016:148–171, 243–246, 2020).

Written sources imply that the Gotlanders paid tribute to the Svea king (Andrén 2021:37–42; see also Blomkvist 2008), but that royal dominion on Gotland was weak. The king owned no estates and had no juridical power on the island in the medieval period, nor did he visit it during the traditional *Eriksgata* itinerary (Lindkvist 1983). This dearth of royal power, as well as the absence of an aristocracy with large-scale landowning (Andrén 2009:53–54; Carlsson, D. 2015), mean that the supposed drivers of religious change are missing on the island. The islanders became Christian all the same, but the chronology and control of this process are debated.

Although missionary activities directed towards the North are known from written sources from the eighth century onwards, there is little indisputable archaeological evidence of Christian cult in Scandinavia prior to the second half of the tenth century (Gelting 2007:77–78, 2020; Ljung in press). On Gotland, the oldest archaeologically-dated cross pendant was deposited circa 990, whereas the youngest Thor's hammer derives from a silver hoard dated to around 1080, a passage of time which is thought broadly to capture the period of religious change (Andrén 2011:148, 2021:43). Where more detailed discussions of the timing of the Christianization process have been attempted, the churchyard finds and their relationship to continued use of ancient burial grounds have stood at the centre. Lena Thunmark-Nylén (1989, 1991, 1995, 1995–2006) in particular carried out extensive work on their typochronology, as well as on the compositions of the grave assemblages, reaching the conclusion that the depositions represent an extended period. She argued, based on the direct correspondence of artefacts found in churchyard burials and in traditional grave fields, for a long period of temporal overlap with use of both old and new sites. This, she suggested, may have continued until sometime around the end of the twelfth century, with possibly even later use of some grave fields. Further, she proposed that this parallel use of different mortuary settings represented contemporaneous pagan and Christian communities coexisting for a considerable period of time. Most subsequent researchers have been critical towards Thunmark-

Nylén's late dating of the contemporaneous use of churchyards and ancient burial grounds, instead arguing that both the use of old sites and furnished burial in churchyards ceased altogether during the beginning of the twelfth century (e.g. Carlsson, A. 1983, 1988, 1990; Kyhlberg 1991:169–172; Rundkvist 2003:75–83, 86; Staecker 2001:238–241, 1997a:67–71).

While the end-dates of both burial elsewhere in the landscape and the use of costumed burial in churchyards are contested, there has been a consensus that churchyard burial started in the early eleventh century (Kyhlberg 1991:165–169; Rundkvist 2003:86; Staecker 1997a:63–71, 1997b:203, 208; Thunmark-Nylén 1980, 1989:223–226, 1995:163). Even with the more cautious earlier dating of the end of burial at older sites, this opens for a century of contemporary use of churchyards and traditional burial grounds.

This long period of diversity in burial practices is interpreted as an outcome of Gotland's decentralized social structure (Staecker 1997a, 1997b, 2001), where the decision to convert to Christianity was made at many different times by smaller units, possibly at local thing assemblies (Trotzig 1969) or reflecting estates or groups of farms (Andrén 2009:46; Rundkvist 2003:82–83). For example, Anders Andrén (2009:53) argues that the first churches on the island were built as private initiatives on major farms and suggests that the ancient burial grounds continued to be used by settlement units lacking early churches. Anders Carlsson (1988:101, 1990) on the other hand recognized no contemporaneity between churchyards and ancient cemeteries on a parish level; he saw them as excluding each other, and suggested that older burial grounds were abandoned when a churchyard was established (see also Liljeholm 1999). It is not, however, possible to verify such a model based on the available archaeological data, and as noted by Jörn Staecker (2001:236–243) there seems to be a certain overlap between early churchyards and late grave fields on a local level (see also Rundkvist 2003:78–80). Further, it is recognized that late Viking Age burials with 'Christian elements' are found in many of the traditional cemeteries, often distributed in between older graves, underlining that the background to different burial locations did not lie in a direct chronological replacement of older (pagan) cemeteries and new (Christian) churchyards (Toplak 2022:100).

Dating churchyard burials

Turning to the details of the chronological discussions, the dating – of the establishment of churches on Gotland in general and of the churchyard finds in particular – has been primarily based on written sources, dendrochronology, coin finds and artefact typologies. For the historical record,

Hans Nielsson Strelow's chronicle of Gotland, *Cronica Guthilandorum*, completed in 1633, gives exact dates for the foundation of the churches on the island. According to Strelow, the first churches were built as a consequence of Olaf (later Saint Olaf) Haraldsson's missionary visit to the island in 1029, an event also related in the Guta Saga (GS chap. 3). Strelow's chronicle dates nearly 40 churches to the eleventh century (see Thunmark-Nylén 1980:30, Tab. 1), and several archaeologists have stressed the correspondence between the years given by Strelow and the archaeological record; many of the sites with churchyard finds are among those with early dates in the chronicle, suggesting a level of authenticity (Kyhlerberg 1991:165–169; Rundkvist 2003:81–82; Staecker 1997a:67, 2001; Thunmark-Nylén 1991:180–182, 1995:163). On the other hand, some of the churches with early churchyard finds have a late foundation date in the chronicle (after 1160) (Carlsson, A. 1990:6–7), and the reliability of Strelow's information is heavily debated (Carlsson, A. 1990; Kyhlerberg 1991; Staecker 1997a:66–67, 2001:195; Thunmark-Nylén 1980, 1989, 1991, 1995; Wase 1995).

Direct archaeological evidence for the first churches is limited, but the remains of three early wooden churches – Eke, Hemse and Sproge – have been dated by dendrochronology, showing that the timbers were felled in the periods 1096–1101, 1107–1112 and after 1149 respectively (Bråthen 1995:83–85, 1998; Bartholin 1998). The complications of dating the remains of these structures are illustrated at St Olofsholm, a harbour site in northern Gotland, where initial radiocarbon dates from posts probably belonging to a wooden church produced dates in the tenth century, despite the building's foundation wall overlying a burial unlikely to have been made before the second quarter of the eleventh century at the earliest. There it appears that wood from early in the tree growth was sampled, and the structure is suggested instead to date from the mid-eleventh century. It was perhaps placed in connection with burials of men killed in battle, possibly related to the historically recorded visit of Olaf Haraldsson (Carlsson, D. 2018; Gerber et al. 2023).

None of those four above-mentioned sites have yielded churchyard finds. At Garda, from where many of the recorded churchyard finds and the bulk of the osteological material discussed in this paper derive, a beam felled soon after 1065 has been discovered in the nave of the early twelfth century Romanesque stone church, suggesting it was reused from an older building (Bråthen 1995:68–72, 88, 1998; Bartholin 1998). It may have come from the preceding wooden church, of which postholes were found in the late 1960s during excavations beneath the flooring of the Romanesque nave (see figure 2). Radiocarbon results from contexts beneath the flooring seem also to indicate dating to approximately the eleventh century (Trotzig 1970; see also Staecker 1997a:67–67, 1997b:207, 2001:199).

Looking at coin finds from early churchyard burials, the *terminus post quem* range is from circa 997 to 1111–1125 (Thunmark-Nyén 1995:184, 189–193). Very few are datable to the twelfth century and none later than its first quarter. This range is seen as indicative of furnished churchyard burial dating to the eleventh and early twelfth centuries (Carlsson, A. 1990:10–11; Staecker 1997a:69–71, 1997b:207–208). However, Thunmark-Nylén (1991:169–171, 1995:184) argued that the apparent twelfth-century fall is a product of coin circulation patterns, and that old coins were still regularly deposited in the twelfth century (for critique see Carlsson, A. 1990:10–11). Coin finds from both Garda and Stånga have evidence of added suspension loops, demonstrating that they were worn as pendants (Audy 2018:176–178, 288, 291). One set from Stånga (SHM 13436b) included coins of diverse origins, one dating to circa 997–1003, and another to 1082–1106 (Audy 2018:134, 291); three of the coins were at least around a century old when entering the graves.

The chief artefacts for the typo-chronological dating of late furnished burials on Gotland are animal-head and penannular brooches (see figure 1). Animal-head brooches found in churchyards are above all the latest types: 6, 7 and 8 (Carlsson, A. 1983:49–53, 72–74; Thunmark-Nyén 1995:169). Most common are 7:7–9, which in Carlsson's (1983:72–74) dating can be placed circa 1000–1100 (his period D). Penannular brooches found in churchyard contexts with few exceptions belong to types FAC:S (with faceted/cubooctahedric terminals) and RUL:SM (with rolled terminals), which are also frequent in Carlsson's period D (Carlsson, A. 1988:18–19, 73–80; Thunmark-Nylén 1995:70). Occasionally a later type belonging to period E (circa 1100–1150), FAC:S with rhomboid cross-section, also appears (Carlsson, A. 1988:73–77). Thunmark-Nylén (1991:163–169, 1995:169, 182) argues that the absolute dates of periods D and E should be pushed forward in time. It should be noted that Carlsson focuses on the production period and Thunmark-Nylén on the time of deposition of the objects, albeit this does not fully explain the disagreement. Thunmark-Nylén stresses that late animal-head brooches as well as penannular brooches occur in the same graves as double-sided combs cut-in-one, or of composite type, which in medieval urban contexts are found primarily in layers dated to the twelfth and thirteenth centuries respectively, even if earlier specimens exist. In Lund double-sided combs cut-in-one occur in the eleventh century (Persson 1976), which Thunmark-Nyhlén also notes, and in Sigtuna from the second half of the century (Ljung & Wikström 2008:77; see also Ljungkvist 2015). Carlsson (1990:8–9) disputes the late dating suggested by Thunmark-Nylén and is critical towards the analogy with mainland urban sites, arguing that the Gotlandic double-sided combs could have been produced locally in the eleventh century.

To sum up, a central line of disagreement concerns how long churchyard burials continued to be costumed and furnished, and the same archaeological material has given rise to different interpretations of whether the custom stopped at the beginning of the twelfth century or continued through to its end. Further, despite lively debate on the former point, most researchers have accepted that churchyard burial began in the early eleventh century with much less discussion. In fact, as Staecker (2001:238–241) points out, it is difficult to define when churches were founded based on the current state of knowledge. With the aim of moving beyond this state of impasse, we now turn to the skeletal remains of the early adopters themselves.

The buried population

The skeletal remains discovered together with artefacts since the late nineteenth century have not previously been drawn on for research purposes; it seems not to have been recognized that in many cases they were also collected or stored. More generally, osteological work on Gotlandic material of this period is limited: of the more than thousand excavated graves from the Viking Age, only a small proportion had until recently been the subject of detailed osteological analysis (Thedéen 2019:97; Thunmark-Nylén 1989:214), even if the rate is now increasing. The recent rediscovery of significant human bone collections from Gotland's early churchyards therefore offered a unique opportunity to characterize the physical remains of those first chosen for burial at ecclesiastical sites, the overall findings from which are presented here (full details in supplementary material: table 1).

Contextual information for the stored human bones is limited, but there is evidence from the storage itself that can help associate specific find events with artefacts and skeletal remains. The individuals from Garda kept in the Gotland Museum facility were still unwashed in their original newspaper wrappings, some stamped with the names of their local subscribers, providing a close date of their finding and the parish in which they were found (figure 5). The skeletal remains held at the Swedish History Museum store – those from Stånga, Havdhem and Fardhem churchyards, as well as some from Garda – were repacked more recently, but sometimes old labels with contextual information were retained inside the new bags. As will be discussed below, metal staining, distributed mostly in areas of the chest and arms, provides additional detail to connect the human remains with the better-studied artefacts.

The osteological analysis was constrained by several factors. The skeletal remains were not, for example, all packaged in a way which fully reflected how the individuals had been buried: some boxes contained several skele-



Figure 5. Newspaper stamped with the name of Anton Johansson, Bjärnes, Garda, dated from 14 January 1950. This newspaper was used to wrap Garda 12. Photograph: Astrid A. Noterman and reproduced with permission of the Gotland Museum.

tons mixed together, while others had mostly limbs packed together without indication of which grave they came from. At both storage facilities the bones thus had to be reassociated prior to the analysis, so the current study is based on the minimum number of identifiable individuals, each only partially represented. The reassociation of skeletal parts was carried out following the second order association method based on matching bilateral bone pairs in terms of similar appearance, size, robustness, maturation stage and joint congruity set out by Henri Duday (1987), Villena i Mota (2015) and Partiot et al. (2020), although lack of clear association markers meant skulls could not always be linked to postcranial remains. Twenty-six individuals from Garda, three from Stånga, two from Fardhem and one from Havdhem were identified and analysed (supplementary material: table 1). The majority of individuals (72 per cent) are present as less than half of a complete skeleton; only three (Garda 16 and 20, Havdhem 1) show completeness of more than 75 per cent.

The osteological assessment focused on biological characterization, traces of activity during life and evidence of funerary costume. The Probabilistic Sex Diagnosis (DSP) was used to determine the sex of the adults (Bruzek 2002; Murail et al. 2005), complemented by secondary sex estimation method for poorly preserved individuals (White et al. 2012). Age-

at-death was estimated based on biological growth and maturation indices for subadults (AlQahtani et al. 2010; Fazekas & Kosa 1978; Schaefer et al. 2009; Sellier 1993; Ubelaker 1978), late fusion of secondary ossification points for young adults, and observation of the iliac sacro-pelvic surface and signs of degeneration for adults over 30 (Adserias-Garriga & Wilson-Taylor 2019; Schmitt 2005). The principal sources for description and diagnosis of pathological conditions were Ortner (2003) and Waldron (2008). Nonmetric skeletal traits and anatomical variants were recorded according to White et al. (2012), Voisin (2012) and Verna et al. (2013). The methods set out by Smith (1984), Molnar (2011) and Perrin et al. (2019) were used to record, describe and classify dental wear.

The results showed that the studied population was made up of 78 per cent adult individuals, at least 75 per cent of whom were over 35 years old at death, plus a relatively small proportion of subadults. Due to the incompleteness of many skeletons, sex could be determined for only 44 per cent of the adult individuals. Among these there is an over-representation of women (93 per cent), in line with the gender segregation noted by previous work on artefact finds, which suggested the inhumation of women on the north side of churches, where the overwhelming majority of discoveries have been made. However, at least one individual from Stånga was identified as male. One grave with male-linked artefacts has previously been recorded south of the church at Garda and two in the western part of Stånga churchyard (Thunmark-Nylén 2000:215, 624). Ancient DNA extraction and analysis is currently being carried out for individuals from Garda and if successful will provide chromosomal sex, including for subadults and those individuals whose skeletons were too incomplete for osteological sexing. The number of subadults recovered was fairly low, but nonetheless enough to show that all age categories could be included in the early churchyards. The six juvenile individuals from Garda were aged between birth and 8 years old, while the skeletal material from Stånga also contained the remains of an infant of circa 40 weeks of gestation.

A general assessment of the health status of these early adopters of churchyard burial was carried out, although should be taken with caution given the fragmentary condition of most individuals. Degenerative disease was the most common pathology, particularly at Garda with 34 per cent of individuals affected by spinal arthritis and osteoarthritis. *Cribra orbitalia* – pitting on the superior wall of the orbit – is another frequent pathology (16 per cent of individuals) and seems to have affected all adult age categories, while arthritis is mainly visible in middle-aged and older people. The factor responsible for *cribra orbitalia* is the subject of much debate; specialists do not fully agree on its cause, but no longer systematically associate it with anaemia (Waldron 2008:136–137; Walper et al. 2004). The overall rather

low rate and extent of degenerative pathologies does not seem to be linked to age at death, since all age categories are present and the population was on average of fairly advanced age, but rather to relatively good health status among the buried population.

Evidence of trauma is also limited, with two individuals definitely and one potentially showing old fractures. An old fracture of a right rib was found on a middle-aged woman at Garda, which was the only pathology recorded on this well preserved and unusually complete skeleton. Another woman from Garda churchyard may have evidence of a head injury; this older individual also has a number of degenerative changes and complete loss of teeth. The Stånga male stands out with a reduced clavicle fracture and a probable fracture of the neck of the left femur with pathological consequences for the spine, pelvis and lower limbs.

The population shows a low rate of dental disease, but extensive signs of use of teeth as tools and some possible indications of deliberate tooth-filing. Among the individuals whose bone preservation was sufficient to make observations of the dental region and excluding those with extensive tooth loss (two cases), no less than 78 per cent of the individuals at Garda show significant tooth wear. Two main categories of dental modifications are recorded at Garda: extensive wear of the first molar or the front teeth which appears to be the result of a habitual activity in life; and teeth which bear signs which may indicate deliberate filing for visual effect. Regarding the wear patterns which are likely to have resulted from tooth use, modification of the first molar is the most common, sometimes also associated with modification of the incisors and/or canines. This usually takes the form of extreme wear of both upper and lower first molars, especially the occlusal surfaces (figure 6). Despite this significant dental wear, tartar deposits are moderate and caries almost non-existent. The similarities in the patterns between the individuals suggest that the wear bears witness to a shared activity of some kind, perhaps related to craftworking. This is particularly interesting in relation to the question of who these early adopters were in social terms, and will require further investigation, including against ethnographic parallels. In addition, the young woman buried at Havdhem churchyard also displays dental wear resulting from a habitual activity in life, but of a different pattern. Lastly, a number of individuals, up to four, present with horizontal lines on the labial surfaces of readily visible upper front teeth, and these appear to fall among the variety of wear patterns previously noted in Viking Age individuals from a number of sites and interpreted as deliberate filing (see Arcini 2005, 2028; Kjellström 2014; Loe et al. 2014:63, 212–213; Radon 2019; Toplak & Kerk 2023) (figure 7). These again will require further investigation to fully understand the processes which could result in such marks.



Figure 6. Detail of the worn first molars on the mandible from the female adult in grave 9 from Garda. Photograph: Astrid A. Noterman and reproduced with permission of the Gotland Museum.

A total of five individuals show one or more nonmetric variations, all located on the skull: three cases of metopic suture, two cases of wormian bones and one case of foramen tympanicum, also known as foramen of Huschke. Also known as epigenetic variants or discrete traits, these are minor variants of the human skeleton which may reflect heredity or environmental influences (Verna et al. 2013:9; White et al. 2012:476–477). All the affected individuals are adults, one female, three probably female and one of undetermined sex.

Evidence of metal staining, likely caused by copper-alloy objects (Buikstra & Ubelaker 1994:96; Dupras & Schultz 2013:327–328; Morris 1981), was found on a total of fourteen individuals (figure 8). This number is a minimum since many skeletons are so incomplete: around half of the Garda skeletons were represented by only cranial elements or a few other skeletal parts, and most of the individuals from Fardhem and Stånga exhibited poor preservation of the upper part of the body where this staining is mostly found.

The distribution of stains on the skeletal remains is indicative of objects being worn mainly on the upper chest, shoulders or around the wrists. This



Figure 7. Detail of apparently modified teeth from Garda (top left), Slite (top right) and Vibble (bottom). Photographs: Astrid A. Noterman, Johnny Karlsson (SHM) and Lisa Hartzell (SHM). Reproduced with permission of the Gotland Museum and Historiska museet/SHM (CC BY 4.0).

is consistent with the funerary practices of the late Viking Age on the island, characterized by the burial of many of the female dead with brooches, pendants and bracelets. Staining was additionally observed in the area of the head in four individuals; as discussed below, the radiocarbon results indicate some of them died rather later.

A final aim of the osteological assessment was to devise a sampling strategy for biomolecular analyses of the skeletal material, first to maximize



Figure 8. Metal staining on the first left rib and the left clavicle of Garda 3 and on the left temporal bone of Garda 6. Photographs: Astrid A. Noterman and reproduced with permission of the Gotland Museum.

efficiency in destructive sampling of the relatively scarce resource offered by these bone collections, and second to make sure that the anticipated results are grounded in osteological understanding of the population. Further biomolecular analyses are underway, but the initial step was to obtain radiocarbon dates for all the identifiable individuals, with the exception of the fragile remains of the perinate from Stånga. Following the recommendations of the literature (e.g. Eriksson & Lidén 2013; Kontopoulos et

al. 2022; Parfitt 2002), the skeletal elements selected for this purpose were primarily the femur, the mandible and the petrous bone. For the poorly preserved and least complete individuals, the selection prioritised long bones.

Radiocarbon dates from the buried population

Radiocarbon results were obtained from 31 of the 32 osteologically identified individuals (figure 9; raw data in supplementary material: table 2). All samples were processed at the 14Chrono Centre for Climate, the Environment and Chronology at Queen's University Belfast, using collagen extraction methods outlined in Brown et al. (1988), Bronk Ramsey et al. (2004) and Brock et al. (2010). Stable carbon and nitrogen isotopic compositions were also determined for all the samples. These will be published separately with discussion of dietary variability in this phase of Gotland's past, but the $\delta^{13}\text{C}$ results are included here since they informed the recalibration of the radiocarbon dates.

Given that the isotopic values suggested a strong contribution of marine protein to diet, it was necessary to correct the radiocarbon dates for marine reservoir effects. Because ^{14}C does not enter aquatic food chains at the same rate as it enters terrestrial food chains, marine organisms can produce radiocarbon ages older than their actual age. On average, this difference is 400 years, but there can be significant variation across marine systems (Ascough et al. 2005). If marine organisms are consumed by humans, then this will affect their radiocarbon results in proportion to the amount of marine protein in their diet (e.g. Dury et al. 2018; Jarman et al. 2018).

The contribution of marine protein (fm) in the diets of the individuals analysed here was calculated using a linear interpolation method laid out by Jarman et al. (2018). The $\delta^{13}\text{C}$ values relate to both marine consumption and the balance of C3 and C4 plants in the diet. Given that there are no C4 plants native to northern Europe, any variation in $\delta^{13}\text{C}$ should relate solely to marine consumption (Kosiba et al. 2007:401; Strand et al. 2022). More complex modelling using $\delta^{15}\text{N}$ was not employed here, as nitrogen values can also be influenced by dietary pathways such as breastfeeding and weaning, although some studies have also shown that $\delta^{13}\text{C}$ could be affected by this (e.g. Fuller et al. 2006; Richards et al. 2002) and there was a number of juveniles in the sample. The following formula was applied:

$$fm = (\delta^{13}\text{C}_n - \delta^{13}\text{C}_{\text{terr}}) / (\delta^{13}\text{C}_{\text{mar}} - \delta^{13}\text{C}_{\text{terr}})$$

Values for a fully terrestrial diet ($\delta^{13}\text{C}_{\text{terr}}$) and fully marine diet ($\delta^{13}\text{C}_{\text{mar}}$) were obtained from faunal data from Gotland. A value of -21.0‰ was used for a fully terrestrial diet, based on the least enriched value obtained

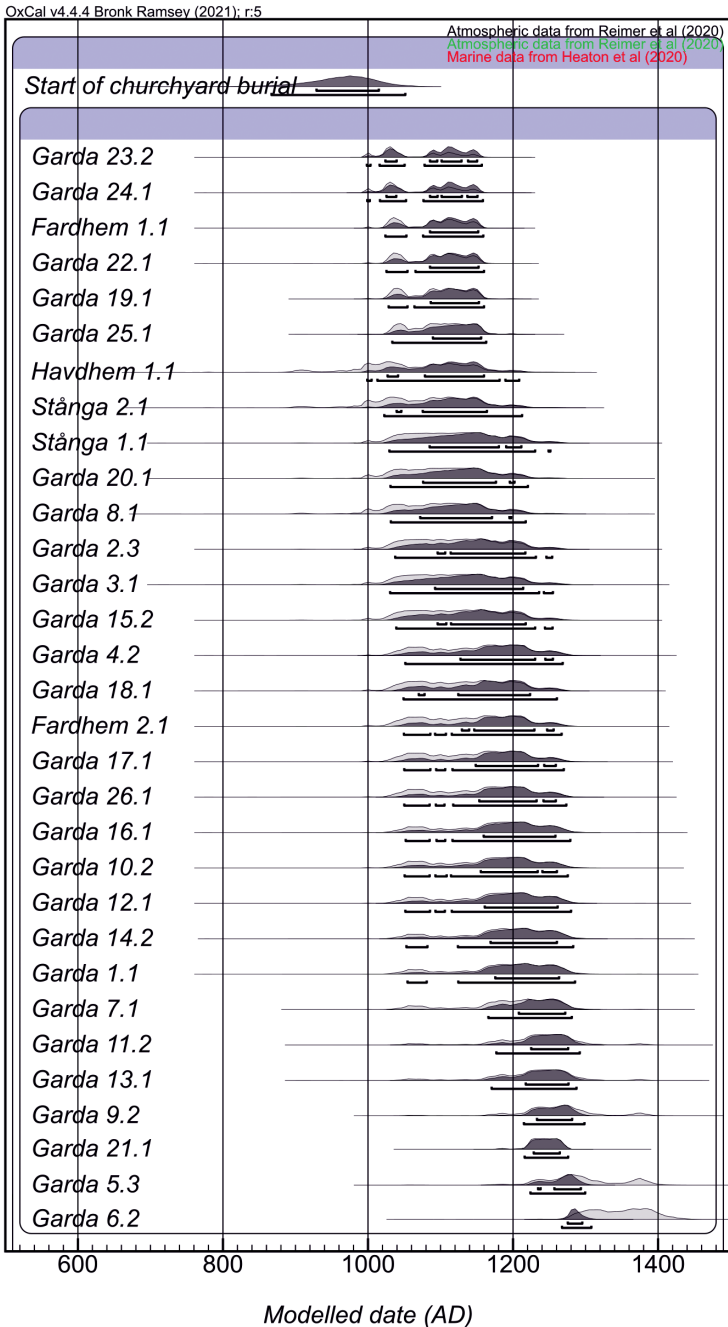


Figure 9. Recalibrated radiocarbon results from individuals buried in the churchyards at Stånga, Fardhem, Havgdhem, and Garda. The light grey distributions represent the radiocarbon dates after adjustment for diet, but before Bayesian modelling. The dark grey distributions represent the dates after Bayesian modelling (highest posterior density).

from the contemporaneous site of Ridanäs, and is comparable to that used in other studies (Cook et al. 2015; Jarman et al. 2018; Kosiba et al. 2007; Strand et al. 2022). A value of -11.9‰ was used for a fully marine diet, based on the average $\delta^{13}\text{C}$ value from the Neolithic site of Västerbjers (Eriksson 2004). The only fish sampled from Ridanäs returned a lower value than this: -16‰ . However, despite not being contemporaneous, the average from Västerbjers, based on more samples, was preferred. The marine end point for the Baltic Sea is likely to be distinct, due to its relatively enclosed nature, and the input of freshwater rivers (Lidén & Nelson 1994:14).

Following the calculation of the proportion of marine protein in the diet, a custom calibration curve was created in Oxcal v. 4.4, by mixing Intcal20 (Reimer et al. 2020) and Marine20 (Heaton et al. 2020) in the necessary proportions for each individual, using a standardized error of ± 10 per cent (Cook et al. 2015). This reduces the precision of the radiocarbon dates, but better reflects the uncertainty involved in dietary modelling.

Determining the local marine offsets (ΔR) is more complex. The Baltic Sea has highly variable reservoir effects, ranging from about 300 ± 50 in the Danish straits, to approximately 110 ± 50 in the Bothnian Sea in the north, with coastal values much higher due to the input of freshwater systems, as high as 1456 ± 51 , on the eastern coast of Sweden (Lougheed et al. 2013). Because of this variability, it is likely that people living on Gotland were consuming marine resources with a mixture of reservoirs, and indeed potentially freshwater fish from Gotland itself. The effect of calibrating with different ΔR values was tested, using three different values from the area around Gotland determined in Lougheed et al.'s study, and was determined to make little difference. The results based on the median ΔR value are presented here (figure 9) and the other results are available in the supplementary material.

The samples processed had varying levels of marine protein in their diet, ranging from 1 per cent to 18 per cent. Anything less than 5 per cent was calibrated using the terrestrial curve only, as any marine effects were so slight that accounting for them introduced an unnecessary level of uncertainty. Although 5 per cent is not a large contribution, it can have a large effect on radiocarbon dates if it causes a potential date range to intersect with a plateau in the calibration curve. In this period, there are notable plateaus from circa 1050 to 1160, and from circa 1300 to 1400. These plateaus mean that the date ranges produced after marine recalibration are quite broad.

Nevertheless, the results show that all the individuals from Stånga, Fardhem and Hårdhem were buried at some point in the eleventh or twelfth centuries. The larger number of individuals from the cemetery at Garda derive from burials over a more extended period of time. Just under half date to the eleventh to twelfth centuries, with a further nine dating broadly

from the eleventh to thirteenth centuries. The remainder date to the thirteenth century, with one final grave from its end or perhaps even the fourteenth century.

To refine the dates further, a Bayesian chronological model was created which modelled the results from Garda as a single phase in which it was assumed that use of the site for burial started at zero and rose linearly over time. This suggested that there was a 68.3 per cent probability that churchyard burial on Gotland had begun by 1017, and a 95.4 per cent probability that it had begun by 1055 (figure 9).

Discussion

The results contribute substantial new data to what is known about the early phases of churchyard burial on Gotland. In the first place, although the radiocarbon date ranges are wide, they give the strongest indications so far of the likely period during which funerary ritual began to move to church sites. As discussed above, the establishment of churches on the island has been believed on the basis of historical texts to date from about AD 1030 onwards, although this point has received less research attention than other aspects of this phase of Christianisation. Meanwhile the earliest dendrochronological date which may be associated with an early church is from the mid-eleventh century (Bartholin 1998; Bråthen 1995:68–72, 83–85, 88, 1998).

The new radiocarbon dates presented here are compatible with this picture. In particular, the start of the probability ranges would not support a substantially earlier date for the establishment of churchyards. A relatively small number of sampled individuals could possibly date from the first half of the eleventh century, with growing numbers and probability from the middle of that century onwards. The numbers of individuals recovered from the sites other than Garda are too small for comparisons between the churchyards to carry much weight, but it may be noted that the remains from Havdhem and Stånga have rather earlier probability distributions than many of the Garda individuals.

It is likely that the new church sites attracted burial from their first phases, since there is no marked delay between estimates of church establishment and the potential date ranges for the earliest graves. Here evidence collated by Staecker from the churchyard at Garda is significant: the spatial distribution of animal-head and penannular brooch finds there showed no chronological pattern (Staecker 1997a:67–70, 1997b:207–209, 2001:198–201). Instead of successive growth of the burial areas, Staecker proposed that the whole of the large churchyard came into use from the foundation of

the church. Similarly the circumstance that burials are segregated according to sex is taken as evidence that they were established in relation to a church (Staecker 1997a, 1997b, 2001; Thunmark-Nylén 1995:161–162). Bringing the archaeology and the new dates together, it appears that churchyards and the disposal and commemoration of the dead within them were integral to the establishment of Gotland's churches as new ritual foci from the start.

Turning to the question of who was buried in the early churchyards, one of the major demographic patterns seen widely in the late Viking Age and often attributed to growing Christian influence is the increased representation of the whole population, including children, in the burial record (Mejsholm 2009). Previously only a proportion of the dead was buried in ways which leave archaeological traces (Price 2020:869). A general tendency of Late Iron Age cemeteries in Scandinavia is a lack of children, and especially newborns. By contrast, late Viking Age burial grounds, like the early churchyards, often include children in more representative proportions (Mejsholm 2009:141–153; Toplak 2018:73–78, 2023:135–139), demonstrating the emergence of new social attitudes towards sub-adults during the time of conversion.

Although children are somewhat under-represented in the population from the early churchyards presented here, this is likely affected by limited and biased bone retrieval, and the full age range appears, from perinatal infants upwards. Meanwhile, despite the general tendency to increased representation, in the large Havor cemetery, less than 3 per cent of the excavated late Viking Age burials belonged to sub-adults, and infants and young children seem to be missing altogether (Toplak 2023:134–135). Havor was returned to after a phase of desertion in the early eleventh century, and burials continued for about 150 years, thus contemporaneously with the use of the churchyard in Garda. New analysis of the late grave assemblages from Havor suggests striking similarities with the churchyard finds, not least through the lack of overtly pagan elements in the burials as well as the find of a cross pendant, suggesting that the site may have been used by Christian communities (Toplak 2022, 2023). Therefore, it is interesting to note that attitudes to the burials of children seem to have differed between these two contemporaneous mortuary settings.

That female burials made up a significant number of the first churchyard graves on Gotland is without doubt; the osteological analyses presented here as well as the gendered artefact assemblages support this conclusion. However, the male proportion is unknown, since finds from the male-linked southern halves of the churchyards are few. The adults among the identified skeletal individuals are a relatively mature population, although too much should not be made of this pattern. The mature profile might suggest, for example, that those placed in churchyards, especially those with decorative

objects, enjoyed relatively high status connected to quality and length of life, or it could simply reflect a tendency for older women to be buried with the types of distinctive artefact which led to their recognition and retrieval.

Since this is the first study of human remains from locations which became Gotland's parish churches, direct parallels are absent. However, the radiocarbon results place the earliest individuals presented here as approximately contemporaneous with five burials associated with the wooden 'prayer house' at St Olofsholm in Hellvi parish (Carlsson, D. 2018; Greber et al. 2023). Comparison of the osteological findings tends to underline the special nature of that site, at which two or possibly three adult men had died from devastating battle injuries. As the foundation wall of the first church building overlays one grave, the suggestion there is that the burials were at least part of the motivation for its placing.

A closer parallel may be provided by the skeletal remains of some 43 individuals recovered from a site interpreted as an early Christian graveyard connected to the major early harbour at Fröjel on Gotland's west coast (Carlsson, D. 1999). Nearby are extensive burial grounds starting perhaps as early as the seventh century and in use through the eleventh century (Arcini 2018; Peschel et al. 2017), but this group is dated by artefact finds to the early eleventh century, possibly even as early as AD 1000. Due to the west-east orientation of almost all the burials, many of which were in narrow wooden coffins, and the exclusive presence of women and children, this is argued to represent the north side of an early churchyard predating the establishment of the twelfth-century church on an elevation about 150 m away. As at Garda, all age ranges are seen, including some individuals of advanced age, but the extent of pathological changes due to activity and illness observable in the skeletal material appears greater here. For the future, comparison of the stable isotope results indicative of diet should give further indications of where the early adopters of churchyard burial stand in relation to other Gotlandic populations.

The results of the present study also contribute new material to the more extensively debated question of how long furnished churchyard burial continued on Gotland. As discussed above, Thunmark-Nylén in particular has argued for prolonged use of this custom on the basis of the artefact chronologies, but also its prevalence. She observes, for example, that with around 30 known female interments at Garda, there are simply too many to represent only a short period in a time of small communities (Thunmark-Nylén 1995:163). Further, her thorough examination showed that many object types usually labelled as 'late Viking Age' in grave finds, hoards and as stray finds in fact have a medieval dating, and indicate that furnished burials continued at least to the turn of the century around 1200 (Thunmark-Nylén 1991).

The radiocarbon results in combination with the evidence of metal staining on many of the skeletons support this interpretation and indeed go further. Some individuals with definitively late radiocarbon dates, such as Gardá 11 (UBA-51199) – a child who almost certainly died after 1150 and most likely in the thirteenth century – show signs of having been buried with artefacts, in this case through copper-alloy marks on the right clavicle and ribs. The extent of the stains makes the possibility of metal shroud fasteners unlikely; on Gardá 3, for example, multiple connected bones are affected. Several individuals with probability ranges right through the twelfth century, such as Gardá 2, have staining on similar areas of the upper body, indicative of funerary costume including brooches fastened to clothing (figure 8, tables 1 & 2). The furnished ritual was thus evidently not exclusive to the first generation of churchyard burials.

Four individuals show copper-alloy staining to the head, and two of these, female adult Gardá 6 (UBA-51194) and child Gardá 10 (UBA-51198), gave radiocarbon results in the late twelfth and thirteenth centuries, with no additional evidence of metal marks. These may be indications of a change in corpse presentation in the later phases. The wearing of an artefact linked to the hairstyle seems a possible hypothesis; S-shaped temple rings have been found in Stånga churchyard (Thunmark-Nylén 1995:178, 185). The other two individuals, Gardá 17 (UBA-52651) and Fardhem 1 (UBA-52664), both adults of undetermined sex giving earlier dates, were each buried with a copper-alloy object in contact with or close to their mouth. One of these individuals was incomplete and poorly preserved, while the other showed average bone preservation and additional traces of metal stains on the left shoulder and upper limb.

Conclusion

This paper has aimed to raise the research gaze from the artefacts found in early churchyard burials on Gotland to the population represented and their customs. The new radiocarbon dates presented here point towards the mid-eleventh century as the start of a growth phase for churchyard burial. However the bulk of our results, especially among the higher number of samples from Gardá churchyard, show a later concentration of probability centring on the twelfth century, with some individuals possibly dating as late as 1400. The dated skeletal remains in combination with the metal staining evidence support arguments for a prolonged period, probably through the twelfth century, during which costumed burial was used for some of the dead placed in churchyards.

The finding of a long chronology for furnished churchyard burials may not be as contentious as it once was, if placed in an updated explanatory model for understanding the conversion period. Late Viking Age mortuary practices on Gotland have mainly been discussed within a dichotomy of pagan versus Christian, as represented by two sets of distinct rituals, with the focus on defining the shift between the two religious modes. However, as outlined above, grave fields elsewhere in the landscape which were in use into and beyond the late Viking Age show considerable changes in terms of ritual expression in their later phases; they do not represent a static form of old ways. Nor does extended parallel use of multiple burial places need to map directly onto divisions in religious belief. This is reflected in the wider picture from elsewhere in Europe, notably England and northern France, where the last decades have seen recognition that the Christianization of mortuary customs is marked by a phase of innovation and creativity, rather than a direct leap from one well-established norm to another (e.g. Geake 1997; Hamerow et al. 2024; Zadora-Rio 2003). Similarly on Gotland, it is now evident that complexity in mortuary practices in this phase goes far beyond parallel use of early churchyards and traditional cemeteries. The Viking Age saw not only continued use of the communal burial grounds, sometimes with hundreds of graves, which had been established in the Bronze Age or Early Iron Age, but also an intensive phase of reuse of ancient sites that had previously been abandoned, as in the case of Havor (Thunmark-Nylén 2006:595–596; Toplak 2022, 2023). At the same time there was considerable establishment of new burial grounds without churches, often located in the coastal zone (Carlsson & Bokor 2018; Thunmark-Nylén 2006:595–596; Widerström 2007).

Moreover, new excavations and interpretations have recently brought further nuance to the complexity of the mortuary changes of the time. At Havor, a key element of the late Viking Age burial ritual was the regular reuse of older graves for new interments, which involved a variety of interactions with the human remains from the primary burials (Toplak 2022, 2023:144–147, 274–283). Likewise at Sundre by the southernmost tip of Gotland, a woman with an animal-head brooch in a style which dates after 1050 and perhaps into the twelfth century, was recently discovered in an ancient stone cist, exemplifying another form of late interaction with older graves (Widerström et al. 2019). Meanwhile, at Gudings slott, an Iron Age fortified enclosure in southern Gotland, east-west oriented inhumation graves in coffins were added as late as the thirteenth century to occasional burials made throughout the Viking Age, of which two or three seem to have been revisited and emptied of skeletal parts (Carlsson & Bokor 2018). Thus for a considerable period of time the archaeological record testifies to creative adaptation of rituals and use of the landscape and past monu-

ments, none of which can readily be placed in a simple pagan-Christian dichotomy. Instead, the picture is of active selection and composition of places and rites by a population navigating radical change.

Although the shift to churchyards involved a major change in the location of burial on Gotland, as well as in many aspects of the forms of graves and funerary rituals, it was thus not necessarily a complete rupture either with the past or with those who continued to use the old burial places. The presentation of the corpses themselves in the churchyard funerals, as either fully dressed or presumably otherwise wrapped individuals, mirrored the customs still in use at sites elsewhere in the landscape. Here we have drawn attention to evidence for extended, if occasional, parallel use of non-churchyard sites alongside the newly established churchyards. Where work on the churchyard finds previously focused on contrasting practices between two categories of sites and defining them in terms of pagan versus Christian, the long period of contemporaneity for which we argue instead opens for research on how funerary practices in a variety of old and new locations mirror or link to each other, along with which individuals were commemorated in different spatial settings.

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- ATA + nr = Document kept in Riksantikvarieämbetets (The National Heritage Board's archive) Antikvarisk-topografiska arkivet, Stockholm.
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