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Picture-stone workshops on Viking Age Gotland – a study of craftworkers' traces

Introduction

The question underlying this investigation is whether Gotland's Viking-Age picture stones were the subject of workshops and schools.

One way of approaching this is to examine whether the use of templates and cutting techniques might show interrelationships between craftsmen and on this basis discuss different craft traditions. This study will thus examine if and how templates or stencils were used on Gotland's Viking-Age picture stones and what cutting techniques were applied when reproducing the sails on the picture-stone ships. The point of departure for comparison of craft traditions is the Insular Celtic approach to ornament in contrast to the Romanized Continental. This is naturally a vast subject encompassing considerable research, which cannot be fairly treated in this study, but some main observations will serve as a background to this discussion on the Gotlandic picture-stone craft which has not been examined so much from the point of view of craftsmanship and techniques of carving, in contrast to for example, Northumbrian sculpture in northern England where there is an extensive discussion on gridding, measuring units, templates, etc.

A selection of 18 picture stones from Sune Lindqvist's C and D groups¹ were analysed with the help of a high resolution 3D-scanner (ATOS II). Several of these picture stones have already been extensively researched with regard to their picture content.² I will concentrate primarily on the evidence for the use of templates and other methods of production that might reflect different craft-working traditions, connections between groups of carvers, and any apparent priorities in pictorial representation. A template study of the D stones has already been published,³ and is here extended to include the C stones and a study of the cutting technique used on the ships' sails. This addresses a related question: do the picture stones realistically reproduce their contemporary material culture or are the representations on the stones governed by technical considerations and craft conventions? This is especially important for ship archaeology which relies on these stones for primary evidence for the early Vik-

¹ Lindqvist 1942.

² Buisson 1976; Hauck 1961; Hauck 1977; Eshleman 1983; Marold 1998; Nylén/Lamm 2003; Lamm 2006; Oehrl 2008; Oehrl 2009; etc.

³ Kitzler Åhfeldt 2009.

ing Age.⁴ A further question concerns attributes. The interpretation of the attributes that accompany the figures has been of utmost significance throughout picture-stone research for identifying the subject matter of the scenes depicted on the stones. On weathered stones much of this significant information has been lost, leaving only the main features of a motif's composition and little or no surviving detail of attributes. However, interesting studies by Sigmund Oehrl show that advances can still be made in this area by minute examination.⁵

According to Sune Lindqvist, the group-C stones can be divided into a southern (Klinte) and a northern (Lärbro and Stenkyrka) 'picture-school'.⁶ He bases this grouping on style and to a certain extent on cutting technique and/or surface treatment. The northern school, according to Lindqvist, can in turn be divided into several different masters or groups. In a later major study, Eshleman has accepted Lindqvist's arguments and further suggested that picture-stone workshops can have existed as early as the 9th century.⁷ The Lärbro stones, according to Eshleman, were produced by a workshop comprising several individuals who varied in style, while another stone-cutting centre existed in parallel at Klinte.⁸ Eshleman links the iconography of the Lärbro stones (placed c. AD 790–840) to the Carolingian Renaissance and the missionary activities of Bishop Ebo of Reims and Anskar of Corbie and sees similarities in Carolingian manuscripts.⁹

In the present article, the question of picture-stone workshops and the interplay between different craftsmen will be examined from the more technical angle of template use and cutting techniques. The social conditions current on Gotland can be expected to have affected the interaction between craftsmen and their geographical itineraries. Traces of craft activity are remnants of a craftsman's physical presence, a presence that was steered by commissioners and governed by social regard and bonds between family groups. One hypothesis might be that shared templates reflected close relationships between craftsmen, for example, masters and pupils, while shared carving techniques indicate looser formations of schools or interrelated groups.

⁴ Cf. Nylén 1982; Nylén 1987, p. 75–84; Crumlin-Pedersen 1997, p. 174–175; for a critical view, see Varenius 1992, p. 51–54.

⁵ Oehrl 2008; Oehrl 2009.

⁶ *bildskola*; Lindqvist 1941, p. 46.

⁷ Eshleman 1983, p. 300.

⁸ Eshleman 1983, p. 303.

⁹ Eshleman 1983, p. 307.

Dating

Any discussion of parallels elsewhere is dependent on the hotly debated dating of Gotland's picture stones. Dating also influences the social and mercantile setting in which the picture stones were produced, since there seems to be quiet a difference between the early and late Viking Age with regard to handicraft organization (see Discussion below). Sune Lindqvist dated the majority of the C stones to the 8th century and the D stones to the second half of the 8th century, possibly extending into the 9th.¹⁰ Since Lindqvist's picture-stone chronology leaves a lacuna for the whole of the 10th century, several researchers have attempted revisions.¹¹ Eshleman considers that the C and D picture stones are dependent on the Carolingian Renaissance which took place c. AD 790–830 and therefore they cannot pre-date it.¹² Lindqvist considered that group D with its deeply cut relief and crowded compositions belonged to a later phase than group C.¹³ Lisbeth Imer has revised these datings and argues that group D is a regional phenomenon and that some D stones are thus contemporary with the C stones.¹⁴ In her summary, Imer weighs up the arguments for earlier datings according to picture field, borders and runic inscriptions.¹⁵ Sanness-Johnsen has pointed out that the runic inscriptions could be secondary since the runological dating is younger than that suggested by the borders,¹⁶ while Eshleman found good reasons to believe that they are contemporary.¹⁷ One detail in the runic inscriptions shows how the height of the runes was adapted to suit the ornament (Fig. 1). Sanness-Johnsen's reservations are therefore justified. Imer however chooses to place more weight on the runological dating since no precise dating is available for the different style elements in the border patterns.¹⁸ Imer's conclusion means that picture stone Alskog Tjängvide I, Alskog K, Ardre VIII and Lärbro Tängelgårda I would date to the 10th century, Garda Bote and Lokrume K to the 9th, När Smiss I and Stenkyrka Lillbjärs I to c. AD 750–900 and finally Stenkyrka Lillbjärs III and Stenkyrka Lillbjärs XVII from 750 and onward.¹⁹ Deep relief is not accorded any chronological significance but considered to be a regional feature.²⁰ This is basically in accordance with the view of runologist Thorgunn Snædal, who proposes a dating for the Viking-Age runic inscribed picture

¹⁰ Eshleman 1983, p. 307.

¹¹ E.g. Hyenstrand 1989, p. 31; Varenius 1992, p. 52; Wilson 1995, p. 64; 1998, p. 49–52; Imer 2004.

¹² Eshleman 1983, p. 307.

¹³ Lindqvist 1942, p. 120–121.

¹⁴ Imer 2004; cf. Table.

¹⁵ Imer 2004.

¹⁶ Sanness-Johnsen 1968, p. 80.

¹⁷ Eshleman 1983, p. 308.

¹⁸ Imer 2004, p. 86, 94.

¹⁹ Imer 2004, p. 104–105, Table 17–20; see Table.

²⁰ Imer 2004, p. 106.

stones to the middle or second half of the 9th century and the 10th.²¹ Lokrume K (runic inscription G252) is placed in the middle of the 9th century, whereas Alskog Tjängvide (G110) is dated to c. 950–1000 AD.²² A serious problem with the dating of picture stones occurs when variations in the runic inscriptions are used as a dating criterion. From a runological point of view it would be desirable to reverse the argument so archaeological dating provides definitive dates for innovations in runic inscriptions.

Geometric principles or templates and pattern books?

Geometric principles – an Insular craft tradition

It has been noticed by previous researchers that the interlace ornament on the Gotlandic picture stones shows some evidence of western Insular (British Isles) influence.²³ Dr Uaininn O'Meadhra has however drawn my attention to the fact that Insular interlace motifs are laid out according to geometric principles, demanding a certain theoretical approach to a motif, based on its intersections. This involves a certain mathematical understanding about how a motif works. Since geometry also had theological implications during this period (in its relative, numerology) and was a subject taught in monastic schools, O'Meadhra consequently asks whether that knowledge bears relation to geometrical art motifs in the ecclesiastic production of the period.²⁴ Since this art form was carried out to great heights, it clearly entailed not only a search for aesthetic expression but also a striving to understand and recreate divine principles of harmony and geometry; the basis of Creation, a search for spiritual truth and aesthetic perfection.²⁵

The Loughcrew Bone Slips

One find category that might have served as a compositional aid in an Insular context for executing motifs based on geometric principles is that of the unfinished partly decorated polished slips of bone found at Loughcrew, Co. Meath, Ireland. In the unfinished examples, we here find compass arcs and their midpoints used to mark the layout of a motif in such a way that the principle rather than the finished ornament is

²¹ Snædal 2002, p. 64.

²² Snædal 2002, p. 52, 64.

²³ Bugge 1905, p. 323–326; Nylén/Lamm 2003, p. 24, 78, 80.

²⁴ O'Meadhra 1987, p. 102, 157f.

²⁵ Brown 2003, p. 297; cf. Laing 2010, p. 163–164.

in evidence. These unique bone finds, which date to the Irish Early Iron Age, (considered c. 200 BC–AD 200) have been interpreted as samples of trial work of one or more skilled craftsman and might have served as some form of pattern book for a metalworker or sculptor (Fig. 2).²⁶

Motif-pieces

The well-known interlace ornament on the Gotlandic picture stones can to some extent be found on the contemporary ‘motif-pieces’²⁷ – fragments of bone or stone with unfinished and repeated motifs belonging to some stage in the craftsman’s production of ornamentation. Their distribution suggests they have an Irish origin perhaps as an extension of the Celtic tradition of the Loughcrew slips, and when they occur outside of the British Isles might suggest a connection with the Insular area. The purpose of these pieces may have been to develop a design by working it out physically rather than mathematically. In contrast to the previously mentioned bone slips from Loughcrew, the Insular motif-pieces rarely show evidence for the use of grids or other geometric aids for creating complicated patterns. Motif-pieces do not appear in Scandinavia until within urban contexts around AD 1000, and then are simple and very few; to the best of my knowledge none have been found (so far) on Gotland. The difference between the Loughcrew slips and the later motif-pieces is that the former illustrate constructional principles whereas the latter show complete motifs.²⁸

The Lindisfarne Gospels

Compass and rule were sometimes used for geometrically determined patterns in Insular illuminated manuscripts, perhaps best exemplified by the outstanding evidence in the Lindisfarne Gospels.²⁹ That manuscript has been described as the life’s work of one person, an artist/scribe who was skilled in not only in philosophy and theology but probably he was also an accomplished metalworker, perhaps the abbot himself of the monastery at Lindisfarne.³⁰ Even the human figures tend to be defined by symmetry. Complex patterns were constructed with the aid of dots and lines which were linked together by compass-drawn segments producing an interlace ornament ‘that was created out of hidden constructional principles’.³¹ Compass-dividers can also be

²⁶ O’Meadhra 1987a, p. 128 and literature cited therein; O’Meadhra 1987b, p. 159.

²⁷ O’Meadhra 1979; O’Meadhra 1987a; O’Meadhra 1987b.

²⁸ O’Meadhra 1987a, p. 171–174; O’Meadhra 1997.

²⁹ Bain 1951; Henry 1965; Brown 2003, p. 291 with literature cited therein.

³⁰ Brown 2003, p. 295, 298, 398.

³¹ Blidmo 1976, p. 68.

used for the scaling up and down of ornament. Such have been found in Loughcrew and elsewhere in Britain. In the east Swedish material record, more contemporary with the Gotlandic picture stones and closer to hand, a possible compass was found at Helgö on Lake Mälaren.³² Other archaeological material shows that Gotland and the Lake Mälaren basin have had close connections at least from the Early Iron Age and onwards,³³ which makes it reasonable to suggest that the same tools ought to have been available on Gotland.

Comparison between the interlaced borders on the picture stones and those in Insular manuscripts indicates interesting similarities, here exemplified by the Lindisfarne Gospels. However only the simplest of the manuscript interlace patterns occur on the picture stones. A variant that can be found on the two stones Alskog Tjängvide and Ardre VIII occur for example on one initial (Fig. 3).³⁴ It should be noted that in the manuscript patterns several interlace variants follow one another in the same band (Fig. 3),³⁵ which seems analogous to the way the knots follow one another on the borders of, for example, Ardre VIII and Alskog Tjängvide I. To my mind, group C lacks the variation of interlace within the same picture stone that occurs on the group D stones and Insular material. The picture stones in group C often contain only one type of interlace. Another feature is the division of the decoration into panels, which can be composed together into a larger composition. Geometrical principles in association with panelling have been used in an advanced manner in Insular manuscript decoration (Fig. 4).

Insular stone sculpture on the Isle of Man and at Lindisfarne

Insular sculpture is a vast topic which lies beyond my expertise and shall not be discussed here in any depth. However, I wish to mention it here since it is not unusual for researchers to consider the Gotland picture stones as an isolated phenomenon.³⁶ Yet to my mind, there are some points in common. The similarities mentioned with regard to the Lindisfarne Gospels recur in Insular stone sculpture and I will limit my discussion to a few elements found in work from Lindisfarne and the Isle of Man. The pillow stones, or name-stones, at Lindisfarne, a type of gravestone dated to the 7th and 8th centuries AD, with peripheral borders of interlacing, deserve mention. These bear bilingual inscriptions in English and Latin written in Roman letters, runes or half-uncial script – the latter with clear parallels in the famous products of the scriptorium on

³² Blidmo 1976, p. 57.

³³ Thunmark-Nylén 1995, p. 655.

³⁴ This also corresponds to the Half Pattern in FIGURE 21 B in Cramp 1995, p. xxxix.

³⁵ Cf. also Brown 2003, Pls. 11, 12, 21.

³⁶ E.g. Wilson 2008, p. 58; Carver 2008, p. 18.

the same site (Fig. 5).³⁷ One tends to imagine all Insular stone crosses to be of the often illustrated form with rich sculpture in deep relief, but these are of miniature size, only c. 20 cm high.³⁸ Yet they have an intreaguig resemblance to the Gotlandic picture stones with regard to the shape and the border ornament. Perhaps a pillow stone could easily be carried away as a model.

If the Gotlandic picture stones can be dated to the 10th century, they are contemporary with some of the Scandinavian-influenced cross-slabs on the Isle of Man.³⁹ I would like to call attention to the high variation in interlace that can be found within the same stone on some of the Manx stones, such as for example 'Thor's Cross' from Bride (Fig. 6). Here we can also note a dog-like figure with arched back and curled tail in a similar form to the dog-figure discussed below on Alskog Tjängvide I and Ardre VIII. A stone cross-slab from Ballaugh has a highly interesting form, with a contour that recalls the so-called mushroom-shaped picture stones (Fig. 7).⁴⁰ On the 'Sigurd stone' cross-shaft from Halton, we see figure scenes in panels including one with a smithy and smith's tools (Fig. 8). On Ardre VIII several scenes are placed one above the other in vertical rows within rectangular fields, as if on a pillar.

Without going into further detail in this extensive field, I would like to mention the relief-carved Class II Pictish stones⁴¹ which would seem, on superficial appearance, to share many of the features of the Gotlandic picture stones. Both reflect a somewhat diffuse contemporary Iron Age culture even if the contexts differ. Indeed the Pictish stones are in themselves a highly interesting parallel phenomenon to the Gotlandic stones, but to study this lies beyond the scope of the present work.

Stencils and pattern books – Continental craftwork traditions

The Roman artisans also used geometric drawing techniques which had their roots in architecture and floor mosaics. The mosaic patterns were primarily created with the aid of compass and rule following the requirements of classical antique art, but also with the aid of templates.⁴² Workshops can be identified through the copying of patterns. This raises an important observation concerning chronology; the use of pattern books could lead to a prolonged use of motifs that were already out of fashion else-

³⁷ Brown 1921, p. 67, Plate VII; Brown 2003, p. 227, Fig. 91.

³⁸ Brown 1921, p. 67.

³⁹ For dating of these, see Wilson 2008, p. 62–63.

⁴⁰ Cf. Bugge 1905, p. 320.

⁴¹ Henderson/Henderson 2004; Foster/Cross 2005; Carver 2008, p. 19; Cummins 2009, p. 142, 147–150.

⁴² Neal 1976, p. 248–250.

wehere.⁴³ Indeed, the mass application of similar art motifs in various contexts encouraged the use of templates within Roman art.⁴⁴ Blidmo has observed that there is a qualitative difference between motifs that required geometric preparatory drawings and those that resembled ‘established geometrical motif forms’.⁴⁵ The Roman legacy was passed on through late antiquity and within Merovingian and Carolingian art. It is in this context that we can understand the more widespread use of templates and pattern books within the Continental craftwork tradition.

It has been shown that the interlace on the Northumbrian crosses was often laid out with the aid of a quadratic grid, but there is also evidence of copying and the use of templates.⁴⁶ According to Richard Bailey templates were used in Northumbrian stone sculpture for the angles between cross arms and the figures; sometimes just parts of figures which could be reversed and adapted in size or combined in various ways. They could also be divided into sections. Some sculptors used templates mechanically while others used them more creatively. When a template can be shown to have been used in several places, this has been interpreted as a sign of a central workshop or travelling sculptor. In either case, Bailey considers that these sculptures must be contemporary to the duration of a generation.⁴⁷ Bailey was able to show that the same human figure was reproduced holding different attributes which completely changed the meaning of the image. The template in itself had no specific meaning, it served merely to reproduce the outer shape/contours, which by later ornamentation could be given varying specific content and meaning.

The use of pattern books had certain consequences. Through their use both iconographic motifs and formal elements can be transferred from place to place and wander through different workshops over generations.⁴⁸ Two examples are known from 3rd century AD Egypt, but then there is a gap, broken by a single page from the 6th/7th century⁴⁹ until the 10th century when surviving examples begin to be more numerous.⁵⁰ Few survive as complete books but rather as isolated sheets, possibly since they were a practical aid which lost significance when a particular motif fell out of use. Scheller considered that this survival more likely reflects a lack of interest in unfashionable motifs than the true number that were in use.⁵¹ The aim was to pass on motifs to those who did not have access to the original. It is therefore more likely that a

⁴³ Neal 1976, p. 250.

⁴⁴ Wilson 1999; for Swedish orientated studies see Arrhenius 1971, p. 55–56; Blidmo 1976, p. 59 and literature cited therein.

⁴⁵ Blidmo 1976, p. 62.

⁴⁶ Adcock 1978, p. 33; cf. Lang 1991, p. 48; Lang 2001, p. 28, 45–47.

⁴⁷ Bailey 1978, p. 184–185; Bailey 1980, p. 240–253; for cross-arms see also Lang 2001, p. 48.

⁴⁸ Scheller 1963, p. 3.

⁴⁹ Date discussed in O’Meadhra 1987a, p. 121.

⁵⁰ Scheller 1963, p. 4; Scheller 1995.

⁵¹ Scheller 1995.

travelling craftsman had a pattern book than a permanently settled one. Those who made model drawings simplified the composition, focussed on certain details and could combine parts from different originals. The artist's interest was mainly focused on noting specific parts, such as people and animals communicating poses and events. The figures have an independent existence which signifies events and expressions so that they can function in different contexts. Pattern books contain separate figures which can be combined in completely different ways. What mattered was to emphasise the outer contours so that the units were clear and easily understood.⁵² The difference between using a pattern book and copying a work was that the collection of patterns provided a source for choosing different elements. One example of a pattern book dated to the 10th century contains late Antique and Carolingian art, Insular interlace and Merovingian animal motifs.⁵³ Occasional drawings in manuscripts as well as the bone and stones motif-pieces have been suggested as alternative forms of pattern books in the period AD 500–1200 in the insular area.⁵⁴

Model collections do not presuppose an intimate interaction between craftsmen; on the contrary these models can be used freely without regard to the creator of the original who has no control over how his ornament is later used. There can thus be a considerable time interval between the two examples which of course leads to problems in dating the later version. An example might be the occasional elements of Ringerike style ornament found in Anglo Saxon manuscripts. Signe Horn Fuglesang has argued that, rather than interaction between Scandinavian craftsmen and English illuminators, they probably indicate borrowing from a pattern book.⁵⁵ The consequence for our study would be that if a picture-stone carver had access to a pattern book it would be very difficult to ascertain his immediate source of inspiration.

Continental and Insular influence on Nordic art styles as represented on Gotland has been exhaustively discussed by previous researchers,⁵⁶ and will not be further examined here. In the above, I have provided analogies between picture stones and the Celtic Insular cultural sphere as expressed in manuscript art and stone sculpture. In manuscript art there are profound references to art from a broad cultural area – Hebrew, Roman and Early Christian legacies are assimilated with local traditions.⁵⁷ There is therefore a great risk that parallels and comparisons might be superficial and meaningless. For our purposes, the most interesting aspect is that the method of working with geometric aids is a part of the British and Celtic tradition found also in metalwork

⁵² Scheller 1995, p. 41–42.

⁵³ Scheller 1963, p. 49.

⁵⁴ O'Meadhra 1987a, p. 110–129; O'Meadhra 1993, p. 533.

⁵⁵ Fuglesang 1978, p. 212.

⁵⁶ E.g. Åberg 1941; Åberg 1948; Nerman 1935; Nerman 1975; Holmqvist 1952; Holmqvist 1977; Wilson/Klindt-Jensen 1966; Wilson 1995, Wilson 1998; Fuglesang 2005.

⁵⁷ Brown 2003, p. 229f.

and stonecarving.⁵⁸ This tradition also includes the use of panels of ornament to form and transfer parts of a decoration.⁵⁹ Somewhat simplified, one can say that the Continental tradition is more marked by a use of templates and pattern books. It should be remembered though, that as shown above, templates have been used on some insular stone sculpture too. There is of course a possibility that Celtic style ornament reached Gotland via the Continent. It is an old idea that there were strong Continental as well as Insular influence on Gotland by the end of the 8th century.⁶⁰ This is not to say that there necessarily needs to have been any external impact on the Gotland picture stones. On the contrary, several scholars have instead stressed the indigenous strand of aesthetics in Nordic art styles.⁶¹ In his reference to grids used on some Viking Age silver jewellery from the Irish Sea area Graham-Campbell has suggested that the use of templates and grids on Viking Age Northumbrian sculpture, as referred to above, originates in an Insular tradition of measured ornament, such as can be seen in the above mentioned Lindisfarne Gospels.⁶² Furthermore, Graham-Campbell notes that the use of templates and grids in 9th–10th century Scandinavia has not been investigated but that this technique might have been acquired in England.⁶³ I find it an interesting view in regard to craftsmanship that griddings and templates can be seen as a means for “the less skilled to achieve a ‘minimum level of performance’”.⁶⁴ This study shows that templates have been used in stone carving in 10th century Gotland, although stone carving is not widely spread elsewhere in Scandinavia in this period. On mainland Sweden, there are only a few rune stones until the Viking Age rune stone tradition gains ground by the end of the 10th century AD. With regard to the influence of Continental, more precisely, Carolingian, manuscript art on the Gotlandic picture stones, this has been most strongly developed by Eshleman, who discusses this topic in her dissertation.⁶⁵ A characteristic feature which distinguishes the Carolingian manuscripts from the Celtic is the naturalism of human and animal figures.⁶⁶ Eshleman goes so far as to detect models in Carolingian manuscripts and considers this could have been made possible through missionary activity on Gotland in the 9th century.⁶⁷ She also noticed the remarkable homogeneity in size and shape in some of the motifs indicating the use of shared patterns, for example on Tängelgård I, Tängelgård IV and Hangvar II.⁶⁸

⁵⁸ Brown 2003, p. 292, 295, 297 f.

⁵⁹ Brown 2003, p. 296.

⁶⁰ Arbman 1937, p. 247.

⁶¹ E.g. Wilson/Klindt-Jensen 1966, p. 20–21.

⁶² Graham-Campbell 1987, p. 145.

⁶³ Graham-Campbell 1987, p. 146.

⁶⁴ Graham-Campbell 1987, p. 146.

⁶⁵ Eshleman 1983.

⁶⁶ Cf. e.g. Nerman 1941; Arbman 1948.

⁶⁷ Eshleman 1983, p. 306.

⁶⁸ Eshleman 1983, p. 118, 125.

Documentation and painting-in

The illustrations in Sune Lindqvist's standard work *Gotlands Bildsteine* have an appealing but deceptive clarity. Lindqvist's interpretations were subjective, as he himself maintained,⁶⁹ but the apparent indisputability of his painted-in readings lends an unwarranted authority to his interpretations. What we understand as documentation may in some cases actually be mainly extrapolation. In my study it has become apparent that that which appears to be a definitive reading sometimes in fact lacks direct evidence on the actual surface of the stone. There is no evidence in support of the interpretation. For example, on the Hunninge stone it is impossible to ascertain if there are women, houses or something quite else in the lower picture field. Lindqvist must have extrapolated some parts, as has been noted by e.g. Beata Böttger-Niedenzu.⁷⁰

Considering the above, it is important to be aware of the method used by Lindqvist in examining these stones. He relied partly on the early 20th century documentation techniques in particular of Gabriel Gustafsson and Fredrik Nordin. Lindqvist also made his own examination of the stones using oblique lighting. There can often be confusion in a photograph between intentionally cut lines and damage or weathering. It was therefore felt necessary to paint-in their readings using removable watercolour.⁷¹ Natural light changes greatly during the day. Indeed, Gustafsson describes how lighting, weather and peculiarities such as insect damage influenced their work. Lindqvist and Faith-Ell covered over the stones and worked in artificial lighting. Lärbro Hammars I took two weeks to examine in this manner. Klinte Hunninge I took more than a week. Lindqvist himself points out that all his readings of details are naturally not indisputable, which should be kept in mind when criticising his results. He observes that his photographs should be seen as incomplete reconstructions rather than exact reproductions and that surface weathering was a further hindrance.⁷²

Best preserved are the stones that had fallen down so their decorated surfaces lay protected from the elements. In many cases the loss of detail caused by weathering has led to purely speculative painted details.⁷³ Some stones required repainting quite soon. For this the former paint was removed completely and the stone coloured in anew, without regard to the previous reading. Lindqvist himself reinterpreted a number of stones. Examples are Stora Hammars I and Stora Hammars III.⁷⁴ Unrecognizable attributes lead to confusion in interpretation.

Clearly the present painted interpretation, made in the 1930's, must not be considered final. This is especially apparent for example from the reinterpretation of a

⁶⁹ Lindqvist 1941, p. 15.

⁷⁰ Böttger-Niedenzu 1982, p. 12.

⁷¹ Lindqvist 1941, p. 13.

⁷² Lindqvist 1941, p. 13–15.

⁷³ Cf. Böttger-Niedenzu 1982, p. 12.

⁷⁴ Böttger-Niedenzu 1982, p. 12.

Type A stone by Birgit Arrhenius and Wilhelm Holmqvist.⁷⁵ Karl Hauck has also made new readings by taking latex impressions of stones in order to check and document fine details. His casts of Ardre VIII, made for a study of how Völund the smith is represented in different sources, led him to observe that the image of a bird, previously interpreted as a reference to Völund's flight from captivity, has a ring around his neck. To Hauck this bird motif instead represents one of the three valkyres from the beginning of the saga.⁷⁶

Painting-in of the cut grooves on the picture-stones is since long time abandoned. It is desirable to develop alternative methods of presentation and avail of what modern technology can offer. We must replace the disputed and criticised practice of filling in the decoration on a stone surface with, albeit watersoluble, paint.⁷⁷ On monuments of limestone the paint sinks into the stone in an irreversible process that prevents future analysis of original colour traces and complicates reinterpretation and alternative readings. It is to be hoped that prior to such measures at least newly discovered stones will be documented with a 3D scanner, as described here.

Optical 3D scanning

A high-resolution portable optical 3D scanner, an ATOS II from GOM, has been used in this study. The 3D scan results in a digital 3D model of high definition which reproduces the surface topography of the picture stone in detail, including worked surfaces and scratched lines. 3D documentation allows each researcher obtain his/her own objective record to work with, unfiltered through another person's eyes.

The measuring principle relies on synchronic photography using two cameras mounted on a measuring head at specifically determined angles. The scanner's software calculates the 3D coordinates with up to 4 million target points from these photographs. In order to document the object in the round and into depressions, the object (or rather, the camera, in this case) is rotated and scanned from different directions. These overlapping images are united into a 3D model. Before scanning, reference points are placed out on the surface of the stone. These reference points are made from small removable self-adhesive labels, c. 4.5 mm in diam., which leave no trace on the stone and are easy to remove. With the aid of these reference points the scanning system can define the position of sensors and transfer partial measurements to a whole image in a common coordinate system. The operator oversees the digitizing process on a screen. Calibration is automatically controlled for each measurement with regard to any movement or fluctuation in lighting conditions. The camera lenses

⁷⁵ Arrhenius/Holmqvist 1960, p. 161.

⁷⁶ Hauck 1977, p. 13–14.

⁷⁷ Cf. Bjelland/Helberg 2006.

are changeable and selected according to the size of the object being measured. A feature of 3D scanning equipment is that image resolution decreases as the size of area to be measured increases. In the ATOS system this means that the measurement volume, and thereby resolution, is regulated by changing the lenses. In this study a measurement volume of $350 \times 280 \times 280$ mm has been used. The resolution of the end result is thus 0.27 mm between measured points. To increase the resolution the measurement volume must be reduced in size. An effect of this is that entire picture surfaces cannot be measured since this would take an unreasonably long time and the amount of data would be unmanageably large. One possibility is to measure limited areas for special study at higher resolution. It is however uncertain if the results would be that much better.

The result of these scans is a three-dimensional digital model of the object that can be analysed with the help of the various software programmes for 3D manipulation which are available on the market.

The reference points leave small vacant holes where data has not been captured. These can be filled in to give a smooth non-structured surface and improve the appearance of the digital model. Other features that can leave holes in the model are shiny or black areas such as registration numbers painted directly on an object. In a few cases reflections or dust particles create so-called erratic points with the result that these holes cannot be filled in since the system does not work there.

If the surface structure is very porous or has very deep and narrow grooves, shadows can form where the camera cannot take a reading. This can be partly compensated for by taking a number of readings at slightly different angles. Sometimes however it is not possible to capture data everywhere though this is normally not a problem with picture stones – a typical case is the broken surface of spongy bone.

Scanner analyses of incisions

The point of departure for present-day interpretations has been the painted-in readings of the 1940s or even earlier. But the incised lines creating the motifs are minute and earlier interpretations are often much debated. Documentation of picture stones by 3D-scanning loosens the hold of the painted-in reading, freeing the researcher from traditional interpretations. The 3D-scanner is a further useful tool for detailed iconographical studies, since the visual image of a topographical map is not disturbed by colour. Without touching the stone, even less, removing paint, we can study the picture stone as a new find, without the prejudice of prior expectation. The advantages of 3D scanning became very obvious in the case of a new picture stone found in 2002, where analysis of the carving by 3D scanner yielded better results than traditional oblique lighting (see Fig. 9).

There are several ways of enhancing the digitized image of the incised decoration on a picture stone. The results of each method vary from stone to stone, and detail to

detail – often several techniques are required in combination. A requirement is that the stone surface still retains traces of the groove. 3D scanners do not have x-ray qualities. They cannot read beneath the surface and see compression in a stone's crystalline structure showing that it has been incised if nothing remains on the surface topography of the stone.

Artificial oblique lighting (Fig. 1). The first variant follows the same principles as those used on the tangible stone surface with the exception that the stone is now on a screen. In some software, such as DeskArtes Design Expert, the light source can be rotated while viewing the object from a fixed angle. This differs from ATOS' own software, where the light source is fixed and the 3D model is rotated and viewed from different angles. DeskArtes Design Expert sometimes provides a clearer image of the incisions but has fewer functions for image analysis. Sometimes a combination of both programmes is needed to get the most out of an incised image.

Individual motifs can be freed by rotating the picture stone and varying the zoom function. This way thin and shallow incisions can be isolated and successively filled in with a selecting tool which 'draws' lines (Fig. 10). Selection does not mean painting on the image as in picture-editing software (e.g. Photoshop) but involves selecting points which are copied and build their own digital 3D model (Fig. 11).

Sections by plane/Isarithm mapping (Fig. 12). Another method is to create an isogram of the picture surface, a form of micro-topographical image or contour map. A suitable distance between the isarithms may be 0.1–0.2 mm for this material. Isarithms define divergences from a plane that is located as close to the stone surface as possible. In practice a picture stone's surface is never flat but usually curves in various directions which the plane does not take into account. Therefore the contour map or isogram usually functions best on small sections of a stone surface.

Selection by Curvature (Fig. 13). A third variant is to select by curvature. Stone surfaces that diverge from the flat are selected. In this way one can separate areas of different surface treatment. On an otherwise smooth surface those areas that are rough will be selected by not conforming. This is suitable for relief carvings where the surface is differentially worked. The quality of the results can however vary. In successful cases incised lines and motifs can be selected so that their contours are easily defined, in other cases no information of value is obtained. The method sometimes yields good results on stones with low relief and weathering. The ornament becomes clearer in a way that is not possible using oblique lighting alone. The image can be extracted by 'tidying' around its contours.

Surface deviation. The fourth method involves making a copy of the 3D model and in the copy 'flattening' the surface using the Smoothing function. This flattened surface is then compared to the original surface by using the Surface Deviation function. The deviation between the two surfaces is depicted in a coloured scale. In some cases this can provide a good image of an incised picture. The advantage is that the deviations are measured from a curved stone surface that follows the shape of the picture stone, rather than a flat plane.

Comparison of motifs

By superimposing extracted sections of the 3D image of the stone surface it is possible to compare the shape and proportions of the relative sections, and determine whether they were created with the aid of the same templates. 3D scans allow comparisons to be made in a reliable identical scale (1:1) match, since the compared sections are not manipulated by scaling problems which are a risk when working with traditional photography and picture-editing software. This is especially valuable when comparing the surfaces of picture stones of varying roughness and form. To facilitate matching the extracted images, a number of easily identifiable fixed points are chosen such as the outer limits of extremities (arms, legs and tails), knotwork intersections, and the outer contours of curves (Fig. 15).

Conversion into an interpretive image

When interpreting a picture stone it is often possible to see the incised scene and decoration clearly with the naked eye, sometimes requiring the enhancement of oblique lighting, and yet still have problems in transferring the image to paper in correct scale or to make a satisfactory photographic record of the complete carving. This can be exemplified by the stone which was found at Bro in 2002 and documented by Per Widerström (see Fig. 9 above).⁷⁸ Another difficulty is how to document weathering and surface treatment correctly. The image is often defined and delimited not by lines but by sunken areas or differential background shading.

Source criticism

A source critical observation about documentation of motifs by filling-in the lines of decoration with the selection tool is that the selection tool produces lines of equal width. On a Gotlandic picture-stone the figures tend to be cut with thick lines for the outer contours and fine lines for inner details. A comparable case is found on 11th century runestones, for example the head of the runic animal. If closely packed lines are cut too deeply the intervening background material will splinter, which is why inner details must be cut with finer lines.⁷⁹ The selection tool in the ATOS software produces lines of equal width for the whole figure and the selected points do not reflect the relative thickness and depth of the original. Perhaps one can also make source critical

⁷⁸ Norderäng/Widerström 2004.

⁷⁹ Kitzler Åhfeldt 2002, Paper I.

observations about how to recognise secondary carvings, where the original incisions began to disappear and someone decided to better them.

Selection

Within the 3D scanning project *Gotlands bildstenar: Verkstäder, ikonografi och datering* ('Gotland's picture stones: workshops, iconography and dating') the decorated surfaces of 69 picture stones were scanned in 3D in situ in the exhibition areas and stores of Gotlands Fornsal, Visby and Statens Historiska Museum, Stockholm. The gathered data has been made generally available as down-loadable STL-files (3ddata.raa.se Kitzler Åhfeldt 2013). It has not been possible to 3D scan and analyse all known group C and D picture stones for this study. A selection of 18 stones was treated (Table). I have chosen certain elements to be used when comparing different stones. These are: horses, humans and knots. Different ways of treating the stone surface in creating motifs is exemplified by a study of the sails on picture-stone ships.

Analysis of template use

The picture stones selected for this study belong to Sune Lindqvist's groups C and D (Table) and the analysis methods used were those presented above. The picture fields have not been totally analysed, focus being directed only to the use of templates and the manner of executing the sails. To isolate the motifs on the stones in group D which are carved in deep relief, it was sufficient to rotate the 3D model in differently angled light and trace the cut lines with a selection tool. The same method has been partly used on the C stones, but the carvings there are so diminutive and the relief so flat that several methods were required to isolate the motifs. In the following I will first present the D stones and follow the order in which the analyses were carried out.

D stones

Alskog Tjängvide and Ardre VIII

Alskog Tjängvide and Ardre VIII are so similar in composition that they have long been considered the work of the same stonecarver or same workshop (Fig. 14).⁸⁰ If we first examine the horses on both stones, we find that their outer contours coincide

⁸⁰ Christiansson 1952–67, p. 459; Wessén in *Gotlands runinskrifter* 1962, p. 194; Wilson 1995, p. 64; Lamm 2006, p. 8.

well: note the necks, actuation of the head, loins, belly and shoulder (Fig. 15). Initially I did not consider the riders as belonging to the same template since they do not fit in every detail. However it is possible that the template slid out of line and the stone carver completed the outer contour giving the riders' bodies different angles in relation to their mounts. The arms of the riders have different lengths and positions. This could be partly explained by these extremities being too thin and flimsy on the template, thus requiring a more freehand treatment. On Ardre VIII the template for the horse is placed where there is insufficient room for it. The hind legs conflict with the border interlace and clear termination of the hoofs is missing (Fig. 16). Thus the same template has been used for the horse on Ardre VIII but the placement seems more mechanical and subsequent treatment of the motif less careful.

Turning now to the figure of the dog, or perhaps a wolf(?), there are deviations in detail but the bodies' proportions coincide (Fig. 17). The motif seems to be somewhat misunderstood on Ardre VIII, in that the template contour is followed but the figure has not been corrected with the detailed carving required to better define the tail (Fig. 18). It thus deviates from the dog on Alskog Tjängvide I (Fig. 19), despite the fact that the same template has been used for both outer contours. A possible explanation for these deviations may be that the carver of Ardre VIII borrowed templates but did not understand how to use them. He seems to have used them only for creating outer contours, other details being filled in later by hand.

With regard to the knotwork, we can note the occurrence of several variants. Here too the same templates have been used on Alskog Tjängvide as on Ardre VIII (Fig. 20–21). At the base of Ardre VIII there is a horizontal border of knots containing a 'paw'-detail. The closest parallels are to be found on jewellery decorated in Broa-style, which Wilhelm Holmqvist considered to be created under influence from the Insular area.⁸¹ The initial visual impression is that the knots lie in pairs, so that the first two knots belong together and are crowded against the junction with the next pair (Fig. 22). It seemed as if the template in this case consisted of two linked knots so that, numbered from the left, knot 1 and 2 were drawn together from one template, then knot 3 and 4 from the same template, and so on. So initially I divided up this border into knot-pairs D1-D3, with the row ending in a single knot D4. The distance from the first to the last paw (inner contours) within each pair of knots seemed to confirm this, as they are remarkably homogeneous (251–257mm, cf. Fig. 23). In my next stage I filled in the knot contours and compared them by making overlays. It then became apparent that only the inner contours coincide from knot to knot, more precisely the two roundels that contain paws. The outer contours and intersections differ. To the extent that a template has been used for these paw-knots it seems that it merely consisted of an inner figure-of-eight, while the outer contour of the knots and details were formed more freely (Fig. 24–25). This is reminiscent of the method of working in the construc-

⁸¹ Holmqvist 1977.

tion of interlace ornament in manuscripts, where the holes rather than the intersections are used for guidance. The same method was used for interlace ornament on Anglian sculpture in Northumbria.⁸² One way to lay out the knots on the picture stones would have been to place a line and mark the distances. However, the knots are not in a straight line but angled in relation to one another (Fig. 26). We can also note the presence of a plait which Cramp defined as a Half Pattern (Cramp 1995, p. xxxix, FIGURE 21 B), in this case also made by templates (Fig. 10; Fig. 14).

The concluding result seems to be that a whole set of templates was available for the two picture stones, of which five have been identified: a horse, a dog, and three border patterns (Fig. 14). I have not been able to find equally strong conformity with regard to the houses, the ships' rolled staves nor the ships' crews.

Alskog K

At the foot of Alskog K there runs a border of two rows of small knots (Fig. 27). This pattern occurs also in Northumbrian sculpture and on some motif-pieces.⁸³ Adcock defines it as a simple variant which is constructed by two knots that are linked side by side.⁸⁴ On Alskog K the knots are distinctly carved while the connection between the two rows of knots is barely visible – the outer contours are clearly carved, while the inner crossing bands are cut with shallow lines. The knots are crowded together and almost join one another (Fig. 28–29). The larger knots have been placed out using a template (Fig. 30). Alskog K is smaller than Alskog Tjängvide I and Ardre VIII, and even if similarities occur the templates used on the latter two have not been used for the first. Alskog K has been reconstructed by Lindqvist as the side or end stone of a cist.⁸⁵ The human and animal figures are smaller than, for example, on Alskog Tjängvide I. The so-called Broa-style paw knot occurs here too, perhaps in miniature? So while it is still possible that the same carver was at work here as at Alskog Tjängvide and Ardre VIII, the set of templates used here are of smaller size and more suitable for smaller stones.

Garda Bote

The most eye-catching motif on this stone is the procession of figures in long gowns (Fig. 31). The third figure from the left, which is considered to be the most complete and undamaged, has been used as the basis for examining whether a template has

⁸² Adcock 1978, p. 34.

⁸³ Adcock 1978, p. 35; O'Meadhra 1979, p. 31, 63 nos 13A5, 58A1.

⁸⁴ Adcock 1978, Fig. 2.9 E, see also Cramp 1995, p. xli, FIGURE 23 E.

⁸⁵ Lindqvist 1941.

been used for these figures. The damaged figures have either top or bottom parts remaining but they can all be compared to the best preserved figure. The line of the backs and back-of-head shape show a very good fit (Fig. 32–33).

It is possible that the same template has been used back-to-front for the figure in the picture field above (Fig. 34). The similarity is not visually apparent, but there is an identical relationship between the three points: top of head (hjässan), lower point of the helmet/hair at the back and the curve of the spine. The front gown edges follow the same line. The template seems not to give such a good fit elsewhere, which I would like to assign to the fact that today it is difficult to fill-in the incised lines since the surface is worn and the relief flattened, and also that it may have been reversed. There is a further possibility that a template has been used but the figure was intentionally modified afterwards, to suit a different function in the composition; converting a woman into a man, or making different characters by changing details of dress and attribute.

När Smiss I

At first sight one gets the impression that templates have been used for the knots on När Smiss I (Fig. 35). These templates are not only crude but have also been used in a remarkably clumsy manner, seemingly without any great care to fitting into the space available. The knots do not coincide so well as on Alskog Tjängvide, but this particular carver drew a half knot in a clearly visible place which I consider a sign of the use of templates, and a poor one at that. But why do they fit so badly (Fig. 36)? Perhaps the carver drew around the template carelessly or perhaps his carving in relief was given even less care. It was also difficult to fill-in the figures in the 3D software because of unclear lines. However the two warriors in the upper picture field have a good fit (Fig. 37). Here the same template has been used; but reversed in one figure.

C-stones

After this detailed survey of the D stones, I will now provide a more concise description of template use on the C stones. Here the horse has been specially studied, and in some cases the human figures. Depending on attributes they have been interpreted in a multitude of different ways: that the deceased died in battle; a horse if it is being led by the reins was killed in the burial ritual; Odin in the shape of a bird or one of Odin's ravens flying over the horse.⁸⁶ A horse with a burden on its back can be interpreted as a reference to Grane in the Sigurd legend and the man under his belly in that case

⁸⁶ Böttger-Niedenzu 1982, p. 50–51 and literature cited therein.

would be Regin.⁸⁷ The man beneath the horse's belly can also be Sigurd himself and the bird flying above can be the bird that cried out at Sigurd's death.⁸⁸ We can conclude that whatever lies around the horse (or more neutrally, the four-footed animal) is very important for interpreting the motif. A template may have been used for a four-footed animal which was then completed with various attributes. The horses that occur on the stones that have been treated in this study are reproduced, to scale, in Fig. 38.

Lärbro Tängelgårda I

On some picture stones four-footed animals occur which are generally interpreted as horses. Some of them however are horned or have some form of head attribute, such as that examined here at Lärbro Tängelgårda I. A similar figure is incised on flooring plank from the Oseberg ship, a horned four-legged animal with an arrow in its shoulder.⁸⁹

The three uppermost picture fields on Lärbro Tängelgårda I contain one horse figure each (Fig. 39). The horse figure in the second picture field has some sort of attribute on its head, which has been interpreted as horns or flames. Perhaps this represents a deer. Erik Nylén has suggested that the deer (or elks) which occur on the older, Type-B Vendel Period, picture stones possibly indicate that the Gutes knew about the Celtic deer-god Cernunnos.⁹⁰

If we compare these three horses we find that at first glance they do not seem similar. They all have different attributes. If we superimpose them however we find that the most complete figure is horse III. Horse I corresponds well with horse III, but on horse I a leg has been shortened, and as in the case with Ardre VIII the tail and the back hind leg are crowded up against the right border. The position of the legs and the proportions of the body seem otherwise to be shaped by the same template as horse III. Horse II is interesting in that the same template seems to have been used as for the other horses, but not for the horse's chinbone – (lower part of head at junction with neck), front section of neck, shoulder, belly and actuation of the forelegs, and the front part of the front hind leg (Fig.39). At the hindquarters, the tail has been 'omitted' and in its stead we find the back hind leg. The hind-quarters provide a chopped off appearance. Under the line of the horse's belly there is an additional feature which has been variously interpreted as a hurdle over which it is jumping; a fixture that supports the horse; or an additional set of legs that means the horse is eight-legged steed,

⁸⁷ Gjessing 1943, p. 87.

⁸⁸ Böttger-Niedenzu 1982, p. 51–52.

⁸⁹ Brøgger 1917, p. 313–317, Fig. 116.

⁹⁰ Nylén/Lamm 2003, p. 44.

Sleipnir.⁹¹ This feature does not belong to the template but has been added as an extra attribute. The form of the horse's neck and withers is narrower than that of the other horses (and the template), which I interpret as being a measure to allow space for the floating figure above the back of the horse. Furthermore some detail has been added at the horse's head.

This example shows that templates have been used for planning the main features of the decoration, but that the stonecarver/ artist apparently made major changes to the basic shape. The opposite is somewhat the case with the human figures on this picture stone. They appear to be homogenous. The ring-bearers might have been cut with a template that formed the body from the shoulders to the end of the tunic, while the heads, arms and legs were formed by hand.

Lärbro Tängelgårda III

This picture stone has two horses which are rather difficult to read (Fig. 38). In the lower one (horse 2) only the lower section (legs, shoulders, chest, tail) can be made out. This is however sufficient to establish that it coincides in the foremost foreleg, back hindleg and tail. The same template may have been used on Lärbro Tängelgårda I, with regard to the horses' hind legs and the line of their backs, while the forelegs have been formed by hand. If so, we have identified the use of the same template on two picture stones.

Lärbro Tängelgårda IV

On Lärbo Tängelgårda IV we find eight human figures ranged on two vertical levels. A common template seems to have been used on the figures in the upper field. Based on the figure farthest to the right, there is a good fit between the shape of dress, line of their backs, and stance, while the head-dresses and arm positions show variations (Fig. 40b). In the lower field the figure farthest to the left (with a sword or knife) has an disproportionately large upper body and seems to tilt forward, while the lower and back part of the body and the line of its back coincide with the opposed figure. Even here, I believe that a template has been used. The figure farthest to the right coincides only in length with these two, and may have been formed using a third template or by hand (Fig. 40a).

⁹¹ Lindqvist 1941, p. 98–101; Kreutzer 1988, p. 19; see also Oehrl 2011, p. 215.

Lokrume K

The two horses on Lokrume K seem to have been formed using the same template as for their belly-contour and tails. The three legs that can be made out on the foremost horse coincide well (Fig. 41).

Stenkyrka Lillbjärs III

On Stenkyrka Lillbjärs III as on Ardre VIII, we find that a template that was too large has been crammed into an insufficient space. There is no room for the horse's hind legs (Fig. 42).

Bro

The newly found picture stone at Bro Church contains a horse. In oblique light alone it was impossible to see if there was anything on the back of the horse such as a rider or load; whether anything was placed under the horse; or if it was being led by the reins. As pointed out above, all of these variants have importance for its interpretation. In this case, 3D scanning showed that the horse has a rider, which had not shown up in oblique light in the field, and it possibly also has dropped reins (Fig. 9).

Results

The use of templates is not a regional feature typical for D stones and the parishes only around Alskog and Tjängvide, but a common feature throughout the whole of Gotland. There is an intimate link between picture stones Alskog Tjängvide I and Ardre VIII through the use of the same templates on both stones. The examples show that templates have been used in planning the main features of the decoration, but that the stone carvers add fairly major changes to the basic shapes.

Analysis of Sails

The ships' sails on the picture stones are usually patterned with a criss-cross of diagonal or horizontal squares. This is a uniform recurring feature. At the same time the way the squares are formed varies. They can be drawn with faint incisions or deep grooves. Do we here see the preferences of different stone carvers' or can a single carver have chosen to vary his work? In this study, detailed images of the sails have

been studied by artificial oblique lighting of the 3D model. The images have been saved as JPEG files and the picture contrast has been intensified using picture-editing software. The following variants in production have been noted:

1. The squares are created by fine parallel striations. The lines creating the squares are shallow but wide. The squares are almost quadratic. Halla Broa IV (Fig. 43).
2. The 'squares' consist of vertical elongated lozenges created by thin curved lines. The curved lines create an effect of movement and give the illusion of wind billowing in the sails. Klinte Hunninge I (Fig. 44).
3. The squares are created by broad lines using a flat-ended tool (the lines are not created by multigrooves as in 1). Lärbro Tängelgård I, Lärbro Tängelgård III (Fig. 45).
4. The squares consist of compact lozenges separated by lines drawn at least twice, side by side. Lokrume K (Fig. 46).
5. The squares form an irregular lattice pattern by means of thin diagonal lines. The square shape has not been accorded any special attention. Stenkyrka Lillbjärs III. Possibly Stenkyrka Lillbjärs XVII, but this stone is worn and it is hard to obtain a good image (Fig. 47).
6. The squares consist of vertically elongated lozenges created by thin lines. Resembles variant 2, but the lines are straight and do not give the same realistic sense of movement. Stenkyrka Smiss I (Fig. 48).
7. The squares are very distinctly separated by deeply incised rectangular recessions which create nodes at the intersections. Alskog Tjängvide I, Ardre VIII (Fig. 49).
8. The squares are created by square fields being alternatively sunken and striated both vertically and horizontally. No lines. Garda Bote (Fig. 50).
9. The squares are horizontal and perpendicular and quadratic fields and created using thin lines. När Smiss I (Fig. 51).
10. Irregular criss-cross pattern created by thin vertical and horizontal lines. The 'squares' are of various sizes with little attention paid to their shape. Resembles variant 5. Unknown provenance, SHM Inv. no. 45110:1 (Fig. 52).

Thus the 13 examined images of sails showed 10 different variants in execution. These fall into 4 groups according to the way the lines creating the square patterning are constructed, if we disregard size and form (Fig. 53).

This categorization does not directly isolate individual or workshop carving techniques, but rather shows the different preferences of groups of stone carvers, and the extent to which they adhere to these. Thus the categorization of sails by technique of execution illustrates different approaches and different craftsmen's choices. Thus the ship types may be divided into groups according to cutting technique shown by this analysis. The sails formed by narrow curving lines (sail variant 2) give a more realistic impression of billowing cloth than do those with distinctly cut squares (sail variant 7) (compare Fig. 44 with Fig. 49).

When set out on a distribution map, we can see that the relatively advanced variants 1 and 4 occur close together along the east coast of Gotland. The simpler variant 2 occurs in two parishes on the west coast. Variant 3 occurs in two parishes without any contact with the sea, and another parish at a sea bay. A possible interpretation is that there were connections between stone carvers at the coast, while those who worked with variant 3 show contacts between the inland parishes (Fig. 54). In the Viking Age however, even the inner part of Gotland could be reached and traversed by boat with a system of inland lakes (drained only in later times). The map shows that analysed material is lacking from the intermittent parishes, so any conclusion must be very tentative, a rough proposal with a high risk of over-interpretation. The stones were selected on the basis of comparing northern and southern Gotland, but the results indicate that it would perhaps be more fruitful to compare the western coast and the interior. If we match the result of this analysis of carvers' traces with Lindqvist's hypothesis concerning a northern and a southern school, then a distinction between the coast and interior, or between eastern and western Gotland, seems more appropriate.

Discussion and conclusions

This study has shown that in several cases full-size templates (in scale 1:1) were applied to a stone, often regardless of whether there was room for the whole image. The templates were saved and reused on several stones to repeat figures in a procession, to produce mirror-images of figures, and to lay out border patterns with knots and interlace. On Gardå Bote there is also evidence of one figure being subsequently given an attribute which is lacking on the other figure taken from the same template. So too, on Lärbro Tängelgård I, only one of the horse-like figures has been supplied with horns. The templates have been applied with varying degrees of skill and elaborated on in quite an innovative manner. Similarities have been noted between insular manuscript art and stone sculpture. However, the mathematical principles underlying Celtic-inspired insular interlace have not been followed. This is apparent in the use of templates on the borders. Templates are not flexible, and are associated more with the Continental tradition of using full-scale templates and pattern books. The use of the same templates on different picture stones implies that they were made either by the same carver or by two or more artists in some form of relationship. The templates may have been used on different stones by one and the same carver. However, the examples cited above, concerning Alskog Tjängvide and Ardre VIII, show that variations in the manner in which the templates were used, indicate that they were executed by different persons.

It is necessary to establish criteria to decide whether templates have been used for the figures, or whether they can appear identical when drawn by hand. How similar do figures have to be when taken from a template? The requirement in this study is

that when figures are superimposed on each other, their outer contours, or the fix points for extremities (arms and legs), must in the main coincide. However details inside the outer contour may differ. Consideration must be made for the fact that the templates are being used on uneven stone surfaces that buckle in various directions and that the templates may have moved while the contour was being filled in. Added to this, weathering and wear have increased the difficulty of interpreting the figures today. With all this in mind the figures often coincide remarkably well. The procession on the Garða Bote stone is one example, where at first sight the shapes do not seem so similar, but on examination it turns out they coincide at certain easily identifiable key points. In my opinion Ardre VIII shows an inflexible approach to the motif. If the horse had been drawn by hand it would have been better placed in the space available. The reoccurrence of special details or defects is a further indication that a figure was not drawn by hand. Templates are sometimes applied even where there is poor concordance, with figures crammed into small spaces, instead of being reduced to fit.

Did the Gotlandic picture stone carvers relate to templates in the manner of the north English stone carvers mentioned above, whereby figures lacked significance until they were complemented with the right attribute; or was the outer guise (posture, stance, proportions) sufficient? How should we interpret the use of the template for a dog/wolf on both Alskog Tjängvide I and Ardre VIII but in different compositions? Was a template imbued with associations from its previous usage or was it considered a 'blank' until incorporated into a larger compositonal context. Was this a template for any quadruped – of whatever sort? Pattern books, where the same motif can serve different contexts, may be the explanation. There even are examples of a reused motif from a pattern book being misunderstood and given the wrong identity, becoming Jesus instead of an apostle!⁹²

The use of panelled fields was mentioned above as a parallel to manuscript and insular stone sculpture. Literature historian Daniel Sävborg has observed in his doctoral dissertation *Sorg och vrede i Eddadiktningen* ('Sorrow and Anger in Edda Verse') that in the saga literature action and feeling are expressed through certain recurring poses, for example, through physical expressions of sorrow such as hanging of the head, wringing one's hands and sitting down. The physical expressions and poses relate to literary conventions where gesticulations and specific constellations aim to isolate associations that are familiar to their public.⁹³ Sävborg's examination of how scenes are described in the literature might be fruitfully applied to the picture stones. A similar way of relating stories by the use of fixed poses or types can be observed on the Gotlandic picture stones; for example, Ardre VIII and Alskog Tjängvide. The picture stones abound in scenes in which persons stand or kneel opposite one another, scenes previously discussed mainly in art-historical terms, but which could well gain

⁹² Scheller 1995, p. 45.

⁹³ Sävborg 1997, p. 240–252.

by treatment from a comparative literary perspective. The images of single blacksmiths provide one argument in favour of the scenes being from a narrative tradition rather than realistic representations, as smithing in real life is mainly carried out by two or more persons together (pers. comm. Björn Gustafsson Ny, Dr in scientific archaeology and also practising craftsman familiar with prehistoric metalworking). This way of decorating the picture stones can also be a consequence of using templates. Templates promote simple, recognisable figures, with clear contours, allowing for the later addition of suitable details and attributes.⁹⁴

Different types of templates

The picture-stone carvers seem to have used templates mainly to lay out the outer contours of a motif and to have subsequently filled in the details. This can be compared to the way we make ginger-bread figures by adding features with icing to a simple stamped-out blank. The absence of details might favour an interpretation that the templates were made of a soft material. A soft template would fall apart if even inner details were cut out. A hard template in glued leather would be sufficiently solid to enable the cutting of minor details and extremities without being too fragile (pers. comm. Björn Gustafsson Ny). Appliqué work of this sort has been found in the Siberian Iron Age kurgans at Paszyryk.⁹⁵ A hypothetical possibility is that a figure was traced onto a stone from cloth. If a figure is drawn on cloth the stone carver can easily tap the cloth to transfer the contour as well as inner details. It is even possible that a motif from one picture stone was copied and then transposed onto another stone. A form of tracing has been noted in the Lindisfarne Gospels by means of pricking and pouncing.⁹⁶ Full-scale templates in leather, lead or textile have been suggested for Northumbrian Anglo-Saxon stone sculpture.⁹⁷ Even Swedish 11th C runestones may have been made with the aid of templates. There are examples where the same details recur on several stones but without consideration of the total composition as a whole.⁹⁸ If the templates were manufactured in sustainable material this might indicate an expectation to have repeated use for them – which occurred for example with Ardre VIII and Alskog Tjängvide (cf above). The term ‘instant templates’ might be applied to those that were used for repeating shapes on a single picture stone, but not used on any others. These could have been made out of flimsy material as they did not need to last, and would also have been inexpensive.

⁹⁴ Scheller 1995, p. 41–42.

⁹⁵ Rudenko 1970.

⁹⁶ Brown 2003, p. 292 Fig.126.

⁹⁷ Bailey 1978, p. 183.

⁹⁸ O'Meadhra 1987a; Herschend 1998, p. 105f.

Do the templates belong to a picture-stone workshop?

The use of templates might indicate that there was a picture-stone workshop, in the sense of a group of picture-stone carvers sharing a set of pictures and tools. Whether the occurrence of the same template on different stones should be interpreted as an indicator of a group or a workshop depends on how the templates are used. If they are used in an unskilled way I interpret this as meaning that the person who made the template had an idea for its use, but that another person who borrowed it obtained a different result. When the template is used wrongly it may indicate that the skilled person is not present, or not observant of the problem. This could mean that an apprentice carver might have so close a relationship to his master that he has access to templates, and can occasionally work alone as best he/she can.

Templates also indicate that design is an activity that is separate from manufacture. Treating the design and manufacture of a motif on an artefact as two separate activities occurs in other craftwork areas, and can thus be an argument for making a craft special and professional. Blidmo expresses it thus: craftsman A creates an object's artistic decoration and form (a model), while craftsman B does the practical work in producing it (e.g. the casting process). Craftsman A, the designer, can thus work completely independently. Blidmo argues further that such 'teamwork' is found to be in great demand as a result of the need for greater manufacturing capacity.⁹⁹ Oval brooches are a clear example of this, as they can be cast in moulds made with the help of existing models, which is a complication when it comes to dating and provenance.¹⁰⁰

O'Meadhra who also noted a distinction between designer and manufacturer with regard to the motif-piece material has further observed that one of the criteria for a workshop is the involvement of several craftsmen, though two are sufficient.¹⁰¹ There is a vast literature on the topic of itinerant versus resident craftsmen, craftsmen's social status, the first craft guilds, etc.¹⁰² The possibility that templates indicate mass production has been discussed. The pre-Viking metal workshops found at Helgö on Lake Mälaren gave rise to a whole debate on the matter of the social situation surrounding the enormous craftwork production that took place there.¹⁰³ In the case of metalworking there seems to have been a development in organization during the Viking Age. Lena Thunmark-Nylén considers that on Gotland the 9th century brooch production is characterized by individual pieces and experimentation, while the late 10th century sees the beginning of serial production and an increase in local work-

⁹⁹ Blidmo 1976, p. 11.

¹⁰⁰ Jansson 1981.

¹⁰¹ O'Meadhra 1987a, p. 171.

¹⁰² Cf. O'Meadhra 1987a, p. 169 and literature cited therein.

¹⁰³ Holmqvist 1972; Blidmo 1982; Lamm/Wigren 1984; Lamm 1985; Kyhlberg 1985.

shops.¹⁰⁴ Johan Callmer sketches a progression in south-eastern Scandinavia for the manufacture of combs and bronze objects in the 9th century to go over to standardized products, so that by the 10th century standard types were developed that stretched beyond regional boundaries. Callmer sees developments in the political situation as having an impact on manufacture and trade.¹⁰⁵

The question is, whether these conditions have any relevance for stone monuments such as the Gotlandic picture stones. They are local and immobile and they are monuments – not functional objects or jewellery. The picture stones show signs of teamwork but that this should be the result of largescale demand seems to me rather unlikely. What would ‘large demand’ mean in the case of picture stones? This would depend on how many were needed and over what length of time, as well as how time-consuming it was to create them. This cannot be directly compared to the production of jewellery, where previous studies have shown that, for example, oval and equal-armed brooches occur in a small number of series in relatively large numbers showing few variations.¹⁰⁶ The Gotlandic picture-stones occur exclusively on Gotland (with a few known exceptions of one stone exported to the Baltic island Öland, one stone in Latvia and one exported to Norrsunda in the mainland province of Uppland, whereof the latter is lost and only known from drawings). This limits the opportunities for largescale organization. The total number of picture stones might seem considerable, but spread over time, their production is in fact quite modest. That makes their situation special in the sense that those who manufactured them might have applied their skills to some other medium between commissions, which also allows them to have collected their motifs from elsewhere. In a corresponding discussion on runestones I have argued that the rune carvers had some form of ecclesiastic association which involved them in other activities when not needed for carving, but that the skill to create one never died; just lay dormant until called upon.¹⁰⁷ However, I would not like to draw a parallel to the Viking-period picture-stones of types C and D, since it is not at all equally clear that they were produced in a Christian context. In the present state of research, the possibility that these picture stones belonged to a Christian or pre-Christian context is an open question. For example, Jörn Staecker has argued that the picture stone from Sanda bears a Christian motif, if difficult to identify; there are however more likely interpretations of a pre-Christian iconography.¹⁰⁸

In contrast to the conclusions of Nerman and Lindqvist,¹⁰⁹ Imer considers that the borders on the picture stones cannot be ascribed any chronological significance and that the picture stones cannot be dated by analogy with other objects bearing similar

¹⁰⁴ Thunmark-Nylén 1995, p. 118–119.

¹⁰⁵ Callmer 1995, p. 65–66.

¹⁰⁶ Blidmo 1976, p. 12; Jansson 1981; Thunmark-Nylén 1995.

¹⁰⁷ Kitzler Åhfeldt 2008, p. 11.

¹⁰⁸ Staecker 2004; cf. discussion on interpretations in Kitzler Åhfeldt 2002, p. 53.

¹⁰⁹ Nerman 1947; Lindqvist 1942.

ornament; the only chronological phasing the borders allow is that they seem to become more complex with time.¹¹⁰ Anders Carlsson has suggested that monumental art may well retain old-fashioned features.¹¹¹ As observed above, this is a possible consequence of using templates and copies – the decorative features can last over a long period. Imer's dating to the 10th century of the picture stones dealt with in this study, means that we perhaps should take the motif-pieces into account when we consider potential models, as also the give-and-take relationship with Anglo-Scandinavian stoncarvings. It is possible that there were more pattern books available then than earlier, depending on how we interpret the evidence of their survival rate. If our picture stones in this study were made with the aid of templates during the 10th century, they would fit in with the development in society towards an adoption of manufacturing aids.

The picture-stones are relatively few and have great variation but they are the result of teamwork. This begs the question of how the stone carvers acquired their skill and where else they applied it. In my opinion the picture-stone carvers were attracted to Insular interlace, but when applying it they used templates instead of the principles of construction on which it was founded. It seems to me that the picture-stone carvers had problems when it came to repetition of the pattern in the interlace, so that the knotwork appears in units. On the picture stones we find elements that can be recognised in the manuscripts and grave markers from Lindisfarne. This does not mean that the connection need have been especially intimate. Templates may have been worked out with the help of some form of collection of patterns which was brought to the island of Gotland. It would be too simplistic to see the geometrically-based interlace as a western trait and the use of templates as a southern, i.e. Continental, one. Insular features were practised on the Continent in manuscripts produced in the monasteries founded by Irishmen such as St Gall. Sets of patterns can travel freely and be independent of directly personal connections. Compositions can be subdivided into smaller units which are reassembled into different wholes.

Summary

In this study a selection of 18 Gotlandic picture-stones from Lindqvist's groups C and D have been documented with an optical 3D scanner. 3D models have been used partly to examine whether the picture-stone carvers have used templates for the figures and ornament, and partly to compare variations in carving techniques when cutting the ships' sails.

¹¹⁰ Imer 2004, p. 100.

¹¹¹ Carlsson 1983.

The results show that templates have been used on all stones selected for this study. Templates have been saved and used on several stones; they have been used when repeating figures in a procession, to mirror figures and for setting out interlace ornament and knotwork borders. On Garda Bote there is also evidence for one figure having an attribute that is lacking on other figures sketched with the same template. Templates have been applied with varying skill and even quite inventively. The use of templates on the Gotlandic picture stones might indicate an attempt to apply Insular Celtic-derived ornament without mastering the principles behind it, so that instead of working with grids they used templates. This might suggest that the carvers of the picture stones were more at home in a Continental craftwork tradition, where templates and pattern books had been a feature of workshops since Roman times. The cutting technique of the ships' sails falls into four main variants, which possibly reflects contact between carvers along the coast on the one hand, and between those in the inland on the other.

The study also shows that by detailed analysis of picture stones one can approach the artists' arrangements and priorities. Template concordance occurs mostly between shapes on the same stone or stones from the same site. I have in this limited study not seen any case of template concordance over great distances. My hypothesis is thus that template concordance between picture-stones indicates associations on the individual level, for example, between a master and apprentice(s) as a workshop; while shared similarities in carving techniques (as exemplified by the sails) perhaps indicate looser associations such as schools.

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Table: The picture-stones examined in this study. 1) Style established by the author.

Parish	Site	Inv.nr.	Inv.nr. identity	Horse	Sail	Sail type	Template	Style (Lqvt)	Picture school (Lqvt)	Dating
Bro	Bro kyrka	GFC21905		Yes	Yes		?	C ¹	–	Imer 2004
Halla	Broa IV	GFA2263	2263	Yes	Yes	3	?	C	–	–
Klinte	Hunninge I	GFC9286		(Yes)	Yes	2	?	C	–	800–1000
Lokrume	Lokrume K	SHM 14342	45257	Yes	Yes	3	Yes	C	–	800–900
Lärbo	Tängelgårda I	SHM 4373	108186	Yes	Yes	3	Yes	C	North	900–1000
Lärbo	Tängelgårda III	SHM 4373	108200	Yes	–	3	Yes	C	North	–
Lärbo	Tängelgårda IV	SHM 4373	44501	–	–	–	Yes	C	North	750–800?
Stenkyrka	Lillbjärs I	SHM 13742	45680	Yes	–	–	?	C	North	C. 750–900
Stenkyrka	Lillbjärs III	SHM 13742:2	45167:3	Yes	Yes	2	Yes	C	North	750–onwards
Stenkyrka	Lillbjärs 17	GFC2483		–	Yes	2	?	C	North	750–onwards
Stenkyrka	Smiss I	SHM 11521		?	Yes	2	?	C	North	–
Alskog	Alskog K	SHM 6562		Yes	–	–	Yes	D	South	900–1000
Alskog	Tjängvide I	SHM 4171		Yes	Yes	4	Yes	D	South	900–1000
Ardre	Ardre VIII	SHM 11118:8		Yes	Yes	4	Yes	D	South	900–1000
Garda	Bote	SHM 15098		Yes	Yes	1	Yes	D	South	800–900
När	Smiss I	SHM 11521		–	Yes	2	Yes	D	South	C.750–900
Unknown	Unknown	SHM 45110:1		–	Yes	2	?	–	–	–
Unknown	Unknown	SHM 45110:2		Yes	–	–	?	–	–	–



Fig. 1: Detail of rune inscription on Alskog Tjängvide. Note how the runic field adapts to the pre-existing tip of the spearhead from the picture field. 3-D-image with artificial oblique light.

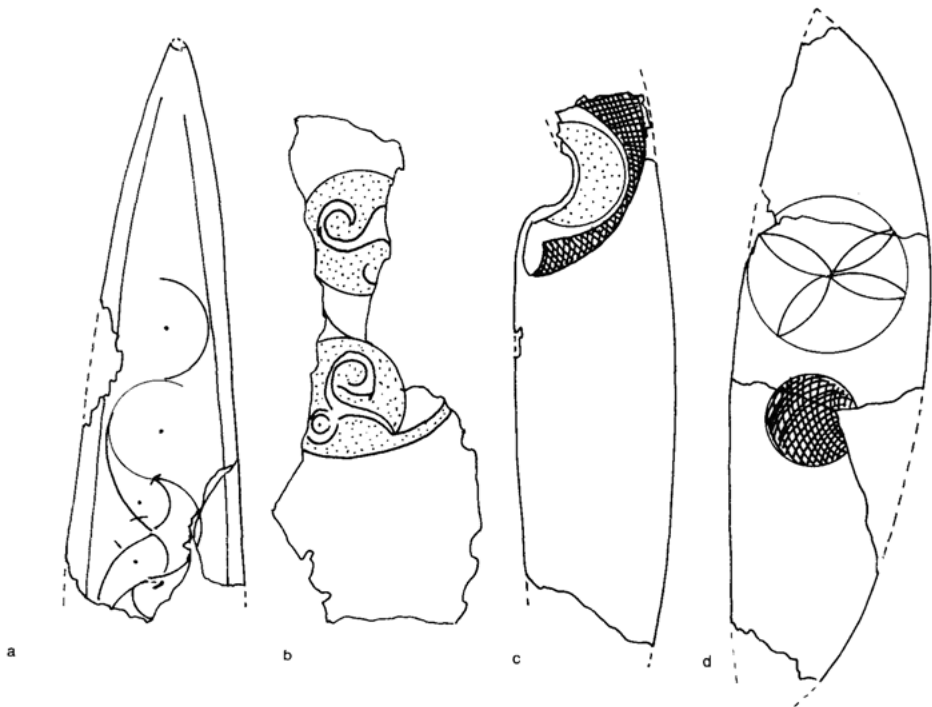


Fig. 2: Examples of the bone slips from Loughcrew, Ireland. Note the use of a compass to set out the ornament on the one to the far left. After O'Meadhra 1987a, p. 128, fig.88.



Fig. 3: The Lindisfarne Gospels (BL, Cotton MS Nero D.iv.), f.29r, Chi-rho page. Note how the different types of knots run together.

Photo: courtesy of British Library. Detail. The photo has been modified by the author.



Fig. 4: Lindisfarne Gospels (BL, Cotton MS Nero D.iv.), f.138v, Luke cross-carpet page.

Photo: courtesy of British Library.



Fig. 5: Cat. no. Lindisfarne 29 in *Corpus of Anglo-Saxon Stone Sculpture*, Volume 1, County Durham and Northumberland, by Rosemary Cramp (Oxford University Press for the British Academy, 1984), p. 204, plate 199, 1113.
Photo: Copyright *Corpus of Anglo-Saxon Stone Sculpture*, photographer T. Middlemass.



Fig. 6: 'Thor's Cross', Bride, Isle of Man.
After Kermode 1907, pl. XLVII, 97a.

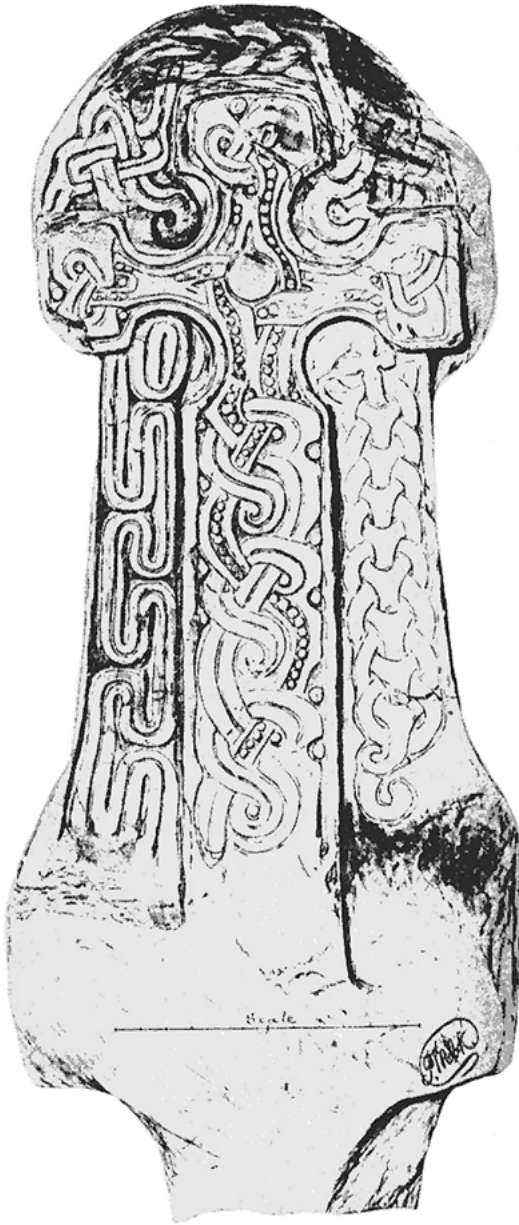


Fig. 7: Stone cross slab from Ballaugh, Isle of Man.
After Kermodé 1907, pl. XXXII, 77A.



FIG. 55.—SIGURD STONE,
HALTON.

Fig. 8: The 'Sigurd Stone', Halton,
Isle of Man. After Kermodé 1907,
fig.55.



Fig. 9a: Bro Church, new find from 2002. Inv.nr. C21905 Gotlands Museum, Visby. Interpretation of the scene on the picture stone using traditional side-lighting on the stone itself (After Norderäng/Widerström 2004, p. 87, illus. 6).

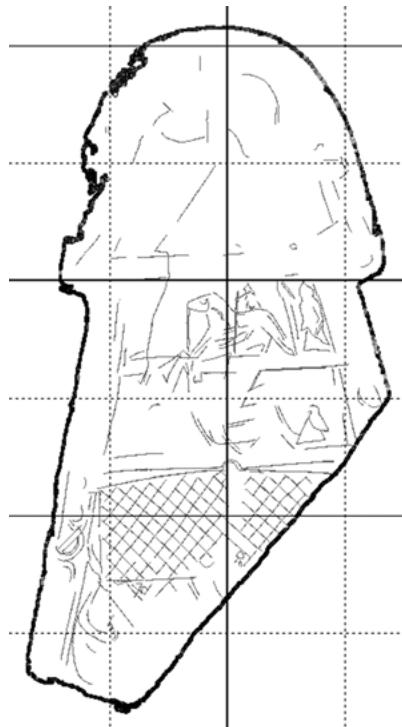


Fig. 9b: Bro Church, new find from 2002. Inv.nr. C21905 Gotlands Museum, Visby. Interpretation of the same scene using a 3D scanner in 2007 by the author and Per Widerström.

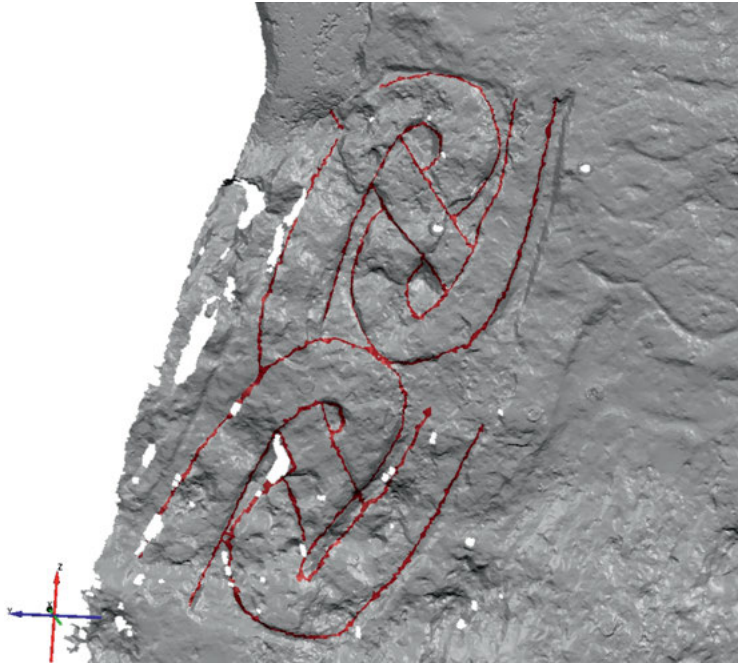


Fig. 10: Incised lines filled in on the 3D model with the Selection Tool. Note the mistaken interlace junction, a mistake made by the carver.

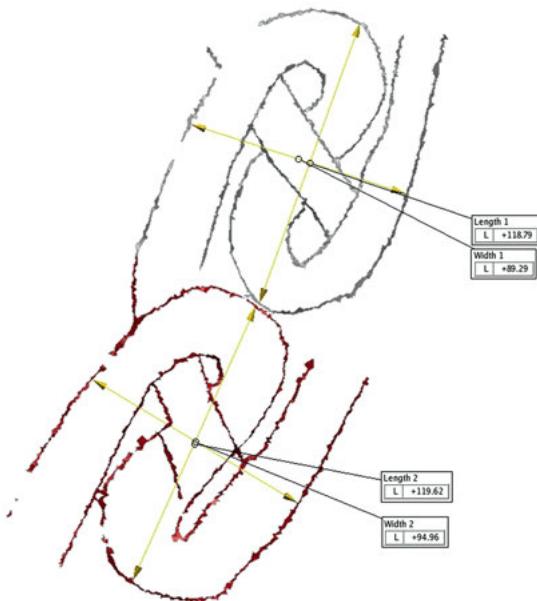


Fig. 11: The selected points when extracted from the 3D model.

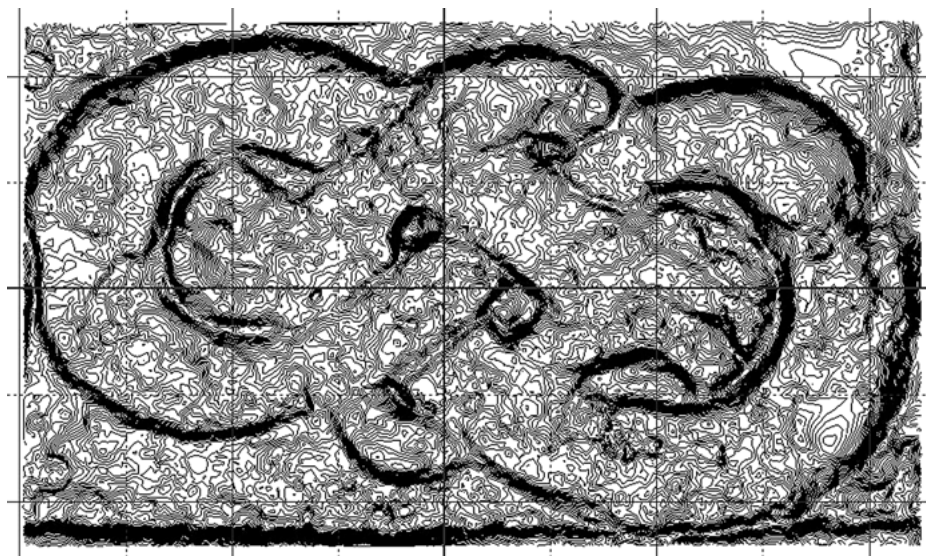


Fig. 12: The contours of the ornament as an isogram.

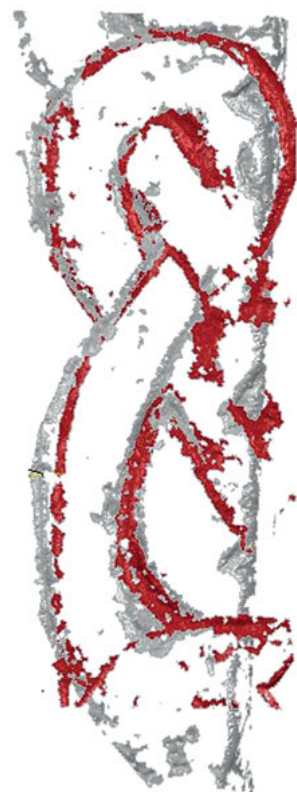


Fig. 13: Selection by Curvature. Comparison of knots on Alskog K. The grooves forming one of the knots (red line) have been filled in using the *selection by curvature* function in the ATOS 3D-software.

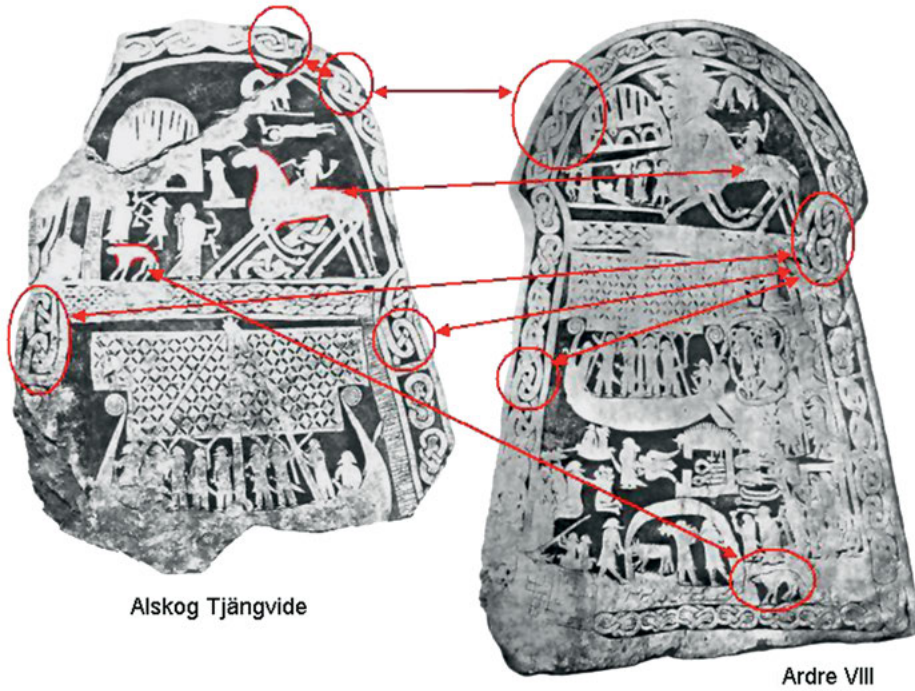


Fig. 14: Alskog Tjängvide and Ardre VIII. After Lindqvist 1941, Taf. 57, 59. Modified by the author. Template identifications have been marked.

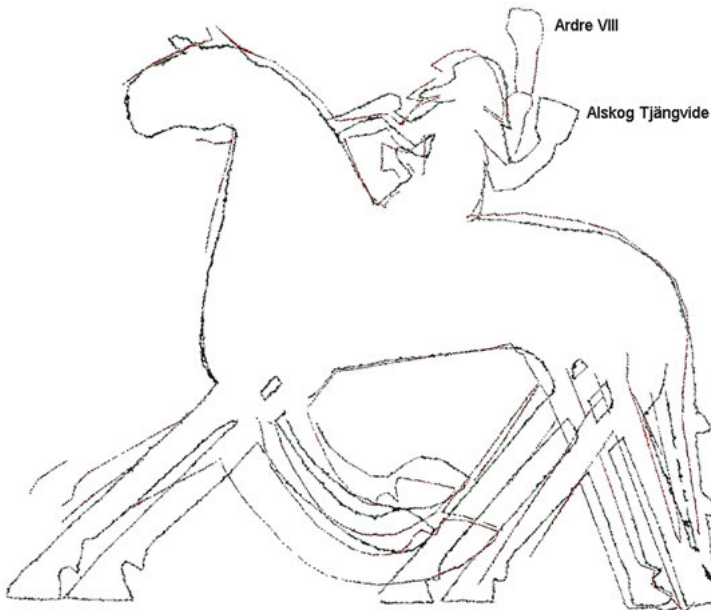


Fig. 15: Superimposition of the horse figures from Alskog Tjängvide and Ardre VIII.

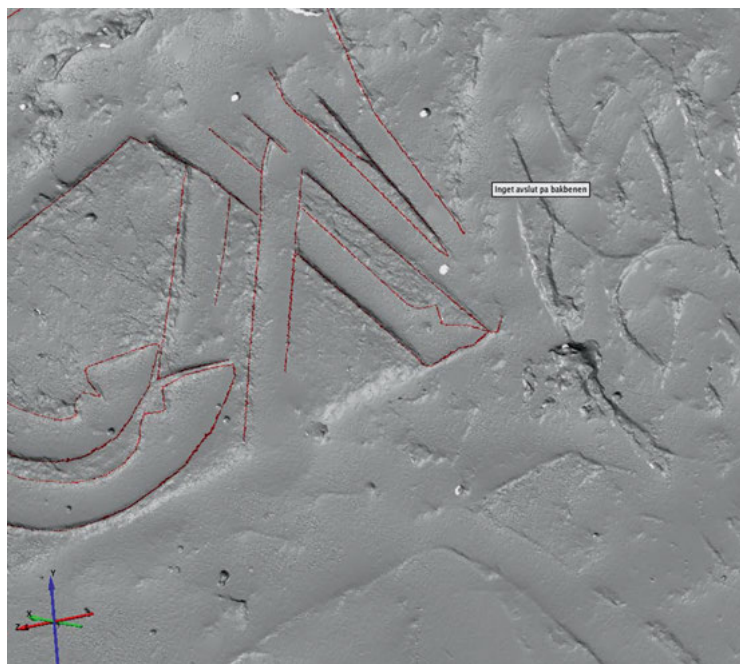


Fig. 16: Detail of the horse on Ardre VIII. The template for the horse has been forced into a space that is too short for it, so that the hindlegs conflict with the knotwork border, cutting off the tips of the hoofs.



Fig. 17: The dog/wolf motif from Ardre VIII and Alskog Tjängvide I superimposed. The outer contours coincide but the figure on Ardre VIII has not been corrected or finished off at the detail of the tail.

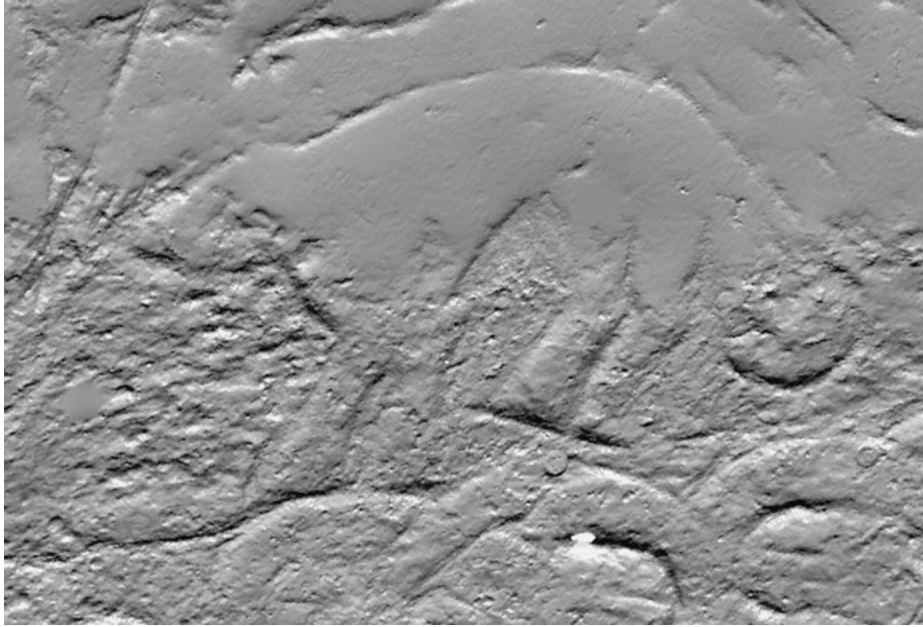


Fig. 18: Dog/wolf on Andre VIII.

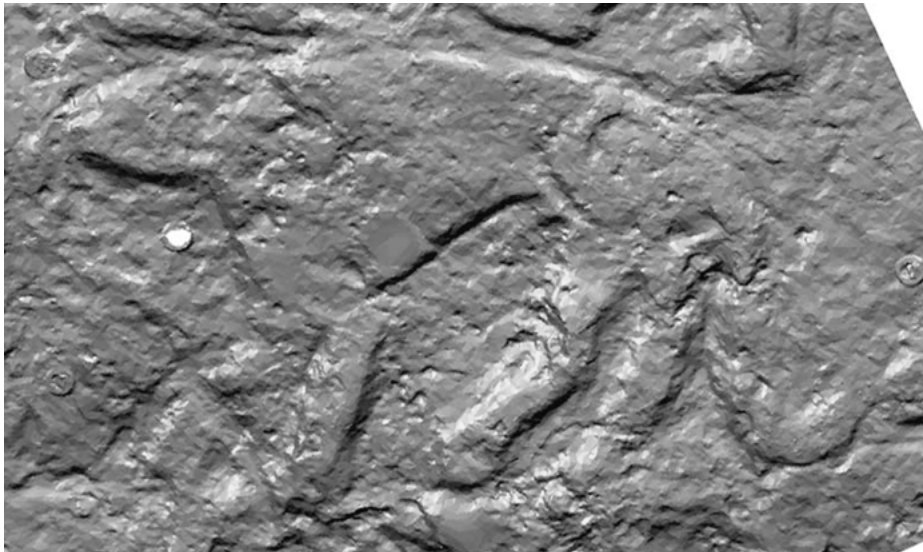


Fig. 19: Dog/wolf on Alskog Tjängvide I.



Fig. 20: Concordance between the interlace border patterns on Alskog Tjängvide I and Ardre VIII.

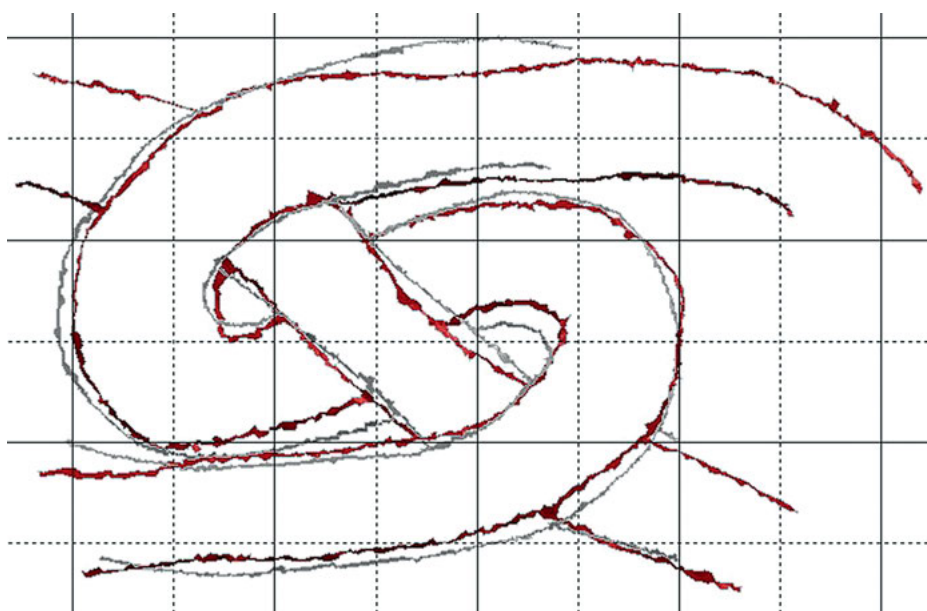


Fig. 21: Concordance between the knotwork border patterns on Alskog Tjängvide I and Ardre VIII.

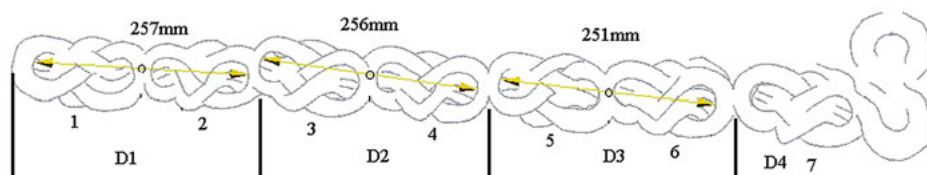


Fig. 22: Ardre VIII. Lower border. The interlaced knots seem to lie in pairs that are crowded together and even overlap.

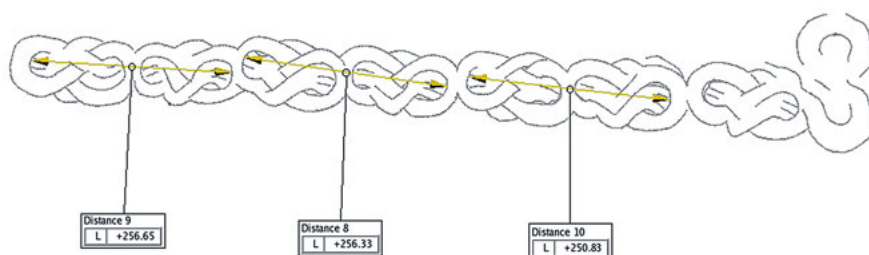


Fig. 23: Ardre VIII. Lower border. Drawing of the knotwork, showing the relative distance between each knot pair.

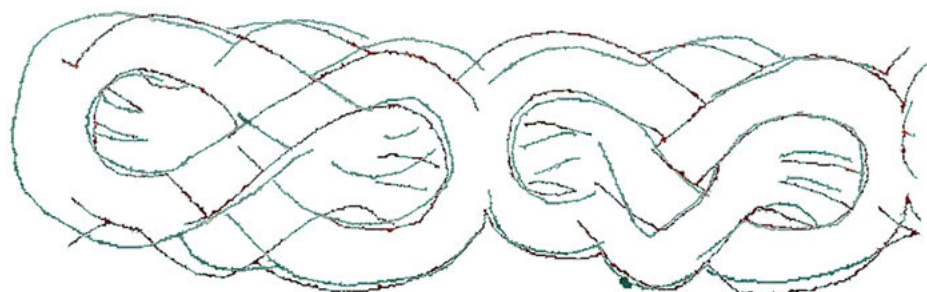


Fig. 24: Ardre VIII. Lower border. The inner sections of the knots have good concordance but the outer contours differ.

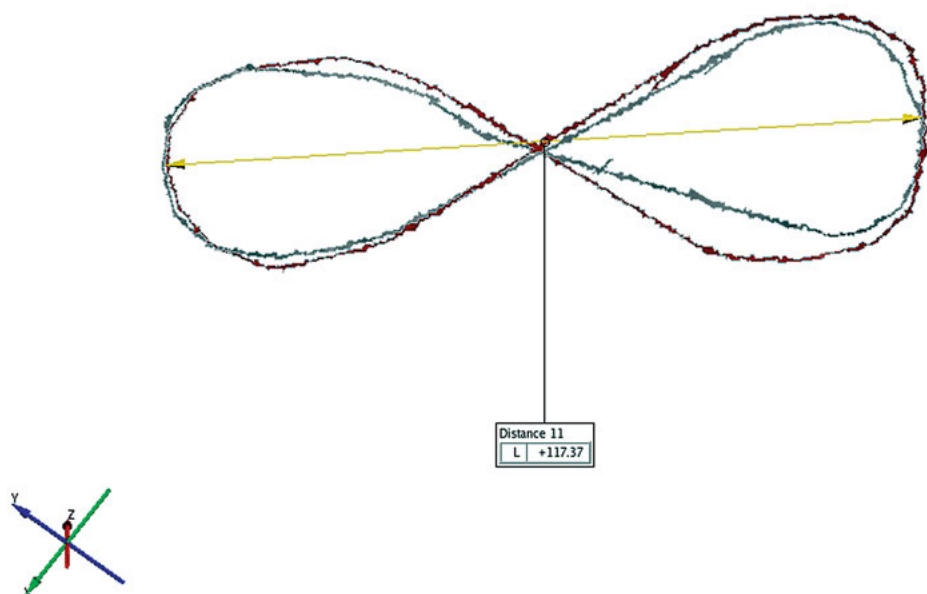


Fig. 25: Ardre VIII. Lower border. The interlace has been laid out using a figure-of-eight template corresponding to the inner contours of the knots, while the paws have been drawn freehand.

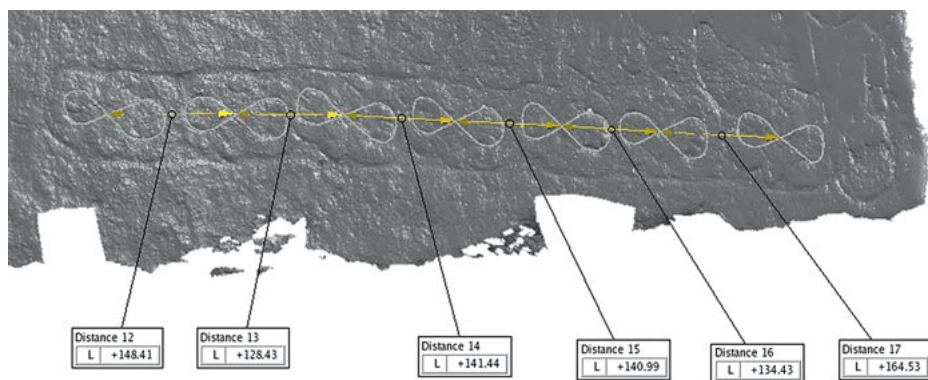


Fig. 26: Ardre VIII. Lower border. Note how the central points of the figure-of-eight contours do not align and differ in distance from one another.



Fig. 27: Alskog K. After Lindqvist 1941, Taf.56, Fig.135.

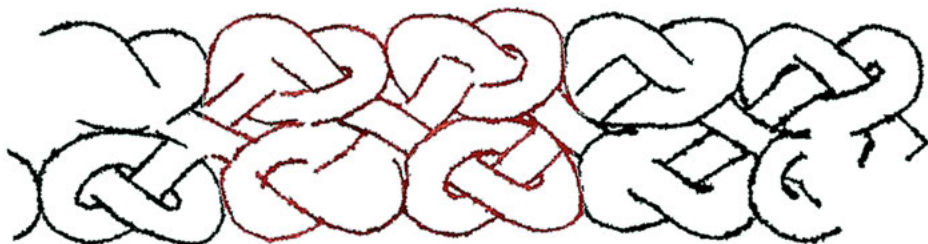


Fig. 28: Alskog K. Analysis image of a section of the double knot border. Reference knots are marked in red.

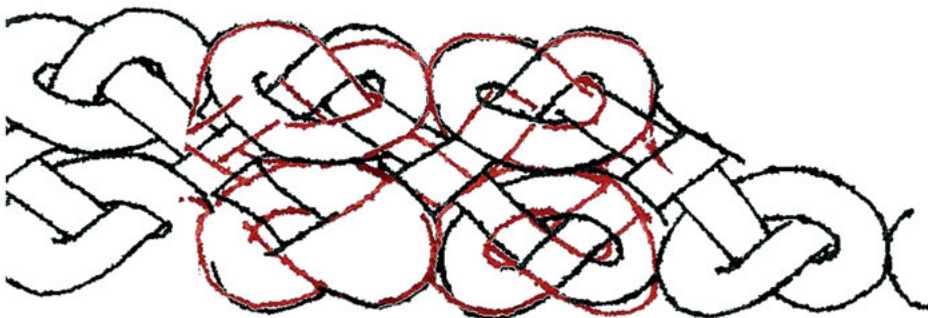


Fig. 29: Alskog K. Comparison between the reference knots and other knots in the same border.

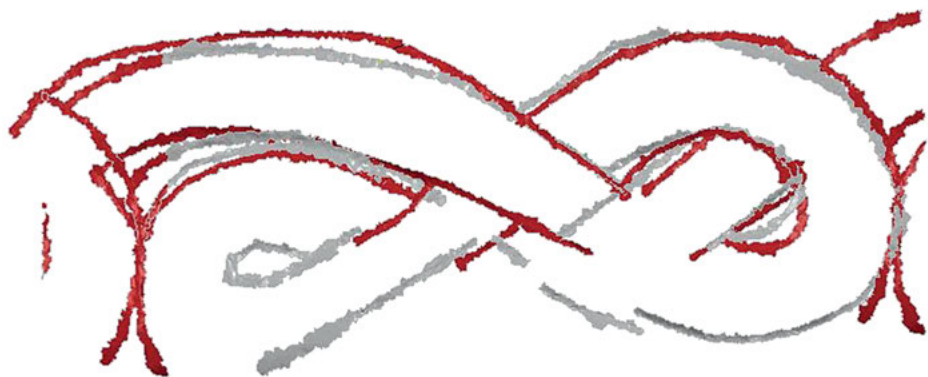


Fig. 30: Alskog K. Comparison between knots in the right-hand border.



Fig. 31: Gardaböte. After Lindqvist 1942, Taf. 61, Fig.141.

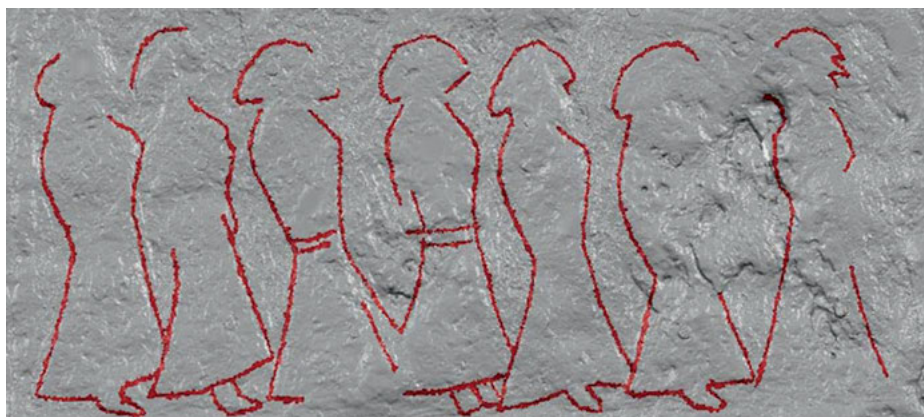


Fig. 32: Garda Bote. Third from the left is the key figure against which all were measured to see if the same template has been used for each member of this precession.

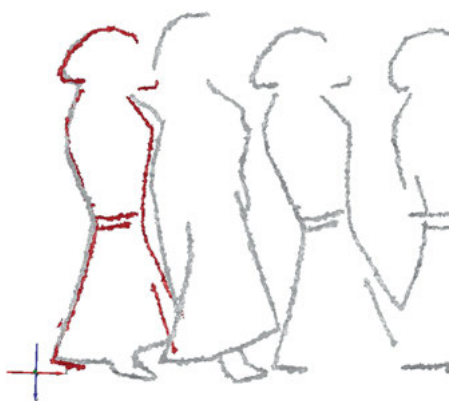


Fig. 33: Garda Bote. Comparison between figures 1 and 3 from the left. Note the correspondence between the lines of the back, head and tunic skirt.

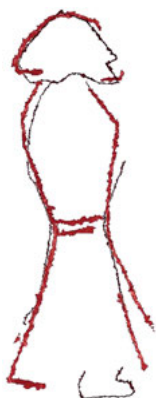


Fig. 34: Garda Bote. The same template has been used reversed to obtain the figure in the upper picture field. They are not identical but the relationship between three fixed points coincide, i.e.: crown of head, back tip of helmet/hair, slope of upper back. Even both front skirt contours share the same curve.



Fig. 35: När Smiss I. After Lindqvist 1942.

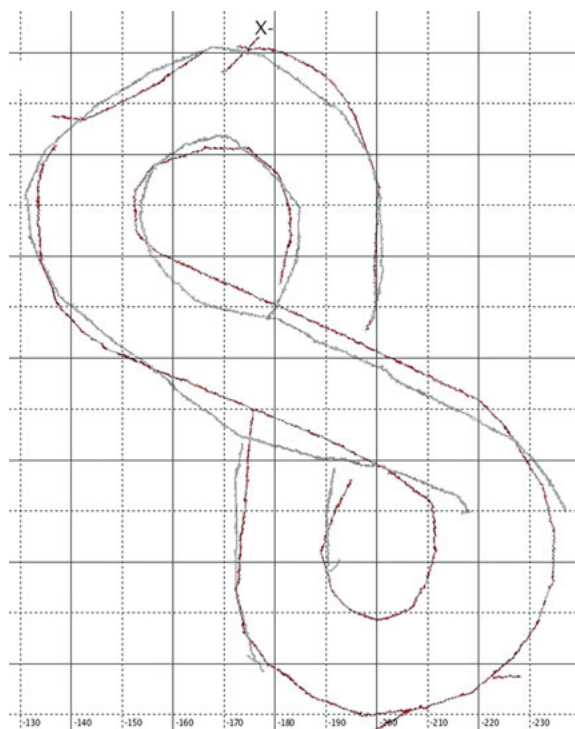


Fig. 36: När Smiss I.
Correspondence between
two knots.

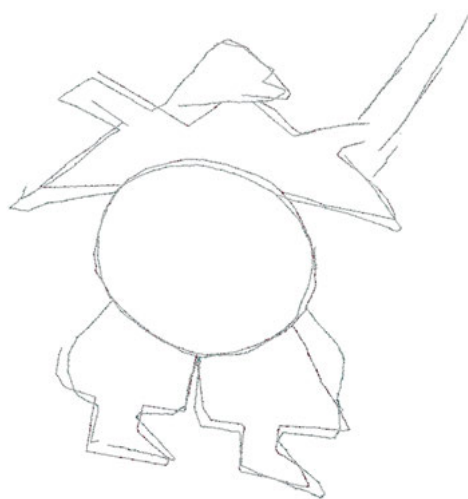


Fig. 37: När Smiss I. Correspondence between
the two warriors. The template has been
reversed for one of the figures.

Alskog K



Alskog Tjängvide I



Ardre VIII



Garda Bote



Lokrume K



Lärbro Tängelgård I
Horse 1



Horse 2



Horse 3



Lärbro Tängelgård III
Horse 1



Horse 2



Stenkyrka Lillbjärs I



Stenkyrka Lillbjärs III



Halla Broa IV



SHM 45110:2



Fig. 38: The various horses as represented on the picture stones in this study.

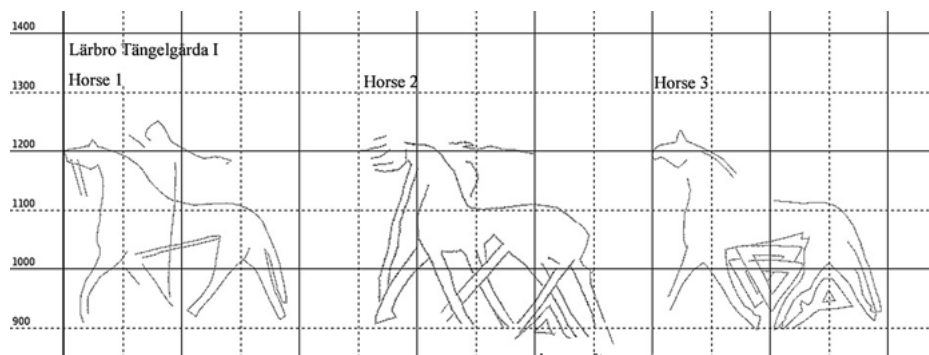


Fig. 39: Lärbro Tängelgård I, horses.

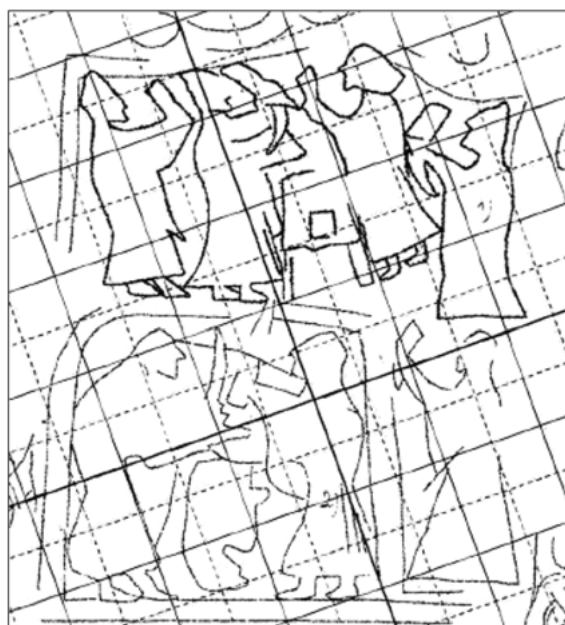


Fig. 40a: Lärbro Tängelgård IV. Human figures.

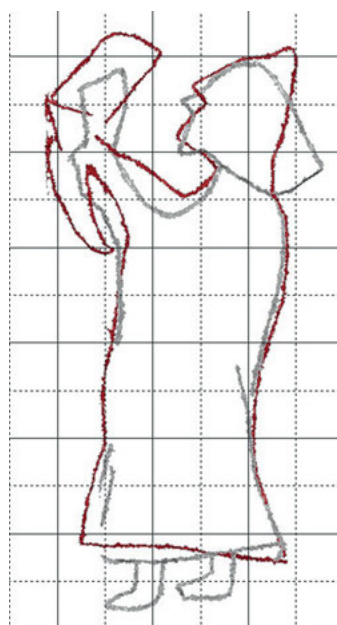


Fig. 40b: Lärbro Tängelgård IV. Superimposition of two figures from the upper row.

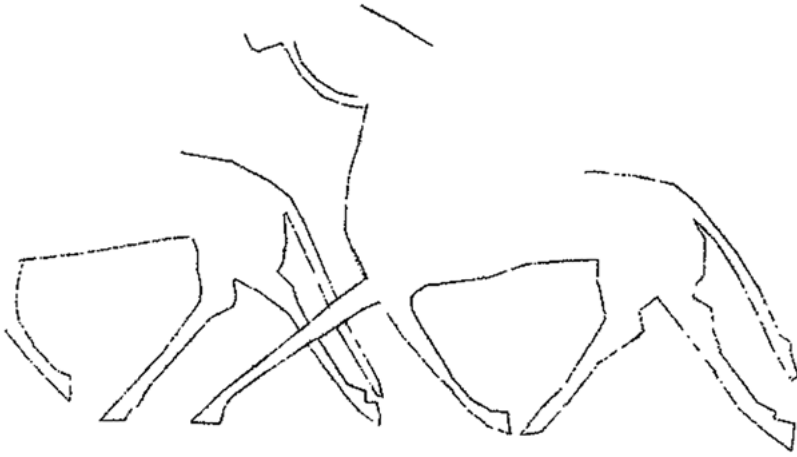


Fig. 41: Lokrume K.



Fig. 42: Stenkyrka Lillbjärs III. A template that was too big for the space available has been used leaving insufficient room for the horse's hindlegs. After Lindqvist 1942, Taf. 43, Fig. 104.

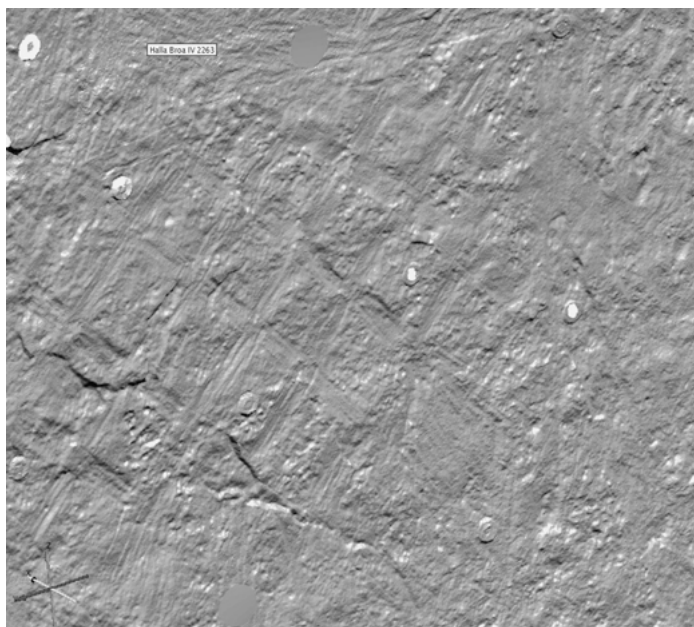


Fig. 43: Sail variant 1. The square pattern is created by fine parallel striations. The grooves between squares are shallow but broad. The fields are almost square. Halla Broa IV.

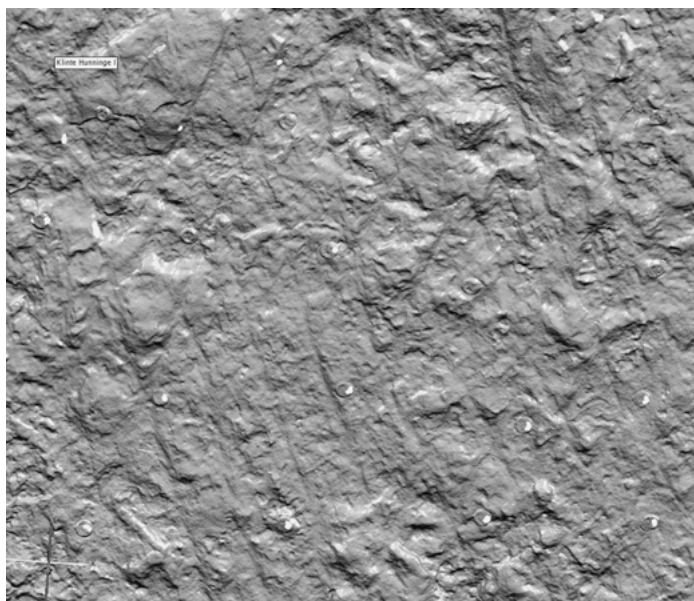


Fig. 44: Sail variant 2. The fields of vertical elongated lozenges are created by thin lines, that curve giving the illusion of wind billowing in the sails. Klinte Hunninge I.

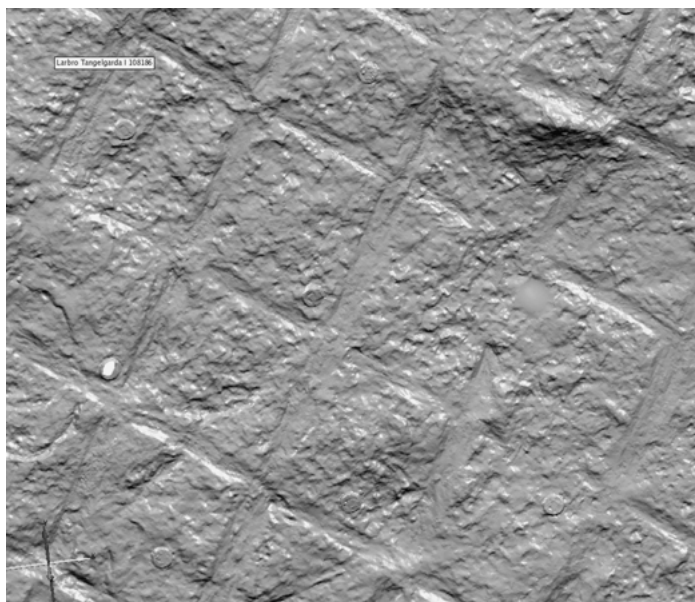


Fig. 45a: Sail variant 3. Square fields created by single broad lines using a flat-ended tool only once unlike the multigrooves in variant 1. Lärbro Tängelgårda I.

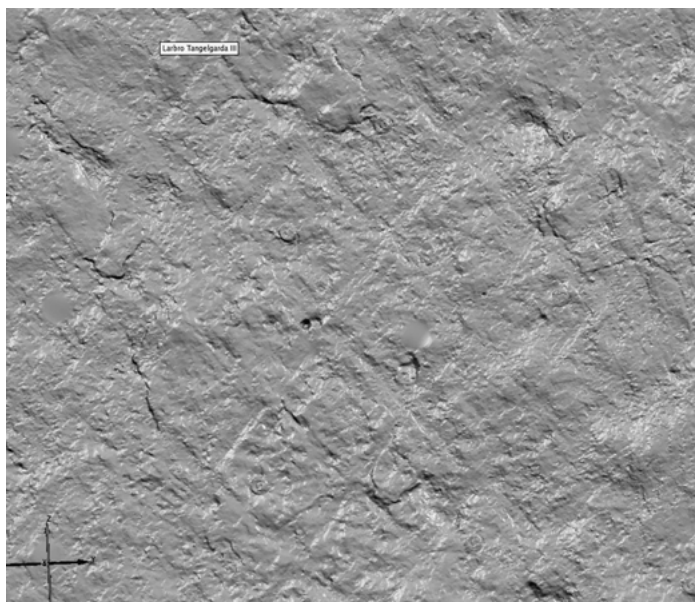


Fig. 45b: Sail variant 3. Square fields created by single broad lines using a flat-ended tool only once unlike the multigrooves in variant 1. Lärbro Tängelgårda III.

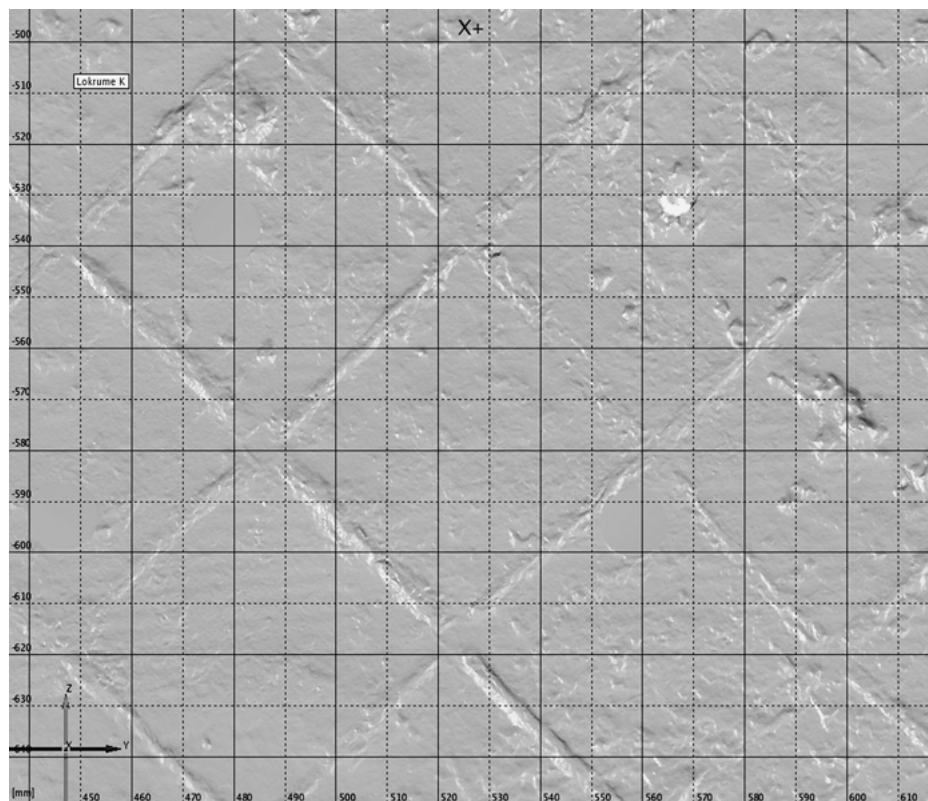


Fig. 46: Sail variant 4. Compact lozenges created by single lines, cut at least twice (double groove). Lokrum K.

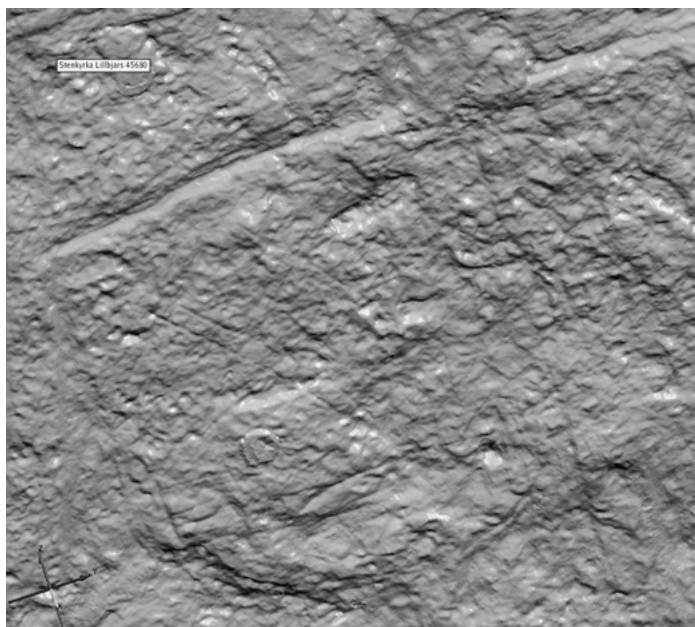


Fig. 47a: Sail variant 5. Irregular lozenge pattern using thin diagonal lines. The field shape has not been accorded any special attention. Stenkyrka Lillbjärs III.

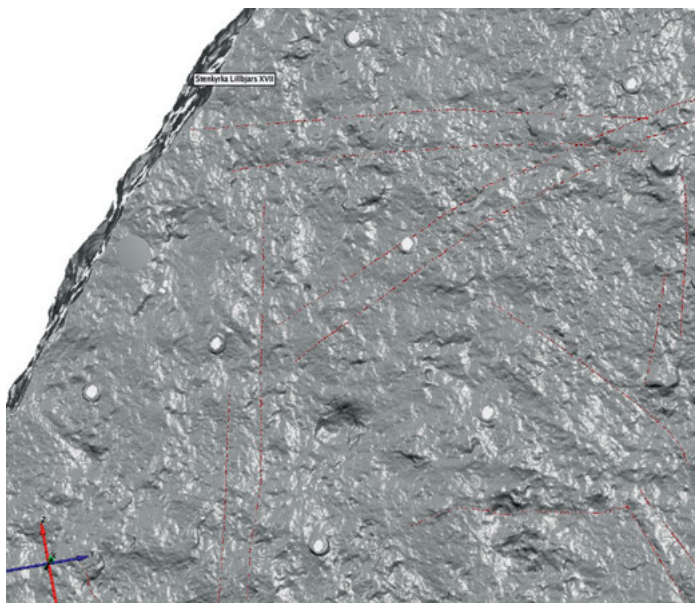


Fig. 47b: Sail variant 5. Irregular lozenge pattern using thin diagonal lines. The field shape has not been accorded any special attention. Stenkyrka Lillbjärs XVII.

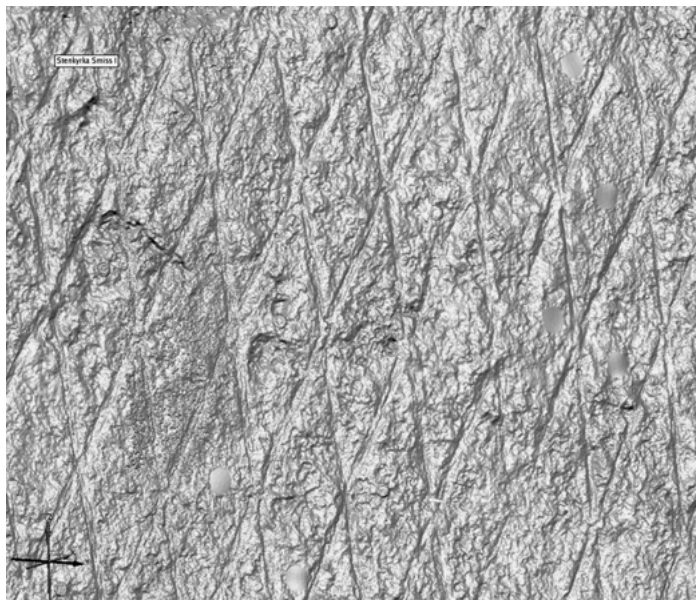


Fig. 48: Sail variant 6. The fields of vertically elongated lozenges are created by single thin lines. Resembles variant 2, but the lines are straight and do not give the same realistic sense of movement. Stenkyrka Smiss I.

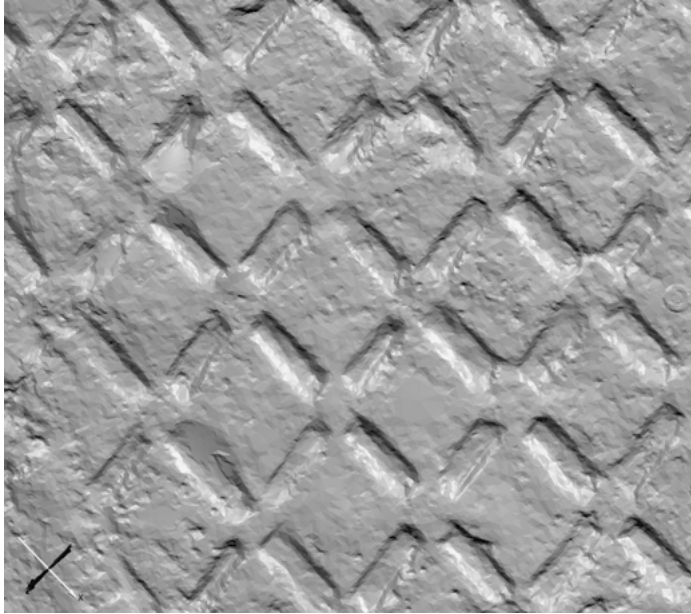


Fig. 49a: Sail variant 7. The fields are very distinctly created by single deeply cut rectangular recessions which create nodes at the intersections. Alskog Tjängvide I.

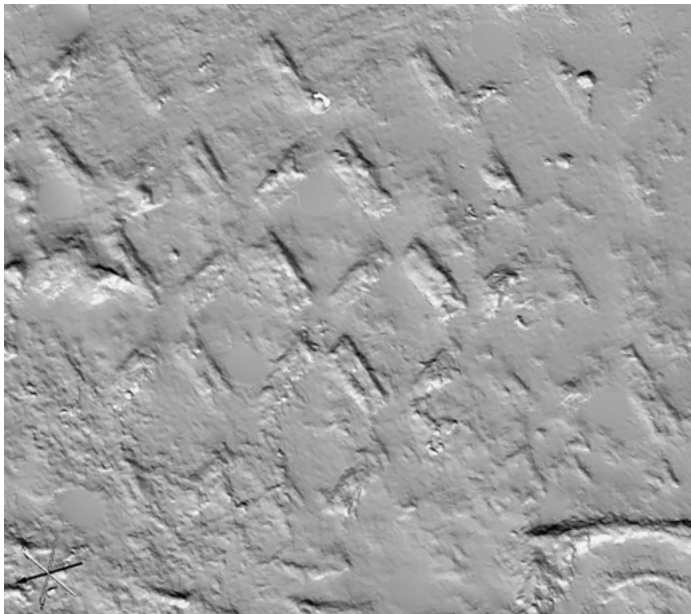


Fig. 49b: Sail variant 7. The fields are very distinctly created by single deeply cut rectangular recessions which create nodes at the intersections. Ardre VIII.

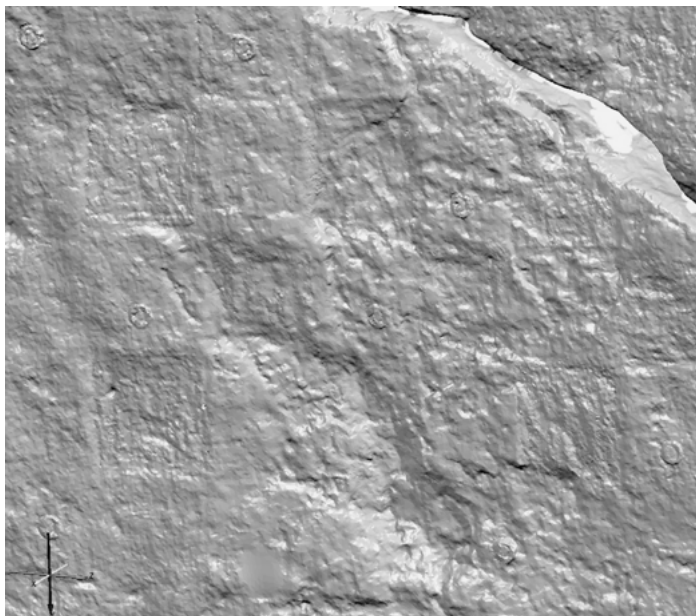


Fig. 50: Sail variant 8. The square pattern is created by every alternative field being sunken and striated both vertically and horizontally. No lines. Garde Bota.

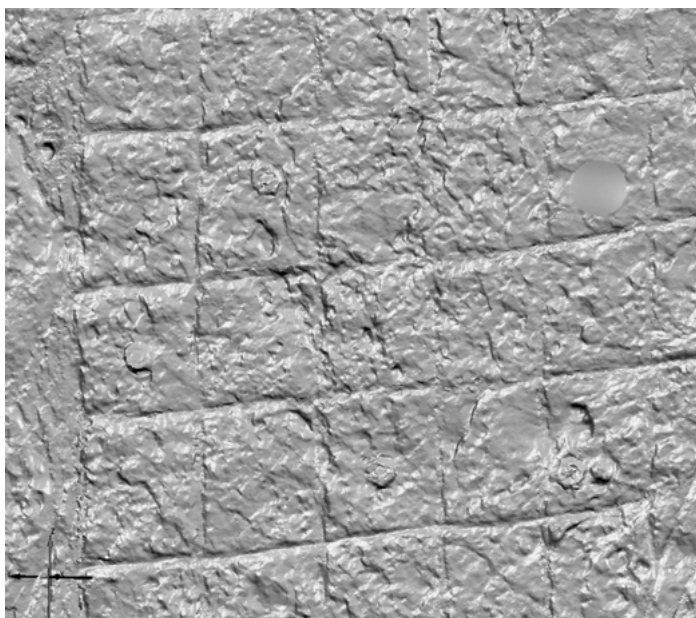


Fig. 51: Sail variant 9. Horizontal, perpendicular squares where quadratic fields are created using thin lines. När Smis I.

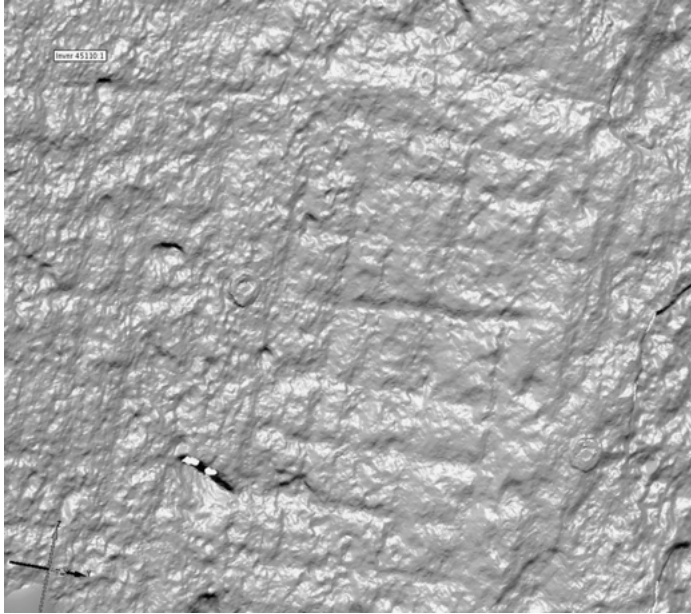


Fig. 52: Sail variant 10. Irregular square patterns created by thin vertical and horizontal lines. The fields are of various sizes with little attention paid to their shape. Resembles variant 5. No loc., Gotland, SHM Inv. no. 45110:1.

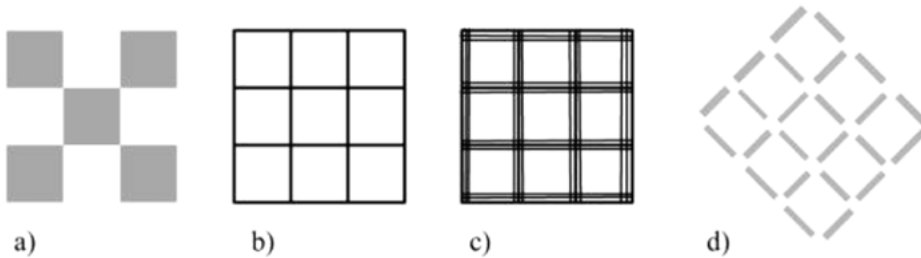


Fig. 53: Schematic representation of the 4 types of cutting techniques used to create the squared pattern on the sails.

- a) Type 1. By striating alternative fields. No lines. Variant 8. Garde Bota.
- b) Type 2. By cutting a single thin line. Variants 2, 5, 6, 9, 10. Klinte Hunninge I, Stenkyrka Lillbjärs III. Possibly Stenkyrka Lillbjärs XVII, Stenkyrka Smiss I, När Smiss I, No loc., Gotland, SHM Inv. no. 45110:1.
- c) Type 3. By a broad line cut a number of times. Variants 1, 3, 4. Halla Broa IV, Lärbro Tängelgård I, Lärbro Tängelgård III, Lokrume K.
- d) Type 4. By thick deeply recessed rectangular 'fields'. Variant 7. Alskog Tjängvide I, Ardre VIII.

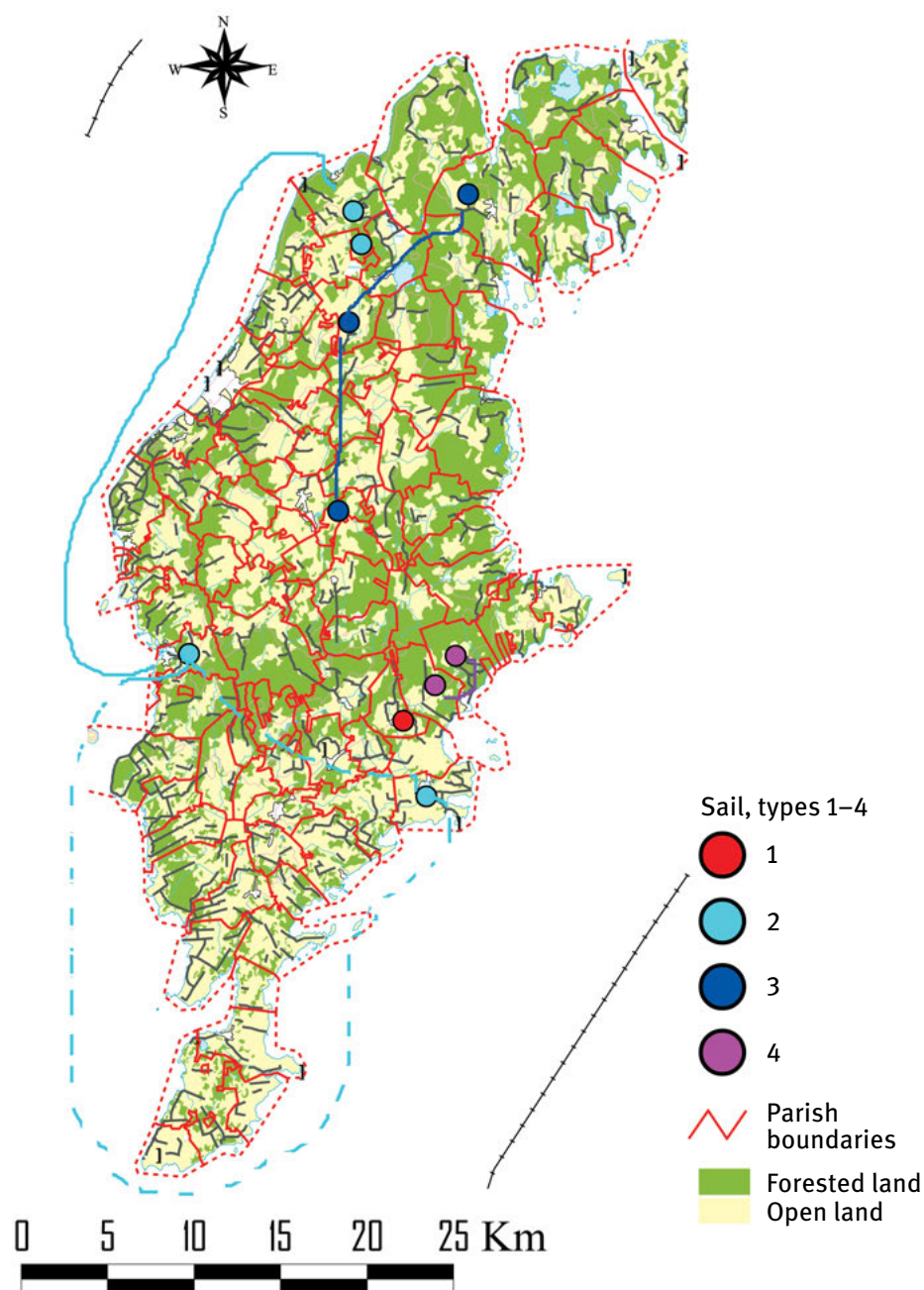


Fig. 54: Map of Gotland showing the distribution of the 4 different types of sail cutting technique.