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Arrangement of space inside Ölandic ringforts

A comparative study of the spatial division within the ringforts Eketorp, Sandby, and Ismantorp

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Abstract

In the Iron Age AD, ringforts were constructed on the Swedish island Öland. Most of them contained a settlement inside. The remains of 15 of these ringforts are still preserved in the landscape. This thesis gives a general overview of the known and the possible Ölandic ringforts and their historical and constructional context, before analysing and comparing the settlements inside the ringforts Eketorp, Sandby, and Ismantorp regarding their spatial division and arrangement. At that, the focus lays on the main settlement phases in the Iron Age. The analysis was conducted to explore if there is a pattern in the arrangement of the settlements inside the ringforts and further to investigate the importance of sufficient open areas. In doing so, the arrangement and grouping of houses and open areas, the relation of built-up and open space, as well as the development of the respective interior settlement are analysed.

The ringforts were an isolated and small settlement complex. Thus, usually there were houses with different kinds of functions (e.g. dwellings, stables, storehouses, workshops) within the ringforts. The results of this study show that there was more built-up space than open space inside each of the analysed ringforts. It is to assume that the open areas were used as public space respectively settlement squares. Consequently, it seems that the priority was to fit as many houses as possible into the limited inner area. Nevertheless, it was also important to have sufficient open areas (in terms of streets and squares) according to the ringfort's function(s) and needs, as well as a well-connected street network inside the ringforts. The amount of open space probably depended on the ringfort's function(s). Furthermore, the analysed ringforts were arranged similarly, with houses placed radially along the ring-wall, creating a large open place in the forts' centre that was built-up in a later phase. A suggestion is that the ringforts all had a first phase in which houses were built only along the ring-wall and the centre was left open for a certain time – maybe until about 400 AD. This theory, however, is speculative and there is no proof for it yet; for that more excavations are needed.

Key words

Öland, Sweden, ringforts, Eketorp, Ismantorp, Sandby, settlement arrangement, Iron Age, Roman Iron Age, Migration Period

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1. Introduction

On the Swedish island Öland (fig. 1) there are 15 ruins of Iron Age ringforts still visible in the landscape. These forts had a defensive enclosure in the form of a usually circular stone wall which in most of the ringforts protected a settlement inside. The construction of the ringforts is connected to the martial and conflictual historical context of the late Iron Age, and it is assumed that most ringforts were used as refuges.

Generally, the Ölandic ringforts are conceived as one type of fortress. Moreover, the ringforts differ in their structure and arrangement from the common settlements and villages on Öland from the Iron Age.

Since the settlements inside the ringforts on Öland were mainly occasionally inhabited it is questionable whether in their structure also open places that functioned as village squares for the social life were considered, or if it was prioritised to fit as many houses as possible inside, in order to provide as much living space as possible?

Moreover, since the space within a ringfort was limited compared with the freestanding farmsteads and settlements or villages on Öland, the question arises how much open respectively public space was included?

The theory that underlies this thesis is that the ringforts with a settlement inside had to undertake the functions of a normal settlement or village for the time they were occupied. Thus, having a good relation between built-up and open areas would be desirable, that is public space e.g. for the communal and social life and activities, to perform religious and cultural ceremonies, but also private space in terms of houses as a safe haven and private working area for a family or household.

The Ölandic ringforts have been archaeologically studied and compared in the past; some more detailed than others. However, it seems that in the previous studies the focus was not on the analysis and comparison of the spatial arrangement of the ringforts and the respective division of the interior space. The study of the relations and proportions of built-up and open space, as well as of the proportions and division of the different functions of space, respectively of the houses inside a ringfort, might help to define a pattern regarding a general spatial arrangement of the Ölandic ringforts. Moreover, if there is a pattern would that suggest that the ringforts were not only based on a shared idea but were also planned and built according to standardised spatial concepts. The study of the spatial arrangement and division of the ringforts can be used to understand the functional character of a ringfort and to ascertain if it was intended to be occupied only occasionally or for a longer time. Moreover, if there is a pattern it possibly enables to predict the intended function and duration of use for other Ölandic ringforts.

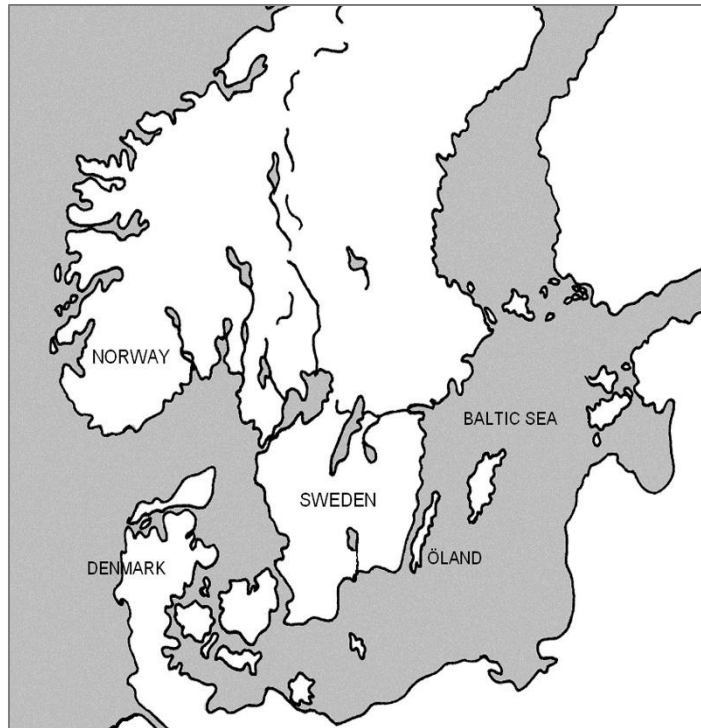


Figure 1: The Swedish island Öland is situated in the Baltic Sea, in front of the south-eastern part of the Swedish mainland. (Map by Ylva Tell Dahl, Emma Svensson, Anders Götherström & Jan Storå 2011. Edited by the author.)

This paper deals with the analysis of the interior spacial arrangement of the ringforts Eketorp, Sandby, and Ismantorp, in order to ascertain if the arrangement of the ringfort settlement and the division of space followed similar patterns. The organisation and function of the limited space within these ringforts is analysed and compared in terms of the arrangement and grouping of houses, the amount and arrangement of open areas, as well as the proportion of built-up and open space. Further, the development of the respective interior settlements is investigated.

The aim of this study is to investigate if there is a concrete pattern in the arrangement of the settlements and the proportions of built-up and open space within the ringforts. Furthermore, it is aimed to achieve conclusions concerning the importance of sufficient open areas or public space within the ringforts. In this context, it is analysed whether it was prioritised to fit as many buildings and hence people as possible into a ringfort, or to have sufficient open areas respectively public space for the social life of the occupants.

The ringforts Eketorp, Sandby, and Ismantorp were selected as case studies because the excavations and contemporary research of these are more comprehensive and archaeological documentations and reports are available. Moreover, reconstruction plans for the inner structures of each ringfort are existing. The study of the ringforts focuses on their main settlement phases in the Swedish Iron Age (500 BC–1050/60 AD).

Before it is turned to the spatial analysis of the respective settlement within the case studies, the previous happened investigations, excavations, and research are reviewed. Further, a temporal integration of the ringforts is made. Following this, the settlement type ‘fortified sites’ is defined, and the theoretical concepts of public and private space are discussed. Then, an overview is given about the historical and constructional context of the ringforts on Öland, as well as about the contemporary historical situation in Sweden. Thereafter, the method and materials used for this study are presented, as well as a critical reflection on these. Subsequently, an overview about the ringforts on Öland is given, clarifying issues regarding the number of definite and possible ringforts and providing general information about the ringforts on Öland while also briefly demarcating them from the hillforts on the Swedish mainland. Following, the three selected ringforts are analysed. The two main phases of the Eketorp ringfort are analysed individually since they are characterised by two subsequent and overlaying ringforts. In the discussion, the results of the analysis are compared and the spatial division and proportions are set into context with the respective functions of the buildings inside a ringfort and the general function of the ringfort. In this way, similarities and dissimilarities between the forts become perceptible. Finally, the research outcomes are resumed and evaluated with a critical perspective in the conclusions. Moreover, a possible extension and further prospects of the study are considered.

1.1 Research questions

In order to conduct the previously described research project, the following research questions were formulated:

- How was the inner space (the settlement complex) of the ringforts arranged and used?
- How are the relations regarding built-up and open areas inside the ringforts?
- Where laid the priorities – in open respectively public space or in buildings and hence fitting as many people as possible into a ringfort?
- Were the ringforts arranged similarly?

1.2 Previous research

Since the ringforts on Öland are only preserved as ruins, documentations and publications of previous observations and investigations, as well as modern surveys and excavations are very important to obtain information about these constructs and their contexts. However, information and especially (reconstruction and interpretative) drawings from the early modern period have to be considered with caution and criticism since scientific and archaeological methods were not quite developed at that time.

One of the first who mentioned the Ölandic ringforts was J. H. Rhezelius in the 1630s. In his manuscript *Monumenta runica in Ölandia comitatu Regni Sveciæ Gothiaquæ* (1634), he wrote about his observations of prehistorical sites on Öland, including some ringforts. In 1741, C. von Linné travelled across Öland and described his observations in his book *Öländska och Gothländska Resa* (1745), including some Ölandic ringforts. In the following years and centuries, the visible remains of the Ölandic ringforts have been investigated, described and drawn by several antiquarians and archaeologists, among them C. G. G. Hilfeling (1797), N. H. Sjöborg (1822), A. Ahlqvist (1822-27), H. Hildebrand, and T. J. Arne (1904) (Wegraeus 1976:36 ff.). It was not until the 1930s that the research on the ringforts revived with the studies of the archaeologists A. Nordén and M. Stenberger. Stenberger was involved in many of the archaeological investigations, documentations and partly excavations of the ringforts (Gustavsson 2014:8). In the 1920s and 1930s he conducted small test excavations at the ringforts Ismantorp and Eketorp (Stenberger 1966:14, 25). Furthermore, in the summers of 1924 to 1932 he investigated the visible remains of the ringforts, as well as early-historic burials and burial customs, houses, farms, and settlements on Öland. His observations were published in his book *Öland under äldre järnåldern. En Bebyggelsehistorisk Undersökning* (1933), where he wrote about 15 known ringforts on Öland (ibid. 1933:VII, 213). In *Ölands forntida borgar* (1966) Stenberger describes 16 fortresses that had been discovered on Öland until that time, with focus on Ismantorp, Gråborg, and Eketorp (ibid. 1966:7). From 1964 to 1974 Eketorp ringfort was completely excavated under the conduct of Stenberger (Borg, Näsman & Wegraeus 1976:25; Gustavsson 2014:14). In the late 1900s and early 2000s test excavations at the ringforts Löt, Treby, Hässleby, Ismantrop, Gråborg, and Triberga were done (Andrén 2014:70 ff.; Pappmehl-Dufay et al. 2016:16 f.; Wegraeus 1976:36). In 2007, a magnetometer survey was carried out at Gråborg ringfort by SAGA Geofysik. In 2008, I. Trinks and A. Biwall carried out two-dimensional ground penetrating radar (GPR) measurements on that site (Viberg, Gustafsson & Burks 2017:2 f.). However, the “quality of the data and the interpretations of the results from Gråborg have recently been strongly questioned and debated” (Viberg 2014:416). In 2008, a study of J.-H. Fallgren was published, and an English translation in 2009, in which he grouped the Ölandic ringforts according to their size, as well as investigated the occurrence of house foundations within the ringforts and calculated the possible number of houses that might have stood in ringforts where no remains of house foundations are visible or were found yet. Further, he analysed the context of the Ölandic ringforts with the closest prehistoric settlements and their spatial location in the landscape (Fallgren 2008; 2009). From 2010 to 2011 GPR surveys and complementing magnetometer surveys were carried out at Sandby ringfort as feasibility study for the project *The Big Five* (Viberg 2015:522 ff.). Since 2011 Sandby ringfort has annually been excavated by the Kalmar läns museum (Kalmar county museum) (Alfsdotter & Kjellström 2019:212). From 2014 to 2017 GPR and magnetometer surveys of the five largest ringforts, Gråborg, Vedby, Bårby, Löt (also called Trindborgen), and Svarteberga were conducted in the context of the project *The Big Five*, under the direction of A. Viberg (Stockholm University

2017). Additionally, surveys were carried out at Hässleby and Triberga ringforts in 2015 (Viberg 2015:525).

The majority of the Ölandic ringforts were archaeologically investigated and minor test excavations were done, however, only some of them were subject to extended archaeological excavations. The only ringfort that has been completely excavated is Eketorp (Gustavsson 2014:11, 21; Hagberg 1987:170). “Several ring-forts are also too large for traditional archaeological excavations and as a consequence little is known about them” (Viberg 2015:522). Besides the Eketorp ringfort, also Gråborg and Ismantorp were analysed in greater detail; motivated by Gråborg’s extraordinary large size and Ismantorp’s good state of preservation and the unusual large number of nine gateways (Holmring 2014:17). In recent years, Sandby ringfort received more attention and is researched and excavated in ongoing projects (Kalmar Läns Museum 2017).

In the following, the research history of the ringforts Eketorp, Sandby and Ismantorp is discussed in greater detail, as well as the dating of these three ringforts.

In 1931, M. Stenberger conducted an archaeological test excavation of Eketorp ringfort which resulted in numerous finds dating back to the late Viking Age (ca. 750–1050/60 AD)¹ and the Early Middle Ages (ca. 1000–1150 AD) (Näsman 1976a:46; Stenberger 1966:25 ff.; Wegraeus 1976:39). An aerial photo from 1960 supported the assumption that the Eketorp ringfort was of prehistoric origin, showing faint traces of radially placed walls inside the ringfort which match a house type that was already known from other ringforts on Öland. Later excavations showed that these walls belonged to the Iron Age settlement phase called Eketorp II (Näsman 1976a:46). Eketorp has been entirely excavated between 1964 and 1974 under the conduct of M. Stenberger² (Borg, Näsman & Wegraeus 1976:25; Gustavsson 2014:14). The excavations revealed three superimposing settlement phases. In the archaeological literature these are called Eketorp I, Eketorp II and Eketorp III (Näsman 1976a:46). After the excavations Eketorp was full-scale reconstructed³ on site over the remains of the original ringfort (Edgren 1998) and made into an open-air museum which opened in 1984 (Edgren & Herschend 1997:19; Olofsson & Josefson 2007:28.). Outside the eastern gate of the ringfort the remains of a shallow lake are located which was probably used as a sacrificial site during the Iron Age. This sacrificial site was reconstructed in 2004 to 2005 (Fabech & Näsman 2013:70; Olofsson & Josefson 2007:29 ff.). In the context of the extensive Eketorp project also geological, botanical and osteological investigations were made (see Boessneck & von den Driesch 1979:406 ff.; Engström 2015:176; Näsman 1976a:55; 1989:85). Additionally, it was experimentally lived in one of the reconstructed Iron Age houses to collect data about temperature, energy or fuel consumption, smoke development and wind speed (see Edgren & Herschend 1997:21; Engström 2015:115 ff., 201 f., 239).

The Eketorp excavation project resulted in a series called *Eketorp: Fortification and Settlement on Öland/Sweden* and further published studies.

Based on found animal bones from the phase Eketorp I, the ringfort and its inner settlement could be absolutely dated to ca. 300+/-50 to 500+/-50 AD (Boessneck 1979:7; Näsman 1976a:51). As a result of the three different building or settlement phases laying superimposed on top of each other, it is presumable that objects and bones from superior occupation layers found their ways

¹ The following given datings of periods relate to the protohistoric Swedish region.

² M. Stenberger was the director of the Eketorp excavation from 1964-72. In 1973 he passed away (Borg, Näsman & Wegraeus 1976:25).

³ The reconstruction work began in 1974 (Edgren 1998:14) or in 1978 (Edgren & Herschend 1997:17; Olofsson & Josefson 2007:28).

into lower layers, e.g. by the rebuilding and enlargement of Eketorp (Herschend 1976:207). The phase Eketorp I is dated to the Roman Iron Age (ca. 1–375/400 AD). It was constructed around 300 AD and existed until ca. 400 AD. At about 400 AD, at the end of the Roman Iron Age and the beginning of the Migration Period (ca. 400–550 AD), Eketorp I was demolished and enlarged. The “new” ringfort Eketorp II was in use from around 400 to 650/700 AD (Näsman & Wegraeus 1979:7; Olofsson & Josefson 2007:30). Eketorp II dates into the Migration Period and the Vendel Period (550–750/800 AD). ¹⁴C-datings of found objects and animal bones gave an absolute dating of 400+/-50 to 700+/-50 AD as occupation period of the ringfort and its inner settlement (Boessneck 1979:7; Näsman 1976a:55). The ringfort was then abandoned for a longer period, before it was reused and reconstructed in the Medieval Period (ca. 1000–1520 AD) (Näsman & Wegraeus 1979:7; Näsman 1989:78). According to older literature, Eketorp III dates to around 1000+/-50 to 1300+/-50 (Boessneck 1979:7; Näsman 1976a:59), according to newer literature, it dates to ca. 1170 to 1240 AD (Olofsson & Josefson 2007:30) or to ca. 1170 to 1220/50 AD (Telldahl et al. 2011:1).

Sandby ringfort was investigated between the end of the 18th and the early 19th century by C. G. G. Hilfeling, N. H. Sjöborg, and A. Ahlqvist who observed traces of house foundations inside the ringfort (Dutra Leivas & Victor 2011:11; Viberg 2012:2 f.). Since then the area inside the fort has been farmed and the traces are no longer visible over ground. However, aerial photos from the 1970s show house foundations below ground level. In 2001, A. Andrén carried out fieldwork at Sandby ringfort (Viberg et al. 2014:414). In 2010 and 2011, GPR and subsequent magnetometer surveys were conducted to map the buried remains and to obtain a plan of the spatial layout of the interior of Sandby ringfort. Thereby, looting pits were uncovered inside the fort. Consequently, archaeological metal detector surveys were done in 2010 and following archaeological excavations in 2011 by the Kalmar läns museum (Viberg 2012:3; Viberg et al. 2014:415 f.; Viberg 2015:524). Since 2011 Sandby ringfort has been object to archaeological research projects and annual excavations led by the Kalmar läns museum, under excavation leader H. Victor (Kalmar Läns Museum 2017). In 2014, Sandby ringfort was entirely surveyed with metal detectors by J. Paulsson (Victor 2014:22). So far only about nine percent of the ringfort’s interior have been excavated, including three completely excavated houses, six partially excavated houses, and parts of the street encompassing the central area of the fort (Alfsdotter & Kjellström 2019:212). The excavations discovered finds of human remains from at least 26 individuals, leading to the assumption that a massacre took place there in the Migration Period (Alfsdotter, Pappmehl-Dufay & Victor 2018: 422). To find human remains during excavations in the Ölandic ringforts is relatively unusual. Exceptions are Sandby, Löt, Eketorp, and Gråborg (Gustavsson 2014:14 f.). The results of the Sandby project are documented in several volumes in a series called *Sandby borgs skrifter* and other publications.

The objects found during the metal detector survey in 2010 could typologically be dated to ca. 460–490 AD (Viberg et al. 2014:420.). Relief brooches could typologically be dated to ca. 430/450–510 AD (Alfsdotter, Pappmehl-Dufay & Victor 2018:424; Gunnarsson, Victor & Alfsdotter 2016:45), and in 2011 a human bone was ¹⁴C-dated to 420–590 AD, calibrated with 2 σ (sigma) (Dutra Leivas & Victor 2011:30). In the metal detector survey from 2014, one brooch dating into the Vendel Period was found as stray find (Gunnarsson, Victor & Alfsdotter 2016:13). All in all, the finds from surveys and excavations from 2010 to 2015 and ¹⁴C-dating of human bones date the usage of Sandby ringfort to the Migration Period, ca. 400–500 AD, particularly in the second half of the 5th century. However, it cannot be determined if the ringfort was also constructed in this period (ibid.:87 f.). It is possible that the ringfort was abandoned around the

second half of the 5th century (Holmring 2014:46) with the event of the massacre. Current research aims at conducting ^{14}C -datings of animal and human remains and of archaeobotanical material, obtained through the excavations (Alfsdotter, Pappmehl-Dufay & Victor 2018:426).

At Ismantorp ringfort, first archaeological investigations were conducted by H. Hildebrand and T. J. Arne (1904) (Wegraeus 1976:36). In 1925, M. Stenberger carried out investigations and some test excavations (Stenberger 1933:239). These early investigations of the fort resulted in no or very few finds (Hagberg 1987:174; Stenberger 1966:14) which could not be used for dating the ringfort (Wegraeus 1976:36). From 1997 to 2001, A. Andrén carried out fieldwork at Ismantorp ringfort, in collaboration with the Kalmar läns museum. The fieldwork included metal detector and GPR surveys, as well as excavations (Andrén 2014:70 ff.).

Found objects could be topologically dated into the period of the middle of the 4th to the 6th century. ^{14}C -datings of charcoal range between 240 and 610 AD, calibrated with 1σ , and calibrated with 2σ the datings range between 130 and 640 AD (ibid.:73 ff.). Ismantorp was presumably built around 200 AD and used until ca. 650 AD (ibid. 2006:34, p. 36). The ^{14}C and the typological datings indicate that it was mainly used around 300–600 AD, and with that in the Roman Iron Age, the Migration Period and the Vendel Period. ^{14}C -datings from younger layers indicate that Ismantorp was reused sometime between the Viking Age and the High Middle Ages (1150–1350 AD), dating between the 10th and the 13th centuries (ibid. 2014:75 f.).

To get an extended and more accurate picture of the ringforts Ismantorp and especially Sandby, both would need to be entirely excavated like Eketorp. The knowledge gained from the partial excavations does not comprise a whole picture and might lead to wrong interpretations or false assumptions where information is missing. Moreover, a complete excavation of the ringforts might give a more accurate dating or even a different dating of the respective ringfort. Additionally, more Ölandic ringforts need to be surveyed with geophysical methods to gain a more detailed picture of their layout and of possible different building or settlement phases. Hence, enabling a better comparison of the material regarding the ringforts, in terms of their similarities and dissimilarities, and creating a greater understanding of the connection of the Ölandic ringforts. However, complete excavations of the ringforts are expensive and time consuming.

So far, not much research has been done about the spatial arrangement and its division into built-up and open space and their function(s) within the Ölandic ringforts. Moreover, research about the importance of open areas in even such a limited space as a ringfort and their significance regarding the social life and the occupants of a ringfort has, to my knowledge, not been done so far. This is where this thesis takes up to investigate the arrangement, division, function, use, as well as the settlement development of the ringforts Eketorp, Sandby, and Ismantorp. Further, this thesis takes up to analyse the relation of built-up and open space inside these three ringforts and the relation to the estimated number of people occupying a ringfort.

1.3 Theory

The Danish archaeologist L. Jørgensen divided Danish settlements from the 6th to the 11th centuries, including sites from southern Sweden, into seven categories. As seventh group he names fortified sites “with a defensive character (refuge forts) or with a definite garrison character (such as Trelleborg, Aggersborg and Fyrkat)” (Jørgensen 2003:176). The Danish Viking Age fortresses Trelleborg, Aggersborg and Fyrkat differentiate from the Ölandic ringforts in their inner structure, the construction of the ring-wall, purpose, function, period of construction and usage (see Nationalmuseet, n.d.), and cannot be compared with each other (Skarin-Frykman 1967:215). Therefore, not all settlements of the fortified type are the same and it needs to be considered that

there are different types of fortified sites that can differ significantly. However, what the Viking Age fortresses and the ringforts on Öland have in common are their roundish shape, a settlement construct in their interior which is enclosed by a rampart or ring-wall, and the limited settlement area. Thus, they can be perceived as isolated and small settlement complexes. Consequently, they can be regarded as a special type of settlement or site, and hence they could be included in the same group of settlement type.

The settlement organisation within the Ölandic ringforts differentiates from the contemporaneous agrarian settlements. In the latter “farms can be clearly ranked between small, medium, and large farms, according to the number of buildings and the size of the houses. There was also a tendency to build houses around enclosed yards, thus emphasizing hierarchy and enclosure in the unfortified settlement” (Andrén 2006:34). By contrast, the houses inside the ringforts were comparatively small and uniform and “placed without any tendency to closed yards. Inside the ring-walls the principles of equality and openness are therefore emphasized in the architecture” (ibid.).

According to B. Trigger archaeological settlement patterns

can be analysed on three levels: the individual structure, the local settlement, and the distribution of settlements within a region. While true settlement systems analysis demands an integration of all three levels, each can be meaningfully investigated in relative isolation (Parsons 1972:137).

In this paper the settlement analysis will be focused on the individual structure of each of the three selected ringforts.

S. Evans and P. Gould state that settlement patterns “are distinct spatial expressions of cultural adaptation” (Evans & Gould 1982:276). Consequently, the Ölandic ringforts can be interpreted as reactions or adaptations to the troubled and conflictual situation of the Iron Age, especially in the Migration Period. Moreover, a ringfort is a visible boundary that marked the physical division of space, as well as the transition of open unprotected outside space to limited and protected inside space. It enabled its occupants to restrict and control access (Parker Pearson & Richards 1994:24; Steadman 1996:67). According to M. Parker Pearson and C. Richards

The creation of boundaries as physical features is often associated with needs of defence, territory, shelter and containment. Entrances and physical barriers, such as walls or earthworks, mark differences in domains and thus restrict and control access between them. By physically dividing up and demarcating space we may classify and control places and relationships more readily (Parker Pearson & Richards 1994:24).

Delimited settlement units – such as ringforts – are also social systems. Hence, they are places of human activities and interactions with their environment and with the settlement complex (Stjernquist 1978:257). The question arises how the settlements inside the ringforts were adjusted to the limited space and to the social needs of people? Were there special structures (like public places) in the settlements that formed space for social life and activities?

1.3.1 Public and private space

In order to perform an interpretation of the different areas within a ringfort as public or private space, the concepts and distinction of public and private space have to be defined. In the following these concepts are defined with focus on the physical space. Nevertheless, the underlying theoretical concepts that form and influence the physical space (or rather the physical division of

space) need to be regarded as well. Following this, the concept of space is set into an archaeological context.

A defining characteristic of settlements is “how a society divides its space into public and private spheres [meaning the entire range of places, physical space, people and activities], and how this division controls movement from one place to another and access to places and activities” (Madanipour 2003:1). In this context, the division of public and private spheres and their meaning and relationship vary largely (ibid.), depending on the period, culture, context and social categories (Marx 2001:160).

In order to understand private and public space, the ‘social space’ itself has to be understood. Space is “not a thing but rather a set of relations between things” (Lefebvre 1992:83). It is not rigid, stable, unchanging and independent, but “contingent and constantly in a process of negotiation” (Trevor 2008). Space is a social product and emerges from and is defined by social relations and actions (Hansen & Meyer 2013:11; Kilian 1998:115).

Private and public space only exist in the context of social interactions (Kilian 1998:124). They are interdependent concepts (Madanipour 2003:3). The constructions of public and private space relate to power (Kilian 1998:118) and “can be used strategically to empower groups” (ibid.:124). There are various dimensions and layers of private and public space (Madanipour 2003:108). “Any site can be transformed into a public or [...] a private sphere” (Deutsche 1992:39). A space can be defined as more public when more people have access to and use it (Vassilaki & Ekim 2015:28). Ideally, public spaces “are public because anyone is entitled to be physically present in them” (Madanipour 2003:111). Access to both the public and the private is essential for human life (ibid.:40).

The outdoors is defined as the ideal public space. Outdoor public spaces can be deliberately created or taken over as such by the local inhabitants (A for architecture 2012). Further, public spaces include open space systems, parks, town and city squares or plazas, streets and paths networks (ibid.; Birch 2007:119, 123). Public space is defined as not being in the control of individuals or small groups and as being accessible (Kutay Karaçor 2016:53). However, public space does not necessarily have to be accessible by everyone; it rather depends on the definition of ‘public’ (Kilian 1998:126), e.g. ‘undesirables’ and socially not accepted people might be excluded from it (ibid.:117; Trevor 2008).

Since ancient times the core function of public space has been to bring people together and to support social life and activities, such as social interaction, trade, political debate and elections (A for architecture 2012; Kutay Karaçor 2016:51 f.; Trevor 2008). Moreover, public space can be used for economic, political, community and cultural activities (A for architecture 2012; Madanipour 2003:194). Thus, the place is given symbolic significance. Further, it can create a sense of belonging to and identification with a community (Birch 2007:118, 125).

In contrast to public space, private space is a restricted and protected area (Kneisel 2013:175; Kutay Karaçor 2016:53), to where the public (usually) has no access to and only open to those with permission (Birch 2007:118, 120). A private space is usually smaller than a public space and has a distinct lower occupancy. “Historically private space has been as small as a bed or as large as a castle” (A for architecture 2012). Private space is linked to ownership and exclusivity, and an area in which certain persons are locatable (Kneisel 2013:175). This includes houses, flats, rooms, and privately-owned residential land. (Birch 2007:120).

Private space provides a “physical home for the body” (Madanipour 2003:68), security and safety. It might be used for work, hobbies, self-reflection or to relax and rest. Moreover, it can be used for

activities that are determined as not appropriate for public (either by society or an individual) (A for architecture 2012).

There is a duality of “real physical space and socially constructed publicity or privacy” (Kilian 1998:124) that needs to be regarded when defining public or private space. T. Kilian defines privacy as the power to exclude and publicity as the power to gain access, and states that both are necessary parts of every space. The level of exclusion or access one has in any space is situation-dependent (ibid.:124, 126).

Public and private are continuous, ambivalent, situational and contextual concepts, with their boundaries socially defined and rather blurred or permeable than clear (Marx 2001:160; Vassilaki & Ekim 2015:24). Their “meaning lies in how they are interpreted and framed” (Marx 2001:160). The boundaries or transition zones between private and public space can have a semi-private and semi-public character and include characteristics from both private and public space (fig. 2) (Vassilaki & Ekim 2015:28). Semi-private spaces are e.g. front yards and semi-public spaces are e.g. public places with a close connection to a limited number of people or residents such as communal spaces within residential blocks or neighbourhoods (the latter being a little more public) (Gehl 2006:58 f., 189).

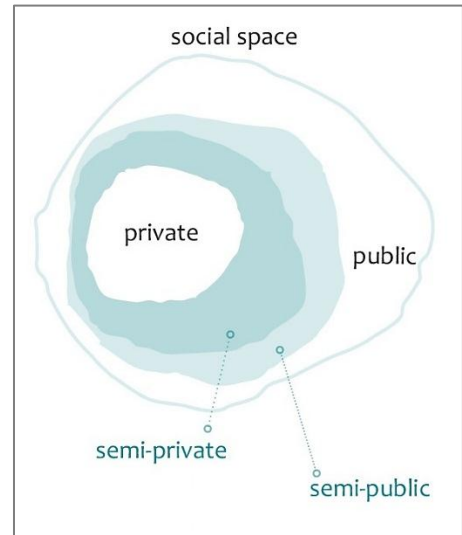


Figure 2: The transition zones of private and public space. (Figure by Pınelopi Vassilaki & Elif Ekim. Edited by the author.)

The concept of public space can be recognised already in the ancient Greek agora. However, here the ‘public’ only included free-born citizens, hence showing that denial of access to certain types of people (‘undesirables’) characterised public space throughout human history (Trevor 2008). “Access is clearly a key issue, as is the question of who controls the space, determining whom is or is not allowed to use it. Of course, ownership plays a central role in this” (ibid.). Ideally, public space is “accessible for everyone without considering about gender, religion, income level, and ethnicity” (Kutay Karaçor 2016:52). However, this is seldom the case. On the other hand, accessibility is about the visual and physical connection of a space with its surroundings and the ease or cost to reach a place. The enclosure of a public space can diminish its accessibility (ibid.:53).

The way space is subdivided into public and private and their relationship, as well as the way people access, use, and modify public space provides information about the societal and community organisation (Birch 2007:123; Madanipour 2003:2).

In archaeological context, space can be defined and analysed based on the type of demarcation through e.g. walls, fences, houses, (Kneisel 2013:175), and the distribution and assemblage of objects, the identification of settlement areas, burial grounds, depositions and production areas. Problematic is the reconstruction of the perception and understanding of space of past societies (Hansen & Meyer 2013:12). The identification of different spaces facilitates conclusions about the settlement structure as well as the function of the respective space and its meaning (Kneisel 2013:175, 178).

Often, the spatial structuring on the basis of preserved masonry, roof constructions, or interior furnishing is not possible and is limited to the distinction of open and closed space. J. Kneisel defined closed space as enclosed areas and this limited area as private space. Open space she defined as open areas outside of buildings and landscape in general. Open areas are public space.

Enclosed space allows a demarcation towards the surroundings, which in turn leads to a stronger affiliation inwards. Also, open spaces and empty spaces can be a demarcation (ibid.:175 f.).

A settlement itself is to be understood as closed space. It is deliberately demarcated from the surrounding landscape through natural boundaries and/or artificial borders like walls, fences, or fortifications. A settlement boundary is directed both outward and inward, by linking the inhabitants to a specific area. According to Kneisel this demarcated space can be seen as political space⁴, that is as an externally cohesive acting entity. Furthermore, this political space is to be understood as a social entity. Political or social organisation and exercise of power are displayed in the construction and maintenance of a settlement complex since this had to be organised and coordinated (ibid.:177, 185, 192).

Inward, a settlement fortification provides security, stability, and possibly an ordered social structure. On the basis of material remains and building structures it is possible to divide smaller units or spaces within this political space (respectively the settlement) which had different functions and qualities. Also, public and private areas can be separated within a settlement (ibid.:177 f., 192, 194). Conclusions regarding the delimitation or occupation of space within a settlement can be made for buildings, manufacturing processes, craft activities, storage, waste disposal, and sometimes space for the dead (ibid.:178, 192). In turn, the smaller units or spaces within a settlement give clues about social organisation and structures (ibid.:194).

This leads to the question how the limited space within the Ölandic ringforts was divided and used in terms of public and private space? Furthermore, it is of interest to study whether the settlement arrangement within the Ölandic ringforts was based on an intended and thought-out plan or was unintentional and ‘just’ happened with the development of the settlement construction.

2. Method and Material

The method for this thesis is the implementation of a comparative study of the archaeological literature. The literature includes documentations, descriptions and analyses of surveys and excavations, including plans and photographs concerning the Ölandic ringforts. The focus of the literature study is on the Iron Age ringforts Eketorp, Sandby, and Ismantorp. For the analysis and in order to compare the spacial arrangement of these three ringforts, special attention lies on the size of each ringfort, on the respective size of open space (such as squares and streets) and built-up space, as well as their relation. Moreover, the number, arrangement and size of the houses and their interpreted function(s) are regarded. Additionally, the estimated number of people occupying a ringfort is calculated and set into context with the respective number of houses and the size of the ringfort. Further, the development or design process of the interior settlement in each ringfort is investigated to gain conclusions regarding the importance of open areas, as well as whether the settlement development was based on a thought-out plan or was arbitrary according to the available space and need of more houses.

The material used for this paper are books, articles, reports and academical papers that deal with the Ölandic ringforts. From the material particularly the three ringforts Eketorp, Sandby, and Ismantorp are analysed in greater detail. Nevertheless, an overview of the Ölandic ringforts is given in the following chapters. The period of interest for the study of the selected ringforts is limited to the period of the Swedish Iron Age, whereas other time periods are omitted. Hence, the

⁴ J. Kneisel defines political space as determined by social organization and stratification, as well as the exercise of power that can be directed both internally and externally (Kneisel 2013:176).

analysis of the ringfort Eketorp, which was the only one of the three analysed ringforts that was reused in the Medieval Period, is solely focused on the Iron Age.

The investigation of the material shows that there were 21 known possible ringforts or fortified constructions on Öland dating back to the Iron Age and the Medieval Period. Three possible ringforts are known from historical sources but not preserved in the landscape (Fallgren 209:28; Wegraeus 1976:39). 18 of the 21 known possible ringforts or fortified constructions are still visible in the landscape, some of them are in a bad state of preservation or have almost vanished from the landscape (Fallgren 2009:27 ff.; Stenberger 1933:248 f.; Wegraeus 1976:35). The best-preserved ringfort is Ismantorp (Andrén 2014:69). 15 of the still visible remains are definitely identified as ringforts (Stenberger 1933:213). The other three remains are most properly falsely interpreted as possible ringforts. They are not ringforts, but other types of fortifications from the Iron Age or fortified farms from the Medieval Period (Fallgren 2009:27 f.; Holmring 2014:18 f., 40). Thus, the number of known possible Ölandic ringforts from the Iron Age is not 21 but 18.

Ten to twelve of the distinct ringforts contain house foundations in their interior (Fallgren 2009:29 f.). In some ringforts, the remaining house foundations are only preserved fragmentarily or lie below ground level, the latter being the case at Sandby ringfort (Viberg et al. 2014:415, 425 f.).

Eketorp is the only known Ölandic ringfort that has been demolished and enlarged in the Iron Age, superimposing the previous ringfort. The first Eketorp ringfort is termed as Eketorp I, the “new” enlarged ringfort as Eketorp II, and the medieval reconstruction as Eketorp III (Näsman & Wegraeus 1979:7; Näsman 1989:78). Eketorp is the only ringfort on Öland that was entirely excavated and thereafter full-scale



Figure 3: Modern reconstruction of the ringfort Eketorp. Inside the ringfort to the left and in the middle are reconstructions of the Iron Age ringfort Eketorp II, and to the right are reconstructions of the medieval ringfort Eketorp III. The reconstruction is superimposing the previous Eketorp ringforts. In the south-west area of the ringfort there are house foundations from the Iron Age visible. (Photo by Göran Uvner 2018.)

reconstructed on site, overlaying the original Eketorp ringforts (fig. 3). The reconstructions consist of a 5 m high ring-wall with a crenelated parapet of Roman model, Iron Age and medieval buildings from the phases Eketorp II and III, and a museum inside the Iron Age houses in the centre of the fort. The reconstructions are based on the interpretations of the archaeological investigations and not a hundred percent historically correct (Edgren 1998:11 ff.; Holmring 2014:16 f.; Olofsson & Josefson 2007:28, 30).

The most recently investigated, researched and excavated ringfort is Sandby (Kalmar Läns Museum 2017; Viberg et al. 2014:414 ff.).

The ringforts Eketorp, Sandby, and Ismantorp were selected as case studies because they are among the few ringforts that were excavated and investigated in greater detail. Also, reconstruction plans of the inner house structures of these ringforts are available.

For the Eketorp ringforts the reconstruction plans which are at the basis of this study are taken from U. Näsman's chapters *The Settlement of Eketorp-I. A Planographic Description* and *The Settlement of Eketorp-II. Planographic Description and Analysis*, which are both in the Eketorp publication volume *Eketorp: Fortification and Settlement on Öland/Sweden. The Monument* (1976). The reconstruction plans are based on photogrammetric plans by the Geographical Survey Office and on photogrammetric plans (Näsman 1976b:74; Näsman 1976c:118). The reconstruction plan for Sandby ringfort is from C. Alfsdotter, L. Pappmehl-Dufay and H. Victor's article *A moment frozen in time: evidence of a late fifth-century massacre at Sandby borg* (2018). It is based on aerial photos combined with results of GPR and magnetometry surveys conducted by A. Viberg, and excavations (Alfsdotter, Pappmehl-Dufay & Victor 2018:424). For Ismantorp ringfort the reconstruction plans are taken from A. Andrén's article *A world of stone. Warrior culture, hybridity, and Old Norse cosmology* (2006) and from A. Andrén's publication *Tracing Old Norse Cosmology. The world tree, middle earth, and the sun in archaeological perspectives* (2014). They are based on digitized and rectified aerial photographs and the analysis of joints between house foundations (Andrén 2006:33; 2014:74). However, there is a discrepancy with the number of houses inside the ringfort stated by Andrén in the text (a total of 95 houses) and the number of houses depicted in his reconstruction plan (a total of 98 houses) (see Andrén 2014:71, 75, fig. 23).

2.1 Source criticism and limitations

This thesis is limited to the information gained from the excavations and studies of the Ölandic ringforts. Also, the analysis of the Ölandic ringforts is limited to only three. If more ringforts would be analysed, more accurate results would be gained which would give a clear understanding whether there is a pattern of the spatial division and arrangement inside the ringforts or not. Moreover, the study is limited even further by the little information that so far has been obtained about Sandby ringfort and the fact that the preserved house foundations inside the ringfort are below ground. Furthermore, the calculations and conclusions in this thesis regarding Sandby are mostly speculative, due to the present state of excavation of the ringfort. It is to assume that further excavations will result in more precise calculations and conclusions. The until now little gained information about Sandby makes it difficult to accurately compare Sandby with the ringforts Eketorp and Ismantorp.

A major difference is that the Eketorp ringforts have been entirely excavated and extensively investigated, whereas in Ismantorp and Sandby only some parts have been excavated. Moreover, in the latter two ringforts only thin occupation layers have been revealed so far and the knowledge gained from the partial excavations does not comprise a whole picture of these ringforts and their function(s). Thus, only the Eketorp ringforts provide enough material to make comprehensive guesses about social activities within the ringfort. However, Eketorp is far more complex than can be dealt with in this thesis.

The analysis of the ringforts is based on mainly secondary sources. Moreover, the estimated number of people in an Iron Age household is taken from secondary sources. Consequently, the number of occupants per ringfort is estimated according to this number and the number of dwelling houses that existed in each ringfort, which information is also obtained from secondary sources. As a result, the calculated population density is based on the estimated average number of occupants and the interior size of the respective ringfort. Since in Sandby ringfort only a few

houses are entirely or partly excavated, it is yet unknown in what function groups the houses can be divided into and how many houses were dwellings. Thus, the estimated number of dwelling houses in Sandby is based on speculations and hence all the calculations made for Sandby are speculative and vague, and it is possible that the true results regarding the number of dwelling houses, occupants and population density are different.

Some complications have surfaced concerning the estimation of dwelling houses and the comparison of the house functions of the analysed ringforts. Different function groups of houses in the ringforts Eketorp and Ismantorp make it difficult to compare the houses of the different ringforts. Moreover, there is a discrepancy with the number of houses inside Ismantorp ringfort given in the text by A. Andrén and represented in his reconstruction plan (see Andrén 2014:71, 75, fig. 23). Another issue that emerged is that there are several different inner measurements for Sandby ringfort in the archaeological literature. Thus, it is unclear how large the inner area of Sandby actually is.

Another aspect that needs to be regarded critically is that in this thesis the averaging values are used for calculations. The averaging house measurements are used to calculate the built-up and open space in the ringforts Sandby and Ismantorp. Concerning Ismantorp – where two values for the inner diameter of the ringfort, and thus two possibilities of how large the interior area is, exist – the averaging size of the ringfort is used for the calculations of built-up and open space, as well as to calculate the population density. If the space the houses took up is more accurately calculated, with the individual size of each house, the results most probably would differ from the calculations made here. Furthermore, for each ringfort the averaging number of occupants is used to calculate its population density. Consequently, the results are rather imprecise.

Furthermore, the amount of open and built-up space for the ringfort Eketorp II is obtained from secondary sources, and it is not known exactly how these numbers were calculated.

Another difficulty is the interpretation of the space inside the ringforts as public or private, since it is not known for sure how the Iron Age people perceived public and private space and how they demarcated these spaces. These spatial concepts can only be defined in the ringforts based on the modern perception of what is public and private space.

2.2 The Ölandic ringforts

On Öland there are 15 definite identified Iron Age ringforts of which the remains are still visible in the landscape. These ringforts are listed in the following with their Swedish names, ordered by their location from south to north: Eketorps borg (Gräsgård parish)⁵, Träby borg (or Treby borg; Segerstad parish)⁶, Triberga borg (Hulterstad parish), Bårby borg (Mörbylånga parish)⁷, Sandby borg (Sandby parish), Lenstad borg (Torslund parish), Norra Möckleby borg (Norra Möckelby parish), Gråborg (Algutsrum parish)⁸, Ismantorps borg (Långlöt parish), Mossberga borg (or

⁵ The first Eketorp ringfort (Eketorp I) has been demolished and enlarged in the Iron Age (Eketorp II), superimposing the previous ringfort. Eketorp II was reused and rebuilt in the Medieval period (Eketorp III) (Näsman & Wegraeus 1979:7; Näsman 1989:78).

⁶ Träby consists of three ringforts that are joined together (Stenberger 1933:219).

⁷ Bårby is the only ringfort on Öland that is semi-circular shaped. Its semi-circle ring-wall runs against a natural steep that is used as boundary line towards the west (Hagberg 1987:170; Stenberger 1933:222).

⁸ In old documents Gråborg is sometimes referred to as Backaborg, Backeborg, or Borg (Hagberg 1987:173; Stenberger 1966:21), but these denotations are incorrect. They refer to a different farm from the Medieval Period which was called Borgh or Bakkaborgh, and was built ca. 100 meters west-northwest of Gråborg ringfort (Fallgren 2009:39).

Vipetorps borg; Högsrum parish), Svarteberga borg (Räpplinge parish), Hässleby borg (Köping parish), Vannborga borg (Köping parish), Löts borg (or Trindborgen; Löt parish), and Vedby borg (Högby parish) (Stenberger 1933:213).

Some of these ringforts, especially Svarteberga and Vannborga, are barely preserved due to damage or removal of the ringforts for cultivation of the land in the past (Fallgren 2009:27, 29; Stenberger 1933:248 f.; Wegraeus 1976:35).

Another six to seven possible ringforts are mentioned in the archaeological literature. However, some of these are doubtful concerning their classification among the Iron Age ringforts and among the Ölandic ringforts in general. Thus, the generally assumed number of 21 known possible ringforts includes ringforts as well as other fortified constructions from the Iron Age as well as from the Medieval Period (Stibéus 2007:38) (fig. 4).

Of these additionally mentioned possible ringforts are three only mentioned in historical sources: one ringfort near or at Sörby (Gårdslösa parish), another possibly on a moraine hill called Åkersberga (Källa parish), and another in Östra Vässby (Föra parish) (Fallgren 2009:28; Wegraeus 1976:39). Sometimes two sites are falsely interpreted as ringforts: a stone-wall enclosed plateau in Brostorp (Glömminge parish) and a fortification on Högkullbacken (Gårdby parish) referred to as Gårdby borg or Högkullbacken. In fact, Gårdby borg is probably a medieval fortified farm and the construction in Brostorp might date to ca. 200–400 AD, thus being prior to the main usage period of the ringforts (Fallgren 2009:27 f.; Holmring 2014:18; Stenberger 1933:111). Another platform, similar to the one in Brostorp, was located near the village Kvigerälla (Glömminge parish) which should not be considered as a ringfort either and usually is not included among the ringforts (Fallgren 2009:27 f.). Furthermore, it is considered possible that a long-lost ringfort once existed in Borgholm (Borgholm parish); maybe as a predecessor of the

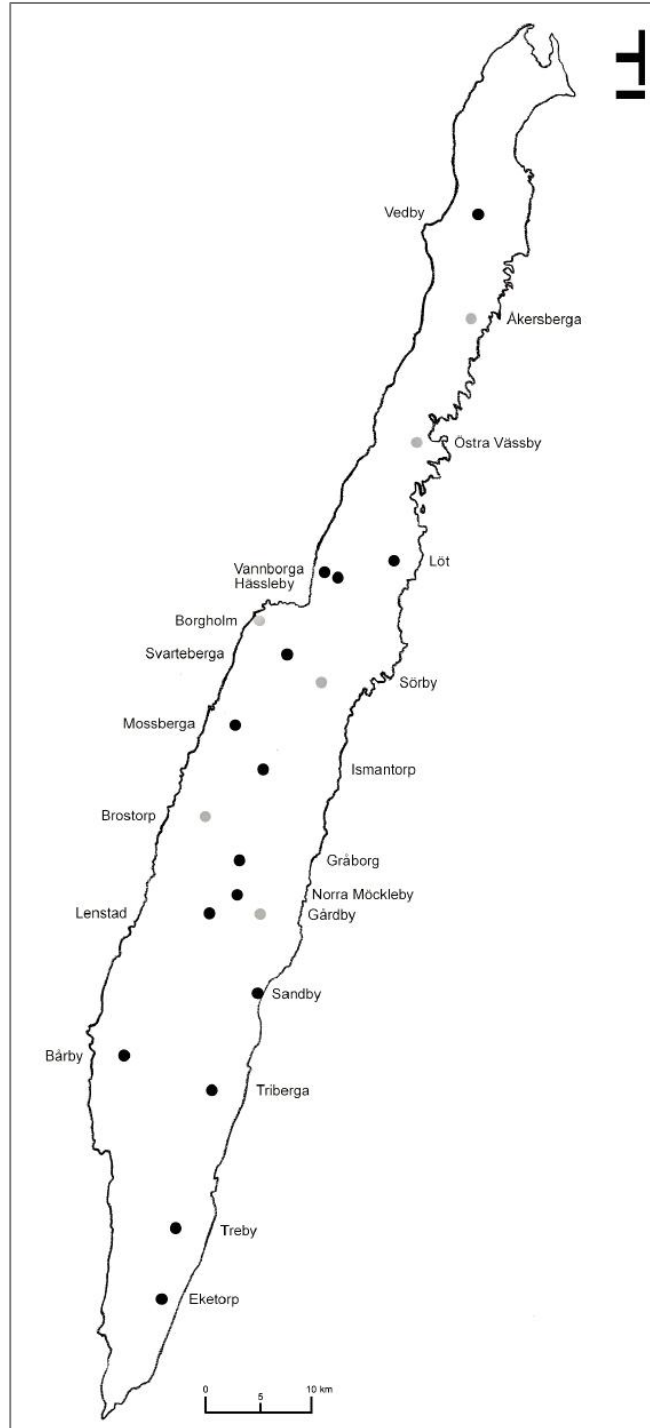


Figure 4: Distribution map of the ringforts on Öland. Black dots represent the 15 definite ringforts which remains are still visible in the landscape. Grey dots represent the 6 possible ringforts. (Map by Jacob Holmring & edited by Beata Holmring 2014.)

one in Brostorp, was located near the village Kvigerälla (Glömminge parish) which should not be considered as a ringfort either and usually is not included among the ringforts (Fallgren 2009:27 f.). Furthermore, it is considered possible that a long-lost ringfort once existed in Borgholm (Borgholm parish); maybe as a predecessor of the

medieval castle Borgholm (Hagberg 1987:167; Holmring 2014:5, 28 ff.; Stenberger 1933:254 f.; Stibéus 2007:37 f.).

It is possible that there were more ringforts during the Iron Age on Öland, which have completely vanished over time (Andersson 2014:6; Fallgren 2009:29).

The Ölandic ringforts can be divided into three groups regarding their size. To the smallest group, with a max. inner diameter of less than 60 m, belong: Eketorp I (ø 55–60 m), Vannborga (ø 53.5–39 m) and the smallest of the three conjoined Treby ringforts (ø 38–44 m) (Fallgren 2009:29; Näsman 1976a:49; Stenberger 1933:220, 249). If the three conjoined Treby ringforts are regarded as one, Vannborga is the smallest ringfort on Öland.

To the medium sized ringforts, that have a max. inner diameter of 60 m to 100 m, belong: Triberga (ø 60–62 m), Hässleby (ø ca. 68 m), Lenstad (ø 55–73 m), Norra Möckleby (ø 52–85 m), Eketorp II⁹ (ø ca. 80 m), Sandby (ø 65–95 m) and Svarteberga (ø 40–70 steps). Moreover, the two larger ones of the Treby ringforts (ø 48–66 m and ø 51–65 m) can be assigned to this group. However, Treby is difficult to assign to any group because of its unique composition of three joined-together ringforts (Dutra Leivas & Victor 2011:15; Fallgren 2009:29; Hagberg 1987:174, 178; Näsman 1976a:52; Stenberger 1933:220 f., 225, 227 f., 248).

The largest ringforts, that have an inner diameter over 100 m, are: Mossberga (ø 115–150 m), Löt (ø 139–155 m), Ismantorp (ø 124–127), Vedby (ø 87–159 m) and Gråborg (ø 162–210 m). Also, the semi-circular ringfort Bårby (ø 150 m) can be included in this group (Capelle 2000:535; Fallgren 2009:29; Hagberg 1987:170; Stenberger 1933:228, 236, 243, 250 f.; Tegnér 2008:42). The largest ringfort is Gråborg, with a max. diameter of 210 m. Thus, it could even constitute a fourth group (Fallgren 2009:29). Gråborg is also one of the largest forts in Scandinavia (Holmring 2014:17).

Fallgren observed that “most of the medium sized ring-forts are located in outfields between the villages belonging to the same settlement district, while the largest ring-forts are situated within outfields – commons – located between different settlement districts” (Fallgren 2009:33).

The 15 certain Ölandic ringforts have an oval or often irregularly round shape. Their walls are built in dry masonry technique as cavity walls, with an outer and an inner wall face, filled with mixed lime and grey stone blocks and sometimes erratics (Stenberger 1933:214; Wegraeus 1976:33 ff.). Ordinarily, the outside of the ring-walls is vertical and the inside is stepped (Stenberger 1933:219). The Ölandic ringforts usually have two gates in opposite directions or three gates (Andrén 2014:78, Stenberger 1933:236 f.). Nevertheless, some ringforts only have one gate, and Ismantorp and probably also Gråborg have even nine gates (Andrén 2014:78 ff.; Holmring 2014:41; Stenberger 1933).

The interior of 10 of the 15 definite ringforts was built-up with densely placed houses (Stenberger 1933:220). Possibly two more ringforts – Svarteberga and Vedby – once also had houses inside (Fallgren 2009:29 f.). The remaining house foundations of some of the ringforts are fragmentary or lay below the ground (Viberg, et al. 2014:425 f.)¹⁰ The ringforts that do not have house foundations are Norra Möckleby, Hässleby and Vannborga (Fallgren 2009:30 f.).

Unclear or thin occupation layers and only a few finds of Iron Age contexts indicate that the ringforts usually were not permanently occupied, with the exception of Eketorp II (Andrén

⁹ For the medieval ringfort Eketorp III the prehistoric ringfort Eketorp II was reconstructed and reused. Additionally, an outer ring-wall was erected around the ringfort as additive defence work (Hagberg 1987:171; Näsman 1989:87). The outer ring-wall of Eketorp III had a diameter of 115–120 m (Ammert 2009:7).

¹⁰ Fallgren estimated the number of houses for the ringforts where the actual number of house foundations is not visible and unknown (see Fallgren 2009:31 f.).

2014:80; Fallgren 2009:40). Thus, the ringforts are often interpreted as refuge forts for times of threat (Holmring 2014:50). However, it is probable that the ringforts were not only used as refuge forts but also functioned as meeting places for various kinds of affairs.

Most of the possible 12 ringforts with houses in the interior were probably used in the Roman Iron Age, Migration period and the Vendel period. It is to assume that the uncertain and long-lost ringforts at Sörby, Östra Vässby and Åkersberg were used during the same periods (Fallgren 2009:30). Generally, the Ölandic ringforts were in use between ca. 200–600/700 AD (ibid.:46). The certainly used as well as the assumingly used ringforts of this period are: Eketorps borg, Träby borg, Triberga borg, Bårby borg, Sandby borg, Lenstad borg, Gråborg, Ismantorps borg, Mossberga borg, Sörby, Svarteberga borg, Löts borg, Östra Vässby, Åkersberg, and Vedby borg (ibid.:33 f.).

Hässleby ringfort dates into the pre-Roman Iron Age (500–1 BC) and the early Roman Iron Age, and hence was in use before the ringforts with house foundations were built. Vannborga ringfort dates possibly into the same periods as Hässleby (Fallgren 2009:30; Holmring 2014:48). These two ringforts also differ in their location¹¹ from the ringforts with house foundations. Norra Möckleby ringfort can be dated into the same period as Hässleby and Vannborga. Presumably it was not used during the Roman Iron Age and the early Vendel Period (Fallgren 2009:30 f.).

The ringforts Eketorp, Gråborg and Ismantorp might have been used temporarily in the Viking Age (Fallgren 2009:32). However, the finds cannot be linked to a settlement phase (Olausson 2009:59). Ismantorp might have been in use until the 13th century (Andrén 2014:75 f.). Eketorp, Triberga, Bårby, Gråborg and probably Vedby were reused in the beginning of the Medieval Period, at the end of the 12th and beginning of the 13th century, as military garrisons by the arising Swedish royal power (Fallgren 2009:40, 48; Olausson 2009:66). Hence, their inner settlement was changed and had a different function than the Iron Age inner settlements (Fallgren 2009:32). Moreover, Gråborg was used in the Early Modern Period (ca. 1500/20–1789/1800 AD) (see Brorsson & Lindahl 2008:78 f.; Jonsson 2008:81, 87; Stenberger 1966:24).

2.2.1 Context of the Ölandic ringforts: historical and constructional background

The emergence of the ringforts on Öland is probably the result of the troubled and belligerent times in the area of the Baltic Sea in the period of the Iron Age AD, when hostile chiefdoms set out on military campaigns against each other. It is the theory of some scholars that from around 200 AD new forms of large-scale warfare arose, as well as a more centralised military organisation, of which the Scandinavian ringforts and hillforts were part of (Andrén 2006:35 f.).

The conflicts exacerbated with additional threats and attacks in the Migration Period (Gustavsson 2014:40; Näsman 1989:86). Presumably, during the 4th and the 5th centuries also attacks against Öland operated from the sea took place, which increased in the second half of the 5th century. One can argue that the Ölandic ringforts were built preventively as protection against such kind of attacks (Andersson 2014:8; Werner 1949:269). In Scandinavia, refuge castles or hillforts were used from the Late Bronze Age, around 1000 BC, until the Medieval Period, around 1300 AD. Most of the excavated sites date to ca. 200–700 AD with an intensified use around 400–550 AD, that is the periods of the late Roman Iron Age and the Migration Period. In flat landscapes, like on the Swedish islands Öland and Gotland, ringforts encircled with high earthworks or stone walls were erected in these periods (Andrén 2014:85; Myhre 2003:74 f.).

¹¹ For a further discussion of the location of the Ölandic ringforts in the landscape see Fallgren 2009:30 ff. and Holmring 2014.

Finds of larger noble metal and solid deposits that probably were buried at around the end of the 5th century, as well as burnt layers in settlements on Öland, indicate a connection of the depositions with disturbances or even catastrophes. The coining leads to the assumption that significant disturbances occurred on Öland after 474 AD, presumably between 480 and 490 AD (Werner 1949:257 ff.). Additionally, other archaeological finds of valuable artefacts and structures indicate disturbances and conflicts or a restructuring of the society around the end of the 5th century. A great number of Iron Age buildings on Öland were abandoned between the 5th and the beginning of the 7th century, that is during the Migration Period and the Vendel Period, since they provided no protection against attacks. Many buildings were probably intentionally burned down (Näsman 1978:347 ff.; Werner 1949:269 f.)

It appears that in the Vendel Period the disturbances in the Baltic Sea region and the conflicts among the different chiefdoms subsided. It is possible that as a consequence of the following peaceful time, the Ölandic ringforts were abandoned at around 650 AD (Näsman 1989:86; Olofsson & Josefson 2007:30).

The Ölandic ringforts are distributed all over the island. Most of them are located in the island's interior. Often the ringforts were only between 1 km and 2 km away from the closest Iron Age settlement. The main gate of a ringfort usually was placed facing the nearest settlement. In the southern and the central region of Öland, the ringforts are so dense that between them there is a distance of max. 8 km (Andersson 2014:6, 8; Andrén 2006:34; Holmring 2014:34 f.). The positioning of the ringforts leads to the assumption that they were constructed on the basis of a joint decision of neighbouring Iron Age settlements and also built and maintained by a local collective, hence indicating a common local politics behind the ringforts (Fallgren 2009:46; Holmring 2014:36; Skarin-Frykman 1967:224). Further, a connection of the ringforts with their surroundings can be discerned:

There is a clear proportional relation between the size of the ringforts and the size and number of surrounding farms, as well as the size of the outland in which the ringforts are situated. The larger the ringfort, the more numerous and larger are the farms surrounding it [...], the greater the area of the outland (Holmring 2014:36).

J. Holmring writes about this pattern:

It is also reasonable that the size of the ringforts reflects the size and number of the connected farms, since that also would reflect the number of involved people in the construction of the ringforts. The more people that are mutually involved, the greater the need may have been for constructing a larger ringfort and the lesser the effort per capita would have been in such a project. This could also reflect the complexity of the social structure and organization on Öland at the time (ibid.).

Presumably the ringforts were correlated with each other and formed a string of defence which served to protect and defend the Ölandic coasts and the inhabitants against hostile attacks (Andersson 2014:6). Based on the isolated location of the ringforts away from common settlements, their defensive construction of strong stone walls and singular weapon finds, it is probable that the ringforts had a martial context and served as refuges for the Ölandic population (Andrén 2006:34; Holmring 2014:31 f.).

The comparatively few finds obtained from the Iron Age ringforts and the absence of occupation layers in many cases indicate that the ringforts were not permanently occupied, except for Eketorp II. Also, it seems that the ringforts were normally not intended for a permanent settlement. Consequently, the interpretation as refuge forts seems reasonable as it has been argued for by

several archaeologists, e.g. Stenberger, Näsman, and Fallgren (Holmring 2014:36). Nevertheless, conclusions regarding one ringfort should not be generalised to all ringforts on Öland. For example, the ringfort Ismantorp has nine gates which are seen problematic in archaeological research, since such a high number of gates would be a great weakness if the ringfort was used for protection and defence (ibid.:17; Wegraeus 1976:40). Hence, it is assumed that Ismantorp had other functions than a purely defensive one (Holmring 2014:17; Stenberger 1933:235 ff.). Apart from the martial interpretations of the ringforts, they also have been set into different ritual and religious contexts; especially Ismantorp ringfort by A. Andrén (2006; 2014) (Andrén 2006:34). Moreover, there are also “a number of circumstances that suggest that the ring-forts on Öland, in the same way as ring-forts generally, functioned as sites for different types of joint meetings and activities” (Fallgren 2009:46).

The spatial layout of the ringforts on Öland suggest that the structural arrangement was based on a well thought-out layout plan, e.g. with the same kind of buildings running radially along the ring-wall (Holmring 2014:53). This practical design saved space and the houses built against the ring-wall helped reinforcing it (Skarin-Frykman 1967:225). For the construction of the Ölandic ringforts local resources like limestone and grey stone (Holmring 2014:40), as well as domestic architectural traditions such as the three-aisled hall building with stone walls and the technique of dry masonry wall were used (Näsman 1976b:76 f.; Skarin-Frykman 1967:224 f.).

The Ölandic ringforts have a very characteristic layout and differentiate in their location and design from the hillforts¹² on the Swedish mainland (Stenberger 1933:124; Wegraeus 1976:33 ff.) and from the ones on the Swedish island Gotland (Fallgren 2009:32). The prehistoric hillforts of the mainland are usually located on natural elevations that were difficult to access. Where such elevations were non-existent the fortification was built close to marshlands or headlands as for its defensive advantage (Stenberger 1925:374). By contrast, due to the topography of Öland the ringforts here are located in the lowland, with the exception of Bårby borg (Holmring 2014:2). The majority of the Ölandic ringforts has been “built on the highest possible terrain of that specific area or on platforms which may have been artificially constructed” (ibid.:31). The choice of a circular shape is probably a result of the ringforts being located in the lowlands and attacks from every direction were to be expected (Ammert 2009:6; Wegraeus 1976:33 ff.). Additionally, the flat and open landscape of Öland made it necessary to build more advanced and complex fortifications than on the mainland (Fallgren 2009:32); completely enclosed ringforts with high and thick stone walls as protection and defence (Holmring 2014:2, 15, 31; Stenberger 1933:214; Wegraeus 1976:33 ff.). Due to the absence of natural obstacles, most of the Ölandic ringforts were strategically placed nearby marshlands. These served as natural defence/protection against hostile attacks and possibly as water sources (Holmring 2014:37 f.; Wegraeus 1976:33; Werner 1949:266). It also might be that the location close to bogs was charged with ritual, religious and mythological meaning, since many bogs were used as sacrificial sites during the Iron Age (Holmring 2014:37). Topographical analyses show that the exact location of the ringforts was of great importance (ibid.:31).

The settlement layout of the Ölandic ringforts, with radially orientated houses along the ring-wall, seems to be unique in Sweden. In the archaeological research it is assumed that foreign influences motivated the Ölandic population to build fortifications with buildings inside the ring-wall. M. Stenberger was initially convinced that the Ölandic ringforts were built on the basis of Germanic models, sharing three commonalities: the round or oval layout, the usually small number of gates, and the placement of buildings close to the ring-wall forming an open place in the fort’s centre.

¹² For a discussion of hillforts and ringforts see Andrén 2014:84 ff. and Holmring 2014:5-16.

On the contrary, B. Skarin-Frykman rejects the idea of a joint-Germanic fortress type and supports J. Werner's argumentation that the Ölandic ringforts were influenced by late Roman-Byzantine citadels.¹³ The late Roman-Byzantine forts are characterised by stone walls which protected a settlement in the interior (Näsman 1976b:76 f.; Skarin-Frykman 1967:210, 216 f., 223; Wegraeus 1976:40 ff.; Werner 1949:267). It is possible that the Ölandic population transferred the concept of the late Roman-Byzantine fortifications to the construction of the ringforts on Öland, but did not adopt all ideas and considered local traditions and resources, as well as adjusted the shape of the ringforts to the surroundings and the soil (Andrén 2006:36; Skarin-Frykman 1967:209 f., 224 f.). The assumption of a late Roman-Byzantine influence is supported by the facts that the periods of the construction correspond and that culture contacts – Scandinavian mercenaries served in the armies of the Roman empire (Olausson 2009:56; Werner 1949:264 f., 268) – between these regions existed (Skarin-Frykman 1967:225). Additionally, the interpretation of an unusual construction in the north-gate of the ringfort Eketorp II as a portcullis, that is an iron gate that was vertically let down (Olofsson & Josefson 2007:30), is assumed to be influenced by Roman defence works (Edgren & Herschend 1997:9). Later, Stenberger agreed with the theory of a late Roman-Byzantine influence as well (Näsman 1976b:77). It is possible that the Ölandic ringforts are the result of the contact between two different cultures and that they represent a gradual expansion and development of a Mediterranean fortification design in the Barbaricum (Fischer 2015:68). On the other hand, Skarin-Frykman points out the possibility that the Ölandic population hit on the idea to build fortresses in shape of ringforts with radially placed houses inside independent of foreign influences. This kind of arrangement is the most economical way of using the space inside a ringfort (Skarin-Frykman 1967:226; Wegraeus 1976:43 f.).

3. Analysis

Within the context of the analyses of the ringfort Eketorp II, the number of people per one household, that is the people who inhabited a dwelling house, in Eketorp II was estimated to about 6–8 individuals (Engström 2015:47 f.) and on average to 7 individuals (Edgren & Herschend 1997:9).

In the following, this estimation is used to calculate the approximate number of people occupying a ringfort in regard to the number of interpreted dwelling houses. However, it is uncertain if this number can be generalised to the other ringforts and how accurate it is. For the purpose of this analysis, it is used to get an impression and a comparable conclusion of the possible population and the population density of the respective ringforts.

Since there were two successive and superimposing Eketorp ringforts in the Iron Age these ringforts are analysed separately as two individual ringforts.

3.1 Eketorp I

The ringfort Eketorp is located in the south of Öland and is the southernmost ringfort on the island. It is placed ca. 10 km north of Öland's southern edge and its distance to the eastern shore is ca. 1.5 km (Boessneck 1979:6). The ringfort is not visible from the Baltic Sea because it is concealed by the Littorina shore ridge (Näsman 1976a:46). The distance to the closest Iron Age settlement was ca. 1.5 km to the southwest and the north (Näsman 1976a:46).

¹³The refuge castles or hillforts on the Swedish mainland are presumably a result of domestic developments (Wegraeus 1976:40).

The ringfort is placed at the south-eastern edge of the *Stora Alvaret*, the flat and barren limestone plateau that is especially characteristic for the southern part of Öland (Borg, Näsman & Wegraeus 1976:11; Stenberger 1966:25). To the east, the ringfort borders to a swampy meadowland that extended south and north and was covered by a shallow lake in past times (Helbaek 1979:115; Stenberger 1966:25). In the Iron Age the lake was used as a sacrificial site (Fabech & Näsman 2013:70). Directly outside the ringfort in the east, there was a waterfilled depression which probably was lowered in the times of Eketorp I to serve as water reservoir in dry periods (Weber 1976a:61). The ringfort is ca. 1 m elevated from its surroundings (Stenberger 1966:25).

The ringfort Eketorp I dates ca. 300–400 AD (Näsman & Wegraeus 1979:7). It had an irregularly circular shape (Weber 1976a:65). The area inside the ring-wall amounted to ca. 2670 m² and had a diameter of 55–60 m, averaging ca. 57 m (Näsman 1976a:49; Weber 1976a:61). The area in the centre was open and had a diameter of 35–40 m (Näsman 1989:79), averaging ca. 38 m (Näsman 1976b:73). The open space in Eketorp I was on average ca. 1134 m² large¹⁴ and the built-up area occupied ca. 1536 m². Of the interior space 42.47 % were open space and 57.53 % were built-up space.

The main gate was placed in the southwest of the ring-wall and presumably there was a small gate located in the east leading outside to the water reservoir and the marshland. The main gate had a well paved street out of limestone plates that was wide enough for carts (Näsman 1976a:49; Weber 1976b:67, 70). The paving ran underneath the house walls that were flanking the gate-street (house walls *y/z* and *z/a*) which means that the pavement was laid prior to the houses, maybe even before the settlement was precisely planned. Thus, the houses inside the ringfort were built after the construction of the ring-wall, the main gate and the pavement (Weber 1976b:70 f.). It is uncertain if Eketorp I consisted in its earliest phase only of the ring-wall and the houses were added later, or if the ring-wall and the houses should be seen as one unit from the beginning (Näsman 1976b:75 f.).

The layout of the ringfort was based on a well thought-out plan (Edgren & Herschend 1997:7). Houses with shared long walls were placed radially along the ring-wall (Näsman 1976b:73). The house entrance was placed in the gable wall that was directed towards the fort's centre. This arrangement of the houses allowed a maximal usage of the limited inner area of the ringfort (Näsman 1976b:76). The houses had about the same layout and structure. They were 1.5 m or possibly 1.6 m high, ca. 6–11 m long, most houses had a length of 8–9 m, and were 6.1–8.7 m wide (fig. 5) (ibid.:73 f.; 1989:79). The house walls were averaging 1–1.2 m thick. They were thickest at the ring-wall and decreased a little towards the centre (ibid. 1976b: 73). The averaging inner space of the houses was between 57 m² and 61 m². Only two houses were a little bigger than the others (house *l* ca. 79 m² and house *p* ca. 86 m²), and two houses were smaller than the others (houses *j* ca. 29.58 m²

a.										
<i>z/a</i>	8.9	<i>e/f</i>	7.?	<i>k/l</i>	8.6?	<i>o/p</i>	10.9	<i>t/u</i>	?	
<i>a/b</i>	8.5	<i>f/g</i>	8.7	<i>l/m</i>	11.1?	<i>p/q</i>	8.6<	<i>u/w</i>	9.6	
<i>b/c</i>	8.6	<i>g/h</i>	8.0?	<i>m/n</i>	7.2?	<i>q/r</i>	?	<i>w/x</i>	8.5	
<i>c/d</i>	8.0	<i>h/j</i>	8.?	<i>m/o</i>	9.7?	<i>r/s</i>	6.2<	<i>x/y</i>	8.5	
<i>d/e</i>	7.6<	<i>j/k</i>	9.4?	<i>n/o</i>	6.5<	<i>s/t</i>	10.9	<i>y/z</i>	8.1	

b.										
<i>a</i>	6.2	<i>f</i>	?*	<i>m</i>	7.6	<i>r</i>	4.5?	<i>x</i>	7.0***	
<i>b</i>	7.2	<i>g</i>	7.1	(<i>n</i>)	4.4)	<i>s</i>	7.0	<i>y</i>	7.3	
<i>c</i>	7.2	<i>h</i>	8.4**	<i>o</i>	6.8	<i>t</i>	5.3?	<i>z</i>	7.0****	
<i>d</i>	6.7	<i>k</i>	6.1	<i>p</i>	8.1?	<i>u</i>	6.2			
<i>e</i>	?*	<i>l</i>	8.7	<i>q</i>	6.8?	<i>w</i>	7.7			

Fig. 61. a. Length of house-walls in Eketorp-I.
b. Breadth of Eketorp-I houses at the ring-wall.

* Breadth of houses *e* and *f* can be calculated: $d/e - f/g = 16\text{m} - 1\text{m} = 15 : 2 = 7.5\text{m}$.
** Breadth of house *h* divided by wall *h/j* into two parts: 3.5 respectively 3.4 m in breadth.
*** An extra wall face on wall *x/y* reduced the breadth of house *x* to 5.8m.
**** The breadth of the gate-street has been measured as if walls *y/z* and *z/a* were continued to the ring-wall.

Figure 5: Length and width measurements of the houses of Eketorp I. (Figure by Ulf Näsman.)

¹⁴ Calculated with the averaging value of the diameter.

and house *n* ca. 30.14 m²) (Appendix A). Both of the smaller houses were added in a later phase by dividing an already existing house through a long wall. The houses were three-aisled¹⁵ (Näsman 1976b:73 ff.). The houses were adjusted to the ring-wall, by what they differed from the freestanding farmsteads outside the ringforts which were of different sizes (ibid. 1976a:51). In the earliest phase of Eketorp I there were probably 20 houses placed inside the fort (fig. 6) (ibid. 1976b:74, 76). Presumably, in the eastern part there was a small gate or passage through the ring-wall (labelled with *r* in the figure), leading to the marshland in the east and the waterfilled depression that was located there. However, no such remains of a passage were found during the excavations (Weber 1976b:67) and it might be the case that this area was a house as well.

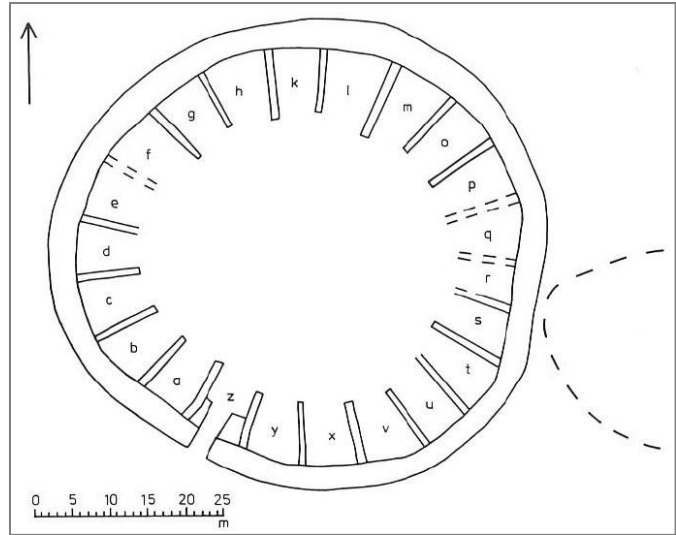


Figure 6: Reconstruction plan of the earliest phase of Eketorp I. East outside the ring-wall was a waterfilled depression located. The area labelled with *r* was probably not a house but a passage (gate) and the area labelled with *z* shows the gate-street leading into the ringfort. (Plan by Ulf Näsman.)

In a later phase some houses were rebuilt and changed (Näsman 1976b:74, 76). A total of 20 to 21 houses were placed in the fort (fig. 7) (ibid. 1976a:49). The wall *x/y* was reinforced with a secondary wall (ibid. 1976b:73 f.). The secondary built house walls *m/n* and *n/o* of house *n* show that house *n* was built after the houses *m* and *o* were torn down. It is unclear if the secondary house wall *h/j* belongs to a later house too or if it was a division of house *h* into two smaller houses (*h:2* and *j*). Secondary built gable fragments were found in house *w* and possibly houses *a* and *c* (ibid.:75 f.).

Assumed that all certain houses in Eketorp I were used as dwelling houses, there were altogether ca. 120–160 people occupying the ringfort in its first phase. In the second phase there were ca. 120–160 or 126–168 people occupying the ringfort (table I). Based on the averaging number of inhabitants, the population density of

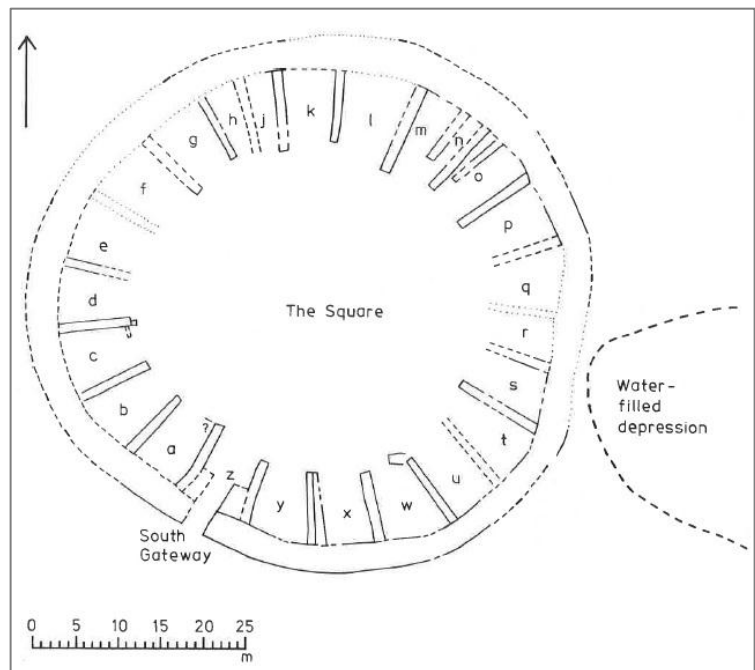


Figure 7: Reconstruction plan of a later phase of Eketorp I. Some houses were rebuilt. (Plan by Ulf Näsman.)

¹⁵ Three-aisled houses were the traditional house type of the early Iron Age on Öland and Scandinavia in general (Näsman 1976b:75).

the first phase of Eketorp I was 0.052 people/m². In the second phase the population density was 0.052 people/m² to 0.055 people/m².

People per household	20 dwellings	21 dwellings
6–8	120–160 people	126–168 people
Averaging 7	140 people	147 people

Table 1: Calculations of the overall population of the ringfort Eketorp I, in accordance with the number of houses interpreted as dwelling houses. The estimations of the basic number of people per household are taken from the population estimation of the ringfort Eketorp II (see Edgren & Herschend 1997:9; Engström 2015:47 f.).

Several houses had their floor paved with stone slabs and this pavement extended over the end of the house walls (Näsman 1976b:75). Only in a few houses were hearths found and no traces of stable structures were discovered (ibid. 1976a:51). Relocated postholes, renewed stone pavements, repositioned house walls and secondary wall sections indicate that the ringfort was used over a long period (ibid. 1989:80).

Since Eketorp I was demolished for the construction of the larger ringfort Eketorp II, there were only few findings and structures preserved based on which conclusions regarding the settlement arrangement of Eketorp I can be made. Further, this restricts the possibilities of a chronological separation of the different building elements of Eketorp I (Herschend 1976:203; Näsman 1976b:75).

The occupation layer is very thin and the number of found artefacts and animal bones is low (Boessneck 1979:6 f.; Näsman 1976a:51). It has to be taken into account as well that probably objects from above layers found their way into lower layers, e.g. with the rebuilding of Eketorp and/or the renewal of existing structures (Herschend 1976:207).

The archaeological findings indicate that Eketorp I was only occasionally occupied. Hence, Eketorp I is interpreted as refuge fort for the surrounding settlements, but it also could have been used as meeting place presumably for political and juridical affairs, cult or markets (Näsman 1976a:51; Olofsson & Josefsson 2007:30). Possibly, markets were held in connection with livestock farming (Ammert 2009:6; Näsman 1976a:51). Consequently, the houses could have been used as dwelling houses in times of unrest and for special meetings and events inside the ringfort, as well as storehouses, shops and maybe improvised stables for markets.

In the area of the now shallow lake east outside the ringfort, many hazel rods and animal bones, characterized by

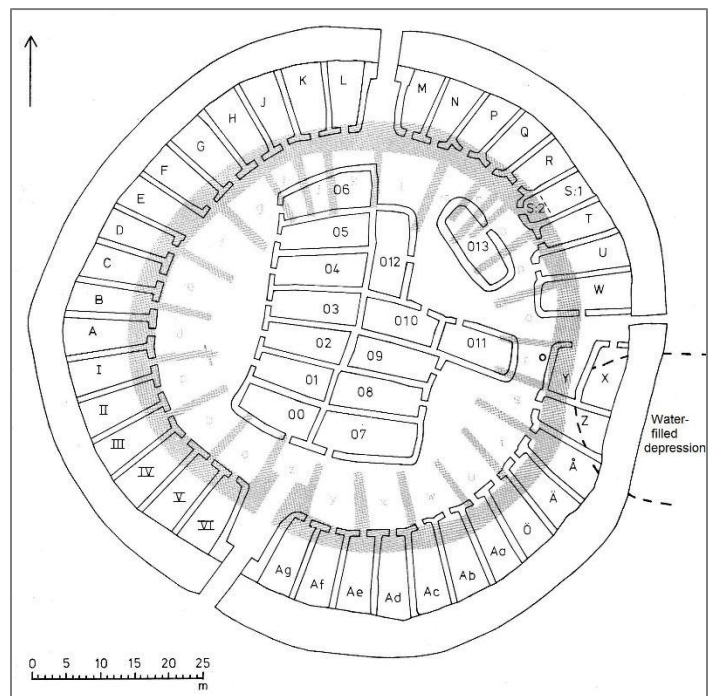


Figure 8: Reconstruction plan of the ringfort Eketorp II overlaying the plan of its predecessor Eketorp I. (Plan by Ulf Näsman.)

horse and swine skulls, were found. The comparison with other Iron Age sacrificial sites in Scandinavia (e.g Skedemosse bog on Öland, Hjärup and Fredriksberg on the Swedish mainland) suggests that the lake was used as a sacrificial site. ¹⁴C-datings attest that the offerings at the Eketorp lake probably started in the early Roman Iron Age and continued into the Viking Age. Especially many sacrifices date to the 7th century AD, that is the Vendel Period. It appears that the sacrificial site was already in use before the ringfort Eketorp I was built in the 4th century AD. Hence, already prior to the ringfort the place was used as a gathering place with assumingly ritual, cultic and religious functions (Fabech & Näsman 2013:70; Olofsson & Josefson 2007:29 ff.). Therefore, it seems possible that after the construction of Eketorp I, sacrificial rituals could have been performed or started in the open centre of the ringfort, before they proceeded outside the ringfort to the lake.

3.2 Eketorp II

The ringfort Eketorp I was demolished and a larger ringfort was built on top of it (fig. 8) (Näsman 1976a:51 f.). The next Eketorp ringfort, Eketorp II, dates ca. 400–650/700 AD (Näsman & Wegraeus 1979:7; Olofsson & Josefson 2007:30). The fort had an irregularly circular shape and a diameter of ca. 80 m (Weber 1976c:79). The area inside the ring-wall was ca. 5280 m² large. From that were 3660 m² built-up, the remaining 1620 m² were open areas consisting of streets and four squares (Näsman 1976a:52 f.; 1976c:117). Of the interior space 30.68 % were open space and 69.32 % built-up space.

The ring-wall of Eketorp II had three gates: one in the southwest which was the main gate, one in the north, and a small one in the east along the waterfilled depression (Weber 1976d:97 f.). The north gate was probably blocked in a later phase (ibid. 1976c:93; 1976d:110). The with stone slabs paved street at the southwest gate from Eketorp I was kept but extended and several times renewed (ibid. 1976d:102 f.). Also, in the north gate was a street which consisted of the limestone ground of the *Stora Alvaret* and was partially patched with gravel and stone plates (ibid.:106, 109 f.). The waterfilled depression east outside the ringfort was deepened and water could flow through a tunnel in the base of the ring-wall into the part of the depression inside the ringfort (ibid. 1976c:80, 83).

In the southwest gate passage a high concentration of charcoal and ash was found, suggesting that wooden structures (possibly the gate) had burnt down there.

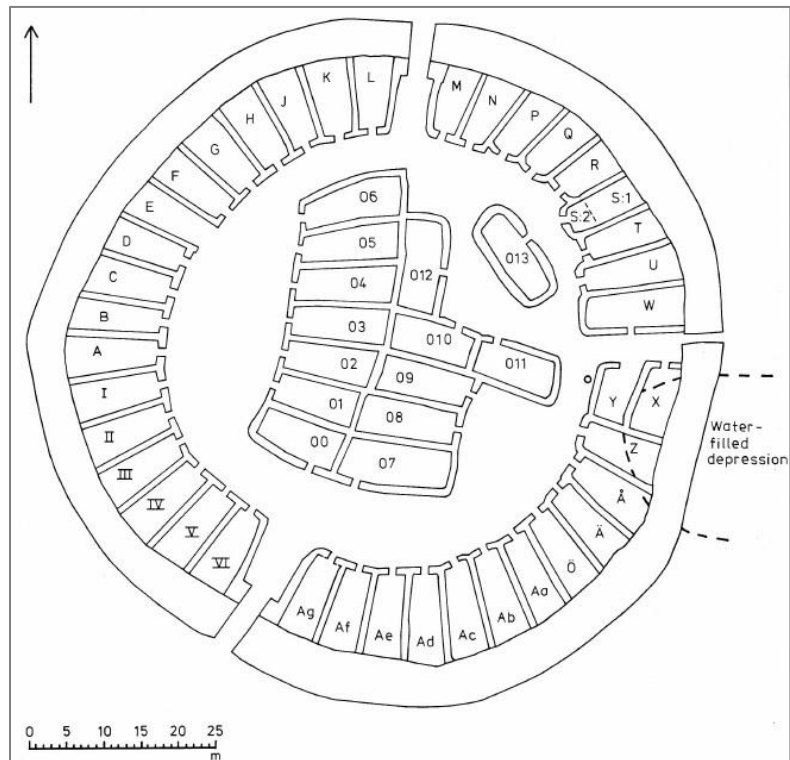


Figure 9: Reconstruction plan of the ringfort Eketorp II. In a later phase the area of the waterfilled depression inside the ringfort was filled in and built-up. Also, a well was built next to house Y. (Plan by Ulf Näsman.)

Further, in the same layer were four arrowheads found. Therefore, it seems possible that Eketorp II was attacked at some time (ibid. 1976d:105 f.).

Along the ring-wall were houses with shared long walls radially placed and the ringfort's centre was built-up with a house-block. In the south-east two houses were placed parallel to the ring-wall (Näsman 1976a:52). The arrangement of the houses appears almost to be done with mathematic accuracy (Stenberger 1966:30). In total 53 houses stood inside the ringfort. The three gates divided the houses along the ring-wall into three blocks: the west block with 17 houses, the north-east block with 9 houses, and the south-east block with 13 houses. In the latter, two houses were placed parallel to the ring-wall which were built in a later phase of the ringfort. A total of 39 houses were placed along the ring-wall. In the fort's centre was another block with 13 houses, separated from the houses along the ring-wall by a ring-street. Additionally, between the central block and the north-east block there was a freestanding house placed (fig. 9) (Näsman 1976a:52). Within the ringfort settlement there were four open areas or squares. The largest of these was located in the western part of the ringfort. A smaller one was located in the north and another in the northwest between the central house-block and the freestanding house. In the south-western area was another open space located (fig. 10) (ibid.:53).

In the settlement layout too narrow streets or passages were avoided and many house foundations had rounded corners (ibid. 1976c:148). It appears that it was important that the area and ring-street in the ringfort were well driveable.

Presumably, in a first building phase 32 houses were built in the south, the west, the north, and partly in the centre of the ringfort (houses VI-N, Ag-Ad and 00-08), leaving the north-eastern, south-eastern, and the eastern area and thus the waterfilled depression inside the fort open. Also, a part of the long wall of house 09 in the central block was built but the construction was then stopped, suggesting a pausing of the settlement construction. Possibly the original layout plan of the settlement was changed during the construction of the buildings (ibid.:142 ff., 147; 1989:84).

In a second building phase, the settlement construction was continued towards the east. Probably the waterfilled depression was filled in in order to build more houses, and a well in the eastern part of the ringfort was built (ibid.:142 ff., 145 ff.; 1989:84). It is to assume that the area around the waterfilled depression was kept open as long as possible for water supply. However, in the last settlement or building phase more buildings, respectively residential space, were needed (Weber 1976c:93 f.). With the filling in of the open water reservoir the water supply was restricted.

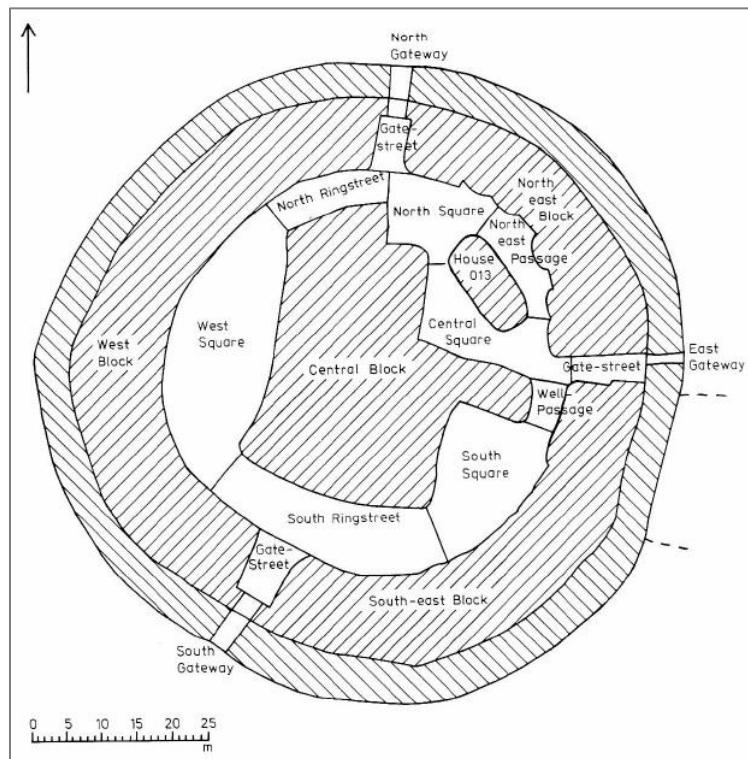


Figure 10: Plan of the ringfort Eketorp II with the division into settlement elements. (Plan by Ulf Näsman.)

Moreover, the densely built-up area around the well restricted the access to the well (Näsman 1976c:145 f.). Usually the area around a well or water source is kept free.

After the filling in of the waterfilled depression, the houses Z, X, Y, and W were built. Houses X and Y were constructed at the same time. After the construction of the well, house 011 in the centre was built. When the freestanding house (house 013) between the northeast and the central house-blocks was built, the northeast block was probably already entirely built-up. The entrance of the freestanding house is towards the ring-street in the northeast and not to the open space in front of the central house-block (ibid.:145 ff., 148).

It is uncertain how much time had passed between the different construction phases and if they all followed consecutively.

Presumably, the eastern part of the ringfort was originally planned to be regularly as well, but in the development of the settlement construction the original plan was changed (ibid. 1989:83 f.). The construction of the north-eastern house-block appears irregular, which is especially visible in the construction of the house fronts respectively gables. Possibly, the houses here were built when needed in several intervals over a longer period. Except of the houses M and N, presumably all other houses of the northeast block were built later than the whole west block and most of the southwest block (ibid. 1976c:146).

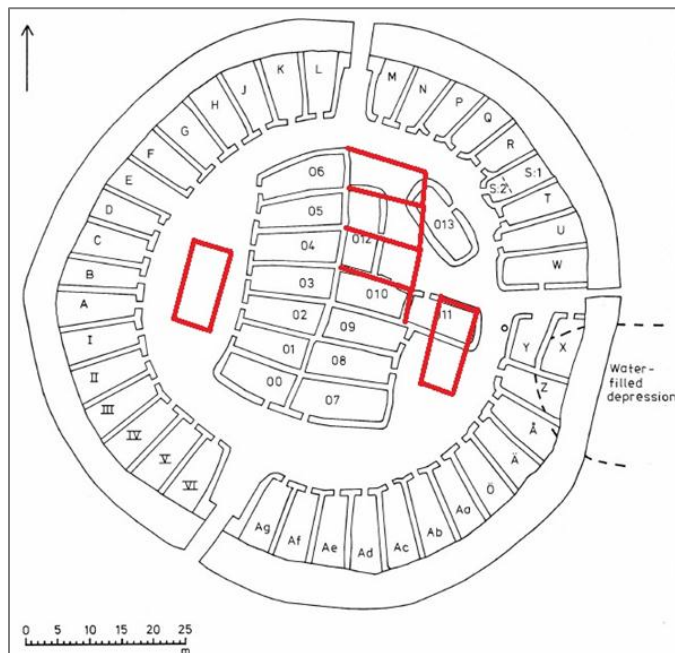


Figure 11: The red lines represent possible houses that could have been built in the free areas or could have additionally been built if the central house-block was arranged more symmetrical. (Plan by Ulf Näsman. Edited by the author.)

It is questionable why the central block was not built symmetrically, and why the construction process was stopped and then probably the planned layout for the ringfort settlement was altered. Was it to build the freestanding house (013) at just the location where it was?

In the central block, instead of the vertically placed house 012, there could have been built three houses horizontally according to the other houses of the central block. The freestanding house would have needed to be placed a little differently. Additionally, in the western part of the ringfort, in front of the central block, there would have been space for another freestanding house (fig. 11). It appears that it was either of importance to keep the open areas free and have sufficient open space, or that there should not be more than one freestanding house in the ringfort what might implicate that the freestanding house had a special meaning and function. However, in the case of Eketorp II this is not the case. The freestanding house did not differ in its function from the other houses inside the ringfort.

Furthermore, it seems that the location of the only freestanding house might have been of significance. Possibly it was connected to the houses of the northeast block (Näsman 1976c:148).

The unsymmetrical layout of the ringfort settlement is probably partly due to the placement of the first built gate in the southwest for having an additional protection through the marshland in the east and to ensure a direct connection to the street on the Alvar plateau. The north gate was not placed symmetrical to the southwest gate because then it would have led directly into the bog in the northeast. The actual position of the north gate might be the reason for the arrangement of the houses in the central block. Assumingly, the conditions of the ground and the demand for easily accessible gates influenced the arrangement of the houses (ibid.:141 f.).

The houses of Eketorp II barely differentiated in size, layout and structure. They were between 6.5 m and 14.35 m long (fig. 12) – averaging 11 m –, on average 4.5 m wide¹⁶, and ca. 1.6 m high. Their inner space was ca. 50 m² (ibid. 1976a:53; 1989:84). It is believed that the houses had two rooms, an outer and an inner room, and each room had a fireplace (Stenberger 1966:29). The houses were usually three-aisled (Näsman 1989:83) and had gables built of stone (ibid. 1976a:53). Some houses had rounded corners (ibid. 1976c:148). The house lengths were adjusted to the given space, so that it was possible to place as many houses as possible in the ringfort and still have enough space for the ring-street and open places respectively squares. A few houses were noticeably smaller than the others. These are the two houses parallel to the ring-wall (houses X and Y) and the houses in the northern part along the ring-wall (houses M to R). The latter being on average 0.5–1 m shorter so it was possible to build the freestanding house (013) in the area in front of them without narrowing the ring-street too much (ibid.:144) (fig. 12).

Almost all houses had a stone slab pavement in front of their entrance to reinforce the ground. Alternatively, the remains of the Eketorp I ring-wall and house foundations provided a firm ground. Often the pavements were large enough so that they possibly formed and marked sturdy workspaces in front of the houses (ibid.: 138 f., 148 f.).

Based on the spatial structures of the buildings and the objects found in them, the houses of Eketorp II can be attributed to different functions (fig. 13). There were 23 dwelling houses, 12–13 stables/byres, 12 store- and workshop houses, and 5–6 houses that had several functions. Among the latter were a smithy¹⁷ and 2 houses each with an oven out of stone (ibid. 1989:84). “A house with a large oven against the curtain wall may have been a bakery, brewhouse or sauna, or perhaps a combination of all three” (Edgren & Herschend 1997:11). Presumably each dwelling

West Block		South-east Block	
<i>VI</i>	10.65–11.55	<i>X</i>	9.00– 9.85
<i>V</i>	11.10–12.00	<i>Y</i>	6.50– 7.55
<i>IV</i>	11.35–12.55	<i>Z</i>	10.40–11.35
<i>III</i>	11.40–12.25	<i>Å</i>	11.40–12.40
<i>II</i>	11.20–12.00	<i>Ä</i>	11.35–12.30
<i>I</i>	11.55–12.50	<i>Ö</i>	11.30–12.20
<i>A</i>	12.20–13.25	<i>Aa</i>	11.45–12.30
<i>B</i>	11.75–12.65	<i>Ab</i>	12.05–12.80
<i>C</i>		<i>Ac</i>	12.10–12.85
<i>D</i>	10.10–11.20	<i>Ad</i>	11.50–12.35
<i>E</i>		<i>Ae</i>	10.95–11.85
<i>F</i>	10.00–10.75	<i>Af</i>	10.90–12.00
<i>G</i>	10.20–11.00	<i>Ag</i>	10.80–11.90
<i>H</i>	10.55–11.50		
<i>J</i>	10.30–11.15	Central Block	
<i>K</i>	10.25–11.05	<i>00</i>	11.05–12.05
<i>L</i>	9.50–10.35	<i>01</i>	10.85–11.65
North-east Block		<i>02</i>	11.80–12.60
<i>M</i>	9.00–10.00	<i>03</i>	12.70–13.50
<i>N</i>	9.40–10.25	<i>04</i>	12.95–13.70
<i>P</i>	9.10–10.25	<i>05</i>	12.75–13.50
<i>Q</i>	9.35–10.20	<i>06</i>	13.20–13.95
<i>R</i>	8.10– 8.95	<i>07</i>	14.35–15.15
<i>SI</i>	6.90– 7.70	<i>08</i>	12.80–13.80
<i>S2</i>	10.05–10.95	<i>09</i>	11.95–12.80
<i>T</i>	10.10–11.00	<i>010</i>	10.85–11.70
<i>U</i>	12.90–13.85	<i>011</i>	10.90–11.95
<i>W</i>	13.20–14.10	<i>012</i>	12.00–13.00
<i>013</i>	12.20–14.15		

Figure 12: Measurements of the inner and the outer length of the Eketorp II houses. Houses C and E could not be exactly measured due to medieval rebuildings. (Figure by Ulf Näsman.)

¹⁶ Calculated with the given values of the surface area and the length.

¹⁷ According to U. Näsman the smithy was located at the southwest gate, according to E. Engström the smithy was located in the east of the ringfort (Engström 2015:51; Näsman 1989:84).

house represents a household. It is assumed that the houses formed farmstead groups. A farmstead consisted of one byre, one storehouse and presumably two dwelling houses. Hence, there were two households per farmstead (ibid.:9; Näsman 1976a:53; 1989:84). The number of byres probably indicates the number of farms within the settlement (Boessneck & von den Driesch 1979:379).

The dwelling houses had an open central aisle (Näsman 1989:84), a slab threshold, a central hearth, and contained many finds (Edgren & Herschend 1997:9). Among the finds were bone fragments from food waste, pieces of pottery, jewellery, and loom weights. Some looms were marked by postholes in the house floors showing that the loom was placed at a wall. Also, in some storehouses loom weights were found; possibly looms were placed there too (Engström 2015:48, 55). The storehouses had a stone pavement on the ground along their sides (Edgren & Herschend 1997:9). In the byres the division of the boxes along the walls could be seen and there were fewer objects and bone material found (ibid.; Näsman 1989:84). The freestanding house does not stand out regarding its function; it has been interpreted as a combined storage and workshop building (Edgren & Herschend 1997:9).

Besides the hearths inside the houses, a few fireplaces were found outside. One was located at the north square, in the corner of the houses 06 and 012, another was placed in the pavement in front of house Q, and a large one was located in the middle of the central square. In front the houses L and N ash and charcoal were found, but they were probably thrown out of the houses and do not origin from fireplaces in front of the houses (Näsman 1976c:138 f.).

In the literature there is a variation of the assumed number of farmsteads and of the estimated population for Eketorp II: 15 farms with 10–15 people per farmstead and thus a total population of ca. 150–200 people (Boessneck & von den Driesch 1979:379), 13 farms (Fabeck & Näsman 2013:70), 12 farms with ca. 150–200 people in total (Engström 2015:172), 13 farmsteads with 12 people per farm giving a population of ca. 160 people (ibid.:48), about 150 people with households of 7 people each (Olofsson & Josefson 2007:30), 12 farms with averaging 14 people per farm giving a population of ca. 160 people (Edgren & Herschend 1997:9).

Assuming that there were indeed two dwellings (and thus two households) per farmstead and regarding the different possibilities of how many dwelling houses there might have been in Eketorp II, the total population fluctuates between 138–240 people. Assuming that there were 23 dwelling houses the population is between 138–184 people (table II). Based on the averaging number of inhabitants (161 people, when there were 23 dwellings) the population density of Eketorp II was 0.03 people/m².

There are no outstanding structures or buildings within the settlement that would indicate social structuring and/or the presence of a chieftain or magnate. However, it is tentatively assumed

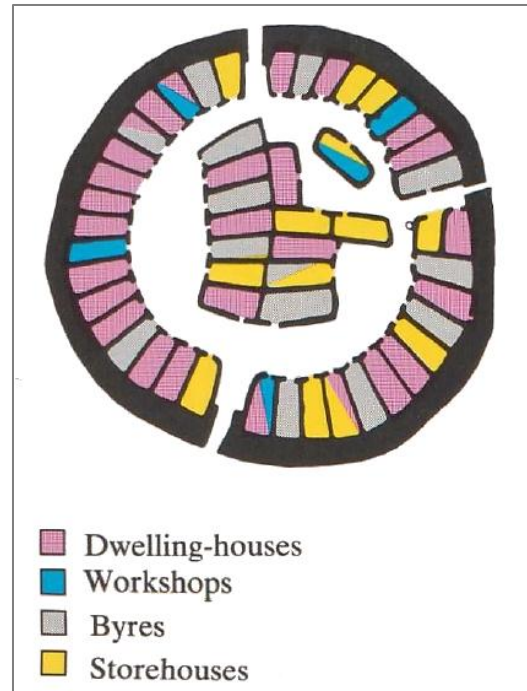


Figure 13: Reconstruction plan of Eketorp II. The coloured buildings represent different functions. After B. Edgren and F. Herschend there were 23 dwelling houses, 12 byres, 12 storehouses, 2 workshops, and 6 houses with combined functions. (Plan by Bengt Edgren & Frands Herschend.)

that three houses in the central block formed a magnate's or chieftain's farmstead (Fabech & Näsman 2013:70).

People per household	23 dwellings	12 farms = 24 dwellings	13 farms = 26 dwellings	15 farms = 30 dwellings
6–8	138–184 people	144–192 people	156–208 people	180–240 people
Averaging 7	161 people	168 people	182 people	210 people

Table II: Calculations of the overall population of the ringfort Eketorp II, in accordance with the number of houses interpreted as dwelling houses. The estimations of the basic number of people per household are taken from the population estimation of the ringfort Eketorp II (see Edgren & Herschend 1997:9; Engström 2015:47 f.).

The building 03 might had been the chieftain's hall. It had a central location, directly at the largest open place in the west of the settlement. Moreover, the building had an outstanding roof construction and was divided into two rooms. In the outer room fragments of weapons and the remains of a large fireplace, which was seemingly not used for food preparation but probably for gatherings, were found. The inner room showed a lot of household pottery. Furthermore, in the house drinking vessels were found and the finds clearly differentiate in their quality from the ones of other dwelling houses inside Eketorp II. Next to the building 03 was placed the largest byre inside the ringfort, building 04 (Engström 2015:77, 196 ff.).

In the western square, north of house 03, a hoard of 15 impressed gold-foil figures (*guldgubbar*) and 5 small gold rods, together with a stone construction were discovered (Fabech & Näsman 2013:70). *Guldgubbar* ordinarily have a cultic and religious context.

The stone construction was initially interpreted as the remains of a deposited stone cist and the *guldgubbar* as an offering. However, in the context with the interpretation of an elite farmstead in the central block, the stone construction could have been the support of an erected stone that was a sanctuary, since a sanctuary was a component of an elite residence (ibid.). If this theory is correct, there were two cult sites at Eketorp II, one inside the ringfort and another at the lake outside the east of the fort where animal bones and hazel rods were found (fig. 14). Maybe the two sites represented different stages in a complex ritual: at the sanctuary the sacrificial animals were slaughtered, the sacrificial meal was prepared and consumed inside the ringfort, and the remains of the sacrifice were deposited in the lake (ibid.:71).

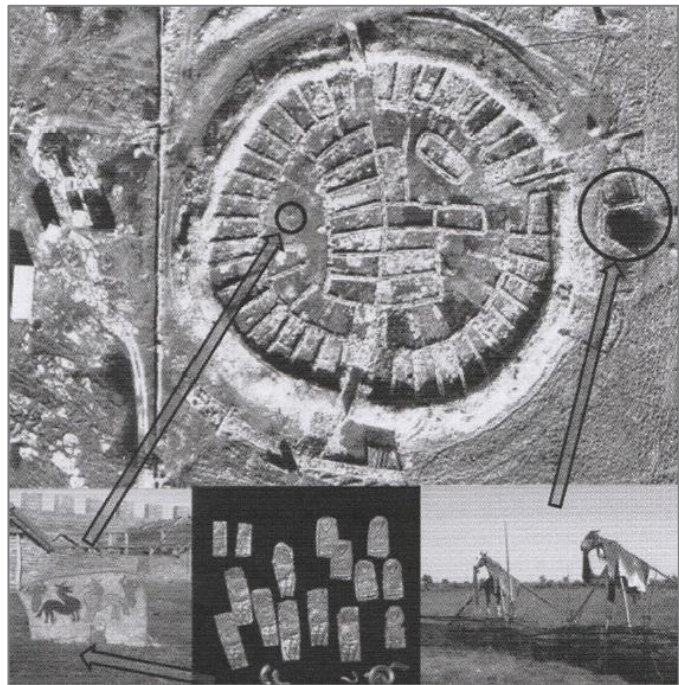


Figure 14: Possibly there were two cult sites at Eketorp II. Up: air photo of the excavations in 1973, showing the ringfort Eketorp II. Bottom left: modern tentative reconstruction of a sanctuary in the western square of the ringfort where the gold-foil figures (image in bottom middle) were found. Bottom right: modern reconstruction of a sacrificial site at the lake outside the east of the ringfort. (Photos by Rune Hedgren, Gunnel Jansson, and Charlotte Fabech.)

The occupation layer of Eketorp II is distinct and contained a lot of artefacts. Especially, the different types of jewellery, animal bones, charcoal and burnt layers inside the houses, as well as ¹⁴C-dating show that Eketorp II was intensively used over a long period, and thus permanently inhabited (Boessneck 1979:7; Edgren & Herschend 1997:7, 11; Näsman 1976a:53).

There are about under 5000 finds from the excavations dating to Eketorp II (see Ammert 2009:7; Holmring 2014:25); not including bone fragments (Boessneck & von den Driesch 1979:409). In the Eketorp II settlement relatively much jewellery, as well as grooming objects, weapon parts like spear- and arrowheads, iron tools, and imported glass vessels were found (see Engström 2015:172, 177, 193 f.; Näsman 1989:85 f.). Generally, the finds from Eketorp II indicate of wealthy inhabitants, from the social upper class (Ammert 2009:7; Edgren & Herschend 1997:11). Moreover, tools and objects for agriculture, wood crafts, metal work, textile crafts, bone and horn workmanship were found (Näsman 1989:85). Furthermore, grains from barley, wheat, oat, rye, and barley malt which is used for beer brewing were found (Engström 2015:192; Näsman 1989:85).

In the final phase of the ringfort Eketorp II, most of the byres, storehouses and workshops were converted into dwelling houses (Engström 2015:195 f.; Näsman 1989:86). It seems that the animals, or at least most of them, were kept at a different place, outside of the ringfort and the settlement inside was used primary as dwelling place. The stratigraphy shows floors of dwelling houses on top of the ones of byres (Herschend & Weber 1971:191). Additionally, some houses interpreted as byres show traces of human habitation. The only byre which was seemingly not transformed into a dwelling was the largest byre (04) inside the ringfort (Engström 2015:195 f.). In this phase, Eketorp II functioned probably as refuge fort. Thus, it appears that in a later phase of the Vendel Period Eketorp II was not permanently inhabited anymore and was used only as refuge (Näsman 1989:86 f.).

After the complete abandonment of Eketorp II the settlement was deliberately destroyed (but not the ring-wall). In the ruins simpler houses were built and a small settlement of an unknown structure existed for a short period; possibly the north gate was blocked during this time (ibid. 1976a:55; Olausson 2009:59).

The ringfort Eketorp II is interpreted as a refuge that was permanently inhabited and functioned as fortified peasant settlement (Näsman 1976a:53 ff.; 1989:86). Consequently, it also entailed the functions of a “densely built village community, i.e. functions of an administrative, economic, social, and religious character” (ibid. 1976c:140). It was important to have all the functions of a farmstead inside the ringfort. Thus, the aim in planning the ringfort was to fit a certain number of farmsteads inside which also included open spaces respectively outdoor areas for the needs of each farmstead, as well as for the common functions of a community (of which the communications are one of the most important functions) (ibid.).

The finds material indicates that the inhabitants of Eketorp II were wealthy peasants living of agriculture and livestock farming (Edgren & Herschend 1997:11; Näsman 1989:86). No traces for a social stratification were discovered, leading to the conclusion that Eketorp II was inhabited by a homogeneous upper class (Edgren & Herschend 1997:11; Engström 2015:192, 225).

U. Näsman considers it possible that the settlement area inside the ringfort was divided into assemblies or plots (Näsman 1976c:145 f., 150). He based this theory on the observation that the construction of the house rows from southeast to northeast was not successive (see ibid.:145 f.) and further on the different construction techniques and stone material used for the houses, which suggest the houses were built individually (ibid. 1989:84). Thus, questioning if the farmsteads were owned by different persons respectively families or households, and if the owners themselves

were responsible for the building of their farm (ibid. 1976c: 150). However, this theory is very uncertain since there is no tangible proof that a system of plot division existed inside the Ölandic ringforts.

3.3 Sandby

The ringfort Sandby is located at the east coast of Öland, ca. 40 m away from the shoreline and ca. 3–4 m above sea level (Stenberger 1966:37; Viberg, et al. 2014:414). Hence, it is closer to the sea than any other Ölandic ringfort (Stenberger 1933:225). In the Roman Iron Age the shoreline was ca. 2 m higher, and thus the eastern part of Sandby's ring-wall was located much closer to the protohistoric shore (Viberg, et al. 2014:414). The ringfort is built on an even plateau which is probably partly artificial (Stenberger 1933:225 f.). From the southwest to the



Figure 15: Sandby ringfort at the east coast of Öland. North is to the left. The structure outside the western area of the ringfort is a special stone structure or defence work. A modern boundary wall runs through the eastern part of the ringfort. (Photo by Daniel Lindskog 2018.)

northwest the ringfort is surrounded by an outer curved stone structure or defence work, consisting of granite boulders sparsely placed in several parallel rows (Dutra Leivas & Victor 2011:17; Stenberger 1933:226). North of this outer defence work is a fresh water source that was opened up in the 1960s (Dutra Leivas & Victor 2011:17). A modern boundary wall, that was built between 1822 and 1933, runs through the eastern part of the ringfort from northeast to southwest (fig. 15) (Viberg, et al. 2014:414).

Sandby ringfort was in use around 400–500 AD; particularly in the second half of the 5th century (Gunnarsson, Victor & Alfsdotter 2016:87 f.). It has a regularly oval shape and is oriented in northwest-southeast direction. According to M. Stenberger its inner diameters are 92 m x 66 m (Stenberger 1966:37), thus the inner area¹⁸ is ca. 4768.94 m². After A. Viberg the inner diameters are ca. 95 m x 64 m and the inner area is ca. 5140 m² (Viberg 2015:523)¹⁹. After I. Dutra Leivas and H. Victor the inner diameters are ca. 95 m x 65 m and the inner area is ca. 5000 m² (Dutra Leivas & Victor 2011:15)²⁰.

The ring-wall is heavily collapsed. In its original state it was higher and thicker towards the inland than to the seaside (Stenberger 1933:225; Victor, Wilhelmsson & Larsson 2012:15). The south-eastern wall base lays ca. 1 m over the ocean's mean water level. At high tide the sea goes almost up to the wall base (Stenberger 1933:225). There were three gates in the ring-wall: one in the north, one probably in the southeast, and one in the west which was presumably the main gate due to the outer defence work in this area (Viberg, et al. 2014:414, 425). The west and the north gates were

¹⁸ Calculated as ellipse, with the long radius 92m÷2 and the short radius 66m÷2.

¹⁹ Calculated as ellipse, with the long radius 95m÷2 and the short radius 64m÷2, it gives an area of ca. 4775.22 m².

²⁰ Calculated as ellipse, with the long radius 95m÷2 and the short radius 65m÷2, it gives an area of ca. 4849.83 m².

facing towards Iron Age settlements, the southeast gate was directed towards the Baltic Sea. Based on Sandby's proximity to the sea and the south-eastern gate being directed towards it, the existence of a harbour is considered possible (Holmring 2014:30; Viberg, et al. 2014:425 f.).

The ringfort's interior was densely built-up (Gunnarsson, Victor & Alfsdotter 2016:88) with houses placed radially along the ring-wall and a house-block as well as a freestanding house were placed in the centre (fig. 16) (Hagberg 1987:178; Victor, Wilhelmsson & Larsson 2012:17). The houses in the centre were separated by a ring-street from the houses along the ring-wall. The ground plan suggests that Sandby did not have multiple phases (Viberg, et al. 2014:425). Since the remaining house foundations lay below ground level in Sandby ringfort, the number of buildings has been previously estimated to about 53 to 54 houses, based on the interpretation of aerial photographs and the data from geophysical surveys. Of these were 37 houses radially placed along the ring-wall and 16 to 17 houses were grouped into a central block including one freestanding house (Fallgren 2009:32; Viberg, et al. 2014:425; Wegraeus 1976:37). The excavation from 2014 showed that there were 16 houses in the central block, and thus a total of 53 houses were inside the ringfort (Victor 2015:98). The houses along the ring-wall were divided into three blocks through the three gates. The north-western block contained 10 houses, the north-eastern block 8 houses, and the south-western block 19 houses (see fig. 16).

M. Stenberger interpreted a pit in the eastern part of the ringfort, ca. 9 m southeast of the freestanding house, as a well (fig. 17) (Stenberger 1933:226;

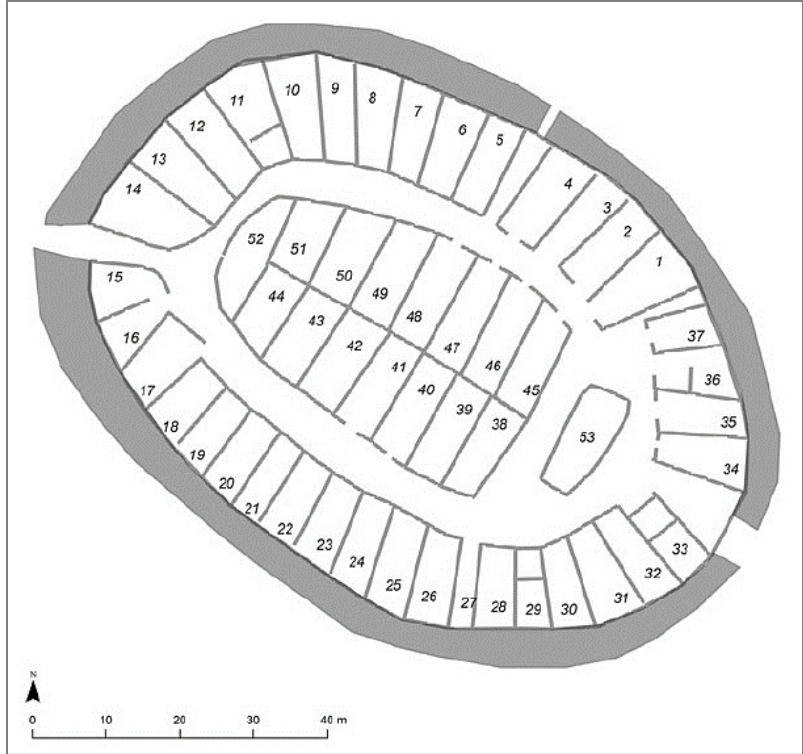


Figure 16: Reconstruction plan of Sandby ringfort with all so far identified house foundations. (Plan by Clara Alfsdotter, Ludvig Pappmehl-Dufay & Helena Victor.)

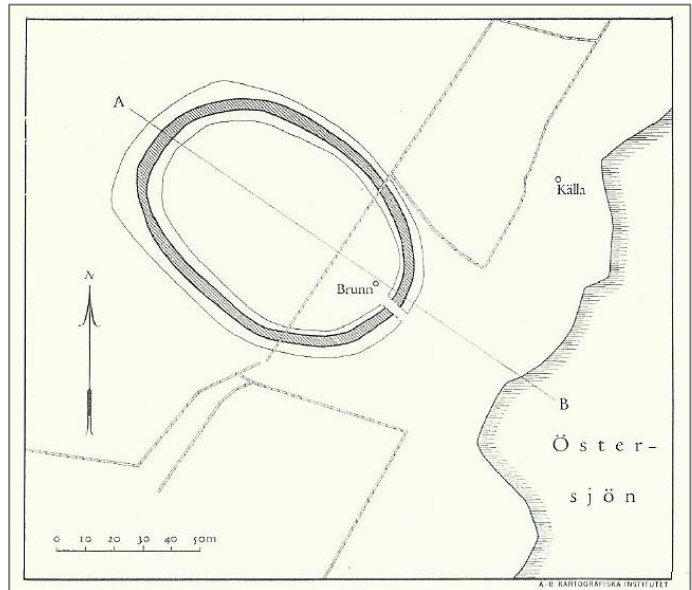


Figure 17: Old plan of Sandby ringfort. The thin lines around the ring-wall describe the extend of the collapsed mass of the ring-wall. In the eastern part of the ringfort is a well depicted. (Plan by Kartografiska institutet.)

Victor, Wilhelmsson & Larsson 2012:15). However, A. Viberg's geophysical surveys do not verify the existence of a well or similar inside the ringfort (Dutra Leivas & Victor 2011:15). Recently L. Pappmehl-Dufay observed a clearly visible pit that seemed to be encircled by a stonewall on aerial photographs taken in the beginning of the extraordinary dry summer in 2018. Possibly this pit could have been indeed the well mentioned by Stenberger (fig. 18). However, at the current state of research the existence of a well remains uncertain. Moreover, Pappmehl-Dufay's reconstruction plan shows a different interpretation of the layout of Sandby ringfort. Notably is the different direction of the central axis of the ringfort's central block, as well as the

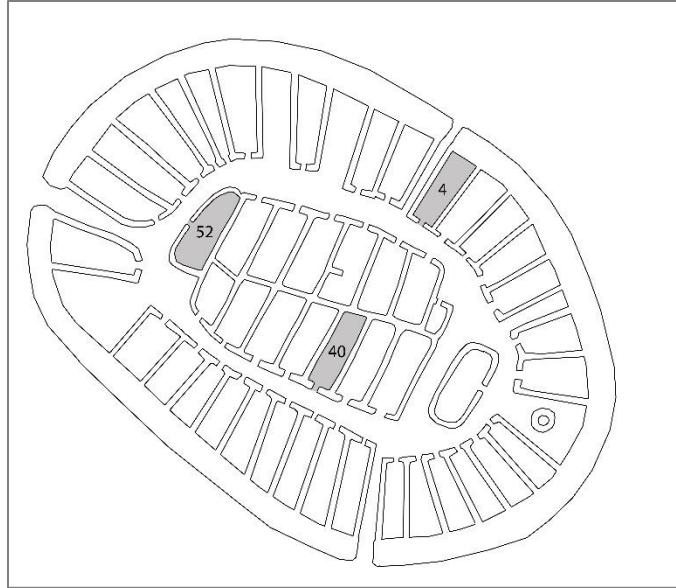


Figure 18: Alternative reconstruction plan of Sandby ringfort. Based on aerial photographs taken in the beginning of the dry summer in 2018. (Plan by Ludvig Pappmehl-Dufay.)

changed position of the southeast gate towards the south compared to the reconstruction plan by C. Alfsdotter, L. Pappmehl-Dufay and H. Victor. Pappmehl-Dufay considers in his interpretation the possibility that the passage of the south-eastern gate could have been a house or a space with a different function instead, e.g. for the well. Additionally, the proximity of the southeast gate to the sea “would have made the ringfort extremely vulnerable to flooding. Even today, during storms the water reaches the perimeter of the ringfort wall” (L. Pappmehl-Dufay 2019, personal communication, 12 June). Hence, Pappmehl-Dufay thought that it would be a flaw to have a gate in the east directly to the sea (ibid.). Furthermore, Pappmehl-Dufay's reconstruction plan depicts 52 houses. However, it seems likely that the large house in the west, which is in figure 16 represented as the houses 16 and 17, actually was two houses and not one.

Both reconstruction plans, the one by Alfsdotter, Pappmehl-Dufay and Victor and the one by Pappmehl-Dufay, contain uncertain elements (ibid.) and should be treated with caution.

Due to the badly preserved houses not all could be measured and many could not be measured accurately. Therefore, the measurements are somewhat imprecise. The houses along the ring-wall and in the central block are on average ca. 13 m long and ca. 5 m wide. Hence, their averaging inner space²¹ was ca. 65 m². The houses in the central block are generally wider than the ones along the ring-wall. The central block seems to have been rebuilt in the course of time (Viberg, et al. 2014:417). The buildings in the central block are joint together and have shared long and inner gable walls. The house walls were ca. 1 m thick and were probably ca. 1.5 m high (Gunnarsson, Victor & Alfsdotter 2016:29 f.). The houses in the south-eastern part of the ringfort seem to be shorter than the others “which may indicate that this section of the fort was built separately” (Viberg, et al. 2014:425), or possibly they were shorter so that the freestanding house and an open square fit there. Some houses might have had inner structures and the interior space of others was possibly divided (houses 41, 49, 51). Some houses (e.g. house 3) show similarity to the box divisions in the byres of the ringfort Eketorp II (ibid.:418 f.).

²¹ Calculated with the given values of the length and the width.

On the basis of the given values regarding the size of the ringfort, of the houses and of the house walls, the approximate size of the built-up space and of the open spaces can be calculated. The built-up area occupied ca. 4548 m² and the open area (consisting of streets and open areas) amounted to ca. 302 m² (Appendix B). Of the interior space 6.23 % were open space and 93.77 % built-up space. It is conspicuous that there was only very little open space inside the ringfort. Apart from the ring-street, the open space was located around the freestanding house. Regarding the traffic or communication routes between the ring-street and the south-eastern gate, the most probable locations of open squares were between the two gable walls of the freestanding house and the central block, and probably also in the empty space between the latter and the detached house (see fig. 16).

Only thin occupation layers were detected in the houses which indicate a short usage period of the ringfort (Gunnarsson, Victor & Alfsdotter 2016:87) after which it was abandoned (Victor, Wilhelmsson & Larsson 2012:6). Six deposits in the central block (inside the houses 40, 43, 44, 50, 52 and 53) dating to the Migration Period were found, most of them containing gilded silver relief brooches, glass beads, finger rings, silver pendants, and other high status artefacts (Alfsdotter, Pappmehl-Dufay & Victor 2018:424; Gunnarsson, Victor & Alfsdotter 2016:13; Viberg, et al. 2014:420; Victor 2015:101). The deposits were situated in the right-hand corner of the entrance, except of the one in the freestanding house (house 53) where the deposition was located along the south-eastern wall (Viberg, et al. 2014:420, 425; see Victor 2014:13, fig. 5). Finds from excavations and metal detector surveys include unburnt animal bones – probably slaughter waste – and little burnt animal bones, Iron Age pottery, iron arrowheads, sword bottom fittings, iron, bronze, silver and gold objects, nails/rivets, glass beads, brooches, knot rings, finger rings, flint for lighting a fire and flint flakes (Alfsdotter, Pappmehl-Dufay & Victor 2018:426; Dutra Leivas & Victor 2011:6, 22 f., 30, 34, 36, 40; Victor, Wilhelmsson & Larsson 2012:23, p. 28, 33; Victor, et al. 2013:22 f., 27, 30, 34 ff.; Victor 2014:22, 39, 41, 47). “A mix of prestigious jewellery and everyday items was discovered in the dwellings” (Alfsdotter & Kjellström 2019:212). So far only two objects have been found with metal detector survey that have a later dating than the Migration Period. One of them was found inside the ringfort and dates into the Vendel Period, the other was found outside the ringfort and dates into the Viking Age (Victor 2014:56). Seemingly, the ringfort was visited in these periods.

Moreover, the excavations have resulted in the discovery of several human skeletons from at least 26 individuals, some showing lethal traumatic injuries. They were in an unusual context and left where they died. The interpretation of the excavating archaeologists is that Sandby ringfort has been the site of a massacre in the late 5th century, after which it was abandoned and not reused (Alfsdotter, Pappmehl-Dufay & Victor 2018:422, 426, 428, 431)²².

Because so far only a little part of the ringfort is excavated, the precise structure and functions of the houses are uncertain. Only three houses are completely excavated: house 4, 40 and 52 (Pappmehl-Dufay 2019:133). In the following, the analysis is focused on a few investigated houses. The freestanding house (house 53) is ca. 14–16 m long, but its width could not be estimated because the modern boundary wall covers the north-western part of the building (Viberg, et al. 2014:416). Inside the house was a fireplace, however, it is assumed that it was used as a source of heat rather than for cooking (Victor 2014:43). Further, burnt and unburnt animal bones, pottery, a glass bead, and rivets were found (ibid.:41). The jewellery deposit, as well as finds of a gold and a silver ring might indicate that the house had a special function, possibly it was some kind of

²² See Alfsdotter, Pappmehl-Dufay & Victor 2018; Alfsdotter & Kjellström 2019; and Victor 2015:115 for more information regarding the massacre and theories about its reason and consequences.

representation building (ibid. 2015:111). However, deposits with high status artefacts were also found in other dwelling houses in Sandby. Thus, it is to assume that their content belonged to the respective people living in the house and consequently that also house 53 might have been a dwelling house. The unusual location at a long wall of the deposit in house 53 possibly could be due to the placement of the entrance in a long wall and not in a gable wall as it was generally the case with the other houses inside the ringfort.

The eastern square, outside of house 53, had a thin cultural layer with seemingly trampled unburned and few burnt animal bones, indicating that waste was thrown on the square outside the house (ibid. 2014:39, 41).

House 40, in the central block, is in total ca. 16 m long and 6.8 m wide (outer measurements). The inner space was ca. 66 m². The house was divided in at least two, possibly three rooms (Gunnarsson, Victor & Alfsdotter 2016:25). The house is unsymmetrical what indicates that a symmetrical layout was not the priority in the construction phase. It was three-aisled (ibid.:29 f.). Inside the house the traces of a hearth probably for food preparation, as well as pottery, animal bones, and loom weights indicating that a loom stood inside the house, were found (ibid.:42, 50, 87). Further, valuable objects such as a Valentinian III solidus (425–455 AD), a treasure depot, glass and silver beads, as well as weapon pieces like an iron spearhead to the left inside the entrance, sword fittings, and iron and other metal objects were discovered (Alfsdotter, Pappmehl-Dufay & Victor 2018:431; Gunnarsson, Kusoffsky & Sellin 2018:14; Victor, et al. 2013:27, 36; Victor 2014:49, 52, 54). Presumably there were fixed constructions along the walls in the middle part of the house that were wall-mounted benches, also used as beds. There are no signs of livestock keeping inside the house (Gunnarsson, Victor & Alfsdotter 2016:42). The house is interpreted as a dwelling house (Victor, et al. 2013:38) that was also to a smaller extent used for handicraft related to iron (Gunnarsson, Victor & Alfsdotter 2016:42). In front of the house was a stone pathway (Gunnarsson, Kusoffsky & Sellin 2018:14).

House 52, at the north-western end of the central block, differs in its construction from the other buildings. Its long wall to the northwest is curved. Further, it is not yet clear how the house ended or extended towards the south (Pappmehl-Dufay, et al. 2016:56, 61). Presumably it was ca. 80 m² large (Victor 2015:110) and thus seemingly larger than the average. In the house were a small amount of animal bones, pottery, glass beads, and two iron arrowheads found, as well as several hearths discovered (Dutra Leivas & Victor 2011:36; Pappmehl-Dufay, et al. 2016:57). Also, a Roman gold coin was found (Pappmehl-Dufay 2019:134). The house is interpreted as dwelling house (Pappmehl-Dufay, et al. 2016:57).

House 4, which is to the right of the northern gate, is 14 m long and 6.8–5.5 m wide on the outside, its interior length is 12 m and width 4–5 m. The house walls are ca. 1 m thick. The north gable was built together with the ring-wall. There was at least one fireplace and one working area in the house (Hedberg 2017:7). Inside the house along the walls there were traces of benches or other fixed constructions found. Finds of a number of glass fragments and glass slag, as well as iron, copper and bronze objects inside the house led to the interpretation that the back part of the house was used as a glass workshop presumably for glass beads and/or metal work. In the south of the house were a lot of animal bones found, thus it might have been used as a waste disposal place. The front part of the house was probably used to prepare food (ibid.:10 f., 21 f.). Furthermore, pottery and clay were found inside the house. The results suggest that there was a spatial division for different activities such as food preparation and handicraft (ibid.:25). In house 4 no distinct high-status objects were found; however, the activities of glass bead making are related to a high-status milieu (Pappmehl-Dufay 2019:135). In other dwelling houses the fixed constructions along the walls,

interpreted as benches, were probably also used as beds. These houses were also spatially divided into different activity or production areas. Hence, it is possible that house 4 was a dwelling house. On the other hand, it is also possible that it was a workshop.

House 3 is in analogy with the byre structures of the ringfort Eketorp II interpreted as a stable (Papmehl-Dufay, et al. 2016:54).

The current interpretation of the settlement layout shows that one house in the ringfort was placed detached from the others (house 53), instead of placing it along the houses of the central block. Moreover, between the central block and the freestanding house there was space to build two more houses (fig. 19), but instead it was chosen to keep these areas open. It appears that it was either of importance to keep precisely these open areas free, or that it was important to have a freestanding house in the ringfort, what might implicate that the freestanding house had a special meaning and function. However, the function of the freestanding house is not certain yet. It might have been some kind of representation building or a dwelling house.

C. Alfsdotter and A. Kjellström write that possibly 200–300 people occupied the ringfort (Alfsdotter & Kjellström 2019:212). Assuming that all 53 houses were dwelling houses, the population number was between 318–424 people. Assuming that, in analogy with the houses of the ringfort Eketorp II²³ (see Näsman 1989:84), not all buildings were used as dwelling houses and that there were just 23 houses used as dwellings, the population number is between 138–184 people (table III).

Based on the averaging number of inhabitants the population density was 0.076 people/m² if all 53 houses were dwellings, or ca. 0.033 people/m² if 23 houses were dwellings.

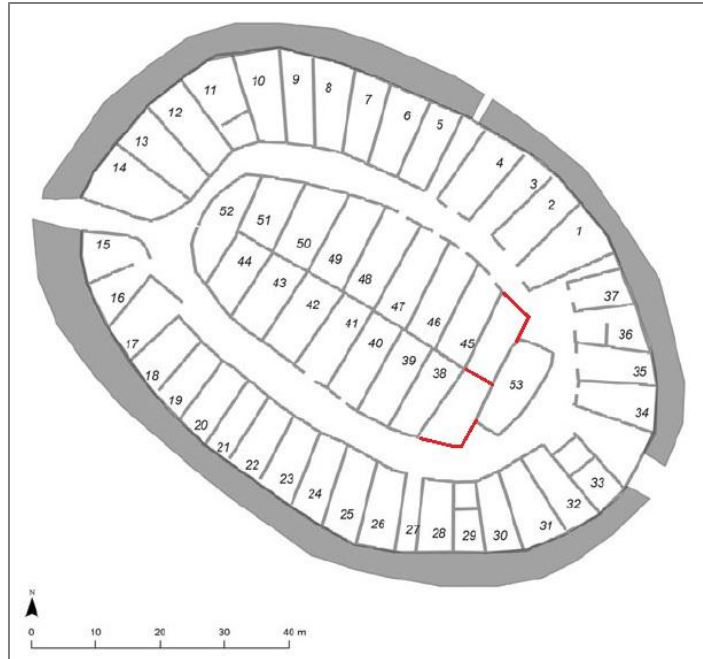


Figure 19: Reconstruction plan of Sandby ringfort. The red lines represent possible houses that additionally could have been built in the open areas. (Plan by Clara Alfsdotter, Ludvig Papmehl-Dufay & Helena Victor. Edited by the author.)

People per household	53 dwellings	23 dwellings*
6–8	318–424 people	138–184 people
Averaging 7	371 people	161 people

* In accordance with the interpreted number of dwelling houses in Eketorp II (see Näsman 1989:84).

Table III: Calculations of the overall population of the ringfort Sandby, in accordance with the number of houses interpreted as dwelling houses. The estimations of the basic number of people per household are taken from the population estimation of the ringfort Eketorp II (see Edgren & Herschend 1997:9; Engström 2015:47 f.).

²³ The parallel to the ringfort Eketorp II is drawn because both Sandby and Eketorp II date approximately into the same period, are classified as medium sized ringforts, and apparently have the same number of houses inside.

The so far obtained archaeological findings suggest that Sandby ringfort was in use for only a short period and did not have several settlement phases (Viberg, et al. 2014:426). Either the ringfort was inhabited for a short time, or it was used for a longer time but was only occupied for short periods (Victor 2015:113). The function of Sandby is yet unclear, but due to its similarities with the ringfort Eketorp II it is considered possible that it was a refuge fort (Viberg, et al. 2014:425). However, until now only a small percentage of the ringfort has been excavated and it is unclear if Sandby was permanently inhabited like the ringfort Eketorp II. The finds material, with many prestigious and high status objects, shows that the inhabitants were wealthy (Gunnarsson, Victor & Alfsson 2016:87; Victor 2015:114 f.) and at least a few inhabitants were aristocratic (Alfsson, Pappmehl-Dufay & Victor 2018:424). Nevertheless, at the current stage of excavation no conclusions about social stratification or homogeneity can be made.

3.4 Ismantorp

The ringfort Ismantorp is located in the centre of Öland (Capelle 2000:535), in the island's largest forest area. Its position makes the ringfort difficult to spot for strangers (Stenberger 1925:360). Ismantorp is built on a dry moraine hillock that is a few meters elevated above a flat landscape (Andrén 2014:71). In the north and the east of the ringfort are remains of shallow marshlands which were probably of greater extent in past times. The location of the fort shows an advantageous use of natural means of defence (Stenberger 1925:360). The distance to the closest settlement is about 1–2 km, in the present and presumably also in the past (Andrén 2014:71).

Ismantorp ringfort dates to ca. 200–650 AD and was primarily used in ca. 300–600 AD²⁴ (ibid. 2006:34; 2014:74 f.). The fort has an irregularly circular shape and a

diameter of 124–127 m (Capelle 2000:535; Stenberger 1933:236). The calculated²⁵ size of its inner area is ca. 12076–12667 m². The ring-wall is well preserved and has 9 gates. The unusual high number of gates is seen problematic as gates are the weakest points in a wall, and hence the ring-wall did not have much of a defensive character or function. The placement of the gates implies that it was not based on a predetermined plan (Stenberger 1925:363 ff.). Their placement shows a

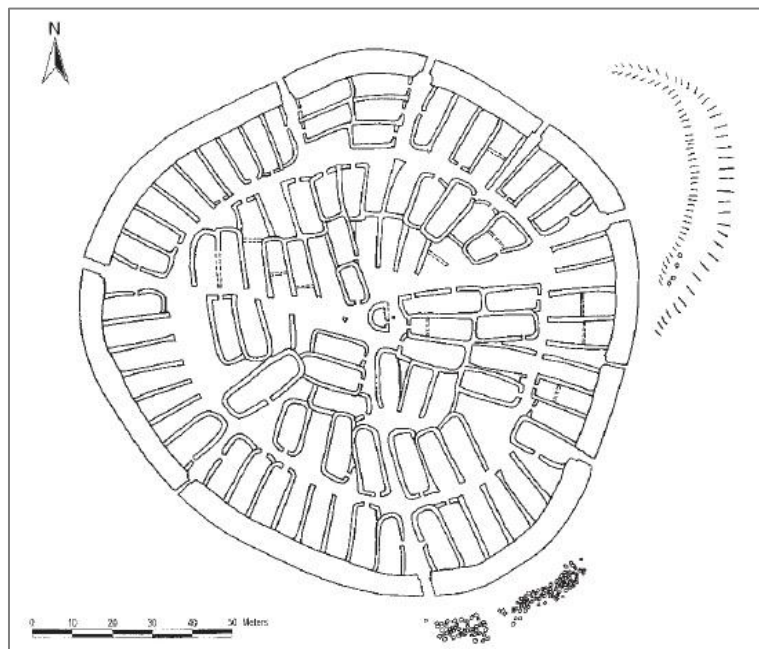


Figure 20: Reconstruction plan of Ismantorp ringfort. The plan is based on digitized aerial photographs. It shows the last phase (designated as second phase) of Ismantorp. The round feature in the fort's centre to the left of the semi-circular structure depicts a large pit. The smaller roundish feature to the right of the semi-circular structure depicts a posthole. The structures outside of two of the gates represent special stone structures or outworks. (Plan by Anders Andrén.)

²⁴ In the 10th to 13th centuries Ismantorp ringfort was reused. It was not fundamentally rebuilt but presumably most gates were blocked and some houses were rebuilt during this period (Andrén 2014:75 f.).

²⁵ Calculated with the given values of the diameter.

concentration in the eastern part of the ringfort. Roughly it can be said that there are 2 gates in the northern part, 4 in about the eastern part, 1 in the south, and 2 in about the western area (fig. 20).

The grounds of Ismantorp rise gently from its periphery towards the ringfort's centre. The height difference from the foot of the ring-wall towards the centre goes up to 2.5 m (ibid. 1933:237).

M. Stenberger's investigations and excavations from the 1920s resulted in the assumption that there were 88 houses placed inside the ringfort, 50 of them placed along the ring-wall and 38 in the fort's centre (fig. 21) (ibid. 1925:366, 368). Further, he interpreted 4 of the 9 gates in the ring-wall as main gates which were orientated after the four cardinal points. He divided the houses in the centre of the ringfort into four quarters through four streets that led from the main gates to the ringfort's centre (ibid. 1933:237 f.).

More recent aerial photos and investigations by A. Andrén resulted in different conclusions.

However, there is a discrepancy with the number of houses in the second phase of the ringfort given by Andrén. He writes that there were in total 95 houses within the ringfort, 49 of them built along the ring-wall and 46 built in the centre (Andrén 2014:71). By contrast, his reconstruction plan depicts a total of 98 houses, of which 49 were built along the ring-wall and 49 built in the centre (fig. 20) (ibid.:75, fig. 23). Further, Andrén interpreted only 3 of the gates as main gates. The other 6 gates are smaller ones without direct connection to the fort's centre (ibid. 2006:33).

The aerial photograph by Metria (fig. 22) on which Andrén's plan is based on (ibid. 2014:72, fig. 21) shows 49 to 50 constructions along the ring-wall, depending whether the construction in the south-eastern part is interpreted as a building (according to Stenberger) or as a

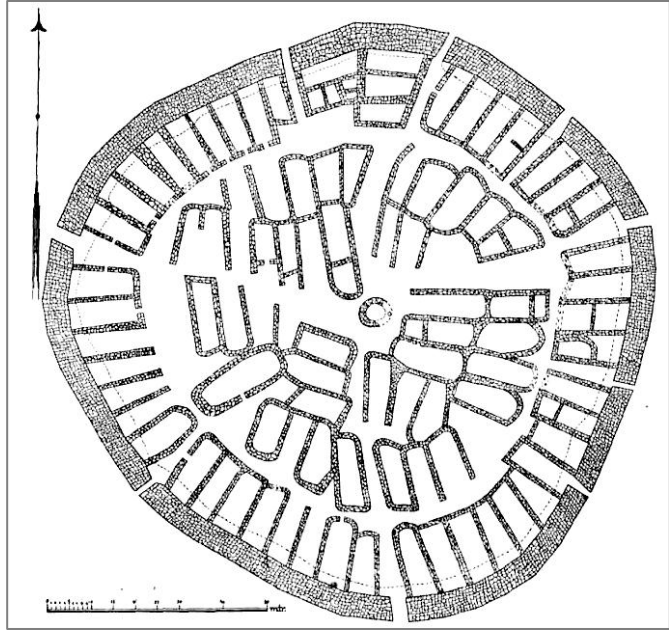


Figure 21: Reconstruction plan of Ismantorp ringfort. The dashed line describes the extend of the collapsed mass of the ring-wall. The house entrances are only marked at places where they were clearly visible (Stenberger 1925:362). (Plan by Mårten Stenberger & Bertil Frostenson.)



Figure 22: Aerial photograph of the ringfort Ismantorp. (Photo by Metria.)

small street (according to Andrén), and possibly 49 constructions in the centre that can be interpreted as houses.

Outside of the eastern and the southern main gates there are special stone structures or possible outworks (Andrén 2006:33). The structure in front of the eastern gate consists of a long rampart and the structure in front of the southern gate consist of a “zone with closely placed granite boulders” (ibid.). Moreover, P. Gustavsson describes a much smaller, probably artificial stone structure in front of the western main gate, which can hardly be seen above the ground (Gustavsson 2014:20). The location of these stone structures in front of the three main gates raises the question if their function was to direct, influence and slow down possible traffic (meaning people, carts and maybe animal flocks)? Or if their main purpose was to give the main gates some degree of protection, so that the three streets leading directly from the outside into the centre of the ringfort were not that exposed?

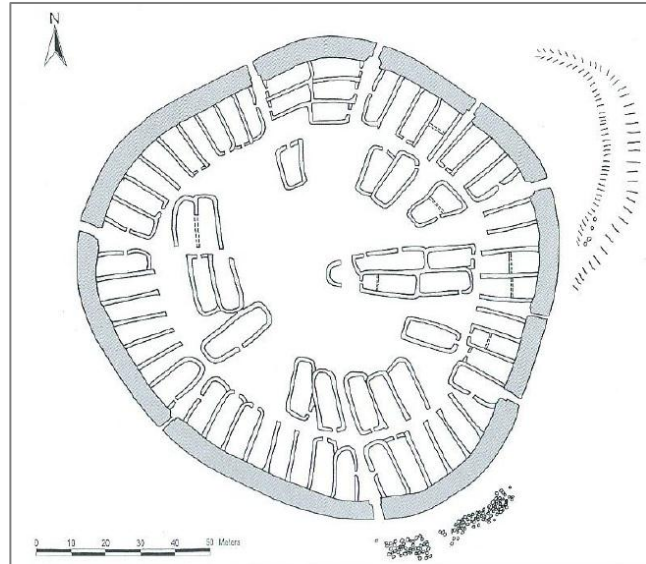


Figure 23: Reconstruction plan of the assumed first phase of Ismantorp ringfort. (Plan by Anders Andrén.)

The joints of the house foundations indicate that the houses were built in different stages. Ismantorp ringfort had at least two main settlement or building phases. However, these two building phases cannot be absolutely dated. In a first phase, 49 houses were placed along the ring-wall, five of them parallel to the wall, the others radially from it (Andrén 2014:71). The houses were built simultaneously with the ring-wall because their rearward gables are integrated into the wall course (Capelle 2000:535). Additionally, 20 houses, including one freestanding semi-circular house, were placed in the centre (fig. 23). However, it is unknown whether the 20 houses in the centre were built simultaneously with the houses along the ring-wall, or if the centre was left open for a certain period of time.

The houses in the centre of the first settlement phase can be divided into nine groups based on joint or touching house walls, excluding the exceptional semi-circular house in the centre from this grouping. Most of the ringfort's centre was made up of a large open area.

In a second phase, 26 houses (or 29 houses according to Andrén's plan) were irregularly added into the centre, thereby creating three blocks, excluding the semi-circular house. In total, 46 houses (or 49 houses according to Andrén's plan) were placed in the centre. These house-blocks were separated from the houses along the ring-wall by a ring-street and between each block by a street leading from the ring-street to the centre of the fort (Andrén 2014:71 f.). According to Andrén's plan the north block in the centre contained 23 houses, the southeast block 13 houses, and the southwest block 12 houses (fig. 20). The ring-street is on average between 2–5 m wide. It is connected with the 9 gates through minor intersection roads (Stenberger 1925:366).

The 95 houses (or 98 houses according to Andrén's plan) were built in 12 blocks: the 3 blocks in the centre and 9 blocks along the ring-wall separated by the 9 gates and the small gate-streets (Andrén 2006:33). According to Andrén's plan the blocks along the ring-wall, starting with the one in the north and proceeding clockwise, contained 5, 4, 3, 4, 4, 5, 8, 7, and 9 houses (see fig. 20). The centre of the ringfort (in its latest phase) consisted of a small open area with a

rudimentarily triangular shape (ibid. 2014:69, 71). In the eastern part of this area is the semi-circular house located. Between this house and the eastern house-block, a posthole with stones scattered around it was discovered, showing that the posthole was lined with stones and indicating there once stood a big post (ibid.:73).

There is a difference in the design and arrangement of the houses in the centre and the ones along the ring-wall. The houses along the ring-wall are constructed in strict symmetry following an apparently predetermined plan (Stenberger 1966:14 f.). They are built diligent and are in meticulous conjunction with each other (ibid. 1933:241). The houses in the centre appear to be disordered (ibid.:241; 1966:15), as if they have outgrown of each other depending on the circumstances and the need for new houses (ibid. 1933:241). Additionally, their wall sides are often unsymmetrically shaped (ibid. 1925:368). According to Stenberger's observations several houses in the centre appear to be incomplete, which is why he presumes that the houses in the central area are younger than the ones along the ring-wall (ibid. 1966:15).



Figure 24: Aerial photograph of the ringfort Ismantorp. The red lines represent possible houses that could have been built in the areas that were seemingly left open, and that could have additionally been built if the central house-blocks were better organised. (Photo by Metria. Edited by the author.)

Based on the analysis of the arrangement of the houses and the street network after Andrén's plan, it seems possible that in the northern part, where the five houses are placed parallel to the ring-wall, there could have been space for a third house in the row with only two buildings that are parallel to the ring-wall. In the southeast house-block of the fort's centre there would have been space for another house, and if the southwest house-block of the centre would have been arranged in a more structured way, there would have been space for at least one or two additional houses (fig. 24). Hence, it appears that either building as many houses inside the ringfort as possible was not a priority and houses were built when and where needed, or it was important to have some open areas, or that there was no time to plan a well-structured layout when the centre was built-up and the houses were rapidly and haphazardly constructed. When comparing the arrangement of the central blocks to one another, it occurs that the northern block is better organised than the others and the south-eastern one is the most haphazardly arranged one. Regardless of the possible reasons behind the unorganised construction of the central houses, it appears that some places might have been kept unoccupied intentionally, forming open spaces. Moreover, it occurs that a well-connected street network was of importance; linking all the gates with the circular main street that ran along the houses at the ring-wall and the ones in the centre, as well as connecting the main

street with the open places in the centre of the ringfort. At some places the streets are very narrow and possible traffic was certainly slowed down in these areas. The narrowest parts are in the south-street between the southeast and the southwest central houses-blocks towards the centre and in the west-street between the southwest and the north central houses-blocks towards the centre, where the streets are only about 1.25 m wide²⁶. In the ringfort there are several areas left open, which are concentrated in the middle and the southern part of the ringfort (fig. 25). There were at least about six open areas of differing sizes that could have been used for public occasions and social activities. Additionally, there might have been three more open areas with public functions. Another open space was directly in front of the entrance side of a house; hence it might have had a function connected to that house.

The houses were long and narrow (Stenberger 1966:11). The houses along the ring-wall are on average 12–14 m long and have an inner width of 4–6 m. The largest foundation has an outer length of 17 m, the smallest one has an outer length of 11.5 m (ibid. 1933:238). The walls of the houses along the ring-wall are between 1–1.1 m and in some places only 80 cm thick (ibid. 1925:367). The width of the houses in the centre varies between normally 5–6 m and 9 m. The largest foundation has an outer length of 23 m, the smallest one has an outer length of 13.5 m (ibid. 1933:239). The walls of the houses in the centre are between 80 cm to 2.3 m (ibid.:238) or 2.5 m (ibid. 1925:369) thick. The outer maximal diameter of the semi-circular house is 6 m and the inner diameter is 3.5 m (ibid. 1966:14)²⁷. The general averaging thickness of the house walls is 1–1.5 m (Capelle 2000:535). Most houses have a one room layout, but a few houses are divided into two rooms through a cross wall, whereby the exterior room is usually smaller than the interior room. (Stenberger 1925:367, 369; 1933:238). The entrance is usually placed in a small face (Capelle 2000:535) respectively the gavel side

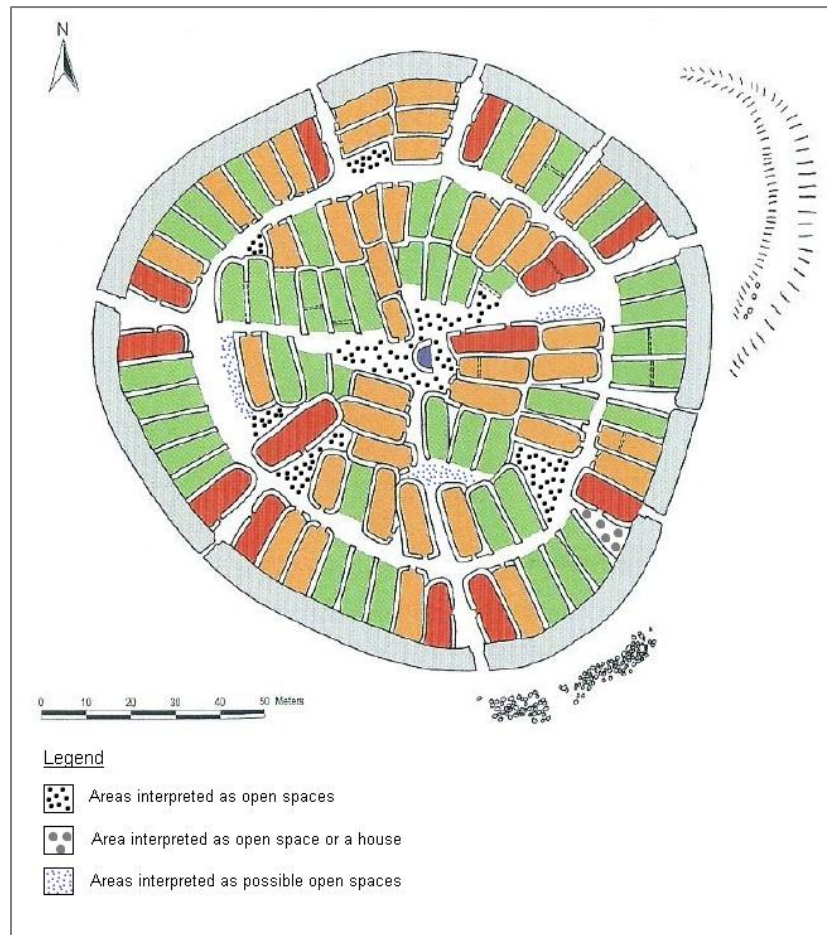


Figure 25: Reconstruction plan of the assumed second phase of Ismantorp ringfort. The coloured buildings show different categories of functions. The with dots marked areas show possible open spaces. (Plan by Anders Andrén. Edited by the author.)

²⁶ According to measurements taken from Andrén's plan (Andrén 2014:75, fig. 23).

²⁷ Capelle (2000:536) and Stenberger (1966:14) interpreted the semi-circular construction in the center as a probable stone circle with an unknown function. According to Andrén (2014:71, 73) this structure is a semi-circular house.

(Stenberger 1966:13). The corners of the house foundations are in general square angled but can also be rounded, both on the outside and the inside (ibid. 1933:238). The houses located on either side of the gate-streets, which also differ from the other houses by having the entrance on the long walls, as well as some houses in the centre have rounded corners (ibid. 1925:367 f.).

On the basis of the given values regarding the size of the ringfort, of the houses and of the house walls, the average size of the interior space of the houses, the approximate size of the built-up space and of the open spaces can be calculated. In the first phase, the built-up area occupied ca. 6383.64 m² and the open area (consisting of streets and open areas) was between 5692.4–6283.4 m² large. In the second phase, according to the number of houses that A. Andrén states in the text, the built-up area occupied ca. 8719.64 m² and the open area was between 3356.4–3947.4 m² large. According to the number of houses that Andrén has illustrated in his reconstruction plan, in the second phase of Ismantorp the built-up area occupied ca. 8899.64 m² and the open area was between 3176.4–3767.4 m² large (Appendix C). In the first phase of Ismantorp 48.4 % of the interior space were open space and 51.6 % built-up space. In the second phase about 29.52 % were open space and 70.48 % were built-up space, according to the number of houses given in Andrén's text; or 28.06 % were open space and 71.94 % were built-up space, according to the number of houses depicted in Andrén's reconstruction plan.

The average inner space of the houses is between 48–84 m². The inner space of the semi-circular house is ca. 4.8 m² which is a fairly small area to live in (Appendix C). It seems reasonable that this house might have had a special function.

On the basis of the central freestanding location of the semi-circular house and its elevated position above the ringfort's houses, as well as its unique shape, Stenberger assumed that it had a religious or cultic function and might have been a temple or another kind of cult-building for ritual purposes (Stenberger 1925:370). Andrén interpreted the semi-circular house in a mythological context, according to Old Norse mythology, as the house of a *vǫlva*, that is a seeress or female shaman. This *vǫlva* possibly accompanied warriors staying at Ismantorp ringfort (Andrén 2014:111).

The semi-circular house had been partially destroyed. Andrén considers it possible that “the destruction was deliberate, since all other houses are well preserved” (ibid.:73). Towards the middle of the semi-circular house, a small pit was excavated which contained a deposited arrowhead that is typologically dated to the 5th or 6th century (ibid. 2006:33; 2014:73).

Test trenches from the central parts of ten houses (including the semi-circular house) and seven smaller trenches dug in the open areas between houses contained some charcoal, a few sherds of Iron Age pottery, some pieces of iron slag, and small pieces of burnt animal bones. In the middle of the triangular open area in the fort's centre, a large pit was discovered which contained earth, charcoal, and unburnt cattle bones. Alongside the pit was a fireplace and next to the fireplace was the bow of an iron fibula found which dates into the period from the middle of the 4th to the end of the 5th century. Close to the large pit was a small pit with a deposited lancehead that is typologically dated to the 6th century (ibid. 2014:73).

Andrén interpreted the “two partly destroyed weapons, deliberately deposited in small pits [...] [as] small-scale weapon deposits” (ibid.:74). In this context it would be interesting to see if further excavations in the centre would reveal more small-scale weapon deposits.

According to Andrén there was a small smithy located in Ismantorp in a later period (ibid.:75 f.). The excavations of a few houses in the southern part of Ismantorp in 1925, did not reveal any occupation layers and revealed only some shallow fire pits placed in the middle of the houses

(Stenberger 1933:239). Furthermore, a small leaf-shaped arrowhead of flint with a pinched off base was found during the excavations in 1925 (ibid.:239). This type of arrowhead is typical for the Late Neolithic (ca. 2400–1800 BC) (Blomqvist 1989:72). Also, in even earlier excavations only scattered animal bones and some charcoal pieces were found (Andrén 2006:33). A very worn-out Arabic silver coin was found in Ismantorp ringfort in 1830, indicating that the fort was still used, reused or at least visited in the Viking Age (Stenberger 1933:239).

On the basis of the few finds, the function of the houses could not be determined. However, the houses can be classified into different categories based on their construction and “differences in building methods, which are also known from the historical settlement on the island” (Andrén 2014:72). Andrén divided the houses of the second phase of the ringfort into four categories, according to the interpretation of different functions of the houses (fig. 26). “The different types of houses can be found in all parts of the fort” (ibid.:73) and they were not grouped in a certain area according to function (ibid.:112). The different categories are:

- a) houses with gable foundations and gable doorways, interpreted as dwellings and workshops (marked in his plan with orange),
- b) houses with gable foundations and an entrance on the long side of the house, interpreted as houses with special functions, most of these houses flank the gates maybe as some kind of gatehouse (marked in his plan with red),
- c) houses without gable foundations, interpreted as stables/byres/barns or stores (marked in his plan with green),
- d) and the unique semi-circular house in the centre of the ringfort (marked in his plan with purple) (ibid.:75).

However, here again is a discrepancy regarding the number of houses in the different categories with what Andrén writes and what he has depicted in his plan (table IV). Presumably, in the text he summarised the houses with gable foundations into one group, counting 55 houses. Of the houses without gable foundations he counts 39 houses in the text (ibid.:72 f.). Additionally, there is the one semi-circular house (ibid.:71). According to his plan, there are 39 houses with gable

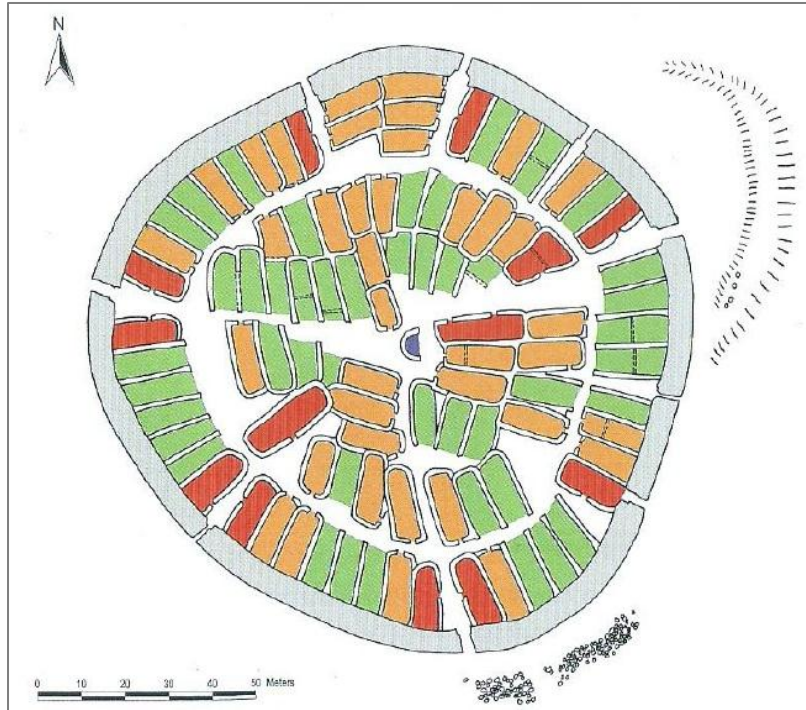


Figure 26: Reconstruction plan of the assumed second phase of Ismantorp ringfort, showing the different categories of functions of the buildings. The different colours represent the presumed functions of the houses. Orange: houses with gable foundations and gable doorways, interpreted as dwellings and workshops. Red: houses with an entrance on the long side of the house, interpreted as houses with special functions. Green: houses without gable foundations, interpreted as stables, byres, barns, or stores. Purple: the semi-circular house in the centre of Ismantorp. (Plan by Anders Andrén.)

foundations and gable doorways (*orange*), 13 houses with gable foundations and an entrance on the long side of the house (*red*), 45 houses without gable foundations (*green*), and the 1 semi-circular house (*purple*) (ibid.:75, fig. 23).

	In text (Andrén 2014:71 ff.)	In plan (Andrén 2014:75, fig. 23)		
House categories	Houses in total	Along ring-wall	In centre	<i>Houses in total</i>
Orange	55 (<i>maybe including 13 red houses; without these houses: 42</i>)*	17	22	39
Red	–	10	3	13
Green	39	22	23	45
Purple	1	0	1	1
<i>Total</i>	95	49	49	98

*According to Andrén's plan there were 13 red marked houses, meaning houses with gables and a doorway on the long side of the house. It might be that in the text, he included the red marked houses in the orange marked houses, meaning houses with gable foundations and gable doorways. When those 13 red marked houses are subtracted from the orange marked houses, there are 42 orange marked houses.

Table IV: Discrepancy in the number of houses sorted into the different categories of the presumed functions. Second phase of Ismantorp ringfort.

When the assumed functions of the houses in the second phase of Ismantorp are assigned to the respective houses of the first phase, there are 28 houses with gable foundations and gable doorways which could have been used as dwellings and workshops (*orange*), 13 houses with gable foundations and an entrance on the long side of the house that are interpreted as houses with special functions (*red*), 27 houses that do not have gable foundations and are interpreted as stables, byres, barns, or stores (*green*), and the 1 semi-circular house in the central area of the ringfort (*purple*) (table V).

House categories	Houses along ring-wall	Houses in centre	<i>Houses in total</i>
Orange	17	11	28
Red	10	3	13
Green	22	5	27
Purple	0	1	1
<i>Total</i>	49	20	69

Table V: Number of houses in the different categories of the interpreted house functions. First phase of Ismantorp ringfort.

Comparing the first and the second phase of Ismantorp according to Andrén's plans (Andrén 2014:74, fig. 22, 75, fig. 23) with each other, it shows that – besides the houses along the ring-wall being built in the first phase – the special semi-circular house (*purple*) and all the houses with gable foundations and an entrance on the long side of the house, which are interpreted to have had

special functions (*red*), in the centre were already built in the first phase of the ringfort. Moreover, there were slightly more dwelling and workshop houses (*orange*) in the first phase. In the second phase stables/byres/barns and storehouses (*green*) were predominant among the houses within the ringfort. This leads to the assumption that houses with special functions, like the ones with gable foundations and an entrance on the long side of the house and the semi-circular house, were not co-dependent on the number of people occupying the ringfort. On the contrary, it seems that the number of stables/byres/barns and storehouses was interrelated with the number of people occupying the fort: the more occupants, the higher was the need for stables/byres/barns and stores.

Assumed that all houses with gable foundations and gable doorways were dwelling houses, in the latest phase of the ringfort there was space for 252–336 people according to Andrén’s text, or for 234–312 people according to Andrén’s plan. If the houses with gable foundations and an entrance on the long side of the house are also interpreted as possible dwelling houses, in the latest phase of the ringfort there was space for 330–440 people according to the text, or for 312–416 people according to the plan (table VI). Accordingly, the overall population is on average between 294–385 or 273–364 individuals.

	In text (Andrén 2014:71 ff.)		In plan (Andrén 2014:75, fig. 23)	
People per household	42 dwellings	55* dwellings	39 dwellings	52* dwellings
6–8	252–336 people	330–440 people	234–312 people	312–416 people
Averaging 7	294 people	385 people	273 people	364 people

*Including the 13 houses with gable foundations and an entrance on the long side of the house.

Table VI: Calculations of the overall population of the second phase of Ismantorp ringfort, in accordance with the number of houses interpreted as dwelling houses. The estimations of the basic number of people per household are taken from the population estimation of the ringfort Eketorp II (see Edgren & Herschend 1997:9; Engström 2015:47 f.).

When the assumed functions of the houses of the second phase of Ismantorp are assigned to the respective houses existing in the first phase (according to Andrén’s plan), in the first phase there was space for 168–224 people in the ringfort, presumed that all houses with gable foundations and gable doorways were dwelling houses. If the houses with gable foundations and an entrance on the long side of the house are also interpreted as possible dwelling houses, there was space for 246–328 people in the ringfort in its first phase (table VII).

People per household	28 dwellings	41* dwellings
6–8	168–224 people	246–328 people
Averaging 7	196 people	287 people

*Including the 13 houses with gable foundations and an entrance on the long side of the house.

Table VII: Calculations of the overall population of the first phase of Ismantorp ringfort, in accordance with the number of houses interpreted as dwelling houses. The estimations of the basic number of people per household are taken from the population estimation of the ringfort Eketorp II (see Edgren & Herschend 1997:9; Engström 2015:47 f.).

Based on the averaging number of inhabitants and the averaging size of interior space within the ringfort (12371.5 m²) the population density of Ismantorp’s first phase was ca. 0.016 people/m²

(with a population of 196 individuals) or 0.023 people/m² (with a population of 287 individuals). In the second phase the population density was ca. 0.031 people/m² when assuming that there were 55 dwelling houses (and thus a population of 385 individuals).

However, regarding Andrén's interpretation of Ismantorp as army camp (Andrén 2014:112, 115) and his assumption that some of the buildings "must have been intended for the followers, who may have included women" (ibid.)²⁸, it is questionable if the estimations of households apply also for Ismantorp, or if the warriors were accommodated separated from their followers. If the latter applies, it is possible that more people shared a house than the estimated number of an Iron Age household.

The absence of occupation layers inside and outside the ring-wall indicates that Ismantorp ringfort was never permanently inhabited (ibid.:71) and the fort was only used at times (Hagberg 2002:594). The function of Ismantorp is unclear, but it was probably a meeting place for a large crowd of people. Capelle takes the view that Ismantorp was never solely used as fortification (Capelle 2000:536). Stenberger interpreted Ismantorp as refuge in times of unrest, but above that he suggested that it could have been a central ritual site, with religious ceremonies being performed probably in the centre and in connection to the semi-circular house (Stenberger 1933:243) which might have been a temple or a cult-building (ibid. 1925:370). Moreover, he considers the possibility that Ismantorp was intended as trading place, in conjunction with a ritual function. It is however questionable where ceremonies or gatherings might have taken place inside the ringfort after the central area had been built-up (ibid. 1966:17, 51). Andrén does not support Stenberger's interpretation of Ismantorp as a refuge or central cultic site (Andrén 2014:70). No traces of large-scale cult and/or rituals have been found in Ismantorp's centre. However, the large pit in the centre, the semi-circular house and the posthole, as well as the deposited arrowhead and lancehead might originate from a ritual context (ibid. 2006:33, 36; 2014:112), e.g. from "foundation rituals of the fort, initiations of warriors and some kind of 'war shamanism'" (ibid. 2006:36) and "divinations before campaigns" (ibid. 2014:112). Consequently, Andrén ascribes Ismantorp martial functions, such as recruiting and training warriors, bonding ceremonies (feasting and drinking), assembly place for organising campaigns towards other districts, as defence base, "for recurrent plundering raids and ritualized wars" (ibid.), for gathering and division of livestock, horses and slaves from raids (ibid.). Furthermore, Andrén considers possible that the layout of Ismantorp could have been based on a cosmological context. He is of the opinion that Ismantorp's design is influenced by Roman concepts of town and camp building, whereby their layout and construction were influenced by the Roman cosmology. These Roman concepts were transformed to the local Old Norse cosmology and mythology (ibid. 2006:36). Hence, Andrén determines that "Ismantorp was neither a place of passive refuge nor a central ritual site. Instead, it functioned as an occasionally used army camp inscribed with a cosmological meaning" (ibid. 2014:115).

In this cosmological context, Andrén interpreted Ismantorp ringfort itself to represent the Earth or the human world *Mitgard*. In the Old Norse mythology it is also said that *Mitgard* was a fortress. According to Roman tradition, the large pit in the centre was the geometrical centre of the fort, from which the fort was laid out. In Ismantorp the pit might possibly be associated with *Urd's* well, the well of fate, which "was located in the middle of the world beside the world tree" (ibid.:111). The post in the centre is interpreted as a representation of the world-tree *Yggdrasil* which is the centre of the world. The world-tree was surrounded by nine different worlds. In Ismantorp this is depicted by the nine gates – each of them symbolizing a gate into one of the nine worlds. The small gate in the southeast of the ringfort that was connected to a house (with the

²⁸ Referring to the women and other people who were not warriors.

doorway on a long wall) might be interpreted as a *Helvegr*, a “special road used only to carry people to the grave” (ibid.:110) and hence as a way to the world of the dead, either *Hel* or *Valhall* which both surrounded the world-tree. The semi-circular building might have symbolised the house of the *Norns* which was placed next to the world-tree. In Ismantorp it might have been the house of a *völva* (ibid. 2006:36; 2014:105, 110 f.).

4. Results and Discussion

The results of the analysis are listed in table VIII and are discussed in the following.

The three analysed ringforts may appear similar at first glance. They have a somewhat roundish shape, the area inside along the ring-wall was built-up with usually radially placed houses which had shared long walls, in a later phase of the ringforts also the centre was built-up with at least one block of houses, in each of these ringforts was a freestanding house, and a circular street ran between the houses in the centre and the ones along the ring-wall. Moreover, some untilled areas are visible. The houses within the investigated ringforts generally functioned as dwelling, byre, storage, or workshop houses. The ringforts were inhabited but the duration, extent, reasons and purpose of the occupation differed.

When analysing the ringforts in greater detail, more similarities but also their differences become apparent. The ringforts Eketorp²⁹ and Ismantorp have an irregularly round shape but Sandby has an oval shape. Eketorp II and the known phase of Sandby ringfort have each three gates but Ismantorp has nine gates, and hence the houses along the ring-wall are divided into more blocks in Ismantorp than in the other ringforts. Ismantorp and Sandby had an outer defence construction of boulders in front of their main gate respectively main gates (as it is the case with Ismantorp). It seems that Eketorp II is the only one of the three ringforts where water supply was ensured inside and outside of the ring-wall (by means of a well and a waterfilled depression), the water supply of the other ringforts was located outside their ring-wall. Hence, when planning the layout of the ringfort settlements an interior water source did not need to be taken into account, except of ringfort Eketorp II. However, Eketorp II was permanently inhabited in contrast to the other ringforts and thus an inner water supply was important. The other ringforts were probably used occasionally. Eketorp I and assumingly Sandby were used a refuge. It is possible that Eketorp I was also used as a meeting and market place due to its large open centre. Ismantorp was assumingly used occasionally too, but probably it was primarily used as an army camp and possibly as a meeting place for other affairs as well. The interpretation of Ismantorp as army camp and since it dates back as early as ca. 200 AD, it is likely that the ringfort was built in connection to the new forms of large-scale warfare – when hostile chiefdoms set out on military campaigns against each other – and the more centralised military organisation that arose around 200 AD.

Furthermore, the ringforts differ in the size of their interior space. Apart from Eketorp I with ca. 2670 m², Sandby was the smallest ringfort with ca. 4850 m², followed by Eketorp II with ca. 5280 m². Eketorp II was just a little less than twice the size of Eketorp I. Ismantorp was more than twice the size of Eketorp II or Sandby, being ca. 12076–12667 m² large and averaging ca. 12371.5 m² (fig. 27). Nevertheless, Eketorp II and Sandby had the same number of 53 houses. Ismantorp had in its latest phase 95 or 98 houses³⁰ inside which is less than twice the number of houses in Eketorp II or Sandby. In its first phase there were 69 houses inside Ismantorp ringfort.

²⁹ It is talked about the ringfort Eketorp generally when it applies for both Eketorp I and II.

³⁰ The two different numbers are due to the discrepancy with the number of houses inside the ringfort Ismantorp given by A. Andrén in his text (a total of 95 houses) and the number of houses depicted in his reconstruction plan (a

Ringfort	Eketorp I	Eketorp II	Sandby	Ismantorp
Period	300–400 AD	400–650/700 AD	ca. 400–500 AD	ca. 200–650 AD (primary 300–600 AD)
Assumed function	refuge fort, meeting place, maybe for markets	fortified hamlet, permanently inhabited	possibly a refuge fort	meeting place, occasionally used army camp
Shape	circular	circular	oval	circular
Interior size	ca. 2670 m ² ∅ ca. 55–60 m /~57 m	ca. 5280 m ² ∅ ca. 80 m	ca. 4850 m ² ∅ 95 m x 65 m	ca. 12076–12667 m ² / ~12371.5 m ² ∅ 124–127 m
Size of open space	ca. 1134 m ² ∅ ca. 35–40 m /~38 m	ca. 1620 m ²	ca. 302 m ²	ca. 5692.4–6283.4 m ² / ~ 5987.9 m ² in 1. phase ca. 3356.4–3947.4 ³¹ m ² / ~3651.9 m ² or 3176.4–3767.4 ³² m ² / ~ 3471.9 m ² in 2. phase
Size of built-up space	1536 m ²	3660 m ²	ca. 4548 m ²	ca. 6383.6 m ² in 1. phase ca. 8719.6 ³³ m ² or 8899.6 ³⁴ m ² in 2. phase
Proportions of open and built-up space	42.47 % open 57.53 % built-up	30.68 % open 69.32 % built-up	6.23 % open 93.77 % built-up	48.4 % open and 51.6 % built-up in 1. phase 29.52 % open and 70.48 % built-up or 28.06 % open and 71.94 % built- up in 2. phase
Number of gates	1, maybe 2	3	3	9
Access to drinking water	waterfilled depression outside ringfort	waterfilled depression outside and in an early stadium also inside the ringfort, later a well inside the ringfort		marshland outside the ringfort
Arrangement and positioning of houses	- radially joined along the ring-wall	- radially joined along the ring-wall, 2 houses parallel to it	- radially joined houses along the ring-wall	- radially joined along the ring-wall, 5 parallel to it - 3 blocks of houses and 1 freestanding

total of 98 houses). The first given number corresponds to the number of houses given in Andrén's text and the second corresponds to number of houses depicted in Andrén's plan.

³¹ Calculated according to the number of houses given in Andrén's text (Andrén 2014:71 f.).

³² Calculated according to the number of houses depicted in Andrén's reconstruction plan (Andrén 2014:75, fig. 23).

³³ Calculated according to the number of houses given in Andrén's text (Andrén 2014:71 f.).

³⁴ Calculated according to the number of houses depicted in Andrén's reconstruction plan (Andrén 2014:75, fig. 23).

		- 1 block of houses and 1 freestanding house in the centre	- 1 block of houses and 1 freestanding house in the centre	semi-circular house in the centre
Number of houses in total	20 in 1. phase 20–21 in 2. phase	53	53	69 in 1. phase 95 ³⁵ or 98 ³⁶ in 2. phase
Number of houses along ring-wall	20 in 1. phase 20–21 in 2. phase	39	37	49 in 1. and 2. phase
Number of houses in centre	0	14	16	20 in 1. phase 46 ³⁷ or 49 ³⁸ in 2. phase
Dimensions of houses	wall height: 1.5 or 1.6 m length: ca. 6–11 m / ~8–9 m width: ca. 6.1–8.7 m interior space: 51–85 m ² / ~59 m ²	wall height: 1.6 m length: 6.5–14.35 m / ~11 m width: ~4.5 m interior space: ~50 m ²	wall height: 1.5 m length: <i>13 m</i> width: <i>5 m</i> interior space: ~65 m ²	wall height: – length: <i>12–14 m</i> width: <i>4–6 m</i> interior space: ca. 48–84 m ² / ~56 m ²
Estimated population	120–160 people in 1. phase 120–160 or 126–168 people in 2. phase	possibly 138–184 people (probably around 150–200 people)	318–424 people (if all houses were dwellings) or possibly 138–184 people (if 23 houses were dwellings)	168–224 or 246–328 people in 1. phase 252–336 or 330–440 people ³⁹ / 234–312 or 312–416 people ⁴⁰ in 2. phase
Average	140 people in 1. phase 140 or 147 people in 2. phase	161 people	371 or 161 people	196 or 287 people in 1. phase 294 or 385 people ⁴¹ / 273 or 364 people ⁴² in 2. phase
Population density	0.052 people/m ² in 1. phase 0.052 or 0.055 people/m ² in 2. phase	0.03 people/m ²	0.076 or 0.033 people/m ²	0.016 or 0.023 people/m ² in 1. phase 0.024 or 0.031 people/m ² / 0.022 or 0.029 people/m ² in 2. phase

Table VIII: Comparison of the Ölandic ringforts Eketorp I, its replacement Eketorp II, Sandby, and Ismantorp concerning their spatial arrangement in the Iron Age. The italic written values are the average values.

³⁵ According to the number of houses given in Andrén's text (Andrén 2014:71 f.).

³⁶ According to the number of houses depicted in Andrén's reconstruction plan (Andrén 2014:75, fig. 23).

³⁷ According to the number of houses given in Andrén's text (Andrén 2014:71 f.).

³⁸ According to the number of houses depicted in Andrén's reconstruction plan (Andrén 2014:75, fig. 23).

³⁹ Calculated according to the number of houses given in Andrén's text (Andrén 2014:71 f.).

⁴⁰ Calculated according to the number of houses depicted in Andrén's reconstruction plan (Andrén 2014:75, fig. 23).

⁴¹ Calculated according to the number of houses given in Andrén's text (Andrén 2014:71 f.).

⁴² Calculated according to the number of houses depicted in Andrén's reconstruction plan (Andrén 2014:75, fig. 23).

Eketorp I contained 20 to 21 houses which is less than half of the number of houses inside Ismantorp's first phase. The addition of houses from Eketorp I to Eketorp II amounted to ca. 33 houses. The addition of houses from the first to the second phase of Ismantorp amounted to 26 or 29 houses. More comparative values are needed to draw conclusion whether these values of the different ringforts are similar or vary too much.

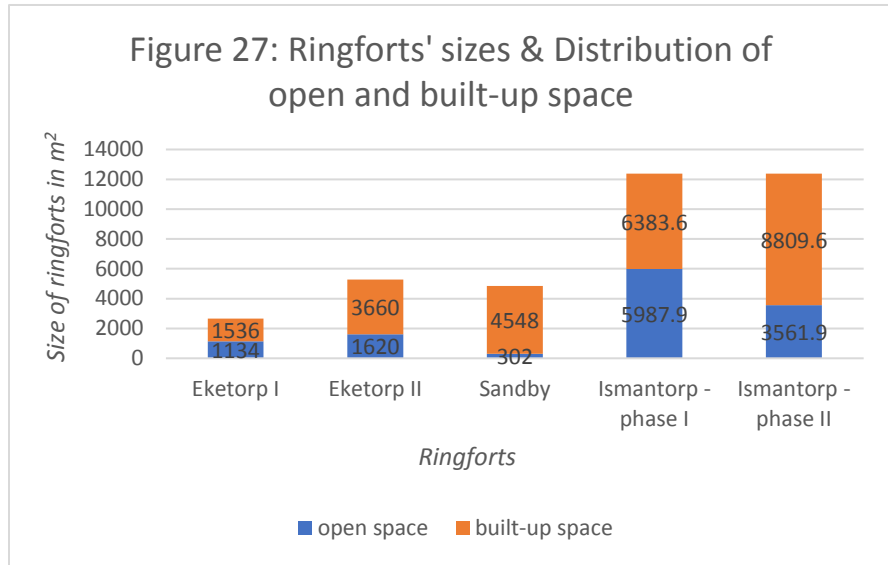


Figure 27: For the second phase of Ismantorp the average values for the two possibilities of what Andrén states in his text and what he depicts in his plan are taken.

In Eketorp I all the houses were placed radially along the ring-wall, leaving the fort's centre open. In Eketorp II and Sandby almost the same number of houses was placed radially along the ring-wall, 39 houses in Eketorp II and 37 houses in Sandby, although in Eketorp II two house were placed parallel to the ring-wall. Consequently, almost the same number of houses was placed in the centre of both of the ringforts, 14 houses in Eketorp II and 16 houses in Sandby. Moreover, in both ringforts the houses in the centre were grouped into one central block, except of one house that was freestanding. In Ismantorp there were 49 houses placed along the ring-wall in both the first and the second phase of the ringfort. Five of the houses were placed parallel to the wall, the others were radially to it. In Eketorp II the houses parallel to the ring-wall were probably oriented like that due to practical matters. If they would have been placed radially, the well area would have been in the entrance areas of the houses and there would not have been enough space for the gate passage leading to the east outside the ring-wall. In Ismantorp the houses parallel to the ring-wall were probably arranged like that to fit more houses at that part of the ring-wall than would be possible if they would have been radially placed. Furthermore, 20 houses were placed as nine groups in the centre of the first phase of Ismantorp. In Ismantorp's second phase a total of 46 or 49 houses⁴³ were placed in the centre which were grouped into three blocks, except of one house that was detached. The two distinguished phases of Ismantorp are not absolutely dated and it is unknown whether the 20 houses in the centre were built at the same time as the houses along the ring-wall, or if the centre was left open for a certain time, in accordance with the first Eketorp ringfort. It seems possible that the second phase of Ismantorp, that is the completely building-up of the centre, coincides with the demolition of Eketorp I and the construction of the larger ringfort Eketorp II. However, it is uncertain how much time passed between the first and the second phase of Ismantorp. In analogy with Eketorp and Ismantorp it seems likely that Sandby also had a first phase in which the centre was not built-up. However, this is just a speculation at this point of time

⁴³ The first given number corresponds to the number of houses given in Andrén's text and the second corresponds to number of houses depicted in Andrén's reconstruction plan.

(until now only about 9 % of the ringfort have been excavated) and future excavations at Sandby ringfort are needed to investigate this.

It seems that it was of significance to have one freestanding house inside the ringforts. In regard to Eketorp I where no freestanding house was placed, it might be that it became important to have a detached house in the settlement when the centre of the ringfort was built-up as well, or that it became important at around 400 AD⁴⁴. However, it is not clear if the freestanding house in the first phase of Ismantorp was built contemporaneous with the houses along the ring-wall or some time later. In any case the freestanding house was already placed in the centre together with a few other houses before the centre was entirely built-up. Hence, the first assumption does not apply for Ismantorp. An arrowhead found in the freestanding house in Ismantorp is dated to the 5th or 6th century. It might be possible that it was deposited there in connection with the construction of the house which hence might date to around 400 AD. This speculation is purely hypothetical and it is also possible that the arrowhead was deposited at a later time. However, this theory would fit with the second assumption that it became important at around 400 AD to have a detached house in the settlement.

The freestanding houses of the analysed ringforts differ in their shape, location and interpreted function. While the ones in Eketorp II and Sandby are placed next to the central block and are very similar to one another in shape and size but also to the other houses in the respective ringfort, the freestanding house in Ismantorp stands out due to its semi-circular shape, small size, interpreted function and placement in the central area of the fort. In all three ringforts it would have been possible to plan the settlement layout a bit differently and place the freestanding house next to

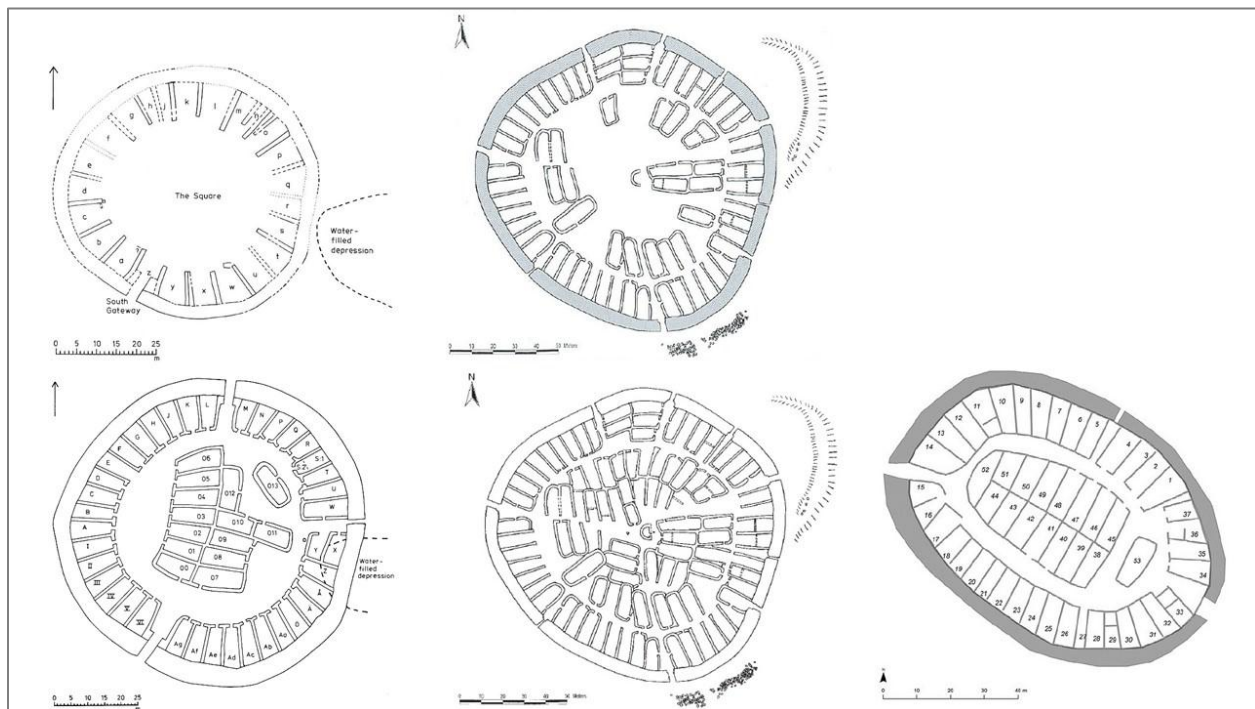


Figure 28: Reconstruction plans showing the development of the ringforts. Top left: ringfort Eketorp I. Bottom left: ringfort Eketorp II. Top middle: first phase of Ismantorp ringfort. Bottom middle: second phase of Ismantorp ringfort. Bottom right: known phase of Sandby ringfort.

⁴⁴ In accordance with the earliest dating respective construction of the ringforts Sandby and Eketorp II at around 400 AD. However, both these ringforts had or were built with the intention to also built-up their centre around this time.

other houses, meaning integrate it into the central house-block. Since this was not done, the question is why was it important to have a freestanding house, or what were the reasons that made a detached position better? – These questions, however, will not be answered in this thesis.

It seems that in the first phase of the ringforts, that is the building of the houses along the ring-wall, it was important to have a well-ordered and more or less symmetrical layout of the houses and to fit as many houses as possible along the ring-wall. Moreover, the arrangement of the houses radially with shared long walls along the ring-wall made it possible to place the largest number of houses within the smallest area (Näsman 1976c:141) while also reinforcing the ring-wall and creating a large open place in the ringfort's centre. In a later phase the centre of each ringfort, except for in Eketorp I, was also build-up, but seemingly not as well planned and not as structured. It is uncertain if the entire building-up of the centre with houses was already planned from the beginning, or if the centre was in a first stage of the ringforts intended to be free. Only for Eketorp II it is certain that the building up of the centre was planned from the beginning. The reason for the rather unsymmetrical and/or unorganised layout and arrangement of the houses in the centre of the three ringforts might be that the houses were built when needed and possibly that there was not much time for the planning, or it was not the priority to have a well-structured and symmetrical layout of the central house-blocks. In the case of Eketorp II the irregular layout is also influenced by the placement of the gates and gate-streets and the placement of the freestanding house. The general layout of the central block in Sandby appears better organised than the ones in Eketorp II and Ismantorp. Comparing the layout of the three ringforts, Eketorp and Sandby appear more regular and better structured than Ismantorp (fig. 28). The latter appears rather disordered. A. Andrén assumes that “the experimental and irregular design of the settlement” (Andrén 2014:78) of Ismantorp is due to its early dating and the inexperience of its architects and constructors.

The buildings within a ringfort differed only slightly in their size. The dimensions of the houses were adjusted to the limited space inside and the layout of the respective fort. Since not every individual measurement of all houses in each ringfort is at hand, the house dimensions of the different ringforts cannot exactly be compared with each other. With reservations, it might be said that on average the houses in the ringforts Eketorp II, Sandby, and Ismantorp had similar measurements.

In each ringfort were only a few houses slightly standing out due to their size or shape, but these houses did not necessarily have a special function. On the basis of the dimensions of the houses it is not possible to determine whether the differences in the size were due to the social status or wealth of the owner, due to the number of people who inhabited a house, if the size was adjusted and calculated in regard to the available space, or if the houses differentiated in size unintentionally. The artefacts discovered inside the houses with the same function(s) of a ringfort do not distinctly differ from each other. The exception is the freestanding house of the ringfort Ismantorp and possibly the one in Sandby. In Ismantorp it distinguishes through its unique semi-circular shape and its interpretation as possible cult-building or place of a seeress. In Sandby it might differentiate through its function as a possible representation house. However, it is also possible that it was a dwelling house, and thus only its detached position would make it different. Due to the present state of excavation of Sandby ringfort the conclusions are rather vague and generalised. The freestanding house in Eketorp II was only outstanding due to its detached position and not in its function; it was used as storehouse and workshop.

In the ringfort Eketorp I presumably 100 % of the houses were used as dwelling houses. In the ringfort Eketorp II the dwelling houses constituted 43 % of the houses, ca. 23 % were byres,

about another 23 % were store- and workshop houses, and ca. 11 % were houses with several functions, such as a smithy and possibly a bakery, brewhouse or sauna. Due to the small number of excavated or partly excavated houses in Sandby ringfort, a distribution of the house functions cannot be ascertained yet. It is certain that there were dwelling houses which were partly also used as workshops in Sandby and it seems that there were also byres. It is possible that the houses in Sandby had similar functions as the houses in Eketorp II. In the first phase of Ismantorp ringfort, dwelling houses and workshops constituted 41 % of the houses, 19 % were houses with special functions which might have been dwellings as well. If that is the case the dwelling and workshop houses would have constituted 60 % of the houses. Byres and storehouses constituted 39 % of the houses, and ca. 1 % was made up by the semi-circular house which certainly had a special function, maybe connected to cult. In the second phase of Ismantorp, 44 % of the houses were dwellings and workshops and 14 % were houses with special functions which might have been dwellings as well. If that is the case the dwelling and workshop houses would have constituted 58 % of the houses. Byres and storehouses constituted 41 % of the houses, and ca. 1 % was made up by the semi-circular house which certainly had a special function, maybe connected to cult⁴⁵. Another possibility is that in the second phase of Ismantorp, 40 % were dwelling houses and workshops, and 13 % were houses with special functions which might have been dwellings as well. If that is the case the dwelling and workshop houses would have constituted 53 % of the houses. Byres and storehouses constituted 46 % of the houses, and ca. 1 % was made up by the semi-circular house which certainly had a special function, maybe connected to cult⁴⁶ (Appendix D). Among the houses in Ismantorp was also a smithy in a later phase.

When only the certain identified dwelling and workshop houses in Ismantorp are regarded, the percentage of dwellings is similar with the one of Eketorp II (on average ca. 42 % give or take). However, Andrén summarised dwellings and workshops in his interpretation of house functions, thus it is unclear if this category includes both dwelling houses and workshops, or if workshops were located in the dwelling houses – as it might be the case in Sandby ringfort. This leads further to the question if the houses in Ismantorp were inhabited by a family respectively household, or if the houses were rather organised like barracks for warriors/soldiers?

The percentage of the different functions of the houses in Ismantorp and Eketorp II are difficult to compare due to the different function categories in which the houses are divided.

The estimated population of Eketorp I is on average about 140 to 147 people. The estimated population of the first phase of Ismantorp is averaging about 287 people which is about twice as much as of Eketorp I. For Eketorp II the estimated population is on average 161 people. The averaging estimated population of Sandby is either about 161 people as well, if it is assumed that 23 houses were used as dwellings – in analogy with the number of houses interpreted as dwellings in ringfort Eketorp II – or 371 people if all 53 houses were used as dwellings. The latter estimation is similar with the averaging population estimation for the second phase of Ismantorp ringfort which is estimated to around 385 people (when there were 55 dwelling houses) or possibly 364 people⁴⁷ (when there were 52 dwelling houses) (fig. 29). This is more than twice as much as the

⁴⁵ Calculations based on the number and function of houses that Andrén states in his text (see Andrén 2014:71 ff.), combined with the analysis of the house functions depicted in his reconstruction plan (see Andrén 2014:75, fig. 23).

⁴⁶ Calculations based on the number and function of houses depicted in Andrén's reconstruction plan (see Andrén 2014:75, fig. 23).

⁴⁷ The first given number corresponds to the number of dwelling houses given in Andrén's text and the second number corresponds to number of houses interpreted as dwellings according to the analysis of Andrén's reconstruction plan.

population of Eketorp II, what corresponds with the fact that Ismantorp was more than double the size of Eketorp II or Sandby.

Since in Eketorp I presumably all houses were used as dwellings the population density is 0.052 people/m² to 0.055 people/m² and thus is higher than the one of Eketorp II. The population density of Eketorp II is 0.03 people/m² since just about 43 % of the houses were dwellings. The population density of Sandby might be similar to the one of Eketorp II, with 0.033 people/m² if 23 houses and thus about 43 % of the houses were used as dwellings. If all 53 houses were dwelling houses, the population density of Sandby is 0.076 people/m². Certainly, it is possible that the percentage of dwelling houses in Sandby, and thus the population density, is different from the two assumed options used in this thesis. The population density of the first phase of Ismantorp is either 0.016 people/m² when about 41 % of the houses were used as dwellings, or 0.023 people/m² when about 60 % of the houses were used as dwellings⁴⁸. Ismantorp's population density in the second phase is either 0.024 people/m² when 44 % of the houses were dwellings, or 0.031 people/m² when 58 % of the houses were

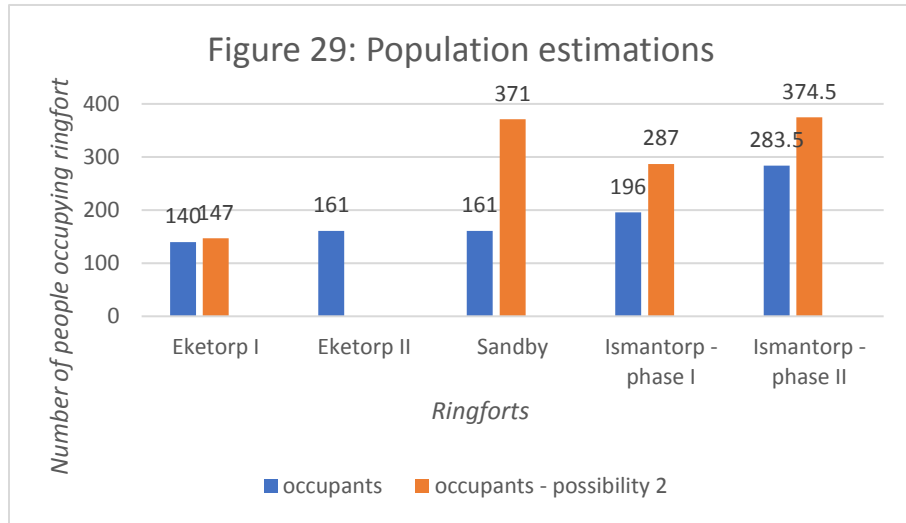


Figure 29: For the second phase of Ismantorp the average values for the two possibilities of what Andrén states in his text and what he depicts in his plan are taken.

used as dwellings. If all 53 houses were dwelling houses, the population density of Sandby is 0.076 people/m². Certainly, it is possible that the percentage of dwelling houses in Sandby, and thus the

population density, is different from the two assumed options used in this thesis. The population density of the first phase of Ismantorp is either 0.016 people/m² when about 41 % of the houses were used as dwellings, or 0.023 people/m² when about 60 % of the houses were used as dwellings⁴⁸. Ismantorp's population density in the second phase is either 0.024 people/m² when 44 % of the houses were dwellings, or 0.031 people/m² when 58 % of the houses were

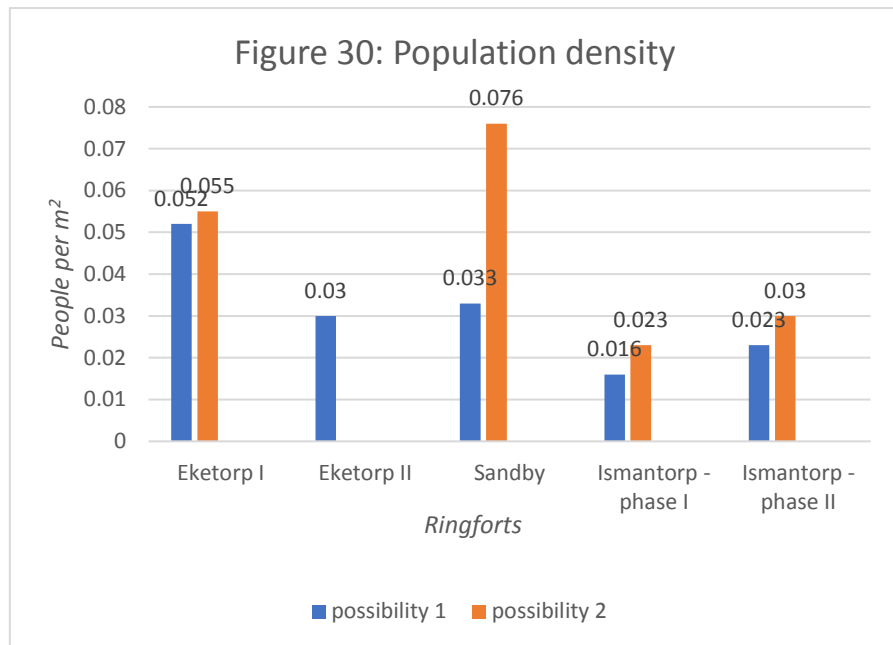


Figure 30: For the second phase of Ismantorp the average values for the two possibilities of what Andrén states in his text and what he depicts in his plan are taken.

⁴⁸ It is to assume that when in the first phase of Ismantorp the lesser percentage of houses were dwellings, then also the lesser percentage of dwellings applies for the second phase and vice versa. Meaning, if in the first phase 41 % of the houses were dwellings, then 40 % or 44 % of the houses were dwellings in the second phase. If in the first phase 60 % of the houses were dwellings, then 53 % or 58 % of the houses were dwellings in the second phase.

dwellings⁴⁹. Another possibility is that Ismantorp's population density is 0.022 people/m² when 40 % of the houses were dwellings, or 0.029 people/m² when 53 % of the houses were dwellings in the ringfort's second phase⁵⁰ (fig. 30) (table IX).

	Eketorp I	Eketorp II	Sandby	Ismantorp – phase I	Ismantorp – phase II
Number of houses in total	20 (phase I) 21 (phase II)	53	53	69	a) 95 b) 98
Number of dwelling houses	20 (phase I) 21 (phase II)	23	23 or 53	28 or 41	a) 42 or 55 b) 39 or 52
Percentage of dwelling houses	100 %	43 %	43 % or 100 %	41 % or 60 %	a) 44% or 58% b) 40% or 53%
Average number of inhabitants	140 (phase I) 147 (phase II)	161	161 or 371	196 or 287	a) 294 or 385 b) 273 or 364
Population density (people/m ²)	0.052 (phase I) 0.055 (phase II)	0.03	0.033 or 0.076	0.016 or 0.023	a) 0.024 or 0.031 b) 0.022 or 0.029
Percentage of open space in ringfort	42.47 %	30.68 %	6.23 %	48.4 %	a) 29.52 % b) 28.06 %
Percentage of built-up space in ringfort	57.53 %	69.32 %	93.77 %	51.6 %	a) 70.48 % b) 71.94 %

Remark to Sandby ringfort: The two possibilities are due to the two assumed possibilities used in this thesis regarding the number of houses used as dwellings in Sandby. It is possible that the number of dwelling houses is actually different from the here mentioned options.

Remark to Ismantorp ringfort: The two possible values in the first phase of Ismantorp are due to the unclarity in the literature regarding the number of houses that can be interpreted as dwelling houses.

The two options (*a* and *b*) in the second phase of Ismantorp are due to the discrepancy in the total number of houses inside the ringfort. The calculations in option *a*) are based on the number and function of houses given in A. Andrén's text (see Andrén 2014:71 ff.) and combined with the analysis of the house functions depicted in his reconstruction plan (see Andrén 2014:75, fig. 23). The calculations in option *b*) are based on the number and function of houses depicted in Andrén's reconstruction plan (see Andrén 2014:75, fig. 23). The two possible values, that are within each of the options *a*) and *b*) in Ismantorp's second phase, are due to the unclarity in the literature regarding the number of houses that can be interpreted as dwelling houses.

Table IX: Overview of the calculated values for the Ölandic ringforts Eketorp I, its replacement Eketorp II, Sandby, and Ismantorp.

In the ringfort Eketorp I, 42.47 % of the interior space were open and 57.53 % of the space were built-up. Of the interior space in the ringfort Eketorp II, 30.68 % were open space and 69.32 % were built-up. Thus, in Eketorp II there were about 12 % more of the inner area built-up than in

⁴⁹ According to the number of houses interpreted as dwellings given in Andrén's text and combined with the analysis of his reconstruction plan.

⁵⁰ According to the possible number of houses interpreted as dwellings in Andrén's reconstruction plan.

Eketorp I. In the first phase of Ismantorp, presumably 48.4 % of the inner space were open and 51.6 % were built-up. In the second phase of Ismantorp, either around 29.52 % were open space and 70.48 % were built-up⁵¹, or about 28.06 % were open space and 71.94 % were built-up⁵² (table IX). However, in Ismantorp's second phase there was more space built-up, and hence there was less open space than in Eketorp II. By contrast, in Ismantorp's first phase there was less space built-up, and hence more open space than in Eketorp I. In the second phase of Ismantorp, there were ca. 19 % or ca. 20 % more of the inner area built-up than in its first phase. The ringfort Sandby differs a lot from the other ringforts regarding the relations of space. In Sandby, only about 6.23 % were open space and 93.77 % of the interior space was built-up (fig. 31). However, it must be taken into account that the calculations regarding the built-up and open space in Sandby ringfort are based on the so far little obtained information of the measurements of the houses. Further excavations might result in different measurements and hence in different proportions of built-up and open space.

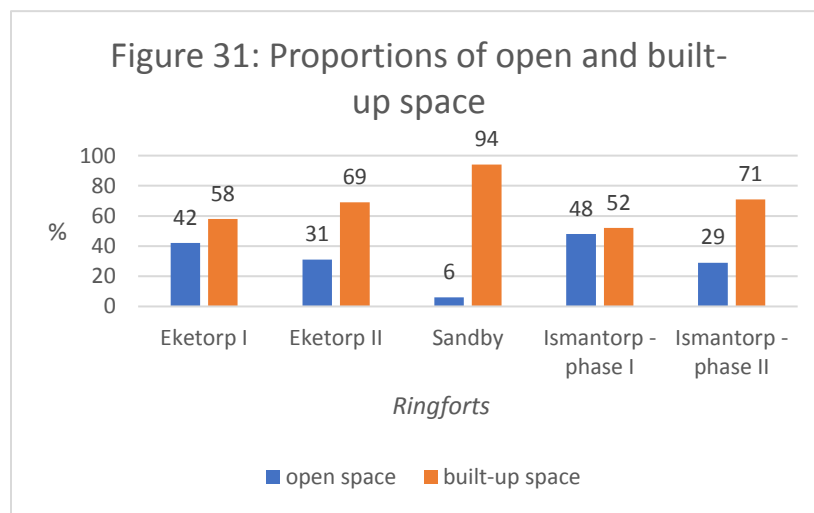


Figure 31: For the second phase of Ismantorp the average values for the two possibilities of what Andrén states in his text and what he depicts in his plan are taken.

In all ringforts there was more built-up space than open space. In the first phase of Ismantorp, the relation of built-up and open space was quite balanced (with a difference of ca. 3–4 %). In Eketorp I, the spatial relation was not very balanced (with a difference of ca. 15 %). In Eketorp II, the built-up space clearly outweighed the open space (with a difference of almost 39 %). The same applies even more distinct for the second phase of Ismantorp (with a difference of ca. 41 % or of almost 44 %). Sandby is

beyond comparison, the built-up space clearly dominated the open space (with a difference of ca. 87–88 %).

As a result, in Eketorp I and the first phase of Ismantorp the built-up area took up a little more than half of the inner space. In Eketorp II and the second phase of Ismantorp the built-up area took up a little less than three-quarters of the inner space. In Sandby supposedly the built-up area took up almost the whole inner space of the ringfort (see Appendix E). In the second phase, after the area in the centre was built-up of both ringforts Eketorp and Ismantorp, there was still more than a quarter of the entire inner space not built-up which constituted a ring-street and several open squares.

The centre of Eketorp I consisted of one large open area. In Eketorp II, there were probably four open places (one in the north, one in the northwest between the central block and the freestanding house, one south/southeast, and one in the west) which were of different sizes. In

⁵¹ Based on the size of built-up and open space calculated according to the number of houses given in Andrén's text (Andrén 2014:71 f.).

⁵² Based on the size of built-up and open space calculated according to the number of houses depicted in Andrén's reconstruction plan (Andrén 2014:75, fig. 23).

Sandby were comparatively little open areas. These were in the southeast around the freestanding house (fig. 28). The meagre amount of open space in Sandby ringfort did not leave much open space for public affairs and daily life. Thus, it could be tentatively assumed that Sandby was not permanently inhabited. If Sandby was only used occasionally the priority might have laid in having as many houses as possible inside the ringfort than in having sufficient open areas for daily life.

In the first phase of Ismantorp, the centre was mostly open, however, the freestanding house was placed in the middle of the centre and also the eastern part of the centre was more or less built-up. The unstructured arrangement of the few houses that were built irregularly in a second row to those along the ring-wall leads to the question why they were not grouped together in one block? Possibly the area around the freestanding house was intentionally left open. Regarding the interpretation of Ismantorp as army camp, this could have been due to having a large open space as training ground and gathering place for the warriors/soldiers. Moreover, this arrangement of the houses gave a better overview of the ringfort than if a house-block was placed in the centre. In the second phase of Ismantorp also the centre was densely built-up. Thus, it is questionable if the open areas gave enough space for e.g. training grounds and gatherings? Possibly, now the training took place outside the ringfort in the forest. It seems that inside the ringfort there were about six to possibly ten areas kept free which were concentrated in and around the central blocks (fig. 25, 28). When looking at the arrangement of the houses around and their distance or proximity to the open places inside the ringforts, it appears that it was not the priority that all houses were equally near to open places. However, the houses were all well connected to them by the street network. It remains an unanswered question if it was considered a better place to live close to an open place or further away from it.

In the latest phase of all three ringforts there would have been space to build a few more houses. However, these spaces were left open. Moreover, enough space was left open in each ringfort for a well-connected communication network. This consisted of a ring-street that ran between the houses along the ring-wall and the central block or blocks. In each ringfort the ring-street was connected with all the gates by minor crossroads (gate-streets). In the case of Ismantorp, three gate-streets ran directly into the open centre of the fort. In the settlement layout of each ringfort, too narrow streets or passages were usually avoided and often house foundations along the streets had rounded corners. Thus, it appears that it was of importance that the streets inside the ringforts were well driveable. In Eketorp II the ring-street was not as distinct as in Sandby and Ismantorp since it intersected with the open areas.

Considering that the ringforts were isolated and small settlement units with a social system, it is natural that open areas for social activities were required. Probably the open areas inside the ringforts were accessible to everyone inside the fort and hence they were public spaces according to the previous defined concepts of public and private space. It is to assume that the houses within the ringforts were private spaces since certain people were locatable in certain houses. Further, the houses must have been owned by someone, or at least certain people must have been responsible for the maintenance and use of certain houses. It is however possible that there were houses that were publicly used for special occasions and under the permission of the "owners". For instance, the semi-circular house in Ismantorp might have been the house of a seeress who allowed access to others for predictions. Thus, the seeress (who was so to say the owner of the house) was in control of allowing and denying access to the private space of her house. In Eketorp II the possible house of a chieftain might have been open for a predefined 'public' for special occasions/social events (e.g. feasting and drinking), but the chieftain was in control of allowing and denying access to his house.

In the ringforts Eketorp I and II, stone pavements were found in front of most houses which are in the case of Eketorp II interpreted as outdoor workspaces of the farms. It is thinkable that the same interpretation applies for Eketorp I. In Sandby ringfort there was a stone pathway discovered in front of a house. It might be possible that this was a pavement for an outdoor workspace. Thus, maybe also in Sandby there were outdoor workspaces located just outside the houses. If that is the case, the ring-street would have been limited by these areas. However, further excavations are needed to investigate whether there were such stone pavements that marked possible working areas in front of the houses or not. These areas just outside the houses might be seen as transition zone of private space (the inside of the house) to the public space (space outside the houses which could be accessed and used by everyone in the ringfort). Possibly they were some sort of front yard for crafts that were usually done outside the house and thus they were a semi-private zone since they were used by the inhabitants of the respective house.

The Ölandic ringforts most probably emerged from the need of defence and protection and can be seen as an adaption to the troubled and conflictual situation of the Iron Age, when new forms of large-scale warfare and consequently a more centralised military organisation arose. Accordingly, the ringforts were a physical boundary, demarcating a settlement from the landscape, and hence creating a limited and protected space which access was controlled and restricted by the occupants. Regarding this background, the definition of space inside a ringfort as public or private space depends on the perspective and has different levels. For the occupants of a ringfort its open areas were presumably public space. However, the public was then defined as the people occupying the ringfort and excluding outsiders, strangers, and – naturally – enemies. The public space, formed by squares and streets, was space used for everyday social activities, for ritual ceremonies (e.g. in Eketorp II and Ismantorp) and possibly for markets and trade (e.g. in Eketorp I)⁵³. For outsiders, that is people who did not have a house inside the ringfort, the space inside the fort was private space. The ringforts certainly were restricted and protected areas, probably in the control of small groups and not accessible to everyone. Presumably they were “owned” by the people who built and occupied them, and these people also controlled who had access to it.

5. Conclusions

The aim of this study was to investigate the arrangement, division and function of the interior space or more precisely the settlement of the three Iron Age ringforts Eketorp, Sandby and Ismantorp on the Swedish island Öland, in order to examine if there was a common pattern. It has been determined that these ringforts were an isolated and small settlement unit with a social system. Consequently, there were open areas inside the ringforts (in all known phases of the forts) which most probably were used as public space for the occupants and more generally for the people inside a ringfort (possibly including visitors, merchants, etc.). The buildings within the ringforts were probably private space since they were used as dwellings and others as byres, storehouses, workshops, or in some cases as buildings with special functions. It is to assume that certain houses were used by certain people who were in control of allowing or denying the access to others. Furthermore, it seems that at least in the Eketorp ringforts (Eketorp I and II) there was also semi-private space in the form of a small front court that functioned as outdoor workspace in front of most of the houses.

⁵³ It is possible that for markets and the like the ringfort was open to more people than just the ones who used it as refuge.

The analysed ringforts were arranged similarly with houses ordinarily placed radially and side by side along the ring-wall, creating a large open place in the forts' centre. Moreover, this arrangement gave an optimal usage of the space within a ringfort and made it possible to place the largest number of houses within a small area. In a later phase of the ringforts (or in the case of Eketorp in the second ringfort) the centre was built-up as well. Concerning Sandby ringfort, so far only one phase is known in which both the area along the ring-wall and the centre were built-up.

It might be that the centre of the first phase of Ismantorp ringfort was left entirely open for a certain time (before the few houses in the centre were built during the first phase), in accordance with the first Eketorp ringfort. Further, it seems possible that the second phase of Ismantorp ringfort, that is the completely building-up of the centre, might coincide with the demolition of Eketorp I and the construction of the larger ringfort Eketorp II. In analogy with Eketorp and Ismantorp, it seems likely that Sandby also had a first phase in which the centre was not built-up. However, these are all just speculations and there is no proof about their correctness yet.

In the ringforts there is a difference in the layout of the houses along the ring-wall and the ones in the centre. The houses along the ring-wall were in all ringforts well-ordered and regular, except for the few houses placed parallel to the ring-wall in the ringforts Eketorp II and Ismantorp. The layout of the houses in the centre was not as well organised and not as symmetrical. In general, the reason for this might be that the houses were built when needed and possibly that there was not much time to plan the layout, or that a well organised and symmetrical arrangement of the central houses was not prioritised. The layouts of the ringforts Eketorp and Sandby were seemingly better planned than the one of Ismantorp.

The dimensions of the houses were adjusted to the limited space in and the layout of the respective ringfort. Except of ringfort Eketorp I, in each ringfort there stood one freestanding house. It would seem that this was of significance; however, it is yet unclear why and in what context and if the existence of a detached house was connected to a certain time. The freestanding house in Ismantorp differs from the ones in Eketorp II and Sandby in location, shape, size and interpreted function. This is probably – based on the interpretation of Ismantorp as occasionally used army camp – due to its different demands on the settlement. The freestanding house in Eketorp II did not differ from the other houses of the ringfort, and for the one in Sandby there is yet too little material to make accurate conclusions. With certainty it can be said that the area around the freestanding house was intentionally left open in each ringfort.

Eketorp II is – according to the current state of research – the only one of the analysed ringforts where water supply was definitely ensured not just outside of the ring-wall but also inside. However, Eketorp II was permanently inhabited contrary to the other ringforts and thus an inner water supply was essential.

The grouping of the houses in the centre into blocks and the arrangement of the open areas in Eketorp II, Sandby, and Ismantorp shows that the ringforts had a thought-out settlement structure and street network. In each ringfort a circular street ran between the houses in the centre and the ones along the ring-wall. Minor streets connected the ring-street with the gates and in Ismantorp also with the open places. It appears that a good communication inside and movement through the ringforts was important. Thus, the arrangement is based on practical and functional aspects, such as to keep certain areas free, have a good street network throughout a ringfort, or to fit more houses in a certain area. Moreover, the layout and arrangement of the inner space of the ringforts was based on the fort's function(s). Eketorp I is interpreted as refuge and also as meeting and possible market place. Thus, a large open centre (42.47 % open space) would be necessary as gathering place or to place market stalls on. Eketorp II is interpreted as permanently inhabited fortified

hamlet. Hence, sufficient open areas (in total 30.68 % open space) were of importance for the daily life of a hamlet, with public places where people could meet and socialise, for community activities and festivities which probably included sacrificial rituals, but also for outdoor working areas of the farmsteads inside the ringfort. Due to the present state of excavation of Sandby ringfort (until now only about 9 % of the ringfort have been excavated) it would be too early to define an accurate interpretation of the fort's function. Nevertheless, the small amount of open space (ca. 6 %) leads to the assumption that Sandby was not permanently inhabited. Regarding the known temporal context of Sandby and the contemporary historical context of the Roman Iron Age and the Migration Period, it is possible that it was used as refuge fort. Moreover, if Sandby was only used occasionally and was possibly used as refuge, the priority might have been in having as many houses as possible inside the ringfort rather than having sufficient open areas for daily social life. Ismantorp ringfort is interpreted as occasionally used army camp and as meeting place. Thus, it had different needs than an ordinary settlement or refuge fort. It presumably required open space primarily as training grounds for the warriors/soldiers, as places to gather for campaigns and raids, and for the gathering and division of plunder from raids. Probably the open space was also used for festivities such as feasting and drinking, as well as for ceremonies and rituals concerning war and before campaigns. In Ismantorp's first phase there was an adequate amount of open space (48.4 % open space), however, in its second phase also the centre was densely built-up (leaving 29.52 %⁵⁴ or 28.06 %⁵⁵ open space). Thus, it is questionable if the size and the strayed position of the open areas gave enough space for e.g. training grounds and gatherings? Possibly the training and gatherings were relocated into the forest outside the ringfort or the function(s) of the ringfort had changed⁵⁶.

The amount of the open space in each ringfort was presumably dependent on the ringfort's function. In all ringforts there was more built-up space than open space, but the relation of the open and built-up space differs from ringfort to ringfort. In the first phase of Ismantorp, the relation of built-up and open space was quite balanced, with a difference of ca. 3–4 %. In Eketorp I, the relation of built-up and open space was rather unbalanced, with a difference of ca. 15 %. In Eketorp II, the built-up space predominated the open space, with a difference of ca. 39 %. The same pertains for the second phase of Ismantorp, with a difference of ca. 41 % or of almost 44 %. Sandby is beyond comparison, the built-up space clearly dominated the open space, with a difference of ca. 87–88 %.

In Eketorp I and the first phase of Ismantorp the built-up area took up a little more than half of the inner space. In Ismantorp's first phase there was a little less space built-up and hence more open space (48.4 % open and 51.6 % built-up space) than in Eketorp I (42.47 % open and 57.53 % built-up space). In Eketorp II and the second phase of Ismantorp the built-up area took up a little less than three-quarters of the inner space. The proportions of built-up and open space in Eketorp II (30.68 % open and 69.32 % built-up space) and Ismantorp (29.52 % open and 70.48 % built-up space⁵⁷, or 28.06 % open and 71.94 % built-up space⁵⁸) are very similar. The ringfort Sandby

⁵⁴ Calculations based on the number of houses given in Andrén's text (see Andrén 2014:71 f.).

⁵⁵ Calculations based on the number of houses depicted in Andrén's reconstruction plan (see Andrén 2014:75, fig. 23).

⁵⁶ It must be kept in mind that the two phases of Ismantorp ringfort are not absolutely dated; thus, it is unclear for how long the known first and second phase each existed.

⁵⁷ Calculations based on the number of houses given in Andrén's text (see Andrén 2014:71 f.).

⁵⁸ Calculations based on the number of houses depicted in Andrén's reconstruction plan (see Andrén 2014:75, fig. 23).

differs a lot from the other ringforts regarding the proportion of space. In Sandby, supposedly the built-up area took up almost the whole interior space of the ringfort (6.23 % open and 93.77 % built-up space) (see Appendix E). However, the calculations for Sandby ringfort are based on the so far little obtained information and further excavations might result in different proportions of built-up and open space. In the second phase, after the area in the centre was built-up, of both ringforts Eketorp and Ismantorp there was still more than a quarter of the entire inner space not built-up which formed the ring-street and several open squares.

Consequently, it seems that the need for more houses, and hence fitting as many people as possible into a ringfort, was greater than the requirement for open places, and thus public space for social life. Especially, in the later phase of the ringforts it was of greater importance to have more houses than open space. Nevertheless, it was also important to have sufficient open areas (in terms of streets and squares) in accordance with the ringfort's function and needs.

Not all houses inside a ringfort were dwelling houses, except for Eketorp I. Generally, it was also important to include houses with other functions such as for sustenance and storage, as well as production areas. In the case of Eketorp II, all the functions of normal farmsteads were included inside the ringfort. Concerning Sandby ringfort it is yet uncertain how the houses were functionally divided and how many houses were used as dwellings.

In the ringfort Eketorp I, presumably 100 % of the houses were used as dwellings. In the ringfort Eketorp II, ca. 43 % of the total number of houses were dwelling houses. In the first phase of Ismantorp ringfort, the dwelling houses and workshops constituted ca. 41 % of the houses, or possibly ca. 60 % if the houses with special functions were dwellings as well. In the second phase of Ismantorp, ca. 44 % of the houses were dwellings and workshops, or possibly ca. 58 % if the houses with special functions were dwellings as well⁵⁹. Another possibility is that in the second phase of Ismantorp ca. 40 % were dwelling houses and workshops, or possibly ca. 53 % if the houses with special functions were dwellings as well⁶⁰. Due to the present state of excavation of Sandby ringfort, an accurate division of house functions cannot be ascertained. It is possible that the houses in Sandby had similar functions like the houses in Eketorp II and that there was also a similar number of dwelling houses as in Eketorp II. Thus, it is possible that either 100 %, or in accordance with Eketorp II ca. 43 % of the houses were used as dwellings. Nevertheless, there are other possibilities regarding the number of dwelling houses and it is to wait that in the future accurate estimations can be made.

In his interpretation of house functions in Ismantorp, A. Andrén summarised dwellings and workshops into one category. Thus, it is unclear if this category includes both dwelling houses and workshops, or if workshops were located in the dwelling houses. The different function categories make it difficult to compare the houses in Ismantorp and Eketorp II with each other.

The comparison of the above values leads to the assumption that if a ringfort is not primarily used as a refuge (where 100 % of the houses are dwelling houses) there might be a tendency regarding the percentage of dwelling houses within a ringfort, which is between ca. 40 % to/and 50 % or possibly to almost 60 %. However, to ascertain a general tendency or pattern more reference values are needed, especially since the estimations for Sandby ringfort are all speculations regarding how many houses were used as dwellings, and thus the calculated estimation of inhabitants, of the population density and of the percentage of living space are speculative. Additionally, for

⁵⁹ Calculations based on the number and function of houses that Andrén states in his text, combined with the analysis of the house functions depicted in his reconstruction plan (see Andrén 2014:71 ff., 75, fig. 23).

⁶⁰ Calculations based on the number and function of houses depicted in Andrén's reconstruction plan (see Andrén 2014:75, fig. 23).

Ismantorp there are at least two possible options regarding the same aspects as in Sandby because from the literature it is not distinct how many houses were used as dwelling houses.

Depending on the number of dwelling houses, the averaging estimated population of the first phase of Ismantorp (196 or 287 people) might be about twice as much as of Eketorp I (140 or 147 people). Depending on the number of dwelling houses, the averaging estimated population of the second phase of Ismantorp (294 or 385 people⁶¹ / 273 or 364 people⁶²) might be more than twice as much as the population of Eketorp II (161 people), what corresponds with the fact that Ismantorp was more than twice the size (on average ca. 12371.5 m²) of Eketorp II (ca. 5280 m²) or Sandby (ca. 4850 m²). Additionally, in Ismantorp's second phase the number of houses inside the ringfort (95 or 98 houses⁶³) was just a little less than twice the number of houses in Eketorp II or Sandby (each 53 houses). The population estimation for Sandby is rather unclear since it is yet unknown how many dwelling houses there were. It is possible that all houses were dwellings, then the averaging estimated population (371 people) is similar to the one of the second phase of Ismantorp. However, it also might be possible that about the same number of houses were dwellings as in Eketorp II, then the estimated population (161 people) corresponds with the one of Eketorp II. Certainly, it is possible that the actual number of dwelling houses is different than from the here considered possibilities.

Ismantorp differs from the other ringforts in its large size, the high number of gates, the layout and arrangement of the houses and house-blocks, the location, shape, size and assumed function of the semi-circular house, as well as in the overall interpretation of the purpose and function of the ringfort. However, Ismantorp's second phase is similar to Eketorp II regarding the proportion of and relation between built-up and open space. To gain accurate conclusions about the proportions of the different house functions, especially about the percentage of the living space respectively the number of dwelling houses, a more detailed and standardised categorisation of the house functions is needed.

Concluding, it can be said that it was in all ringforts the priority to fit as many houses as possible into the limited inner area, which was achieved through their radially placement along the ring-wall and their grouping into blocks in the fort's centre. Moreover, it was important to have enough open areas according to the ringfort's function(s) and needs, as well as a well-connected and drivable street network inside the ringforts.

To determine a pattern regarding the proportions of open and built-up space, as well as the percentage of dwelling houses within the ringforts, more comparative values are needed in order to estimate whether the values of the analysed ringforts are similar or vary too much.

5.1 Future prospects

It is apparent that there are too many varieties or uncertainties when comparing the analysed ringforts as to determine definite conclusions or patterns that apply for all three respectively four ringforts. More of the 10 to possibly 12 Ölandic ringforts that were built-up with densely placed

⁶¹ Calculations based on the number of dwelling houses given in Andrén's text, combined with the analysis of the house function depicted in his reconstruction plan (see Andrén 2014:71 ff., 75, fig. 23). The first number includes dwellings and workshops, the second number includes dwellings, workshops and houses with special functions.

⁶² Calculations based on the number of dwelling houses depicted in Andrén's reconstruction plan (see Andrén 2014:75, fig. 23). The first number includes dwellings and workshops, the second number includes dwellings, workshops and houses with special functions.

⁶³ The first given number corresponds to the number of houses given in Andrén's text and the second corresponds to the number of houses depicted in Andrén's plan.

houses need to be analysed in order to define a generalised pattern regarding the proportions of open and built-up space, as well as the percentage of dwelling houses within the ringforts. Additionally, the results for Sandby ringfort have to be recalculated and re-compared with the values of Eketorp and Ismantorp when more information is available, in order to see if these were more or less correct, or if possibly other results would be reached with more information.

If more ringforts would have a similar percentage of dwelling houses respectively living space, then predictions regarding the population estimation could be made for other Ölandic ringforts. Moreover, if all or at least most of the ringforts would have similar values regarding the proportions of open and built-up space and the percentage of dwelling houses respectively living space, would this imply that most of the ringforts on Öland were based on a common idea or even ideal, and were planned and built according to a standardised plan. Further, this would mean that a very good communication existed between the Ölandic people throughout the whole island. Nevertheless, the at the present available information is too little to draw conclusions like that.

In order to get a complete picture regarding the connection and possible patterns of the Ölandic ringforts, it also needs to be investigated in what context the three ringforts without house foundations⁶⁴ stand with the ringforts that have house foundations⁶⁵. Do they have a different historical and constructional background? And hence, should the ringforts with and the ones without house foundations be considered as two types of Ölandic ringforts?

For further studies, it would be interesting to analyse the relation of the different functions of the houses with their respective size in the ringforts Eketorp II, Sandby, and Ismantorp. In this way it might be ascertained if houses with the same function(s) had the same dimensions. Moreover, if it would turn out that there is a pattern, then predictions regarding house functions (and possibly population estimations) can be made for other Ölandic ringforts. Therefore, the individual measurement of every house for all of the ringforts are needed.

Furthermore, it would be interesting to study and compare the spatial distribution of the house functions within each ringfort, in order to analyse if there were any preferences to use certain areas more than others for certain activities. This kind of study might be a first step to reconstruct how the people of the time of the Ölandic ringforts conceptualised and organised space.

⁶⁴ The ringforts without house foundations were already used somewhen between 500 BC–375/400 AD.

⁶⁵ The ringforts with house foundations were approximately used somewhen between ca. 200–600/700 AD.

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7. List of figures

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Figure 5: Näsman, U., 1976. The Settlement of Eketorp-I. A Planographic Description. In: K. Borg, U. Näsman & E. Wegraeus (eds.), 1976. *Eketorp: Fortification and Settlement on Öland/Sweden. The Monument*. Eketorp: Fortification and Settlement on Öland/Sweden I. Stockholm: Royal Academy of Letters History and Antiquities. p. 75, fig. 61.

Figure 6: Näsman, U., 1976. The Settlement of Eketorp-I. A Planographic Description. In: K. Borg, U. Näsman & E. Wegraeus (eds.), 1976. *Eketorp: Fortification and Settlement on Öland/Sweden. The Monument*. Eketorp: Fortification and Settlement on Öland/Sweden I. Stockholm: Royal Academy of Letters History and Antiquities. p. 75, fig. 60.

Figure 7: Näsman, U., 1976. The Settlement of Eketorp-I. A Planographic Description. In: K. Borg, U. Näsman & E. Wegraeus (eds.), 1976. *Eketorp: Fortification and Settlement on Öland/Sweden. The Monument*. Eketorp: Fortification and Settlement on Öland/Sweden I. Stockholm: Royal Academy of Letters History and Antiquities. p. 74, fig. 58.

Figure 8: Näsman, U., 1976. The Settlement of Eketorp-II. Planographic Description and Analysis. In: K. Borg, U. Näsman & E. Wegraeus (eds.), 1976. *Eketorp: Fortification and Settlement on Öland/Sweden. The Monument*. Eketorp: Fortification and Settlement on Öland/Sweden I. Stockholm: Royal Academy of Letters History and Antiquities. p. 119, fig. 129.

Figure 9: Näsman, U., 1976. The Settlement of Eketorp-II. Planographic Description and Analysis. In: K. Borg, U. Näsman & E. Wegraeus (eds.), 1976. *Eketorp: Fortification and Settlement on Öland/Sweden. The Monument*. Eketorp: Fortification and Settlement on Öland/Sweden I. Stockholm: Royal Academy of Letters History and Antiquities. p. 118, fig. 127.

Figure 10: Näsman, U., 1976. The Settlement of Eketorp-II. Planographic Description and Analysis. In: K. Borg, U. Näsman & E. Wegraeus (eds.), 1976. *Eketorp: Fortification and Settlement on Öland/Sweden. The Monument*. Eketorp: Fortification and Settlement on Öland/Sweden I. Stockholm: Royal Academy of Letters History and Antiquities. p. 138, fig. 180.

Figure 11: Näsman, U., 1976. The Settlement of Eketorp-II. Planographic Description and Analysis. In: K. Borg, U. Näsman & E. Wegraeus (eds.), 1976. *Eketorp: Fortification and Settlement on Öland/Sweden. The Monument*. Eketorp: Fortification and Settlement on Öland/Sweden I. Stockholm: Royal Academy of Letters History and Antiquities. p. 118, fig. 127. (Edited by F.-N. Denninghaus.)

Figure 12: Näsman, U., 1976. The Settlement of Eketorp-II. Planographic Description and Analysis. In: K. Borg, U. Näsman & E. Wegraeus (eds.), 1976. *Eketorp: Fortification and Settlement on Öland/Sweden. The Monument*. Eketorp: Fortification and Settlement on Öland/Sweden I. Stockholm: Royal Academy of Letters History and Antiquities. p. 123, fig. 141.

Figure 13: Edgren, B. & Herschend, F., 1997. *Eketorp: The fortified village on the island of Öland*. Stockholm: Riksantikvarieämbetet. p. 9. Available from: <https://www.diva-portal.org/smash/get/diva2:1287899/FULLTEXT01.pdf> [Accessed 26 May 2019].

Figure 14: Fabech, C. & Näsman, U., 2013. Ritual Landscapes and Sacral Places in the First Millennium AD in South Scandinavia. In: S. Walaker Nordeide & S. Brink (eds.), 2013. *Sacred Sites and Holy Places: Exploring the Sacralization of Landscape through Time and Space*. Studies in the Early Middle Ages 11. Turnhout: Brepols. p. 71, fig. 8.

Figure 15: Photo by Daniel Lindskog, 2018.

Figure 16: Alfsdotter, C., Pappmehl-Dufay, L. & Victor, H., 2018. A moment frozen in time: evidence of a late fifth-century massacre at Sandby borg. *Antiquity* 92 (362), p. 424, fig. 2.

Figure 17: Stenberger, M., 1933. *Öland under äldre järnåldern. En Bebyggelsehistorisk Undersökning*. Arkeologiska Monografier 19. Stockholm: Kungl. Vitterhets Historie och Antikvitets Akademien. p. 226, fig. 143.

Figure 18: Pappmehl-Dufay, L., 2019. Massakern i Sandby borg på Öland. Arkeologin ger nya svar och nya frågor. *Historielärarnas Förenings Årsskrift 2019*, p. 133.

Figure 19: Alfsdotter, C., Pappmehl-Dufay, L. & Victor, H., 2018. A moment frozen in time: evidence of a late fifth-century massacre at Sandby borg. *Antiquity* 92 (362), p. 424, fig. 2. (Edited by F.-N. Denninghaus.)

Figure 20: Andrén, A., 2006. A world of stone. Warrior culture, hybridity, and Old Norse cosmology. In: A. Andrén, K. Jennbert & C. Raudvere (eds.), 2006. *Old Norse religion in long-term perspectives. Origins, changes, and interactions. An international conference in Lund, Sweden, June 3–7, 2004*. Vågar Till Midgård 8. Lund: Nordic Academy Press. p. 33, fig. 1.

Figure 21: Stenberger, M., 1925. En preliminär undersökning av Ismantorps borg. *Fornvännen* 20, p. 362, fig. 178.

Figure 22: Andrén, A., 2014. *Tracing Old Norse Cosmology. The world tree, middle earth, and the sun in archaeological perspectives*. Vägar Till Midgård 16. Lund: Nordic Academic Press. p. 72, fig. 21.

Figure 23: Andrén, A., 2014. *Tracing Old Norse Cosmology. The world tree, middle earth, and the sun in archaeological perspectives*. Vägar Till Midgård 16. Lund: Nordic Academic Press. p. 74, fig. 22.

Figure 24: Andrén, A., 2014. *Tracing Old Norse Cosmology. The world tree, middle earth, and the sun in archaeological perspectives*. Vägar Till Midgård 16. Lund: Nordic Academic Press. p. 72, fig. 21. (Edited by F.-N. Denninghaus.)

Figure 25: Andrén, A., 2014. *Tracing Old Norse Cosmology. The world tree, middle earth, and the sun in archaeological perspectives*. Vägar Till Midgård 16. Lund: Nordic Academic Press. p. 75, fig. 23. (Edited by F.-N. Denninghaus.)

Figure 26: Andrén, A., 2014. *Tracing Old Norse Cosmology. The world tree, middle earth, and the sun in archaeological perspectives*. Vägar Till Midgård 16. Lund: Nordic Academic Press. p. 75, fig. 23.

Figure 27: Figure by F.-N. Denninghaus.

Figure 28: (Put together by F.-N. Denninghaus.)

Top left, ringfort Eketorp I: Näsman, U., 1976. The Settlement of Eketorp-I. A Planographic Description. In: K. Borg, U. Näsman & E. Wegraeus (eds.), 1976. *Eketorp: Fortification and Settlement on Öland/Sweden. The Monument*. Eketorp: Fortification and Settlement on Öland/Sweden I. Stockholm: Royal Academy of Letters History and Antiquities. p. 74, fig. 58.

Bottom left, ringfort Eketorp II: Näsman, U., 1976. The Settlement of Eketorp-II. Planographic Description and Analysis. In: K. Borg, U. Näsman & E. Wegraeus (eds.), 1976. *Eketorp: Fortification and Settlement on Öland/Sweden. The Monument*. Eketorp: Fortification and Settlement on Öland/Sweden I. Stockholm: Royal Academy of Letters History and Antiquities. p. 118, fig. 127.

Top middle, first phase of Ismantorp ringfort: Andrén, A., 2014. *Tracing Old Norse Cosmology. The world tree, middle earth, and the sun in archaeological perspectives*. Vägar Till Midgård 16. Lund: Nordic Academic Press. p. 74, fig. 22.

Bottom middle, second phase of Ismantorp ringfort: Andrén, A., 2006. A world of stone. Warrior culture, hybridity, and Old Norse cosmology. In: A. Andrén, K. Jennbert & C. Raudvere (eds.), 2006. *Old Norse religion in long-term perspectives. Origins, changes, and interactions. An international conference in Lund, Sweden, June 3–7, 2004*. Vägar Till Midgård 8. Lund: Nordic Academy Press. p. 33, fig. 1.

Bottom right, known phase of Sandby ringfort: Alfsdotter, C., Pappmehl-Dufay, L. & Victor, H., 2018. A moment frozen in time: evidence of a late fifth-century massacre at Sandby borg. *Antiquity* 92 (362), p. 424, fig. 2.

Figure 29: Figure by F.-N. Denninghaus.

Figure 30: Figure by F.-N. Denninghaus.

Figure 31: Figure by F.-N. Denninghaus.

8. Appendices

Appendix A – Calculation of the square measures for the houses of Eketorp I

To calculate the averaging inner space of the Eketorp I houses the measurements depicted in fig. 5⁶⁶ were used.

To get the average length of a building, the value of the two walls of that building were taken and the lower value was subtracted from the higher one. The result was divided through two and the new result was added to the lower wall length. For example, calculation of the average wall length for house *s*: wall *r/s*: ca. 6.2 m long, wall *s/t*: ca. 10.9 m long

$$\rightarrow 10.9 \text{ m} - 6.2 \text{ m} = 4.7 \text{ m} \rightarrow 4.7 \text{ m} : 2 = 2.35 \text{ m} \rightarrow 6.2 \text{ m} + 2.35 \text{ m} = 8.55 \text{ m}$$

Square measures for the houses of Eketorp I (ordered by size in m²):

House *j*: ca. 8.7 m long, ca. 3.4 m wide = 29.58 m² (from the second settlement phase of Eketorp I)

House *n*: ca. 6.85 m long, 4.4 m wide = 30.14 m² (from the second settlement phase of Eketorp I)

House *k*: ca. 8.4 m long, 6.1 m wide = 51.24 m²

House *d*: ca. 7.8 m long, 6.7 m wide = 52.26 m²

House *a*: ca. 8.7 m long, 6.2 m wide = 53.94 m²

House *e*: ca. 7.3 m long, ca. 7.5 m wide = 54.75 m²

House *o*: ca. 8.1 m long, 6.8 m wide = 55.08 m²

House *t*: ca. 10.9 m long, ca. 5.3 m wide = 57.77 m²

House *q*: ca. 8.6 m long, ca. 6.8 m wide = 58.48 m²

House *f*: ca. 7.85 m long, ca. 7.5 m wide = ca. 58.88 m²

House *g*: ca. 8.35 m long, 7.1 m wide = 59.285 m²

House *x*: 8.5 m long, 7 m wide = 59.5 m² & in the second settlement phase of Eketorp I: 8.5 m long, 5.8 m wide = 49.3 m²

House *s*: ca. 8.55 m long, 7 m wide = 59.85 m²

House *u*: ca. 9.6 m long, 6.2 m wide = 59.52 m²

House *c*: ca. 8.3 m long, 7.2 m wide = 59.76 m²

House *y*: ca. 8.3 m long, 7.3 m wide = 60.59 m²

House *b*: ca. 8.55 m long, 7.2 m wide = 61.56 m²

House *h*: ca. 8 m long, 8.4 m wide = 67.2 m²

House *m*: ca. 9.15 m long, 7.6 m wide = 69.54 m²

House *w* or *v*: ca. 9.05 m long, 7.7 m wide = ca. 69.69 m²

House *p*: ca. 9.75 m long, 8.1 m wide = ca. 78.96 m²

House *l*: ca. 9.85 m long, 8.7 m wide = ca. 85.7 m²

⁶⁶ Corresponds to Näsman 1976b:75, fig. 61.

Appendix B – Calculation of the built-up and open areas in Sandby

For the following calculations of the built-up and open areas in Sandby ringfort, the averaging measures for the houses along the ring-wall are used as an overall average. These describe a house length of 13 m, an inner width of 5 m (Viberg, et al. 2014:417), and a wall thickness of ca. 1 m (Gunnarsson, Victor & Alfsson 2016:29 f.; Hedberg 2017:7). Thus, the averaging interior size of a house inside Sandby ringfort is 65 m².

To calculate the occupied area of Sandby, the total area that the 53 houses took up is calculated first.

$$53 \times 65 \text{ m}^2 = 3445 \text{ m}^2$$

Thus, just the area of the houses (leaving out the space of the house walls) took up a space of **3445 m²**.

The house walls were ca. 1 m thick, ca. 13 m long (as the length of the houses is) and ca. 5 m wide (as the width of the houses is). In fig. 16⁶⁷ I counted 61 long walls (counting the long walls of house 52 as two long walls on each side⁶⁸) and 62 short walls (assuming that every house had gable walls and that the houses along the ring-wall were joined with the ring-wall).

$$13 \text{ m length} \times 1 \text{ m thickness} = 13 \text{ m}^2 \rightarrow 61 \times 13 \text{ m}^2 = 793 \text{ m}^2$$
$$5 \text{ m length} \times 1 \text{ m thickness} = 5 \text{ m}^2 \rightarrow 62 \times 5 \text{ m}^2 = 310 \text{ m}^2$$

$$793 \text{ m}^2 + 310 \text{ m}^2 = 1103 \text{ m}^2$$

In total all the house walls took up a space of **1103 m²**.

$$3445 \text{ m}^2 + 1103 \text{ m}^2 = 4548 \text{ m}^2$$

The houses including the house walls occupied a space of about **4548 m²**.

According to A. Viber the size of Sandby ringfort amounts to ca. 5140 m² (Viberg 2015:523).

$$5140 \text{ m}^2 - 4548 \text{ m}^2 = 592 \text{ m}^2$$

Hence, the free area in Sandby was about **592 m²**.

However, the author cannot comprehend how Viberg reached this result when he also states that Sandby's inner diameters are ca. 95 m x 64 m (Viberg 2015:523)⁶⁹.

According to I. Dutra Leivas and H. Victor the inner diameters are ca. 95 m x 65 m and the size of the ringfort amounts to ca. 5000 m² (Dutra Leivas & Victor 2011:15). This result is generously rounded up. The accurate calculation of the inner size⁷⁰ of Sandby amounts to ca. 4850 m².

$$4850 \text{ m}^2 - 4548 \text{ m}^2 = 302 \text{ m}^2$$

Hence, the free area in Sandby was about **302 m²**. This value is used for the analysis.

⁶⁷ Corresponds to Alfsson, Pappmehl-Dufay & Victor 2018:424, fig. 2.

⁶⁸ However, it is yet unclear how long house 52 was because its walls are badly preserved (Victor 2015:98).

⁶⁹ Calculated as ellipse, with the long radius 95m÷2 and the short radius 64m÷2, it gives a surface of ca. 4775,22 m².

⁷⁰ Calculated as ellipse, with the long radius 95m÷2 and the short radius 65m÷2, it gives a surface of ca. 4849.83 m².

Appendix C– Calculation of the built-up and open areas in Ismantorp

In order to calculate the surface of the built-up and the open areas in Ismantorp ringfort, the square measures of the houses inside the ringfort need to be calculated.

For the following calculations, the averaging length and width measurements of the houses along the ring-wall are taken as an overall average. These constitute a house length of 12–14 m and an inner width of 4–6 m (Capelle 2000:535; Stenberger 1933:238).

To get the averaging measures of the inner space of the houses, the smallest surface and the largest surface are calculated:

$$12 \text{ m length} \times 4 \text{ m width} = 48 \text{ m}^2$$

$$14 \text{ m length} \times 6 \text{ m width} = 84 \text{ m}^2$$

The interior space of a house within Ismantorp ringfort was ca. 48–84 m².

For the following calculations of the built-up and open areas, the averaging measures for the houses along the ring-wall are used as an overall average. These constitute a house length of 12–14 m, an inner width of 4–6 m, and a wall thickness of ca. 1–1.5 m (Capelle 2000:535). The outer max. diameter of the semi-circular house is 6 m and the inner diameter is 3.5 m (Stenberger 1966:14).

In the first phase of Ismantorp ringfort there were 49 houses along the ring-wall and 20 houses in the centre. Thus, giving a total of 69 houses within the ringfort (Andrén 2014:74, fig. 22). In the second phase there were 49 houses along the ring-wall and 46 in the centre, giving a total of 95 houses, according to what A. Andrén states in his text (Andrén 2014:71 f.). According to A. Andrén's plan, there were 49 houses along the ring-wall and 49 houses in the centre, giving a total of 98 houses in the second phase of Ismantorp ringfort (Andrén 2014:75, fig. 23).

To calculate the occupied area of Ismantorp, the total area the houses took up is calculated.

For the **first settlement phase**, I supposed that 34 houses had each an inner space of 48 m² and 35 houses one of 84 m², to get somewhat an average.

$$34 \times 48 \text{ m}^2 = 1632 \text{ m}^2$$

$$35 \times 84 \text{ m}^2 = 2940 \text{ m}^2$$

$$1632 \text{ m}^2 + 2940 \text{ m}^2 = 4572 \text{ m}^2$$

Thus, just the area of the houses (leaving out the space of the house walls) took up a space of **4572 m²** in the first settlement phase.

The house walls were ca. 1–1.5 m thick and ca. 12–14 m long (as the length of the houses is). In fig. 23⁷¹ I counted 87 long walls and 61 short walls. For the long walls I supposed that 43 walls were 12 m long each and 44 walls were 14 m long each, to get roughly an average. (I also could have supposed that 44 walls were 12 m long each and 43 walls were 14 m long each. But I decided to ascribe the higher number of houses to the higher length measurement, for no specific reason, and will continue like this for all following calculations.)

$$12 \text{ m length} \times 1 \text{ m thickness} = 12 \text{ m}^2 \rightarrow 43 \times 12 \text{ m}^2 = 516 \text{ m}^2$$

⁷¹ Corresponds to Andrén 2014:74, fig. 22.

$$12 \text{ m length} \times 1.5 \text{ m thickness} = 18 \text{ m}^2 \rightarrow 43 \times 18 \text{ m}^2 = 774 \text{ m}^2$$

$$14 \text{ m length} \times 1 \text{ m thickness} = 14 \text{ m}^2 \rightarrow 44 \times 14 \text{ m}^2 = 616 \text{ m}^2$$

$$14 \text{ m length} \times 1.5 \text{ m thickness} = 21 \text{ m}^2 \rightarrow 44 \times 21 \text{ m}^2 = 924 \text{ m}^2$$

The average value of the two groups is used for further calculation. For the long walls with 12 m length that is 645 m² and for the walls with 14 m length that is 770 m².

For the short walls I supposed that 30 walls were 4 m long each and 31 walls were 6 m long each (as the width of the houses is), to get roughly an average.

$$4 \text{ m length} \times 1 \text{ m thickness} = 4 \text{ m}^2 \rightarrow 30 \times 4 \text{ m}^2 = 120 \text{ m}^2$$

$$4 \text{ m length} \times 1.5 \text{ m thickness} = 6 \text{ m}^2 \rightarrow 30 \times 6 \text{ m}^2 = 180 \text{ m}^2$$

$$6 \text{ m length} \times 1 \text{ m thickness} = 6 \text{ m}^2 \rightarrow 31 \times 6 \text{ m}^2 = 186 \text{ m}^2$$

$$6 \text{ m length} \times 1.5 \text{ m thickness} = 9 \text{ m}^2 \rightarrow 31 \times 9 \text{ m}^2 = 279 \text{ m}^2$$

The average value of the two groups is used for further calculation. For the short walls with 4 m length that is 150 m² and for the walls with 6 m length that is 232.5 m².

$645 \text{ m}^2 + 770 \text{ m}^2 + 150 \text{ m}^2 + 232.5 \text{ m}^2 = 1797.5 \text{ m}^2 \rightarrow$ In total all the house walls took up a space of **1797.5 m²**.

To calculate the total space that the semi-circular house occupied, its outer diameter respectively width (which includes the house walls) of 6 m is taken to calculate the area of a circle (= 28.274 m²). Then that value is divided by two (= 14.137 m²).

Hence the semi-circular house occupied a total space of ca. **14.137 m²**.

To calculate the inner space of the semi-circular house, its inner diameter or width of 3.5 m is taken to calculate the area of a circle (= 9.621 m²). Then that value is divided by two (= 4.8105 m²).

Hence, the inner space of the semi-circular house is ca. 4.8 m².

$$1797.5 \text{ m}^2 + 4572 \text{ m}^2 + 14.137 \text{ m}^2 = 6383.637 \text{ m}^2$$

The houses including the house walls occupied a space of about **6383.64 m²** in the first settlement phase of Ismantorp.

The size of Ismantorp ringfort amounts to 12076–12667 m².

$$12076 \text{ m}^2 - 6383.637 \text{ m}^2 = 5692.363 \text{ m}^2$$

$$12667 \text{ m}^2 - 6383.637 \text{ m}^2 = 6283.363 \text{ m}^2$$

Hence, the free area in Ismantorp was about **5692.4 m² to 6283.4 m²** in the first settlement phase.

For the **second settlement phase, according to the numbers A. Andrén states in his text** (see Andrén 2014:71 f.), I supposed that 47 houses had each an inner space of 48 m² and 48 houses one of 84 m², to get somewhat an average.

$$47 \times 48 \text{ m}^2 = 2256 \text{ m}^2$$

$$48 \times 84 \text{ m}^2 = 4032 \text{ m}^2$$

$$2256 \text{ m}^2 + 4032 \text{ m}^2 = 6288 \text{ m}^2$$

Thus, just the area of the houses (leaving out the space of the house walls) took up a space of **6288 m²** in the second settlement phase.

To calculate the surface which the house walls occupy, in accordance with the number of houses given by Andrén in his text (49 houses along the ring-wall and 46 houses in the centre), I excluded three houses from Andrén's plan from the calculations. To simplify matter, I selected three houses that have joint walls with the adjacent houses and have no own gable walls. Moreover, I chose these houses since it seems most reasonable that they would not be interpreted as houses due to their construction and not having distinctive walls themselves. The figure below shows which houses from the centre are included in the calculations (the houses along the ring-wall are all included).

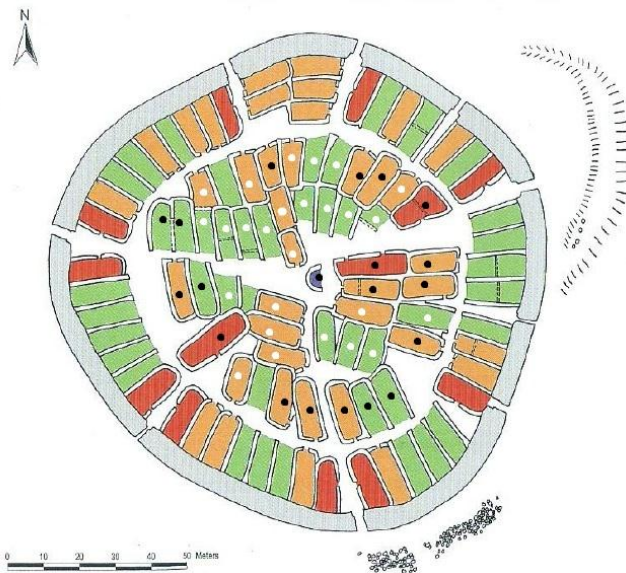


Figure: Reconstruction plan of the second phase of Ismantorp ringfort. 46 houses are marked in the fort's centre. Black dots mark the houses in the centre that were presumably built in the first phase of the ringfort and are included in the following calculations. White dots mark the houses in the centre that the author additionally selected for the following calculations. (Figure from: Andrén 2014:75, fig. 23. Edited by the author.)

The house walls were ca. 1–1.5 m thick and ca. 12–14 m long. In fig. 26⁷² I counted 116 long walls and 85 short walls. For the long walls I supposed that 58 walls were 12 m long each and 58 walls were 14 m long each, to get roughly an average.

$$12 \text{ m length} \times 1 \text{ m thickness} = 12 \text{ m}^2 \rightarrow 58 \times 12 \text{ m}^2 = 696 \text{ m}^2$$

$$12 \text{ m length} \times 1.5 \text{ m thickness} = 18 \text{ m}^2 \rightarrow 58 \times 18 \text{ m}^2 = 1044 \text{ m}^2$$

$$14 \text{ m length} \times 1 \text{ m thickness} = 14 \text{ m}^2 \rightarrow 58 \times 14 \text{ m}^2 = 812 \text{ m}^2$$

$$14 \text{ m length} \times 1.5 \text{ m thickness} = 21 \text{ m}^2 \rightarrow 58 \times 21 \text{ m}^2 = 1218 \text{ m}^2$$

The average value of the two groups is used for further calculation. For the long walls with 12 m length that is 870 m² and for the walls with 14 m length that is 1015 m².

For the short walls I supposed that 42 walls were 4 m long each and 43 walls were 6 m long each, to get roughly an average.

$$4 \text{ m length} \times 1 \text{ m thickness} = 4 \text{ m}^2 \rightarrow 42 \times 4 \text{ m}^2 = 168 \text{ m}^2$$

$$4 \text{ m length} \times 1.5 \text{ m thickness} = 6 \text{ m}^2 \rightarrow 42 \times 6 \text{ m}^2 = 252 \text{ m}^2$$

⁷² Corresponds to Andrén 2014:75, fig. 23.

$$6 \text{ m length} \times 1 \text{ m thickness} = 6 \text{ m}^2 \rightarrow 43 \times 6 \text{ m}^2 = 258 \text{ m}^2$$

$$6 \text{ m length} \times 1.5 \text{ m thickness} = 9 \text{ m}^2 \rightarrow 43 \times 9 \text{ m}^2 = 387 \text{ m}^2$$

The average value of the two groups is used for further calculation. For the short walls with 4 m length that is 210 m² and for the ones with 6 m length that is 322.5 m².

$870 \text{ m}^2 + 1015 \text{ m}^2 + 210 \text{ m}^2 + 322.5 \text{ m}^2 = 2417.5 \text{ m}^2$ → In total all the house walls took up a space of **2417.5 m²**.

The semi-circular house (incl. house wall) occupied a total space of ca. **14.137 m²**.

$$2417.5 \text{ m}^2 + 14.137 \text{ m}^2 + 6288 \text{ m}^2 = 8719.637 \text{ m}^2$$

The houses including the house walls occupied a space of about **8719.64 m²** in the second settlement phase of Ismantorp according to the numbers A. Andrén states in his text.

The size of Ismantorp ringfort amounts to 12076–12667 m².

$$12076 \text{ m}^2 - 8719.637 \text{ m}^2 = 3356.363 \text{ m}^2$$

$$12667 \text{ m}^2 - 8719.637 \text{ m}^2 = 3947.363 \text{ m}^2$$

Hence, the free area in Ismantorp was about **3356.4 m² to 3947.4 m²** in the second settlement phase according to the numbers A. Andrén states in his text.

To calculate the built-up and the open area for the **second settlement phase, according to A. Andrén's plan** (see Andrén 2014:75, fig. 23), most of the results from the previous calculations regarding the second phase of Ismantorp can be taken. Just a few additional calculations and adjustments have to be made.

To calculate the total area the houses took up, I used the above calculated value of a built-up space of 6288 m² for 95 houses and added the values for 3 additional houses. I supposed that 2 houses had an inner space of 48 m² each and 1 house one of 84 m².

$$2 \times 48 \text{ m}^2 = 96 \text{ m}^2$$

$$1 \times 84 \text{ m}^2 = 84 \text{ m}^2$$

$$96 \text{ m}^2 + 84 \text{ m}^2 = 180 \text{ m}^2$$

$$6288 \text{ m}^2 + 180 \text{ m}^2 = 6468 \text{ m}^2$$

Thus, just the area of the houses (leaving out the space of the house walls) took up a space of **6468 m²** in the second settlement phase.

No additional values for the house walls had to be added. In total all the house walls took up a space of **2417.5 m²**.

The semi-circular house (incl. house wall) occupied a total space of ca. **14.137 m²**.

$$6468 \text{ m}^2 + 2417.5 \text{ m}^2 + 14.137 \text{ m}^2 = 8899.637 \text{ m}^2$$

The houses including the house walls occupied a space of about **8899.64 m²** in the second settlement phase of Ismantorp according to A. Andrén's plan.

The size of Ismantorp ringfort amounts to 12076–12667 m².

$$12076 \text{ m}^2 - 8899.637 \text{ m}^2 = 3176.363 \text{ m}^2$$

$$12667 \text{ m}^2 - 8899.637 \text{ m}^2 = 3767.363 \text{ m}^2$$

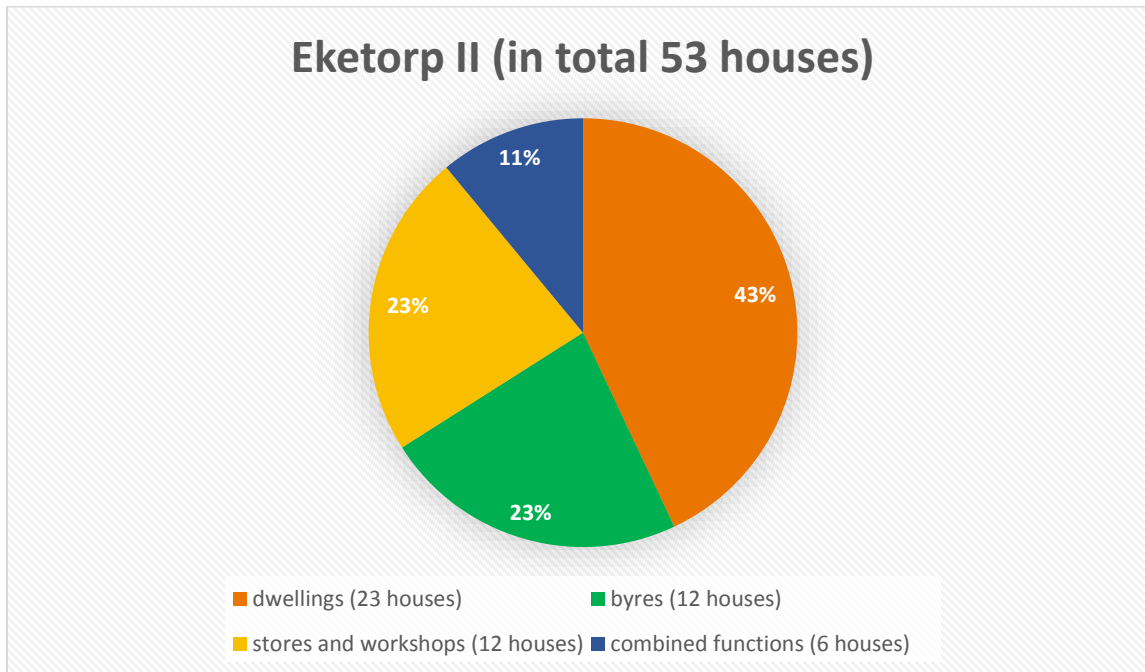
Hence, the free area in Ismantorp was about *3176.4 m² to 3767.4 m²* in the second settlement phase according to A. Andrén's plan.

Results:

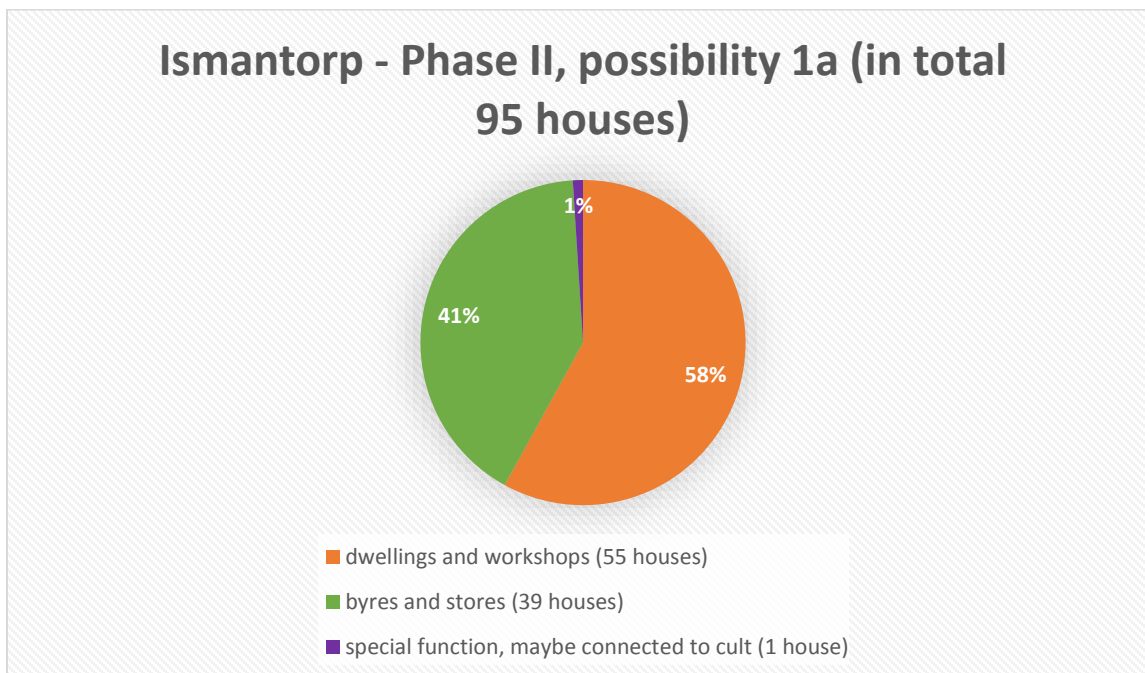
	Phase I	Phase II (according to text)	Phase II (according to plan)
Built-up space	6383.64 m ²	8719.64 m ²	8899.64 m ²
Open space	5692.4 – 6283.4 m ²	3356.4 – 3947.4 m ²	3176.4 – 3767.4 m ²

The table shows the calculated average values for the built-up and the open space for the first and for the second phase of Ismantorp ringfort. For the second phase the values were calculated in regard to the number of houses A. Andrén states in his text (see Andrén 2014:71 f.), as well as in regard to the number of houses A. Andrén has illustrated in his reconstruction plan (see Andrén 2014:75, fig. 23).

Appendix D – Proportions of the different house functions in the ringforts Eketorp II and Ismantorp

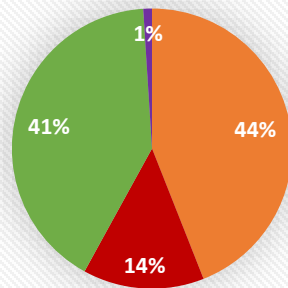


Calculations are based on the number and function of houses depicted in the reconstruction plan of Edgren and Herschend (see Edgren & Herschend 1997:9).



Calculations are based on the number and function of houses that Andrén states in his text (see Andrén 2014:71 ff.).

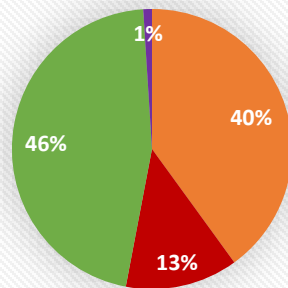
Ismantorp - Phase II, possibility 1b (in total 95 houses)



- dwellings and workshops (42 houses)
- special functions, maybe also dwellings? (13 houses)
- byres and stores (39 houses)
- special function, maybe connected to cult (1 house)

Calculations are based on the number and functions of houses that Andrén states in his text (see Andrén 2014:71 ff.), combined with the analysis of the house functions depicted in his reconstruction plan (see Andrén 2014:75, fig. 23).

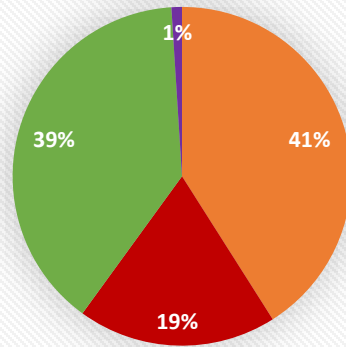
Ismantorp - Phase II, possibility 2 (in total 98 houses)



- dwellings and workshops (39 houses)
- special functions, maybe also dwellings? (13 houses)
- byres and stores (45 houses)
- special function, maybe connected to cult (1 house)

Calculations are based on the number and functions of houses depicted in Andrén's reconstruction plan (see Andrén 2014:75, fig. 23).

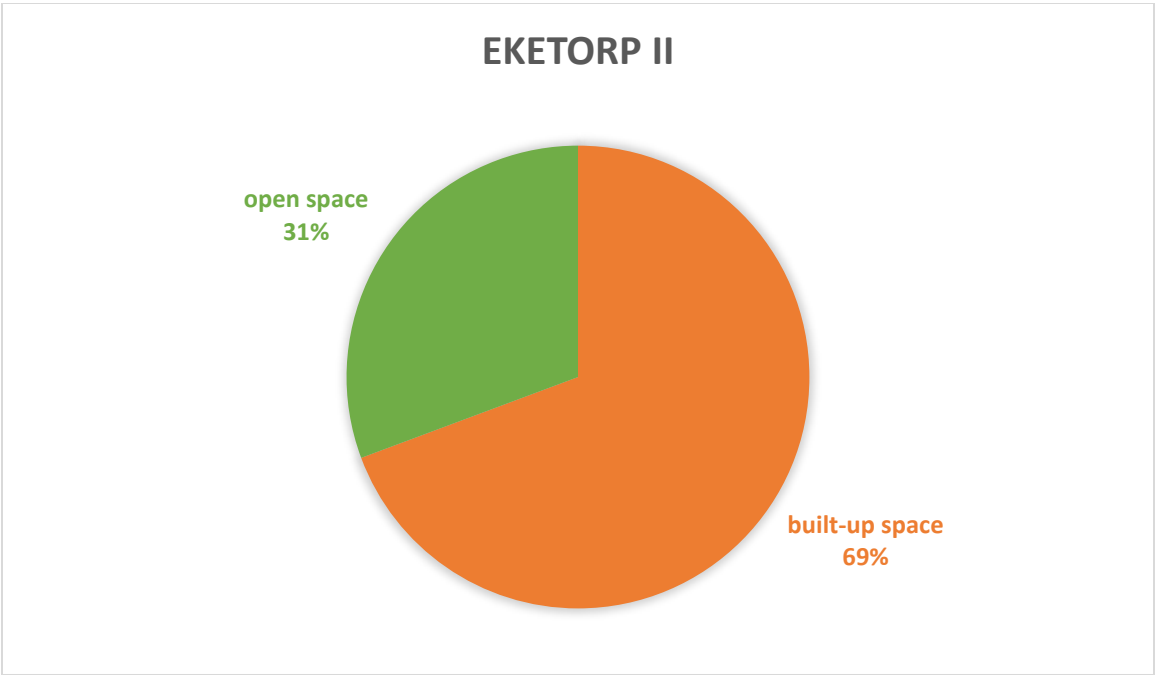
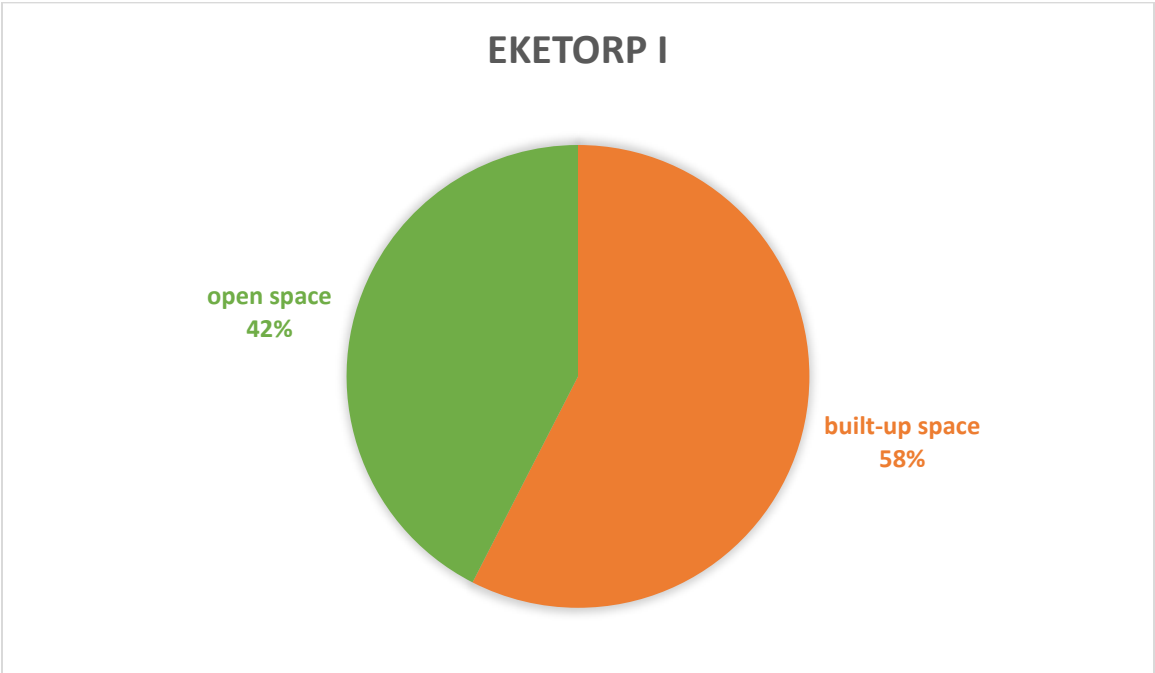
Ismantorp - Phase I (in total 69 houses)

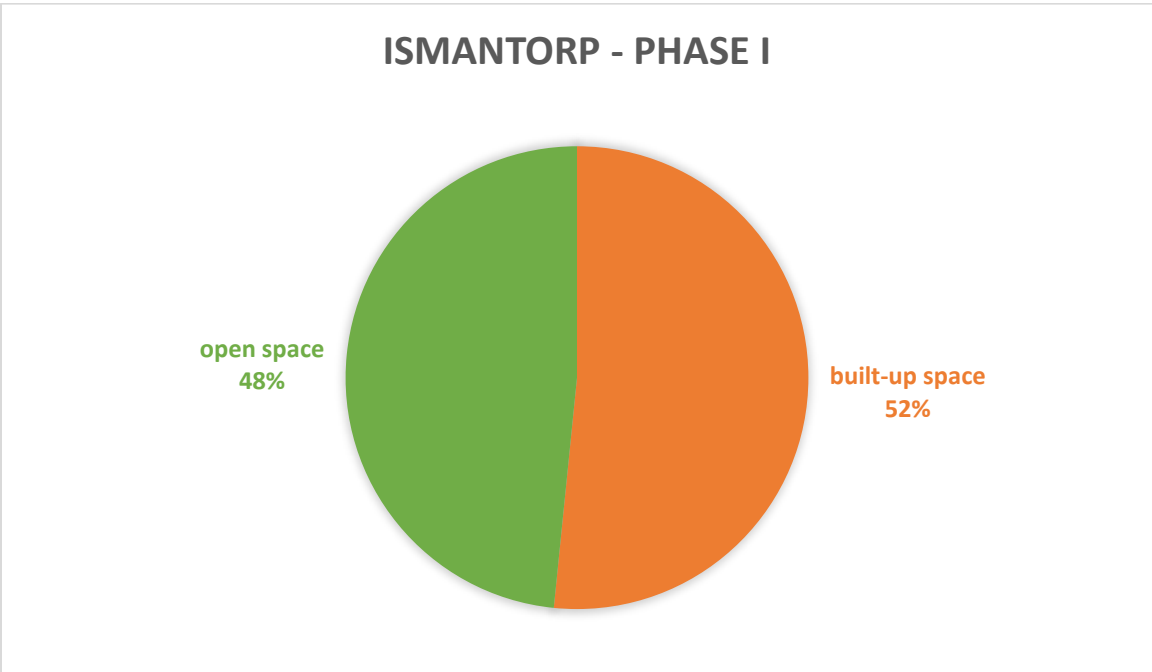
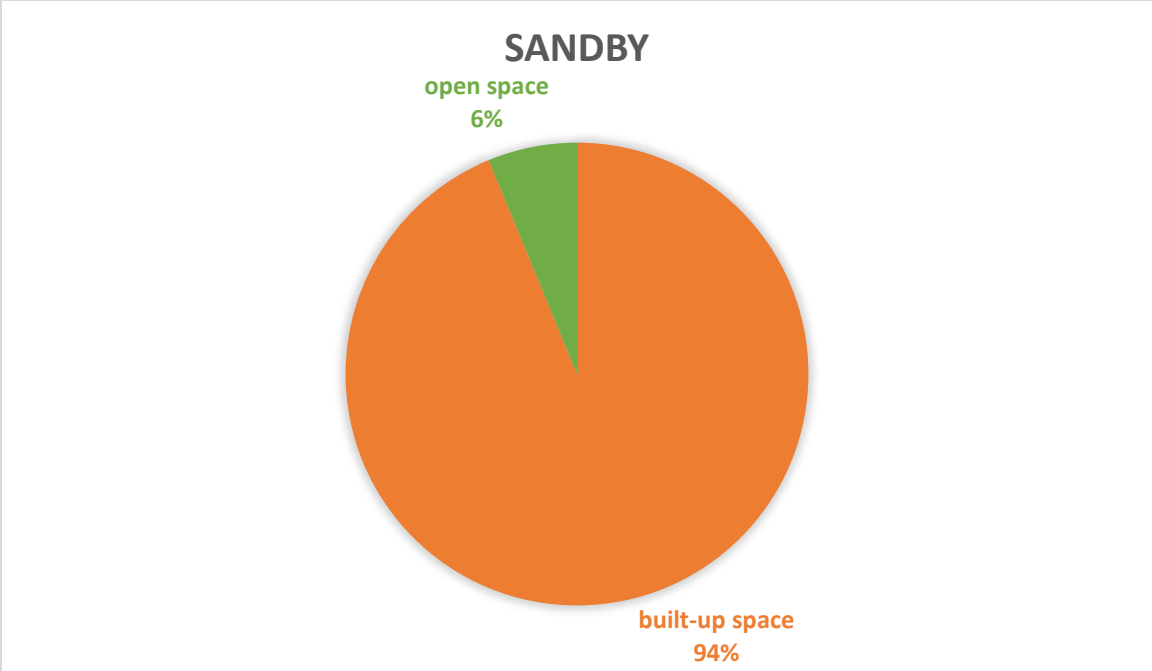


- dwellings and workshops (28 houses)
- special functions, maybe also dwellings? (13 houses)
- byres and stores (27 houses)
- special function, maybe connected to cult (1 house)

Calculations are based on the functions of houses depicted in Andrén's reconstruction plan of the second phase of Ismantorp (see Andrén 2014: 75, fig. 23) which are assigned to the houses depicted in Andrén's reconstruction plan of the first phase of Ismantorp, as well as on the number of houses depicted in the latter plan (see Andrén 2014:74, fig. 22).

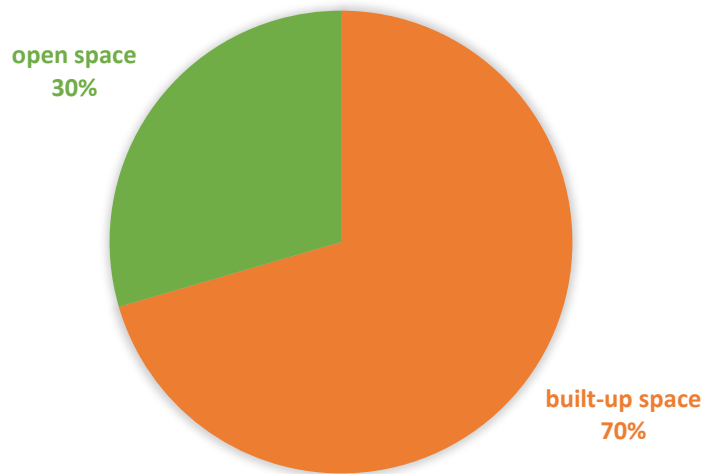
Appendix E – Proportions of built-up and open space in the ringforts Eketorp I, Eketorp II, Sandby, and Ismantorp





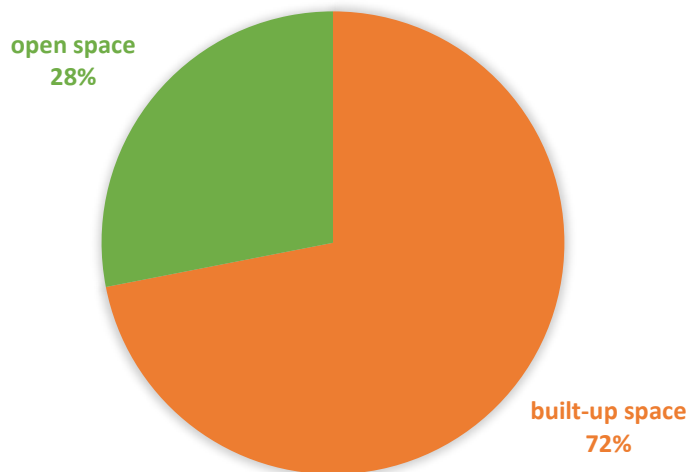
Calculations are based on the number of houses depicted in A. Andrén's reconstruction plan for the first phase of Ismantorp (see Andrén 2014:74, fig. 22).

ISMANTORP - PHASE II, POSSIBILITY 1



Calculations are based on the number of houses given in A. Andrén's text (see Andrén 2014:71 ff.).

ISMANTORP - PHASE II, POSSIBILITY 2



Calculations are based on the number of houses depicted in A. Andrén's reconstruction plan for the second phase of Ismantorp (see Andrén 2014:75, fig. 23).