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Artefacts and bone patterns in stone ship settings on Gotland

Picture of the Rannarve complex in Klinte parish on Gotland.
Photo Anders Gustavsson

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Abstract

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This thesis is an attempt to gather and discuss the archaeological and osteological results that has been found in stone ship settings on Gotland. The bone material from five ship settings, one stone setting and a cairn from the bronze age complex at Rannarve in Klinte parish on Gotland has been osteologically analysed during this study to further expand the osteological results that are available from ship settings on Gotland and try to interpret this site. The aim is to try to find what artefacts and bone patterns that can be distinguished from the material found within ship settings. What patterns can be seen in artefacts, age, sex and burial contexts that has been found in ship settings? What are the most common patterns?

Keywords: Stone ship settings, Gotland, Bronze age, Artefacts, Osteology, Rannarve, Artefact and bone patterns

Abstrakt

Fynd och benmönster i skeppssättningar på Gotland

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Den här uppsatsen är ett försök till att samla och diskutera vilka arkeologiska och osteologiska resultat som påträffats i skeppssättningar på Gotland. Benmaterialet från fem skeppssättningar, en stensättning och ett röse i Rannarve i Klinte socken på Gotland har analyserats osteologiskt för att utöka de osteologiska resultaten som finns tillgängliga för skeppssättningar på Gotland samt för att försöka tolka platsen. Målet är att försöka se vilka föremål och benmönster som går att urskilja från materialet och se vilka mönster som finns mellan fynd, ålder, kön och gravkontext i de olika skeppssättningarna, samt vilka mönster som är de mest vanliga.

Nyckelord: Skeppssättningar, Gotland, Bronsålder, Föremål, Osteologi, Rannarve, Fyndmönster

Content

Acknowledgements

I would like to thank my supervisor Joakim Wehlin who provided me with a lot of literature and archaeological and osteological reports, and for making the maps used in this thesis. All of this has made my work easier. I would also like to thank Sabine Sten who helped me with all aspects of the osteological analysis and Paul Wallin for editing the text and answering questions of all sorts during the process of this thesis.

1. Introduction

The ship setting is a burial form that arose during the late bronze age on Gotland and can be found on several places around the Baltic sea but are the most common on Gotland. In Scandinavia the bronze age spans between 1700-500 BC and is divided into early bronze age (1700-1100 BC) and late bronze age (1100-500 BC). The ship settings vary in size and shape and during excavations some have been found empty while others have contained several burials, with bones found within house urns and with several artefacts. Cremating the dead were the most common funeral rite during this period and therefore most burials in ship settings are cremations (Schnittger 1920, Hansson 1927).

This thesis is a partial continuation of my bachelor thesis where I analysed bones from six ship settings from two locations on Gotland. The bachelors thesis was a purely osteological study whilst this one will try to connect the artefacts and burial contexts of ship settings with the osteological results that the bones from these ship settings have shown. The goals will be to study what artefacts, burial contexts, age groups and sex of the individuals, are the most common in ship settings, and try to see if there are any special groups of the people that can be distinguished from this. The subject of this thesis was suggested to me by doctoral student Joakim Wehlin who is writing his dissertation about ship settings. He has also provided me with a lot of information that has helped me in my work.

Bones from the location at Rannarve in Klinte Parish on Gotland that have five ship settings, one stone setting and a cairn was osteologically analysed during this study to further expand the material of osteologically analysed ship settings on Gotland.

1.1 Purpose and research issues

The purpose of this thesis is to study what kind of archaeological findings connected to cremated bones are the most common in stone ship settings from the late bronze age period on Gotland, and if any of these findings can be considered typical for ship settings in general. The osteological results of the cremated bones will also be analysed to evaluate potential patterns of what parts of the skeleton that has been buried. The archaeological findings and the osteological results will then be compared to see if specific artefacts can be connected to sex or age. Another purpose is to compare the results with other burial forms with archaeological findings and cremated bones from the same period to see if there is anything distinguishing ship settings from other burial forms from the same time.

The aim of the study is as follows:

- **Can a general artefact and bone pattern be distinguished from the material found within stone ship settings?**
- **Which types of artefacts are common with cremated bones in stone ship settings on Gotland?**
- **Is it possible to see any patterns between the artefacts and age/sex of the individuals buried in the ship settings?**
- **Are the results similar to those in other bronze age burials/bone deposits with cremated bones?**

- **What osteological results can the bone material from the bronze age complex at Rannarve show? How can the site be interpreted?**

1.2 Restrictions

The restrictions of this study will be to ship settings on the island of Gotland and to the late bronze age period. In the ships where bones were found in the ship settings, only the cremated bones have been included in the analysis, this is because some ship settings also contain inhumations, but most of these have been dated to early iron age and have been interpreted as secondary burials (Hanson 1927, Wehlin 2012). These inhumations will therefore not be included in this study.

I have also excluded a number of ship settings from the study due to them being plundered or not fully excavated this is further explained below.

1.3 Criticism of the sources

The results from the excavation at Rannarve was never put into a report which have made it hard to know exactly what context some of the bones were found in. Bones from some of the monuments were put into different bags, and the reason for this is not documented anywhere in the excavation notes or on the bags.

Many of the analysed ship settings were excavated in the early 20th century and are therefore not very well documented. Some of Hanson's excavated ship settings were only dug out in the middle of the ships which might mean that finds may have been missed, because sometimes urns have been found between the stones on the edges of the ship settings or in the stem and stern parts.

The amount of bones found during the excavation has also been very poorly documented in the older research. A lot of the time it is only written that burnt bones were found and no indication of how much. This has made some parts of my analysis limited.

2. Earlier research

A lot of research has been done on the subject of ship settings over the years. To make things easier this section will be divided into archaeological research and osteological research. I will also include the different interpretations that has been put forth by these researchers. After that earlier research on the location of Rannarve and similar studies of artefacts will be presented.

2.1 Archaeological excavations and theory

There are more than 350 ship settings on Gotland and a total of 77 of these have been excavated between the years 1875-2011. The first who excavated ship settings archaeologically on Gotland were Sigge Ulfsparre and Gabriel Gustafson during the late 19th century (Hansson 1927:67-70). Later excavators were Harald Hanson and Bror Schnittger early 20th century, Gerdin 1965 and 1973-74, Grimlund-Manneke 1966-67, Englund 1977, Pettersson 1982, Hallin 2004 and Martinsson-Wallin and Wehlin 2010 (Schnittger 1920, Hanson 1927, Gerdin 1979, Grimlund-Manneke 1979, Englund 1979, Pettersson 1982, Hallin 2004, Martinsson-Wallin 2010).

Harald Hanson and Bror Schnittger did a lot of excavations in the early 20th century and Hanson basically laid the foundation for bronze age research on Gotland with his work "Gotlands Bronsålder" in 1927. He also categorised the ship settings into different groups depending on size and type of stones (Hansson 1927:63-67).

Theoretical thought and attempts to interpret the symbolic meaning of the ship in bronze age society have been discussed by Stenberger 1945a, Artelius 1996, Bradley et al 2010 and Wehlin 2010. The ship symbol has long been interpreted as a method of transportation for the dead to the otherworld (Stenberger 1945a:64, Artelius 1996:18). This way of thinking might have come here from the southern parts of Europe (Artelius 1996:64-65) and given rise for a new symbolic world where the ship is depicted both on artefacts, rock carvings and in the form of ship settings. Stenberger believed that the ship settings also represent something more worldly like the meaning of trade and travel in society. He also discusses that those buried in ship settings probably had been people who were a big part of this trade with foreign countries (Stenberger 1945a:64).

Another theory of the ship setting is that it has had a purpose in sun worship where the sun is pulled by a wagon over the sky during the day and by a boat under the sea by night, and the ship setting therefore represents this vessel of the sun, or that all the ship settings represent the path that the sun takes during the day and night (Kaul 1998, Bradley et al. 2010). The ship has also been viewed as a symbolic image of time that transports the world and life forward and in that way makes the seasons of the year (Artelius 1996:18).

Furthermore the ship setting have also been interpreted as having several symbolic purposes in the bronze age society, where different kinds of ship settings had different uses. For example birth and death, meaning that some ships have had ritual purpose when someone was born, whilst other ships were burial sites when someone died. The ships therefore represent both the beginning and the end of life (Wehlin 2010:103).

2.2 Osteological analysis and theory

Of the 77 excavated ship settings there are 27 that have been osteologically analysed on Gotland. These analysis were performed by Sigvallius 1982, 1998 and 1999, Aijä 1982, Sten 1998, Vretemark 2003-04, Malmborg 2004, Blücher 2005 and Eifert 2009, Gustavsson 2011 (Sigvallius 1982, Aijä 1982, Sten 1998, Zerpe 1999, Zerpe 2002, Vretemark 2007, Hallin 2004, Blücher 2005, Eifert 2009, Gustavsson 2011).

The first time cremated bones from ship settings were osteologically analysed on Gotland were in 1982 by Berit Sigvallius where she analysed bones from six ship settings in Rute parish. These contained a total of 20 individuals with up to seven graves in one ship. The results showed that these individuals were males and females both young and adult which led to the conclusion that these must be family graves (Pettersson 1982:112). This also led to that all ship settings were

interpreted as family graves. This interpretation did not really change until 2009 when Lydia Eifert analysed cremated bones from seven ship settings on Gotland which showed that it was more common with fewer individuals in each ship settings (Eifert 2009). I also came to that same conclusion in my bachelor thesis in 2011 where I analysed another six ship settings from Gotland (Gustavsson 2011).

2.3 The Rannarve complex

The burial complex at Rannarve was excavated in 1966-67 by Gunilla Manneke but no report was ever published. No osteological analysis has been performed before on the bone material found during the excavation. Not much further research seems to have been undertaken on the location at Rannarve. The only other work found on this subject was a bachelor thesis written in 2004 by Fredrik Johansson at Gotland University (Johansson 2004).

2.4 Earlier analysis of bronze age artefacts

Some works that have written on the subject of artefacts from the bronze age are Ohlmarks 1945, Pettersson 1982, Kaliff 1997, Thedéen 2004 and Karlenby 2011 to mention a few. Ohlmarks discusses that the objects like tweezers and razor that he refers to as "the toilet articles" had a religious purpose rather than a practical one. These artefacts were used in rituals like preparing the dead before the cremation. Similar theories are discussed by Thedéen in her dissertation where she has analysed artefacts from bronze age cairns in Södermanland and Uppland in Sweden. She comes to a conclusion that the objects razor, tweezers, double stud and knife were the possessions of a individual in society that had a specific ritual role that included rituals like birth, manhood trials and death (Thedéen 2004:116-127).

3. Material

The material of this study consists of the Gotlandic ship settings, from which a number of ships have been chosen to be included in the analysis, this will be explained more below. Furthermore the burial complex at Rannarve in Klinte parish on Gotland will be studied and the bone material from the monuments there have been osteologically analysed and will later be interpreted archaeologically.

3.1 Gotlandic ship settings

There are 77 ship settings on Gotland that have been excavated between circa 1875 until 2011. During that time 27 of these have been osteologically analysed, not including the ones analysed in this thesis. In this study, the ship settings that have been plundered and those not fully excavated have been excluded from the analysis. This has left 54 ship settings that are included in the analysis, also six of the plundered ship settings that were removed have been used to compare their osteological results, because the bones that were left after they had been plundered still have some osteological value. However, it is unknown what the burial context looked like before it was plundered, therefore these six ships have not been used in the comparison made of the artefacts and

burial contexts. It is only the cremated burials in the ship settings that have been used in the analysis. There are several cases of inhumation burials in ship settings, but these are usually secondary burials from early iron age and have therefore not been included. Below is a map of Gotland showing the ship settings included in the analysis, see Figure 1.

Figure 1: Map over Gotland with the coastline at 4000 BP showing the analysed ship settings. The plundered ship settings that were used solely for their osteological results are marked as triangles. Made by Joakim Wehlin.

3.2 Rannarve Klinte parish

The burial complex at Rannarve in Klinte parish consist of five ship settings, one stone setting (which may also be a ship setting) and one small cairn. Four of the ship settings are positioned in a line, ship 5, the stone setting and the cairn is located 6 metres south-east of ships 1-4, see Figure 2.

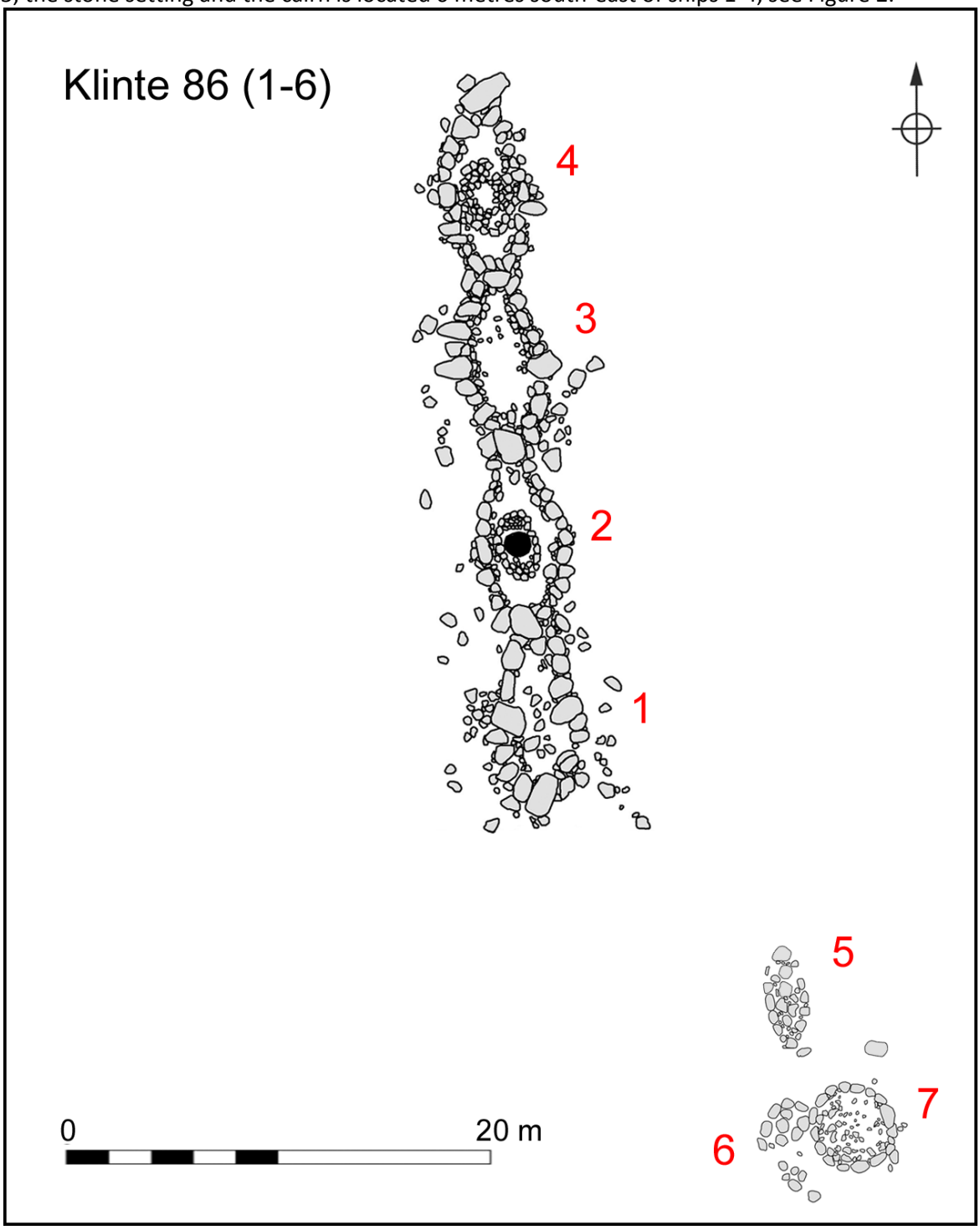

Figure 2: Map showing the Rannarve complex with the original numbers of each monument from the excavation. From Wehlin in press. Monumentala stenskepp och diskreta landskap

In the notes from the excavation the different monuments were named feature 1-7, see Figure 2, where 1-5 was ship setting 1-5 and feature 6 was the stone setting, and feature 7 was the cairn. In this study they will simply be called ship setting 1-5, stone setting and cairn.

The complex was excavated and restored in 1966-1967 by Gunilla Manneke. No report has been published, therefore the documentation of the site is somewhat limited. I have had access to the original notes and plans from the excavation and the following presentation is based on those notes. I have also had access to the archaeological finds that was found in the monuments at Rannarve.

The excavation
The four ship settings are all together about 35 metres long and individually around 8-9 metres long and 5 metres wide. A rectangular area around all the ships was excavated and all the monuments were examined and later restored. All the ships, the stone setting and the cairn were excavated completely. What was found in each monument is presented below.

Ship 1
The ship was filled with stones 10-30 cm in size. Placed about 30 cm under the first layer of stones was an area north-north-east of the middle of the ship measuring about 70x70 cm containing some smaller and bigger pieces of charcoal and also small amounts of burnt bones was found. All together about 0,3 l of charcoal was collected and about 0,1 l of burnt bones.

Ship 2
The ship was filled with stones measuring 5-40 cm in size mixed with sand. In the bottom layer of these stones an oval shaped stone formation was found in the middle of the ship with stones measuring about 20 cm in size. In the middle of this was a large granite stone slab, 60x75 cm in size. Underneath this slab was a square stone cist with a house urn in the middle. The urn had a diameter of circa 30 cm and contained burnt bones mixed with sand, also two miniature knives were found within the urn. The ship also contained 27 pieces of flint.

North-east of ship 2 was an area of about 3,5x2 m that contained about 40 pieces of flint scattered among smaller rocks. This area was in the excavation notes called feature 2B. On the excavation plans this area was written out as "Verkstan" (the work shop), but nothing is mentioned about this interpretation in the notes.

Ship 3
The ship was filled with layers of 10-40 cm sized stones mixed with sand. In the middle of the ship in an area of 2x1 m some scattered burnt bones and charcoal was found. East of this area about 40 pieces of flint were also found. All together about 0,5 l of burned bones and 0,75 l of charcoal was found in this ship.

Ship 4
The ship was filled with 10-40 cm sized stones mixed with sand. In the middle of the ship an oval shaped stone formation was observed. In the middle of this formation there was an area of 1x0,8 m that did not have any stones, a red sandstone slab was located two metres east of the ship that fitted this empty area. The soil in this area first contained a layer of sand and underneath that, dark soil mixed with sand which contained a small amount of burnt bones and charcoal, all in all circa 0,1 l.

No interpretation was made by the excavators concerning if this ship might have been plundered or not, and that this area might be a destroyed grave. No such discussion was raised in the excavation notes. The area in the middle of ship 4 looked very similar to the area in the middle of ship 2 though, see Figure 3. The middle part of ship 2 contained the house run with burnt bones, maybe ship 4 had a similar burial at some point? Although this is unknown at this time, and one might think that if ship 4 was plundered then maybe ship 2 should have been plundered as well, which is not the case.

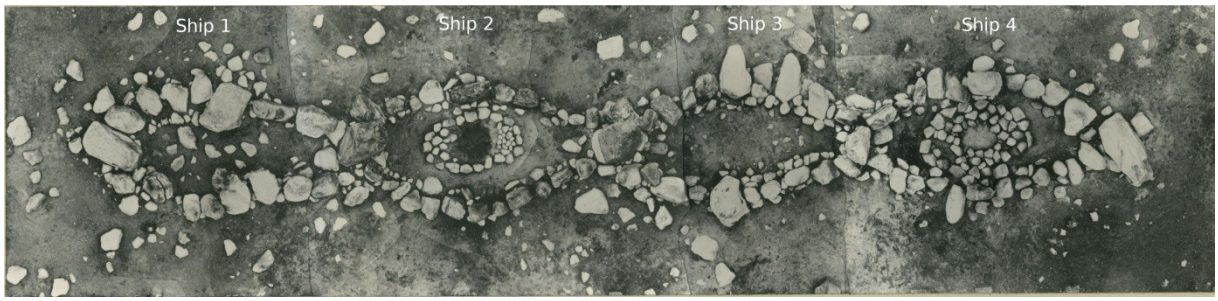

Figure 3: Ship setting 1-4 during the excavation at Rannarve in Klinte parish on Gotland. Ship 1 is to the far left and ship 4 to the far right. From Grimlund-Manneke 1979.

Ship 5

The ship was 5 m long and 2, 75 m wide and had a dark coloured area of soil about 2,4-0,8-1 m in size and a depth of 0,4 m. Here flint was found and a layer of soot mixed with around 20 small pieces of burnt bones. More flint was found in other areas inside and outside of the ship.

The stone setting

It is a bit unclear what was found in the stone setting because it is not mentioned that much in the notes, but from the list of finds the only things they seem to have found was 6 pieces of flint. This monument was also discussed as being a possible ship setting, see Figure 4.

The Cairn

The cairn was about 4,5 m in diameter and had a considerable amount of flint that was found scattered around the monument. In the centre of the cairn there was a stone cist with a ceramic urn in the middle. The urn contained burnt bones, a razor, awl, and a bronze bar.

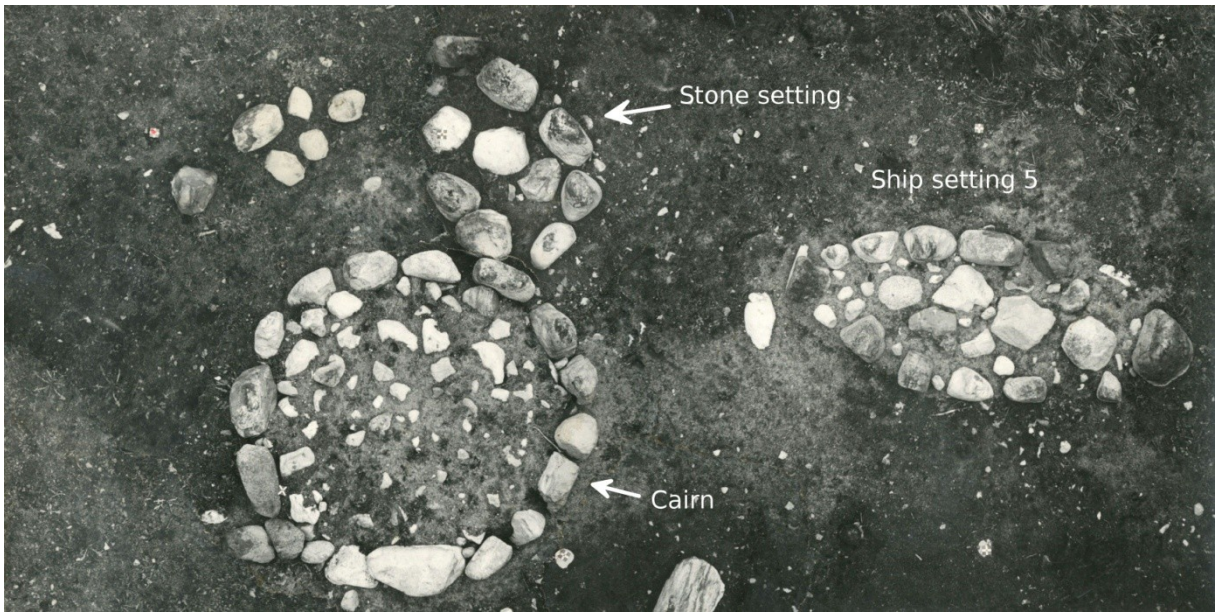

Figure 4: Ship 5, the stone setting and the cairn in Rannarve, Klinte parish on Gotland. Photo G & P Manneke

4. Methods

4.1 Archaeological methods

The collection of data on the different ship settings have been gathered from the archaeological and osteological reports from each excavation (when reports have been available), also information from Statens historiska museum (SHM) and Fornminnesregistret (FMIS) have been used to some degree. These reports and all the "SHM inventarienummer" were given to me by Joakim Wehlin. All this data has later been summed up in different tables from which the results in this thesis is presented.

4.2 Osteological methods

The bone material was cremated bones meaning that the osteological methods that are applicable are somewhat limited due to the severe fragmentation of the bones. The methods that were able to be used on the Rannarve material are presented below.

The osteological laboratory at Gotland University was used during the analysis and the reference material there was used to determine the different fragments of bones.

4.2.1 Age assessment

Due to the fragmentation of the bones reliable age assessments are very hard to do, therefore wide age intervals have been used after Sjøvold (1978), see Table 1. The age assessment methods that have been used are those studying the epiphysis fusing. This has been used both on the human individuals where data from Scheuer & Black (2000) has been used, and for the animals data from Schmid (1972:75) was used.

Table 1: Age intervals after Sjøvold 1978

Term	Age interval
Infant	1 Year
Infans 1	0-7 years
Infans 2	5-14 years
Juvenilis	10-24 years
Adultus	18-44 years
Maturus	35-64 years
Senilis	50-89 years
Adult	>20 years

These terms for the different age groups have been used in the text and in some of the tables. Also when an individual has been assessed to "adult" that means that no closer age assessment, beside from being a grown up, could be made and that the individual can be any age older than 20 years old.

4.2.2 Sex assessment

The ability to determine sex on cremated individuals is mostly very limited and requires several preserved characteristics on the bones to be reliable, which very rarely is the case with cremated bones. In this analysis some bones have been available for sex assessment and the methods that have been used are from Bukistra & Ubelaker (1994) on the cranium where they use a five grade scale on different characteristics on the skull to determine the most likely assessment.

Grade 1 = Female (Clearly female)
Grade 2 = Female? (Possible female)
Grade 3 = ? (The characteristics cannot be determined to any sex)
Grade 4 = Male? (Possible male)
Grade 5 = Male (Clearly male)

In the tables presented below these grades have been shortened and termed as F, F?, ?, M? and M. (F=Female and M=Male).

One other method was used for sex assessment and that was measurements on the second vertebrae (Dens axis) that was developed by Wescott (2000). The measurements that were taken were DTS = Dens transverse diameter and DSD = Dens sagital diameter, anterior-posterior max diameter because these were the only ones still preserved.

4.2.3 Degree of cremation

The temperatures during the cremation was also documented by using a scale of degrees, see Table 2, based from a colour chart according to Schmidt & Symes (2008) which present the colours of bones at different temperatures during cremations. Also changes in the bone structure have been used in that scale according to Holck (1997:94-100).

Table 2: Table showing the different degrees of cremations based of a colour chart from Schmidt & Symes (2008) and Holcks (1997) descriptions of surface structure.

Degree	Temperature (C°)	Colour	Structure
0	100°-200°	Brown, yellow, orange	Unburned appearance but show signs of being burnt
1	200°-400°	Black	
2	400°-700°	Beige, dark gray, greyish-blue	Cracks starts to appear. Although no mark will appear from scraping of the bone.
3	700°-1100°	Light gray, white	Marks will appear from scraping
4	>1100°	White	Chalk like structure and very fragile

4.2.4 Minimum number of individuals (MNI)

Minimum number of individuals is a method used to calculate the minimum number of identified individuals in a grave. This is done looking at the identified bone elements and searching for duplicates that indicates that there are more than one individual. Differing sizes of the same bones or signs of differing age can also indicate several individuals.

In this analysis MNI has been calculated for every bag of bones. When there have been several bags of bones from the same burial context, then MNI has also been calculated for all the bags together.

4.2.5 Documentation

During the analysis weight (grams) and volume (litres) has been taken on each bag of bones. The biggest fragment has been measured and an average bone size for every bag has been roughly calculated. The amount of bones has also been counted and documented in the list of bones. The list of bones can be viewed in appendix 5.

During the analysis and in the list of bones I define a determined bone fragment as determined species, bone element and part of that bone. I also divide the undetermined bones into categories such as "Undetermined long bones", "Undetermined cranium", "Undetermined vertebraes" and the bones that are completely undetermined are documented simply as "Undetermined". This categorisation is made for both humans and animals. When calculating the number of identified fragments in each bag I only include the fully determined bone fragments, and not any of the undetermined categories, even though some of them are partially determined.

In the analysed material bones from sheep/goat was found. This is termed sheep/goat because the bones from sheep and the bones from goat are very similar and very hard to differentiate unless specific bone elements are found. Therefore in the text and the list of bones when sheep/goat is written that means that it is uncertain if the bone is from a sheep or a goat.

4.2.6 Represented body parts

For every bag of bones the identified bone elements have been put together to see if all the different parts of the body are represented in the remains. This has been done on both the human individuals and the animals. This can help to determine if it is likely that a complete individual has been buried or if some parts of the body are missing. With animals for example this can reveal if a complete animal has been buried alongside the human or if just certain pieces of meat has been given to the dead on the funeral pyre.

4.2.7 Criticism of the osteological methods

It is very difficult to make a reliable sex assessment on cremated bones and good, well preserved characteristics are needed on the bones to do so. In this case it should also be mentioned that it is, in a way, easier to identify males from the bones, because male characteristics stands out more, especially on the cranium. Whilst female characteristics are usually the absence of male characteristics. This is why it is easier to be certain about a male sex assessment than a female assessment. The pelvis is best for sex assessments but it is in my experience rarely found well preserved in cremated remains. Therefore it will always be harder to make proper assessments on cremated bones and the results will always be more limited. Other assessments like age assessments has the same difficulties and reliable age assessments are also hard to perform.

5. Results Rannarve

This section will present the osteological results of the analysis of the cremated bones from the Rannarve complex in Klinte parish on Gotland. After that the archaeological finds that was found in the Rannarve monuments will be presented. The results from the osteological analysis is summed up in the discussion but a more detailed description of the bone material will be presented here.

The different monuments will here be presented in order, with the five ship settings presented first and after that the cairn. The stone setting did not contain any bones and will therefore not be included here. The Bnr-numbers mentioned in the text refers to the numbers on the different bags of bones. Each bag was analysed separately and will also be presented that way. There are bags 1-13 and they will be presented in that order. In the table below are the weight and number of bones in each bag of bone and the percentage of identified fragments, see Table 3.

Table 3: Table showing the weight and number of bones of each bag of bone from the Rannarve material. The percentage of number of identified fragments and weight of the identified fragments is also presented.

Monument	Bag number	Number of fragments	Weight (g)	Number of identified fragments (Percent)	Weight identified fragments (Percent)
Ship 1	Bnr: 1	73	19,5	2 (2%)	1 (5%)
Ship 2	Bnr: 2	1544	1405	212 (14%)	308 (22%)
	Bnr: 3	281	147	10 (3%)	20 (14%)
	Bnr: 4	639	334	29 (4%)	22 (6%)
Ship 3	Bnr: 5	633	189	49 (8%)	25 (13%)
	Bnr: 6	257	85	0 (0%)	0 (0%)
Ship 4	Bnr: 7	27	3,5	0 (0%)	0 (0%)
Ship 5	Bnr: 8	32	8,5	0 (0%)	0 (0%)
The cairn	Bnr: 9	24	1,5	1 (4%)	1 (4%)
	Bnr: 10	38	3	2 (5%)	1 (33%)
	Bnr: 11	247	81,5	4 (2%)	4 (5%)
	Bnr: 12	5592	1581	121 (2%)	68 (4%)
Unknown	Bnr: 13	17	2	1 (6%)	0,5 (25%)

The entire bone material was cremated and the degree of cremation will be presented. This refers to the estimated temperature during the cremation based from colour and surface structure of the bone. Most of the material from Rannarve looked similar in colour, structure and size of the fragments. Figure 5 shows what most of the bone fragments looked like.

Figure 5: Cremated bones from ship setting 2 in Rannarve. Photo: Anders Gustavsson

I have described the colour of the bones in Figure 5 as beige. As people's perception of colours is a bit different from person to person, hopefully this picture will give a better insight to the description of colours in the text below.

The combined amount of bones in each monument is presented in Table 4. Ship 2 and 3 and the cairn had bones divided into different bags. It is unclear why these bones have been separated, it is not mentioned in the excavation notes. During the analysis these have been analysed separately.

Table 4: Table showing the weight and volume distribution of the bones in the different features at Rannarve. The weights and volume for feature 2 and 3, which had several bags of bones, have been added together into one weight and one volume in this table.

Monument	Weight (gram)	Volume (litre)
Ship 1	19,5	<0,1
Ship 2	1886	3,3
Ship 3	274	0,5
Ship 4	3,5	<0,1
Ship 5	8,5	<0,1
Stone setting	0	0
Cairn	1667	2,45

5.1 Osteological analysis of Rannarve Klinte parish

5.1.1 Ship setting 1

Ship 1 only contained a small amount of bones which consisted of one bag.

Bnr: 1

This bag contained 73 fragments of bones and only two could be identified. Table 5 shows the compiled osteological results for this bag.

Table 5: Table showing the compiled results from Bnr: 1

Human	1 individual	**Weight**	19,5 gram
Sex	-	**Volume**	<0,1 l
Age	-	**Biggest fragment**	3,4 cm
Animals	-	**Average fragment size**	0,5-2 cm
Degree of cremation	2 (400°-700°)	**Identified fragments (fragments/weight)**	2% / 5%
Identified bone elements	Cranium, teeth		

Identification

The two identified fragments were identified as human cranium and the root from a human tooth. No other species were identified.

MNI

There are no signs that there could be more than one individual in this bag.

Age assessment
No age assessment could be made from the fragments.

Sex assessment
No sex assessments could be made on the fragments.

Fragmentation and degree of cremation
The fragmentation of the bones was between 0,5-2 centimetres. The colour of the bones were mostly beige and had small cracks. The degree of cremation was therefore determined to grade 2 (400°-700° C).

5.1.2 Ship setting 2

The second ship setting at Rannarve had three bags of bones. No markings on the bags said if they all were from the house urn or not, but they have been analysed separately and also presented that way.

Bnr: 2

There were about 1544 fragments in this bag and 212 fragments were identified. Table 6 shows the compiled osteological results for this bag.

Table 6: Table showing the compiled results from Bnr: 2

Human	1 individual	**Weight**	1405 gram
Sex	-	**Volume**	2,5 l
Age	Adult	**Biggest fragment**	11,5 cm
Animals	-	**Average fragment size**	2-5 cm
Degree of cremation	2 (400°-700°)	**Identified fragments (fragments/weight)**	14% / 22%
Identified bone elements	Cranium, mandible, vertebraes, ribs, scapula, clavicle, humerus, ulna, radius, carpus bone, metacarpus bones, phalanges (hand), pelvis, femur, shinbone, calf bone, metatarsal bones, metapodium		

Identification
A lot of the fragments could be identified in this bag and at least one adult human individual could be distinguished from the bones. Bones from all parts of the body were identified. No other species were identified.

MNI
There are no signs that there could be more than one individual in this bag.

Age assessment
The individual was an adult at least older than 20 years. This assessment was made from that the vertebras were completely fused. Also eight of the cranium fragments had preserved sutures, and three of these hade signs of starting to close up , although it is unclear which suture these are so it is hard to make an age assessment on that.

Sex assessment
The only sex assessment that could be performed was through measurements on the second vertebrae on the *dens axis*, see Table 7.

Table 7: Measurement (mm) of the second cervical vertebrae (Axis) from Bnr: 2. DTD = Dens transverse diameter. DSD = Dens sagital diameter, anterior-posterior max diameter. sd = standard deviation. Method after Wescott (2000).

Bone (Part)	Target area	Measurement	Average for men	Average for women	sd
Axis (Dens axis)	DTD	8,7	10,37	10,02	1,16
Axis (Dens axis)	DSD	9,6	11,48	10,78	0,94

The measurements were smaller than those of the average for women based on the data from Wescott (2000). The small value may partially be caused by shrinkage due to the cremation, but it leans to being a bit more of a female value. Although due to this being the only bone in this bag used for sex assessment, it is still uncertain if the individual was female or male.

The sex assessment is therefore undetermined.

Fragmentation and degree of cremation
The fragmentation of the remains varied and there were some rather well preserved bones but also a lot of severely fragmented. The average size ranged from 2-5 centimetres. The majority of the bones had a beige colour and had a lot of cracks. The degree of the cremation was therefore determined to grade 2 (400°-700° C).

Bnr: 3
There were about 281 fragments in this bag and only 10 were identified. Table 8 shows the compiled osteological results for this bag.

Table 8: Table showing the compiled results from Bnr: 3

Human	1 individual	**Weight**	147 gram
Sex	-	**Volume**	0,3 l
Age	Adult	**Biggest fragment**	5,2 cm
Animals	-	**Average fragment size**	1-2 cm
Degree of cremation	2 (400°-700°)	**Identified fragments (fragments/weight)**	3% / 14%
Identified bone elements	Cranium, vertebraes, scapula, phalanges (hand), ribs		

Identification
Remains from one adult human individual were identified in this bag. The parts of the body that were identified were cranium, shoulders, torso and hands. Bones from the arms, pelvis, legs and feet were missing.

No other species were identified.

MNI
There are no signs that there could be more than one individual in this bag.

Age assessment
The individual was assessed to being an adult, older than 20 years, based on a fused *corpus* on a vertebrae.

Sex assessment
One fragment of the cranium (*Margo supraorbitalis & Glabella*) was used for sex assessment. Both were determined to be "Female?". These characteristics can however vary a lot between individuals and between different groups of people. Therefore there is an uncertainty to this assessment. It would be necessary to have more fragments with sex characteristics to be sure.

The sex of the individual in this bag is therefore undetermined.

Fragmentation and degree of cremation
The average fragment size ranged between 1-2 centimetres. The colour of the bones were mostly beige and the degree of cremation was determined to grade 2 (400°-700° C).

Bnr: 4

There were about 639 fragments in this bag and 29 were identified. Table 9 shows the compiled osteological results for this bag.

Table 9: Table showing the compiled results from Bnr: 4

Human	1 individual	**Weight**	334 gram
Sex	-	**Volume**	0,5 l
Age	Adult	**Biggest fragment**	7 cm
Animals	Dog/Fox, Sheep/Goat	**Average fragment size**	1-3 cm
Degree of cremation	2 (400°-700°)	**Identified fragments (fragments/weight)**	4% / 6%
Identified bone elements	Cranium, carpus bone, phalanges (hand), tarsal bone, phalanges (foot) **Dog/Fox:** Mandible, ulna, carpal bones (hand), humerus, metacarpal bone, baculum, patella, pelvis, tarsal bone. **Sheep/Goat:** Tarsal bone		

Identification
Three species were identified in the bag, remains from at least one human individual, one dog/fox and one sheep/goat. The bag also contained some small pieces of charcoal, the bones were not coloured black on the surface from this though.

The identified parts of the human were cranium and phalanges and carpal bones from the hands and feet. No other parts of the body were identified.

MNI
There are no signs that there could be more than one human individual in this bag.

Age assessment
The human individual was assessed to being an adult, older than 20 years, based on that there were no signs that this could be a younger individual. The sizes of the bones looked to be those of an adult. All the bones that had a preserved epiphysis surface were fused, these were only phalanges though which fuse around 13-16 years of age.

Sex assessment
No sex assessments could be made on the human fragments.

Animals
Dog/Fox
The bones from the dog/fox could not be distinguished to be either dog or fox, and because the bones seemed to be the same size as a fox, the animal was determined to be either a fox or a dog in the same size as a fox. One measurement was taken on the second metatarsal bone on the proximal end to see if it was close to those measurements that have been made on foxes by Ratjen & Heinrich (1978). The measurement was at around the measurements taken by Ratjen & Heinrich on foxes, so the animal can very well be a fox, but it can't be excluded that it may also be a dog.

The parts of the body that were represented from the dog/fox was the cranium, front and back feet, pelvis and some smaller fragments of the front and back legs. Parts from the torso and from most of the long bones were not found. *Os baculum* (the penisbone) was found which determines the animal to have been male. The age of the animal was determined to older than one year from a fused proximal ulna.

Sheep/Goat
Only one fragment was identified from the sheep/Goat and it was a fragment of a tarsal bone (*Talus)*.

Fragmentation and degree of cremation
The average fragment size was 1-3 centimetres. The colour was mostly beige and the bones had cracks. The degree of cremation was determined to grade 2 (400°-700° C).

5.1.3 Conclusion Ship setting 2
Assuming that all the bones from the different bags came from the same context, then the interpretation of ship setting 2 is that it contained one human adult individual. No signs have been found that there might be more than one individual. Two bones could be used for a sex assessment and both leaned towards female, but the determination is still uncertain because more bones with sex characteristics are needed for a reliable sex assessment. Most reliable would be the pelvis, but no parts of the pelvis could be used in the sex assessment. So the sex of the individual is therefore undetermined.

The remains of one male, probably adult, dog/fox were also identified. So ship setting 2 contained at least one adult human individual and at least one dog/fox.

If the bones however came from different contexts, which is uncertain, then the bags needs to be treated separately. Although I find it unlikely that the bones came from different contexts. It should probably have been mentioned somewhere in the excavation notes if that was the case. No clear evidence was found that the bones in the different bags could be from different individuals.

5.1.4 Ship setting 3
There were 2 bags of bones from ship setting 3. There was no documentation about if these bags came from the same context or not, therefore they have been analysed separately.

Bnr: 5

There were about 633 fragments in this bag and 49 were identified. Table 10 shows the compiled osteological results for this bag.

Table 10: Table showing the compiled results from Bnr: 5

Human	1 individual	**Weight**	189 gram
Sex	-	**Volume**	0,3 l
Age	-	**Biggest fragment**	4,1 cm
Animals	Dog, Sheep/Goat	**Average fragment size**	1-2 cm
Degree of cremation	2 (400°-700°)	**Identified fragments (fragments/weight)**	8% / 13%
Identified bone elements	**Human:** Phalanges (hand), phalanges (foot), ribs. **Dog:** Cranium, upper jaw, mandible, vertebraes, thigh bone, pelvis. **Sheep/Goat:** Metatarsal bones, tarsal bone, phalanges, metapodium		

Identification

Three species were identified in this bag: human, dog and sheep/goat. The identified human bones were two phalanges, one from the hand and one from the foot. Most of the bones in this bag were not human remains.

MNI

There are no signs of there being more than one individual of each species in this bag.

Age assessment

The human phalanges were fused which they do at the age of 13-16 years, so the individual was at least older than 13, but no better age assessment could be made than that.

Sex assessment

No sex assessment could be made on any of the human fragments.

Animals

Dog

Of the identified fragments 30 of them were from the dog, so the majority of the identified bones in this bag were from the dog. The bones were bigger than those from a fox, so therefore it was determined to be a dog. There were bones identified from the cranium, spine, pelvis and thigh bone.

The vertebraes of the animal had fused which gives it an adult age older 1 ¾ years. The sex could not be determined.

Sheep/Goat

Of the identified fragments 15 of them were from the sheep/goat. All of the bones were from the feet of the animal. Some of the them were unfused which gives the animal a young age at around 6-9 months when it died.

Fragmentation and degree of cremation

The average fragment size ranged from 1-2 cm. The degree of cremation was determined to grade 2 (400°-700° C) and the colours of the bones were beige and brownish.

Bnr: 6

There were about 257 fragments in this bag and none could be identified. Table 11 shows the compiled osteological results for this bag.

Table 11: Table showing the compiled results from Bnr: 6

Human	-	**Weight**	85 gram
Sex	-	**Volume**	0,2 l
Age	-	**Biggest fragment**	3,8 cm
Animals	-	**Average fragment size**	1 cm
Degree of cremation	2 (400°-700°)	**Identified fragments (fragments/weight)**	0% / 0%
Identified bone elements			

Identification

No species could be definitely identified in this bag but one bone looked to be a vertebrae from a sheep/goat, but no other fragments in this bag showed evidence of a sheep/goat. Some of the bones could be distinguished as cranium and long bones but undetermined species. Some of the long bones possibly be human, but nothing was evident.

The bag also contained some pieces of charcoal, the bones were not discoloured black on the surface from this though.

MNI

Due to no identified species, no MNI could be calculated.

Age assessment

No age assessments could be made.

Sex assessment

No sex assessments could be made.

Fragmentation and degree of cremation

Average size of the bone fragments were around 1 cm and the biggest were 3, 8 cm. The colours of the bones were mostly beige and the degree of cremation was determined to grade 2 (400°-700° C).

5.1.5 Conclusion ship setting 3

Due to the lack of results from the second bag from this ship, the results of ship setting 3 are basically the same as those presented under Bnr: 5: One human individual, which only consisted of two bones, with undetermined age and sex. The most part of the bone material in this ship were bones from the dog and the sheep/goat.

5.1.6 Ship setting 4

Ship setting 4 only contained a small amount of bone in one bag.

Bnr: 7

There were about 257 fragments in this bag and none of them could be identified. Table 12 shows the compiled osteological results for this bag.

Table 12: Table showing the compiled results from Bnr: 7

Human	-	**Weight**	3,5 gram
Sex	-	**Volume**	<0,1 l
Age	-	**Biggest fragment**	2,1 cm
Animals	-	**Average fragment size**	0,5-1 cm
Degree of cremation	1-3	**Identified fragments (fragments/weight)**	0% / 0%
Identified bone elements			

Identification

The bones in this bag were very small and none of them had any characteristics that made them identifiable. Thereby all the fragments in this bag were undetermined.

Most of the bones were discoloured black by what seemed to be charcoal.

MNI

Due to no identified fragments, no MNI could be calculated.

Age assessment

No age assessment could be made.

Sex assessment

No sex assessment could be made.

Fragmentation and degree of cremation

The colours of the bones were mixed, some black, beige, brown and a few white. The degree of cremation was hard to determine and seem to range from grade 1-3.

5.1.7 Ship setting 5

Ship setting 5 only contained a small amount of bone in one bag.

Bnr: 8

There were about 32 fragments in this bag and none of them could be identified. Table 13 shows the compiled osteological results for this bag.

Table 13: Table showing the compiled results from Bnr: 8

Human	-	**Weight**	8,5 gram
Sex	-	**Volume**	<0,1 l
Age	-	**Biggest fragment**	1,7 cm
Animals	-	**Average fragment size**	1 cm
Degree of cremation	2 (400°-700° C)	**Identified fragments (fragments/weight)**	0% / 0%
Identified bone elements			

Identification
No species could be identified in this bag. Only fragments of cranium and long bones from an undetermined species were identified.

Some of the bones had a discolouration of charcoal, but not on all of the fragments.

MNI
Due to no identified fragments, no MNI could be calculated.

Age assessment
No age assessment could be made.

Sex assessment
No sex assessment could be made.

Fragmentation and degree of cremation
The bones in this bag were very small and the average size was around 1 cm. The colours of the bones were mostly beige, with some black and some white. The degree of cremation was determined to grade 2 (400°-700° C) due to the majority of the beige fragments.

5.1.8 The cairn

Four bags of bones were from the cairn. It is unknown if these are from the same context or not, and there was nothing written about it in the excavation notes.

Bnr. 9

There were about 24 fragments in this bag and only one could be identified. Table 14 shows the compiled osteological results for this bag.

Table 14: Table showing the compiled results from Bnr: 9

Human	1 individual	**Weight**	1,5 gram
Sex	-	**Volume**	<0,1 l
Age	-	**Biggest fragment**	1,5 cm
Animals	-	**Average fragment size**	<1 cm
Degree of cremation	2-3	**Identified fragments (fragments/weight)**	4% / 4%
Identified bone elements	Teeth		

Identification
There was a very small amount of bones in this bag and they were also very fragmented. One root from a human tooth could be identified. There were also four other roots from teeth but they were too fragmented to be determined to any species. Some long bones were also found but undetermined species.

No other species could be identified.

MNI
No signs of there being more than one human individual in this bag.

Age assessment
No age assessment could be made.

Sex assessment
No sex assessment could be made.

Fragmentation and degree of cremation
The fragmentation was very severe and most bones were smaller than 1 cm. The degree of cremation was hard to determine due to there being very few bones and varying colours, but most of the bones were beige in colour and were determined to grade 2. There were also some fragments that were harder burnt and were determined to grade 3.

Bnr: 10

There were about 38 fragments in this bag and only 2 could be identified. Table 15 shows the compiled osteological results for this bag.

Table 15: Table showing the compiled results from Bnr: 10

Human	1 individual	**Weight**	3 gram
Sex	-	**Volume**	<0,1 l
Age	-	**Biggest fragment**	1,6 cm
Animals	-	**Average fragment size**	<1 cm
Degree of cremation	2-3	**Identified fragments**	5% / 33%
Identified bone elements	Phalanges (hand)		

Identification
This bag contained a very small amount of bones. The two identified fragments were two phalanges that were determined to be human. No other species could be identified in this bag.

The bag contained some very small pieces of charcoal.

MNI
No signs of there being more than one human individual in this bag.

Age assessment
No age assessment could be made.

Sex assessment
No sex assessment could be made.

Fragmentation and degree of cremation
The degree of cremation seem to have been between grade 2-3 because most of the bones varied in colour on the same bone and they seemed to have been on the passover from grade 2 to 3

Bnr: 11

There were about 247 fragments in this bag and four could be identified. Table 16 shows the compiled osteological results for this bag.

Table 16: Table showing the compiled results from Bnr: 11

Human	1 individual	**Weight**	81,5 gram
Sex	-	**Volume**	0,1 l
Age	Adult	**Biggest fragment**	6 cm
Animals	-	**Average fragment size**	1-2 cm
Degree of cremation	2 (400°-700° C)	**Identified fragments (fragments/weight)**	2% / 5%
Identified bone elements	Cranium, Upper jaw, teeth, metapodium,		

Identification
Human was the only identified species in this bag. The identified parts of the human were a part of the upper jaw, the root from a tooth and two fragments of a metacarpal/metatarsal bone (probably the same bone). There was also one phalanges that could not be determined to any species.

No other species were identified in this bag.

This bag also contained some pieces of charcoal.

MNI
No signs of there being more than one human individual in this bag.

Age assessment
The age of the individual seem to be an adult from the tooth and the size of the bones. The root of the tooth was closed which means it had finished growing. The epiphysis of the phalanges and the metapodium were also fused, therefore the individual was assessed to be older than 20 years.

Sex assessment
No sex assessment could be made

Fragmentation and degree of cremation
The average fragment size was around 1-2 centimetres. The degree of cremation was determined to grade 2. Most bones had a dark grey or beige colour.

Bnr: 12

There were about 5592 fragments in this bag and 121 fragments could be identified. Table 17 shows the compiled osteological results for this bag.

Table 17: Table showing the compiled results from Bnr: 12

Human	1 individual	**Weight**	1581 gram
Sex	Female?	**Volume**	2,3 l
Age	Adultus (18-44)	**Biggest fragment**	6,2 cm
Animals	-	**Average fragment size**	1-2 cm
Degree of cremation	2 (400°-700° C)	**Identified fragments (fragments/weight)**	2% / 4%
Identified bone elements	Cranium, upper jaw, mandible, teeth, vertebraes, ribs, humerus, ulna, radius, carpal bones, phalanges (hand), pelvis, thigh bone, patella, shinbone, calf bone		

Identification
All the fragments that could be identified were human remains. Bones from all parts of the body were represented in the identified fragments, except for parts from the shoulder area (*scapula, clavicula*).

The sizes of the bones from this individual were rather small, so this person may have been small in stature, but that is hard to determine due to the fragmentation of the bones.

No other species was identified in this bag.

MNI
No signs of there being more than one individual in this bag.

Age assessment
The age of the individual was determined to adultus from fused vertebraes that fuses completely around 24-25 years of age. So the individual must be older than 24 years. Four fragments of the cranium had preserved sutures and all of them seemed to be open and had not started to close. This probably means that the individual was a younger adult, circa 25-30. The individual is therefore assessed to *adultus* (18-44 years).

Sex assessment
One fragment from the cranium (*Margo supraorbitalis)* could be assessed to "Female". This was the only bone that could be used for sex assessment, so the assessment is not certain, but the characteristic of this fragment was very clearly female. It is hard to make an assessment from just one fragment and the cranium can vary a lot between different individuals and groups of people. Therefore I assessed the individual to Female? because of it only being from one fragment.

Fragmentation and degree of cremation
There were a lot of very small bone fragments in this bag, over 5000 fragments were unidentified because of the fragmentation. The average bone size was probably 1-2 centimetres or less. Most of the identified bones were quite small as well.

The degree of cremation varied a bit, most of the bones were grade 2, but some were burned harder and were more of a grade 3. The degree of cremation for the whole bag was assessed of being grade 2 though, due to that the majority of the bones were of that grade.

5.1.9 Conclusion The cairn

It is unknown if all the bags came from the same context, but there are no specific signs in the different bags that would suggest them being different individuals. Although the bones in bags 9-11 had quite small amounts of bones and did therefore not give much results to base this assessment on. It is however likely that they are all from the grave in the urn.

The results of the cairn is that it contained at least one human individual 18-44 years and assessed to being "female?". No other species were found in the cairn.

5.1.10 Bag from unknown context

This bag had no documented context, so it is unknown where it came from.

Bnr: 13

There were 17 fragments in this bag and only 1 could be identified. Table 18 shows the compiled osteological results for this bag.

Table 18: Table showing the compiled results from Bnr: 13

Human	1 individual	**Weight**	2 gram
Sex	-	**Volume**	<0,1 l
Age	-	**Biggest fragment**	2,3 cm
Animals	-	**Average fragment size**	<1 cm
Degree of cremation	-	**Identified fragments (fragments/weight)**	6% / 25%
Identified bone elements	Vertebrae		

Identification
Only one fragment could be identified, and it was a piece of a vertebra from a human.

No other species were found.

MNI
No signs of there being more than one human individual in this bag.

Age assessment
No age assessment could be made.

Sex assessment
No sex assessment could be made.

Fragmentation and degree of cremation
There was a very small amount of bones in this bag. Most fragments were smaller than 1 cm. The degree of the cremation was somewhat hard to determine because of the small size of the bones. Most of the fragments had a brownish colour and had cracks, so the degree of cremation may be somewhere around 1-2 but it is too uncertain to make an assessment.

5.2 Archaeological finds of Rannarve Klinte parish

The only monuments that had artefacts were ship 2 and the cairn. In both of these monuments an urn was found and also some bronze artefacts. In ship 2 two miniature knives were found beside the house urn, see Figure 7. These knives were not found in the boxes of finds from the excavation during this analysis but was documented in the excavation notes. It is unknown were these artefacts are and they were not documented in the list of finds that was written after the excavation. In the cairn a razor, awl, and a bronze bar were found inside the urn. These finds were found and are shown in the picture below, see Figure 6.

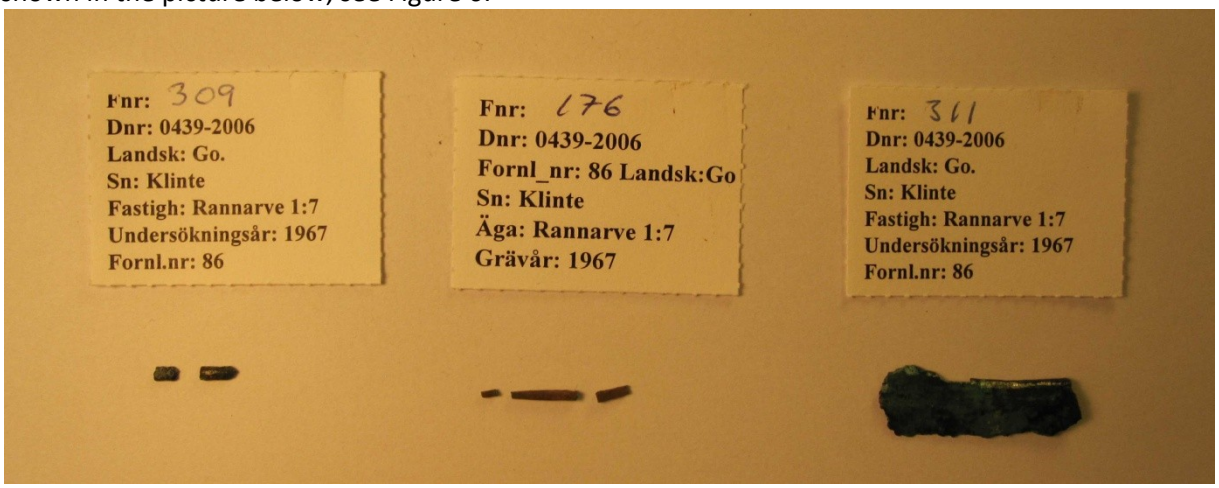

Figure 6: Showing the bronze artefacts from the cairn. These finds were interpreted by the excavators as bronze bar (left), awl (middle) and razor (right).

Figure 7: The house urn during excavation in Ship setting 2. Photo G & P Manneke

A lot of flint was found in and around the different monuments at Rannarve, see Table 19. This data was collected from the list of finds that was made after the excavation.

Table 19: Table showing the distribution of flint objects in the features at Rannarve.

Monument	Total weight of flint (g)	Number of flint fragments
Ship setting 1	4	2
Ship setting 2	1214	168
Ship setting 3	1239	43
Ship setting 4	0	0
Ship setting 5	251	11
Stone setting	218	6
The Cairn	1521	53
Total in ship 1-4	2457	213
Total in all features	4447	283

The total amount of flint that was found at Rannarve was 4447 grams and a total of 283 fragments. Ship 2, 3 and the cairn had quite a significant amount of flint. Ship 1, 5 and the stone setting did also have flint but in smaller amount. Ship 4 did not have any flint at all.

6. Results of the Gotlandic ship settings

During the analysis I have compiled the results from all 77 excavated ship settings on Gotland and 54 of those were found appropriate for this analysis. Six of the ones that was excluded because of them being plundered, were still used for their osteological results, but not their artefacts or contexts of the bones.

The information has been gathered from the archaeological and osteological reports from the different excavations or other publications where the ship settings are mentions. These works were given to me by Joakim Wehlin and I have used his compiled information about the different ship settings to gather the data I have used in this study. Also Statens historiska museum (SHM) online archive has been used to find out additional information. The references to each report and other works that was used for each ship setting are presented in appendix 3. The locations have also been written out in the same way that Joakim Wehlin categorises in his compilation.

6.1 Compilation of the analysed ship settings

In the following four pages Table 20 is showing the compiled results for each ship setting in this analysis. After that some statistics is presented with information of what the analysis of these ships showed.

Table 20: Showing all the 54 analysed ship settings. When the stone cist column is marked that means that a stone cist was found in the ship setting, and if bones or a urn with bones were found within the stone cist this is written in the "Context of the burned bones in the ship setting". If nothing is written about the stone cist then nothing was found in the stone cist. When the urn column is marked it means that the bones were found in that urn. If ceramics were found in any other way they are written under "other finds in the ship setting". Resin refers to remains after a wooden, or other organic container where the bones were probably stored. The MNI refers to the minimum number of human individuals. The animal are not included in the MNI.

Location	Stone cist	House urn	Urn	Resin	Context of the burned bones in the ship setting	Burial artefacts (Bronze artefacts/other)	Other finds in the ship setting	Burnt bones (g)	Human remains	MNI	Age (years)	Sex	Animals
Alskog 62 a	-	-	-	-	-	-	Ceramics, flint, quartz, charcoal	-					
Alskog 62 b	-	-	X	-	Middle	-	Quartz, flint	36	Human	1	18-44	-	
Alskog 9 a	-	-	-	-	Middle	-	-	176	Human	1	Adult	-	
Alskog 9 b	-	-	-	-	Middle	-	-	132,5	-	-	-	-	Dog, bird
Alskog 9 c	-	-	X	-	Middle	Tweezers , Razor	-	49	Human	1	-	-	Dog
Alskog 9 d	-	-	-	-	Middle	-	-	36	-	1	-	-	
Alskog 9 e	-	-	-	-	Middle	-	-	31	Human	1	-	-	Dog, sheep/goat
Alskog 9 f	X	-	X	-	Middle, Inside stone cist	Tweezers, knife, arrowhead, awl	-	935	Human	1	Adult	F?	
Bäl 26	X	-	X	-	Middle, inside stone cist	Tweezers	-	52	Human	1	-	-	
Endre 42	X?	-	-	-	West and east part		Faceted stone, charcoal	298					
Fole 54	X (2)	-	X	-	The two stone cist were in the middle of the ship. The west of these had an urn with bones, the east had burnt bones mixed with the soil. Scattered burned bones were also found in other parts of the ship.	Arrowhead, razor, Tinplate of bronze, bronze wire (in a spiral)/ ceramic pot x2 (one in each stone cist)	-	2458					
Fårö 206 a	-	-	-	-	?	-	Ceramics, charcoal, iron (recent?)	250					
Fårö 57 a	-	-	-	-	Middle and north	-	-	49,5	Human	1-2	-	-	Sheep/goat, bird
Fårö 57 b	-	-	-	-	-	-	-	-					
Klinte 86 a	-	-	-	-	Middle	-	Flint	19,5	Human	1	-	-	
Klinte 86 b	X	X	-	-	Middle, Inside the stone cist	2 x Miniature knives	Flint	1886	Human	1	18-44	-	Dog/fox
Klinte 86 c	-	-	-	-	Scattered in middle	-	Flint	274	Human	1	Adult	-	Dog, sheep/goat
Klinte 86 d	-	-	-	-	Middle	-	-	3,5	-	-	-	-	

Table 20 continued

Location	Stone cist	House urn	Urn	Resin	Context of the burned bones in the ship setting	Burial artefacts (Bronze artefacts/other)	Other finds in the ship setting	Burnt bones (g)	Human remains	MNI	Age (years)	Sex	Animals
Klinte 86 e	-	-	-	-	-	-	Flint	8,5	-	-	-	-	
Lau 49 a	X	-	X	-	The stone cist with the urn was found in the west part of the ship. Burnt bones were also found in the east part.	Tweezers, razor, arrow head/bone needle	Flint	1881	Human	2?	35-64	M	Dog, cattle
Lau 49 b	X	-	X	-	Middle, Inside stone cist	Tweezers, razor, knife	-	1518	Human	2	18-44/10-24	F?/ M	Cattle
Levide 1 a	X	-	X (2)	-	Two burials: 1. Middle, covered by a small cairn. 2. Northeast from middle inside stone cist	Ring/ceramic pot	Flint	668 + 266	Human	2	10-24/18-44	-/M	Seal
Levide 1 b	X	-	X	-	Middle, Inside stone cist	-	-	179	Human	2	5-14/10-24	-/F?	
Lummelunda 52 a	-	-	-	-	Southwest part	-	-	16	Human	-	-	-	-
Lummelunda 52 b	-	-	-	-	Middle	-	-	10	-	-	-	-	-
Lärbro 114 a	X	-	X	-	Urn with burnt bones was found 3 m north of the stone cist. The stone cist was in the middle of the ship containing an inhumation.	-	-	448	Human	1	Adult	-	-
Lärbro 114 b	X	-	X	-	Middle, Inside stone cist	-	-	720	Human	1	Adult	-	Sheep/goat
Lärbro 162 a	X	-	X	-	The urn was found between ship 1 and 2	Miniature sword, tweezers, razor, double stud	-	Unknown weight	-	-	-	-	-
Lärbro 162 b	-	-	X	-	The urn was found between ship 2 and 3. Scattered bones were also found outside the ship.	-	-	Unknown weight	-	-	-	-	-
Lärbro 162 c	-	-	-	-	Scattered burned bones were found outside the ship that might have originated from the ship	-	-	-	-	-	-	-	-
Lärbro 162 d	-	-	-	-	Southwest part of the ship. Small amount of bones.	-	-	Unknown weight	-	-	-	-	-
Lärbro 162 e	-	-	-	-	Middle of the ship and some bones outside the ship	-	-	Unknown weight	-	-	-	-	-
Lärbro 203	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 20 continued

Location	Stone cist	House urn	Urn	Resin	Context of the burned bones in the ship setting	Burial artefacts (Bronze artefacts/other)	Other finds in the ship setting	Burnt bones (g)	Human remains	MNI	Age (years)	Sex	Animals
Lärbro 248	-	-	-	-	**?**	Tinplate of bronze	Flint, ceramics, resin	Unknown weight	-	-	-	-	-
Lärbro 281	-	-	-	-	North part of ship	-	Ceramics	Unknown weight	Human	-	-	-	-
Lärbro 630	-	-	-	-	-	-	-	-	-	-	-	-	-
Norrlanda 89	-	-	-	-	?	-	Ceramics, charcoal, iron (recent?)	309 + (422)	Human	-	-	-	Dog, sheep/goat, cattle
Rute 77 a	X	X	-	-	Middle inside stone cist, also scattered in whole ship	Bronze bar, Double stud, tweezers, razor	Resin, grinding stone, stone for sleeking, wood, charcoal	3338	Human	4	All adult	One male	Dog, sheep/goat
Rute 77 e	X	X (3)	-	-	Middle, Inside stone cist	-	Ceramics	1635	Human	4	Adult/adult/5-14/-	M?/-/-/-	-
Rute 77 f	X	-	?	-	Middle, Inside stone cist and west of stone cist	-	Ceramics	363	Human	2	Adult/adult	-	-
Silte 29	X	X	-	-	Southwest middle, inside stone cist	Tweezers, razor, awl, double stud, arrow head	-	600	-	-	-	-	-
Sproge 68	-	-	-	-	-	-	-	-	-	-	-	-	-
Sproge 68	-	-	-	-	-	-	-	-	-	-	-	-	-
Stenkyrka 30 a	X	-	-	X	Two burials. One in middle with resin and the burial gifts. The second was in the south part and had only small amounts of bone.	Tweezers/ceramic pot	flint	1100 + 75	-	-	-	-	-
Stenkyrka 30 b	X	-	-	-	Middle, inside stone cist	Bronze bar x 2	Ceramics, flint, grinding stone, resin	110	-	-	-	-	Cattle, rodent
Stenkyrka 48	X	-	-	X (2)	Stone cist in middle with 2 burials. 3-4 secondary burials were also found in other parts of the ship	Razor x 3/ceramic pot x 2	-	Unknown weight	-	-	-	-	-
Tofta 15	-	-	-	-	-	-	-	-					
Tofta 26	X	-	X	-	Middle, not inside stone cist	Tweezers/ceramic pot	-	460	Human	2	10-24/35-64	-/M	-
Tofta 78	X	X	-	-	South part, inside the stone cist	Tweezers, razor, awl, double stud	-	944	Human	1	Adult	M	-
Vallstena 103 a	X	-	X	-	Urn inside stone cist	-	-	Unknown weight	-	-	-	-	-

Table 20 continued

Location	Stone cist	House urn	Urn	Resin	Context of the burned bones in the ship setting	Burial artefacts (Bronze artefacts/other)	Other finds in the ship setting	Amount of bones (g)	Human remains	MNI	Age (years)	Sex	Animals
Visby 3	-	-	-	-	-	-	-	One unburned bone		-	-	-	-
Visby 8 a	X	-	-	X (2)	3 burials: 1. Middle, inside stone cist, 2. North part, 3. South part	Fragment of a needle/ceramic pot	-	Bones from 3 burials. Unknown weight	-	-	-	-	-
Visby 8 b	X	-	-	X	Middle, inside stone cist	Fragment of a needle	-	Unknown weight	-	-	-	-	-
Väte 13	-	-	-	X	North of the middle	Tweezers, razor	Ceramics, flint, slag, charcoal	846,7	Human	1	35-64	M	-

And below, in Table 21, are the six ships that have been used solely for the osteological part of the analysis and not for the artefact and burial context.

Table 21: Showing the Six ship settings only used for the osteological results and not for the artefacts and the grave context

Location	Stone cist	House urn	Urn	Resin	Context of the burned bones in the ship setting	Burial artefacts (Bronze artefacts/other)	Other finds in the ship setting	Burnt bones (g)	Human remains	MNI	Age (years)	Sex	Animals
Lärbro 162 f	X	X	-	-	Stone cist in middle with inhumations (secondary). The burnt bones was found outside the stone cist, not in a house urn but are possibly from the house urn, possibly thrown out from digging new grave and destroying older grave in middle.	Tweezers	Ceramics	136	Human	1	35-64	-	-
Lärbro 253	-	-	?	-	Plundered, bones scattered. Original burial was probably in the middle	-	-	869,9	Human	1	18-44	-	Sheep/goat
Rute 18	?	X	-	-	East part, and middle	-	-	600	Human	1	-	-	Fish
Rute 77 b	X	-	X?	-	Plundered, remains in middle inside stone cist and also scattered around the ship. Bones found in between ship 1 and 2.	-	Ceramics	459	Human	2	2 Adults	F?/ -	Sheep/goat
Rute 77 c	X?	-	X?	-	Plundered, but signs that there were 2 stone cists with burned remains and urns	-	-	377,5	Human	5	4 adults/ 1 young (15 y)	-	-
Rute 77 d	-	-	-	-	Plundered, bones found scattered	-	-	79	-	-	-	-	-

6.2 Archaeological Statistics

Below I have compiled two diagrams showing the most common burial gifts that have been observed and the context of the bones. In Figure 8 we see that the most common gifts are the tweezers, razor and ceramic pot. The rest of the artefacts are not as common but still occur at several burials within ship settings. It should also be mentioned that the artefacts that have been found in less than three ship settings have not been included in the diagram. These artefacts are the following: Knife, needle, tinplate of bronze, miniature knife, miniature sword, spiral of bronze wire and fingering, all of these are bronze artefacts, furthermore a bone needle has been found, these can be viewed in appendix 1 or in Table 20 above.

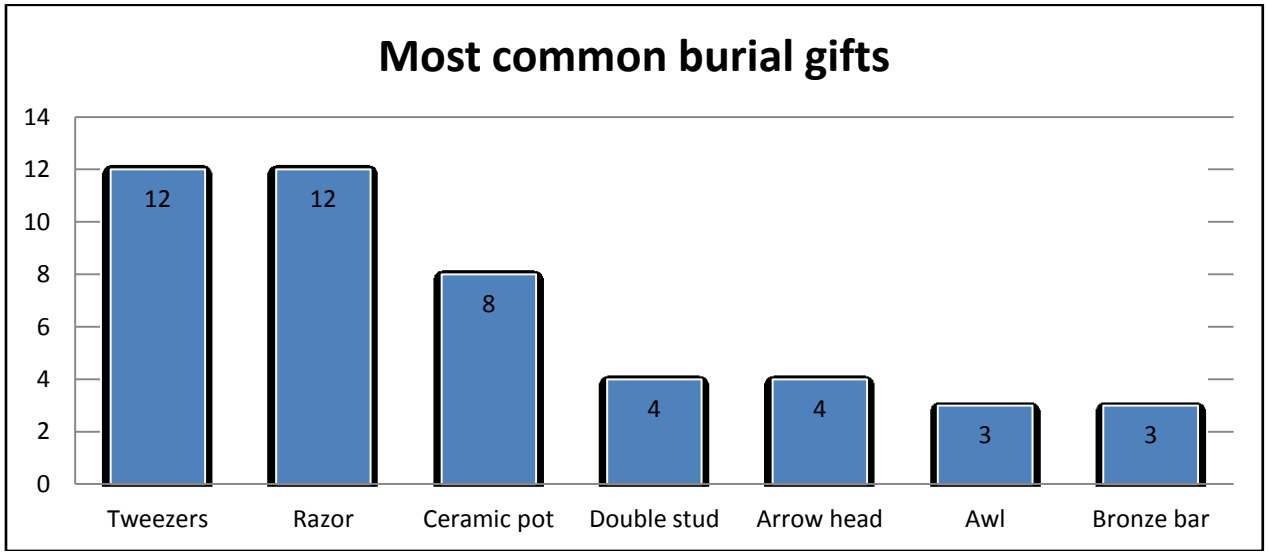

Figure 8: Showing the most common burial gifts in the analysed ship settings. All the artefacts are made from bronze except the ceramic pots.

I have divided the context in which the bones were found in the ship settings into different categories, and in Figure 9 below I have compiled that information to see what was the most common. House urns are here categorised in the same way as other kinds of urns.

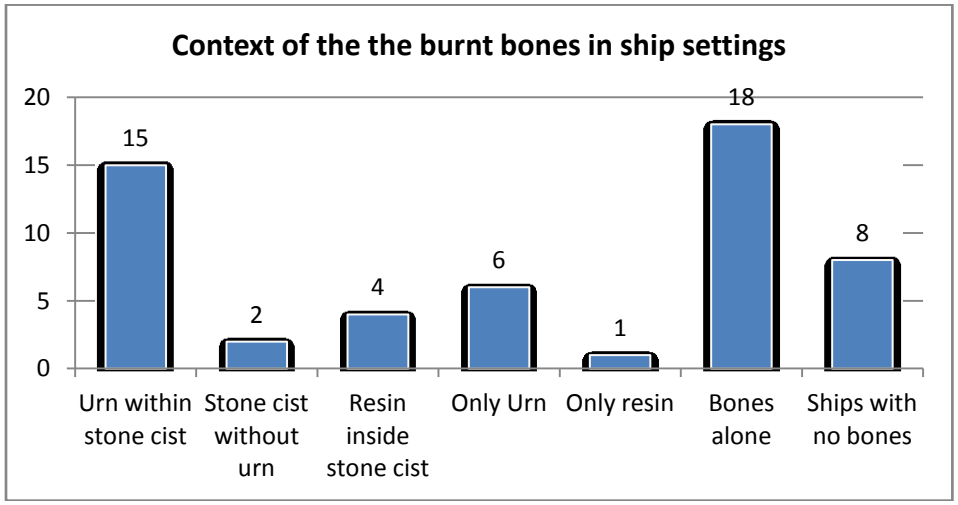

Figure 9: Diagram showing the different kinds of burial contexts that have been observed inside the analysed ship settings

Bones alone where bones have been buried/deposited alone without any form of container that have been preserved are the most common occurrence in the ship settings. Urns within a stone cists were almost as common as bones alone. Bones found inside only an urn or inside an stone cist with

resin also occurred in several ship settings. Bones found in only a stone cist or only with resin was however unusual. Eight of the ships did not have any bones at all.

Most of the ships where bones have occurred alone there have been a rather small amount of bones buried, whilst the urns within the stone cists or urns alone have larger amounts of bones. In Figure 10 below I have divided the amount of bones found in the ship settings in different categories. From this I could draw the conclusion that the first two columns from the left (<100-200 grams) are the amount of bones that occurred quite often alone within the ship settings. The columns with the higher amounts of bones are more commonly within urns either alone or inside stone cists.

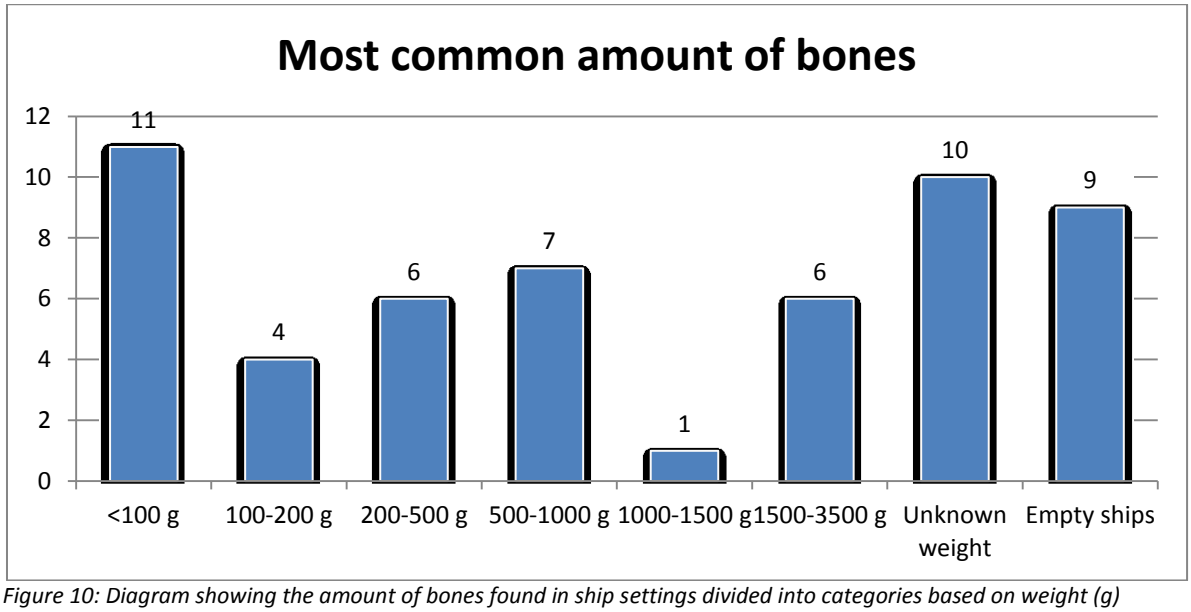

Figure 10: Diagram showing the amount of bones found in ship settings divided into categories based on weight (g)

6.3 Osteological statistics

Age and sex distributions

Below are the age and sex distributions that were observed in the analysis. A total of 12 sex assessments have been documented on individuals buried in 11 of the ship settings, and a total of 36 age assessments have been documented on individuals from 21 of the ship settings. The distribution of these can be observed in the diagrams below, see figures 11-14.

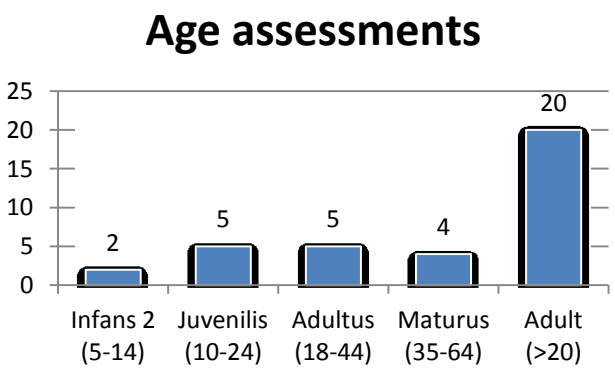

Figure 11: Distribution of age in the ship settings

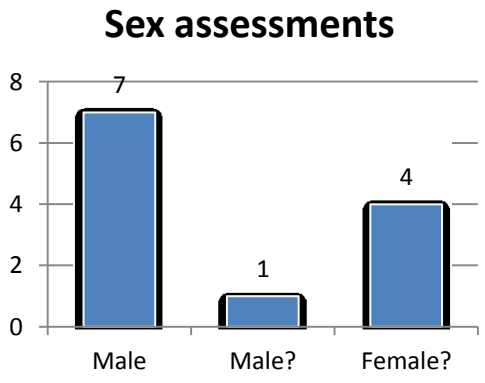

Figure 12: Sex distribution in the ship settings

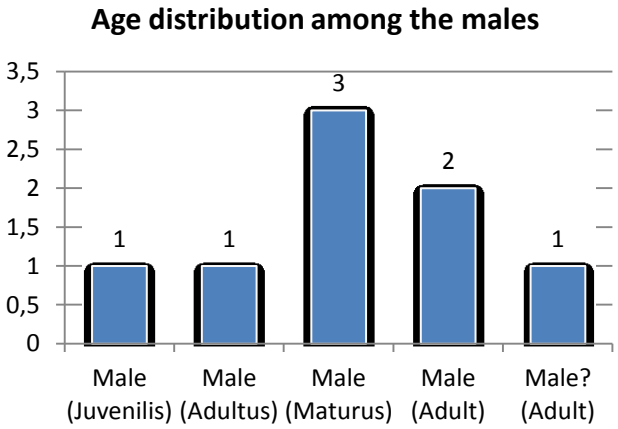

Figure 13: Age distributions among the males

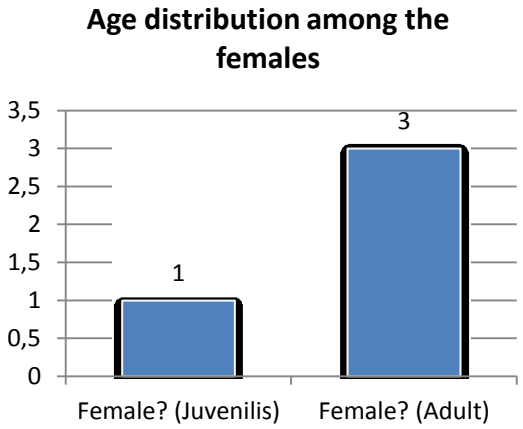

Figure 14: Age distribution among the females

Of the 12 sex assessments that were documented there were 7 "Male", 1 "Male?" and 4 "Female?". This means there are seven certain males, but no certain females, the four females have been assessed as possible females and are therefore a bit uncertain.

The sex distribution shows a majority of males and a majority of adults in the ship settings, only 20% were younger individuals. The reason why there are so many "Adult" assessments is because it is very hard to make any closer assessments on cremated bones, so the assessments are very often just "Adult", because nothing more could be said about the fragments.

The age distribution among the different sexes shows that among the eight that were assessed to males there is a slight majority of "Maturus" 35-64 years but due to the small number of individuals it is hard to make an accurate age distribution from this. For the females three were assessed as "Adult" and one as "Juvenilis".

Overall the age distribution shows that multiple age groups were being buried in the ship settings, even though the majority are adults, and majority males, the females and young individuals also seem to have been buried in them.

Number of individuals and animals within the ship settings

In the diagram below I have compiled the number of human individuals in each ship setting where MNI has been calculated. A total of 27 of the ships have had MNI calculated and in Figure 15 this is presented. The diagram shows that the most common occurrence is one or two individuals in each ship settings, and very rarely are there more individuals, with just three cases of 4-5 individuals in each ship setting.

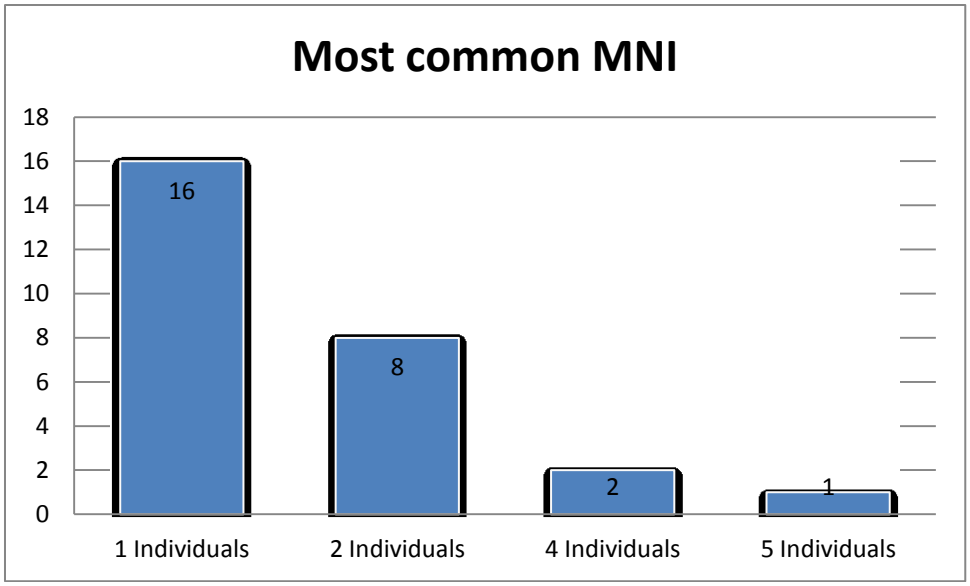

Figure 15: Diagram showing the most common number of individuals in each ship setting

The distribution of animals from the ship settings have been counted and compiled in the diagram below, se Figure 16.

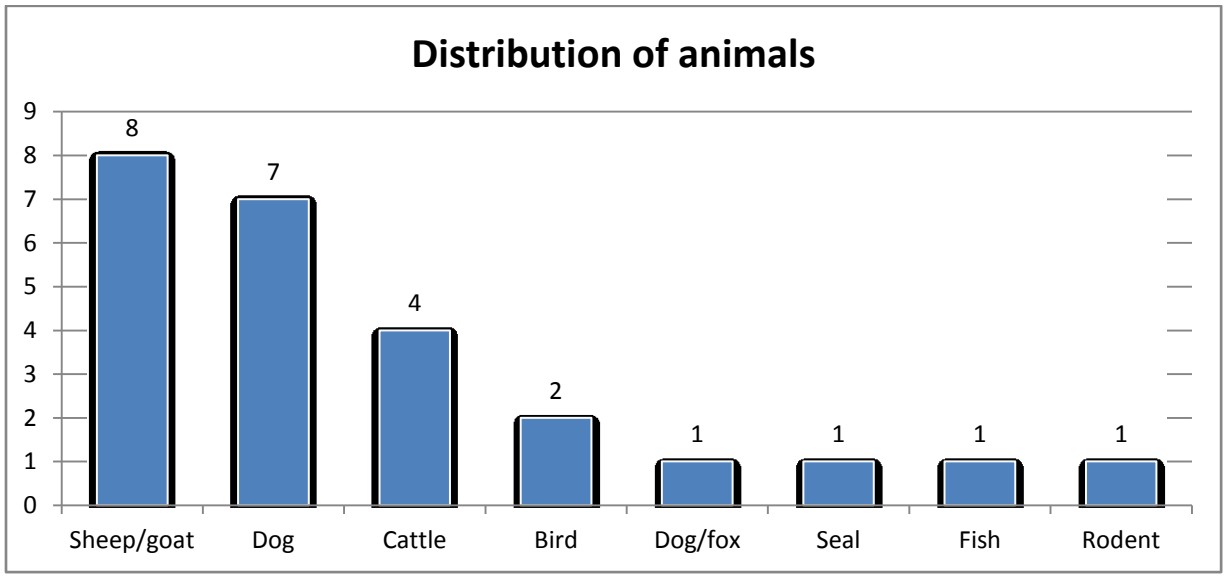

Figure: 16: Diagram showing the distribution of animals in the ship settings.

A total of 17 of the ship settings had bones from animals in them, three of these were not ships that had been osteologically analysed but they still had documented the presence of these animal bones. Among these were the horse, rodent, dog sheep/goat and cattle (these sources might be somewhat unreliably due to the fact that they are not results from a osteological analysis).

A total of eight different species have been identified in the ship settings. The most common animals are sheep/goat and dogs. Sheep/goat has been found in eight ships and dogs in seven. In four cases sheep/goat and dog have been found together in the same ship setting, so it seems very common that these, not only occur, but also occur together.

Cattle occurred in four of the ship settings, but two of these cases there were very few unburned bones, with an unclear context. Therefore it is possible that these two might be of a later period. In

the other two cases pieces of horn (*os cornu)* from cattle was found within urns alongside the cremated bones of humans.

Represented bone elements

Of the 32 osteologically analysed ship settings 21 had documentation about what parts of the body that were represented in that material . These have been compiled in the table below, see Table 22.

Table 22: Table showing the represented bone elements for the human bones in each ship that had documentation for what parts of the body that were found. The letters under context stands for: BA =Bones Alone, U =Urn, SC= Stone Cist, HU=House Urn, R=Resin

	Alskog 9 a	**Alskog 9 c**	**Alskog 9 e**	**Alskog 9 f**	**Alskog 62 b**	**Bäl 26**	**Fårö 57 a (A)**	**Fårö 57 a (B)**	**Klinte 86 a**	**Klinte 86 b**	**Klinte 86 c**
Context	BA	U	BA	SC+U	U	SC+U	BA	BA	BA	SC+HU	BA
Amount of bones	176 g	49 g	31 g	935 g	36 g	52 g	49,5 g	24	19,5 g	1886 g	278 g
Represented bone elements											
Cranium	X	X	X	X	X	X	X	X	X	X	
Shoulders										X	
Torso	X			X						X	
Arms	X	X		X			X			X	
Hands										X	X
Pelvis				X						X	
Legs	X	X	X	X		X	X			X	
Feet	X									X	X
	Lau 49 a (A)	**Lau 49 a (B)**	**Lau 49 b**	**Levide 1 a (A:a)**	**Levide 1 a (A:b)**	**Levide 1 b**	**Lärbro 114 a**	**Lärbro 114 b**	**Tofta 26**	**Tofta 78**	**Väte 13**
Context	SC+U	BA	SC+U	U	SC+U	SC+U	SC+U	SC+U	U	SC+HU	R
Amount of bones	1595	176 g	1518 g	266 g	668 g	179 g	448 g	720 g	460 g	944 g	847 g
Represented bone elements											
Cranium	X	X	X	X	X	X	X	X	X	X	X
Shoulders						X	X	X	X		X
Torso	X		X	X	X	X	X	X	X	X	X
Arms	X	X	X	X	X	X	X	X	X	X	X
Hands	X			X	X	X			X		X
Pelvis	X		X	X	X	X	X		X		X
Legs	X		X	X	X	X	X	X	X	X	X
Feet			X	X	X		X			X	X

Cranium was found in all but one of these ships. This may suggest that the cranium was the most important part and therefore were always collected after the pyre and later buried. It should also be mentioned that cranium is fairly easy to identify, even in cremated bones. The reason why the shoulder area is missing in most ships for example, which is represented by the clavicle and the shoulder blade, is probably because the shoulder blade is very easily missed due to it being severely fragmented in cremated bones, and the clavicle is often mistaken for a long bone.

A pattern that can be seen in this though is when the bones have been found in a stone cist+urn then it seems very common that most parts of the human body is represented in that material. when the

bones have been found alone without any container, then it seems to be a scattered mix of bones from some parts of the body that are found. Although as mentioned before the cranium is found even in the ones with few bones. A more detailed table with the specific parts of the body that were found in each of these ships is presented in appendix 2.

Ten of these ship settings also had animals where it had been documented what parts of the body that had been found from them. This information is compiled in Table 23 below.

Table 23: Table showing the represented bone elements for the animal bones in each grave where this was documented. S/G stands for Sheep/Goat. The row "Feet" have been marked when it is unknown if the bone are from the front feet or the back feet.

	Alskog 9 b	**Alskog 9 c**	**Alskog 9 e**		**Fårö 57 a (B)**	**Klinte 86 b**		**Klinte 86 c**		**Lau 49 a**		**Lau 49 b**	**Lärbro 114 b**	**Tofta 26**
	Dog	Dog	Dog	S/G	S/G	Dog/Fox	S/G	Dog	S/G	Dog	Cattle	Cattle	S/G	Dog
Cranium	X					X		X		X	X	X		X
Shoulders														
Torso	X		X					X		X				X
Front legs	X		X			X				X			X	X
Front feet	X					X								
Pelvis	X					X		X						X
Back legs	X	X		X	X			X		X				
Back feet	X					X	X		X					
Feet	X		X	X		X		X	X	X			X	
Tail	X			X										

A rather clear pattern can be seen here. Almost all the dogs have bones represented from many different parts of the body, which might indicate that a the entire animal has been buried. The sheep/goats however have in all cases only bones represented from either the back or front feet and legs. This probably means that in most of these cases only a small part of the sheep/goats body have been included in the grave. That part seems to be a piece of the animals legs.

The two cattle that were found had in both these cases only pieces of their horns represented in these graves.

Correlation between the burial gifts, burial context and the osteological results

To try to distinguish if there are any patterns between artefacts and human sex/age in the ship settings I extracted all the ships where sex assessments had been made on the bones. These are presented below in Table 24.

Table 24: Table showing all the ship setting on Gotland that had individuals where sex assessments have been made.

Ship setting	**Burial**	**Individuals**	**Stone cist**	**House urn**	**Urn**	**Resin**	**Burial artefacts (Bronze artefacts/other)**	**Burnt bones (g)**	**Age (years)**	**Sex**	**Animals**
Alskog 9 f		1 Individual	X	-	X	-	Tweezers, knife, arrowhead, Awl	935	Adult	F?	
Lau 49 a		2 Individuals?	X	-	X	-	Tweezers, razor, arrow head/bone needle	1881	35-64	M	Dog, cattle
Lau 49 b		2 Individuals both from same urn	X	-	X	-	Tweezers, razor, knife	1518	18-44/10-24	F?/M	Cattle

Levide 1 a	Two burials										
	Aa	1 Individual	-	-	X	-	Ring/ceramic pot	266	10-24	-	seal
	Ab	1 Individual	X	-	X	-	-	668	18-44	M	-
Levide 1 b		2 Individuals both from same urn	X	-	X	-	-	179	5-14/10-24	-/F?	
Rute 77 a		4 Individuals	X	X	-	-	Tweezers, razor, bronze bar, double stud	3338	All adult	M/-/-/-	Dog, Sheep/goat
Rute 77 b		2 Individuals	?	-	?	-	-	459	2 Adults	F?/ -	Sheep/goat
Rute 77 e		4 Individuals	X	X (3)	-	-	-	1635	Adultus/adult/5-14/-	M?/-/-/-	-
Tofta 26		2 Individuals Both from same urn	-	-	X	-	Tweezers/ceramic pot	460	10-24/35-64	-/M	-
Tofta 78		1 Individual	X	X	-	-	Tweezers, razor, awl, double stud	944	Adult	M	-
Väte 13		1 Individual	-	-	-	X	Tweezers, razor	846,7	35-64	M	-

Firstly, Lau 49 b could not be used because it had both a "Male" and a "Female?" in the same urn. Therefore it is not known what artefacts belonged to which individual. After that it can see that there are five males that received tweezers and/or razors, four of these were each buried in an urn inside a stone cist.

The only "Female?" that had burial gifts was the one in Alskog 9 f which had tweezers, knife, arrow head and awl. The other two "Female?" did not have any burial gifts at all.

Only two ship settings had young individuals without them being buried along with an adult. These were "Levide 1 a burial Aa", that contained a "Juvenilis" with a bronze ring and a ceramic pot, and "Levide 1 b" that had two young individuals in the same urn, one "Juvenilis" and one "Infans 2", that did not receive any burial gifts at all. There were more young individuals than that but because they were buried along with adults it is not known which individual the artefacts belonged to.

Now, what results can be seen in this? Because it is a very small sample of useful data it is hard to make reliable assessments, but what can be seen is that the most common thing here is adult males, buried in an urn, inside a stone cist and that they have received tweezers and/or razors as burial gifts, sometimes along with some other kinds of bronze artefacts like: arrow head, knife, double stud, bronze bar or awl.

The "Female?" in "Alskog 9 f" also had these kinds of gifts and were buried in an urn inside a stone cist. This might mean that tweezers and razor were gifts given to both sexes, or that the sex assessment on this individual is incorrect.

The only young individual to receive any burial gifts received a bronze ring and a ceramic pot and was buried in just an urn without any stone cist. This is a bit different from the more common occurrence that we saw, but because this is just one individual it is hard to draw any conclusions on younger individuals buried in ship settings just from that.

The burial context does not seem to be different between the sexes or the different age groups. Both male, female and young individuals seem to have been buried inside stone cists with urns.

7. Discussion

7.1 The site at Rannarve

Figure 17: Picture of Rannarve ship 1-4 today. Photo: Anders Gustavsson

Today, the Rannarve complex is a beautiful location on a remote path in the forest, visited mostly by tourist and students. When it was built and in use the site probably looked quite different. The sea would have been close by and there would probably have been fewer trees. The meaning of these monuments back then was probably more obvious to ordinary people and they were most likely visited and used in more ways than just burial sites. When visiting the Rannarve ships you are struck by the immense size of the stern and stem stones of ships 1-4, and you realise the amount of work that were invested building these monuments. It must have been a well organised group of people putting a lot of effort into doing something they probably had a very good reason for doing. That reason though, is unfortunately unbeknownst to us today. All we know about this place today is based on the excavations in 1966-67 and the osteological analysis that have been carried out during this study.

If you look at a map of Rannarve today you will see that there are a lot of other stone monuments in this area, among them three rather large bronze age cairns (20 m, 17 m, 17 m), two to the east and one to the north of the Rannarve complex. So the area around Klinte parish during the bronze age may have been a important place on Gotland.

How then can we interpret a place like Rannarve? What meaning does the cairn have in association to the ship settings? Let us first sum up what was found at Rannarve.

7.1.1 Osteology

Below are the compiled results from the osteological analysis carried out in this study, see Table 25. In ship 2, 3 and the cairn there were several bags of bone that came from the same monument and there were no documentation about why these had been separated. All of these bags have been analysed separately. I have assumed though that these bags all came from the same context in the different monuments. This seemed the most likely. Nothing was written about it in the excavation notes and if there were several clearly outlined contexts in these two ships and the cairn it should have been noted somewhere. Therefore the compilation of the results below are based on that assumption and the results from the different bags from each monument has been added together as one.

Table 25: Table of the osteological results from ship setting 1-4 from Rannarve.

Monument	Total weight (g)	Human	Age (years)	Sex	Animals	Burial gifts	Temp. (C°)
Ship 1	19,5	1 Individual	-	-		-	400°-700°
Ship 2	1886	1 Individual	Adult	-	Dog/fox, Sheep/Goat	2 Miniature knives	400°-700°
Ship 3	274	1 Individual	>13	-	Dog, Sheep/Goat	-	400°-700°
Ship 4	3,5	-	-	-		-	-
Ship 5	8,5	-	-	-	-	-	400°-700°
The cairn	1667	1 Individual	Adultus	F?	-	Razor, awl, bronze bar	400°-700°

Ship setting 2 is the only one of ship settings 1-4 that had a urn with a large amount of bones and with artefacts. The other ships have far lesser amounts of bones and no clear burial feature like the stone cist with an house urn found in ship 2. Ship 4 had a similar oval shaped stone formation in the middle like Ship 2, but the middle part was missing and a stone slab that seemingly fitted that area was located two metres outside of the ship. This might mean that ship 4 has been plundered at some point and the small amount of bones left in the ship is all that was left behind. This however is hard to determine at this point. Nothing was mentioned about this in the excavation notes. But as mentioned before if ship 4 were plundered then one might expect that the other ships should have been plundered as well, which is not the case, at least not with ship 2.

Ship 3 only had two phalanges from the human and the rest of the bones were from the dog and the sheep/goat. The dog had bones represented from several parts of the body which might mean that a complete dog was buried. The sheep/goat only had bones from the feet which probably means that only a part of the animals leg was buried or alternatively a hide that still had bones from the feet. A similar case where only animal bones were found in a ship setting is from Gålrum burial site in Alskog parish on Gotland where only remains from a complete dog was found (Gustavsson 2011). Why animals were buried in ship 3 with almost no human bones is hard to say, but there were no signs on the human bones found in ships 1-4 that they might come from different individuals, so there is a possibility that all the human bones in ship 1-4 are from the same person buried in the urn in ship 2. One theory could be that the individual was partially spread in ship 1, 3 and 4, maybe even ship 5 and on other places in the landscape, and the rest of the bones were then buried in the middle of ship 2. The animals in ship 3 might then have been additional burial gifts to the individual in ship 2.

Two carbon dating has been made on bones from ship 2 and ship 4. These both showed 1050-890 BC (Email contact Wehlin 2012-05-24). This shows that it is a possibility that the bones from ship 2 and 4 have the same origin and maybe also the bones from ship 1 and 3.

Ship 4 and 5 did not give much osteological results, and the stone setting did not contain any bones at all. The cairn however contained an urn with bones and this was the only individual at Rannarve where a sex assessment and a closer age assessment could be made. The sex assessment were rather uncertain though due to the fact that it was only based of one fragment of bone. This characteristic was however very female, but it is still uncertain to make an assessment of only one fragment, and therefore it was assessed as being "Female?". The individual was assessed to be between 18-44 years old at death.

7.1.2 Artefacts

Ship 1-4

The house urn from ship 2 is currently on display in Gotlands museum, see Figure 18. This and the two miniature knives found within the urn were the only artefacts found in ship 1-4.

Figure 18: Picture of the house urn from ship setting 2 on display at Gotland museum. Photo: Anders Gustavsson

Although ship 1-4 also contained all together 2457 grams of flint, where almost all of it came from Ship 2 and 3, see Table 19. Why there were so much flint in these ship settings is quite interesting, because flint have not been found in that great amount in any other ship setting complex that have been excavated. What this means was not discussed by Manneke in the excavation notes that I studied, but there were an area on the plans outside ship 2 named "feature 2B" in the notes but on

the plans it was also named "Verkstan" (The work shop) which might mean that they interpreted this area as a flint work shop of some kind, due to the fact that a lot of flint was found there.

The cairn

In the excavation notes this monument is defined as a cairn but it can be questioned that it might just be a stone setting, see Figure 4, due to its size.

The artefacts found with the bones in the cairn were razor, awl and a bronze bar. There was also 1521 grams of flint found within the cairn which is a significant amount, so this might mean that there has been the same kind of activity at the cairn as at ship 1-4.

7.1.3 Interpretation of Rannarve

We know a bit more about the Rannarve complex now after the osteological analysis of the bones that were found there and the results compiled with what artefacts that were found on the site. It seems rather likely that only one individual has been buried in ship 1-4 and another in the cairn. This is consistent with the results that 1-2 individuals are the most common in ship settings. Therefore maybe ship 1-4 should not be interpret as separate ship settings, but rather as one large ship setting. Maybe they represented a union of something, four ships coming together as one. Other ship settings has also been found positioned in this way. One example is at the Gålrum burial site in Alskog parish where two pairs of ships have been positioned next to each other (Ship 3 & 4 and ship 5 & 6) and only one ship of each pair contained an urn with cremated bones and the other ship only contained small amounts of cremated bones (Hansson 1927, Eifert 2009, Gustavsson 2011).

The amount of flint found both in ship 1-4 and in the cairn do indicate that some form of activity has been going on at the site. Did people make flint objects at the site or did they have a more ritualistic meaning? Flint is often found in bronze age monuments but it is rare to find it in such a large amount as it was at Rannarve. If the site has been part of ritual activities then maybe it should be interpreted more as a temple or holy place rather than simply a burial site. The individuals being buried here might then be important religious people that would bring more power to the site. Thereby the monuments were not built for the ones being buried there but rather for the ones living.

Due to the fact that flint in this large amount at the same place is rather unusual in ship settings, it is a possibility that the flint might be from a older period and that they were present in this area before the ship settings were built. This is however needs more research to prove or disprove.

If the monuments were built for the person being buried then one might think that this individual should have been powerful in life. Often when people build large monuments they are to indicate power and wealth rather than religion. One example of this are the Egyptian pyramids that far exceeded the extravagancy that any religious building or burial site should ever need.

Why else did the individual buried in ship 1-4 need to be buried in four ships build from very large stones? and why are they positioned one after the other? Does this symbolise something in the religion or in the culture? Maybe the individual in ship 1-4 was buried in four ships because it represented that this individual possessed a large fleet of ships in real life, maybe as a trader, explorer or warlord. If the ships had a more religious meaning then maybe it represented something that the individual needed to ensure the safe travel to the otherworld.

What connection did the cairn and ship 5 have to ship 1-4? They seem to have been used for the same kind of activity due to a high frequency of flint being found in both the cairn and ship 1-4. What kind of activity does the flint represent? Ritual or practical? Due to the fact that we don´t know how

ritualistic people were during the late bronze age in Klinte parish that is something that is very hard to answer.

In the end, what we know for certain about Rannarve is what is seen in the bones and the artefacts found at the site. The site must have been important in some way due to the amounts of monuments in the area close by to Rannarve, and the work that was needed to build ship 1-4 means that a well organised group of people put a lot of effort into building this site. If that was for one special individual being buried there or for some religious or cultural reason we may never know.

7.2 Ship settings on Gotland

A question that was asked in the beginning of this thesis was: Can a general artefact and bone pattern be distinguished from the material found within stone ship settings? I will discuss what patterns was found in the analysis below.

The artefacts and the people buried with them

The most common artefacts that were found along with the cremated bones in ship settings were tweezers, razors and ceramic pots. Double stud, arrow head, ring, needle and awl were also present in several ship settings (see Figure 20) but not in the same extent. This result is not something new, it has been seen by other researchers before (Ohlmarks 1945, Pettersson 1982, Artelius 1996). Tweezers and/or razors were found in 14 of the analysed ship settings and nine of these have been osteologically analysed. Five of those ships that contained these artefacts had an adult male buried with them. Only in one of these cases there were an adult female buried, and that was assessed to a "Female?". The other two females included in the analysis did not receive any burial gifts at all. This seems to suggest that tweezers and razors were more common in male burials, but this is a very small sample of individuals and I think more osteological work need to be done before an proper interpretation about this can be made for ship settings.

Susann Thedéen have in her dissertation looked at 43 bronze age cairns from Södermanland and Uppland in Sweden that all contained bronze artefacts like razors, tweezers, double stud and knife (Thedéen 2004:116). These types of artefacts are also very common in other bronze age burial forms like the cairn. Note that the cairn at Rannarve also contained a razor, awl and a bronze bar along with the buried adult "Female?". Of Thedéens 43 cairns 15 of them had been osteologically analysed. These analysis showed that all the individuals buried with these artefacts were adults. Sex assessments had been done on ten of them, and six of those were females and four were males (Thedéen 2004:120). This shows that in these cairns it seems that artefacts like razor, tweezers, double stud and knife were common with both sexes. Maybe a similar pattern is to be expected in ship settings if a bigger osteological material were available. Although as it appear at this point these types of artefacts seem more common with males in ship settings.

Figure 19: Picture of the most common burial gifts in ship settings. a) Razor from Fole 54. b) Tweezers from Tofta 26. c) Ceramic pot from Tofta 26. d) Arrow head from Fole 54. e) Double stud on exhibition on Gotland museum (uncertain origin). f) Tinplate of bronze from Fole 54. g) Ring from Fole 54. h) Awl and tweezers on exhibition on Gotland museum (unknown origin).

It is hard to make an interpretation about why these artefacts were given to the dead when they were buried. It has been discussed that the artefacts like tweezers, razors, double stud and knife and so on should not be interpreted as practical objects but rather as religious objects (Ohlmarks 1945, Hyenstrand 1966, Thedéen 2004). Thedéen thinks that the individual buried with these objects had a ritual role in the society/family and that there could have been several individuals that possessed this role in society at once (Thedéen 2004:121). This role could be possessed by both male and female but were restricted to age, due to the fact that all individuals found with these artefacts were adults (Thedéen 2004:121). This fact is also true in the ship settings, all individuals in this study that was buried with tweezers and razors were adults. Thedéen further says that the duties that this role possessed were everyday rituals as well as birth and burial rituals. Some of these rituals might include as the cutting of the umbilical cord, cutting the body for healing or ritual purposes like achievements or passages through life, shaving and preparing the dead before they are cremated (Thedéen 2004:118-122). The double stud is according to Thedéen an object used for holding a container together in which the tweezers, razors and knife were stored.

The ceramic pots that were found in the ship settings were usually found beside the urn and did not contain anything that had been preserved. These may have contained some organic material like food or drink that were gifts to the dead.

Context of the cremated bones

The most common contexts that cremated bones have been found in ship settings are either in a urn inside a stone cist or deposited without any preserved container (Something I have defined as "Bones alone" in the diagrams). Of the 54 analysed ships 15 had stone cist with urn and 18 of them had bones alone, see Figure 9. These two different contexts may indicate two ways of burying the cremated bones, alternatively a mix of these two, but we get back to that later. One way may have been a more proper burial (by today's standards at least) that the individual was cremated and then the bones were collected and put inside an urn and buried inside a stone cist within the ship setting. The other way might be that the individual was cremated and later scattered and buried on different

locations in the landscape, where the ship setting is one of those locations. The ship would in this case not be the burial site, the landscape itself is the burial site, and the ship setting is only a part of that landscape. It should also be noted that there are only one of the 18 ships that had bones alone that had any bronze artefacts. There are also usually rather small amounts of bones in these ships (<100-200 g) which also indicates that the entire individual has not been buried there. In a modern cremation 1-3 kilograms of bones remain after the cremation of a human body, varying a bit depending on size and sex (Lynnerup et al. 2008:393). So the bones in these ships hardly represents all the bones that was left from the cremation. The ship settings with stone cists and urns usually have larger amounts of bone (500-3500 g).

The third alternative to this two way burial practice that was just presented, is that individuals were buried in an urn inside a stone cist but some of the bones were also scattered in different ship settings nearby and maybe also around the landscape. This may explain ship 1-4 at Rannarve for example.

There also seem to be a pattern between the context of the bones, amount of bones and what bone elements were found. In the ship settings where stone cist with an urn was found there were usually a sizable amount of bones that represented most parts of the human body. Whilst in the ships where bones were found alone there were small amount of bones that only represented some parts of the human body, see Table 22. This is consistent with the notion that, as mentioned before, one individual being scattered on several locations and therefore only some parts of the body ended up on each location. Although parts from the cranium was found in all the ship settings except one, so the cranium seem to have been an important part when burying the bones.

Definition of a burial

It can be questioned that the ship settings that have small amounts of bones, that cannot represent an entire individuals bones and that are found alone, should be defined as a burial. As mentioned before these individuals might have been scattered on several places in the landscape and the ship setting is in that case only one part of the entire burial. Although it is difficult to know if this has been the case. If this is not the case, what does these bones represent? and should they be defined as a burial? There is a very clear contrast between this context and the other above mentioned context with stone cist, urn and often bronze artefacts, which can easier be interpret as a burial. It should also be mentioned that a lot has happened to the bones from the time they were cremated and until today. The amount of bones present can vary a bit depending on how hard the bones were burned, how well the remaining bones were gathered after the cremation, how much of the bones have decomposed or disappeared over time and how well the bones were collected during the excavation.

Any amount of human bones can probably be interpret as a burial, but it is difficult for us to know, or prove, what the people from the time thought about this and what they saw as a burial. Today's standards for what a burial is may not be the same as during the bronze age.

Eight of the ship settings did not contain any bones at all and if these should be interpreted as burial monuments or not is a question that has been raised before by Joakim Wehlin (2010) where he discusses that ship settings may have had several proposes, not just as burials, but also as ritual places where rituals for both birth and death was performed and that the ships represented both the beginning and the end of life. The empty ship settings could then maybe be ships that was used for birth rituals. Wehlin also discusses that the empty ship settings may be monument built for people who died abroad or at sea and due to this there were no body to bury, but the monument was still built to honour that person.

The individuals in the ship settings

There have been people of both sexes and from different age groups buried in the ship settings. The males do have a majority, eight of the twelve osteologically assessed individuals were males, and four were female.

As a osteologist I cannot emphasise enough the fact that these females were assessed to "Female?" which is not a certain assessment of sex, also one of the males were a "Male?". Therefore these individuals are somewhat unreliable in this analysis because they are uncertain in their sex assessment. As mentioned earlier it is very hard to make sex assessments on cremated bones, and because males are easier to distinguish than females, then the majority of males that were seen in the sex distributions in ship settings may be due to the difficulties of sex assessments in the osteological analysis.

The identified age groups were majority adults with seven young individuals out of 36 individuals that were age assessed. Five of these were buried along with adult individuals and there is only one case were there have only been young individuals buried in a ship setting and that was in Levide 1b. Although one of those individuals may have been a young adult (Juvenilis spans between 10-24 years). This means that it is very unusual for young individuals to be buried in ship settings, at least alone, and it seems that ship settings are burials for the adults. Maybe age was a qualification for being buried in a ship setting. Alternatively certain achievements in life needed to be fulfilled by an individual before they were allowed to be buried in a ship setting. Unless maybe a young individual died along with an adult, perhaps a relative, that were qualified to be buried in a ship setting, and therefore both were buried in the ship. It should also be mentioned that our standards for a young individual may not have applied during the late bronze age, the individuals that has been classified as young in the osteological analysis may very well have been considered as adults in their society. Age should not always be considered as a factor of years a person has lived, but also what deeds he or she has performed.

The most common number of individuals that are present in the ship settings are one or two individuals in each ship. Only three ships had more individuals and they were all from Rute parish and were osteologically analysed by Berit Sigvallius in 1982 (Sigvallius 1982). Although it seems that Sigvallius made those assessment based on the different contexts that the bones were found in rather than from ostological evidence. That means that the bones in these ships may be from fewer individuals that has been scattered or distributed on several places within the ships. The amount of bones in these ships were 377,5 g, 1635 g and 3338 g and was assessed to containing 5, 4 and 4 individuals. This is quite a small amounts of bone to represent that many complete individuals in the same burial. I find it likely that there is probably only one or two individuals in each of these ships as well. Although the osteological material from these ships needs to be revised for that to be proven.

It is however still unclear what type of people that was buried in ship settings in general, and why the ship was such an important symbol for them. As was mentioned before it has been discussed by Stenberger that they may have been traders and explorers and that the individuals being buried within the ship settings were people that had been a big part of this activity (Stenberger 1945a:64). This however is a puzzle that is very hard to solve from the material that we have available to us today. We know very little about the culture and religion of the people living during the late bronze age and it is hard to interpret symbols from ancient times when we don´t know anything about the background for them.

The animals

The most common animals that were found in the ship settings were sheep/goat and dogs. It was also common that these two animals was found in the same ship setting. This same pattern was viewed by Thedéen in her bronze age cairns (Thedéen 2004:108) so the occurrence of the same animals also seem to be similar in ship settings and cairns. No patterns could be distinguished relating the different animals to the sex or age of the human individuals though.

The analysis of the different bone elements from the animals showed that complete dogs seem to have been buried but only parts of the feet from the sheep/goats. This probably means that the dog was considered as a whole individual and was added to the pyre as one, maybe as a companion to the individual who had died. The sheep/goat on the other hand was more likely considered as food that was added to the pyre or in the form of a hide that the dead was wrapped in or given as a gift and that still contained pieces of bones from the feet of the animal. A similar theory has been discussed by Arcini (2007:182-183) on the Gualöv burial site in Skåne where bones from the feet and cranium from sheep/goat was common.

7.3 General interpretations of the ship settings on Gotland

When excavating ship settings in the future one might expect to find one of two scenarios:
1) There is a stone cist within the ship setting containing an urn of some sort with cremated bones inside. If artefacts are found along with these bones they might be tweezers, razor and in some cases double stud, knife, awl, needle and ring. Beside the urn an empty ceramic pot may also be found which once might have contained some sort of organic material. The osteological analysis will show that the urn most likely contained one adult human individual (sometimes two) with bones represented from most parts of the body. If a sex assessment can be made a male might be expected but a female is not unlikely. If no artefacts are found it seems more likely that the individual is either a female or a young individual. If tweezers and razor are found then a male individual seems more likely. If animal bones are found along with the human these are probably from a dog or sheep/goat or from both.

2) The second scenario is that there is no stone cist and no urn in the ship setting, instead there is a small amounts of bone scattered/deposited in one area of the ship without any artefacts. The osteological analysis of these bones will most likely show human bones from the cranium and some other parts of the body, sometimes along with animal bones from dog or sheep/goat.

These two expected scenarios are based from the statistics of what was the most common in this analysis and that may very well change when more ship settings are excavated and analysed osteologically in the future. This is simply what is to be expected if it should follow the same pattern seen in this analysis.

The artefacts found in ship settings correspond with artefacts found in bronze age cairns, at least when compared with the results from Susann Thedéens dissertation. These cairns are from the mainland of Sweden though. No cairns from Gotland, except the one at Rannarve, have been compared with these results from the ship settings.

An interpretation of why ship settings were built and what they were used for and who the people were that was buried within them is still a very difficult question to answer. But hopefully this work will help other scholars to answer that question in the future.

8. Conclusion

To conclude this thesis I will return to the questions that were asked in the beginning and try to answer these as simply as possible.

Can a general artefact and bone pattern be distinguished from the material found within Stone ship settings?

A lot of results have been presented about what patterns that have been seen in the material found in ship settings. To sum up what has been seen I will present these as a list.

- Most common artefacts: Tweezers, razor and ceramic pot.
- Two distinct contexts of the bones were distinguished. 1) Bones found within a urn inside a stone cist. 2) Bones were found alone without any preserved container.
- <100-200 grams of bones was common when the bones had been found alone. 500-3500 grams of bones were common inside urns within stone cists or urns alone.
- One or two individuals were the most common number of individuals buried in each ship setting.
- Most individuals were adults. Younger individuals found alone are unusual in ship settings, most young individuals have been found along with adults in the same burial.
- Males were more common than females.
- Most common animals found were sheep/goat and dog. The dogs were seemingly buried whole and only bones from the feet were buried from sheep/goat.
- Represented bone elements from the humans showed that most parts of the body were being buried in urns inside stone cist but when bones had been buried alone the represented bone elements were scattered parts of the body. Although the cranium were present in most cases.

Which types of artefacts are common with cremated bones in stone ship settings on Gotland?

The most common burial gifts that was found with cremated bones in the ship settings were tweezers, razor and ceramic pot, other bronze artefacts that were also frequently occurring were double stud, arrow head, ring, needle, awl, tinplate of bronze and bronze bar.

Is it possible to see any patterns between the artefacts and age/sex of the individuals buried in the ship settings?

Adult males with tweezers and/or razor buried in an urn inside a stone cist within the ship setting seem to be the most common pattern seen in the analysis. One of the females also received tweezers, knife, arrow head and awl but the other females did not receive any known burial artefacts at all. Although there were only three females used in the analysis of correlation between artefacts and sex and this is a very small sample, therefore an interpretation about what artefacts are the most common with females buried in ship settings is difficult to make.

Of the seven young individuals found in the ship settings without them being buried along with an adult, only one of these individuals received any artefacts and that was a bronze ring. This is however to few individuals to make an interpretation about what artefacts were the most common with the young in ship settings. One conclusion that can be made is that the younger individuals were most commonly buried along with adults. Therefore ship settings seem to have been burials mostly for adults.

Are the results similar to those in other bronze age burials/bone deposits with cremated bones?

The results of the most common artefacts and animal bones found in ship settings were compared with the results from Susann Thedéens dissertation and both results seem to show the same patterns. One can then expect that burials in ship settings and other bronze age burials are similar in what burial gifts that are found and which sex and age groups that are buried with those artefacts. This however needs more research before a proper assessment can be made about the similarities between burials in ship settings and other bronze age burials.

What osteological results can the bone material from the burial complex at Rannarve show? How can the site be interpreted?

The osteological analysis of the bones from Rannarve showed that it was probably just one individual buried within ship 2 and another in the cairn. Bones were scattered in the other ship settings as well but it is unclear if these are bones from other individuals or the same one buried in ship 2 and the cairn. All age assessments showed adults and the only sex assessment that were performed were on the individual in the cairn and it was assessed to "Female?".

The interpretation that was made of the Rannarve complex was that there was probably one individual buried in ship 1-4 and that it might be interpreted as one large ship setting rather than four. It is unclear how the cairn is associated with the ship settings but they have probably been used in similar ways due to the similarities of how the bones looked and that the large number of flint that was found both in ship 1-4 and in the cairn. However it is difficult to interpret how the site has been used but due to the amount of work that must have been done building the monuments they must have been important in some way, either for ritual or cultural purposes. Also a lot of other bronze age monuments are present in the area around Rannarve which might indicate that this area was an important place during the bronze age.

9. Summary

In this thesis Two analysis were made: 1) An osteological analysis of the cremated bones from the burial complex at Rannarve in Klinte parish. 2) An analysis of 54 excavated ship settings on Gotland where the artefacts and bone patterns found within these ship settings were compiled and analysed. The purpose of this was to try to see what the most common patterns were.

The osteological analysis of the bones from Rannarve showed that one individual was buried within ship 2 and another in the cairn. Bones were also scattered in the other ship settings as well but it is unclear if these are bones from other individuals or the same one buried in ship 2 or the cairn. All age assessments showed adults and the only sex assessment that were performed were on the individual in the cairn and it was assessed to "Female?".

The analysis of the excavated ship settings on Gotland showed that the most common artefacts found were tweezers, razor and ceramic pot. Two distinct burial context were observed where bones in ship settings either were found inside urns inside stone cists or the bones were found alone without any preserved container. The osteological results from these ship settings showed that one to two individuals were the most common found in each ship setting and most of the individuals were adults. Eight out of twelve individuals that were assessed to a sex were assessed to males and four to female. The most common animals that were found were sheep/goat and dog.

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11. Appendix

Appendix 1 - Less frequently occurring artefacts

Table 1: Table showing the less frequently occurring artefacts found in ship settings on Gotland.

Rarely occurring burial gifts	Number of Graves they occur in
Bronze needle	2
Tinplate of bronze	2
Miniature knife of bronze	2
Bronze knife	2
Bone needle	1
Miniature sword of bronze	1
Bronze finger ring	1
Spiral of bronze wire	1

Appendix 2 - Represented bone elements

Table 2: Table of the represented bone elements of all the osteologically analysed sip settings that had this documented.

Location	Burial	Bags of bone	Amount of bones	Identified bone elements
Alskog 9 a			176	Cranium, mandible, humerus, ulna, ribs, thigh bone, shinbone, vertebraes, metatarsal bones, foot
Alskog 9 c			49	Cranium, ulna, thigh bone
Alskog 9 e			31	Cranium, thigh bone
Alskog 9 f			935	Cranium, upper jaw, mandible, vertebrae, ribs, ulna, radius, pelvis,thigh bone, patella, shin bone, calf bone
Alskog 62 b			36	Cranium, long bones
Bäl 26			52	Cranium, thigh bone, shinbone
Fårö 57 a			49,5	
	A		44	Cranium, radius, shinbone
	B		24	Cranium
Klinte 86 a			19,5	Cranium, teeth
Klinte 86 b			1886	
		Bnr: 2	1405	Cranium, mandible, vertebraes, ribs, scapula, clavicle, humerus, ulna, radius, carpus bone, metacarpus bones, phalanges (hand), pelvis, femur, shinbone, calf bone, metatarsal bones, metapodium
		Bnr: 3	147	Cranium, vertebraes, scapula, phalanges (hand), ribs
		Bnr: 4	334	Cranium, carpus bone, phalanges (hand), tarsal bone, phalanges (foot)
Klinte 86 c			274	
		Bnr: 5	189	Phalanges (hand), phalanges (foot), ribs
		Bnr: 6	85	-
Lau 49 a			1881	
	A (From the urn)		1595	Cranium, upper jaw, mandible, teeth, vertebrae, ribs, humerus, ulna, radius, handbones, pelvis, thigh bone, shinbone, calf bone
	B (From the eastern part of the ship)		288	Cranium, humerus
Lau 49 b			1518	
		Bag 1	213	Cranium, teeth, vertebraes, ribs, humerus, ulna, radius, shinbone

		Bag 2	1305	Cranium, upper jaw, mandible, teeth, vertebraes, ribs, humerus, ulna, radius, pelvis, thigh bone, shinbone, calf bone, foot
Levide 1 a			934	
	A.a		266	Cranium, vertebraes, sacrum, ribs, humerus, ulna, radius, metacarpal bones, hand bones, pelvis, thigh bone, shinbone, metatarsal bone, foot bone
	A:b		668	Cranium, upper jaw, mandible, teeth, vertebraes, ribs, humerus, ulna, radius, carpal bones, hand bone, pelvis, thigh bone, shinbone, calf bone, metatarsal bone

Appendix 3 - References used in the compilation of the ship settings

Table 3: Table with all the references that were used in the compilation of the 77 excavated ship settings on Gotland. References were provided by Joakim Wehlin.

Location	Excavated	Excavated by	Reference	Osteology reference	Locations that were included in the analysis (Marked with X)
Alskog 62 a	2003	Gunilla Hallin	Hallin 2003		X
Alskog 62 b	2004	Gunilla Hallin	Hallin 2004, 2005	Malmborg 2004	X
Alskog 9 a	1919	Bror Schnittger & Harald Hansson	Schnittger 1920, Hansson 1927	Gustavsson 2011	X
Alskog 9 b	1919	Bror Schnittger & Harald Hansson	Schnittger 1920, Hansson 1927	Gustavsson 2011	X
Alskog 9 c	1919	Bror Schnittger & Harald Hansson	Schnittger 1920, Hansson 1927	Eifert 2009	X
Alskog 9 d	1919	Bror Schnittger & Harald Hansson	Schnittger 1920, Hansson 1927	Gustavsson 2011	X
Alskog 9 e	1919	Bror Schnittger & Harald Hansson	Schnittger 1920, Hansson 1927	Gustavsson 2011	X
Alskog 9 f	1919	Bror Schnittger & Harald Hansson	Schnittger 1920, Hansson 1927	Eifert 2009	X
Alskog 9 g	1919	Bror Schnittger & Harald Hansson	Schnittger 1920, Hansson 1927		
Ardre 149	1948	Greta Arwidsson	Arwidsson 1949		
Boge 28	1938	Mårten Stenberger	Ulfsparre 1875, Stenberger 1938		
Bäl 26	1875	Sigge Ulfsparre	Ulfsparre 1875, Schnittger 1920, Hansson 1927	Eifert 2009	X
Eksta 124	1945	Mårten Stenberger	Stenberger 1945		
Eksta 180	1945	Mårten Stenberger	Stenberger 1945		
Endre 42	1953	Greta Arwidsson	Silvén 1954		X
Fole 54	1959	Erik Nylén	Nylén 1964		X
Fröjel 9	1959	Erik Nylén & Gunilla Manneke	Manneke 1967		
Fårö 206 a	1968	Erik Nylén & Sture Engqvist	Nylén 1972, Östergren 2004		X
Fårö 57 a	1928	Harald Hansson	Hansson 1928a	Sten 1998, 2004	X
Fårö 57 b	1928	Harald Hansson	Hansson 1928a		X
Gothem 134	1875	Sigge Ulfsparre	Ulfsparre 1875		
Gothem 79 or 80	Before 1927	Unknown	Hansson 1927		
Grötlingbo 4	1928	Harald Hansson	Hansson 1928b		
Havdhem 9	1952	Greta Arwidsson	?		
Hörsne 7	1883	Fredrik Nordin	Nordin 1886		

Klinte 86 a	1966-67	Gunilla Manneke	Nylén 1976, Grimlund-Manneke 1979	Gustavsson 2012	X
Klinte 86 b	1966-67	Gunilla Manneke	Nylén 1976, Grimlund-Manneke 1979, Sabatini 2007	Gustavsson 2012	X
Klinte 86 c	1966-67	Gunilla Manneke	Nylén 1976, Grimlund-Manneke 1979	Gustavsson 2012	X
Klinte 86 d	1966-67	Gunilla Manneke	Nylén 1976, Grimlund-Manneke 1979	Gustavsson 2012	X
Klinte 86 e	1966-67	Gunilla Manneke	Nylén 1976, Grimlund-Manneke 1979	Gustavsson 2012	X
Lau 41	2010	Joakim Wehlin	Martinsson-Wallin & Wehlin 2010		
Lau 49 a	1928	Ture J. Arne	Arne 1928	Eifert 2009	X
Lau 49 b	1990	Malin Lindqvist	Lindquist 1990	Eifert 2009	X
Levide 1 a	1916	Harald Hansson	Hansson 1916, 1927	Eifert 2009	X
Levide 1 b	1916	Harald Hansson	Hansson 1916, 1927	Eifert 2009	X
Lummelunda 52 a	1956	Erik Nylén	Nylén 1958		X
Lummelunda 52 b	1956	Erik Nylén	Nylén 1958		X
Lärbro 114 a	1915	Bror Schnittger	Schnittger 1920, Hansson 1927	Gustavsson 2011	X
Lärbro 114 b	1915	Bror Schnittger	Schnittger 1920, Hansson 1927	Gustavsson 2011	X
Lärbro 144	1962	Almgren, Schönbäck, Trotzig & Rydh	Rydh 1964		
Lärbro 162 a	1916, 1973-74	Harald Hansson & Anna-Lena Gerdin	Schnittger 1920, Hansson 1927, Gerdin 1973, 74, 75, 76, 79		X
Lärbro 162 b	1916, 1973-74	Harald Hansson & Anna-Lena Gerdin	Schnittger 1920, Hansson 1927, Gerdin 1973, 74, 75, 76, 79		X
Lärbro 162 c	1916, 1973-74	Harald Hansson & Anna-Lena Gerdin	Schnittger 1920, Hansson 1927, Gerdin 1973, 74, 75, 76, 79		X
Lärbro 162 d	1916, 1973-74	Harald Hansson & Anna-Lena Gerdin	Schnittger 1920, Hansson 1927, Gerdin 1973, 74, 75, 76, 79		X
Lärbro 162 e	1916, 1973-74	Harald Hansson & Anna-Lena Gerdin	Schnittger 1920, Hansson 1927, Gerdin 1973, 74, 75, 76, 79		X
Lärbro 162 f	1916, 1973-74	Hansson & Anna-Lena Gerdin	Schnittger 1920, Hansson 1927, Gerdin 1973, 74, 75, 76, 79, Sabatini 2007	Vretemark 2003	X
Lärbro 203	1923	A. Edle	Hansson 1927		X
Lärbro 248	1972	Arne Hallström	Hallström 1973		X
Lärbro 253	1997	Wickman-Nydolf & Zerpe	Zerpe 1998a, 1999	Sigvallius 1999	
Lärbro 281	1877	Gabriel A. Gustafson	Gustafson 1878, 1884-1891, Hansson 1927		X
Lärbro 630	2004	Dan Carlsson	Carlsson & Widerström 2004		X
Martebo 68	1952, 1958	Greta Arwidsson, Claës Varenius & Valdemar Ginters	Arwidsson 1956, Varenius & Ginters 1959	Varenius & Ginters 1959	
Norrlanda 89	1888	Gabriel A. Gustafson	Gustafson 1888, Hansson 1927		X
Norrlanda oreg.	1999	Anne-Marie Lund	Lund 1999, 2000		
Rute 18	1964	Ingrid & Sture Engqvist	Pettersson 1982, Äijä 1982, Sabatini 2007	Aijä 1982	
Rute 77 a	1980-81	Ann-Marie Petterson	Pettersson 1982	Sigvallius-Vilkancis 1982	X
Rute 77 b	1980-81	Ann-Marie Petterson	Pettersson 1982	Sigvallius-Vilkancis 1982	

Rute 77 c	1980-81	Ann-Marie Petterson	Pettersson 1982	Sigvallius-Vilkancis 1982	
Rute 77 d	1980-81	Ann-Marie Petterson	Pettersson 1982	Sigvallius-Vilkancis 1982	
Rute 77 e	1980-81	Ann-Marie Petterson	Pettersson 1982	Sigvallius-Vilkancis 1982	X
Rute 77 f	1980-81	Ann-Marie Petterson	Pettersson 1982	Sigvallius-Vilkancis 1982	X
Sanda 58	1919	Harald Hansson	Hansson 1928c		
Silte 29	1887	Gabriel A. Gustafson	Schnittger 1920, Hansson 1927, Sabatini 2007		X
Sproge 68	After 1919 but before 1927	Harald Hansson	Säve 1852, Hansson 1927		X
Sproge 68	After 1919 but before 1927	Harald Hansson	Säve 1852, Hansson 1927		X
Stenkyrka 30 a	1953	Ulla Silvén	Silvén 1954		X
Stenkyrka 30 b	1953	Ulla Silvén	Silvén 1954		X
Stenkyrka 48	1965	Anna-Lena Gerdin	Gerdin 1979		X
Tofta 15	1928	Harald Hansson	Hansson 1928d		X
Tofta 26	1929	Harald Hansson	Hansson 1929	Eifert 2009	X
Tofta 78	1951	Greta Arwidsson	Arwidsson 1952, Sabatini 2007	Blücher 2005	X
Vallstena 103 a	Before 1875	Unknown	Ulfsparre 1875, Hansson 1927		X
Vallstena oreg.	1977-79	Gunilla Wickman & Stig Englund	Wickman 1978, Englund 1979		
Visby 3	1899, 1922	Oscar Wennersten	Hansson 1927		X
Visby 8 a	1975-1977	Monica Wennersten	Wennersten 1977		X
Visby 8 b	1975-1977	Monica Wennersten	Wennersten 1977		X
Väte 13	1998	Leif Zerpe	Zerpe 1998b, 2002	Sigvallius 2002	X

Appendix 4 - Results from the ship settings not included in the analysis

Table 4: Table showing the compiled results from the ship settings that was not included in the analysis.

Location	Stone cist	House urn	Urn	Resin	Context of the burned bones in the ship setting	Burial artefacts (Bronze artefacts/other)	Other finds in the ship setting	Amount of bones (g)	Identified Human bones	MNI	Age (years)	Sex	Identified animal bones	Comment	Reason for not including in analysis
Lärbro 253	-	-	?	-	Plundered, bones scattered. Original burial was probably in the middle	-	-	869,9	Human	1	18-44	-	Sheep/goat		Plundered
Rute 18	?	X	-	-	East part, and middle	-	-	600	Human	1	-	-	Fish	Nothing is mentioned about this being plundered but to me it seems like a possibility	Unsure if it is plundered or not. Uncertain context.
Rute 77 b	X	-	X?	-	Plundered, remains in middle inside stone cist and also scattered around the ship	-	Ceramics	459	Human	2	2 Adults	F?/-	Sheep/goat		
Rute 77 c	X?	-	X?	-	Plundered, but signs that there were 2 stone cists with burned remains and urns	-	-	377,5	Human	5	4 adults/ 1 young (15 y)	-	-		Plundered
Rute 77 d	-	-	-	-	Plundered, bones found scattered	-	-	79	-	-	-	-	-		Plundered
Alskog 9 g	-	-	-	-	Plundered	-	Animal shaped buckle (Viking age)	-	-	-	-	-	-		Plundered
Ardre 149	-	-	-	-	South part	-	Charcoal	Unknown weight	-	-	-	-	-	Unclear if the bones were burned or unburned	Unclear if this is a ship setting. Not completely excavated
Boge 28	X	-	?	-	Plundered. East part, inside stone cist	-	Ceramics, charcoal	341	-	-	-	-	-	Not completely excavated	Plundered
Eksta 124	-	-	-	-	Plundered, bones scattered	-	Ceramics, iron	476 + (93)	Human	1	-	-	Sheep/goat, cattle	The ship is a ship shaped stone cist	Plundered, might be mixed with recent or iron age material
Eksta 180	-	-	-	-	Plundered?, bones scattered	-	Charcoal	Unknown weight	Human	1	-	-	Horse		Plundered, might be mixed with recent or iron age material
Fröjel 9	-	-	-	-	Plundered? Signs after a destroyed stone cist	-	Flint, charcoal, resin	-	-	-	-	-	-		Plundered
Gothem 79 el. 80	?	-	X	-	Plundered, unknown context	-	-	Unknown weight	-	-	-	-	-	Not completly excavated	Plundered

Gothem 134	-	-	-	-	Plundered?	-	Ceramics	-	-	-	-	-	-			Plundered
Grötlingbo 4	X?	-	-	-	Plundered, the small amaount of bones were found in the south part of the ship	-	Flint, ceramics	90	-	-	-	-	-			Plundered
Havdhem 9	-	-	-	-	Plundered, bones found scattered in south part of ship	-	-	Unknown weight	-	-	-	-	-			Plundered
Hörsne 7	-	-	-	-	?	-	-	Unknown weight	-	-	-	-	Animal bones			Very little information
Lau 41	-	-	-	-	-	-	Flint, charcoal, quartz	-	-	-	-	-	-	Not completly excavated		Not completly excavated
Lärbro 144	-	-	-	-	?	-	Charcoal	218	Human	-	-	-	-			Unsure if it is a ship setting
Norrlanda oreg.	-	-	-	-	Bones were found in the middle, north and south part of the ship. Also outside of the ship. Both burned and unburned bones.	2 bronze tubes, 3 fingerings, animal shaped buckle, 2 needles, tinplate of bronze, arm chain, buckle, part to a buckle, 5 pieces of bronze spiral	Ceramics, 6 glass pearls, one unidentified object	Unknown weight	Human	-	-	-	Horse	Was found in a large stone setting 19 m. Ship setting was not completely excavated		
Sanda 58	-	-	-	-	Plundered	-	-	-	-	-	-	-	-			Plundered
Vallstena oreg.	-	-	-	-	?	-	-	Unknown weight	-	-	-	-	-			Destroyed ship setting and unsure what finds belonged to the ship.
Martebo 68	?	?	?	-	Many graves around this presumably ship setting. Unclear which belong to the ship setting.	?	?	?	-	-	-	-	-			Unclear if it is a ship setting

Appendix 5 - List of Bones

In the age column the following abbreviations are used:
"Fus." = Fused
"Unfus." = Unfused
After these abbreviations there are sometimes a parentheses that shows when the bone fuses.

In several columns in the list the following sign is used:
"-"
This means that there were no characteristics on the fragment to make an assessment.

Table 5: Table showing the detailed results from the osteological analysis. All the bones from each bag is presented in order of the Bnr-number.

Ship setting 1
Bnr: 1
Totalweight: 19,5 g
Biggest fragment 3,4 cm Average 0,5-2
Number of fragments: 73
Number of indentified fragments: 2
Weight Identified fragments: 1 g
Degree of cremation: 2

Species	Bone element	Part of the bone	Number of fragments	Side: (DX/SIN)	Sex	Age (years)	Degree of cremation (Colour)	Weight (g)	MNI	Comment	Bnr
Homo sapiens	Cranium	Pars petrosa	1	-	-	-	2 (Beige)		1		1
Homo sapiens	Dentes	Root from a tooth	1	-	-	-	2 (Beige)		1		1
Indeterminata	Indeterminata	Indeterminata	68	-	-	-	2 (mostly beige)	14,5 g	1		1
Indeterminata	Ossa longa	Indeterminata	2	-	-	-	2 (Beige)	2 g	1		1
Indeterminata	Cranium	Indeterminata	1	-	-	-	2 (Beige)	1 g	1		1

Ship setting 2
Bnr: 2
Total weight: 1405 g
Volume: 2,5 l
Biggeste fragment: 11,5 cm Average: 2-5 cm
Number of fragments: 1544
Number of identified fragments: 212
Weight Identified fragments: 308 g

Species	Bone element	Part of the bone	Number of fragments	Side: (DX/SIN)	Sex	Age (years)	Degree of cremation (Colour)	Weight (g)	MNI	Comment	Bnr
Homo Sapiens	Zygomaticum	Processus frontalis	1	DX	-	-	2 (Beige)		1		2
Homo Sapiens	Zygomaticum	Processus frontalis	1	-	-	-	2 (Beige)		1		2
Homo Sapiens	Temporale	Fossa mandibularis	1	SIN	-	-	2-3 (White-grey-beige)		1	Has a red discolouration	2
Homo Sapiens	Temporale	Fossa mandibularis	1	DX	-	-	2 (Beige)		1		2
Homo Sapiens	Occipitale	Fragment av Eminentia Cruciformis	1	-	-	-	2 (Grey-beige)		1		2
Homo Sapiens	Occipitale	Condylus occipitalis	1	SIN	-	-	2 (Beige)		1		2
Homo Sapiens	Occipitale	Condylus occipitalis	1	DX	-	-	2 (Beige)		1		2
Homo Sapiens	Frontale	Margo supraorbitalis	1	SIN	-	-	2 (Beige)		1		2
Homo Sapiens	Frontale	Margo supraorbitalis	1	-	-	-	2 (Beige)		1		2
Homo Sapiens	Temporale	Processus zygimaticus	1	DX	-	-	2 (Beige)		1		2
Homo Sapiens	Temporale	Pars petrosa	1	DX	-	-	2 (Grey-beige)		1		2
Homo Sapiens	Temporale	Pars petrosa	1	SIN	-	-	2 (Grey-beige)		1		2
Homo Sapiens	Maxilla	Processus palatinus	1	SIN	-	-	2 (Beige)		1		2
Homo Sapiens	Mandibula	Ramus mandibulae	1	SIN	-	-	2 (Beige)		1		2
Homo Sapiens	Mandibula	Fragment with dental alveolus	3 small fragments	-	-	-	2 (Beige)		1		2
Homo Sapiens	Mandibula	Alveoli dentales (incisors)	1	-	-	-	2 (Beige)		1		2
Homo Sapiens	Cranium	Indeterminata	Circa 77	-	-	-	2 (beige & grey-blue)	143	1	Total weight of all cranium fragments 192,5 g	2
Homo Sapiens	Scapula	Cavitas glenoidale	1	DX	-	Fus. (15-20 yr)	2 (Beige)		1		2
Homo Sapiens	Scapula	Fragment of margo lateralis	1	DX	-	-	2 (Beige)		1		2

Homo Sapiens	Clavicula	Extremitas sternalis	1	-	-	Fus. (16-21 yr)	2 (Beige)		1		2
Homo Sapiens	Clavicula	Extremitas acromialis	1	DX	-	Fus. (19-20 yr)	2 (Beige)		1		2
Homo Sapiens	Ulna	Proximal part of the bone	1	SIN	-	Fus. (12-16 yr)	2 (Beige)		1		2
Homo Sapiens	Ulna	Part of the diaphysis	3 small fragments	-	-	-	2 (Beige)		1		2
Homo Sapiens	Ulna	Processus Styliodeus ulnae	1	-	-	-	2 (Beige)		1		2
Homo Sapiens	Radius	Distal end of the bone	1	DX	-	Fus. (14-20 yr)	2 (Beige)		1		2
Homo Sapiens	Radius	Part of the diaphysis	3	-	-	-	2 (beige & grey-blue)		1		2
Homo Sapiens	Humerus	Caput	1	-	-	Fus. (13-20 yr)	2 (Beige)		1	Caput largest diameter: 38,56 mm. Too fragmented for sex assessment	2
Homo Sapiens	Humerus	Condylus humeri	1	-	-	Fus. (11-17 yr)	2 (Beige)		1		2
Homo Sapiens	Humerus	Part of the middle of the diaphysis	1	DX	-	Fus. (13-20 yr)	2 (Beige)		1		2
Homo Sapiens	Humerus	Caput	1	-	-	-	2 (Beige)		1		2
Homo Sapiens	Scaphoideum	Partly fragmented	1	SIN	-	-	2 (Grey-blue)		1		2
Homo Sapiens	MC2	Distal half	1	DX	-	Fus. (14,5-16,5 yr)	2 (Beige)		1		2
Homo Sapiens	MC1	Distal half	1	DX	-	Fus. (14,5-16,5 yr)	2 (Beige)		1		2
Homo Sapiens	MC	Distal end	1	-	-	Fus. (14,5-16,5 yr)	2 (Beige)		1		2
Homo Sapiens	Manus	Phalang 1 (Complete)	1	-	-	Fus. (14-16 yr)	2 (Beige)		1		2
Homo Sapiens	Manus	Phalang 2 (Complete)	1	-	-	Fus. (14-16,5 yr)	2 (Beige)		1		2
Homo Sapiens	Manus	Phalang 1 (Distal half)	3 of the same type	-	-	Fus. (14-16 yr)	2 (Beige)		1	Weight upper extremity: 100 g	2
Homo Sapiens	Atlas	Arcus posterior + facies articularis	2	-	-	-	2 (Beige)		1		2
Homo Sapiens	Axis	Dens axis	1	-	-	-	2 (Beige)		1	DTD: 8,7 mm DSD: 9,6 mm	2
Homo Sapiens	Vertebrae lumbales	Frag. of Corpus & Pediculus	1	-	-	Fus. (24-25 yr)	2 (Beige)		1		2
Homo Sapiens	Vertebrae lumbales	Frag. of Corpus & Pediculus	1	-	-	Fus. (24-25 yr)	2 (Beige)		1		2
Homo Sapiens	Vertebrae lumbales	Processus Costiformis	1	-	-	-	2 (Beige)		1		2
Homo Sapiens	Vertebrae lumbales	Processus costiformis	1	-	-	-	2 (Beige)		1		2
Homo Sapiens	Vertebrae Thoracicae	Part of the corpus	1	-	-	Fus. (24-25 yr)	2 (Beige)		1		2

Homo Sapiens	Vertebrae Thoracicae	Processus spinosus	3 of the same type	-	-	-	2 (Beige)		1		2
Homo Sapiens	Vertebrae Thoracicae	Corpus	1	-	-	Fus. (24-25 yr)	2 (Beige)		1		2
Homo Sapiens	Vertebrae Thoracicae	Processus articularis	7 of the same type	-	-	-	2 (Beige)		1		2
Homo Sapiens	Vertebrae Coccygeae	Corpus (Half)	1	-	-	Fus. (24-25 yr)	2 (Beige)		1		2
Homo Sapiens	Vertebrae	Indeterminata	46	-	-	Some of the fragments were the corpus part. All corpus parts were Fus.	2 (beige & grey-blue)	39	1	Weight identified vertebrae: 23 g. Total weight for all vertebrae: 62 g.	2
											2
Homo Sapiens	Costae	Indeterminata	46	-	-	Some fragments had visable characteristics for age and all of them were Fus.	2 (Beige)	38,5	1		2
Homo Sapiens	Coxae	Accetabulum fragment	1	-	-	Fus. (11-17 yr)	2 (Beige)		1		2
Homo Sapiens	Coxae	Tuberositas ischiadicum	1	-	-	Fus. (16-18 yr)	2 (Beige)		1		2
Homo Sapiens	Coxae	Part of facies auricularis	1	-	-	-	2 (Beige)		1		2
Homo Sapiens	Coxae	Indeterminata, delvis frag. av os Illium	13	-	-	-	2 (Beige)		1		2
Homo Sapiens	Coxae	Incisura ischiadica major and small part of the facies auricularis	1	DX	-	-	2 (Beige)		1	The angle was to fragmented for a sex assessment to be made.	2
Homo Sapiens	Femur	Part of distal articulating surface	1	-	-	Fus. (14-16 yr)	2 (Beige)		1		2
Homo Sapiens	Femur	Part of the diaphysis	3 small fragments	-	-	-	2 (beige & grey-blue)		1		2
Homo Sapiens	Femur	Distal epicondyl	2	-	-	-	2 (Beige)		1		2
Homo Sapiens	Tibia	Part of the diaphysis	3 small fragments	-	-	-	2 (Beige)		1		2
Homo Sapiens	Tibia	Prox articulating surface	1	-	-	-	2 (Beige)		1		2
Homo Sapiens	Fibula	Part of the diaphysis	3 small fragments	-	-	-	2 (Beige)		1		2
Homo Sapiens	Fibula	Part of the distal end	1	SIN	-	Fus. (12-18 yr)	2 (Beige)		1		2
Homo Sapiens	MT	Part of the distal end & diaphysis	1	-	-	Fus. (13-18 yr)	2 (Beige)		1		2

Homo Sapiens	Femur/Tibia	Indeterminata diaphysis	1	-	-	-	2 (Beige)		1		2
Homo Sapiens	Ossa longa	Indeterminata	86	-	-	-	2 (beige & grey-blue)	228,5	1		2
Intedterminata	Indeterminata	Indeterminata	Circa 1200	-	-	-	2 (beige & grey-blue)	626	1		2

Ship setting 2
Bnr: 3
Total weight: 147 g
Volume: Circa 0,3 l
Biggest fragment: 5,2 cm Average: 1-2 cm
Number of fragments: 281
Identified fragments: 10
Weith identified fragments: 20 g

Species	**Bone element**	**Part of the bone**	**Number of fragments**	**Side: (DX/SIN)**	**Sex**	**Age (years)**	**Degree of cremation (Colour)**	**Weight (g)**	**MNI**	**Comment**	**Bnr**
Homo Sapiens	Mandibula	Caput mandibulae+collum	1	SIN	-	-	2 (Beige)		1		3
Homo Sapiens	Frontale	Glabella + margo supraorbitalis	1	SIN	F?	-	2 (Beige)		1	Bothc the margo and the glabella was assessed to F?	3
Homo Sapiens	Frontale	Crista frontalis+foramen caecum+spina nasalis	1	-	-	-	2 (Beige)		1		3
Homo Sapiens	Temporale	Del runt meatus acusticus	1	SIN	-	-	2 (Beige)		1		3
Homo Sapiens	Cranium	Indeterminata	22	-	-	-	2 (Beige)	21	1	Weight identified cranium: 15g Total weight for all cranium: 36g	3
Homo Sapiens	Vertebrae thoracicae	Corpus + fovea costalis	1	-	-	-	2 (Beige)		1		3
Homo Sapiens	Vertebrae thoracicae	Indeterminata	8	-	-	One of the corpus parts were fused	2 (Beige)	4,5	1	Total weight vertebrae 5,5g	3

Homo Sapiens	Scapula	Small fragment of facies posterior/anterior	1	-	-	-	2 (Beige)		1		3
Homo Sapiens	Manus	Phalang 1 (Hel)	1	-	-	Fus. (14-16 yr)	2 (Beige)		1		3
Homo Sapiens	Manus	Phalang (Distal del)	1	-	-		2 (Beige)		1	Total weight of the upper extremity 3,5 g	3
Homo Sapiens	Costae	Indeterminata	2	-	-	-	2 (Beige)	>1	1		3
Homo Sapiens	Ossa longa	Indeterminata	41	-	-	-	1, 2, 3 (Black, beige, white)	37,5	1	Mostly beige fragments, only one black and one white fragment.	3
		Indeterminata									
Indeterminata	Indeterminata	Indeterminata	Circa 200	-	-	-	2 (Mostly beige)	56	1		3

Ship setting 2
Bnr 4
Total weight: 334 g
Volume: 0,5 l
Biggest fragment: 7 cm Average: 1-3 cm
Number of fragments: Circa 639
Identified fragments: 29
Weight identified fragments: 22 g

Species	**Bone element**	**Part of the bone**	**Number of fragments**	**Side: (DX/SIN)**	**Sex**	**Age (years)**	**Degree of cremation (Colour)**	**Weight (g)**	**MNI**	**Comment**	**Bnr**
Homo Sapiens	Frontale	Part of crista frontalis	1	-	-	-	2 (Beige)		1		4
Homo Sapiens	Temporale	Del runt meatus acusticus	1	DX	-	-	2 (Brown-beige)		1		4
Homo Sapiens	Scaphoideum	Half	1	DX	-	-	2 (Beige)		1		4
Homo Sapiens	Manus	Phalang 1 (Distal Halfa)	1	-	-	Fus. (14-16 yr)	2 (Beige)		1		4
Homo Sapiens	Manus	Phalang 1 (Distal end)	1	-	-	Fus. (14-16 yr)	2 (Beige)		1		4
Homo Sapiens	Manus	Phalang 2 (Hel)	1	-	-	Fus. (14-16,5 yr)	2 (Beige)		1		4
Homo Sapiens	Manus	Phalang 2 (Distal Halfa)	1	-	-	Fus. (14-16,5 yr)	2 (Beige)		1		4
Homo Sapiens	Manus	Phalang 3 (Hel)	1	-	-	Fus. (13,5-16 yr)	2 (Beige)		1		4

Homo Sapiens	Manus	Phalang 3 (Hel)	1	-	-	Fus. (13,5-16 yr)	2 (Beige)		1		4
Homo Sapiens	Indeterminata Phalang	Indeterminata	2	-	-	Fus. (13,5-16 yr)	2 (Beige)		1		4
Homo Sapiens	Metapod	Distal end	2 lika fragment	-	-	-	2 (Beige)		1		4
Homo Sapiens	Talus	Part with facies superior + malleolaris medialis	1	-	-	-	2 (Beige)		1		4
Homo Sapiens	Pedis	Phalang 3 (Hel)	1	-	-	-	2 (Beige)		1		4
Homo Sapiens	Weight all identified fragments							11,5	1	All parts of the cranium weight: 3 g	4
Troligtvis Homo Sapiens	Ossa longa	Indeterminata	68	-	-	-	2 (Beige, Dark Brown)	97,5	1		4
Canis Familaris/Vulpes Vulpes	Mandibula	Fragment of caput mandibulae	1	DX	-	-	2 (Beige)		1		4
Canis Familaris/Vulpes Vulpes	Ulna	Proximal del	1	DX	-	Fus. (1 ¼ yr)	2 (Beige)		1		4
Canis Familaris/Vulpes Vulpes	Manus	Cu (Hel)	1	DX	-	-	2 (Beige)		1		4
Canis Familaris/Vulpes Vulpes	Manus	Cu (Hel)	1	SIN	-	-	2 (Beige)		1		4
Canis Familaris/Vulpes Vulpes	Phalang Indeterminata	Distal del	2	-			2 (Beige)				
Canis Familaris/Vulpes Vulpes	Humerus	Distal del	1	-	-	-	2 (Beige)		1		4
Canis Familaris/Vulpes Vulpes	MT 2	Proximal Half	1	DX	-	Fus. (0,5 yr)	2 (Beige)		1	PW (Proximal width) was = 3,98 mm	4
Canis Familaris/Vulpes Vulpes	Os Bacculum	Fragmenterad	1	-	M	-	2 (Beige)		1		4
Canis Familaris/Vulpes Vulpes	Patella	Fragmenterad	1	-	-	-	2 (Beige)		1		4
Canis Familaris/Vulpes Vulpes	Coxae	Small part of accetabulum	1	SIN	-	Fus. (0,5 yr)	2 (Beige)		1		4
Canis Familaris/Vulpes Vulpes	Calcaneus	Litet fragment	1	-	-	-	2 (Beige)		1		4
Canis Familaris/Vulpes	Phalang	Indeterminata	1	-	-	-	2 (Beige)		1		4

Vulpes											
Ovis/Capra	Talus	Litet fragment	1	SIN	-	-	2 (Beige)		1		
Troligtvis Canis familiaris/Vulpes vulpes	Ossa longa	Indeterminata	31	-	-	-	2 (Beige)	22	1		4
Indeterminata	Cranium	Indeterminata	5	-	-	-	2 (Beige)	3	1		4
Indeterminata	Mandibula/ Maxilla	Small fragment with dental alveolus	2	-	-	-	2 (Beige)	0,5	1		4
Indeterminata	Vertebrae	Indeterminata	4	-	-	-	2 (Beige)	<0,5	1		4
Indeterminata	Indeterminata	Indeterminata	Circa 500	-	-	-		169	1		
Non-bones	Stones and fossils		18	-	-	-		10	1		4

Ship setting 3
Bnr: 5
Total weight: 189 g
Volume: 0,3 l
Biggest fragment: 4,1 cm Average: 1-2 cm
Number of fragments: Circa 633
Identified fragments: 49
Weight identified fragments: 25 g

Species	Bone element	Part of the bone	Number of fragments	Side: (DX/SIN)	Sex	Age (years)	Degree of cremation (Colour)	Weight (g)	MNI	Comment	Bnr
Canis familiaris	Occipitale	Condylus occipitalis	1	SIN	-	-	2 (Beige)		1		5
Canis familiaris	Maxilla	Part with dental alveolus	1	-	-	-	2 (Beige)		1		5
Canis familiaris	Mandibula	Caput mandibulae	1	DX	-	-	2 (Beige)		1		5
Canis familiaris	Cranium	Dentes M2	1	-	-	-	2 (Beige)		1	Hard to determine if the enamel crown of the tooth had been destroyed by the cremation or was severely worn down. The age was therefore undetermined.	5

Canis familiaris	Metapod	Distala änden	4 fragment of the same type	-	-	Fus. (0,5 yr)	2 (Beige)	<0,5g	1		5
Canis familiaris	Phalanges	6 Phallanges (1 partly fragmented, two complete and three fragmented)	12	-	-	Fus. (0,5 yr)	2 (Beige)	4,5 g			5
Canis familiaris	Femur	Distal condyl	1	-	-	Fus. (1 ½ yr)	2 (Brown)		1		5
Canis familiaris	Coxae	Acetabulum	1	-	-	Fus. (0,5 yr)	2 (Beige)		1		5
Canis familiaris	Vertebrae cervicales	fragment	1	-	-	-	2 (Beige)		1		5
Canis familiaris	Vertebrae Coccygeae	Delvis fragmenterade fragment	7	-	-	Fus. (1 ¾ -2 yr)	2 (Brown-beige)		1		5
Canis familiaris	Vertebrae	Indeterminata	10	-	-	Fus. (1 ¾ -2 yr)	2 (Brown-beige)		1	Several of the fragments were parts of the corpus that all were fused	5
Canis familiaris	Weight all identified fragments							15,5 g	1		5
Ovis/Capra	MT	Proximal end	3 fragmented fragments	-	-	-	2 (Beige)		1		5
Ovis/Capra	MP	Parts of the distal end	9 Small fragment	-	-	Unfus. (1⅓ - 2 yr)	2 (Brown-beige)		1	2 of the fragments had unfused surfaces	5
Ovis/Capra	Phalang 1	Proximal epiphysis	2	-	-	Unfus. (½-¾ yr)	2 (Brown-beige)		1		5
Ovis/Capra	CT	Fragmented	1	-	-	-	2 (Beige)		1		5
Ovis/Capra	Weight all identified fragments							3,5 g	1		5
Homo Sapiens	Manus	Phalang 1 (Distal end)	2	-	-	Fus. (14-16 yr)	2 (Brown-beige)		1		5
Homo Sapiens	Pedis	Phalang 3 (Hel men lite nött)	1	-	-	Fus. (13,5-16 yr)	2 (Beige)		1		5
Homo Sapiens?	Costae?	Part of the diaphysisen	1	-	-	-	2 (Beige)		1	Has bone spurs	

Homo Sapiens	Weight all identified fragments							3	1		5
Indeterminata	Phalanges	Distal del	2	-	-	-	2 (Beige)		1		5
Indeterminata	Carpi/Tarsi	-	2	-	-	-	2 (Brown-beige)		1		5
Indeterminata	Cranium	Indeterminata	3	-	-	-	2 (Beige and White)	<0,5g	1	Total weight for all the cranium: 2 g	5
Indeterminata	Ossa longa	Indeterminata	65	-	-	-	2 (Beige, Brown)	36,5 g	1	The majority of the fragments probably belong to the dog but this cannot be proven. However from the size and the structure of the bones they conform with dog.	5
Indeterminata	Costae	Indeterminata	2	-	-	-	2 (Beige)	0,5 g	1		5
Indeterminata	Indeterminata	Indeterminata	Circa 500	-	-	-	2 (Mostly beige)	117 g	1		5

Ship setting 3
Bnr: 6
Total weight: 85 g
Volume: Circa 0,2 l
Biggest fragment: 3,8 cm Average 1 cm
Number of fragments: 257
Identified fragments: 0
Weight identified fragments: 0 g

Species	**Bone element**	**Part of the bone**	**Number of fragments**	**Side: (DX/SIN)**	**Sex**	**Age (years)**	**Degree of cremation (Colour)**	**Weight (g)**	**MNI**	**Comment**	**Bnr**
Ovis/Capra?	Vertebrae Cervicales	Small peice of the corpus	1	-	-	Fus.	2 (Beige)	<0,5	1		6
Indeterminata	Cranium	Indeterminata	11	-	-	-	2 (Beige)	6	1		6
Indeterminata	Ossa longa	Indeterminata	20	-	-	-	2 (Beige)	20,5	1	Probably contains human	6
Indeterminata	Vertebrae	Indeterminata	5	-	-	-	2 (Beige)	0,5	1		6

Indeterminata	Indeterminata	Indeterminata	Circa 220	-	-	-	2 (Beige)	52	1		6

Ship setting 4
Bnr: 7
Total weight: 3,5 g
Volume: 1/10 dl
Biggest fragment: 2,1 cm Average: 0,5-1 cm
Number of fragments: 27
Identified fragments: 0
Weight identified fragments: 0 g

Species	Bone element	Part of the bone	Number of fragments	Side: (DX/SIN)	Sex	Age (years)	Degree of cremation (Colour)	Weight (g)	MNI	Comment	Bnr
Indeterminata	Indeterminata	Indeterminata	27	-	-	-	1-3 (A few black fragments, some beige and some white)	3,5	1	The bones looked discoloured dark on the surface. Looked different from then the bones from the other bags.	7

Ship setting 5
Bnr 8
Total weight: 8,5 g
Volume: 1/100 l
Biggest fragment: 1,7 cm Average: 1 cm
Number of fragments: 32
Identified fragments: 0
Weight identified fragments: 0 g

Species	Bone element	Part of the bone	Number of fragments	Side: (DX/SIN)	Sex	Age (years)	Degree of cremation (Colour)	Weight (g)	MNI	Comment	Bnr
Indeterminata	Cranium	Indeterminata	1	-	-	-	2 (Beige)	<0,5	1		8
Indeterminata	Ossa longa	Indeterminata	4	-	-	-	2-3 (2 white-beige, 1 beige och 1 dark beige	2,5	1		8
Indeterminata	Indeterminata	Indeterminata	27	-	-	-	2-3 (Mixed colours. Mostly beige, but also	4,5	1		8

							some black and a few white)				

The cairn
Bnr: 9
Total weight: 1,5 g
Volume: <1 dl
Biggest fragment: 1,5 cm Average: < 1 cm
Number of fragments: 24
Identified fragments: 1
Weight identified fragments: 1 g

Species	Bone element	Part of the bone	Number of fragments	Side: (DX/SIN)	Sex	Age (years)	Degree of cremation (Colour)	Weight (g)	MNI	Comment	Bnr
Homo sapiens	Dentes	Root from a tooth	1	-	-	The root was closed	2 (Beige)	<0,5	1		9
Indeterminata	Dentes	Roots from teeth	4	-	-	-	2-3 (One white and three beige)	<0,5	1		9
Indeterminata	Ossa longa	Indeterminata	5				2 (Mostly beige)	1,5	1		9
Indeterminata	Indeterminata	Indeterminata	14	-	-	-	2-3 (Beige and white)	<0,5	1		9

The cairn
Bnr: 10
Total weight: 3 g
Volume: <0,1 l
Biggest fragment: 1,6 cm Average: <1 cm
Number of fragments: 38
Identified fragments: 2
Weight identified fragments: 1 g

Species	Bone element	Part of the bone	Number of fragments	Side: (DX/SIN)	Sex	Age (years)	Degree of cremation (Colour)	Weight (g)	MNI	Comment	Bnr
Homo sapiens	Manus	Phalang (Indeterminata) Distal end.	1	-	-	Fus.	3 (White-beige)	<0,5	1		10
Homo sapiens	Manus	Phalang (Indeterminata) Distal end.	1	-	-	Fus.	2-3 (half white, half beige)	<0,5	1		10

Indeterminata	Ossa longa	Indeterminata	1	-	-	-	3 (White)	<0,5	1		10
Indeterminata	Indeterminata	Indeterminata	35	-	-	-	2-3 (Majority white but also som beige)	2	1		10

The cairn
Bnr: 11
Total weight: 81,5 g
Volume: 0,1 l
Biggest fragment: 6 cm Average:1-2 cm
Number of fragments: 247
Identified fragments: 4
Weight identified fragments: 4 g

Species	**Bone element**	**Part of the bone**	**Number of fragments**	**Side: (DX/SIN)**	**Sex**	**Age (years)**	**Degree of cremation (Colour)**	**Weight (g)**	**MNI**	**Comment**	**Bnr**
Homo sapiens	Maxilla	Part of processus palatinus and dental alveolus	1	SIN	-	-	2-3 (Light grey/beige)		1		11
Homo sapiens	Dentes	Indeterminata rot	1	-	-	The root was closed	2 (Beige)		1	Probably a molar	11
Homo sapiens	MP	Distal end with fragmented articulating surface	1	-	-	-	2 (Beige)		1		11
Homo sapiens	MP	Distal articulating surface	1	-	-	Fus.	2 (Beige)		1		11
Homo sapiens	Cranium	Indeterminata	6	-	-	-	2 (Beige, Dark grey)	7,5	1		11
Homo sapiens	Ossa longa	Indeterminata	36	-	-	-	2 (Beige, Dark grey)	33,5	1		11
Indeterminata	Phalang	Complete distal end but proximal part was fragmented	1	-	-	Fus.	2-3 (Light grey/beige)		1	Probably human	11
Indeterminata	Indeterminata	Indeterminata	Circa 200	-	-	-	2 (Beige, Dark grey)	31	1		11

The cairn
Bnr: 12
Total weight: 1581 g
Volume: 2,3 l
Biggest fragment: 6,2 cm Average: 1-2 cm
Number of fragments: 5592
Identified fragments: 121
Weight identified fragments: 101 g

Species	Bone element	Part of the bone	Number of fragments	Side: (DX/SIN)	Sex	Age (years)	Degree of cremation (Colour)	Weight (g)	MNI	Comment	Bnr
Homo sapiens	Frontale	Margo supraorbitalis	2	DX	F	-	2 (Dark grey, beige)		1	The two fragments fit together	12
Homo sapiens	Occipitale	Part of eminentia cruciformis	1	-	-	-	2 (Dark grey)				
Homo sapiens	Frontale	Part with crista frontalis	2	-	-	-	3 (Light grey)		1	The two fragments fit together	12
Homo sapiens	Zygomaticum	Part with foramen zygomaticofaciale	1	SIN	-	-	2 (Beige)		1		12
Homo sapiens	Zygomaticum	Processus frontalis	1	DX	-	-	2 (Beige)		1		12
Homo sapiens	Maxilla	Part of processus palatinus	1	DX	-	-	2 (Beige)		1		12
Homo sapiens	Mandibula	Prcessus coranoideus	1	DX	-	-	2 (Dark grey and beige)		1		12
Homo sapiens	Mandibula	Small fragment with 2 dental alveolus	1	-	-	-	2 (Beige and Light grey)		1		12
Homo sapiens	Maxilla/mandibula	Small fragment with dental alveolus	1	-	-	-	2 (Beige)		1		12
Homo sapiens	Temporale	Pars petrosa	3 Small fragment	-	-	-	2 (Beige)		1		12
Homo sapiens	Vikt bestämt kranium							16 g	1		12
Homo sapiens	Humerus	Trocklea humeri	1	DX	-	-	2 Beige)		1		12
Homo sapiens	Ulna	Part of the diaphysis	2	DX	-	-	2 (Beige)		1	The two fragments fit together	12
Homo sapiens	Radius	Liten Part of the diaphysis	1	-	-	-	2 (Beige)		1		12

Homo sapiens	Tibia	Part of the diaphysis	1	-	-	-	3 (White)		1		12
Homo sapiens	Fibula	Part of the diaphysis	1	-	-	-	2 (Beige)		1		12
Homo sapiens	Femur	Caput	1	-	-	-	2 (Beige)		1		12
Homo sapiens	Patella	Half	1	DX	-	-	2 (Beige)		1		12
Homo sapiens	Weight long bones + patella							15 g	1		12
Homo sapiens	Coxae	Part of facies auricularis	1	-	-	-	2 (Beige)		1		12
Homo sapiens	Coxae	Part of facies auricularis	1	-	-	-	2 (Beige)		1		12
Homo sapiens	Coxae	Part of acetabulum	1	-	-	-	2 (Beige)		1		12
Homo sapiens	Coxae	Part of illium	1	-	-	-	2 (Beige)		1		12
Homo sapiens	Coxae	Part of illium around incisura ischiadica major	1	-	-	-	2 (Beige)		1		12
Homo sapiens	Sacrum	Troligtvis kota nr. 1	1	-	-	Fus.	2 (beige)		1		12
Homo sapiens	Axis	Dens axis	1	-	-	-	2 (Beige)		1	Too fragmented to be able to measure	12
Homo sapiens	Vertebrae cervicales	Corpus	1	-	-	Fus.	2 (Dark grey)		1		12
Homo sapiens	Vertebrae lumbales	Corpus	1	-	-	Fus.	2 (Beige)		1		12
Homo sapiens	Vertebrae lumbales	Processus transversus	1	-	-	-	2 (Beige)		1		12
Homo sapiens	MT 1	Distal articulating surface	1	SIN	-	Fus.	2 (Beige)		1		12
Homo sapiens	Lunatum	Lite fragmenterad	1	SIN	-	-	2 (beige)		1		12
Homo sapiens	Manus	Phalang 1 (Distal Half)	1	-	-	Fus.	3 (Light grey)		1		12
Homo sapiens	Manus	Phalang 1 (Distal Half)	1	-	-	Fus.	3 (Light grey)		1		12
Homo sapiens	Manus	Phalang 1 (Distal Half)	1	-	-	Fus.	3 (Light grey)		1		12
Homo sapiens	Manus	Phalang 1 (Proximal Half)	1	-	-	Fus.	2 (Dark grey)		1		12
Homo sapiens	Manus	Phalang 2 (Proximal articulating surface)	1	-	-	Fus.	2 (Dark grey)		1		12
Homo sapiens	Manus	Phalang 2 (Proximal	1	-	-	Fus.	2 (Dark grey)		1		12

		articulating surface)									
Homo sapiens	Manus	Phalang 2 (Proximal articulating surface)	1	-	-	Fus.	2 (Beige)		1		12
Homo sapiens	Manus/Pedis	Phalang 3 (Hel men nött)	1	-	-	Fus.	2 (Beige)		1		12
Homo sapiens	Manus/Pedis	Phalang 3 (Distala ledänden)	1	-	-	Fus.	2 (Dark grey)		1		12
Homo sapiens	Pedis	Phalang 1 (hel)	1	-	-	Fus.	3 (Light grey)		1		12
Homo sapiens	Manus/Pedis	Indeterminataa phalanger	11	-	-	Fus.	2 (Beige, Dark grey, White)		1		12
Homo sapiens	Metapodium	Small fragment of fragmented articulating surface and a diaphysis	10	-	-	-	2 (Beige, Dark grey)		1		12
Homo sapiens	Dentes	Indeterminataa tandrötter	24	-	-	Rötterna stängda	2-3 (Beige/Light grey)	4,5	1		12
Homo sapiens	Costae	Blandade fragment	33	-	-	2 fused tuber	2 (Mostly beige)	17	1		12
Weight identified fragments from human								101		1	12
Homo sapiens	Cranium	Indeterminata	149	-	-	-	2 (Mostly beige)	140,5	1	3 fragments with dark spots on the inside of the cranium	12
Homo sapiens	Vertebrae	Indeterminata	59	-	-	-	2 (Mostly beige)	29,5	1		12
Homo sapiens	Ossa longa	Indeterminata	263	-	-	-	2 (Mostly beige and Dark grey)	251	1		12
Indeterminata	Indeterminata	Indeterminata	Circa 5000	-	-	-	2 (Mostly beige and Dark grey)	989	1		12

Bag from unknown context
Bnr:13
Total weight: 2 g
Volume: <1 dl
Biggest fragment: 2,3 cm Average: 1 cm
Number of fragments: 17
Identified fragments: 1
Weight identified fragments: 0,5 g

Species	Bone element	Part of the bone	Number of fragments	Side: (DX/SIN)	Sex	Age (years)	Degree of cremation (Colour)	Weight (g)	MNI	Comment	Bnr
Homo sapiens	Vertebrae lumbales	Processus articularis inferior (Only the articulating surface is preserved)	1	-	-	-	1-2 (Brown, but with cracks)		1		13
							1 (Black/Brown)		1		13
Indeterminata	Ossa longa	Indeterminata	1	-	-	-					
Indeterminata	Indeterminata	Indeterminata	15	-	-	-	Indeterminata (Brown, grey, white, beige)	0,5	1		13