Abstract

WHO ARE YOU? AN ARCHAEOLOGICAL EXAMINATION OF

THE HUMAN REMAINS ASSOCIATED WITH *VASA*

by

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When the Swedish warship *Vasa* sank in 1628, approximately 30 lives were lost. The ship was raised and fully excavated in the 1950s and 1960s, and through the course of the excavation, over 1,500 human bones were recorded and cataloged. These bones are currently believed to represent 15 individuals. Eleven of these individuals were found inside the ship, while the remaining four were found outside during salvage excavations after the ship was raised. The human remains have been the subject of osteological, odontological, and DNA analyses, though none of these studies have taken into account their archaeological context. This thesis represents the first complete archaeological analysis of the human remains by examining find locations and the site formation processes affecting distribution. This study aims to provide an identification for each individual based on their location on the ship, their personal possessions, and their biological profile. By linking the methodologies of archaeology and osteology, this thesis provides an interpretation of what the men and women aboard *Vasa* were doing when the ship sank in order to better understand who these people were and why they died in the sinking.

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CHAPTER 1: INTRODUCTION

When the Swedish warship *Vasa* sank in 1628, it took approximately 30 lives down with it. The ship sank during its maiden voyage in Stockholm harbor when a strong gust of wind forced the portside gunports below the water line causing the ship to founder. Today, *Vasa* is displayed in a purpose-built museum in Stockholm on the same harbor where the ship originally met its fate. In the late 1950s, the ship was relocated and subsequently raised and excavated. Through the excavation, over 40,000 artifacts were recorded and cataloged, including over 1,500 human bones (Cederlund 2006a). These human remains and the context in which they were found are the focus of this thesis.

The human remains were studied in the 1960s and again in the 1990s. However, analysis of the collection since then has demonstrated documentary errors in the museum's current catalog, including incorrect find locations, bone identifications, and assigned individuals, as well as others. Furthermore, the catalog does not strongly account for the provenience of the finds, which is more significant than previously believed and informs the determination of the minimum number of individuals represented (Hocker 2003a, 2003b). These potential errors necessitated a re-evaluation of the remains that accounts for both the osteological and archaeological records. Properly cataloging the bones was a necessary step in this re-evaluation, as these errors had to be corrected before questions of identity could be considered. An accurate catalog of the bones afforded a strong foundation on which to build the analyses for providing identity. By linking the methodologies of archaeology and osteology, this thesis provides an interpretation of what the men and women aboard *Vasa* were doing when the ship sank in order to better understand who these people were and why they died in the sinking.

Research Questions

The research questions can be divided into two basic categories: site formation and identity. The questions of site formation deal with the relationship between the archaeological provenience and the locations of the individuals at their time of death. These questions will be addressed through use of the current knowledge of the ship's site formation processes, as well as taphonomic studies of human remains recovered from similar underwater environments. The second set of questions on identity addresses the ultimate aim of this thesis – to provide an identity for the individuals who were found in association with *Vasa*. While identity can take on many meanings, in the context of this analysis, identity is defined as assigning a shipboard role for an individual based on the find location and osteological analyses of his or her physical remains. Identity will be interpreted through an examination of the find locations of each individual and their potential activities at the time of the sinking based on models of survival psychology. This information will be taken alongside previous archaeological and osteological analyses to answer further questions of social status and biology.

Site Formation

- How do the locations of the remains as they were excavated relate to the locations of the individuals at their times of death?
    - How did the wrecking event affect the provenience of the bodies?
        - If a body landed on the starboard side, would there have been enough friction to keep it there? Or would it have slid to port?
    - How did the site formation processes, including decomposition of the remains, affect the provenience of the bones and associated artifacts?
        - How did the various salvage operations affect the provenience of the bones?
        - What were the effects of water conditions (e.g., temperature, current)?
        - Would the bodies have bloated?
        - What effect did local maritime activities have on provenience?

        - What were the effects of local marine life?

Identity

- How many individuals are there?
    - What bones or other remains do we have for each individual?
- What tasks were these individuals participating in before the sinking?
- What were their actions once the ship began sinking?
    - Why were they at each of their locations at death?
    - At what point in the process of the ship's sinking did these individuals die?
        - Can cause of death be identified?
- Were all of the men sailors? Is there the potential for them to have been visiting family members?
- What can be discerned about the lives of the women aboard?
    - Were the women guests, as usually assumed, or were they perhaps unlisted crew members?
    - Could the women have been related to the captain or officers and intended to stay on the ship?

Questions of site formation include a multitude of factors with the potential to affect the context of the remains. After the wrecking event, both environmental and human activities in the harbor may have caused the bones and artifacts to be displaced from their original locations. The cold water temperature and the pressure at depth had direct effects on the decomposition of the remains, particularly bloating. If substantial enough, bloating could have allowed the remains to float and move from their original locations at death and could also have caused the abdomen to rupture, potentially accelerating the decomposition process.

Once answered, these questions help to ensure that the correct bones are assigned to each individual, improving the accuracy of future analyses. Providing identities for the men and woman aboard *Vasa* allows for them to be considered within the broader study of 17th-century

society, particularly that of seamen and navies. Establishing identity also establishes representativity, and thus how well the *Vasa* individuals represent a maritime population.

Preliminary Research

Preliminary research for this project began with an examination of previous studies of human skeletal remains recovered archaeologically from shipwreck sites. Human remains have been recovered and subsequently studied from several shipwreck sites, including the Swedish warship *Kronan* (During 1997), England's *Mary Rose* (Stirland 2000), and the Confederate submarine *H. L. Hunley* (Chaffin 2008). Though intriguing, many of these studies are limited by their purely biological examination of the remains and often do not take the archaeological context of the remains into account. More informative for the purposes of this study were the studies of remains recovered from *La Belle* (Bruseth and Turner 2005) and HMS *Pandora* (Steptoe and Wood 2002). The analysis in these studies included the archaeological context in which the individuals were found, coupled with information provided by the associated artifacts and the individuals' biological aspects.

Research then led to a survey of literature on 17th-century Sweden and its navy, as well as information on *Vasa* itself, in order to understand the culture and events that shaped the individuals aboard the ship. Together, Paul Lockhart's *Sweden in the Seventeenth Century* (2004) and Geoffrey Parker's *The Thirty Years' War* (1984) provided a review of the historical events in Sweden and Europe at large that would have impacted these individuals and caused the creation of the war machine *Vasa* was built to be.

The first in a continuing series of books about the ship, Vasa *I: The Archaeology of a Swedish Warship of 1628* (Cederlund 2006), provides a history of the ship from its construction through its excavation. The book is critical to understanding the design of the ship, the events of

its sinking, and the excavation procedures. Additionally, a detailed study of the site formation processes forms a significant chapter in the volume. Information is also provided on the human remains themselves throughout the work. Further information on the remains is available through internal reports from the museum (Hocker 2003a, 2003b, 2013; Fred Hocker 2004).

An interpretation of the individuals' associated artifacts was necessary to paint a better picture of their lives. Jessica Smeeks's Master's thesis (2014) provided just such an interpretation through an analysis of the personal possessions that were found in association with the remains. Smeeks focused on the nine seamen found within the ship. Through analysis of the quality of the sailors' clothing and items found in association with them, including swords, spoons, and money, she was able to establish potential shipboard roles for these individuals, including whether or not they were commissioned officers.

As Martin Gibbs has noted, the actions taken by individuals during the wrecking event are of great import because these actions "create the post-disaster archaeological record" (2002:66). Gibbs used a model of disaster response and survival psychology to interpret the behavior of the individuals during the wreck of the Dutch merchant ship *Batavia*. This model of survival psychology was developed by John Leach (1994) and is useful for recognizing the behaviors of the *Vasa* individuals. Leach's model provides a set of five stages of disaster response based on observable, patterned, and somewhat predictable crisis behavior.

An understanding of the wreck's site formation processes and particularly the decomposition of human remains in water environments was also necessary for this project. This allowed for a description of the site formation processes that affected each individual.

Two of the most recognized theoretical works of maritime site formation processes are from Michael Schiffer (1996) and Keith Muckelroy (1978). Derived from multiple fields of

archaeology and taphonomy, Schiffer's work stresses the use of the scientific method to examine the factors influencing site formation. He breaks these down into cultural and environmental factors. Muckelroy's *Maritime Archaeology* (1978) exclusively examined underwater site formation processes, describing both depositional and post-depositional factors. Muckelroy defined what he termed "extracting filters," which remove material from the site, and "scrambling devices," which cause post-depositional movement and rearrangement of materials (1978:165–181).

In directly examining the location of *Vasa*, the physical environment of the site (Hocker 2006b) and the associated formation processes (Hocker and Wendel 2006) were reviewed in the first edition of the *Vasa* book series (Cederlund 2006), which provides information on site depth, temperature, salinity, current, and sedimentation, along with other potential modifying factors. Understanding how these site formation processes affected the human remains led to a review of the sources on human remains in aqueous environments. Recent scholarship, using experiments and case studies, is now focusing on creating a better model of decomposition for remains recovered from aqueous environments. Two key sources for such information are the comprehensive texts, *Forensic Taphonomy: The Postmortem Fate of Human Remains* (Haglund and Sorg 1997) and *Advances in Forensic Taphonomy: Method, Theory, and Archaeological Perspectives* (Haglund and Sorg 2002). William Haglund's report on the "Disappearance of Soft Tissue and the Disarticulation of Human Remains from Aqueous Environments" (1993) provides information on the remains of a young woman recovered from within a closed vehicle underwater. A case study of 15 bodies recovered from a shipwreck in the East China Sea (Khana et al. 1999) also provides some information on remains recovered from an enclosed environment.

Reports such as these provided the information necessary to reconstruct a model of decomposition for the individuals who went down with *Vasa*.

Organization

The body of this thesis is organized into six chapters, the first of which is the Introduction. Chapter 2 discusses the history and excavation of *Vasa*, as well as the site formation processes that occurred on *Vasa* and how they affected the decomposition of the human remains. Chapter 3 presents the research methodology used to collect the data for this study. It discusses the on-site research at the *Vasa* Museum, the subsequent analysis of the find locations, and the examinations of each individual's biological profile and associated artifacts. Chapter 4 presents each individual in turn with a discussion of their find location, the remains assigned to them, and any changes that were made through this study. It also presents biological information from previous osteological and odontological studies and examinations of their associated artifacts. Chapter 5 discusses the behavioral model used to interpret the actions of the *Vasa* individuals at the time of the sinking, followed by an examination of each individual. In discussing each individual, the site formation processes affecting the distribution of their remains is analyzed, and an interpretation of their actions during sinking and why they may have been aboard the ship is given. The conclusion chapter discusses the results of this research and its ability to answer the research questions listed above, as well as its limitations and opportunities for future research.

CHAPTER 2: SITE FORMATION AND COLLECTION MANAGEMENT

For 333 years, *Vasa* lay in the cold, brackish waters of Stockholm harbor. There, the ship and its associated artifacts were affected by multiple environmental and human-driven processes from the time of the sinking through to the raising and subsequent excavation. Understanding these processes and how they affected the human remains and associated artifacts is critical to interpreting those remains in their archaeological context. This chapter includes an examination of the site formation processes and their effects on the decomposition of the human remains, followed by an overview of *Vasa*'s excavation, the subsequent studies of the *Vasa* individuals, and the current state of the collection.

Site Formation

When *Vasa* was sailed on its maiden voyage in Stockholm harbor on 10 August 1628, it was a day of celebration, and along with the officers and crew, guests were allowed on board. The great ship was warped along the shore of the island of Stadsholmen until it could catch the southerly breeze and set the sails. The gun ports were all open and the guns run out in preparation to fire a salute as the ship left the harbor. After sailing for just under a mile, a gust of wind overtook the sails and the ship listed precipitously to port. The gun ports on the lower gundeck were pushed below the surface and water came rushing in. All efforts were made to right the ship, but they had little effect, and *Vasa* could not be saved (Hocker 2006a:36–60).

The ship came to rest on the seabed at a depth of approximately 32 m (Cederlund and Hocker 2006a:181). At the wreck site, the seabed "consists of a layer of sterile glacial clay over the bedrock, covered by a loose layer of organic-rich black mud up to 3 m thick. A thin layer of silt on top of the mud is easily stirred up" (Hocker 2006b:64). The current on the site is not especially swift, though it is constant, with minor variations in rate of flow due to wind and

rainfall. This current carried the mud, with some clay and silt, over and through the site. The sediment accumulated in the ship's interior, covering every deck in a layer up to a meter or deeper. Though the initial movement of the sediment was damaging to the ship and its artifacts, eroding away their surfaces, it served as a layer of protection once the sediment had settled and the initial layer had built up. The underlying wood and artifacts, including the bodies, were effectively sealed off from oxygen. This protective layer also secured objects in place, thus largely preserving their context (Hocker and Wendel 2006:149–151).

Sedimentation was also responsible for restricting the movement of the ship itself. When *Vasa* first came to rest on the bottom of the harbor, the ship was upright but listing to port. Attempts to salvage the vessel began immediately after the sinking. The first of these salvage attempts, in mid-August 1628, was able to right the ship so that it sat properly on its keel, where it remained until it was raised in the 1960s (Hafström and Hocker 2006:69). Since this occurred so shortly after the wrecking event, the ship had not yet settled into the deep mud and clay and become entrenched, as would later occur.

Successive salvage efforts through to 1629 and again in the 1660s succeeded in removing the upper deck and recovering a majority of the cannon (Hocker and Wendel 2006:151). After the salvage attempts ceased, the ship was subject to the activities of the harbor traffic and the surrounding city. From the 1850s until 1956, blasting rubble from the construction of nearby drydocks was dumped on the site, as well as slag and clinker from the boilers of steamships. This material came to rest on the ship's upper gundeck, in the stern cabins, and on the forward port side and was likely responsible for the collapse of part of the ship. Despite this collapse and the salvage efforts, the majority of the remains on the upper gundeck were found in relative isolation

from one another with little commingling, owing likely to the sedimentation that held them in place (Hocker and Wendel 2006:151,156).

FIGURE 1. Port side, stern of *Vasa* displaying the quarter galleries. (Photo courtesy of the *Vasa* Museum, Stockholm, Sweden.)

Additionally, the quarter galleries, small compartments fastened to the hull at the stern of the ship as seen in Figure 1, fell off the ship once the nails holding them in place had corroded through. Models of the deterioration of the ship have shown that these galleries fell off relatively early, perhaps only a few years after the sinking. This is supported by the remains of Ylva, one of the four individuals found outside of the ship. Ylva's remains are listed in the find record as a skeleton with her feet still in her shoes. This indicates she, or at least her clothes, had not yet fully decayed when her remains fell with the galleries. The other remains found outside the ship were not as well intact, however, and so were likely at a further decomposed state when the quarter galleries broke off (Hocker and Wendel 2006:163–164).

Decomposition of the Human Remains

The decomposition of the human remains was affected by a variety of factors on the site, making a taphonomic approach critical to interpreting the find locations of the individuals. The breakdown of human remains follows three general processes: autolysis, putrefaction, and decay. Once an individual's heart stops beating, the body is depleted of oxygen by internal aerobic microorganisms, marking the beginning of autolysis (Carter and Tibbett 2008:31). Autolysis is the process of cellular destruction through enzymatic self-digestion, which releases carbohydrates, lipids, and proteins. In this environment, anaerobic microorganisms (bacteria and fungi) from the gastrointestinal tract and respiratory system multiply rapidly while feeding off the body's tissues. This putrefaction process forms organic acids and gases that cause color changes, odors, and bloating. Once the skin ruptures from the expansion of these gases, oxygen is reintroduced into the body, allowing aerobic metabolism to recommence and signaling the start of the decay process (Clark et al. 1997:153–155; Rodriguez 1997:459–464; Carter and Tibbett 2008:31).

Understanding how these processes occurred in the context of *Vasa* is difficult because although models of decomposition for terrestrial sites are in common usage, they are not suitable for application to aqueous environments. Aquatic systems can vary greatly between one another due to their differing biological, physical, and chemical properties, which serve to create further difficulty in fully understanding the taphonomic processes within these environments. The effects of water temperature, current, depth, salinity, pH, and plant and animal activity can all serve as factors, alone or in combination, that contribute to the rate of decomposition. It is important to note that the individual's biological profile, degree and type of clothing, and manner and cause of death can be contributing factors as well (Boyle et al. 1997:605; Rodriguez

1997:463–464). Although it would be ideal to develop a model of water decomposition for the Stockholm harbor based on experiments and case studies particular to the area, such a model can also be extrapolated with some degree of certainty based on studies of remains from similar environments.

Generally, "decomposition of a body submerged in an aquatic environment occurs at a rate roughly half that of decomposition in air" (Rodriguez 1997:461) and it seems that the bodies of the *Vasa* individuals were no exception. Each of the decomposition processes was delayed by different factors on the site, with few factors contributing to acceleration. The first stage, autolysis, is highly affected by temperature, as cold slows the process and heat hastens it (Clark et al. 1997:153). At the site of the wreck today, the water temperature remains relatively constant between 3 to 6°C (Hafström and Hocker 2006:102). Temperatures that far below normal operative temperature for the body's enzymes (37°C) would have inhibited cellular reactions, thereby retarding autolysis (Gill-King 1997:93). The process of autolysis is accelerated by hemorrhaging, and it is possible one or more of the individuals were hemorrhaging at the time of the wreck. In cases of drowning, "there is a tendency for hemorrhages in the lungs, middle ears, and mastoid air cells due to the change in blood pressure" (Boyle et al. 1997:606). External injuries would also have led to hemorrhaging, though despite the violent action that is inherent in any wrecking event, there is only one injury that can be attributed with confidence to the ship's sinking. Adam has a perimortem compound impact fracture of the tibia, which completely separated the bone (Hocker and Wendel 2006:152).

The carbohydrates, proteins, and lipids released by the autolysis process fuel the second decomposition process: putrefaction. The process of putrefaction is the most easily recognizable stage of decomposition, as it is when the gases accumulate within the body, causing bloating,

color changes, and odors. Since these changes are caused by internal bacteria, a body in salt water will have delayed putrefaction, as salinity hinders bacterial growth (Boyle et al. 1997:606). Although Stockholm harbor is not a saltwater environment, it is brackish with a salinity level typically below 0.5%. This is in contrast to the nearby Baltic Sea, which the harbor opens into, that averages a salinity of around 2.0% (Hocker 2006b:66). The low salinity level of the harbor may not have inhibited bacterial growth as well as a true saltwater environment, but it is possible it provided some check to the putrefaction process.

The depth and temperature of the wreck may also have retarded the development of the putrefactive gases, preventing the remains from bloating and floating. It has been argued (Wendel and Hocker 2006:152) that the ambient pressure at the depth of the *Vasa* site would have prevented any bloating. All of the substantially complete individuals were found in areas of the ship that rested between 32 m and 35.8 m, which would provide an ambient pressure of 3 to 4 atmospheres (Hocker 2006b:62). While it has been shown that bodies at depths of at least 54 m do not float, temperature rather than depth is the more commonly listed factor in preventing or delaying the onset of bloating (Gill-King 1997:100–101).

Therefore, while it can be stated that the putrefaction process that traditionally results in bloating took place, the question remains if the pressure created by the gases was great enough or if were they able to form quickly enough for the remains to float. This question is of importance in determining if the remains could have floated around within the wreck, thereby altering their original deposition and bringing into question the reliability of the archaeological record. The determination of whether or not the remains bloated is hindered by the lack of studies and information on submerged remains, particularly those within a closed environment. Only two such case studies were found during the course of this research.

In Haglund's study (1993) of the decomposition of human remains from aqueous environments, one of the individuals was submerged within a closed environment. The remains of a young woman were recovered from within a vehicle with the windows up. The vehicle and remains had been at a depth of 61 m with a pressure of 6 atmospheres. The water temperature ranged between 0.56 and 1.67°C, and the remains had been underwater for 26 months. Despite this extensive immersion period, Haglund's report does not mention bloating of the abdomen, only that the internal organs were in place and demonstrated softening and autolysis.

A case study of 15 bodies recovered from a shipwreck in the East China Sea (Kahana et al. 1999) also provides some information on remains recovered from an enclosed environment. Though the study focused on the formation of adiopocere on the bodies, other information can be inferred on the state of the remains. Thirteen of the bodies were found at depths between 65 and 85 m, which provides a variation in pressure from 6.5 to 8.5 atmospheres. The temperature of the water was 10-12°C. Two of the bodies had been recovered from the surface the day after the wreck, though it is unclear whether these individuals had resurfaced from the wreck due to bloating or if they had never been lodged in the wreck. Of the nine individuals that were recovered from within the wreck with soft tissue still intact, there was extensive bloating of the face, and the majority of the individuals had well-preserved internal organs. Though the research cites the bloating of these individuals once in the research lab, there is no mention, either positive or negative, of bloating while submerged. The potential then remains that the bodies did not float while within the ship, and the expansion of the gases occurred only once they were raised to the surface, where pressure decreased and temperature increased.

Unfortunately, neither of these case studies can definitively answer whether or not the bodies within *Vasa* floated during the bloating stage. Based on the description of the young

woman submerged within the car, her remains do not appear to have bloated enough for flotation, despite the long submersion interval. This was likely due to the extreme depth and cold temperature of the water, which negated adequate expansion of the gases for the body to have floated. Though the environment differs from that of *Vasa*, it is similar enough to argue that remains will not float if subjected to sufficient depth in cold water. The possibility also exists that the cold water and salinity of Stockholm harbor retarded the formation of gases for a long enough period of time until the remains had become entrapped in the sediment. Therefore, while it cannot be conclusively stated, it is likely that the human remains trapped within *Vasa* did not float within the wreck.

The final process, decay, begins once the skin ruptures, either through expansion of the gases or skin slippage (Clark et al. 1997:153–154), allowing oxygen back into the body and reestablishing aerobic metabolism. For the *Vasa* individuals, however, the aerobic activity would have been hindered by the lack of oxygen in the environment. Oxygen levels in the harbor range between 0 and 12 mg/l, though they are subject to variation with depth and season. At the depth of the wreck site, the oxygen levels are not completely anoxic, although they "are generally well below what will support oxygen-dependent organisms" (Hocker 2006b:65). Untreated sewage was dumped into the harbor until the 1940s, making the water too toxic for edible fish until the 1970s (Hocker and Wendel 2006:151) and possibly lowering the oxygen levels further.

In general, decomposition processes are accelerated by insect activity and animal predation. However, submersion in water naturally prohibits insect activity. In the particular case of *Vasa*, there is an absence of evidence for any animal activity on the wreck site. Alongside the low oxygen levels, high hydrogen sulfide levels are also common on the site. This combination of salinity level, lack of oxygen, and high hydrogen sulfide serve to inhibit plant and animal

activity at the site. There is, in fact, no plant life on the bottom of the harbor, except in shallow areas (Hocker 2006b:66). The bodies would not have been exposed to the animal predation that typically removes soft tissues, providing an entry point for bacteria, and reducing the body mass (Rodriguez 1997:461).

Once the loss of soft tissue was complete, the bones remained, and understanding the circumstances surrounding them is as important as the initial decomposition. Fortunately, it appears as though the majority of the skeletal remains were not disturbed from their initial resting place before the archaeological excavation. This is due to the same sediment that had prevented the original movement of the bodies, as well as the clothing worn by the individuals. The substantially complete skeletal remains were all found with aspects of their clothing remaining, manys even with shoes still on their feet, which would have further inhibited movement of the skeletonized remains.

As mentioned above, untreated sewage was dumped into the harbor until the 1940s (Hocker and Wendel 2006:151). The sewage would have affected the chemistry of both the water and the sedimentation. This creates a problem in reconstructing and analyzing the environment surrounding *Vasa*, as it is impossible to know the exact chemistry resulting from these products, nor their effects on the remains. The sewage may have altered the pH of the water and the sediment, which could have potentially led to either preservative or destructive properties, particularly on the skeletal remains. The effects of pH extremes have been observed in conservation efforts on skeletal materials. When left in an acidic environment, the hydroxyapatite of the bone will decay, leaving only soft collagen that will collapse easily. The opposite is true of bone in an alkaline environment, where the collagen decays, leaving behind the fragile and brittle hydroxyapatite (Cronyn 1990:277).

Christensen and Myers (2011) performed an experiment on the effects of varying pH levels on bone with some muscle and connective tissue still attached. Though their study used fresh water, the low salinity of the water on the *Vasa* site allows for their information to still be comparable. Bovine bone samples were placed in solutions of pH 1, 4, 7, 10, and 14 for one year, during which time they were regularly observed for macroscopic changes. In agreement with the conservation practices noted above, the extreme pH levels were the most destructive. The more moderate levels (pH 4, 7, and 10) showed slower signs of detaching tissue from bone and were not destructive towards the bones themselves, though they did alter them. By the end of the study, all of the bones in the moderate pH levels showed signs of adiopocere formation in the marrow cavities. The best-preserved samples came from the pH 10 solution, which, at the end of the study, still retained some of the soft tissue within the solution, while the bone remained in good overall condition and still had visible cut marks. Considering the generally good condition of the bones recovered from *Vasa*, it becomes apparent that the water and sedimentation must have been near a moderate level of pH, helping to preserve the skeletal material.

Due to a combination of factors within the wreck site, it appears that the decomposition and loss of soft tissue of the remains was heavily delayed. Potential hemorrhaging and the increased bacterial activity from the untreated sewage would have been the only factors serving to increase the rate of decomposition. The limited movement of the remains due to the sedimentation and lack of bloating prevented abrasion damage. This, in combination with the limited amount of perimortem injuries, limited the initial access of bacteria to the soft tissues. The sedimentation further served to keep the remains in a near anaerobic condition and would have protected the soft tissues from animal scavenging had there been any. The low oxygen and high sulfide content of the water already served to inhibit plant and animal activity on the site.

Though an exact timeline of decomposition cannot be constructed, all of the reviewed factors indicate an extremely delayed rate of decomposition. If similarity to Haglund's case of the woman enclosed in the car exists, it is possible that full decomposition could have taken years. Perhaps if earliest salvaging efforts had succeeded, they would have been met with a grim sight.

Excavation and Recording Techniques

Using a simple grapnel and coring device, Anders Franzén and Per Edvin Fälting rediscovered *Vasa* in August 1956, and diving on the site began soon after to confirm the identity of the wreck (Cederlund and Hocker 2006a:176–178). The decision was then made to raise the entire ship using a system of lifting pontoons, first by slowly raising it into shallower waters, where work could be more easily completed, then with a final lift to bring the entire ship to the surface. Between 20 August and 16 September 1959, through a series of careful lifts, *Vasa* was brought to a depth of 16–17 m near the island of Kastellholmen (Cederlund 2006b:263–264). The shallower depths provided longer working times and greater visibility for the divers, who worked to lighten the ship, reinforce the upper decks, and make the ship watertight (Cederlund 2006c:265,269). The preparations for lightening the ship included dredging sections of the upper and lower gundecks, as well as using water hoses to shift sediment into the lower parts of the ship. While clearing the upper gundeck, Fälting, who had been appointed chief diver, encountered the first set of human remains, and subsequent dives recovered four other individuals from the wreck, all from the upper gundeck (Cederlund 2006c:282–283). Current research refers to these individuals by names based on the order in which they were found, so the individuals found by divers were named Adam, Beata, Cesar, David, and Erik.

Once the initial preparations were complete, *Vasa* was slowly lifted off the seafloor once more, while three pumps were used to remove water from the lower decks. During the raising,

the ship began listing to port, so the decision was made to use water hoses on the port side of the upper and lower gundecks to wash the heavy sediment down to the orlop. This action shifted some of the skeletons in the area of the hoses (Cederlund 2006d:313), intermingling the remains of Cesar and Beata and disturbing Ludvig and Erik. The final lift came on 24 April 1961, and the ship was soon brought to the dock on Beckholmen, where it was placed on the pontoon on which it still rests (Cederlund and Hocker 2006b:306).

Archaeological excavation of the interior of the ship began the day after the ship was raised and continued through the end of September 1961 (Cederlund and Hocker 2006b:292). Excavation proceeded from the upper gundeck to the lower gundeck, then the hold, followed by the orlop. Through the excavation, thousands of artifacts were recorded and cataloged, including over 1,500 human bones (Hocker 2003a). Finds were recorded in the *Fyndliggare* (find log), which could include a drawing of the artifact and list any associated find numbers. To record location, the excavators continued with the recording system developed by the divers, using the ship's structure for reference points, based on deck, distance aft, and side of the ship. Occasionally, finds were also given a height above the deck. Each deck was treated as a discrete component and given an abbreviation, which continues in use today: ÖB for upper gundeck, UB for lower gundeck, TD for orlop, and HS for hold. The excavators used a lot-and-locus system. For longitudinal control, the deck beams were used to record locations of objects, originally using the distance between each beam to create a "room." Later, the deck beams were numbered 1 to 27, forward to aft, as seen in Figure 2. These "rooms" were then separated by port (BB), starboard (SB), and midships (MS), which was used for any finds within the width of the hatches (Cederlund and Hocker 2006b:304). For example, Filip was found on the starboard side of the

upper gundeck between beams 22 and 24. The find number for his cranium, 10288, would have been recorded as:

10288 ÖB SB 22–24

This find number exists today as the number assigned to Filip's cranium, but it was originally used for both his cranium and mandible, while the majority of his remains were grouped under find numbers 10289 and 10290. A single find number was often used to record a large group of objects found together, as was the case with Filip and many of the other individuals who were found as nearly complete sets of remains. Recent curatorial policy has aimed to assign each bone a unique find number (Cederlund and Hocker 2006b:304).

During the excavation, the sediment built up on the orlop and particularly in the hold, where it was found to be several meters deep in some locations, and removal of the sediment was necessary to begin examining these decks. Pumping the sediment out proved unsuccessful, so instead a hole was cut through the bottom of the ship to drain it. This hole was cut through by the starboard side of the keel between beams 12 and 13. The sediment was made more fluid by spraying it with water, and it drained out through a trough covered with a sieve. This screening captured any small artifacts that came out with the sludge, which includes some of the skeletal remains (Cederlund 2006f:359–360). These artifacts were recorded as they were found, so the find numbers are mixed in between the find numbers of other artifacts from the hold and orlop, and their find locations were recorded as the *ränna*n (drain).

Though the original find numbers are ordered somewhat sequentially, they have some discontinuities and cannot be taken on their own to establish a connection between artifacts. During excavation, there could be multiple teams working at the same time on different areas of the ship, with each team assigned a set of fifty find numbers; thereby producing a situation where

a sequence of find numbers may come from separate locations. Though artifacts were generally assigned find numbers aboard the ship, record keeping was sometimes delayed, creating problems in the *Fyndliggare* today (Cederlund and Hocker 2006b:302).

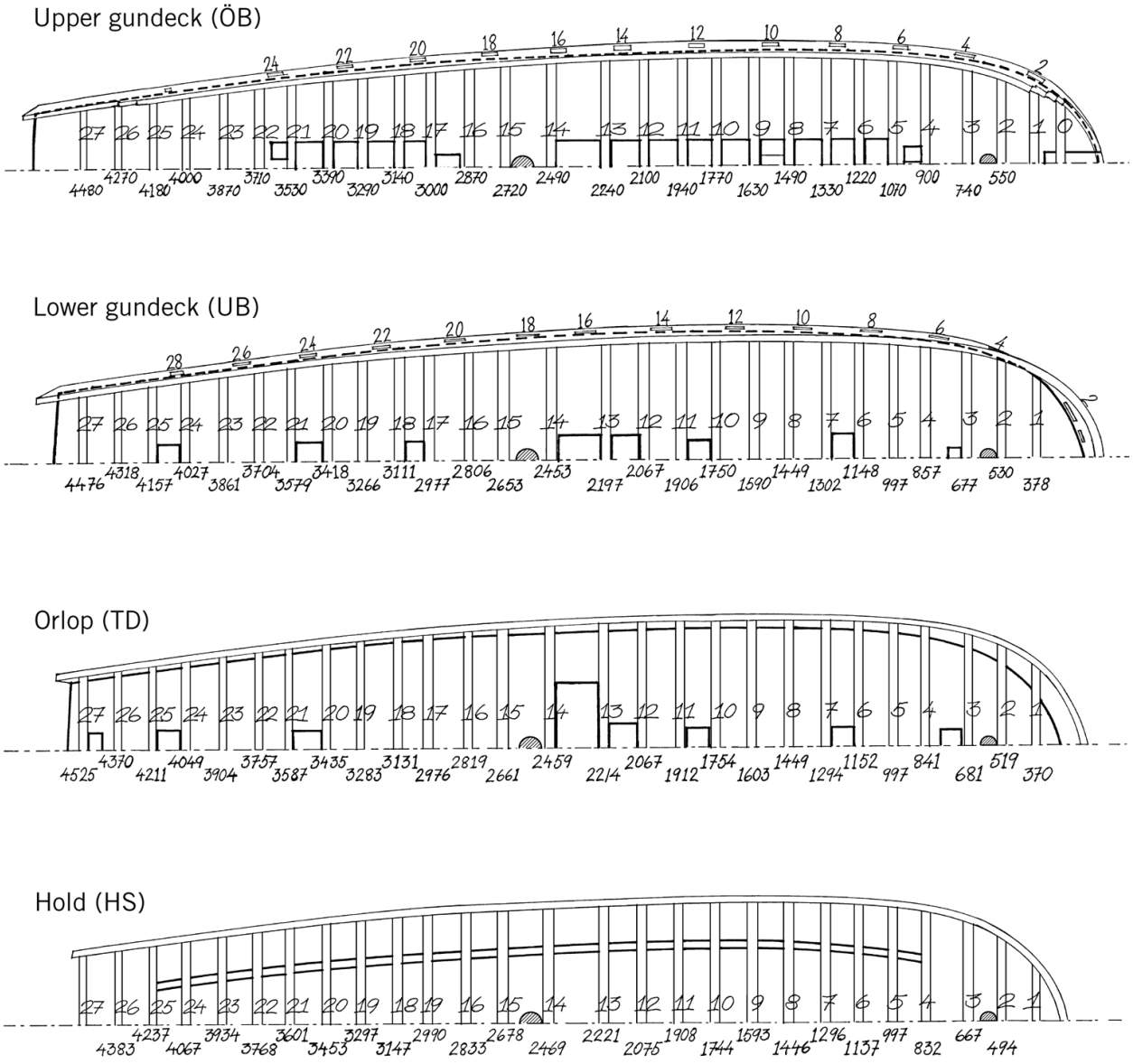

FIGURE 2. Ship's plan showing deck beams with measured lengths and assigned numbers. (Courtesy of the *Vasa* Museum, Stockholm, Sweden.)

Additionally, find numbers that had not been used in the excavation of the ship's interior were later used in the excavation of the seafloor at the *Vasa* wreck site. These numbers "are odd blocks that fit into the gaps in the excavation find number sequence" (Cederlund 2006i:461). Work at the wreck site began once the ship had been moved to shallower waters in 1959 and continued until early 1961, when work was put on hold until excavation and cataloging of *Vasa*'s interior was complete. Diving resumed in 1963 and continued through 1967, during which time divers methodically explored the area surrounding the impression *Vasa* had left in the seabed. It was during these explorations that divers discovered the remains of four individuals in the collapsed sections of the port side quarter galleries (Cederlund 2006i:467–469).

Since the original excavations, several items have lost their original find numbers, and often, any information on their find location. This is the case with two groups of skeletal remains now referred to as the "2" bones and the "X" bones, which are lacking any find information. The "2" bones, which are called such as each bone is marked with a "2," include a right femur, a right tibia, a left patella, left and right fibulae, and seven metatarsals. Currently, the leg bones are assigned to Gustav and the metatarsals are assigned to Johan. Given the disparity in location between these two individuals (the upper gundeck and the hold, respectively), it is unclear whether these bones were found in a single location or were later grouped together. The "X" bones, which are likewise marked with an "X," include a right humerus, a left radius, a left ulna, both femurs, both tibiae, both fibulae, a complete pelvis (both os coxae and sacrum), two vertebrae, and a maxilla fragment with teeth. It has been suggested that these bones were marked X "to denote that these all belonged to one individual and had the same provenience, near amidships on the starboard side of the upper gundeck" (Hocker 2003a). However, recent analysis of these remains has determined they match with several of the remains found on the forward

port side of the orlop. Therefore, this has been recorded as the find location for the "X" bones, as it is the most likely original location. The bone pairings are further described in Chapter 4's discussion of Ivar.

Previous Studies of the Human Remains

Nils-Gustaf Gejvall from the Museum of National Antiquities conducted the initial study of the human remains from *Vasa*. During 1962 and 1963, Gejvall studied the human remains found inside the ship. He conducted a complete osteological analysis, determining that the remains represented 12 individuals, including two women. Gejvall designated each individual with a letter A through L, beginning with the first individual recovered. In July 1963, these remains were interred in the naval cemetery at Galärvarvet. The bones were separated by individual and placed in sealed plastic bags, which were then laid in a concrete coffin covered by a granite slab. The slab was topped with one of the anchors recovered from the wreck, and the walkway was paved with ballast stones from the ship, as seen in Figure 3. The non-skeletal remains (fingernails, hair, and brain from Helge) remained in the archaeological collections (Cederlund 2006h:446–447). Gejvall then studied the bones that were recovered from the salvage excavations between 1963 and 1966, which he determined represented another six individuals. These too were kept in the collections and not interred (During 1994:147).

In May 1989, the remains that had been buried were disinterred for further study of the entire assemblage of skeletal remains. Though precautions had been taken to protect the remains, the internment caused damage to many of the bones. Water had seeped into the grave and into several of the bags, causing mold to grow on and damage the bones. Before examination, the disinterred bones were cleaned with water and 95% ethanol and left to dry (During 1994:148). Ebba During of the Archaeological Institute of Osteology in Ulriksdal was assigned to undertake

the renewed examination of the remains (Hocker 2003a). During was able to broaden and revise Gejvall's preliminary determinations through her assessment of the entire skeletal sample. She also performed "further scientific analyses of the bones in order to clarify age, diet, and other physical characteristics" (Hocker 2003a:1). During reassigned many of the bones from Gejvall's determinations, including some of the individuals who were found in a relatively confined locations, and created several new individuals. She concluded that the collection represented 25 individuals, 16 of whom were found inside the ship. Twelve of the inside individuals were substantially complete skeletons, whereas only single bones, a pair of jaws, or a single tooth represent the four other individuals (Hocker 2003a). During instituted the current naming system for the *Vasa* individuals based on the original alphabetical designations from Gejvall. Instead of referring to the individuals by their alphabetical designations, During used their assigned letter to assign them names from the Swedish military radio alphabet, which is comprised of Swedish male names. Only the two females' names, Beata and Ylva, differ from the alphabet.

FIGURE 3. The *Vasa* grave in the naval cemetery on Djurgården, near the *Vasa* Museum. (Photo by author, 2014.)

The skeletal remains have undergone a variety of scientific analyses since this time. Multiple tests using radiocarbon dating have been undertaken to guarantee the remains, particularly those from outside the ship, belong in association with it. A sample studied in 1967, which was from outside the ship, was dated 1662 ± 56 A.D, and all subsequent studies have also excluded the possibility of the remains as prehistoric or modern material (During 1994:148). In 1999, with Sigrid Kvaal of the University of Oslo's Department of Oral Pathology, During published the results of a study comparing the age estimations from osteological analysis and multiple dental studies to provide a better approximation of age for each individual.

In 2004 and 2013, DNA samples were taken from several of the human bones and sent for testing at Uppsala University's genetic laboratory. The initial results from 10 tooth samples were published in an internal report in 2013 (Hocker 2013), with the final results of all DNA samples published in a 2015 internal report (Hocker 2015). The purpose of this sampling was to provide a better estimation of the number of individuals present and to better determine which bones belong together. Though some samples did not provide a clear profile, the study was successful overall and helped in determining which remains belonged with whom. Individual cases where the DNA samples changed the assignment of a bone from one individual to another are discussed in Chapter 4.

Collections Management

After the raising, *Vasa* was first housed at the Gustav V Dock on the harbor island of Beckhlomen, not far from the wreck site. In November 1961, the ship was towed on its pontoon to the new *Wasa* Shipyard on the nearby island of Djurgården. An aluminum structure was built over the ship and its pontoon, which provided a closed environment for conservation, protection from the weather, and, with its two levels of viewing galleries, the ability to host visitors. In

1962, the first *Vasa* museum opened to visitors (Cederlund 2006h:429,431). In 1988, *Vasa* was moved again, this time to a purpose-built museum, also on Djurgården. The new *Vasa* museum opened in 1990 and is where the ship resides today (Lindblom 2003:192).

FIGURE 4. Several of the individuals as seen on display in the the *Vasa* Museum's Face to Face exhibit. (Photo by Anneli Karlsson; courtesy of the *Vasa* Museum, Stockholm, Sweden.)

All of the human remains are currently stored in one of two locations at the museum: the exhibition hall or the storage magazine. Ten individuals, those who have the most complete sets of remains, are on display in the museum's Face to Face (*Ansikte mot ansikte*) exhibit. These include Adam, Beata, David, Filip, Gustav, Helge, Ivar, Johan, Tore, and Ylva. As shown in Figure 4, each individual on display is housed in a separate case with a glass top. The bones are laid on black aquarium sand for support, and each case contains a black stocking bag of silica gel beads to maintain humidity levels (Emma Hocker 2004). Along with information on the osteological and archaeological analyses, the exhibit also includes some of the associated artifacts and six facial reconstructions, which can be seen in the discussion of each individual in Chapter 5. The facial reconstructions were done by Oscar Nilsson, a trained sculptor and

archaeologist. The remaining individuals and any bones deemed too fragile for display are stored in the bone and leather room of the magazine. The bones are sorted by individual and housed in separate cardboard boxes with smaller boxes and tissue paper separating and protecting the bones from one another. The primary individuals stored in the magazine are Cesar, Erik, Ludvig, Rudolf, and Sigurd.

CHAPTER 3: METHODOLOGY

This thesis represents the first complete archaeological analysis of the human remains recovered from the wreck of *Vasa*. Though the remains have been the subject of extensive osteological analysis, this study is the first to include a thorough assessment of their archaeological context. The remains were examined and all corresponding data were compiled during a research visit to the *Vasa* Museum in the summer of 2014. This chapter discusses the data collection and analyses used in completing this thesis. The methods used during data collection, including the examination of the remains, are discussed first, followed by the methods used for analysis, including the creation of a distribution plan and timeline of the site formation processes.

Data Collection

Data for this study were compiled during a nine-week field season at the *Vasa* Museum in the summer of 2014. This included analyzing the collection of human remains and associated artifacts, providing a new catalog for the remains, and examining the find locations of the remains recorded during the initial excavation. The observations made on site, in conjunction with the results of previous research, informed interpretations of site formation processes, the significance of artifacts associated with the remains, and the identities of the individuals represented by the remains.

Dr. Fred Hocker, director of research at the *Vasa* Museum, had previously compiled the information on the human remains into a series of Excel spreadsheets listing the remains assigned to each individual. Data from the museum's online catalog, MarketStore, was then checked against the information in the spreadsheets. The remains were typically bones, but included other types, such as hair and nails, for some individuals. Each listing included the new

find number, the original find number, the identification of the bone or other remains, siding (whether such remains belonged to the left or right side of the individual), the original find location, and the designated individual according to Ebba During, as well as any additional comments. These comments included further details on bone identification, problems noted in the catalog, questions that remained to be answered, and additional information that could be of use for analysis. An example can be seen in Table 1 below, with the full listings available in Appendix II.

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
09296	09296	Fibula	Sin	ÖB	S	14.9-16.3	A	
08994	08994	Humerus	Dex	ÖB	S	12.2-13.3	A	Siding not listed in MS.
25780	08994	Humerus	Sin	ÖB	S	12.2-13.3	A	Siding not listed in MS.
25701 (+02560)	03220	Mandible + dentes		ÖB	S	11.0	A	Dentes: C-P2, M1 sin; C, M1-M2 dex. Original find number written on bone.
25706	03220	Mc II	Sin	ÖB	S	11.0	A	
25708	03220	Mc III	Dex	ÖB	S	11.0	A	

TABLE 1. A listing of some of the remains associated with Adam.

A review of the remains assigned to each individual helped determine the accuracy of those original assessments. This began with an examination of the remains stored in the museum's magazine and then moved to the individuals kept on display in the Face to Face exhibit. The spreadsheets were used during these examinations to check against the information listed for each find and to make corrections where necessary. These corrections were often relatively minor, such as incorrect siding or misnumbering of the bones of the hands and feet.

Any incorrect pairings found among the remains were then reassigned to the proper individual, when one could be determined. Bone length and girth, discoloration patterns, and other distinguishing marks formed the basis of any new assignments.

Apart from the established sets of remains, there was a collection of bones that had not been previously assigned to any individual. An examination helped determine if these bones could be assigned to one of the established individuals. This began with a basic check of each bone to determine its type. The bones were then compared against the previously created listings for individuals who were missing that bone type. If an individual was missing a bone of that type, the bone was then compared to similar or paired bones, such as phalanges, or any articulating bones from that individual to see if a match could be made. Where such assignments could be made, the previously unassigned bone was then moved to be stored or displayed with that individual.

The last information gathered while at the museum was a review of the original find ledger, called the *Fyndliggare* in Swedish, which is stored in the magazine, kept in binders, and organized by find number. An Excel spreadsheet was used to create a list of original find numbers associated with human remains and the corresponding find locations. This review of the *Fyndliggare* with the original find numbers allowed for a comparison of the originally recorded find locations with those currently listed in the catalog, thereby ensuring accuracy in the find locations of all the remains.

Analysis

The new catalog of the human remains provided a find location for each bone, with only a few exceptions where provenience information has been lost. Using Adobe Photoshop CS5, the locations of the remains found inside the ship were plotted on a site distribution plan, which

includes plans of each deck of the ship showing the approximate find location of each bone. These locations are approximate because the excavators did not record the exact location of finds. Rather, they based their find locations on the deck beams, assigning each beam a number and noting between which beams an artifact was found. They also noted whether an artifact was found on port, starboard, or the centerline. Occasionally, a breadth distance was also given (Cederlund and Hocker 2006b:299).

In the present distribution plan, bones are grouped by area of the body to limit the number of symbols used, and each individual is assigned a color for their symbols. Table 2 and Table 3 show the colors assigned for each individual and the symbol groups for each area of the body, respectively.

Individual	Color
Adam	green
Beata	blue
Cesar	red
David	peach
Erik	purple
Filip	yellow
Gustav	teal
Helge	orange
Ivar	fuchsia
Johan	lime
Ludvig	aqua

TABLE 2. Colors assigned to individuals in the distribution plans.

Symbol	Bones represented
	cranium, mandible, teeth
	vertebrae
	ribs, sternum, clavicle
	innominate, sacrum, coccyx
	humerus, ulna, radius, scapula
	carpals, metacarpals, phalanges
	femur, patella, tibia, fibula
	tarsals, metatarsals, phalanges

TABLE 3. Distribution plan symbols and their meanings.

The distribution plan provided a means for spatial analysis and helped to inform the analysis of site formation processes, which were charted on a timeline that incorporates both the specific site formation processes of *Vasa* and the general processes that affect the decomposition of human remains in underwater environments. In determining find location and site formation processes, the hand and foot bones were generally disregarded because these bones are easily moved and often difficult to match with the main body of an individual. The site formation processes and factors affecting decomposition of the human remains as a general group have been discussed in Chapter 2 and will be discussed for each person individually in Chapter 5.

Finally, the identification of each individual was determined based on their location on the ship, their personal possessions, and their biological profile. Having established their specific find locations through an examination of the distribution plan and the site formation processes, Smeeks's thesis (2014) provided a basis to determine their individual shipboard roles or social statuses based on the personal possessions found on or near the individuals. Leach's (1994) model of survival psychology added insights into what decisions outside of their shipboard roles led the individuals to be where they were when they died. Once correcting for the reapportioning of bones to incorrect individuals, the previous osteological analyses of Dr. Gejvall and Dr. During provided the information for a biological profile for each individual, including sex, age, and stature. Instances of disease and other health issues, such as Filip's supernumerary dentition, were also taken into account. Together, these various datasets represent as complete an identity as can currently be determined for each set of remains, encompassing biological descriptions, shipboard roles, and their potential behavior during the sinking. This information is presented in Chapter 4, and a profile of each individual is discussed in Chapter 5.

CHAPTER 4: DATA AND ANALYSIS

This chapter discusses each individual as they were found in association with the ship, their assigned remains, their associated artifacts, and the biological information that is known about them. A distribution plan is provided for each individual found within the ship. The deck illustration for each distribution plan is to scale, while the bone symbols represent the approximate locations of the remains but are not to scale. The full listing of remains assigned to each individual can be found in Appendix II. Each bone is mentioned with its current find number where possible. For bones that do not have a new find number, the original find number is given in parentheses following the bone name. When discussing reassigning remains between individuals, the original associations referred to are those from Ebba During's determinations. The location information for each individual is from the author's own interpretation of the find records in the *Fyndliggare*, while information on associated artifacts comes primarily from Jessica Smeeks's 2014 master's thesis. Smeeks determined the association of artifacts to individuals based on three factors: the excavators linked the object to the individual during excavation, museum staff later linked the object to the individual, or the artifact was found in the same area as the individual and Smeeks determined it belonged to the individual. Additional information is drawn from Vasa *I* (2006) and internal museum reports (Hocker 2003a, 2003b, 2004, 2013, 2015). Osteological and biological data were provided by the museum's database and Ebba During's publications (1994; Kvaal and During 1999).

Adam

During the initial recovery work, divers encountered five sets of remains on the upper gundeck. Found on the starboard side of the upper gundeck, Adam was the first individual to be recovered. Per Edvin Fälting, dive boss, first recovered Adam's femurs at beam 5 and, upon

further investigation, located more of Adam's remains, including his ribs, vertebrae, cranium, and mandible (Cederlund 2006c:283). Adam was a well localized find with the majority of his remains found at beam 5, and the remainder found nearby, no more than a few meters away, as shown in Figure 5. The primary find number associated with Adam is 03220, which is the number still assigned to his cranium. This number previously included the majority of his remains, recovered by divers in 1960.

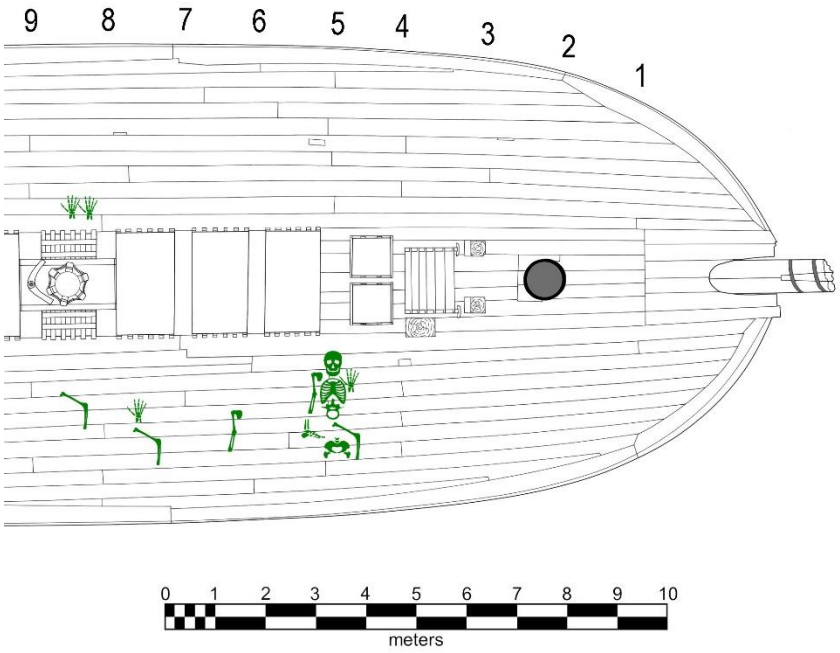

FIGURE 5. Distribution plan of Adam's remains on the upper gundeck. (Deck plan by Fred Hocker and Jorgen Wallin; courtesy of the *Vasa* Museum. Bone distribution by author, 2017.)

Adam's remains had not previously been assigned to other individuals, so no remains were reassigned from other individuals. When compared to Ebba During's database, however, some changes have been made. Three additional left ribs (08947, 25766, 25767), which were previously not assigned to any individual, have since been assigned to Adam based on find location. Two hand phalanges (25777, 10930) were removed from Adam because both were

found on the port side of the lower gundeck and are therefore unlikely to belong to him, as he was found relatively well localized on the starboard side of the upper gundeck. The find location of the phalanges is not suggestive of any particular individual; they remain, therefore, unassigned until future osteological analysis can be conducted. A third hand phalanx 09329 was reassigned to Erik because it was found on the port side of the upper gundeck with a few other small bones from Erik and shares an original find number with a metacarpal previously assigned to him. Additionally, current research has been unable to locate some of Adam's remains within the museum's collections, including six ribs, a femur condyle, and two lumbar vertebrae.

Several artifacts were found in association with Adam. Sections of his jacket remained, as well as fragments from his stockings and shoes. His jacket was homemade of an undyed, plain-woven wool with thread buttons. Adam also carried a variety of objects with him, including copper coins, a wooden spoon, a knife inside a wooden sheath marked with initials, and, possibly, a small book. A wooden cartridge tube was found close to Adam's remains and has often been considered in association with him, though no weapons were found nearby. An awl and an unidentified tool were also recorded near his remains (Smeeks 2014:215–216).

Adam was between 35 and 40 years old at the time of his death. He was 165 cm tall, but likely stood with a slightly stooped posture or hump back caused by Scheuermann's kyphosis. He had also received several injuries to his face earlier in life. He broke his nose, which healed crooked, along with breaks to his upper jaw and the frontal bone above his right eye. It is unknown whether these injuries occurred at the same time or on separate occasions, but they gave him a rather unique appearance. He had broken several ribs during his life, but the break to his right tibia is the most significant, as it is the only fracture that may be associated with the wrecking event. The tibia displays inflammatory changes and malformations that indicate the

healing process was interrupted (During 1994:154). Isotope and trace element analyses showed that Adam had high copper values, indicating a diet high in shellfish and/or foods from the intestines of animals (During 1994:152–153).

Beata

Discovered on the same day as Adam, Beata was found by diver Janssen, who initially brought up her cranium, as shown in Figure 6 (Cederlund 2006c:283). Beata's cranium maintains original find number 03256. Only a small portion of the rest of her skeleton was recovered by divers and all bones have subsequently been assigned individual numbers. The find records from the divers indicate Beata was primarily found on the port side of the upper gundeck near beams 4 and 5. Unfortunately, one of the water hoses used to move the sludge during the raising of the ship disturbed Beata's remains and scattered them over the upper and lower gundecks, as can be seen in the distribution plan in Figure 7. A large portion of her remains ended up clustered at beam 3. Her original location also placed her next to Cesar, and this disturbance from the water hose intermingled their remains (Cederlund 2006d:328).

Beata is one of the many individuals on display in the museum's Face to Face exhibit. As such, her remains had previously undergone reexamination and some bones had been reassigned to her from other individuals. Most significantly, the DNA analysis conducted in 2004 showed that the tooth thought to represent Niklas actually belonged to Beata (Hocker 2013). This eliminated one person from Ebba During's list of 25 individuals because the tooth was the only item representing Niklas. In addition, the first and second cervical vertebrae (35187, 35188) that had been assigned to Kalle were moved to Beata, while three thoracic vertebrae were reassigned from Beata to Filip based on find location. The thoracic vertebrae are reviewed in further detail below under the discussion of Filip's remains. The current study reassigned two right

metacarpals (25799, 25800) from Beata to Cesar based on a size comparison of the bones. Since their remains were intermingled, the find location is suggestive of Beata or Cesar, though fourth metacarpal 25800 is more robust when compared to Beata's left fourth metacarpal (25801). Third metacarpal 25799 is similarly sized to the fourth metacarpal 25800 and shares the same find location, thus it has also been assigned to Cesar. Right clavicle 35336 was reassigned from Erik to Beata because examination of find locations revealed a different right clavicle better matched to Erik's find location. Clavicle 35336 lacks an original find number or location, but Beata was the only individual without an assigned right clavicle. Further osteological or DNA analysis could verify these reassignments. A third metatarsal (orig. no. 11328) and a left os carpi hamate (orig. no. 13712) are assigned to Beata in Ebba During's database, but current research has been unable to locate these bones within the museum's collections.

FIGURE 6. Diver Janssen with Beata's cranium, shortly after recovering her. (Photo courtesy of the *Vasa* Museum, Stockholm, Sweden.)

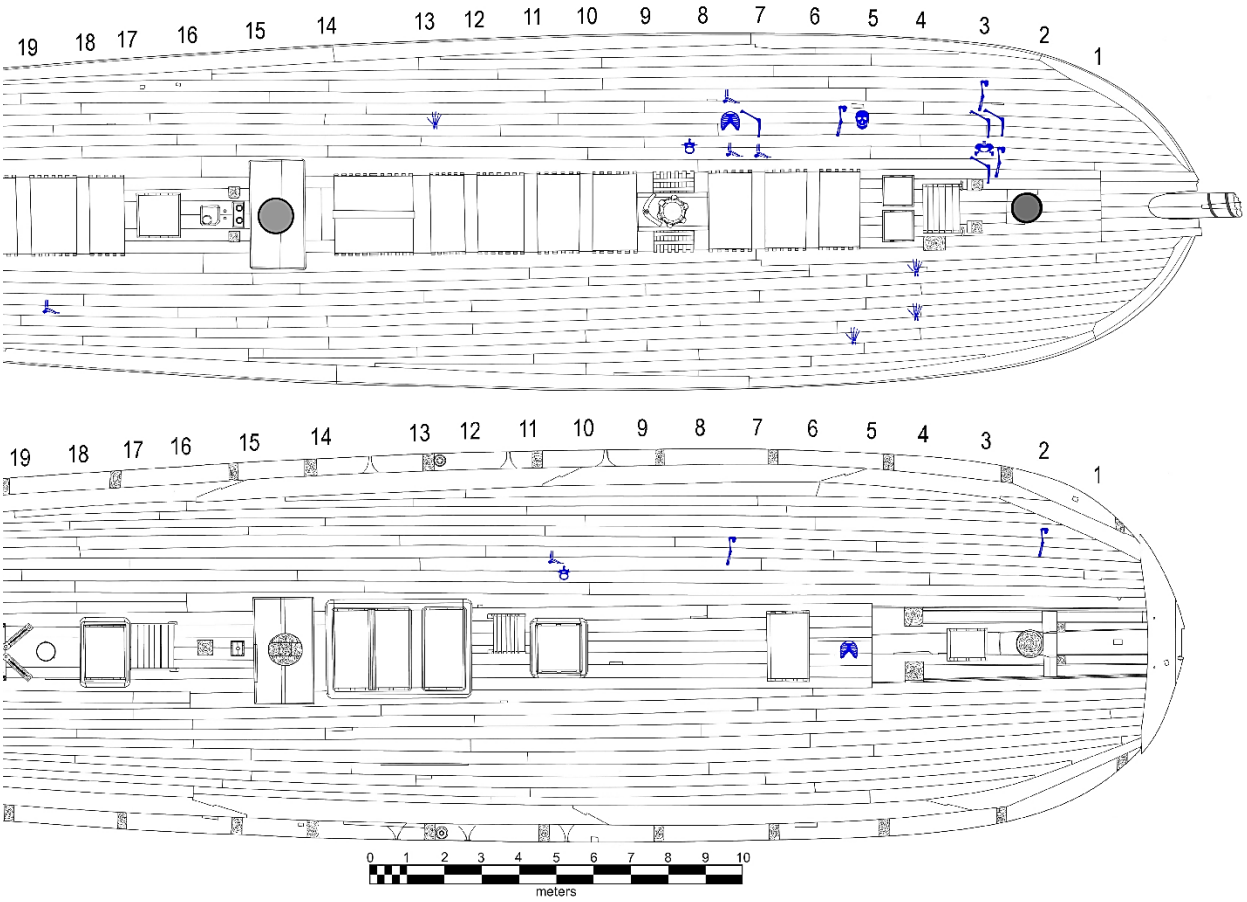

FIGURE 7. Distribution plan of the Beata's remains scattered over the upper (*top*) and lower (*bottom*) gundecks. (Deck plan by Fred Hocker and Jorgen Wallin; courtesy of the *Vasa* Museum. Bone distribution by author, 2017.)

The intermingling of Beata's and Cesar's remains makes it difficult to firmly ascertain which artifacts were associated with whom. Those that have previously been established as most likely belonging to Beata are reviewed here. Several shoes and shoe fragments were found between beams 5 and 6 on the upper gundeck, and it is likely that shoes belonging to Beata are part of this artifact group (Smeeks 2014:290). Divers recovered a broken wooden spoon on the port side, along with a wooden knife handle amidships, between beams 5 and 6 that have also been linked to Beata (Smeeks 2014:144–145).

Osteological analysis has shown Beata to be female. She was approximately 20 to 25 years old and stood between 160 and 162 cm tall (During 1994:150). Isotope analysis has shown Beata had low copper values. This, in conjunction with enamel hypoplasia evidenced on her teeth, indicates she suffered from malnutrition and/or illness during her lifetime, particularly childhood (During 1994:154–155). Beata's skull has two unique features—a persistent metopic suture and bathrocephaly (During 1994:151). The metopic suture is a vertical suture between the right and left halves of the frontal bone, which normally closes and fuses during childhood (White and Folkens 2005:88,91). The persistent suture can be seen in the center of Beata's forehead in Figure 6. Bathrocephaly is a condition in which the occipital bone forms a posterior bulge (During 1994:151), as shown on Beata's skull in Figure 8.

FIGURE 8. Beata's skull showing evidence of bathrocephaly, a bulging of the occipital bone. (Photo courtesy of the *Vasa* Museum, Stockholm, Sweden.)

Cesar

Cesar's primary find location was on the forward port side of the upper gundeck, though his remains were widely scattered over the upper gundeck, lower gundeck, and orlop. As in the

case of Beata, near whom he was found, the water hose used to move sludge during the raising of the ship caused the wide distribution of Cesar's remains (Cederlund 2006d:328), as shown in his distribution plan in Figure 9.

Due to this scattering of his remains, establishing which bones belong to Cesar has been difficult at times and many changes have been made since Ebba During's analysis, reassigning bones both to and from Cesar. Mandible 07613, which retains its original find number as its current designation, was reassigned from Cesar to David based on a number of variables, as discussed further below under David. Two thoracic vertebrae (09875, 35329) were moved to Erik based on find location and original find number. Right patella 35172 was reassigned to Ivar because it comes from his original find number 19527, also discussed further below. Ludvig gained left radius 29216 because he was the only remaining individual without a left radius and the find location is appropriate for him. Radius 29216 was removed from Cesar because a collection of ribs and a left radius, all from original find number 04271, were assigned to him after eliminating them from Johan based on find location. These bones were found amidships near beam 5 between the upper and lower gundecks, and so better match Cesar's find location than Johan's, who was found in a semi-closed context in the hold. Left humerus 99586 was also added to Cesar's assigned remains from Olof based on find location and original find number 07767, which matches Cesar's other remains. As previously mentioned, a pair of right metacarpals (25799, 25800) were removed from Beata's display and reassigned to Cesar based on a size comparison of the bones. Perhaps most significantly, partial cranium 30452 from Kalle and mandible 18588 from Martin were assigned to Cesar, though these designations require further DNA analysis for confirmation (Hocker 2015).

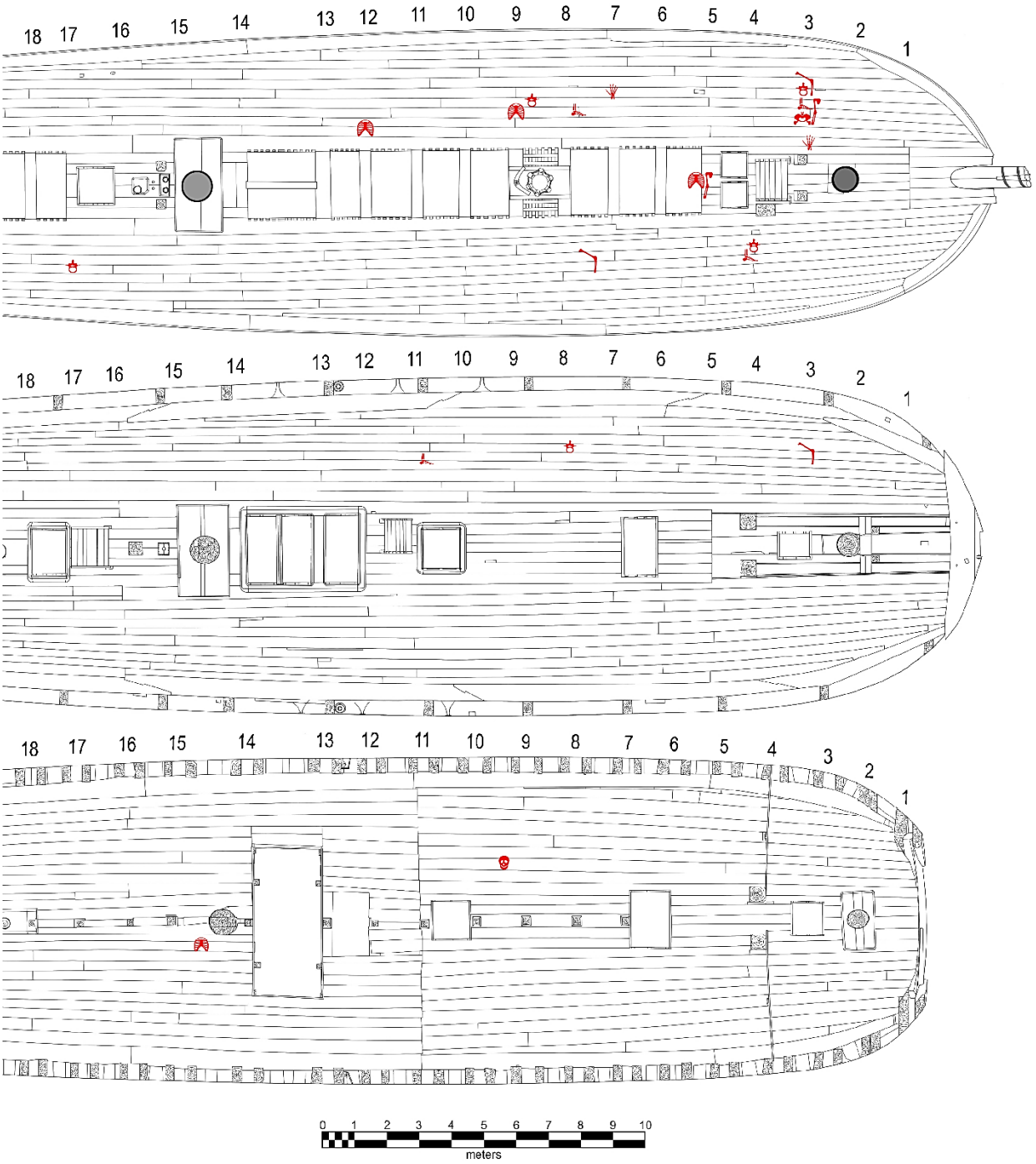

FIGURE 9. Distribution plan of Cesar's remains as found scattered across the upper gundeck (*top*), lower gundeck (*middle*), and orlop (*bottom*). (Deck plan by Fred Hocker and Jorgen Wallin; courtesy of the *Vasa* Museum. Bone distribution by author, 2017.)

As for the artifacts found in association with Cesar, a wooden spoon, a leather bound book, a jacket, and an awl were found nearby and have been hypothesized as belonging to him. His jacket was homemade of undyed, plain-woven wool. The wooden spoon had a decoratively carved handle, and both it and the book could have fit within Cesar's pockets (Smeeks 2014:216).

Cesar stood approximately 170 cm tall and was between 34 and 43 years old at the time of his death (Kvaal and During 1999:174,178). Based on osteological studies, Cesar was in generally good health. He had no significant zinc or copper values and no signs of pathological changes or disease (During 1994). Unfortunately, since Cesar's mandible was reassigned to another individual, previous odontological studies no longer provide accurate information about his age or health.

David

David's primary find location was on the starboard side of the upper gundeck between beams 13 and 15, with the majority of his remains under the original find numbers 07611 and 07612. David's cranium (03909) and left femur (05093) were found slightly farther aft nearer to beam 16. Some earlier diver finds include David's right femur (25825), left humerus (04204), and right os coxae (25833) as found on the port side between just abaft beam 10 to abaft of beam 14. These are shown in the distribution plan of David's remains in Figure 10.

Mandible 07613 had previously been assigned to Cesar, though now has been reassigned to David. The find number of the mandible is sequential with David's other remains, and the find location matches the majority of his remains. DNA analysis has reaffirmed this assignment, as samples from the mandible, David's maxilla (03909), and David's right femur (25825) all share a well-defined profile (Hocker 2015). With David's skull now complete, a facial reconstruction

is possible for him. Ebba During assigned two left hand distal phalanges (oirg, no. 07612) to David, though present research has only been able to locate one of these. In addition, left metatarsal 25864, not listed by During, has been assigned to David and is kept on display with his remains, though this bone has no original find number or location. A right fifth metatarsal with original find number 09232 was reassigned from David to Cesar based on find location. No other bones have been removed from David or reassigned to other individuals.

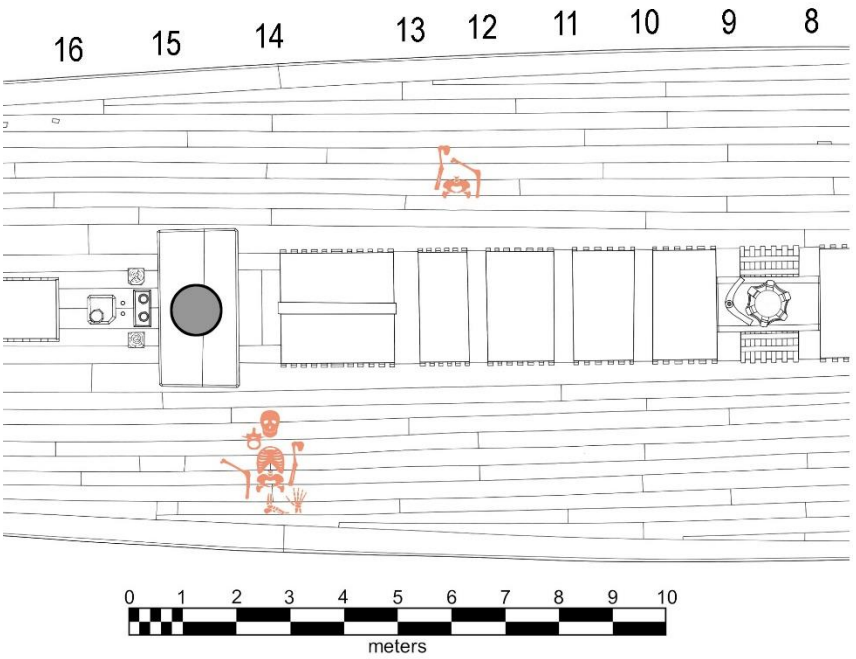

FIGURE 10. Distribution plan of David's remains on the upper gundeck. (Deck plan by Fred Hocker and Jorgen Wallin; courtesy of the *Vasa* Museum. Bone distribution by author, 2017.)

Several artifacts were found near David's remains, some of which are more readily identifiable as belonging to him than others. Textile fragments of blue-dyed, plain-woven broadcloth and two pewter buttons are all that remain of his jacket. Several fragments of leather mittens were found nearby, which represent multiple mittens. It is probable that at least one set of mittens belonged to David, though not all of them. A small bentwood box, small enough to fit

inside a pocket, and a wooden knife were definitively found with David, while two wooden spoons were found close by. David was found near 48 copper coins, which may or may not have belonged to him, though a silver coin was conclusively linked to him by the excavators. He was the only individual recovered with such a valuable coin (Smeeks 2014:217–218).

David was between 30 and 35 years old and stood approximately 162 cm tall. Though shorter than others on the ship, he was markedly robust with large muscle insertions exhibited on his bones. Several of his ribs and a femur show healed breaks. He had a maxillary molar removed less than four months before he died (During 1994:155), while the first two left mandibular molars were lost earlier in life. Isotope analysis showed that David had a mixed diet of both fish and meat.

Erik

The fifth and final set of remains recovered from the upper gundeck by divers belong to the individual designated as Erik. His cranium (04013) was found heavily damaged just abaft the mainmast with only the parietals, part of the occipital, and the left temporal remaining. A piece of his cranium, his left maxilla (30454), was found by divers on the lower gundeck amidships just forward of the mainmast, and his mandible was also located on the lower gundeck amidships, between beams 12 and 13. While a portion of his remains were found nearby on the upper gundeck, Erik's remains were widely scattered, found on all lower decks and in the drain, as shown in his distribution plan in Figure 11.

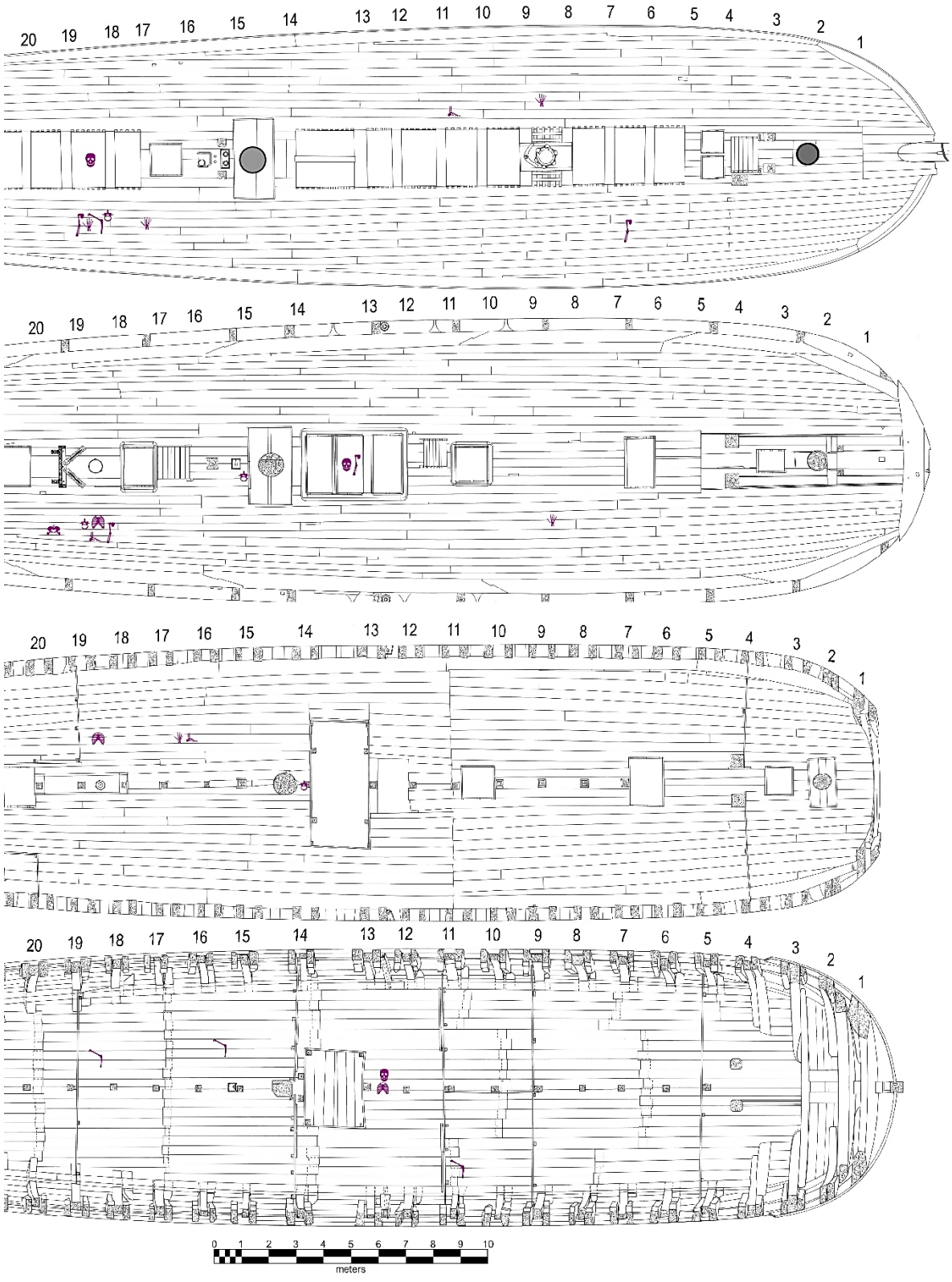

FIGURE 11. Distribution plan of Erik's remains over all of *Vasa*'s decks (*top* to *bottom*: upper gundeck, lower gundeck, orlop, hold). (Deck plan by Fred Hocker and Jorgen Wallin; courtesy of the *Vasa* Museum. Bone distribution by author, 2017.)

A large portion of the remains currently assigned to Erik were assigned to him by Ebba During, though many new bones have been assigned to him, particularly because of DNA analysis. The majority of the new bones assigned to Erik have come from Kalle and Ludvig. DNA analysis showed femur 29212, humerus 04237, mandible 11688, and maxilla 30454 all share a common profile (Hocker 2015), and these remains have all now been assigned to Erik. Femur 29212 and humerus 04237 were reassigned from Ludvig, while maxilla 30454 was reassigned from Kalle. A physical examination of the bones revealed the left femur with original find number 12095 as the pair for right femur 29212, so it too was reassigned from Ludvig to Erik. Right radius 29208 shares an original find number with left humerus 04237 and maxilla 30454, and was therefore also moved to Erik from Ludvig. A set of hand and foot bones found between beams 16 and 17 on the orlop were reassigned from Kalle to Erik because their find location suggests they fell through hatches or spaces between boards from Erik's original location on the upper gundeck. Rib 29244 was reassigned from Ludvig to Erik for the same reason, as well as fibula 16620, which was found in the hold. Left tibia 29213 was originally assigned to Ludvig but does not match right tibia 12095 currently assigned to him. Though left tibia 29213 and Erik's right tibia 35334 are badly deteriorated and broken, they are a probable match from size comparison. Accordingly, tibia 29213 has been assigned to Erik. The remaining bones reassigned to Erik from other individuals were all based on find location.

Despite the scattering of his remains, it is possible to directly associate certain clothing remnants with Erik. A leather mitten was found near Erik's remains on the upper gundeck, while several jacket fragments were found near his remains on the orlop (Smeeks 2014:80–81,123,147–148). The jacket was of a plain-woven, undyed wool, and no fasteners were found that could be positively identified with it (Smeeks 2014:218).

Erik was approximately 162 cm tall and around 40 years old (Kvaal and During 1999:174,178). Isotope and trace element analyses showed he had high copper values, indicating a diet rich in animal protein, particularly shellfish and/or intestinal food (During 1994:152–153). There is unfortunately no more information available about Erik's remains until further DNA and/or osteological analyses are conducted on his now more fully complete remains.

Filip

Long believed to be the ship's steersman, Filip was found on the upper gundeck near the whipstaff. He was located between beams 22 and 23 on the starboard side, buried beneath the collapsed bulkhead separating the steerage from the captain's cabin (Cederlund 2006d:332). As can be seen in Figure 12, his remains were somewhat disarticulated but were found within a confined area. The primary find number for Filip is 10288, which is assigned to his cranium. The majority of his remains come from original find numbers 10288, 10289, and 10290. The exception is two thoracic vertebrae and a right rib that During assigned to Beata but have been reassigned to Filip based on find location. Two vertebrae (07792, 25808) from original number 07792 were found on the starboard side of the upper gundeck between beams 22 and 23—the exact location of Filip. Rib 10216 was also found between beams 22 and 23, though on the port side, as seen in the distribution plan of Filip's remains in Figure 13.

Little remained of Filip's clothing, only pieces of his jacket and hat. There were textile fragments from his jacket, which was made of coarse, undyed twill, along with twelve glass buttons and the brass eye of a hook-and-eye closure. His hat was evidenced by a felt fragment, along with a decorative silk ribbon. Several other artifacts were found in association with him, including ten copper coins, a wooden spoon, a knife with a wooden handle, and a decorative wooden knife sheath, which may have connected to a belt. Two weapons were found in close

proximity—a sword and a hunting rifle. The sword was well-made with a skillfully carved grip embellished with wire patterns. A corresponding sword sheath and baldric were also found (Smeeks 2014:218–220).

FIGURE 12. Filip's remains as found on the upper gundeck. (Photo by Gerhard Bauer; courtesy of the *Vasa* Museum, Stockholm, Sweden.)

Filip was around 30 years old when *Vasa* sank. He was short at only 163 cm tall, and he was thin, probably due to his diet. Low zinc values indicate that Filip's diet was composed largely of plants, likely bread and porridge, with little to no meat or fish. Filip would have been unable to effectively chew such food because his molars did not meet when he closed his mouth (During 1994:153; Hocker 2011:114). Filip also had supernumerary teeth on his lower jaw, where his deciduous lateral incisors had not been lost and his permanent incisors had erupted behind them. This can be seen in Figure 14, though the deciduous incisors were lost post-mortem (Kvaal and During 1999:174). The lack of wear on Filip's molars due to the gap between the

upper and lower molars can also be seen.

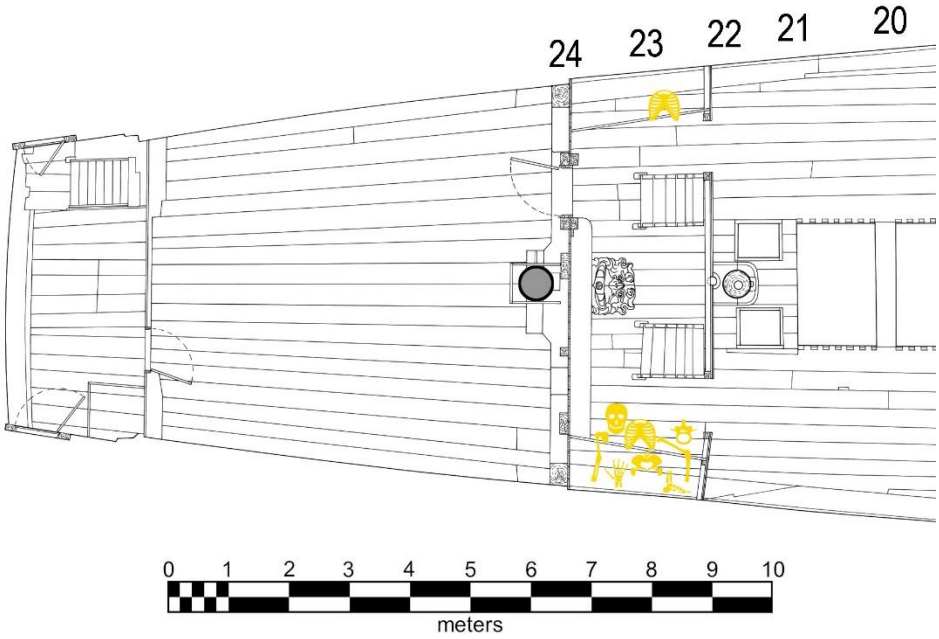

FIGURE 13. Distribution plan of Filip's remains near the whipstaff on the upper gundeck. (Deck plan by Fred Hocker and Jorgen Wallin; courtesy of the *Vasa* Museum. Bone distribution by author, 2017.)

FIGURE 14. Filip's mandible (25949) displaying his extra incisors. (Photo courtesy of the *Vasa* Museum, Stockholm, Sweden.)

Filip's remains display one other unique feature—holes in the humeral trochlea of both humerii, the end of the upper arm bone that forms part of the elbow, as shown in Figure 15. Ebba During suggested these were caused by a condition known as osteochondritis dissecans, whereby epiphyseal bone is damaged from an impact or chronic trauma. Holding with the theory that Filip was the steersman, she proposed that the stress on Filip's elbows while holding a ship's rudder steady over long periods of time would have caused this type of chronic injury and created the lesions (During 1994:155). Recent analysis continues to ascribe the condition as osteochondritis dissecans, though the cause of the original injury cannot be determined (Fred Hocker 2017, pers. comm.).

FIGURE 15. Filip's right femur displaying a hole in the humeral trochlea. (Photo courtesy of the *Vasa* Museum, Stockholm, Sweden.)

Gustav

Gustav was found during the excavation of the lower gundeck, located between beams 11 and 12 on the starboard side (Cederlund 2006e:353). His find location can be seen on the distribution plan in Figure 16. Gustav's remains were relatively undisturbed, and the vast majority of his bones were found within the same area with only three exceptions. Gustav's left

talus (11344), an ankle bone, was moved to port and slightly forward, between beams 9 and 10. His left femur (07697) was also shifted forward to between beams 6 and 7, though this may be an error in recording as the *Fyndliggare* does not record a location or find date for this bone. Gustav's right os coxae (19121), the pelvic bone, was the farthest displaced, as it was found on the orlop between beams 7 and 8. This bone was originally assigned to Gustav and remains so because it is a good match to the left os coxae in size, coloring, and deterioration.

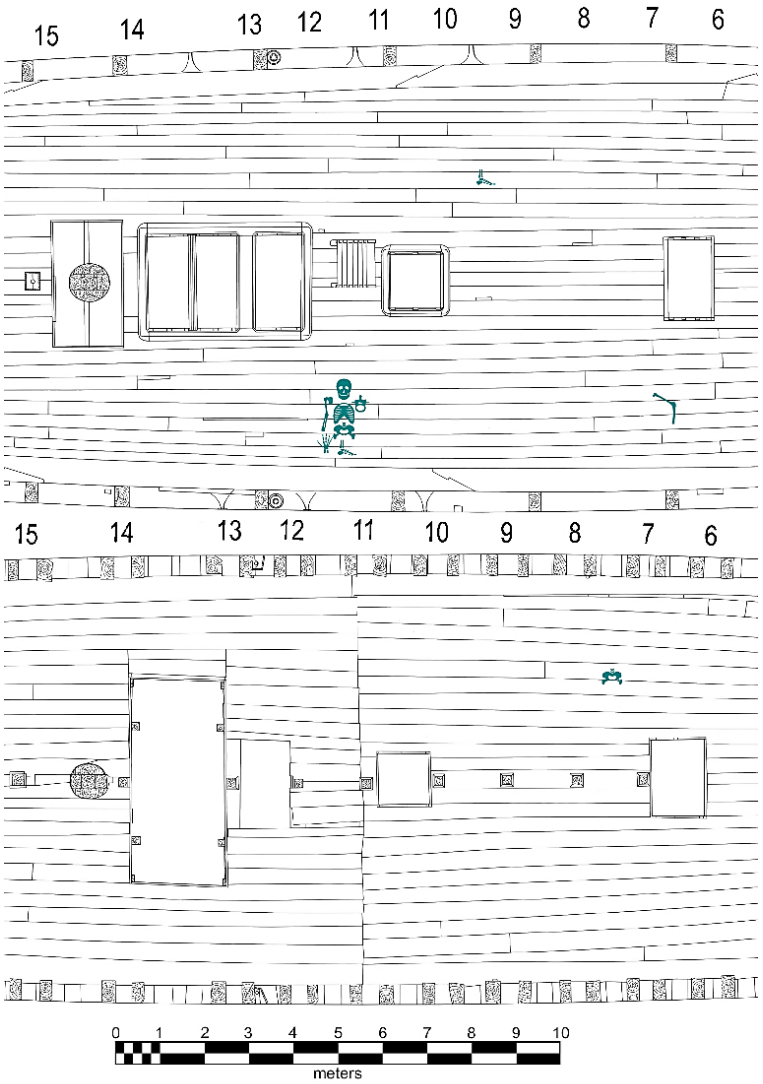

FIGURE 16. Distribution plan of Gustav's remains on the lower gundeck (*top*) and orlop (*bottom*). (Deck plan by Fred Hocker and Jorgen Wallin; courtesy of the *Vasa* Museum. Bone distribution by author, 2017.)

None of Gustav's remains, except for one, have been reassigned to other individuals, so changes between the current listing of his remains and Ebba During's database are few. The one item reassigned to Gustav is a section of rib cartilage that was previously allotted to Johan. Current research, however, has been unable to locate the cartilage within the museum's collections. In addition, four ribs and rib fragments, which remain assigned to Gustav, have not been found. Gustav's left and right calcanei (35202, 35203) come from his primary original find number 12882, though they are not listed in Ebba During's database.

Despite his skeleton being relatively undisturbed, many barrels of personal belongings in the area surrounding Gustav were upset during the wrecking event and their contents spilled out. With such a large amount of material strewn about him and few photographs of the excavation area, no finds of personal possessions could be definitively linked to him (Smeeks 2014:51–52).

Osteological analysis has shown Gustav to be approximately 45 years old and 160 cm tall, making him one of the shortest men aboard the ship. Gustav was thinly built with fine features, which led Gejvall to determine that he was a woman, though During later concluded that he was a man. Cavities were found in several teeth, and his first maxillary molar on the right had been removed less than four months before his death. Isotope analysis shows that he ate a diet of both meat and fish. Gustav suffered from spinal problems, with ossified ligaments and sharp osteoarthritic changes to the vertebral bodies and articular facets (During 1994:154–155).

Helge

Helge was the most complete and well preserved of the human remains when found, with hair, nails, and brain still extant, as well as much of his clothing. During the excavation of the lower gundeck, Helge was found on the port side at gunport 16 lying on top of the anchor cable with his feet underneath the gun carriage and only his lower left arm disarticulated from the rest

of his remains. He was immediately recognized as being remarkably well intact and was thus one of the most carefully excavated sets of remains. Helge was cleaned, drawn, and photographed *in situ* before he was block lifted in three separate sections—torso, upper legs, and lower legs (Cederlund 2006e:339). A photograph of Helge *in situ* is seen in Figure 17, and the drawing of his remains as discovered are shown in Figure 18. All of Helge's remains are from original find numbers 11359, 11360, and 11361. The distribution plan of his remains is shown in Figure 19. Since Helge was found in such an intact state, his remains were not misassigned to any other individuals, and therefore maintain their original assignations.

FIGURE 17. Photograph of Helge in situ. (Photo by Gerhard Bauer; courtesy of the *Vasa* Museum, Stockholm, Sweden.)

Once Helge's remains were transferred to the laboratory, they were again carefully cleaned and photographed before removing the skeletal pieces from the clothing fragments (Cederlund 2006j:401–402). As previously mentioned, much of Helge's clothing remained,

including his jacket, shirt, trousers, and shoes. Helge wore a twill jacket with a pair of cloak bag breeches made of a plain weave. His feet remained in his shoes, which were leather tie shoes with multi-layered thick soles (Smeeks 2014:220). At his waist, Helge's coin pouch remained with 33 copper coins. A knife sheath and the wooden handle of the corresponding knife were found in his breeches pocket (Cederlund 2006e:339; Smeeks 2014:220).

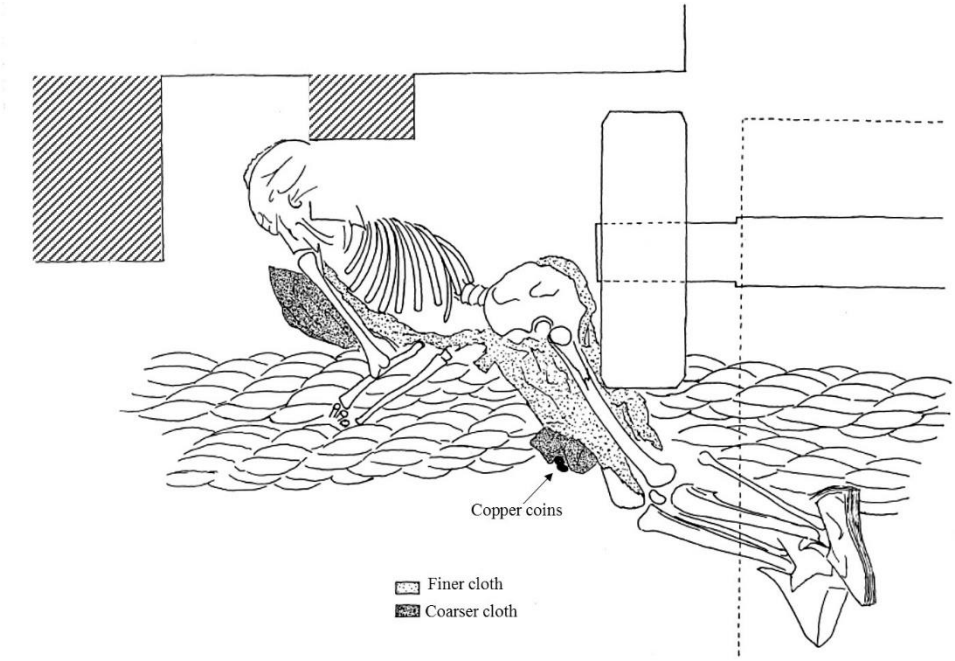

FIGURE 18. Drawing of Helge's remains as found at gunport 16 on the lower gundeck. (Illustration by Bo Wingren; courtesy of the *Vasa* Museum, Stockholm, Sweden.)

Helge was initially examined by Nils-Gustaf Gejvall and was then interred in the naval cemetery with the other individuals from the interior of the ship (During 1994). This interment was unfortunate, as the bag he was held in leaked, allowing mold and fungus to develop on the bones. Though the remains have since been cleaned, they are now in an extremely fragile state. The bones are too brittle to handle for more than a brief moment, and several bones have fragmented or nearly disintegrated. Fortunately, Ebba During's analysis was still able to provide

information on Helge. He was approximately 35 years old and stood 165 cm tall. Isotope analysis shows he had a high protein intake of meat and fish. He does not show signs of suffering from any nutritional or genetic problems, unlike many other individuals on board.

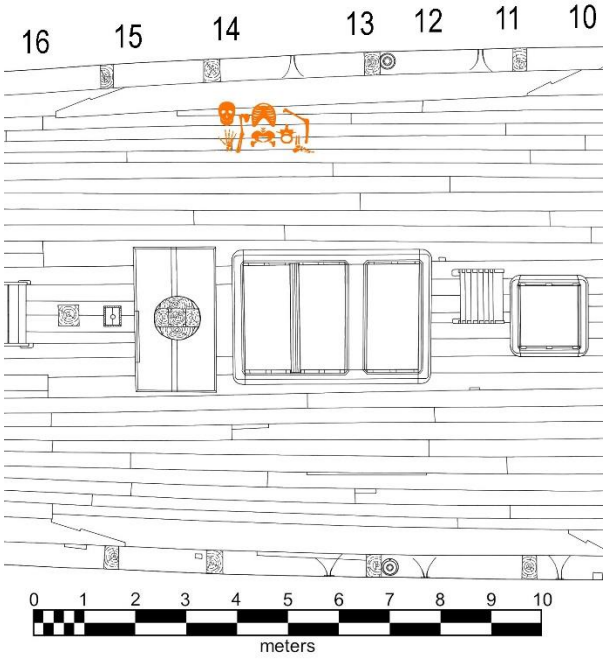

FIGURE 19. The location of Helge's remains as found on the lower gundeck. (Deck plan by Fred Hocker and Jorgen Wallin; courtesy of the *Vasa* Museum. Bone distribution by author, 2017.)

Ivar

Ivar was found on the port side of the forward compartment of the orlop—a relatively well enclosed space. He was found as a nearly complete skeleton, though some of his remains had fallen down into the hold (Cederlund 2006g:391), as shown in Figure 20. The majority of Ivar's remains were found under the original find numbers 19526 and 19527, and his cranium maintains the designation 19526.

Ebba During's analysis had assigned many of Ivar's remains to Johan and Kalle, and some of the remains she had assigned to Ivar have now been reassigned to other individuals. The

majority of the remains reassigned to Ivar from Johan and Kalle were reassigned because they were found under original find number 19527, which is clearly associated with Ivar's closed find location. Right patella 35172 was moved from Cesar to Ivar for the same reason. Right rib 35353 was reassigned from Erik because the original find location is listed as all the way forward on the orlop, suggesting it belongs to Ivar. Original find number 20067 was found all the way forward in the hold, therefore the three bones from this number were moved from Kalle to Ivar, as well as thoracic vertebra 35151 that was found all the way forward on the orlop. In addition, the majority of the X bones were moved from Kalle to Ivar, including both femurs, both fibulae, both tibias, right humerus, left ulna, and left radius. In the *Fyndliggare*, 19527 was recorded as a skeleton, meaning the excavators felt Ivar represented a relatively complete set of remains. There is, however, only one long bone with original number 19527, suggesting that several bones are missing from this find number. The "X" right humerus 35158 is an excellent match to the left humerus 35157 from original number 19527, while the "X" left radius 35160 and left ulna 35159 are also good matches to the right radius 35162 and right ulna 35161 from original number 17061. This number has a find location on the port side of the hold from 0 to 6.67 meters, placing it in the front of the ship just below Ivar's primary find location, where it could have fallen through; therefore, these remains were reassigned from Kalle to Ivar. This allows the "X" arm bones to be paired, providing Ivar with the long bones of the arm and leaving the leg bones as the only bones missing from his skeleton. The remaining "X" bones provide these missing bones with pairs for all three leg bones, making Ivar a nearly complete skeleton. These "X" bones are likely then the missing remains from 19527 (Hocker 2003a). DNA analysis has been inconclusive thus far and further testing is necessary to firmly establish these designations (Hocker 2015).

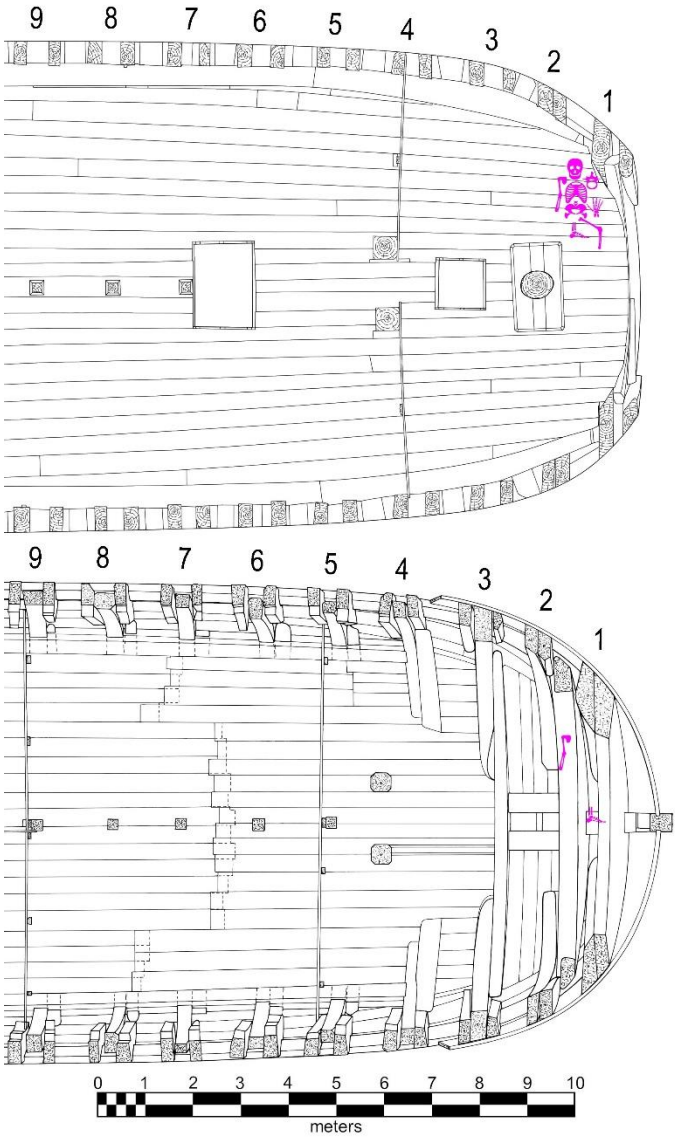

FIGURE 20. Distribution plan of Ivar's remains in the forward part of the orlop (*top*) and hold (*bottom*). (Deck plan by Fred Hocker and Jorgen Wallin; courtesy of the *Vasa* Museum. Bone distribution by author, 2017.)

As for the remains removed from Ivar's listing, the sacrum numbered 11399 that had been assigned to Ivar has now been moved to Erik. The sacrum was found on the lower gundeck directly below Erik, where it could have fallen through a hatch, and therefore more appropriately matches his find location. A grouping of seven metatarsals, which belong to the "2" grouping and match one another, though they have no find location information, were reassigned from Ivar

to Johan. Once three metatarsals from original find number 19527 were reassigned to Ivar from Kalle, the "2" metatarsals no longer matched. Two additional bones that During had assigned to Ivar, left and right calcanei from the "2" grouping, are no longer assigned to him, and current research has been unable to locate them within the museum's collections or database.

The only remnants of Ivar's clothing were a silver button that may have come from his jacket and fragments of a leather glove. He was carrying a military issue snaplock musket and a lantern that were found in direct association with him (Hocker 2011:114–115; Smeeks 2014:220–221). Part of the musket was found with the arm bones in the hold below, further confirming the association of these bones with Ivar.

FIGURE 21. The back of Ivar's skull showing damage to his left parietal. (Photo by Anneli Karlsson; courtesy of the *Vasa* Museum, Stockholm, Sweden.)

Ivar was one of the oldest individuals found aboard the ship, aged at around 50 years old. He was approximately 173 cm tall and had more than a few injuries. Primarily, the left parietal

shows a depressed skull fracture at the back of his head. While it must have been a terrible injury at the time, it healed to the point that it now appears as only two small depressions surrounded by scarred bone (Hocker 2011:114–115). These probably would have caused Ivar headaches during his lifetime (Dr. J. McAllister, pers. comm.). The healed fracture can be seen in Figure 21. Ivar was in generally good health with no significant zinc or copper values and no signs of pathological changes or suffering from disease (During 1994).

Johan

Johan was the only individual found in the hold of the ship. Though his remains were disturbed, he was distributed over only a small area and was a relatively closed find. A large portion of his remains were found between beams 6 and 7 on the starboard side in the pocket formed by the bilge stringer. His cranium 17113 was found on the centerline at the base of the bulkhead running along beam 5, while several other bones, mainly small bones, were found in an excised section of the starboard anchor cable (Cederlund 2006f:372). This distribution of his remains is shown in Figure 22 below.

Several bones that were previously assigned to Johan came from the upper decks of the ship, and these bones have since been reassigned to the appropriate individuals. A group of hand phalanges and one foot phalanx, all with original find number 19527, were reassigned to Ivar because this is one of his original find numbers and he was found in a closed context. Additionally, a grouping of ribs and a left radius under original number 04271 were reassigned to Cesar based on find location. Other bones were moved to Erik, Gustav, and Ludvig and are mentioned under the discussion of their remains. In addition, three bones that were assigned to Ludvig have now been reassigned to Johan based on find location. All three bones—right rib 29235, right foot phalanx 29234, and cervical vertebra 29236—were found in the starboard

anchor cable with Johan's other remains. As mentioned above, a group of matching metatarsals from the "2" grouping were reassigned from Ivar to Johan. Though these bones have no find location information, they were reassigned to Johan because he was the only individual who did not have assigned metatarsals. All other individuals had assigned metatarsals that would have created a conflict when assigning such a large group of metatarsals to the individual. Additionally, DNA analysis has reaffirmed confirmed that Johan's right femur 35283 is a positive match to right tibia 35288 (Hocker 2015).

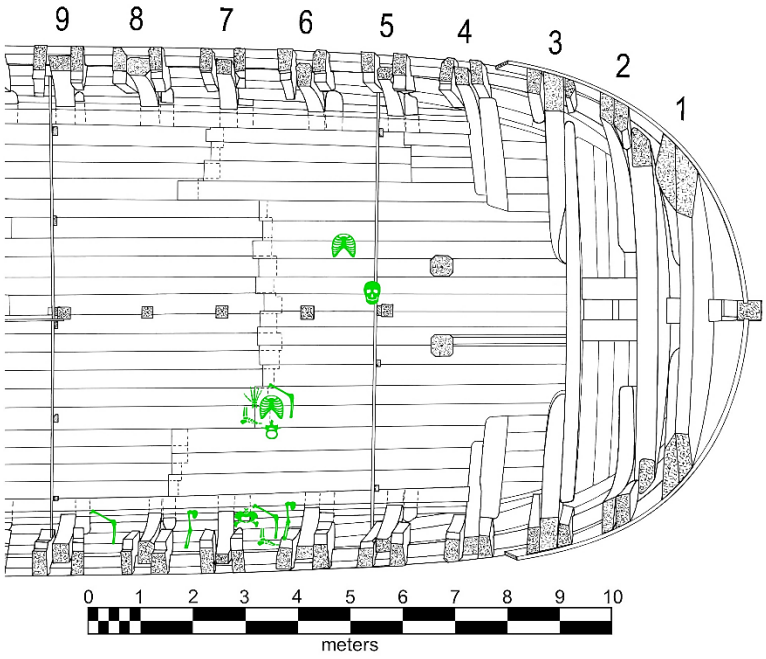

FIGURE 22. Distribution plan of Johan's remains in forward section of the hold. (Deck plan by Fred Hocker and Jorgen Wallin; courtesy of the *Vasa* Museum. Bone distribution by author, 2017.)

Johan's jacket and shoes were found with his remains. His jacket was one of the nicest pieces of clothing found aboard the ship. It was a long jacket made of blue-dyed finely woven twill. His shoes were a pair of half-slippers, the only person found wearing such shoes (Smeeks 2014:221).

Like Ivar, Johan was one of the oldest men on the ship between 50 and 60 years old. He stood about 160 cm tall, and his bones show evidence of a hard life with many injuries. He had lost all but one of the molars in his mandible, retaining only his front teeth and his right third molar. The jaw appears to have healed well after the loss of the teeth. His left fibula shows evidence of a fracture that did not heal properly, possibly because the healing process was interrupted. It is possible that the bone was either never set right or that he began walking on it too early (Hocker 2011:115). The most considerable injury is evident in Johan's feet. He lost the first digit on his right foot with damage to end of the first metatarsal and associated damage to the second digit. His other metatarsals are deformed with strong curvature on the shaft. Ebba During proposed that the damage was caused by a severe crushing injury that altered Johan's gait, even after healing. She also suggested that the deformities may be a result of amputation from gangrene, or some other skeletal disease or neuropathic process (During 1994:155).

Ludvig

The final set of remains from aboard the ship are designated as Ludvig. His remains were largely disturbed and often intermingled with Erik's. Ludvig's remains were scattered from the lower gundeck to the orlop and the hold, where a large portion of his bones were found, as shown in Figure 23. In fact, the majority of the remains assigned to Ludvig come from the drain or are bones that have lost their original find numbers.

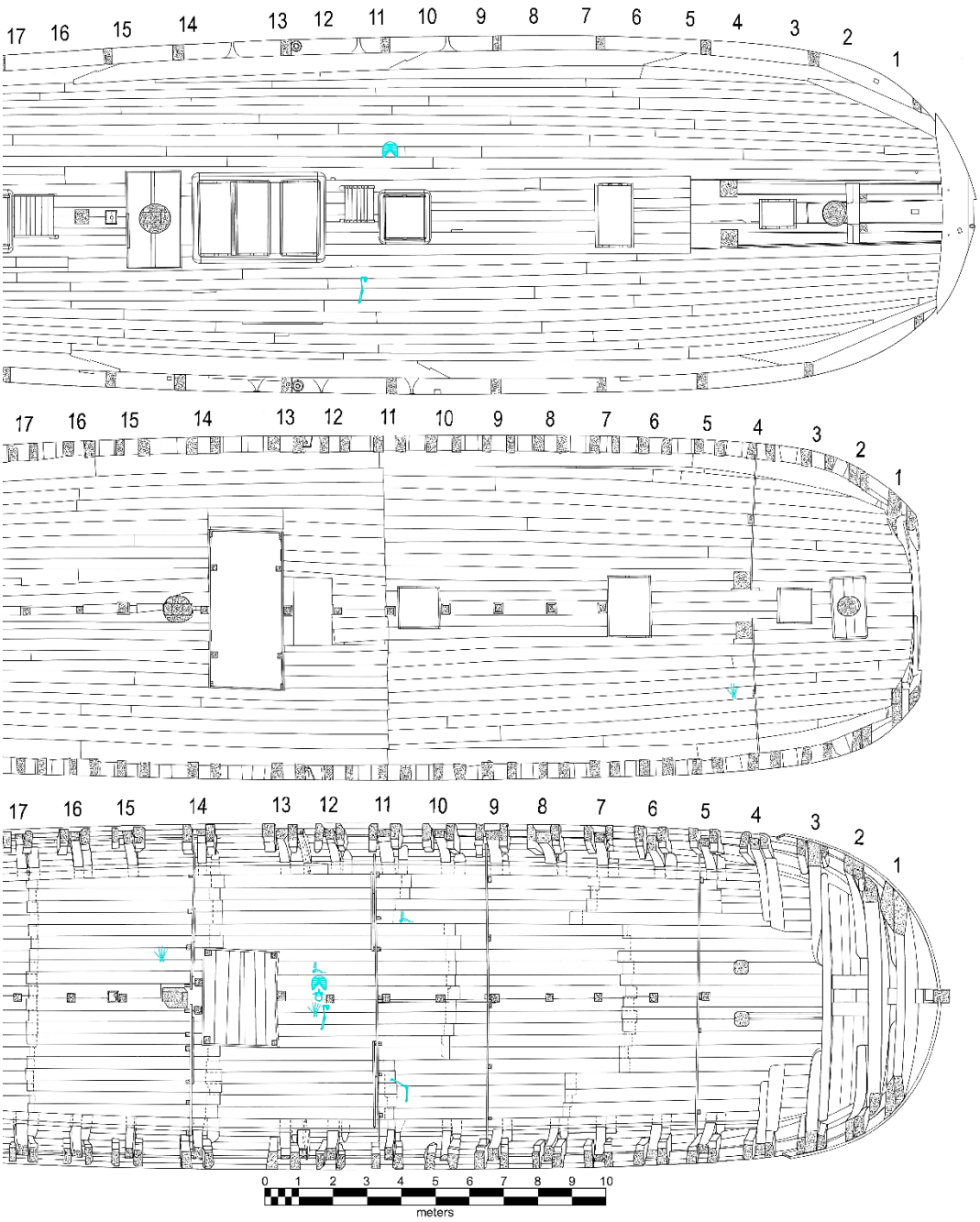

FIGURE 23. Distribution plan of Ludvig's remains on the lower gundeck (*top*), orlop (*middle*), and hold (*bottom*). (Deck plan by Fred Hocker and Jorgen Wallin; courtesy of the *Vasa* Museum. Bone distribution by author, 2017.)

Many changes have been made to Ludvig's assigned remains since Ebba During's analysis. As previously discussed, a large portion of remains previously assigned to Ludvig were

reassigned to Erik based on DNA analysis and bone pairing, while three bones were moved to Johan based on find location. Conversely, two bones—right scaphoid 35292 and foot phalanx 13813—were reassigned from Johan to Ludvig based on find location. Left radius 12882 was reassigned from Cesar to Ludvig based on find location and because Ludvig was the only individual from the upper decks without an assigned left radius. A cranial piece, right parietal 29107, was moved from Cesar to Ludvig for a similar reason—the original find number and location have been lost, but Ludvig was the only individual without any cranial fragments that would have conflicted with this bone assignment. Thoracic vertebra 24249 was assigned to Ludvig from Kalle based on find location.

Ludvig's clothing was found near his remains in the hold. His jacket was homemade of plain-woven, undyed wool. His stockings and cloak bag breeches were also made of plain-woven wool with woven blue bands. Due to the many changes to Ludvig's assigned remains, chiefly his long bones, previous osteological and odontological studies for Ludvig no longer provide accurate information about him. The current study is therefore unable to provide information on his age, stature, or health.

Rudolf

Several bones were found during the post-recovery salvage excavations of the seafloor surrounding the ship. With the exception of one set of remains, discussed further below, the bones were intermingled and primarily found under the original find numbers 23162 and 23163. Three crania, along with several other bones, are listed under these numbers, and the individuals have been designated as Rudolf, Sigurd, and Tore. Though their find location is uncertain due to some inconsistencies within the *Fyndliggare*, collation of various excavation documents and

photographs has made it pretty certain that they were found in the wreckage of the port quarter galleries (Fred Hocker 2004:4–5).

The first of these individuals from outside the ship is Rudolf. Rudolf's cranium, found under find number 23163, has since been assigned find number 35308 and is the primary find number for his remains. Ebba During's analysis assigned him six additional bones, and the current analysis has left four of these bones assigned to him. The first bone removed is a proximal hand phalanx of the fifth digit, because current research has been unable to locate this bone within the museum's collections or database. The second bone removed is left femur (orig. no. 23163) that has been moved to Sigurd and is discussed further in the section below. DNA analysis also revealed that right femur (orig. no. 23162), previously assigned to Sigurd, and left humerus 35310, previously assigned to Tore, share a well-defined profile with Rudolf's cranium (Hocker 2015). Right femur (orig. no. 23162) and corresponding left femur (orig. no. 23162), which had been shown to be a positive physical match, both from Sigurd, have now been assigned to Rudolf. From Tore, left humerus 35310 as well as paired radius 35311 and ulna 35309 have been allocated to Rudolf.

Based on previous osteological analysis of left humerus 35310, Rudolf was approximately 175 cm tall. This makes Rudolf one of the tallest of the individuals found in association with the ship (Hocker 2015). Combined osteological and odontological studies provide an estimated age of approximately 20 years old for Rudolf (Kvaal and During 1999:176,178). His remains showed high zinc values, indicating a high amount of fish in his diet, though he also showed low copper values, which can indicate malnutrition, illness, diarrhea, or anemia (During 1994:153).

Sigurd

The cranium designated as Sigurd retains original find number 23162. Of the bones assigned to Sigurd by Ebba During, only the femurs have been changed. As discussed above, DNA analysis showed that right femur (orig. no. 23162), which During had assigned to Sigurd, belongs to Rudolf (Hocker 2015). Left femur (orig. no. 23162) is an osteological match for (orig. no. 23162), so the paired femurs have now been assigned to Rudolf. Sigurd has now been assigned left femur (orig. no. 23163) that was previously assigned to Rudolf. Though both this femur and Sigurd's cranium have shown unique DNA profiles (Hocker 2015), it is possible that one of the samples was contaminated and a true sample may match. Sigurd is also the only individual with whom this femur can be paired osteologically. Rudolf and Ylva already have a pair of femurs each, and the femur does not match with Tore's right femur (no number).

Examination through osteological and odontological analyses showed Sigurd to have been approximately 25 years old (Kvaal and During 1999:178). Within four months before his death, Sigurd had a tooth extracted (During 1994:155).

Tore

The third individual found outside the ship in a disarticulated state is Tore, whose cranium maintains original find number 23163. Ebba During's examination assigned eight bones to Tore, including his cranium. From this association, the three arm bones have been removed. DNA analysis showed left humerus 35310, previously assigned to Tore, is a match for Rudolf, as was mentioned earlier. Left ulna 35309 and radius 35311, which physically match the humerus, were also reassigned to Rudolf. Additionally, DNA analysis showed right femur (no number) and left tibia (no number), previously allocated to Quintus, are a match for Tore, and these bones have been reassigned to him (Hocker 2015).

FIGURE 24. Tore's cranium (23163) displaying an impacted incisor. (Photo courtesy of the *Vasa* Museum, Stockholm, Sweden.)

Aged at approximately 20 years old, Tore is one of the youngest individuals found with *Vasa* (Kvaal and During 1999:178). He stood about 166 cm tall (Hocker 2015). Tore had retained most of his teeth, though he does display evidence of cavities, and he had an impacted tooth, a left permanent incisor, as seen in Figure 24 (Kvaal and During 1999:174,177). His cranial frontal bone also displays a strong metopic suture, just as Ylva and Beata do (During 1994:151). He shows low zinc values, indicating he had a diet low in fish and meat (During 1994:153).

Ylva

The primary find number for Ylva, 23161, lists her as found as a largely complete skeleton close to the stern of the ship, likely in the debris from the quarter galleries. The *Fyndliggare* lists the find location at the bow, but this has previously been reviewed (Fred Hocker 2004) and is considered an error in the records. The majority of Ylva's remains were originally listed under the primary find number and have since been assigned individual find

numbers. In addition to these remains, a pair of shoes was found in association with Ylva. These shoes were not cleaned and conserved until several years later, when it was discovered that the shoes contained Ylva's ankle and foot bones. The bones from shoe 23069 were assigned find number 31002, and those from shoe 23070 were assigned 31062 (Fred Hocker 2004). The atlas, axis, and patella that were previously allocated to another individual, Zäta, have now been reassigned to Ylva. This is on the basis of find number, as all three bones were found under original number 23161.

Despite being found outside the ship, the *Fyndliggare* records some artifacts as found in direct association with Ylva. The previously mentioned shoes were found nearby, as both shoes are listed as belonging to a skeleton. A small key is listed in connection with the shoes, which puts it in association with Ylva. Additionally, a collection of 26 copper coins was found between her femurs.

Ylva is one of the most well-known skeletons from *Vasa*, as she was displayed for many years as *skeppsgossen*, the ship's boy. However, Ebba During's osteological analysis showed Ylva to more likely be a female of approximately 16 years old. At 166 cm, she was tall compared to many others on the ship, but she was unlikely able to stand straight up because she had Scheuermann's kyphosis. This is the same disease that affected Adam, but it was more pronounced in Ylva, causing severe changes to her thoracic spine. She also shares several traits with Beata. Ylva's skull shows a strong bulging of the occipital bone, bathrocephaly, and retains the metopic suture (During 1994:151). Her copper values were low, indicating she likely suffered from malnutrition or illness, and her teeth display evidence of enamel hypoplasia, showing Ylva suffered from malnutrition or serious illness during her childhood as well (During 1994:153–155).

CHAPTER 5: INTERPRETATIONS

This chapter presents interpretations of the actions of the individuals aboard *Vasa* at the time of the sinking. It begins with a discussion of the behavioral model used in the interpretations, followed by an examination of the individuals separately. For each, this includes analysis of the site formation processes affecting the distribution of the remains and an interpretation of their actions during the sinking and their possible role aboard the ship.

Behavioral Model

Despite common misperceptions, panic and self-centered actions are not commonly observed in disaster situations. In fact, disaster victims exhibit identifiable and predictable behaviors, which are consistent across different types of disasters (Leach 1994:1). Based on this evidence, John Leach (1994) has proposed a behavioral model that follows five stages of a disaster: pre-impact, impact, recoil, rescue, and post-trauma. This behavioral model is used to interpret the actions of the individuals aboard *Vasa* at the time of the sinking.

The first phase, pre-impact, is further divided into two stages: threat and warning. The threat stage is when the potential for a disaster is recognized. The most common reaction is denial, the belief that 'this cannot happen to me' (Leach 1994:12–17). In the case of *Vasa*, the threat phase encompasses the period when it was recognized that the ship was unstable and likely to founder. This includes the period before *Vasa* sailed, since about a month earlier, a demonstration was arranged by the captain to show the admiralty that the ship was unstable. For the test, the captain ordered a group of 30 sailors to run back and forth across the deck to make the ship roll (Hocker 2006a:53).

The warning stage is the period just before impact when disaster is imminent. People most commonly react with denial and will seek secondary information to better understand the

situation and what to do. Individuals most often respond with frenzied and ineffective over-activity, while those with proper training or experience are more likely to remain composed and react appropriately (Leach 1994:18–22).

The impact phase begins when disaster strikes, lasting anywhere from a few seconds to several minutes. Victims experience an overload of sensory information that they are unable to process or comprehend. Leach divides the typical pattern of responses during this period into three broad groups. The first group covers between 10% and 20% of the population who will remain clearheaded and aware of their situation. Members of this group will be able to respond rationally and act upon their decisions. The second group is the largest, accounting for approximately 75% of people. Members of this group will be shocked and confused, unable to reason or think clearly. They will have numbed emotions and will behave reflexively. The third group encompasses about 10% to 15% of people. These individuals will display inappropriate and ineffective behavior, which might also increase their risk of danger (Leach 1994:23–25).

In discussing the *Vasa* individuals, Leach's model applies only through the impact phase, when the disaster was actively taking place, as the later phases are applicable only to survivors of the initial disaster. The recoil phase is when the disaster has ended or the survivors have made their escape. This is followed by the rescue stage, when the survivors are back to safety, and then the post-trauma stage, when they attempt to cope and rebuild their lives (Leach 1994:25–29). Each individual will now be discussed in the context of these two phases.

Adam

The majority of Adam's remains were recovered by divers in 1960. They were found well localized on the starboard side of the upper gundeck at beam 5, indicating they were largely undisturbed by the site formation processes. Only three of Adam's bones were found elsewhere,

though all were nearby on the starboard upper gundeck. His right humerus (08994) and the distal end of his broken right tibia (09169) were found between beams seven and eight, while his left fibula (09296) was found between beams 8 and 9. These are the only bones assigned to Adam that were recovered after the ship's raising. Their disturbance from Adam's original location can be explained by the water hoses that were used to clear the upper gundeck of sludge as the ship was being raised. Despite this distribution and some mingling with the remains of other individuals, all three bones are osteological matches to remains known to belong to Adam.

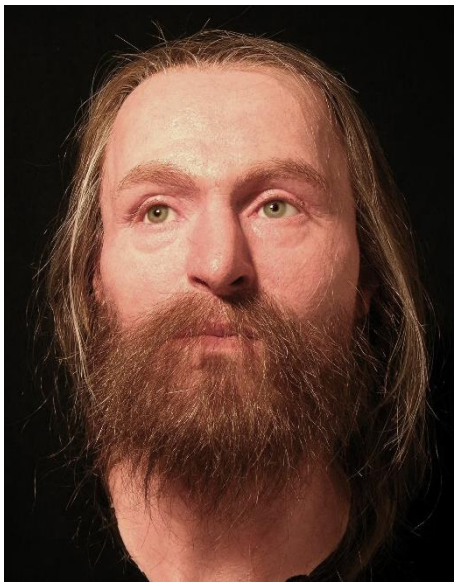

FIGURE 25. The facial reconstruction of Adam. (Reconstruction by Oscar Nilsson. Photo courtesy of the *Vasa* Museum, Stockholm, Sweden.)

Neither Adam's clothing nor any items on his person indicate that he was particularly affluent. A facial reconstruction can be seen in Figure 25. He appears to have been a typical sailor or a conscript, who had suffered more than a few injuries in his time, possibly from previous dangerous situations (During 1994:154; Smeeks 2014:215–216). Adam's find location puts him very near the upper gundeck's forward ladder leading to the weather deck, which would clearly have been a means of escape for him. However, the fracture to his right tibia (09169,

25773) would have caused pain and restricted his movement. Unfortunately, there are no indications as to what may have caused the fracture in the first place. Following the behavioral model and given that Adam was likely experienced in hazardous situations, he probably falls into the first group of individuals, those who remain calm in the face of disaster. Despite his leg injury, he appears to have been heading toward an exit, though he did not reach it quickly enough to survive.

Beata and Cesar

Given the close proximity and comingling of their remains, Beata and Cesar will be discussed together. While some of their remains were recovered by divers spread across the forward part of the upper gundeck, particularly on the port side, the majority were found during the post-raising excavation. Of the diver finds, Beata's cranium (03256), mandible (03257), and right scapula (25772) were found at beam 5 port side, while others were found at beam 8 port side, just in front of beam 3 port side, and at beam 4 starboard side. A couple of Cesar's vertebrae and metatarsals were also found by divers at beam 4 on the starboard side. His left radius and a number of ribs (04271) were located between the upper and lower gundecks amidships at beam 5. The *Fyndliggare* does not provide any further explanation for how these remains were found between decks, though there are hatches running just below beam 5, and it is possible the grating had fallen through with Cesar's remains resting on top.

No clear explanation presents itself as to why Beata's and Cesar's remains were so heavily disturbed before the raising, though there are several possibilities that may have contributed to their movement. The salvage excavations in the 1600s may have caused some of the disturbance as the men in the diving bell attempted to raise the cannon. If they had disturbed the silt built up on the deck, they could have also inadvertently moved some of the remains,

particularly the smaller bones such as vertebrae, hand bones, and foot bones, which make up the majority of the disturbed remains. The same can be said of the divers in the 1960s, who carefully tried not to disturb the find layer but may have done so unintentionally as they cleared the upper gundeck of silt for the raising. Later, both individuals' remains were heavily disturbed by the water hoses during the raising and were spread over several decks. Beata's and Cesar's remains were primarily mixed at beam 3 on the port side of the upper gundeck, as shown in Figure 26.

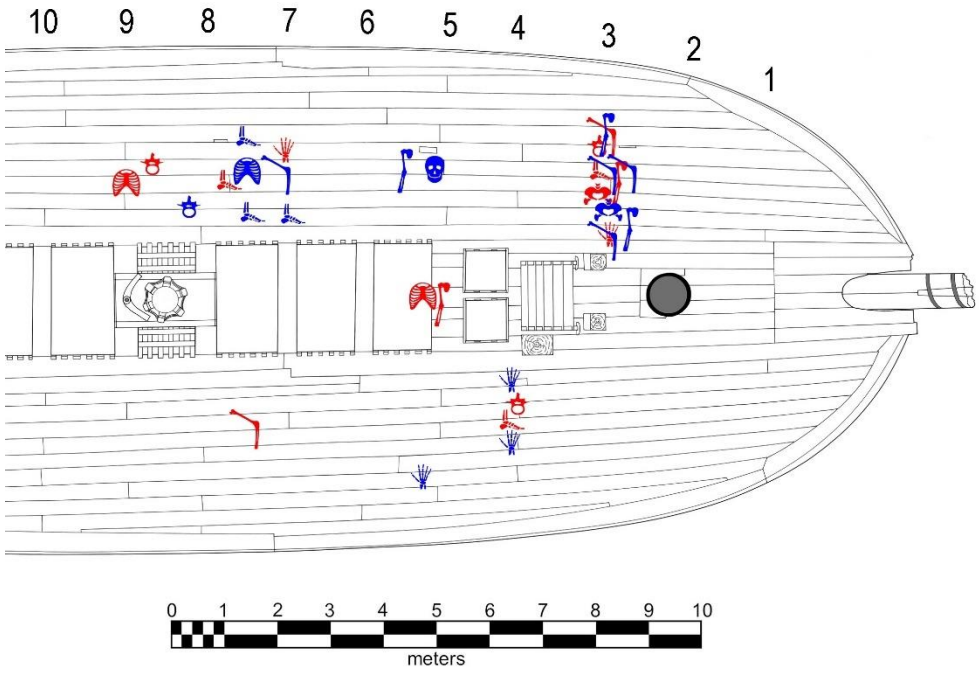

FIGURE 26. Distribution plan of Beata and Cesar's remains on the forward part of the upper gundeck. (Deck plan by Fred Hocker and Jorgen Wallin; courtesy of the *Vasa* Museum. Bone distribution by author, 2017.)

Despite this confusion in the distribution of their remains, it is clear that Beata and Cesar were originally near beams 4 and 5 of the upper gundeck, as the majority of their remains found by divers were recovered from this area. Like Adam, this puts them near the wide ladder between beams 3 and 4 that leads to the weather deck.

Neither individual was found with any artifacts that indicated they were wealthy. In fact, the quality of Cesar's homemade jacket indicates he lived a rather frugal lifestyle, not uncommon for a sailor (Smeeks 2014:216). When *Vasa* sailed, the sailors were allowed visiting family members, including women and children, aboard the ship for the day (Hocker2006a:53). Beata has long been supposed to one of these visitors, and current research has not provided any information to contradict this. However, analysis of the mitochondrial DNA has not shown her to have any maternal relation to others on board. In the absence of a familial DNA relation, her age and historical data suggest that she is probably the wife of a sailor, most likely Cesar.

Cesar may have been a common sailor or a conscript, however, without knowing which he was, there is no way to gauge his level of experience. He may fallen into any of Leach's three groupings of people in an emergency. Since Beata probably had little experience aboard a ship or in such a disaster, she likely belongs with the second and largest group, those who are stunned and confused and will seek out guidance and information. There is an absence of any evidence for panic in either individual. Research has shown that individuals in a disaster situation will seek out family members and loved ones, often to ensure they are able to escape as well (Johnson et al. 1994). This supports the supposition that Beata and Cesar were related in some way, and were likely helping one another to exit the ship, though they were not able to reach the weather deck in time.

David

David was found primarily between beams 14 and 15 on the starboard side of the upper gundeck, with his cranium (03909) and left femur (05093) closer to beam 16. Given this close proximity, David's remains appear to have remained undisturbed by the site formation processes. There are only three bones assigned to him that may have been more greatly disturbed: his right

femur (25825), right os coxae (25833), and left humerus (04204). All three are diver finds with their location given as the upper gundeck, port side between beams 10 and 14. This find location seems questionable at best. There is a fair distance between beams 10 and 14 (7.2 m), meaning these bones could have been very close or quite far from their original deposition. Their placement on the opposite side of the deck would also mean they moved across hatches that may or may not have been covered. Additionally, all three bones are large, robust bones that would not be so easily moved, especially together. Despite the diver efforts to accurately record the find locations of artifacts, the simplest explanation for these bones is that their location was recorded incorrectly. Their most probable find location is on the starboard side between beams 14 and 15, which would place them with the rest of David's remains.

Like most of the other men found aboard the ship, David was a common sailor or a conscript. However, he was the only individual found with a silver coin on his person, which carried greater value than the standard copper currency. At the time of his death, he was near the mainmast, which puts him nearly equidistant between two different ladders leading to the lower gundeck but not close to any of the ladders to the weather deck. A person in a disaster situation is most likely to follow the same route they take in their daily life (Leach 1994:124). Perhaps this is the path that David was taking. He was most likely heading for the ladders in the steerage area of the upper gundeck, between beams 22 and 23, which were closest to him. He may have come from the lower gundeck, where he had been standing ready for the cannon salute.

Erik

Erik's remains were heavily disturbed by multiple site formation processes. His original location was between beams 18 and 19 on the starboard upper gundeck, though his remains were scattered throughout the ship. During the 1660s salvage ventures, a cannon was dropped nearby

on the port side, where it was later found in 1960 along with a cluster of gun carriages, suggesting a great deal of activity in the area during the 1660s cannon salvage. Then, while preparing to raise the ship, divers dredged large sections of the upper gundeck and dug three test pits with water jets down to the orlop and hold. One of these test soundings was between beams 19 and 20. Erik's bones found on the upper gundeck were located to starboard, but the bones found directly below on the orlop and in the hold were on the port side, indicating the diver with the water jet was likely standing to starboard of the hatch. Additionally, there was an open hatchway between beams 16 and 17 on the upper gundeck that would have provided an opening for Erik's remains to move through.

Erik was probably a common sailor or a conscript. There is no evidence from which to gauge his level of experience, so he may have fallen into any of Leach's three behavioral model groups. His find location, however, suggests movement in an attempt to escape the sinking ship. His location between beams 18 and 19 on the starboard side places Erik just abaft the mainmast. Forward of his location, about 3 m away between beams 16 and 17, was a ladder down to the lower gundeck. Given his proximity to this ladder, it is possible Erik had just come up from below decks. The nearest way up to the weather deck was the ladders in the steerage, which, at 6.5 m away, were considerably closer than the ladder all the way forward near Adam. It is probable he was moving towards the steerage ladders but was unable to reach them before the ship went under.

Filip

Filip was a well-isolated find in the steerage area of the upper gundeck. He was the first set of remains to be completely recovered by the excavation. All but two of his bones have their find location recorded as the upper gundeck, starboard side between beams 22 and 23. Of those

two bones, one has lost its original find location, while the other, a rib (10216), is listed as the upper gundeck between beams 22 and 23 on the port side. This is most likely a mistake in the original record, given that the rest of Filip's remains were close to one another and the other finds from the same time period were recorded as being on the starboard side. Accepting this explanation, it is clear Filip's remains were undisturbed by any of the natural or cultural site formation processes until the archaeological excavation.

With his location near the whipstaff, researchers had long believed Filip to be one of the ship's *styrmän*, or navigators, who died at his post. The official complement of officers aboard *Vasa* did include two *styrmän*, though it also included two lieutenants (Hocker 2006a:52), only one of whom testified in the inquest after the sinking, suggesting the other had died in the wreck. The items found in association with Filip indicate he was of higher status. He wore a felt hat and a twill woven jacket with glass buttons, all of which were more costly. He also carried a carved sword and may have been carrying a wooden slamlock hunting rifle, both symbols of wealth and rank (Smeeks 2014: 218–220). Clearly Filip was no ordinary seaman, which supports the longstanding belief that he was an officer, though not definitively a navigator. His facial reconstruction can be seen in Figure 27.

However, whether he died at his post as an act of duty is debatable. In disaster situations, some individuals are so overcome by stress that they experience an episode of paralyzing anxiety. In this case, they are incapable of moving from their location, and no amount of coaxing can force them to do so; they are "frozen to the spot" (Leach 1994:35). After the initial order to put the whipstaff hard over to starboard in an effort to right the ship, Filip may have been overcome by fear and been unable to move, despite the fact that there was a ladder just in front

of him leading to the weather deck. This is a possible explanation for why he would have remained at his post when it became clear that the ship was lost.

FIGURE 27. The facial reconstruction of Filip. (Reconstruction by Oscar Nilsson. Photo courtesy of the *Vasa* Museum, Stockholm, Sweden.)

Gustav

Gustav's remains were found on the starboard lower gundeck between beams 11 and 12, near a ladder to the upper gundeck. There appears to have been minimal disturbance of his remains prior to the excavation, as only three bones were located away from the primary find location. Gustav's left talus (11344), an ankle bone, was found on the starboard side of the lower gundeck between beams 9 and 10, though it is possible this bone could be assigned to another individual, as a variety of foot bones were found nearby. His left femur (07697) does not have a find location or date recorded in the *Fyndliggare*, though it was later recorded as the lower gundeck between beams 6 and 7, amidships to correspond with the other items registered in the same sequence. This find location remains uncertain. Gustav's right os coxae (19121) was found on the orlop, port side between beams 7 and 8. This movement would have happened after

decomposition of the soft tissue. It is possible the bone slipped through the deck down to the orlop, and was then moved by the current before settling in the mud.

Unfortunately, little can be said about Gustav's rank on the ship because there are no artifacts that can be positively linked with him. His spine shows a life of hard labor, possibly from years of experience aboard a ship, and could have remained calm throughout the wrecking event. When the ship heeled to port, water quickly rushed in through the lower gundeck's open gunports. Gustav, who may have been assigned to tend the cannon for the salute, moved along the higher side of the ship for the nearest ladder to the upper decks. Though he was close to escape, just near a ladder to the upper gundeck, the water came in too quickly and he was unable to reach the ladder in time, which may have fallen as the ship listed further to port.

Helge

Helge's remains and associated artifacts were remarkably well preserved and articulated at the time of the excavation, completely undisturbed by the site formation processes. Found with his legs underneath the cannon at gunport 16 on the lower gundeck, Helge was lying on his right side, with his legs bent and draped over the anchor cable. His clothing was the typical outfit of the time, without any buttons or expensive ornament, though the cloth is decent quality (Smeeks 2014:220). The fixed way in which Helge's remains were found does not indicate any signs of struggle, suggesting he was unconscious when he died, and he may have been one of the first casualties. As water rushed in through the gunport, Helge may have attempted to close it before being knocked aside by the force of the water and rendered unconscious, possibly from a concussion. This would explain both his odd placement next to the port side, which would have been the first to go under, and how he could have slid underneath the carriage.

Ivar

A curious find, Ivar is the only individual whose remains indicate he was on the orlop at the time of the sinking. His remains were located on the port side of the forward compartment as a nearly complete skeleton. Only the bones of his lower right arm and some foot bones were disturbed, when, post-decomposition, they had fallen down into the hold nearly directly underneath his original location.

Little remains of his clothing to indicate his station, but the lantern and military issue musket he carried may provide some clues. The lantern indicates he intended to be down in the orlop, as there was no natural light so far below decks. Since the maiden voyage of the ship was a time for celebration, there would have been little reason for him to be so far below decks. However, there were no soldiers aboard the ship yet, and the musket he was carrying was likely provided for him to guard the ammunition stores, which were housed in the compartment directly below with access only through the hatch in the compartment Ivar was in. The orlop would have flooded quickly as water poured in from above, providing Ivar with little time to react or escape. The nearest ladder for him to reach the lower gundeck was between beams 12 and 13, approximately 17 m away. This would have been quite a distance to travel with the low height clearance (1.5 m) of the orlop and the tilting of the deck as the ship heeled to port. Additionally, there was a hatch directly overhead through which he could have stood up straight into the lower gundeck, even without a ladder, and potentially climb out. Given his find situation, however, it does not appear that Ivar moved from his post, leaving open a couple of possibilities for what may have happened.

FIGURE 28. The facial reconstruction of Ivar. (Reconstruction by Oscar Nilsson. Photo courtesy of the *Vasa* Museum, Stockholm, Sweden.)

Ivar, whose facial reconstruction is shown in Figure 28, was a mature man, a trusted sailor, given the important task of guarding the ammunition stores. He was therefore likely experienced in high stress situations. Despite this experience though, Ivar may have been overcome with paralyzing anxiety, unable to respond appropriately to the circumstances, even as the ship filled with water around him. The second possibility is that when the ship heeled to port, Ivar was knocked off his feet and, with the orlop's low head clearance, hit his head, perhaps on one of the deck beams. Like Helge, he could have been knocked unconscious and drowned. Either circumstance explains Ivar's remains staying within the storage room that he was originally guarding.

Johan

Johan’s remains were found in a closed room in the forward section of the hold, though there was some scattering of his remains within the area. The majority of his remains were found in the starboard bilge stringer between beams 6 and 7, and a portion of his remains were

recovered from the starboard anchor coil, which was piled up against the stringer. Further displaced were his cranium, which was found on the centerline against the forward bulkhead, and his right clavicle, which was found between beams 5 and 6 on the port side. Johan's remains were moved during the excavation when the hold was being emptied of sediment. Once the hole was cut in the bottom of the ship to drain the watery sludge, excavators used an 8-inch flushing hose to loosen the sediment. It was during this time that Johan's remains were shifted to starboard. They had originally lain on top of the anchor cable but were forced into the bilge stringer. The strongest evidence for this movement is his mandible (13548), which was found in the drain, approximately 8 m from Johan's original location. However, some of the smaller bones, such as vertebrae and phalanges, fell into gaps in the coil and were not moved by the spray.

Johan's jacket was one of the nicest pieces of clothing found aboard the ship, both expensive and stylish. He was clearly not a common sailor. At roughly 50 years old, he was one of the oldest individuals aboard *Vasa*. He likely walked with a limp due to his improperly healed fibula and deformed metatarsals. His facial reconstruction is shown in Figure 29.

As the only older man found aboard *Vasa* wearing distinguished clothing, Johan is the only victim to whom we can assign a likely name - Captain Hans Jonsson. He is the only person sources mention by name as having died aboard the ship, trapped below decks. He is mentioned in the wreck report to the king, which suggests he was a friend or acquaintance of the king. Jonsson was originally appointed as captain of *Vasa* but was later replaced by Söfring Hansson for unknown reasons. Still, he remained with the ship as a commissioned officer or consultant. Jonsson was often referred to as Old Captain Jonsson. He had achieved the rank of senior captain and was an experienced officer with the Swedish navy.

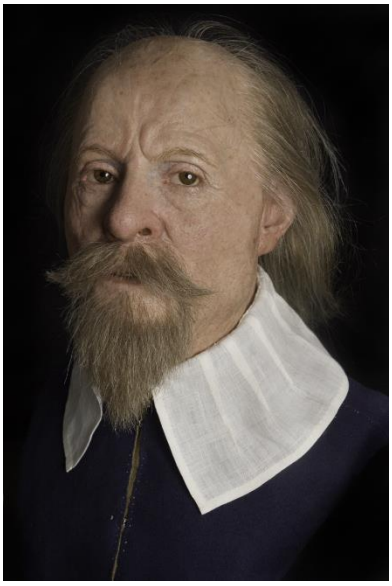

FIGURE 29. The facial reconstruction of Johan. (Reconstruction by Oscar Nilsson. Photo courtesy of the *Vasa* Museum, Stockholm, Sweden.)

The room in which he was found had a ladder through a hatch leading to the orlop. Directly above this hatch, there is a hatch to the lower gundeck, which is just abaft the riding bitts. Hans Jonsson had likely been supervising the hauling in of the anchor line as the ship was warped along the shore. Standing by the open hatch when the ship heeled to port, Jonsson, already unstable on his feet due to his limp, may have lost his footing and fallen through the open hatch through to the hold. A distance of only about 3 m, he could have easily survived the fall. Though a seasoned sailor with a long and active career, who was likely able to remain composed during the disaster, there was little he could do to save himself as the hold filled with water around him. He climbed atop the anchor cable to avoid the rising water, but it was to little benefit.

Ludvig

Ludvig's remains originated on the lower gundeck but were later disturbed by the diving preparations for and the raising of the ship. His remains were scattered downward from the lower

gundeck with the majority of his remains recovered from the hold and the drain. Only three bones remained on the lower gundeck - two ribs found between beams 10 and 11 on the port side and his left radius found between beams 11 and 12 on the starboard side. The remains in the hold were found near the bulkhead doorway at beam 11 and amidships between beams 12 and 13. A number of the finds found nearby were easily identifiable as having fallen from the upper decks of the ship. During preparations to raise the ship, one of the three test pits, the same that disturbed Erik's remains, was dug just forward of the mainmast from the upper gundeck to the orlop. This would have disturbed Ludvig's remains and provided a clear path for them to fall down from the lower gundeck. Between beams 12 and 13, where Ludvig was found in the hold, were open hatchways to the lower gundeck and orlop where a ladder reached down into the hold.

Little is known about Ludvig's person because many of his bone designations have changed since the osteological and odontological studies, and he has few remaining cranial pieces. His clothing was made of plain-woven fabrics, and he was likely a common sailor or conscript. Taking Ludvig's original find location as the lower gundeck near beam 11 places him near ladders both up to the upper gundeck and down to the orlop and hold. There would have been little reason for him to have been down in the orlop or hold during the ship's maiden voyage, so it is probable he had been on the lower gundeck before the sinking. Like Gustav, he may have been part of a gun crew for the salute. Though he was near the ladder to the upper gundeck, it may have fallen before he had the chance to reach it. He likely drowned as the ship went under.

Rudolf, Sigurd, Tore, and Ylva

The remains of these four individuals were found outside the ship in the port side wreckage of the stern. The remains of Rudolf, Sigurd, and Tore were intermingled, while Ylva

was found separately as a complete skeleton. Their remains were clearly heavily disturbed by the site formation processes as the stern collapsed around them. Though it is impossible to set an exact date on when the stern collapsed, it likely occurred within a few years after the sinking, since Ylva was found as a relatively complete skeleton. This indicates there was either soft tissue remaining to connect the bones or enough clothing to keep the bones together.

All four individuals were relatively young. Rudolf was the oldest at about 25 years old, though he may have been closer to 20, and Ylva was the youngest at approximately 16 years old. Ylva is the only exterior individual with whom any artifacts can be associated. She carried a key and copper coins, and she wore a pair of tie shoes, a common type in the 17th century.

The wreckage in which they were found was that of the port side quarter galleries. The find situation and diving conditions did not allow divers to determine whether they were in the upper or lower quarter gallery. The galleries were attached to the sterncastle and could only be reached through the great cabin or upper cabin. Given her youth, sex, and weak health, Ylva was almost certainly a visitor aboard the ship. Unfortunately, without any associated artifacts for Rudolf, Sigurd, and Tore, it is not possible to say whether they were visitors or part of the crew.

The quarter galleries are high up in the ship and thus would have been one of the last places to be submerged, though the list to port would have caused them to go under sooner than the rest of the stern. It is difficult to say what these four individuals were doing in this area and why they would have remained there as the ship sank. The quarter galleries are a small, cramped space and do not provide a good view of the outside. It is likely they were previously in the cabins or stern gallery before the disaster began. Rudolf, Sigurd, Tore, and Ylva would not have fit comfortably together inside the galleries. The upper galleries are considerably smaller than the lower galleries, where there would be enough room for all four individuals to fit, if still not

comfortably. Though, since Ylva was found separately from Rudolf, Sigurd, and Tore, this might indicate that she was on a different level than them.

Since the quarter galleries seem such an illogical place for these people to have been as the ship sank, it is possible that one or more of them would have fallen into Leach's third group - the 10% to 15% of people who respond irrationally to the situation, which includes panic (Leach 1994:25). Though rare, panic is possible. All four of the individuals were young and likely not experienced in disaster situations, making them more susceptible to panic. If only one person panicked, it could have been enough to create panic in the others, as it is contagious. When panicked, people do not respond with rational reasoning or judgment and can instead subject themselves to self-destructive behaviors (Leach 1994:30–34). Rudolf, Sigurd, Tore, and Ylva may have convinced themselves that the quarter galleries were their best chance for escape or perhaps rescue.

If they were in the lower quarter galleries, however, there is a hole in the gallery roof halfway along the length of it. A person could relatively easily fit through this hole if they could reach it. Calm is contagious, just as panic is, and if only one person had initiated a plan to escape through the hole, the others would likely have followed suit. Instead of panicking, they may have been attempting to help one another up and out through this hole but were unable to do so before the ship went under. Unfortunately, without knowing their original locations, uncertainty remains.

CHAPTER 6: CONCLUSION

The previous chapters provided an overview of the history, site formation processes, and excavation of *Vasa*, followed by the research methodology employed. The information on each individual was then discussed in turn, including their find location, assigned remains, associated artifacts, and biological profile. Together, these various datasets were analyzed to present as complete an identity as can currently be determined for each set of remains. Each individual was examined within the framework of John Leach's model of survival psychology to best interpret their actions during the sinking. This serves to not only help preserve the memory of the individuals in question, but also to deepen our understanding of the crew of *Vasa* and, thereby, the ship itself and its place in the wider context of Swedish maritime history.

Observations

Though the majority of the people aboard *Vasa* made it safely off the ship when it sank, approximately 30 people were not so fortunate. Fifteen of these individuals were found within or in association with the ship during its excavation in the 1960s. The find locations of the remains are more reliable than previously believed, as the majority of remains were undisturbed from their original positions. For the individuals whose remains were disturbed, their original find locations can be determined through an examination of the site formation processes. Despite the ship's list to port as it sank and when it first came to rest on the seabed, it does not appear this affected the human remains, as many individuals were found on the starboard side. The largest factors in disturbance of the human remains were the various salvage efforts, both the cannon salvage in the 17th century and the raising of the ship in the 1960s. The site conditions, including temperature, salinity, and sediment buildup, greatly delayed the decomposition of the remains, so

much so that two individuals were found with their brains still recognizable after more than 300 years under water.

Two women and thirteen men were found in association with *Vasa*, all of whom have been assigned names based on the Swedish radio alphabet. Most of the individuals from within the ship were found relatively undisturbed, isolated from one another. Beata, Cesar, Erik, and Ludvig were the most heavily disturbed with their remains scattered across multiple decks of the ship. All four individuals lay in areas where mud from the upper decks was washed down into the ship during the salvage operations of 1956–1961, so their distribution is not a mystery. Three of the individuals from the exterior of the ship, Rudolf, Sigurd, and Tore, were found comingled, while the fourth exterior individual, Ylva, was found as a separate, complete skeleton. The distribution of the human remains across each deck are available in Appendix I, and the complete listings of remains assigned to each individual are provided in Appendix II.

Many of the individuals, though not all, appear to have been attempting to escape the ship before they died. Their actions at the time of the sinking depended largely on their previous shipboard experience. Adam, Cesar, David, and Ludvig were all likely common sailors or conscripts, who probably had some level of experience with emergencies and were familiar with the ship, as they were all heading toward an exit. Additionally, Cesar and Beata were helping one another to escape. She was a visitor aboard the ship, probably related to Cesar, as people often seek out loved ones during a disaster situation. Gustav was also attempting to escape as the ship sank, though nothing can be said of his rank as there were no artifacts that could be positively associated with him. Erik, another common sailor or conscript, was found on the upper gundeck likely heading towards the steerage ladders that would have let him out onto the weather deck.

Adam, Cesar, David, Erik, Ludvig, and possibly Gustav were likely below decks as members of the gun crews tending to the cannon for the salute.

Ivar was a common sailor or possibly a petty officer entrusted with guarding the ammunition stores on the orlop. His location suggests he was not attempting to escape and may have been overcome by paralyzing anxiety or knocked unconscious.

Filip, Helge, and Johan all wore higher quality clothing suggesting they may have been officers aboard *Vasa*. Filip's associated items confirm he was an officer, possibly one of the ship's lieutenants, and he died at his post, though whether this was as an act of duty or he was overcome with paralyzing anxiety is inconclusive. Helge was knocked unconscious as the ship sank and fell next to a cannon on the lower gundeck with his legs underneath the gun carriage. The find situation of his remains was the least disturbed of all the individuals, as his skeleton was found completely articulated. Johan is the best candidate for Captain Hans Jonsson, the only person that records name as having died aboard *Vasa*. As the ship heeled to port, he may have fallen through the hatches from the lower gundeck to the hold. Unfortunately, he may have been injured or disoriented from the fall, and he perhaps crawled onto the starboard anchor cable to avoid the rising water.

The four individuals found outside of the ship, Rudolf, Sigurd, Tore, and Ylva, were in the wreckage of the port side quarter galleries. Ylva was the second female found in association with the ship and, like Beata, she was likely a visitor aboard the ship. No associated artifacts were found with Rudolf, Sigurd, or Tore, so it is possible they were also visitors, though they may have been part of the crew. To the outside observer, the quarter galleries are an odd location to remain in as the ship was sinking, because the galleries are an enclosed, cramped space. Though panic is uncommon, it is contagious, and it is possible one or more of them panicked,

causing them to believe the quarter galleries were a rational place to be. If they were in the lower quarter gallery, however, they may have remained calm and been attempting to help one another climb out through a hole in the roof.

None of the individuals exhibit bone injuries that could explain cause of death. In fact, only one injury can be attributed to the wrecking event - Adam's broken right tibia. This, though, would not have been a mortal wound. Given the disaster type, it is most likely that all of *Vasa*'s victims drowned as the ship sank, which does not leave any diagnostic features on bones. For many individuals, particularly Helge, concussion or other head injury may have been a contributing cause to drowning.

Limitations and Opportunities for Future Research

During the course of the on-site research at the *Vasa* Museum, there was no osteologist on hand to consult with and the researcher had a limited knowledge of osteology, meaning some pairings could not be made. In particular, the foot phalanges found in boot 21202, which was found outside of the ship, could perhaps be assigned to an individual with the knowledge of an osteologist. These bones are currently stored in the box of unidentified/unassigned remains in the magazine. An osteologist's more thorough knowledge of bone development and comparison of size with other bones may allow this assignment.

Additionally, David has most of his hand bones, and they are generally in excellent condition. While it is possible to identify and side the metacarpals, the phalanges are not as simple. The majority of the phalanges have been assigned a side (presumably by Ebba During) but it is unclear to which digit they belong. It is suggested that all of David's available hand and wrist bones be examined by an experienced osteologist to provide more definitive identification.

There is one individual from *Vasa* that was not discussed at all in this research. A child's humerus was found in the aft area of the hold. No other bones have been identified as belonging to the child, and there has been limited study of the humerus. Current DNA analysis has shown that the bone is definitely human, and osteological examination has confirmed the size and development are juvenile rather than typical of dwarfism. Though children's bones are smaller and more gracile, and therefore decompose more quickly, it is curious that there would be only one bone remaining when the majority of the collection's bones were recovered in such excellent condition. It is possible that this humerus has been misidentified or that there are other bones belonging to the child within the collection that have not yet been identified as such. Further DNA analysis and review by an experienced osteologist would best be able to determine this.

Future research will likely cause many bones assignments to change for the individuals whose remains were heavily disturbed. This is particularly true in the case of Erik and Ludvig, where DNA analysis has already allowed several bones to be reassigned from Ludvig to Erik. Future DNA analyses will look at the nuclear DNA, which comes from both parents, rather than the mitochondrial DNA, which is passed only through the mother, that has been studied so far. This may allow for any familial relations between the individuals to be detected.

In conclusion, *Vasa* serves as a treasure trove of information on ship construction and shipboard life in the mid-17th century Swedish navy. This presents fascinating research opportunities in these general fields; however, it is equally important to understand the details of life aboard this specific vessel, in particular as it relates to the individuals who lost their lives in its sinking. This study has gone some way toward clearing up the lingering questions about the identity of those individuals whose remains have been recovered, but future research would be beneficial. Expanded DNA analysis and renewed osteological study will undoubtedly clarify the

assignment of bones from the more heavily disturbed sets of remains and could also lend credence to the suggestions of familial relations between individuals that have been posited here. Detailed studies of the decomposition of bodies in aqueous environments would also allow for a better understanding of the site formation processes that affected the remains. Although the loss of so many lives in 1628 was tragic, it can only be hoped that we will continue to learn more from their remains that we might one day tell their full stories.

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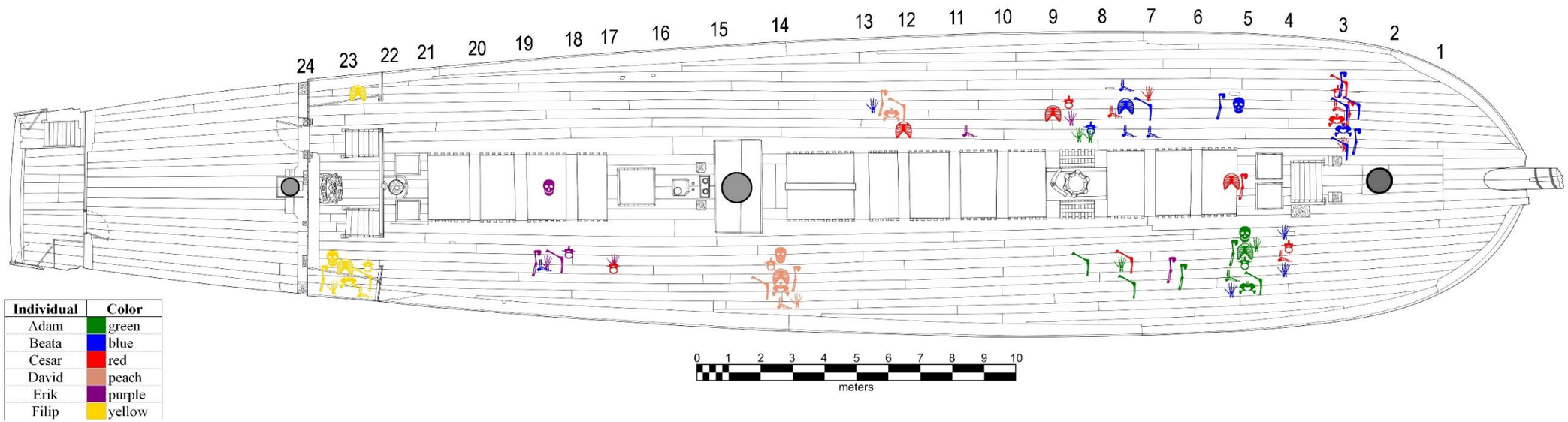
APPENDIX I

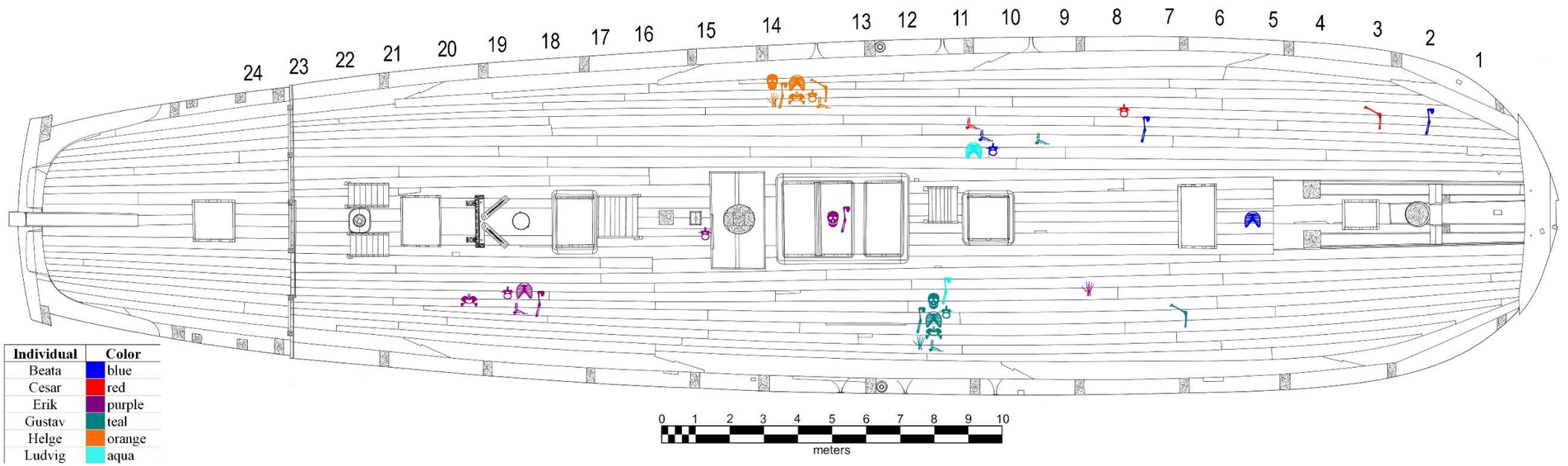
Distribution plan of human remains on the upper gundeck



Individual	Color
Adam	green
Beata	blue
Cesar	red
David	peach
Erik	purple
Filip	yellow

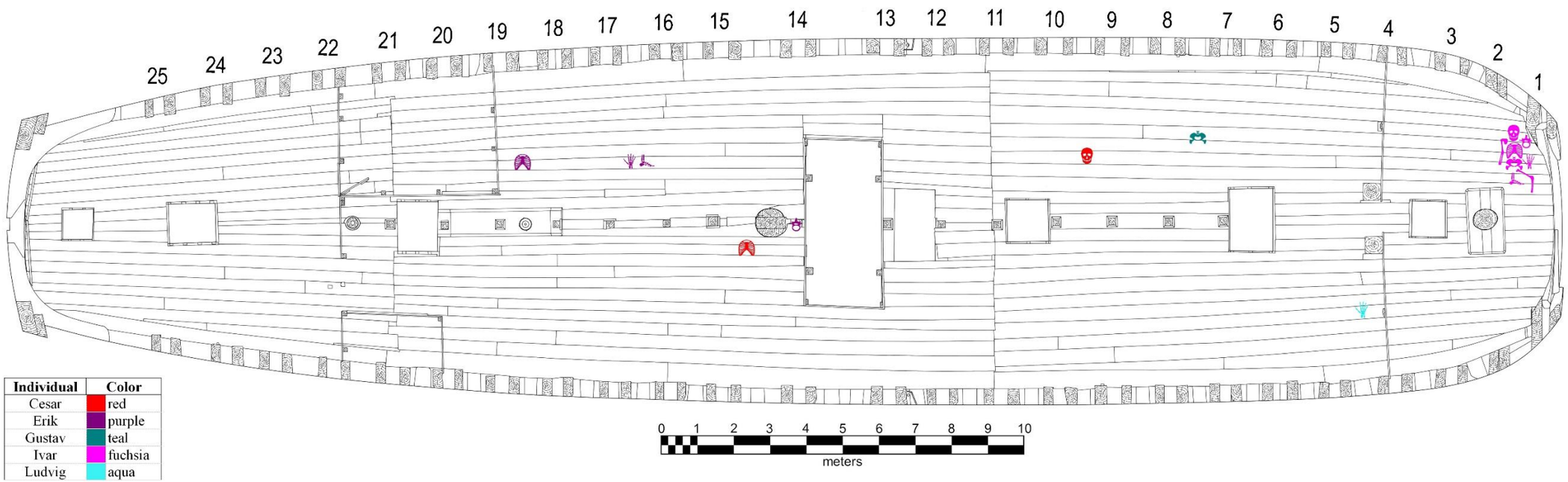
(Deck plan by Fred Hocker and Jorgen Wallin; courtesy of the *Vasa* Museum. Bone distribution by author, 2017.)

Distribution plan of human remains on the lower gundeck



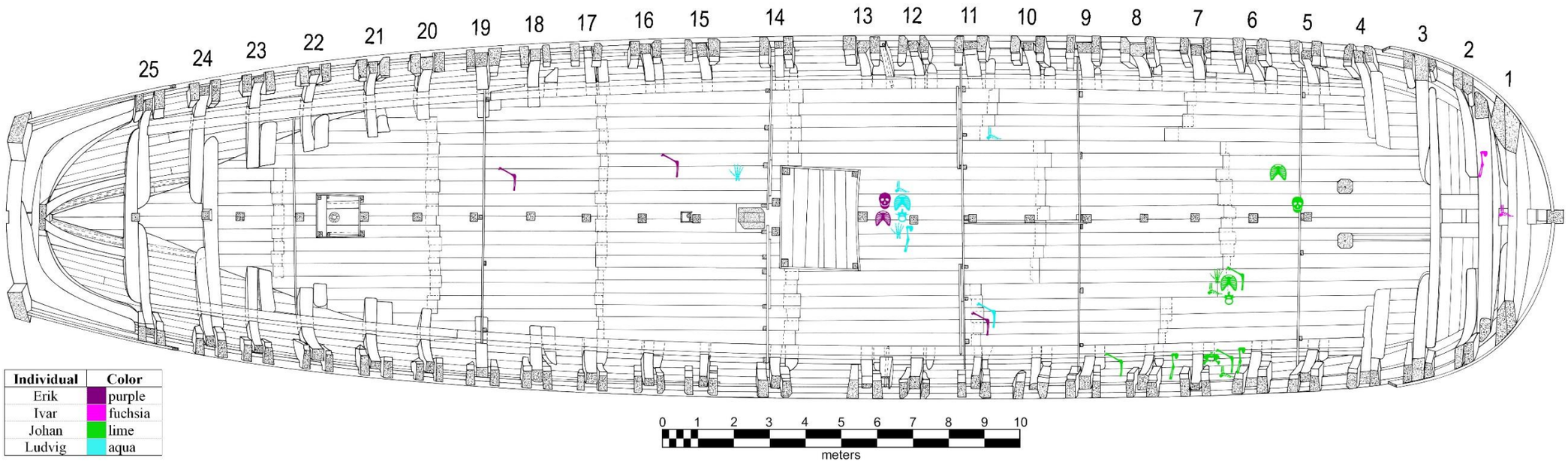
(Deck plan by Fred Hocker and Jorgen Wallin; courtesy of the *Vasa* Museum. Bone distribution by author, 2017.)

Distribution plan of human remains on the orlop



(Deck plan by Fred Hocker and Jorgen Wallin; courtesy of the *Vasa* Museum. Bone distribution by author, 2017.)

Distribution plan of human remains in the hold



(Deck plan by Fred Hocker and Jorgen Wallin; courtesy of the *Vasa* Museum. Bone distribution by author, 2017.)

APPENDIX II

Bones assigned to Adam

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
25735	03220	Atlas		ÖB	S	11.0	A	
25736	03220	Axis		ÖB	S	11.0	A	
25740	03220	Clavicula	Dex	ÖB	S	11.0	A	
25739	03220	Clavicula	Sin	ÖB	S	11.0	A	
25759	03220	Costa	Dex	ÖB	S	11.0	A	Ribs 2-12.
25760	03220	Costa	Dex	ÖB	S	11.0	A	Ribs 2-12.
25761	03220	Costa	Dex	ÖB	S	11.0	A	Ribs 2-12.
25762	03220	Costa	Dex	ÖB	S	11.0	A	Ribs 2-12.
25763	03220	Costa	Dex	ÖB	S	11.0	A	Ribs 2-12.
25764	03220	Costa	Dex	ÖB	S	11.0	A	Ribs 2-12.
25765	03220	Costa	Dex	ÖB	S	11.0	A	Ribs 2-12.
25766	03220	Costa	Dex	ÖB	S	11.0		Ribs 2-12. Not in ED's database.
25767	03220	Costa	Dex	ÖB	S	11.0		Ribs 2-12. Not in ED's database.
25756	03220	Costa	Dex	ÖB	S	11.0	A	Fragments. Not found in museum.
25757	03220	Costa	Dex	ÖB	S	11.0	A	Fragments. Not found in museum.
25758	03220	Costa	Dex	ÖB	S	11.0	A	Fragments. Not found in museum.
08947	08947	Costa	Sin	ÖB	S	10.7-12.2		Ribs 2-12. Not in ED's database. *2.20.2016: Changed original find number from 03220 to 08947 and changed location.*
25745	03220	Costa	Sin	ÖB	S	11.0	A	Ribs 2-12.
25747	03220	Costa	Sin	ÖB	S	11.0	A	Ribs 2-12.
25748	03220	Costa	Sin	ÖB	S	11.0	A	Ribs 2-12.
25749	03220	Costa	Sin	ÖB	S	11.0	A	Ribs 2-12.
25751	03220	Costa	Sin	ÖB	S	11.0	A	Ribs 2-12.
25752	03220	Costa	Sin	ÖB	S	11.0	A	Ribs 2-12.
25753	03220	Costa	Sin	ÖB	S	11.0	A	Ribs 2-12.
25754	03220	Costa	Sin	ÖB	S	11.0	A	Ribs 2-12.
25746	03220	Costa	Sin	ÖB	S	11.0	A	Not found in museum.
25750	03220	Costa	Sin	ÖB	S	11.0	A	Not found in museum.
25755	03220	Costa	?	ÖB	S	11.0	A	2 small fragments. Not found in museum.

Bones assigned to Adam

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
03220	03220	Cranium + dentes		ÖB	S	11.0	A	Dentes: P2-M1 sin; C, P1-M2 dex. DNA: 65638 tooth max—needs re-examined
25768	03220	Femur	Dex	ÖB	S	11.0	A	Cut for analyses. DNA: There is no sample number associated with Adam's femur dex.
25769	03220	Femur	Sin	ÖB	S	11.0	A	Cut for analyses. DNA: 65620.
25771	03220	Femur		ÖB	S	11.0		Fragments. Catalog note: "E. During: femur condyl[e]" Not in ED's database. Not found in museum.
09296	09296	Fibula	Sin	ÖB	S	14.9-16.3	A	
08994	08994	Humerus	Dex	ÖB	S	12.2-13.3	A	ED lists 03220 as the original find number for both humerii.
25780	03220	Humerus	Sin	ÖB	S	11.0	A	ED lists 03220 as the original find number for both humerii. *02.07.2017: Changed original no. from 08994 to 03220 to match online database.*
25701	03220	Mandible + dentes		ÖB	S	11.0	A	Dentes: C-P2, M1 sin; C, M1-M2 dex. Original find number written on bone. DNA: 02560 1st molar sin.
25706	03220	Mc II	Sin	ÖB	S	11.0	A	
25708	03220	Mc III	Dex	ÖB	S	11.0	A	
25707	03220	Mc III	Sin	ÖB	S	11.0	A	
25709	03220	Mc V	Dex	ÖB	S	11.0	A	
25702		Mt I	Dex				A	
25703	03220	Mt II	Dex	ÖB	S	11.0	A	
25704	03220	Mt V	Dex	ÖB	S	11.0	A	
25770	03220	Os Coxae	Dex	ÖB	S	11.0	A	Joint socket only.
25775	03220	Phal I, 2 m	Sin	ÖB	S	11.0	A	
25712	03220	Phal I, 3 m	Dex	ÖB	S	11.0	A	
25710	03220	Phal I, 4 m	Sin	ÖB	S	11.0	A	
25713	03220	Phal I, 5 m	Dex	ÖB	S	11.0	A	

Bones assigned to Adam

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
25713	03220	Phal I, 5 m	Dex	ÖB	S	11.0	A	
25711	03220	Phal III, 1 m	Sin	ÖB	S	11.0	A	
25742	03220	Radius	Dex	ÖB	S	11.0	A	
25741	03220	Radius	Sin	ÖB	S	11.0	A	
25705	03220	Sacrum		ÖB	S	11.0	A	Fragment of sacral spine.
25744	03220	Scapula	Dex	ÖB	S	11.0	A	
25743	03220	Scapula	Sin	ÖB	S	11.0	A	
25773	08947	Tibia	Dex	ÖB	S	10.7-12.2	A	Proximal end.
09169	09169	Tibia	Dex	ÖB	S	13.3-14.9	A	Distal end.
25779	08947	Tibia	Sin	ÖB	S	10.7-12.2	A	Shaft only.
25738	03220	Ulna	Dex	ÖB	S	11.0	A	
25737	03220	Ulna	Sin	ÖB	S	11.0	A	
25714	03220	Vert cervical		ÖB	S	11.0	A	C3
25715	03220	Vert cervical		ÖB	S	11.0	A	C4
25716	03220	Vert cervical		ÖB	S	11.0	A	C5
25717	03220	Vert cervical		ÖB	S	11.0	A	C6
25718	03220	Vert cervical		ÖB	S	11.0	A	C7
25732	03220	Vert lumbar		ÖB	S	11.0	A	L4 and L5/6. Both broken and fragmented. Listed as on exhibit but not there. Not found in museum.
25733	03220	Vert lumbar		ÖB	S	11.0	A	L4 and L5/6. Both broken and fragmented. Listed as on exhibit but not there. Not found in museum.
25729	03220	Vert lumbar		ÖB	S	11.0	A	L1
25730	03220	Vert lumbar		ÖB	S	11.0	A	L2 or 3
25731	03220	Vert lumbar		ÖB	S	11.0	A	L2 or 3
25734	03220	Vert lumbar		ÖB	S	11.0	A	L5 or 6
25719	03220	Vert thoracic		ÖB	S	11.0	A	T1
25720	03220	Vert thoracic		ÖB	S	11.0	A	T2
25721	03220	Vert thoracic		ÖB	S	11.0	A	T4
25722	03220	Vert thoracic		ÖB	S	11.0	A	T5

Bones assigned to Adam

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
25723	03220	Vert thoracic		ÖB	S	11.0	A	T6
25724	03220	Vert thoracic		ÖB	S	11.0	A	T7
25725	03220	Vert thoracic		ÖB	S	11.0	A	T8
25726	03220	Vert thoracic		ÖB	S	11.0	A	T10
25727	03220	Vert thoracic		ÖB	S	11.0	A	T11
25728	03220	Vert thoracic		ÖB	S	11.0	A	T12

Bones assigned to Beata

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
35187	11328	Atlas		UB	B	17.5-19.06	K	Is most probably Beata, but could it belong to Cesar?
35188	11328	Axis		UB	B	17.5-19.06	K	Is most probably Beata, but could it belong to Cesar?
09232	09232	Clavicula	Sin	ÖB	B	13.3-14.9	B	
35336		Clavicula	Dex				E	
11651	11651	Costa	Dex	UB	M	9.97-11.48	B	
25804		Costa	Sin				B	No original find number or location.
25805		Costa	Sin				B	Two fragments exhibited in F:F with this find number, also listed in online catalog as such. Are they two different ribs (as displayed) or are they fragments of the same rib? No original find number or location.
03256	03256	Cranium + dentes		ÖB	B	11.0	B	Dentes: I1-M1, M3 sin, I1-M1dex. Fyndliggare links it 3257. DNA: 02561 2nd molar sin.
05121	05121	Femur	Dex	ÖB	B	7.0	B	Cut in two for analyses.
07767	07767	Femur	Sin	ÖB	B	7.4	B	
25791	08853	Fibula	Sin	ÖB	B	6.9-8.5	B	Found just abaft the foremast. Mislabeled as 25719 on bone.
09025	09025	Fibula	Dex	ÖB	B	12.2-14.9	B	Original find number was listed in spreadsheet and by ED as 3909, but with new #9025. Number 3909 belongs to David and was found at a different location.
07740	07740	Humerus	Dex	ÖB	B	7.4	B	Found at 4th cannon port. Broken proximal end.
25789	07767	Humerus	Sin	ÖB	B	7.4	B	Broken proximal end.
03257	03257	Mandible + dentes		ÖB	B	11.0	B	Dentes: M1 sin. Mandibular condyle sin broken.
25801	03251	Mc IV	Sin	ÖB	S	9.0	B	Does not match Mc IV dex #25800 (removed). Breadth 2.0-4.0m.

Bones assigned to Beata

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
09312	09312	Mc V	Sin	ÖB	B	21.0-22.4	B	Far from the other bones but matches well with Mc IV.
25798	09232	Mt I	Sin	ÖB	B	13.3-14.9	B	
25797	09025	Mt II	Dex	ÖB	B	12.2-14.9	B	
11328	11328	Mt II	Sin	UB	B	17.5-19.06	B	Catalog note: "Possibly there are more bones belonging to the find. Text in the ledger and c-card: Bone. Parts of ribs. Vertebrae etc."
03251	03251	Mt III	Dex	ÖB	S	9.0	B	Breadth 2.0-4.0m. Not found in museum.
25792	07767	Os coxae	Sin	ÖB	B	7.4	B	
25793	07767	Os coxae	Dex	ÖB	B	7.4	B	
12237	12237	Os tarsi Calcaneus	Dex	UB	B	17.5-19.06	B	
25814	03251	Phal I, 1 m	Dex	ÖB	S	9.0	B	Displayed as Sin; might actually be. Breadth 2.0-4.0m.
25796	09232	Phal I, 1 p	Dex	ÖB	B	13.3-14.9	B	Was displayed as sin but moved to dex upon re-placement. Online catalog lists original no. 09239.
25815		Phal I, 5 m	Sin				B	No original find number or location.
25813	03220	Phal III, 1 m	Sin	ÖB	S	11.0	B	Location breadth of 2.5m SB.
08853	08853	Radius	Dex	ÖB	B	6.9-8.5	B	Found just abaft the foremast.
07709	07709	Radius	Sin	UB	B	5.3	B	Found at 4th cannon port.
25795	07767	Scapula	Sin	ÖB	B	7.4	B	
25772	03256	Scapula	Dex	ÖB	B	11.0	B	
25816	07767	Tibia	Dex	ÖB	B	7.4	B	Catalog note: Bone was x-rayed (Harris lines) during Ebba During's survey (1980s). Sample #65621 took to the DNA analysis of Uppsala University on May 8, 2013 for Mary Lembring. DNA: 65621.
25817	07767	Tibia	Sin	ÖB	B	7.4	B	
10948	10948	Ulna	Sin	UB	B	13.0-14.5	B	

Bones assigned to Beata

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
25794		Ulna	Dex				B	No original find number or location. Ulnas match.
25865		Unidentified					B	Not in ED's database. Catalog note: Packed with Beata's tibia. Both tibias are complete with only some wearing on the ends, so not likely to be a broken piece from them. The Beata skeleton drawing showing which bones are on display lists it as "broken upper end of tibia." Not found in museum.
30495	03450	Vert cervical		ÖB	B	15.0	K	C7 complete.
25781	03450	Vert thoracic		ÖB	B	15.0	B	T6 (E.D.) Location breadth 3.5m BB
25782	03450	Vert thoracic		ÖB	B	15.0	B	T7 (E.D.) Location breadth 3.5m BB
03450 ~~25783~~	03450	Vert thoracic		ÖB	B	15.0	B	T8 (E.D.) Vertebral body only. Duplicate number: 25783 is a Mc V dex belonging to and on display with David.
25788		Vert thoracic					B	No original find number or location.
25810		Vert thoracic					B	T11 (E.D.) No original find number or location.
25785		Vert thoracic					B	No original find number or location.
25786		Vert thoracic					B	No original find number or location.
25787		Vert thoracic					B	No original find number or location.
25809		Vert thoracic					B	T10 (E.D.) No original find number or find location.

Bones assigned to Cesar

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
~~35313~~	17809	Clavicula	Dex	TD	M	24.59-26.61	C	Duplicate find number. See tibia dex below. Fyndliggare: midships, starboard of main mast.
35295	04271	Costa	Sin	ÖB/UB	M	11.0*	J	*FH: ladder at this location or possible fallen timber. #2
35296	04271	Costa	Sin	ÖB/UB	M	11.0*	J	*FH: ladder at this location or possible fallen timber. #3-9
35297	04271	Costa	Sin	ÖB/UB	M	11.0*	J	*FH: ladder at this location or possible fallen timber. #3-9
35298	04271	Costa	Sin	ÖB/UB	M	11.0*	J	*FH: ladder at this location or possible fallen timber. #3-9
35299	04271	Costa	Sin	ÖB/UB	M	11.0*	J	*FH: ladder at this location or possible fallen timber. #3-9
35300	04271	Costa	Sin?	ÖB/UB	M	11.0*	J	*FH: ladder at this location or possible fallen timber. Sin? 7-10? Not found in museum.
~~11344~~	11344	Costa	Dex	ÖB	B	15.9-17.5	C	#11344 listed in online catalog as a talus assigned to Gustav.
35326	04204	Costa	Dex	ÖB	B	18.0-25.0	C	fragment
30452		Cranium (partial)					K	Complete frontal with parts of the parietals, and zygomatic, maxilla (minor), and sphenoid sin + fragmentary cranial pieces. Magazine note: "Prov nr. 65653 Prov till DNA analys 2013-05-24"
35318	09169	Femur	Dex	ÖB	S	13.3-14.9	C	Femur is broken at the distal end with wearing away of the shaft. Normal abrasion? Or injury? DNA: 65623.
13011	13011	Femur	Sin			Drain	C	matches 09169, although both incomplete and eroded. #13011 listed in online catalog as set of cattle bones.

Bones assigned to Cesar

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
99586	07767	Humerus	Sin	ÖB	B	7.4	O	ED decided not Cesar on basis of age and length (too old and too long). #07767 listed in online catalog as a femur assigned to Beata. Magazine note: Could be from C or E
18588	18588	Mandible + dentes		TD	B	16-17.5	M	Could have fallen through the hatches. 5 dentes: M1-M2 dex; P2, M1 sin. Broken ramus dex. No photo. Primary number for Martin. DNA: 02565 3rd molar dex; 65646 tooth mand—both need re-examined.
25799	09025	Mc III	Dex	ÖB	B	12.2-14.9	B	
25800	08853	Mc IV	Dex	ÖB	B	6.95-8.5	B	
35345	03247	Mt I	Dex	ÖB	S	9.0	E	Fyndliggare: breadth SB 2-4, height 0.5.
18753	18753	Mt I	Sin			Drain	C	#18753 listed in online catalog as cattle bones.
NN	09232	Mt V	Dex	ÖB	B	13.3-14.9	D	On display with David. Marked with 09232, but number is assigned to clavicular associated with Beata.
35316	07767	Os Coxae	Dex	ÖB	B	7.4	C	
35320	07767	Os tarsi Calcaneus	Sin	ÖB	B	7.4	C	
35321		Os tarsi Calcaneus	Dex				C	
35325	11328	Os tarsi Navicular	Dex	UB	B	17.5-19.06	C	
04271	04271	Radius	Sin	ÖB/UB	M	11.0*	J	*FH: ladder at this location or possible fallen timber.
35314	07767	Tibia	Sin	ÖB	B	7.4	C	
35313	07722	Tibia	Dex	UB	B	5.3-8.57	C	#07722 is an unidentified femur in MS. Found in Cesar's box. #35313 is also C's Clavicula dex. (*Possible find location*: UB - B - 5.3-8.57; Fyndligarre note reads "Between 4, 5, 6 cannon ports" but the note is erased.)

Bones assigned to Cesar

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
35319	07767	Ulna	Dex	ÖB	B	7.4	C	Distal ends broken. Similarly sized but differently formed, particulary near the radial tuberosity.
35317	07767	Ulna	Sin	ÖB	B	7.4	C	Distal ends broken. Similarly sized but differently formed, particulary near the radial tuberosity.
35327	07767	Vert lumbar		ÖB	B	7.4	C	L1 (?)
35328	03251	Vert lumbar		ÖB	S	9.0	C	L2-4. Fyndliggare: breadth SB 2-4, height 0.5.
35333	03251	Vert thoracic		ÖB	S	9.0	C	2 of uncertain placement. Fragments. Only 1 vert in Cesar's box. Fyndliggare: breadth SB 2-4, height 0.5.
35331	09329	Vert thoracic		ÖB	B	14.9-16.3	C	T4-9
35330	10948	Vert thoracic		UB	B	13.96-14.49	C	T4-9. Did not have original find number, but found on ED's database.
35332		Vert thoracic					C	T12

Bones assigned to David

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
25807		Atlas		ÖB	S	22.4-24.9	D	Unknown initial find number but E. During specified find place.
25818		Axis		ÖB	S	22.4-24.9	D	Unknown initial find number but E. During specified find place.
25900		Bone fragments/dust					D	Not found in museum.
25819	07612	Clavicula	Dex	ÖB	S	24.9-27.2	D	
07612	07612	Clavicula	Sin	ÖB	S	24.9-27.2	D	
25875	07612	Costa	Dex	ÖB	S	24.9-27.2	D	Rib 1. Originally assigned and displayed as sin but changed to dex. Online catalog note: Packed with ribs with original find nr. 07612 and indicated by E.D. as the original find nr. but bone marked only with a dash.
25877	07612	Costa	Dex	ÖB	S	24.9-27.2	D	Rib 3-10
25878	07612	Costa	Dex	ÖB	S	24.9-27.2	D	Rib 3-10
25879	07612	Costa	Dex	ÖB	S	24.9-27.2	D	Rib 3-10
25880	07612	Costa	Dex	ÖB	S	24.9-27.2	D	Rib 3-10
25881	07612	Costa	Dex	ÖB	S	24.9-27.2	D	Rib 3-10
25882	07612	Costa	Dex	ÖB	S	24.9-27.2	D	Rib 3-10
25883	07612	Costa	Dex ?	ÖB	S	24.9-27.2	D	Fragment. Assigned and displayed as dex but uncertain. Should be examined by an osteologist.
25884	07612	Costa	Dex	ÖB	S	24.9-27.2	D	Rib 3-9
25885	07612	Costa	Dex	ÖB	S	24.9-27.2	D	Rib 2
25886	07612	Costa	Dex	ÖB	S	24.9-27.2	D	Rib 3-10. Online catalog note: Packed with ribs with original find nr. 07612 and indicated by E.D. as the original find nr. but bone marked only with a dash.

Bones assigned to David

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
25866	07646	Costa	Sin	ÖB	S	24.9-27.2	D	Rib 2-12. Online catalog note: Packed with David's left ribs. All ribs have E. During assigned as 7612 but this is marked with 7646, though that doesn't change the find location.
25867	07612	Costa	Sin	ÖB	S	24.9-27.2	D	Rib 2-12
25868	07612	Costa	Sin	ÖB	S	24.9-27.2	D	Rib 2-12
25869	07612	Costa	Sin	ÖB	S	24.9-27.2	D	Rib 2-12
25870	07612	Costa	Sin	ÖB	S	24.9-27.2	D	Rib 2-12
25871	07612	Costa	Sin	ÖB	S	24.9-27.2	D	Rib 2-12
25872	07612	Costa	Sin	ÖB	S	24.9-27.2	D	Rib 2-12
25873	07612	Costa	Sin	ÖB	S	24.9-27.2	D	Rib 2-12. Online catalog lists as on display but not found. Not found in museum.
25874	07612	Costa	Sin	ÖB	S	24.9-27.2	D	Rib 2-12. Online catalog lists as on display but not found. Not found in museum.
25876	07612	Costa	Sin	ÖB	S	24.9-27.2	D	Rib 2-12. Strange "bump" in angle of the rib - healed break?
03909	03909	Cranium + dentes		ÖB	S	28.5	D	Breadth: 2.0 m. Dentes: C-P2, M2 sin; C-P2, M2 dex. M3 sin removed for DNA? DNA: 02563 3rd molar dex.
25825	04204	Femur	Dex	ÖB	B	18.0-25.0	D	Seems slightly more gracile than Femur sin #05093. Cut for DNA analysis. X-rayed during E.D.'s analysis. DNA: 65624 (confirmed this femur belongs to David).
05093	05093	Femur	Sin	ÖB	S	29.0	D	Breadth: 4.0 m
25836	07611	Fibula	Dex	ÖB	S	24.9-27.2	D	Severely degraded - broken proximal and distal ends.
25835	07611	Fibula	Sin	ÖB	S	24.9-27.2	D	
04204	04204	Humerus	Sin	ÖB	B	18.0-25.0	D	Different coloring (white-ish) than other bones. Matches humerus dex #25826.

Bones assigned to David

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
25826	07611	Humerus	Dex	ÖB	S	24.9-27.2	D	Pieces of distal end broken.
07613	07613	Mandible + dentes		ÖB	S	24.9-27.2	C	Teeth I1-P2 sin; I1-I2, P1, M1-M3 dex + loose in box (C?). Cesar has Mandible #18588. DNA: 02562 premolar sin; 65625 tooth mand; 65640 tooth mand.
25857		Mc I	Sin	ÖB	S	22.4-24.9	D	Unknown initial find number but E. During specified find place.
25902	07612	Mc I	Dex	ÖB	S	24.9-27.2	D	Tips of proximal and distal ends are cracked.
25858	07612	Mc II	Sin	ÖB	S	24.9-27.2	D	
25901		Mc II	Dex	ÖB	S	24.9-27.2	D	ED's database does not list an orig # but gives find location.
25903	07612	Mc III	Dex	ÖB	S	24.9-27.2	D	
25859	07612	Mc III	Sin	ÖB	S	24.9-27.2	D	
25774	07612	Mc IV	Dex	ÖB	S	24.9-27.2	D	
25860	07612	Mc IV	Sin	ÖB	S	24.9-27.2	D	
25861		Mc V	Sin	ÖB	S	22.4-24.9	D	Unknown initial find number but E. During specified find place.
25783	07612	Mc V	Dex	ÖB	S	24.9-27.2	D	
25863	07612	Mt I	Sin	ÖB	S	24.9-27.2	D	Listed in online catalog as Mc II dex but pictures are of Mt I sin. Online catalog note: "Unknown original find nr. but find location noted by E. During." Orig # is definitely listed in ED's database.
25864		Mt II/III	Sin ?					Not listed in ED's database. Packed with Metatarsal bones but is not in the list. A note that was left over in the bag says 2 sin. We are missing currently two metacarpals for David (mc), confusion in the list or bags?

Bones assigned to David

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
07646	07646	Mt V	Sin	ÖB	S	24.9-27.2	D	Online catalog says bone was originally marked with 07612, but is only seen with 07646 in pictures.
25837		Os carpi Capitate	Sin	ÖB	S	22.4-24.9	D	Unknown initial find number but E. During specified find place.
25838	07612	Os carpi Scaphoid	Sin	ÖB	S	24.9-27.2	D	
25839	07612	Os carpi Trapezium	Dex	ÖB	S	24.9-27.2	D	
25833	04204	Os Coxae	Dex	ÖB	B	18.0-25.0	D	
08123	08123	Os Coxae	Sin	ÖB	S	24.9*	D	*found together with barrel parts before the mainmast
25834		Patella	Sin	ÖB	S	22.4-24.9	D	Unknown initial find number but E. During specified find place.
25849		Phal I, 1 m	Dex	ÖB	S	22.4-24.9	D	Unknown initial find number but E. During specified find place.
25840		Phal I, 1 m	Sin	ÖB	S	22.4-24.9	D	Unknown initial find number but E. During specified find place.
25862		Phal I, 1 p	Dex	ÖB	S	22.4-24.9	D	Unknown initial find number but E. During specified find place.
25841		Phal I, 2-5 m	Sin	ÖB	S	22.4-24.9	D	Unknown initial find number but E. During specified find place. Displayed as 2 m.
25842		Phal I, 2-5 m	Sin	ÖB	S	22.4-24.9	D	Unknown initial find number but E. During specified find place. Displayed as 3 m.
25843		Phal I, 2-5 m	Sin	ÖB	S	22.4-24.9	D	Unknown initial find number but E. During specified find place. Displayed as 4 m.
25845	07612	Phal I, 2-5 m	Dex	ÖB	S	24.9-27.2	D	
25846	07612	Phal I, 2-5 m	Dex	ÖB	S	24.9-27.2	D	Displayed as 3 m.
25844	07612	Phal I, 2-5 m	Sin	ÖB	S	24.9-27.2	D	Displayed as 5 m.
25847		Phal I, 2-5m	Dex	ÖB	S	24.9-27.2	D	Unknown initial find number but E. During specified find place. Displayed as 5 m.

Bones assigned to David

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
25848		Phal I, 2-5m	Dex	ÖB	S	24.9-27.2	D	Unknown initial find number but E. During specified find place. Displayed as 4 m.
25851		Phal II, # m	Dex	ÖB	S	22.4-24.9	D	Unknown initial find number but E. During specified find place. Displayed as 5 m.
25852		Phal II, # m	Dex	ÖB	S	22.4-24.9	D	Unknown initial find number but E. During specified find place. Displayed as 4 m.
25850		Phal II, 2-5 m	Sin ?	ÖB	S	22.4-24.9	D	Unknown initial find number but E. During specified find place. Displayed as 3 m.
25853		Phal II, 2-5 m	Dex	ÖB	S	22.4-24.9	D	Unknown initial find number but E. During specified find place.
25854		Phal II, 2-5 m	Dex ?	ÖB	S	22.4-24.9	D	Unknown initial find number but E. During specified find place. Siding uncertain. Displayed as II, 3 m dex.
25856		Phal III, 1 m	Dex	ÖB	S	22.4-24.9	D	Unknown initial find number but E. During specified find place. Originally listed as 2-5 m, siding unknown. Displayed as III, 1 m dex. Siding uncertain but definitely III, 1 m.
25855	07612	Phal III, 2-5 m	?	ÖB	S	24.9-27.2	D	Online catalog note: "Two phalange III taken, E. During lists four pieces, I find only two." Displayed as 2 m dex, though uncertain. ED's database lists two Phal III, 2-5 m with orig #7612, but I cannot locate the other one.
25829	07612	Radius	Dex	ÖB	S	24.9-27.2	D	Broken proximal end.
25828	07612	Radius	Sin	ÖB	S	24.9-27.2	D	
25887	07646	Sacrum		ÖB	S	24.9-27.2	D	
25827		Sternum					D	Fragment. Unknown original find number or location. Not found in museum.
07611	07611	Tibia	Dex	ÖB	S	24.9-27.2	D	Broken distal end.
25832	07611	Tibia	Sin	ÖB	S	24.9-27.2	D	
30451	07613	Tooth		ÖB	S	24.9-27.2	C	Tooth from David's mandible

Bones assigned to David

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
25831	07612	Ulna	Dex	ÖB	S	24.9-27.2	D	Broken proximal end.
25830	07612	Ulna	Sin	ÖB	S	24.9-27.2	D	Both ulnas show extreme lateral curvature, particularly near the proximal ends.
25824		Vert cervical		ÖB	S	22.4-24.9	D	C7. Unknown initial find number but E. During specified find place.
25821	07612	Vert cervical		ÖB	S	24.9-27.2	D	C4
25822	07612	Vert cervical		ÖB	S	24.9-27.2	D	C5
25823		Vert cervical		ÖB	S	24.9-27.2	D	C6. ED's database provides a find location but no orig #.
25820		Vert cervical		ÖB	S	24.9-27.2	D	C3. Unknown initial find number but E. During specified find place.
25890		Vert lumbar		ÖB	S	22.4-24.9	D	Unknown initial find number but E. During specified find place.
25888	07612	Vert lumbar		ÖB	S	24.9-27.2	D	L2 or 3
25889	07646	Vert lumbar		ÖB	S	24.9-27.2	D	Online catalog note: "Located at find No 7646? Only unmarked bone of all lumbar vertebrae. These were packed together and were labeled either 7612 or bar except this. A lumbar vertebra will according to E. During having 7646 as the initial find number (NW No. 5)."
25895		Vert thoracic		ÖB	S	22.4-24.9	D	Online catalog note: "E. During indicates No 1, 2-8, 12, packed together. Need examined by osteolog to be distinguished." No original find number (marked with a dash) but we have find location?
25896		Vert thoracic		ÖB	S	22.4-24.9	D	Online catalog note: "E. During indicates No 1, 2-8, 12, packed together. Need examined by osteolog to be distinguished." No original find number (marked with a dash) but we have find location?

Bones assigned to David

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
25897		Vert thoracic		ÖB	S	22.4-24.9	D	Online catalog note: "E. During indicates No 1, 2-8, 12, packed together. Need examined by osteolog to be distinguished." No original find number (marked with a dash) but we have find location?
25898		Vert thoracic		ÖB	S	22.4-24.9	D	Online catalog note: "E. During indicates No 1, 2-8, 12, packed together. Need examined by osteolog to be distinguished." No original find number (marked with a dash) but we have find location?
25899		Vert thoracic		ÖB	S	22.4-24.9	D	Online catalog note: "E. During indicates No 1, 2-8, 12, packed together. Need examined by osteolog to be distinguished." No original find number (marked with a dash) but we have find location?
25892	07612	Vert thoracic		ÖB	S	24.9-27.2	D	Online catalog note: "E. During indicates No 1, 2-8, 12, packed together. Need examined by osteolog to be distinguished."
25893	07612	Vert thoracic		ÖB	S	24.9-27.2	D	Online catalog note: "E. During indicates No 1, 2-8, 12, packed together. Need examined by osteolog to be distinguished."
25894	07612	Vert thoracic		ÖB	S	24.9-27.2	D	Online catalog note: "E. During indicates No 1, 2-8, 12, packed together. Need examined by osteolog to be distinguished."
25891	07612	Vert thoracic		ÖB	S	24.9-27.2	D	Online catalog note: "E. During indicates No 1, 2-8, 12, packed together. Need examined by osteolog to be distinguished."

Bones assigned to Erik

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
13834	13834	Clavicula	Dex	UB	M	20.67-21.97	K	
35350	11532	Costa	Dex	UB	S	31.1-32.7	E	rib 2
35351	11532	Costa	Dex	UB	S	31.1-32.7	E	rib 5
11532	11532	Costa	Sin	UB	S	31.1-32.7	E	1 rib from nos 3-9
29214	12831	Costa	Dex			Drain	E	Mag. Note: Middle chute HS. Nr. 10 [This is not noted in the Fyndliggare.]
35352	13012	Costa	Sin			Drain	E	nr. 3
29244	18506	Costa	Dex	TD	B	31.3-32.8	L	rib 1
04013	04013	Cranium (Calvaria)		ÖB	M	31.0-32.0	E	No facial bones, calvarium only. Partial occipital, parietals sin & dex, and temporal sin. #04013 listed in online catalog as a sculpture. Calvaria is marked W4013 E.
30454	04237	Cranium (Maxilla)	Sin	UB	M	22.0-24.0	K	Teeth Alv, P2. #04237 listed in online catalog as: Bones of man. Upper arm and upper jaw. Magazine note: "Prov. Nr: 65654 - Tand - prov till DNA analys 2013-05-24" Magazine says there are teeth but there are none. Extremely worn alveolar portion.
30453		Cranium (Temporal)	Dex					Fragment - zygomatic process and manibular fossa
29212	11756	Femur	Dex	UB	S	17.5-19.06	L	osteological match to Femur sin orig #12095
NN	12095	Femur	Sin	UB	S	17.5-19.06	L	osteological match to Femur dex orig #11756. Needs new find number.
16620	16620	Fibula	Dex	HS	B	31.4-33.0	L	maybe - no hatch at this location. Originally listed as an ulna but decided it is the shaft and distal end of a fibula. Need to change Magazine note.
33535	11532	Humerus	Dex	UB	S	31.1-32.7	E	cut for analysis DNA: 65626
04237	04237	Humerus	Sin	UB	M	22.0-24.0	L	DNA: 65628

Bones assigned to Erik

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
11688	11688	Mandible + 7 dentes		UB	M	20.67-21.97	E	Teeth C, P2-M2 sin; P1-M2 dex. Magazine notecard says 7 teeth, but one was removed. DNA: 02567 2nd molar dex; 65639 tooth mand.
35348	03512	Mc II	Sin	ÖB	B	19.0	E	Fyndliggare breadth: BB 1
29240	18426	Mc II	Sin	TD	B	28.2-29.8	K	Fyndliggare says this number is a rib
35349	09329	Mc III	Dex	ÖB	B	14.9-16.3	E	
29241	18426	Mc III	Sin	TD	B	28.2-29.8	K	Fyndliggare says this number is a rib
29242	18426	Mt I	Dex	TD	B	28.2-29.8	K	Fyndliggare says this number is a rib, this bone seems to match Mt I sin from Ivar (19527)
35346	09121	Mt II	Dex	ÖB	B	17.7-19.4	E	marked "9121"
35347	11532	Mt III	Dex	UB	S	31.1-32.7	E	
04019	04019	Mt IV	Dex	ÖB	S	31.0-32.0	B	
29243	18426	Phal I 2/3 m	?	TD	B	28.2-29.8	K	Fyndliggare says this number is a rib
35342	13712	Phal I, 3 m	Dex	UB	S	13.02-17.5	E	Fyndliggare breadth: 0-2
09329	09329	Phal I, 4 m	Dex	ÖB	B	14.9-16.3	A	Was listed as Left but changed to Right to match MS listing, and the individual couldn't have two Left 4th phalanges
29229	13548	Phal I, 5 m	?			Drain	E	
35341	10017	Phal II, # m	?	ÖB	S	31.4-32.9	E	
35344	13712	Phal II, # m	?	UB	S	13.02-17.5	E	2 or 5 m? Magazine note: from B. Fyndliggare breadth: 0-2
35343	13712	Phal II, # m	?	UB	S	13.02-17.5	E	Mag. Note: From B. Fyndliggare breadth: 0-2
	09875	Phal II, # m	Dex	ÖB	S	28.7-31.4	K	There is a Phal II, # m with original find #09875 in the M (U).
09875	09875	Phal II, 2-5 m	?	ÖB	S	28.7-31.4	K	1 bone
29208	04237	Radius	Dex	UB	M	22.0-24.0	L	Shaft only. Cannot verify if it does or does not match #12882

Bones assigned to Erik

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
09053	09053	Radius	Sin	ÖB	S	12.2-13.3		Shaft only. This is awfully far from the other bones. Closer to Adam but he already has both radii.
11399	11399	Sacrum		UB	S	32.7-34.1	I	On the deck below Erik's find location. Could have fallen through a hatch. Not the correct location for Ivar.
35334	10017	Tibia	Dex	ÖB	S	31.4-32.9	E	Marked "10017". Tibia #35334 and Tibia Sin NN are both badly deteriorated and broken but are a probable match with size comparison.
29213	12048	Tibia	Sin	UB	B	26.5-28.1	L	far from right tibia - Both tibia are badly deteriorated but probable match. Originally assigned to Ludvig but does not match his tibia dex 12095.
10017	10017	Ulna	Sin	ÖB	S	31.4-32.9	E	broken distal and proximal ends
35338	11532	Vert lumbar		UB	S	31.1-32.7	E	Marked "4019". Looks more like a vert thoracic, though unsure.
35329	09875	Vert thoracic		ÖB	S	28.7-31.4	C	
09875	09875	Vert thoracic		ÖB	S	28.7-31.4	C	2 of uncertain placement. One vert thor housed with C, marked nr. 3-9. Online catalog note: 09875 listed as "Two vertebrae. Two phalanges or similar."
35339	04019	Vert thoracic		ÖB	S	31.0-32.0	E	1 vertebra from T2-9. #04019 listed in MS as cattle bone: fragment of ribs. Magazine note: Found with B. Definitely a thoracic, no markings on bone.
35337	11532	Vert thoracic		UB	S	31.1-32.7	E	T10 or T11, Marked "11532". Could also be a vert lumbar.
12303	12303	Vert thoracic		UB	S	26.5*	J	T4-9? *Found aft of the mainmast. Strongly deteriorated.
17809	17809	Vert thoracic		TD	M	24.59-26.61	J	T5-9? Found at the mainmast.

Bones assigned to Filip

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
25977	10290	Atlas		ÖB	S	37.1-39.3	F	
25978	10290	Axis		ÖB	S	37.1-39.3	F	
25989	10288	Bone fragment		ÖB	S	37.1-39.3	F	Not found in museum.
25990	10290	Bone fragment		ÖB	S	37.1-39.3	F	Not found in museum.
10288	10288	Cranium + dentes		ÖB	S	37.1-39.3	F	Gouges/cuts on frontal bone. Strong muscle attachment visible on temporal near zygomatic. Dentes: C-P1, M1-M3 Dex; I2-C, P2-M1, M3 Sin
29059	10290	Clavicula	Dex	ÖB	S	37.1-39.3	F	
29060	10290	Clavicula	Sin	ÖB	S	37.1-39.3	F	
29049	10290	Costa	Sin	ÖB	S	37.1-39.3	F	Nrs 1-12. Fragment. Not found in museum.
29050	10290	Costa	Sin	ÖB	S	37.1-39.3	F	Nrs 1-12. Fragment. Not found in museum.
29051	10290	Costa	Sin	ÖB	S	37.1-39.3	F	Nrs 1-12. Fragment.
29054	10290	Costa	Sin	ÖB	S	37.1-39.3	F	Nrs 1-12. Fragment. Not found in museum.
29055	10290	Costa	Sin	ÖB	S	37.1-39.3	F	Nrs 1-12. Fragment.
29056	10290	Costa	Sin	ÖB	S	37.1-39.3	F	Nrs 1-12. Fragment. Not found in museum.
29057	10290	Costa	Sin	ÖB	S	37.1-39.3	F	Nrs 1-12. Fragment.
29058	10290	Costa	Sin	ÖB	S	37.1-39.3	F	Nrs 1-12. Fragment. Not found in museum.
29061	10290	Costa		ÖB	S	37.1-39.3	F	Grouped in the same bag 29061-29070. Nrs 1-12. Fragment.
29062	10290	Costa	Sin	ÖB	S	37.1-39.3	F	
29063	10290	Costa	Dex	ÖB	S	37.1-39.3	F	
29064	10290	Costa	Sin	ÖB	S	37.1-39.3	F	
29065	10290	Costa	Sin	ÖB	S	37.1-39.3	F	
29066	10290	Costa	Sin	ÖB	S	37.1-39.3	F	
29067	10290	Costa	Dex	ÖB	S	37.1-39.3	F	
29068	10290	Costa	Sin	ÖB	S	37.1-39.3	F	
29069	10290	Costa	Sin	ÖB	S	37.1-39.3	F	

Bones assigned to Filip

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
29070	10290	Costa	Sin	ÖB	S	37.1-39.3	F	
29072	10290	Costa	Dex	ÖB	S	37.1-39.3	F	Nrs 1-12. Not found in museum.
29073	10290	Costa	Dex	ÖB	S	37.1-39.3	F	Nrs 1-12. Not found in museum.
29074	10290	Costa	Dex	ÖB	S	37.1-39.3	F	Nrs 1-12. Not found in museum.
29075	10290	Costa	Dex	ÖB	S	37.1-39.3	F	Nrs 1-12. Not found in museum.
29076	10290	Costa	Dex	ÖB	S	37.1-39.3	F	Nrs 1-12. Not found in museum.
29077	10290	Costa	Dex	ÖB	S	37.1-39.3	F	Nrs 1-12. Not found in museum.
29078	10290	Costa	Dex	ÖB	S	37.1-39.3	F	Nrs 1-12. Not found in museum.
29079	10290	Costa	Dex	ÖB	S	37.1-39.3	F	Nrs 1-12. Not found in museum.
29080	10290	Costa		ÖB	S	37.1-39.3	F	fragments. Not found in museum.
29081	10290	Costa		ÖB	S	37.1-39.3	F	fragments. Not found in museum.
29082	10290	Costa		ÖB	S	37.1-39.3	F	fragments. Not found in museum.
29083	10290	Costa		ÖB	S	37.1-39.3	F	fragments. Not found in museum.
29084	10290	Costa		ÖB	S	37.1-39.3	F	fragments. Not found in museum.
29085	10290	Costa		ÖB	S	37.1-39.3	F	fragments. Not found in museum.
29071		Costa	Dex				F	Nr. 1-12
29093	10290	Costa	Dex	ÖB	S	37.1-39.3	F	Nrs 1-12. Not found in museum.
10216	10216	Costa	Dex	ÖB	B	37.1-39.3	B	
25955	10290	Femur	Sin	ÖB	S	37.1-39.3	F	DNA: 65659—showed low coverage
25956	10290	Femur	Dex	ÖB	S	37.1-39.3	F	
25957	10290	Fibula	Sin	ÖB	S	37.1-39.3	F	
25958	10290	Fibula	Dex	ÖB	S	37.1-39.3	F	
25951	10289	Humerus	Sin	ÖB	S	37.1-39.3	F	
25952	10289	Humerus	Dex	ÖB	S	37.1-39.3	F	
25949	10288	Mandible + dentes		ÖB	S	37.1-39.3	F	Dentes: C-P2, M2-M3 (+I2?) Dex; C-P2, M3 (+I2?) Sin. DNA: 65636 tooth mand
29030	10289	Mc I	Dex	ÖB	S	37.1-39.3	F	

Bones assigned to Filip

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
29030	10289	Mc I	Dex	ÖB	S	37.1-39.3	F	
29032	10289	Mc I	Sin	ÖB	S	37.1-39.3	F	
29031	10289	Mc II	Dex	ÖB	S	37.1-39.3	F	
29033	10289	Mc II	Sin	ÖB	S	37.1-39.3	F	
29034	10289	Mc III	Sin	ÖB	S	37.1-39.3	F	
29035	10289	Mc III	Dex	ÖB	S	37.1-39.3	F	
29036	10289	Mc IV	Sin	ÖB	S	37.1-39.3	F	
29037	10289	Mc IV	Dex	ÖB	S	37.1-39.3	F	
29038	10289	Mc V	Dex	ÖB	S	37.1-39.3	F	
29042	10289	Mt I	Dex	ÖB	S	37.1-39.3	F	
29043	10289	Mt I	Sin	ÖB	S	37.1-39.3	F	
29046	10289	Mt II	Dex	ÖB	S	37.1-39.3	F	
29047	10289	Mt III	Dex	ÖB	S	37.1-39.3	F	
29048	10289	Mt IV	Sin	ÖB	S	37.1-39.3	F	
29044	10289	Mt V	Dex	ÖB	S	37.1-39.3	F	
29045	10289	Mt V	Sin	ÖB	S	37.1-39.3	F	
35110	10290	Os carpi ?	?	ÖB	S	37.1-39.3	F	Not found in museum.
35111	10290	Os carpi ?	?	ÖB	S	37.1-39.3	F	Not found in museum.
35112	10290	Os carpi ?	?	ÖB	S	37.1-39.3	F	Not found in museum.
35113	10290	Os carpi ?	?	ÖB	S	37.1-39.3	F	Not found in museum.
35114	10290	Os carpi ?	?	ÖB	S	37.1-39.3	F	Not found in museum.
35115	10290	Os carpi ?	?	ÖB	S	37.1-39.3	F	Not found in museum.
35116	10290	Os carpi ?	?	ÖB	S	37.1-39.3	F	Not found in museum.
25995	10289	Os carpi Capitate	Dex	ÖB	S	37.1-39.3	F	
29090	10289	Os carpi Capitate	Sin	ÖB	S	37.1-39.3	F	
25996	10289	Os carpi Hamate	Sin	ÖB	S	37.1-39.3	F	
25997	10289	Os carpi Hamate	Dex	ÖB	S	37.1-39.3	F	

Bones assigned to Filip

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
25997	10289	Os carpi Hamate	Dex	ÖB	S	37.1-39.3	F	
25998	10289	Os carpi Lunate	Dex	ÖB	S	37.1-39.3	F	
29092	10289	Os carpi Lunate	Sin	ÖB	S	37.1-39.3	F	
29089	10289	Os carpi Pisiform	Sin	ÖB	S	37.1-39.3	F	
29091	10289	Os carpi Scaphoid	Sin	ÖB	S	37.1-39.3	F	
29086	10289	Os carpi Trapezium	Dex	ÖB	S	37.1-39.3	F	
29087	10289	Os carpi Trapezium	Sin	ÖB	S	37.1-39.3	F	
25999	10289	Os carpi Trapezoid	Dex	ÖB	S	37.1-39.3	F	
26000	10289	Os carpi Trapezoid	Sin	ÖB	S	37.1-39.3	F	
29088	10289	Os carpi Triquetral	Sin	ÖB	S	37.1-39.3	F	
25959	10290	Os coxae	Sin	ÖB	S	37.1-39.3	F	
25960	10290	Os coxae	Dex	ÖB	S	37.1-39.3	F	
25992	10289	Os tarsi Cuneiform Medial	Sin	ÖB	S	37.1-39.3	F	Catalog note: E. Durings list: Os cun med. The list says sin, on the bag it was dex.
25991	10289	Os tarsi Talus	Dex	ÖB	S	37.1-39.3	F	
29025	10290	Phal I, 1 m	Dex	ÖB	S	37.1-39.3	F	Excel sheet listed original find # 10289.
29026	10290	Phal I, 1 m	Sin	ÖB	S	37.1-39.3	F	Excel sheet listed original find # 10289.
29039	10290	Phal I, 1 m	?	ÖB	S	37.1-39.3		Filip already has two Phal I, 1 m's, both on display and numbered. Not found in museum.
29009	10289	Phal I, 1 p	Sin	ÖB	S	37.1-39.3	F	
29024	10290	Phal I, 2 m	Dex	ÖB	S	37.1-39.3	F	Excel sheet listed original find # 10289.
29029	10290	Phal I, 2 m	Sin	ÖB	S	37.1-39.3	F	Excel sheet listed original find # 10289.
29008	10289	Phal I, 2-5 p	?	ÖB	S	37.1-39.3	F	Find number written on bone but #8 hard to read. Displayed as Dex.
29023	10290	Phal I, 3 m	Dex	ÖB	S	37.1-39.3	F	Excel sheet listed original find # 10289.
29041	10290	Phal I, 3 m	Sin	ÖB	S	37.1-39.3	F	Excel sheet listed original find # 10289.
29021	10290	Phal I, 4 m	Dex	ÖB	S	37.1-39.3	F	Excel sheet listed original find # 10289.

Bones assigned to Filip

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
29028	10290	Phal I, 4 m	Sin	ÖB	S	37.1-39.3	F	Excel sheet listed original find # 10289.
29022	10290	Phal I, 5 m	Dex	ÖB	S	37.1-39.3	F	Excel sheet listed original find # 10289.
29027	10290	Phal I, 5 m	Sin	ÖB	S	37.1-39.3	F	Excel sheet listed original find # 10289.
29013	10290	Phal II, 2 m	Sin	ÖB	S	37.1-39.3	F	Excel sheet listed original find # 10289.
29014	10290	Phal II, 2 m	Dex	ÖB	S	37.1-39.3	F	Excel sheet listed original find # 10289.
29015	10290	Phal II, 3 m	Sin	ÖB	S	37.1-39.3	F	Excel sheet listed original find # 10289.
29040	10290	Phal II, 3 m	Dex	ÖB	S	37.1-39.3	F	Excel sheet listed original find # 10289.
29010	10290	Phal II, 4 m	Sin	ÖB	S	37.1-39.3	F	Excel sheet listed original find # 10289.
29016	10290	Phal II, 4 m	Dex	ÖB	S	37.1-39.3	F	Excel sheet listed original find # 10289.
29011	10290	Phal II, 5 m	Sin	ÖB	S	37.1-39.3	F	Excel sheet listed original find # 10289.
29012	10290	Phal II, 5 m	Dex	ÖB	S	37.1-39.3	F	Excel sheet listed original find # 10289.
29017	10290	Phal III, 1 m	Dex	ÖB	S	37.1-39.3	F	Excel sheet listed original find # 10289.
	10289	Phal III, 2 m	?	ÖB	S	37.1-39.3	F	Not found in museum.
29018	10290	Phal III, 3 m	Dex	ÖB	S	37.1-39.3	F	
29539	10289	Phal III, 3 m	Sin	ÖB	S	37.1-39.3	F	
29020	10290	Phal III, 4 m	Dex	ÖB	S	37.1-39.3	F	
29019	10290	Phal III, 5 m	Dex	ÖB	S	37.1-39.3	F	
25953	10289	Radius	Dex	ÖB	S	37.1-39.3	F	
25993	10289	Radius	Sin	ÖB	S	37.1-39.3	F	3 fragments
25984	10290	Sacrum		ÖB	S	37.1-39.3	F	fragments. Not found in museum.
25985	10290	Sacrum		ÖB	S	37.1-39.3	F	fragments. Not found in museum.
25986	10290	Sacrum		ÖB	S	37.1-39.3	F	fragments. Not found in museum.
25987	10290	Sacrum		ÖB	S	37.1-39.3	F	fragments. Not found in museum.
25988	10290	Sacrum		ÖB	S	37.1-39.3	F	ED's database lists the sacrum as four pieces.
25961	10290	Scapula	Sin	ÖB	S	37.1-39.3	F	Find number difficult to read on bone.
	10290	Sternum		ÖB	S	37.1-39.3	F	Not found in museum.
10290	10289	Tibia	Sin	ÖB	S	37.1-39.3	F	
25954	10289	Tibia	Dex	ÖB	S	37.1-39.3	F	Online catalog lists original find 10290.

Bones assigned to Filip

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
10289	10289	Ulna	Sin	ÖB	S	37.1-39.3	F	
25950	10289	Ulna	Dex	ÖB	S	37.1-39.3	F	
25979	10290	Vert cervical		ÖB	S	37.1-39.3	F	C3
25980	10290	Vert cervical		ÖB	S	37.1-39.3	F	C4
25981	10290	Vert cervical		ÖB	S	37.1-39.3	F	C5
25982	10290	Vert cervical		ÖB	S	37.1-39.3	F	C6
25983	10290	Vert cervical		ÖB	S	37.1-39.3	F	C7
25972	10290	Vert lumbar		ÖB	S	37.1-39.3	F	L1
25973	10290	Vert lumbar		ÖB	S	37.1-39.3	F	L2
25974	10290	Vert lumbar		ÖB	S	37.1-39.3	F	L3
25975	10290	Vert lumbar		ÖB	S	37.1-39.3	F	L4
25976	10290	Vert lumbar		ÖB	S	37.1-39.3	F	L5
07792	07792	Vert thoracic		ÖB	S	37.2-40.0	B	
25808	07792	Vert thoracic		ÖB	S	37.2-40.0	B	T1 or T2.
25962	10290	Vert thoracic		ÖB	S	37.1-39.3	F	T1. Online catalog lists as T3.
25963	10290	Vert thoracic		ÖB	S	37.1-39.3	F	T2. Online catalog lists as T4.
25964	10290	Vert thoracic		ÖB	S	37.1-39.3	F	T3. Online catalog lists as T5.
25965	10290	Vert thoracic		ÖB	S	37.1-39.3	F	T4-7. Online catalog lists as T6.
25966	10290	Vert thoracic		ÖB	S	37.1-39.3	F	T4-7. Online catalog lists as T7.
25967	10290	Vert thoracic		ÖB	S	37.1-39.3	F	T8
25968	10290	Vert thoracic		ÖB	S	37.1-39.3	F	T9
25969	10290	Vert thoracic		ÖB	S	37.1-39.3	F	T10
25970	10290	Vert thoracic		ÖB	S	37.1-39.3	F	T11
25971	10290	Vert thoracic		ÖB	S	37.1-39.3	F	T12

Bones assigned to Gustav

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
35208	12882	Atlas		UB	S	19.0-20.7	G	
35209	12882	Axis		UB	S	19.0-20.7	G	
35196	12882	Clavicula	Sin	UB	S	19.0-20.7	G	
35197	12882	Clavicula	Dex	UB	S	19.0-20.7	G	
35227	12882	Costa	Sin	UB	S	19.0-20.7	G	#2 ?
35228	12882	Costa	Sin	UB	S	19.0-20.7	G	#3-9
35229	12882	Costa	Sin	UB	S	19.0-20.7	G	#3-9
35230	12882	Costa	Sin	UB	S	19.0-20.7	G	#3-9
35231	12882	Costa	Sin	UB	S	19.0-20.7	G	#3-9
35232	12882	Costa	Sin	UB	S	19.0-20.7	G	#3-9
35233	12882	Costa	Sin	UB	S	19.0-20.7	G	#3-9
35234	12882	Costa	Sin	UB	S	19.0-20.7	G	#3-9
35235	12882	Costa	Sin	UB	S	19.0-20.7	G	Fragments. Not found in museum.
35236	12882	Costa	Dex	UB	S	19.0-20.7	G	#1 Fragment.
35237	12882	Costa	Dex	UB	S	19.0-20.7	G	#2 Broken distal end.
35238	12882	Costa	Dex	UB	S	19.0-20.7	G	#3-9
35239	12882	Costa	Dex	UB	S	19.0-20.7	G	#3-9
35240	12882	Costa	Dex	UB	S	19.0-20.7	G	#3-9
35241	12882	Costa	Dex	UB	S	19.0-20.7	G	#3-9 Fragment
35242	12882	Costa	Dex	UB	S	19.0-20.7	G	#3-9 Fragment
35243	12882	Costa	Dex	UB	S	19.0-20.7	G	#3-9
35244	12882	Costa	Dex	UB	S	19.0-20.7	G	#3-9
35245	12882	Costa	Dex	UB	S	19.0-20.7	G	#3-9
35246	12882	Costa	Dex	UB	S	19.0-20.7	G	#3-9
12881	12881	Cranium + dentes		UB	S	19.0-20.7	G	Dentes: C-P2, M2-M3 dex; C, P2-M3 sin. M1 dex lost in life and mostly healed closed at death. Corresponding M1 in mandible lost later, only partially healed.

Bones assigned to Gustav

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
07697	07697	Femur	Sin	UB			G	Spreadsheet initally had location as UB-s-11.48-13.02. Location uncertain, not recorded in *Fyndliggare.* Text in *Fyndliggare:* "Ref. H. Soop, LA..."
35200	2	Femur	Dex				G	DNA: 65660—needs re-examined
35206	2	Fibula	Sin				G	tibiae and fibulae match each other, similar color and preservation to other Gustav bones - F.H. They also match the talus(es). Not listed as "2" in ED's database.
35207	2	Fibula	Dex				G	
35204	12882	Humerus	Sin	UB	S	19.0-20.7	G	
35205	12882	Humerus	Dex	UB	S	19.0-20.7	G	
35302	12881	Mandible + dentes		UB	S	19.0-20.7	G	Dentes: P1-P2, roots for M1-M2 dex; P1, M1-3 sin. DNA: 65634—needs re-examined
35262	12882	Mc I	Sin	UB	S	19.0-20.7	G	
35263	12882	Mc I	Dex	UB	S	19.0-20.7	G	
35264	12882	Mc II	Sin	UB	S	19.0-20.7	G	
35265	12882	Mc II	Dex	UB	S	19.0-20.7	G	
35266	12882	Mc III	Sin	UB	S	19.0-20.7	G	
35267	12882	Mc III	Dex	UB	S	19.0-20.7	G	
35268	12882	Mc IV	Sin	UB	S	19.0-20.7	G	
35269	12882	Mc IV	Dex	UB	S	19.0-20.7	G	
35270	12882	Mc V	Sin	UB	S	19.0-20.7	G	
35271	12882	Mc V	Dex	UB	S	19.0-20.7	G	
35250	12882	Mt IV	Sin	UB	S	19.0-20.7	G	Online catalog: "III eller IV"
35251	12882	Mt III	Sin	UB	S	19.0-20.7	G	Online catalog: "III eller IV"
35249	12882	Mt V	Sin	UB	S	19.0-20.7	G	
35255	12882	Os carpi Capitate	Sin	UB	S	19.0-20.7	G	
35260	12882	Os carpi Capitate	Dex	UB	S	19.0-20.7	G	
35258	12882	Os carpi Hamate	Dex	UB	S	19.0-20.7	G	

Bones assigned to Gustav

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
35253	12882	Os carpi Lunate	Sin	UB	S	19.0-20.7	G	
35252	12882	Os carpi Scaphoid	Sin	UB	S	19.0-20.7	G	
35257	12882	Os carpi Scaphoid	Dex	UB	S	19.0-20.7	G	
35254	12882	Os carpi Trapezium	Sin	UB	S	19.0-20.7	G	
35259	12882	Os carpi Trapezium	Dex	UB	S	19.0-20.7	G	
35261	12882	Os carpi Trapezoid	Dex	UB	S	19.0-20.7	G	
35256	12882	Os carpi Triquetral	Sin	UB	S	19.0-20.7	G	
12882	12882	Os coxae	Sin	UB	S	19.0-20.7	G	
19121	19121	Os coxae	Dex	TD	B	12.9-14.5	G	Incomplete pieces but seem to match- similar size, coloring, and deterioration.
35202	12882	Os tarsi Calcaneus	Sin	UB	S	19.0-20.7		not in ED's database
35203	12882	Os tarsi Calcaneus	Dex	UB	S	19.0-20.7		not in ED's database
11344	11344	Os tarsi Talus	Sin	UB	B	15.9-17.5	G	
35201	12882	Os tarsi Talus	Dex	UB	S	19.0-20.7	G	
35189	2	Patella	Sin					ED's database lists it as dex
35272	12882	Phal I, 1 m	Sin	UB	S	19.0-20.7	G	
35273	12882	Phal I, 1 m	Dex	UB	S	19.0-20.7	G	
35274	12882	Phal I, 2 m	Dex	UB	S	19.0-20.7	G	
35277	12882	Phal I, 3 m	Sin	UB	S	19.0-20.7	G	
35275	12882	Phal I, 5 m	Sin	UB	S	19.0-20.7	G	
35276	12882	Phal I, 5 m	Dex	UB	S	19.0-20.7	G	
35278	12882	Phal II, 2 m	?	UB	S	19.0-20.7	G	Displayed as dex
35279	12882	Phal II, 3 m	?	UB	S	19.0-20.7	G	Displayed as dex
35280	12882	Phal II, 4 m	?	UB	S	19.0-20.7	G	Displayed as dex
35281	12882	Phal II, 5 m	?	UB	S	19.0-20.7	G	Displayed as dex
35190	12882	Radius	Dex	UB	S	19.0-20.7	G	
35193	12882	Radius	Sin	UB	S	19.0-20.7	G	
35247	12882	Sacrum		UB	S	19.0-20.7	G	Fragment of promontory, ala, and top of spine.
35198	12882	Scapula	Sin	UB	S	19.0-20.7	G	
35199	12882	Scapula	Dex	UB	S	19.0-20.7	G	

Bones assigned to Gustav

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
35191		Tibia	Sin					tibiae and fibulae match each other, similar color and preservation to other Gustav bones - F.H. Neither are listed with a find number in ED's database.
35192	2	Tibia	Dex					
35194	12882	Ulna	Sin	UB	S	19.0-20.7	G	
35195	12882	Ulna	Dex	UB	S	19.0-20.7	G	
35210	12882	Vert cervical		UB	S	19.0-20.7	G	C3
35211	12882	Vert cervical		UB	S	19.0-20.7	G	C4
35212	12882	Vert cervical		UB	S	19.0-20.7	G	C5
35213	12882	Vert cervical		UB	S	19.0-20.7	G	C6
35214	12882	Vert cervical		UB	S	19.0-20.7	G	C7
35248	12882	Vert lumbar		UB	S	19.0-20.7	G	L1
35215	12882	Vert thoracic		UB	S	19.0-20.7	G	T1
35216	12882	Vert thoracic		UB	S	19.0-20.7	G	T2
35217	12882	Vert thoracic		UB	S	19.0-20.7	G	T3
35218	12882	Vert thoracic		UB	S	19.0-20.7	G	T4
35219	12882	Vert thoracic		UB	S	19.0-20.7	G	T5
35220	12882	Vert thoracic		UB	S	19.0-20.7	G	T6
35221	12882	Vert thoracic		UB	S	19.0-20.7	G	T7
35222	12882	Vert thoracic		UB	S	19.0-20.7	G	T8
35223	12882	Vert thoracic		UB	S	19.0-20.7	G	T9
35224	12882	Vert thoracic		UB	S	19.0-20.7	G	T10
35225	12882	Vert thoracic		UB	S	19.0-20.7	G	T11
35226	12882	Vert thoracic		UB	S	19.0-20.7	G	T12

Bones assigned to Helge

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
35000	11359	Axis		UB	B	21.97-24.56	H	C2. Magazine note: remnants from the axis.
11360	11360	Calotte (Cranium)		UB	B	21.97-24.56	H	
35139	11359	Clavicula	Sin	UB	B	21.97-24.56	H	
35140	11359	Clavicula	Dex	UB	B	21.97-24.56	H	
25528	11359	Costa	?	UB	B	21.97-24.56	H	Fragments, including Rib 1 or 2
25529	11359	Costa	?	UB	B	21.97-24.56	H	fragments of multiple ribs
25530	11359	Costa	?	UB	B	21.97-24.56	H	Fragments of multiple ribs. In two boxes.
30480	11359	Cranial fragments		UB	B	21.97-24.56	H	Unidentifiable cranial fragments and dust.
30477	11360	Cranium (Zygomatic)	?	UB	B	21.97-24.56	H	
30478	11360	Cranium (Zygomatic)	?	UB	B	21.97-24.56	H	
30479	11360	Cranial fragment		UB	B	21.97-24.56	H	Two connected fragments? Occipital and sphenoid?
30461	11360	Dentes		UB	B	21.97-24.56	H	9~ maxillary teeth
30462	11360	Dentes		UB	B	21.97-24.56	H	9~ maxillary teeth
30463	11360	Dentes		UB	B	21.97-24.56	H	9~ maxillary teeth
30464	11360	Dentes		UB	B	21.97-24.56	H	9~ maxillary teeth
30465	11360	Dentes		UB	B	21.97-24.56	H	9~ maxillary teeth
30466	11360	Dentes		UB	B	21.97-24.56	H	9~ maxillary teeth
30467	11360	Dentes		UB	B	21.97-24.56	H	9~ maxillary teeth
30468	11360	Dentes		UB	B	21.97-24.56	H	9~ maxillary teeth
30469	11360	Dentes		UB	B	21.97-24.56	H	9~ maxillary teeth
30470	11359	Dentes		UB	B	21.97-24.56	H	5 mandibular canines and incisors
30471	11359	Dentes		UB	B	21.97-24.56	H	5 mandibular canines and incisors
30472	11359	Dentes		UB	B	21.97-24.56	H	5 mandibular canines and incisors
30473	11359	Dentes		UB	B	21.97-24.56	H	5 mandibular canines and incisors
30474	11359	Dentes		UB	B	21.97-24.56	H	5 mandibular canines and incisors
25519	11360	Femur	Dex	UB	B	21.97-24.56	H	in 3 boxes
25524	11360	Femur	Sin	UB	B	21.97-24.56	H	Main bone on display in F:F. Fragments in Magazine.
25520	11361	Fibula	Dex	UB	B	21.97-24.56	H	

Bones assigned to Helge

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
25522	11361	Fibula	Sin	UB	B	21.97-24.56	H	Main bone on display in F:F. Fragments in Magazine.
25518	11359	Humerus	Sin	UB	B	21.97-24.56	H	Fragments from Humerus in the Magazine, #30481. DNA: 65656—needs re-examined.
25527	11359	Humerus	Dex	UB	B	21.97-24.56	H	
35141	11360	Indeterminate bone fragments		UB	B	21.97-24.56	H	
35143	11360	Indeterminate bone fragments		UB	B	21.97-24.56	H	
35144	11360	Indeterminate bone fragments		UB	B	21.97-24.56	H	
35145	11360	Indeterminate bone fragments		UB	B	21.97-24.56	H	
11359	11359	Mandible + dentes		UB	B	21.97-24.56	H	
35059	11359	Mc #	?	UB	B	21.97-24.56	H	Online catalog note: E.D: Dx? IV/V.
35011	11359	Mc I	Dex	UB	B	21.97-24.56	H	
35012	11359	Mc II	Sin	UB	B	21.97-24.56	H	
35013	11359	Mc III	Sin	UB	B	21.97-24.56	H	
35014	11359	Mc IV	Sin	UB	B	21.97-24.56	H	
35020	11361	Mt I	?	UB	B	21.97-24.56	H	One box in Magazine for Mt I-V. On display in F:F as Sin.
35021	11361	Mt II	?	UB	B	21.97-24.56	H	
35022	11361	Mt III	?	UB	B	21.97-24.56	H	
35023	11361	Mt IV	?	UB	B	21.97-24.56	H	
35044	11361	Mt IV	Dex	UB	B	21.97-24.56	H	Fragments but "complete" base. Listed in online catalog as Mt IV but looks like Mt I sin?
35024	11361	Mt V	?	UB	B	21.97-24.56	H	
35037	11359	Os carpi (?)	Dex	UB	B	21.97-24.56	H	Trapezium (or Hamate?). Magazine lists original find nr. 11360. Online catalog lists as Lunate Dex.

Bones assigned to Helge

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
35039	11360	Os carpi (?)	?	UB	B	21.97-24.56	H	Hamate, lunate, or trapezium? Dex? Unidentifiable.
35036	11360	Os carpi Hamate	Dex	UB	B	21.97-24.56	H	
35040	11359	Os carpi Lunate	Sin	UB	B	21.97-24.56	H	
35038	11359	Os carpi Pisiform	Dex	UB	B	21.97-24.56	H	Magazine lists original find nr. 11360. Online catalog lists original find number 11359.
35035	11359	Os carpi Scaphoid	Dex	UB	B	21.97-24.56	H	Fragments. Dex not marked in Magazine.
35041	11359	Os carpi Trapezium	Sin	UB	B	21.97-24.56	H	
35042	11359	Os carpi Trapezoid	Sin	UB	B	21.97-24.56	H	
35147	11360	Os coxae	?	UB	B	21.97-24.56	H	Crumbs and fragments. 2 boxes + 2 baggies.
35051	11361	Os tarsi ?	?	UB	B	21.97-24.56	H	2 fragments
35054	11361	Os tarsi ?	?	UB	B	21.97-24.56	H	Cuneiform? In 2 fragments.
35055	11361	Os tarsi ?	?	UB	B	21.97-24.56	H	Magazine note: Tarsal dex. 2 fragments.
35045	11361	Os tarsi Calcaneus	Dex	UB	B	21.97-24.56	H	Multiple fragments. Cannot identify.
35046	11361	Os tarsi Calcaneus	Sin	UB	B	21.97-24.56	H	
35048	11361	Os tarsi Cuboid	Sin	UB	B	21.97-24.56	H	
35053	11361	Os tarsi Cuboid	Dex	UB	B	21.97-24.56	H	fragments
35050	11361	Os tarsi Cuneiform?	?	UB	B	21.97-24.56	H	Intermediate?
35049	11361	Os tarsi Cuneiform Lateral	?	UB	B	21.97-24.56	H	
35047	11361	Os tarsi Cuneiform Medial	Sin	UB	B	21.97-24.56	H	Originally designated as Os tarsi Navicular.
35052	11361	Os tarsi Cuneiform Medial	Dex	UB	B	21.97-24.56	H	Originally designated as Os tarsi Navicular.
24514	11360	Os tarsi Sesamoid	?	UB	B	21.97-24.56	H	3 sesamoid bones
35043	11361	Os tarsi Talus	Sin	UB	B	21.97-24.56	H	Fragments
35002	11360	Patella	Sin	UB	B	21.97-24.56	H	Helge has two Patella sin? Or is it two pieces? Patella sin on display but can't tell.
35142	11360	Patella	Sin	UB	B	21.97-24.56	H	Duplicate find number? Not found in museum.

Bones assigned to Helge

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
35003	11359	Phal I, # m	?	UB	B	21.97-24.56	H	Phalanx I, 2-4, sin? Displayed as 2 Sin.
35004	11359	Phal I, # m	?	UB	B	21.97-24.56	H	Phalanx I, 2-4, sin? Displayed as 3 Sin.
35005	11359	Phal I, # m	?	UB	B	21.97-24.56	H	Phalanx I, 2-4, sin? Displayed as 4 Sin.
24510	11361	Phal I, # p	Sin	UB	B	21.97-24.56	H	#2-3
35015	11359	Phal I, 1 m	Sin	UB	B	21.97-24.56	H	
35017	11361	Phal I, 1 p	Sin	UB	B	21.97-24.56	H	"p" and "1" not noted on Magazine note.
35019	11361	Phal I, 1 p	Dex	UB	B	21.97-24.56	H	
24512	11361	Phal I, 4 p	Sin	UB	B	21.97-24.56	H	
24511	11361	Phal I, 5 p	Sin	UB	B	21.97-24.56	H	
35006	11359	Phal II, # m	?	UB	B	21.97-24.56	H	Phalanx II, 2-5, sin? Displayed as 2 Sin.
35007	11359	Phal II, # m	?	UB	B	21.97-24.56	H	Phalanx II, 2-5, sin? Displayed as 3 Sin.
35008	11359	Phal II, # m	?	UB	B	21.97-24.56	H	Phalanx II, 2-5, sin? Displayed as 4 Sin.
24513	11361	Phal I, # p	?	UB	B	21.97-24.56	H	24513 + 35131-35134 originally ID'd as Phal II.
35131	11361	Phal I, # p	Dex?	UB	B	21.97-24.56	H	
35132	11361	Phal I, # p	Sin?	UB	B	21.97-24.56	H	#2 or 3
35133	11361	Phal I, # p	Dex?	UB	B	21.97-24.56	H	On dorsal side - growth? break?
35134	11361	Phal I, # p	Sin	UB	B	21.97-24.56	H	3, 4, or 5?
35135	11361	Phal II, # p	Sin?	UB	B	21.97-24.56	H	3 phalanges (Or 3 pieces?). MS note: One or more, dx/sin.
35009	11359	Phal III, # m	?	UB	B	21.97-24.56	H	Phalanx III, 2-5. Two Phal IIIs on display as 2 & 3 Sin but can't see Find #s.
35010	11359	Phal III, # m	?	UB	B	21.97-24.56	H	Phalanx III, 2-5. Two Phal IIIs on display as 2 & 3 Sin but can't see Find #s.
24515	11360	Phal III, # p	?	UB	B	21.97-24.56	H	#2-5
24516	11360	Phal III, # p	?	UB	B	21.97-24.56	H	#2-5
35033		Phal III, # p	?				H	What is the original find number? E.D.'s db records only 7 Phal III p's.
35034		Phal III, # p	?				H	
35136	11361	Phal III, # p	?	UB	B	21.97-24.56	H	#2-5

Bones assigned to Helge

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
35137	11361	Phal III, # p	?	UB	B	21.97-24.56	H	#2-5
35138	11360	Phal III, # p	?	UB	B	21.97-24.56	H	
35016	11361	Phal III, 1 p	Sin	UB	B	21.97-24.56	H	
35018	11361	Phal III, 1 p	Dex	UB	B	21.97-24.56	H	
25525	11359	Radius	Sin	UB	B	21.97-24.56	H	
25526	11359	Radius	Dex	UB	B	21.97-24.56	H	
25531	11360	Sacrum		UB	B	21.97-24.56	H	Fragments.
35149	11359	Scapula	?	UB	B	21.97-24.56	H	Fragments.
35150	11359	Scapula	?	UB	B	21.97-24.56	H	Fragments.
35001	11359	Sternum		UB	B	21.97-24.56	H	manubrium + body
30475	11360	Cranium (Temporal)	Sin	UB	B	21.97-24.56	H	hair still attached
30476	11360	Cranium (Temporal)	Dex	UB	B	21.97-24.56	H	
25521	11361	Tibia	Dex	UB	B	21.97-24.56	H	Stored in a box and fragments in baggie.
25523	11361	Tibia	Sin	UB	B	21.97-24.56	H	
30481	11359	Humerus	Sin	UB	B	21.97-24.56	H	Fragments from Humerus Sin #25518
35060	11359	Ulna	Sin	UB	B	21.97-24.56	H	
35146	11360	Ulna	Dex	UB	B	21.97-24.56	H	
25550	11359	Vert Cervical		UB	B	21.97-24.56	H	fragments of multiple verts
25532	11359	Vert Lumbar		UB	B	21.97-24.56	H	L1
25533	11359	Vert Lumbar		UB	B	21.97-24.56	H	L2
25534	11359	Vert Lumbar		UB	B	21.97-24.56	H	L3
25535	11359	Vert Lumbar		UB	B	21.97-24.56	H	L4
25536	11359	Vert Lumbar		UB	B	21.97-24.56	H	
25537	11359	Vert Thoracic		UB	B	21.97-24.56	H	T1
25538	11359	Vert Thoracic		UB	B	21.97-24.56	H	T2
25539	11359	Vert Thoracic		UB	B	21.97-24.56	H	T3
25540	11359	Vert Thoracic		UB	B	21.97-24.56	H	T4
25541	11359	Vert Thoracic		UB	B	21.97-24.56	H	T5

Bones assigned to Helge

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
25542	11359	Vert Thoracic		UB	B	21.97-24.56	H	T6
25543	11359	Vert Thoracic		UB	B	21.97-24.56	H	T7
25544	11359	Vert Thoracic		UB	B	21.97-24.56	H	T8
25545	11359	Vert Thoracic		UB	B	21.97-24.56	H	T9
25546	11359	Vert Thoracic		UB	B	21.97-24.56	H	T10
25547	11359	Vert Thoracic		UB	B	21.97-24.56	H	T11
25548	11359	Vert Thoracic		UB	B	21.97-24.56	H	T12
25549	11359	Vert Thoracic		UB	B	21.97-24.56	H	fragments of multiple verts #1-12

Bones assigned to Ivar

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
25925	19527	Atlas		TD	B	3.7-5.2	I	
25926	19527	Axis		TD	B	3.7-5.2	I	
25948	19527	Cartilage (larynx)		TD	B	3.7-5.2	I	Online catalog note: "The bag was labeled with 'Cartilage Hyoideum' and' Found at individual K '. Does not exist in E. durings list."
25905	19526	Clavicula	Sin	TD	B	3.7-5.2	I	
19527	19527	Clavicula	Dex	TD	B	3.7-5.2	I	
35353	20012	Costa	Dex	TD		0-2.0	E	rib 4. Fyndliggare does not provide find location information other than the deck with a comment that the bones were found "all the way forward."
25909	19527	Costa	Dex	TD	B	3.7-5.2	I	#3-9 MS: not sided
25910	19527	Costa	Dex	TD	B	3.7-5.2	I	#3-9
25911	19527	Costa	Dex	TD	B	3.7-5.2	I	#3-9
25912	19527	Costa	Dex	TD	B	3.7-5.2	I	#3-9
25913	19527	Costa	Dex	TD	B	3.7-5.2	I	#3-9
25914	19527	Costa	Dex	TD	B	3.7-5.2	I	#3-9
25915	19527	Costa	Dex	TD	B	3.7-5.2	I	#11?
25916	19527	Costa	Sin	TD	B	3.7-5.2	I	#3-9
25917	19527	Costa	Sin	TD	B	3.7-5.2	I	#3-9
25918	19527	Costa	Sin	TD	B	3.7-5.2	I	#3-9
25919	19527	Costa	Sin	TD	B	3.7-5.2	I	#3-9
25920	19527	Costa	Sin	TD	B	3.7-5.2	I	#2-9
25921	19527	Costa	Sin	TD	B	3.7-5.2	I	#3-9
25922	19527	Costa	Sin	TD	B	3.7-5.2	I	not found in museum
25923	19527	Costa	Dex	TD	B	3.7-5.2	I	#1
25924	19527	Costa	Sin	TD	B	3.7-5.2	I	#1
19526	19526	Cranium + dentes		TD	B	3.7-5.2	I	Dentes: M1-2 dex; M1 sin
35165	X	Femur	Sin	TD	B	Forward	K	location uncertain
35166	X	Femur	Dex	TD	B	Forward	K	location uncertain. DNA: 65661—needs re-examining

Bones assigned to Ivar

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
35155	X	Fibula	Dex	TD	B	Forward	K	location uncertain. Growth on distal end?
35156	X	Fibula	Sin	TD	B	Forward	K	location uncertain
35158	X	Humerus	Dex	TD	B	Forward	K	location uncertain
35162	17061	Radius	Dex	HS	B	0-6.67	K	
25904	19526	Mandible + dentes		TD	B	3.7-5.2	I	Dentes: C-M3 sin; P1-M2 dex. Tooth #65635 removed for DNA analysis 24 May 2013. DNA: 65635 tooth mand—shares a common profile with Martin but cannot belong together; possibly related
35152	19527	Mt I	Sin	TD	B	3.7-5.2	K	Was displayed as Dex.
35153	19527	Mt III	Sin	TD	B	3.7-5.2	K	
35154	19527	Mt IV	Sin	TD	B	3.7-5.2	K	
35181	19527	Os carpi Capitate	Dex	TD	B	3.7-5.2	K	
35179	19527	Os carpi Hamate	Dex	TD	B	3.7-5.2	K	
35178	19527	Os carpi Lunate	Dex	TD	B	3.7-5.2	K	
35182	19527	Os carpi Trapezium	Dex	TD	B	3.7-5.2	K	
35180	19527	Os carpi Trapezoid	Dex	TD	B	3.7-5.2	K	
35183	19527	Os carpi Triquetral	Dex	TD	B	3.7-5.2	K	not found in museum
25906	19526	Os coxae	Sin	TD	B	3.7-5.2	I	
35170	19527	Os tarsi Calcaneus	Sin	TD	B	3.7-5.2	K	
NN	20067	Os tarsi Calcaneus	Dex	HS	M	*0-2.5	K	Exact Fyndliggare location: HS - M - Beam 1. Needs a new find number.
35169	17061	Os tarsi Calcaneus	Dex	HS	B	0-6.67	K	not found in museum
35174	19527	Os tarsi Cuneiform Medial	Dex	TD	B	3.7-5.2	K	
35173	19527	Os tarsi Navicular	Sin	TD	B	3.7-5.2	K	
35167	20067	Os tarsi Talus	Sin	HS	M	*0-2.5	K	Exact Fyndliggare location: HS - M - Beam 1.
35168	20067	Os tarsi Talus	Dex	HS	M	*0-2.5	K	Exact Fyndliggare location: HS - M - Beam 1.
35172	19527	Patella	Dex	TD	B	3.7-5.2	C	
35185	19527	Phal I, # m	?	TD	B	3.7-5.2	I	Displayed as I, 5 m Dex.
35184	19527	Phal I, 1 m	Dex	TD	B	3.7-5.2	I	
35171	19527	Phal I, 2-5 p	?	TD	B	3.7-5.2	J	Displayed as Sin.

Bones assigned to Ivar

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
35175	19527	Phal II, 2-5 m	?	TD	B	3.7-5.2	J	Displayed as 3 m Dex.
35176	19527	Phal II, 2-5 m	?	TD	B	3.7-5.2	J	Displayed as 4 m Dex.
35177	19527	Phal II, 2-5 m	?	TD	B	3.7-5.2	J	Displayed as 5 m Dex.
35161	17061	Ulna	Dex	HS	B	0-6.67	K	
35157	19527	Humerus	Sin	TD	B	3.7-5.2	K	
25907	19527	Scapula	Dex	TD	B	3.7-5.2	I	
35163	X	Tibia	Sin	TD	B	Forward	K	location uncertain
35164	X	Tibia	Dex	TD	B	Forward	K	location uncertain. Sample #65662 taken for DNA analysis 24 May 2013. DNA: 65662—shares a common profile with Martin but cannot belong together; possibly related
35160	X	Radius	Sin	TD	B	Forward	K	location uncertain
35159	X	Ulna	Sin	TD	B	Forward	K	location uncertain
25927	19527	Vert cervical		TD	B	3.7-5.2	I	(C3-7) C3?
25928	19527	Vert cervical		TD	B	3.7-5.2	I	(C3-7) C5?
25929	19527	Vert cervical		TD	B	3.7-5.2	I	(C3-7) C6?
25930	19527	Vert cervical		TD	B	3.7-5.2	I	(C3-7) C7?
25931	19527	Vert lumbar		TD	B	3.7-5.2	I	(L1-5) L5? Does not match others. Crumbly and incomplete.
25932	19527	Vert lumbar		TD	B	3.7-5.2	I	(L1-5) L2?
25933	19527	Vert lumbar		TD	B	3.7-5.2	I	(L1-5) L1?
25934	19527	Vert lumbar		TD	B	3.7-5.2	I	(L1-5) L3?
25935	19527	Vert lumbar		TD	B	3.7-5.2	I	(L1-5) L4?
25938	19527	Vert thoracic		TD	B	3.7-5.2	I	T1
25939	19527	Vert thoracic		TD	B	3.7-5.2	I	
25940	19527	Vert thoracic		TD	B	3.7-5.2	I	
25941	19527	Vert thoracic		TD	B	3.7-5.2	I	
25942	19527	Vert thoracic		TD	B	3.7-5.2	I	
25943	19527	Vert thoracic		TD	B	3.7-5.2	I	
25945	19527	Vert thoracic		TD	B	3.7-5.2	I	

Bones assigned to Ivar

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
25946	19527	Vert thoracic		TD	B	3.7-5.2	I	
25947	19527	Vert thoracic		TD	B	3.7-5.2	I	
25936	19526	Vert thoracic		TD	B	3.7-5.2	I	Online catalog note: "All thoracic vertebrae listed as 19527 in the list but this and another thoracic vertebra is labeled with the 19526"
25937	19526	Vert thoracic		TD	B	3.7-5.2	I	Online catalog note: "All thoracic vertebrae listed as 19527 in the list but this and another thoracic vertebra is labeled with the 19526"
25944	19527	Vert thoracic		TD	B	3.7-5.2	I	not found in museum
35151	22890	Vert thoracic		TD	S	Forward	K	T8

Bones assigned to Johan

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
14289	14289	Atlas		HS	S	9.97-14.46	J	found in anchor cable
17095	17095	Clavicula	Dex	HS	B	9.97-11.37	J	
35301		Costa	Sin				J	#1. ED's list has this as dex
29235	14568	Costa	Dex	HS	S	9.97-14.46	L	Rib 12. Magazine notes: Bagged dex but ED labelled as sin.
17113	17113	Cranium + dentes		HS	B	9.97-11.37	J	Teeth I1-M2 sin; C-P1, M1 dex. Sutures barely visible > only coronal suture remains easily discernible. Tooth #65637 taken for DNA analysis 24 May 2013.
35283	17663	Femur	Dex	HS	S	11.37-12.96*	J	*Fyndligarre breadth: Pocket above the big stringer. DNA: 65657—matches tibia dex 35288.
18003	18003	Femur	Sin	HS	S	14.46-15.93*	J	*Fyndligarre breadth: Pocket above the big stringer.
17663	17663	Fibula	Sin	HS	S	11.37-12.96*	J	*Fyndligarre breadth: Pocket above the big stringer. Was labelled as Dex by ED.
35287	17663	Humerus	Dex	HS	S	11.37-12.96*	J	Cut for analyses. Proximal end unnumbered.
17708	17708	Humerus	Sin	HS	S	12.96-14.46*	J	*Fyndligarre breadth: Pocket above the big stringer.
13548	13548	Mandible + dentes				Drain	J	Dentes: C-P1 sin. Alveoli completely healed for molars, except M3 Dex.
14303	14303	Mc V	Sin	HS	S	9.97-14.46	J	found in anchor cable
02572	2	Mt I	Sin				I	Identification labelled on bone "I s" Strong curvature on shaft.
02568	2	Mt I	Dex				I	Labelled with identification and original find number. "I d" Strong curvature on shaft. Evidence of amputated toe on distal end.
02573	2	Mt III	Sin				I	"III s" Arthritic (?) distal ends. Strong curvature on shaft.

Bones assigned to Johan

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
02569	2	Mt III	Dex				I	Labelled with identification and original find number. "III d" Strong curvature on shaft.
02574	2	Mt IV	Sin				I	"IV s" Strong curvature on shaft.
02570	2	Mt IV	Dex				I	Labelled with identification and original find number. "IV d" Strong curvature on shaft.
02571	2	Mt V	Dex				I	Labelled with identification and original find number. "V d" Strong curvature on shaft. DNA: 65655
35284	17663	Os coxae	Sin	HS	S	11.37-12.96*	J	*Fyndliggare breadth: Pocket above the big stringer.
35293	17663	Os tarsi Calcaneus	Dex	HS	S	11.37-12.96*	J	*Fyndliggare breadth: Pocket above the big stringer.
35294	17663	Os tarsi Talus	Dex	HS	S	11.37-12.96*	J	*Fyndliggare breadth: Pocket above the big stringer.
29234	14303	Phal III, 1 p	Dex	HS	S	9.97-14.46	L	found in anchor cable
35290		Radius	Dex				J	
35286	17663	Scapula	Dex	HS	S	11.37-12.96*	J	*Fyndliggare breadth: Pocket above the big stringer.
35285	17663	Scapula	Sin	HS	S	11.37-12.96*	J	*Fyndliggare breadth: Pocket above the big stringer.
35288	16794	Tibia	Dex	HS	S	9.97-14.46	J	found in anchor cable. DNA: 65658—matches femur dex 35283.
16794	16794	Tibia	Sin	HS	S	9.97-14.46	J	found in anchor cable. Tibias found together.
35291	17663	Ulna	Sin	HS	S	11.37-12.96*	J	*Fyndliggare breadth: Pocket above the big stringer.
29236	14568	Vert cervical		HS	S	9.97-14.46	L	C3. Broken but complete.
35289		Vert thoracic					J	T12

Bones assigned to Ludvig

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
29217	13012	Clavicula	Dex			Drain	L	
29230	13760	Costa	Dex	HS	M	20.67-21.97	L	Nr. 6, Magazine note: “coll. + corp.”
29219	13012	Costa	Sin			Drain	L	Nr. 4
29209	11328	Costa	Dex	UB	B	17.5-19.06	L	Nr. 4, Magazine note: “coll. + corp.”
29210	11328	Costa	Dex	UB	B	17.5-19.06	L	Nr. 2
29218	13012	Costa	Sin			Drain	L	Nr. 3
29221	13012	Costa	Sin			Drain	L	Nr. 10. Magazine note: Does not match with E.D.'s database
29222	13012	Costa	Sin			Drain	L	Nr. 11
29223	13012	Costa	Dex			Drain	L	Nr. 3. Marked Dex but I think Sin.
29220	18753	Costa	Sin			Drain	L	Nr. 7
29246	20017	Costa	Dex			Drain	L	Nr. 5
29224	13012	Costa (?)	?			Drain		5 fragments. Magazine note: from the drain.
29107		Cranium (parietal)	Dex				C	Magazine note: Prov. Nr. 65653, Prov till DNA-analys 2013-05-24.
29245	18753	Mc II	Dex			Drain	L	Fits with Mc III Dex, but II is oddly smaller than III.
29238	18223	Mc III	Sin	TD	S	8.41-9.97	L	Mc IIIs match one another
29239	18223	Mc III	Dex	TD	S	8.41-9.97	L	Mc IIIs match one another
29237	16934	Mc IV	Sin	HS	B	24.7-26.8	L	matches Mc III Sin
29225	13012	Mt I	Dex			Drain	L	
29247		Mt III	Dex				L	
29248		Mt IV	Dex				L	matches Mt III Dex
35292	13813	Os carpi Scaphoid	Dex	HS	M	20.67-21.97	J	Online catalog note: Os carpi scaph. dx does not match Johan. Find location suggest Ludvig.

Bones assigned to Ludvig

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
29226	13012	Os coxae	Sin			Drain	L	+ a fragment. Broken and abraded. Incorrectly marked as Dex in Magazine.
12237	12237	Os tarsi Calcaneus	Dex	HS	B	17.5-19.06	B	FH: hatch nearby, so could be Beata. Not found in museum.
13813	13813	Phal I, 1 p	Sin	HS	M	20.67-21.97	J	
29216	12882	Radius	Sin	UB	S	19.06-20.67	C	Shaft only. Magazine note: "~~Belongs to G.~~ Buried with ~~E~~ F. Added to C." Cannot verify if it does or does not match #04237. Orig #12882 is a Gustav number, but he already has a left radius that pairs with his right.
29231	13760	Scapula	Dex	HS	M	20.67-21.97	L	
12095	12095	Tibia	Dex	HS	S	17.5-19.06	L	Shaft only. Paired with L's NN/12048 but does not match; reassigned to Erik. Heavily abraded. Shaft and distal end (?).
29211	11687	Vert cervical		HS	M	20.67-21.97	L	C5
29232	13760	Vert cervical		HS	M	20.67-21.97	L	C4
29215	12831	Vert cervical				Drain	L	C6
29233	13760	Vert lumbar		HS	M	20.67-21.97	L	L1
29227	13012	Vert lumbar				Drain	L	L5
24249	13760	Vert thoracic		HS	M	20.67-21.97	K	T12
NN		Vert thoracic					L	T12. Magazine label: Vert. Cerv. Nr 12. Needs new find number

Bones assigned to Rudolf

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
35308	23163	Cranium + dentes				outside	R	Teeth P1-P2 sin, M1dex (discolored frontal). Nasal bones broken off but in separate baggie with cranium.
NN	23162	Femur	Sin			outside	S	Complete bone. Matches S's Femur Dex (23162). Moved from Sigurd to Rudolf 3 Nov 2015 with paired femur dex. Needs new find number.
NN	23162	Femur	Dex			outside	S	Complete bone. Cut for analyses. Incorrectly labeled as Sin in Magazine. Matches S's Femur Sin (23162). DNA: 65631 showed to match Rudolf. Moved from Sigurd to Rudolf 3 Nov 2015 with paired femur sin. Needs new find number.
35310		Humerus	Sin			outside	T	Sample #65632 taken for DNA analysis 8 May 2013. DNA: 65632 showed to match Rudolf. Moved from Tore to Rudolf 3 Nov 2015 with paired ulna and radius.
NN		Mc III	Dex				R	Needs new find number.
NN		Phal I, 3 m	?				R	"m" not marked on storage box. Needs new find number.
NN		Radius	Sin			outside	T	Moved from Tore to Rudolf 3 Nov 2015 with paired humerus and ulna. Needs new find number.
NN		Scapula	Sin				R	Needs new find number.
NN	23163	Tibia	Dex			outside	R	complete tibia. Needs new find number.
35309		Ulna	Sin			outside	T	Moved from Tore to Rudolf 3 Nov 2015 with paired humerus and radius.

Bones assigned to Sigurd

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
NN		Costae	Dex				S	Nr. 2. Complete bone. Incorrectly labeled as Sin in Magazine. Needs new find number.
NN		Costae	Sin				S	Nr. 3. Complete bone. Needs new find number.
NN		Costae	Sin				S	Nr. 4. Complete bone. Needs new find number.
23162	23162	Cranium + dentes				outside	S	Dentes: C, P1, M1-M2 sin; P1-P2, M1-M2 dex. Tooth #65642 removed for DNA analysis. Metopic suture barely visible. Dark coloring on frontal bone, similar to Tore. Two puncture (?) marks on the Pariteals either side of the Sagittal suture. Show signs of remodeling. DNA: 65642 tooth max, broke during sampling—"produced a clear and well defined profile, but one without any matches"
NN	23163	Femur	Sin			outside	R	complete femur though cut for analyses. DNA: 65630 showed unique profile.
NN	23162	Fibula	Dex			outside	S	Not marked as Dex in Magazine. Complete bone, worn proximal end. Matches S's Tibia Dex (23162). Needs new find number.
NN	23163	Os coxae	Sin			outside	S	Complete bone. Needs new find number.
NN		Phal I, 2 m	Dex				S	Complete bone. Not marked as hand phalanx in Magazine. Needs new find number.
NN		Phal I, 3 m	Sin				S	Complete bone. Not marked as hand phalanx in Magazine. Needs new find number.
NN	23161	Phal I, 4 m	Sin			outside	S	Complete bone. Not marked as hand phalanx in Magazine. Needs new find number.
NN	23163	Tibia	Dex			outside	S	Complete bone. Section removed for DNA analysis. Not labeled Dex in Magazine. Matches S's Fibula Dex (23162). DNA: 65649. Needs new find number.

Bones assigned to Tore

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
35307		Clavicula	Dex	UW		outside	T	
23163	23163	Cranium + dentes		UW		outside	T	Dentes: M1-M2 dex; M1-M2 sin with impacted I or C. DNA: 02578 premolar sin
NN		Femur	Dex			outside	Q	Mag note: "Prov till DNA analys 2013-05-24" *01/31/2016 Moved from Q to Tore based on DNA analysis.*
35305		Os coxae	Dex				T	
35306		Sternum		UW		outside	T	Manubrium
NN		Tibia	Sin				Q	Mag note: "Prov till DNA analys 2013-05-24" DNA: 65650 *2/7/2016: moved from Q to Tore based on DNA analysis*

Bones assigned to Ylva

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
02575	23161	Atlas				outside	Z	Online catalog: "Note on bag: 2x cervical vertebrae belonging to the skeleton on display - 15-year-old."
02576	23161	Axis				outside	Z	Online catalog: "Note on bag: 2x cervical vertebrae belonging to the skeleton on display - 15-year-old."
23161	23161	Calvaria				outside	Y	Cranium without the face
29099	23161	Clavicula	Dex			outside	Y	
30648	23161	Clavicula	Sin			outside	Y	MS note: "E. Durings lista: W s epi (extr s+a)."
30625	23161	Costae	Dex			outside	Y	Nr. 3-12. Not found in museum.
30626	23161	Costae	Dex			outside	Y	Nr. 1
30627	23161	Costae	Dex			outside	Y	Nr. 2
30628	23161	Costae	Dex			outside	Y	Nr. 3-12. NR. 11?
30629	23161	Costae	Dex			outside	Y	Nr. 3-12
30630	23161	Costae	Dex			outside	Y	Nr. 3-12
30631	23161	Costae	Dex			outside	Y	Nr. 3-12
30632	23161	Costae	Dex			outside	Y	Nr. 3-12
30633	23161	Costae	Dex			outside	Y	Nr. 3-12
30634	23161	Costae	Dex			outside	Y	Nr. 3-12
30635	23161	Costae	Dex			outside	Y	Nr. 3-12
30636	23161	Costae	Dex			outside	Y	Nr. 3-12
30637	23161	Costae	Sin			outside	Y	Nr. 1
30638	23161	Costae	Sin			outside	Y	Nr. 3-12
30639	23161	Costae	Sin			outside	Y	Nr. 2
30640	23161	Costae	Sin			outside	Y	Nr. 3-12. NR. 11?
30641	23161	Costae	Sin			outside	Y	Nr. 3-12
30642	23161	Costae	Sin			outside	Y	Nr. 3-12
30643	23161	Costae	Sin			outside	Y	Nr. 3-12
30644	23161	Costae	Sin			outside	Y	Nr. 3-12
30645	23161	Costae	Sin			outside	Y	Nr. 3-12

Bones assigned to Ylva

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
30646	23161	Costae	Sin			outside	Y	Nr. 3-12
30647	23161	Costae	Sin			outside	Y	Nr. 3-12
29096	23161	Femur	Sin			outside	Y	
29097	23161	Femur	Dex			outside	Y	Section #65633 removed for DNA analysis, 8 May 2013. DNA: 65633 (no results)
30650	23161	Fibula	Dex			outside	Y	
30602	23161	Humerus	Dex			outside	Y	
35304	23161	Humerus	Sin			outside	Y	
29094	23161	Mandible + dentes				outside	Y	Teeth I1-M2 both sides (all teeth). M2 sin removed.
30620	23161	Mc I	Dex			outside	Y	MS note: "E. Durings lista: W s prox epi."
30621	23161	Mc II	Dex			outside	Y	
30622	23161	Mc III	Sin			outside	Y	Could be Mc II?
30623	23161	Mc IV	Sin			outside	Y	
30624	23161	Mc V	Sin			outside	Y	
02564	29094	Molar, M3	Sin			outside	Y	From Mandible #29094. Removed for DNA analysis 2004.
30614	23161	Os carpi Scaphoid	Sin			outside	Y	
30613	23161	Os carpi Trapezium	Dex			outside	Y	
30605	23161	Os coxae	Sin			outside	Y	MS note: "E. Durings lista: W il s epi." Silica sand is sticking in some porous areas of the bone.
30606	23161	Os coxae	Dex			outside	Y	
30612	23161	Os tarsi Cuneiform lateral	Dex			outside	Y	
35361	31062	Os tarsi ?	?			outside	Y	Found in shoe #23070. Not found in museum.
35362	31062	Os tarsi ?	?			outside	Y	Found in shoe #23070. Not found in museum.
30619	23161	Phal I, 2 m	?			outside	Y	2-4 m. Displayed as 3 m sin. Designated as 2m by ED, should check which digit since there are also two 2ms assigned to Ylva.

Bones assigned to Ylva

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
30617	23161	Phal I, 3 m	?			outside	Y	2-4 m. Displayed as 4 m sin.
30618	23161	Phal I, 4 m	?			outside	Y	2-4 m. Displayed as 4 m dex.
30615	23161	Phal I, 5 m	Sin			outside	Y	Displayed as sin.
30616	23161	Phal I, 5 m	Dex			outside	Y	Online catalog: "E. Durings lista: W s prox e." Displayed as dex.
30609	23161	Phal II, 2 m	?			outside	Y	2-5 m. Displayed as 3 m sin.
30610	23161	Phal II, 3 m	?			outside	Y	2-5 m. Was displayed as 4 m dex.
30611	23161	Phal II, 4 m	?			outside	Y	2-5 m. Displayed as 4 m sin.
30608	23161	Phal II, 5 m	?			outside	Y	2-5 m. Displayed as 5 m sin.
31002	31002	Phal #, # p	?			outside	Y	unidentified "toe bone." Not found in museum.
31062	31062	Phal #, # p	?			outside	Y	unidentified "toe bone." Not found in museum.
35360	31062	Phal #, # p	?			outside	Y	unidentified "toe bone". Found in shoe #23070. Not found in museum.
35354	31002	Phal I, # p	?			outside	Y	unidentified "toe bone". Found in shoe #23069. Not found in museum.
35358	31062	Phal I, # p	?			outside	Y	Broken and worn proximal end. Found in shoe #23070.
35359	31062	Phal I, # p	?			outside	Y	Broken and worn proximal end. Found in shoe #23070.
35356	31062	Phal II, # p	?			outside	Y	unidentified "toe bone". Found in shoe #23070. Not found in museum.
35357	31062	Phal II # p	?			outside	Y	unidentified "toe bone". Found in shoe #23070. Not found in museum.
35355	31002	Phalanx epihpysis	?			outside	Y	Found in shoe #23069. Not found in museum.
29100	23161	Radius	Sin			outside	Y	MS note: "E. Durings lista: W c prox l epi." Listed as dex but is acually sin and was/is displayed as sin.
30607	23161	Radius	Dex			outside	Y	Listed as sin but is actually dex and was/is displayed as dex.
29095	23161	Sacrum				outside	Y	MS note: "E. Durings lista: Nw (nr 1-4)"

Bones assigned to Ylva

New find no.	Original find no.	Bone ID	Dex-Sin	Deck	Side	Location	Original individual	Comments
30603	23161	Scapula	Sin			outside	Y	MS note: "E. Durings lista: W s epi."
30604	23161	Scapula	Dex			outside	Y	
29098	23161	Tibia	Dex			outside	Y	
30649	23161	Tibia	Sin			outside	Y	In two pieces. Online catalog: "E. Durings lista om skenben vänster (2 poster): Dia (w), Prox part s epi."
30601	23161	Ulna	Sin			outside	Y	
25512	23161	Vert cervical				outside	Y	C3. Silica sand was sticking to the section of bone with the Find number written on it.
25513	23161	Vert cervical				outside	Y	C5
25514	23161	Vert cervical				outside	Y	C4. Silica sand was sticking to the section of bone with the Find number written on it.
25515	23161	Vert lumbar				outside	Y	L1
25516	23161	Vert lumbar				outside	Y	L2
25517		Vert lumbar				outside	Y	L5
25501	23161	Vert thoracic				outside	Y	T1
25502	23161	Vert thoracic				outside	Y	T3
25503	23161	Vert thoracic				outside	Y	T4
25504	23161	Vert thoracic				outside	Y	T5
25505	23161	Vert thoracic				outside	Y	T6
25506	23161	Vert thoracic				outside	Y	T7
25507	23161	Vert thoracic				outside	Y	T8
25508	23161	Vert thoracic				outside	Y	T9
25509	23161	Vert thoracic				outside	Y	T10
25510	23161	Vert thoracic				outside	Y	T11
25511		Vert thoracic				outside	Y	T12