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**Abstract**

We present an interim archaeological report on the shipwreck of the Danish-Norwegian flagship *Gribshunden*. Built in 1485, extensively employed by King Hans as his floating castle, and ultimately lost in June 1495 en route to Kalmar, the ship carried people and material selected to further the political goal of re-unifying the Nordic region. Three field campaigns led by Lund University and Blekinge Museum since 2019 have delivered a compelling assemblage of mundane artefacts and high-status items, some without precedent, and all conveying new information beyond the events of the ship's loss. Highlights include wooden casks, a milled tankard, a purse of silver coins, artillery and accoutrements, several crossbows and accessories, mail armour elements, and an assortment of exotic spices. Laboratory analyses of these and other finds allow new avenues of inquiry and provide deep insights into the late medieval world. This manuscript is derived from a conference presentation. It delivers an overview of recent scientific results, alerts readers to detailed studies already published, and offers waypoints to ongoing research threads.

**Keywords**


1 **Introduction**

The wreck of *Gribshunden* (or Gryffen) is among the most important maritime archaeological sites discovered in the Baltic Sea because of its construction style, unique service to its owner, and the circumstances of its loss. This combination of factors opens wide archaeological vistas into the late medieval world. A summary of selected findings from three years of investigations is presented here, along with notice of research now in progress. More detailed expositions on several of the topics can be found in the specific journal articles dedicated to them, cited herein. The topics sketched here connect individual artefacts from the wreck to broader questions concerning northern European politics, economics, technology, and society in the medieval to modern transition.

*Gribshunden* was the flagship of the Danish-Norwegian King Hans (lived 1455 to 1513), and he was aboard the vessel during its final voyage, en route to a political summit in Kalmar, Sweden, where he expected to be elected king of that country and thereby fulfil his ambition to unify the entire Nordic region. Interdisciplinary scientific investigation of this site and its artefacts is generating new knowledge about the late medieval world, highlighting the contributions made possible by intrusive maritime archaeological research to complement ship biography and hull reconstruction. Lund University, Blekinge Museum, and the Viking Ship Museum have formed a partnership to investigate *Gribshunden* with funding from the Swedish Research Council (Vetenskapsrådet) and other sources and bring to this study a new perspective. We note that while scholars sometimes aptly refer to early modern-era warships as ‘floating castles’ or ‘floating fortresses’, this description rarely extends beyond their military function (Runyan 1994, 50; Adams 2003, 97; Soop 2007; Eriksson 2020, 271). As will be shown below and in forthcoming manuscripts, *Gribshunden* was more than this.

We contend that King Hans employed his vessel as a mobile castle to knit together his sprawling realm. He frequently ranged throughout his kingdom, often necessarily by sea. His surviving letters place him in 50 different locations across 27 years. By comparison, Hans’
father, Christian 1, sent missives from 27 different locations over 29 years (Christensen 1912).1 Gribshunden was a travelling seat of government, serving all of the functions of a terrestrial redoubt: administrative, political, economic, social, cultural, and military (Foley & Hansson, forthcoming).2 Because King Hans employed the ship in this manner, and because the ship was lost while he sailed on it to what he considered a momentous diplomatic and political summit, the archaeological finds from this ship offer novel views into major historical problems. For instance, artefact studies summarized here, and detailed in greater depth in a series of published journal articles, touch on the monetary policy of late medieval Denmark and Norway: the political-economic quest for uniform shipping containers conforming to a decreed standard, cultural and economic interconnectedness in the first decade of true globalization, methods by which the elite maintained their status in a hierarchical society, and adoption of emerging technologies including gunpowder weapons at sea, which partly enabled European conquest of the Americas and Asia. It is not necessary to excavate this site completely to obtain this information: something less than 1% of the Gribshunden site's total volume has been disturbed over four recent field campaigns, but the historical insights gained are substantial.3

2 Historical Background and Initial Identification of the Wreck

Gribshunden was constructed in 1484–1485, probably in the Low Countries, from timber harvested in the Ardennes along the River Meuse watershed two years earlier (Hansson et al. 2021). Launched into the first generations of ‘carrack’ warships purpose-built to carry gunpowder weapons, its carvel hull and lapstrake superstructure construction fused traditions from the Mediterranean and northern Europe. Vessels like this served as the ships of exploration in the late 15th and early 16th centuries (Friel 1994, 86). This imposing vessel would have added to King Hans' stature, and his positive assessment of this innovative technology quickly led the king to bring Dutch shipbuilders to Denmark to fill out his fleet with similar carrvel ships (Christensen 2021, 54). Hans' preference for Dutch-built vessels is further demonstrated by his 22 December 1488 message to Henrik Krummedige, instructing him to arrange for a vessel to be built in Holland and sent to Copenhagen as soon as possible (Christensen 1912, 91, letter 128). Hans was an early adopter of the new vessel style that issued from yards beyond and subsequently within Denmark.

After an active ten-year career with voyages documented to Norway, England, and Gotland, in the summer of 1495, Gribshunden sank following an explosion while at anchor off Stora Ekön, Blekinge, in present-day Sweden. The destination of this final voyage was Kalmar, where the Swedish Council would join the Norwegian and Danish Councils to address King Hans' goal of reconstituting the Kalmar Union. The ship was loaded with all manner of prestigious things and people (Huitfeldt 1599, 116–117). King Hans intended the vessel itself, along with the material and personnel aboard, to impress all who saw it in Kalmar and demonstrate the power of his emerging nation-state.

The wreck site has been known to divers since the 1970s and was recognized as a medieval warship by the late 1990s. It was identified by name in 2002 (Einarsson & Wallbom 2002, 9; Sjöblom 2015, 33–44). Despite its obvious historical value, it has attracted curiously little archaeological attention until recently. The wreck is easily accessible in protected shallow water, with depths ranging from 8 meters at the bow to 9.5 m under the keel. The ship settled onto the sea bed with a starboard list of about 27 degrees. Its masts and rigging would have stood above the water, and the upper parts of the forecastle and sterncastle would have been above or close to the surface. Because of the wealth carried within the hull, some areas of the ship were salvaged immediately after the sinking (Zeeberg, forthcoming). Evidence of these activities is the deck beams displaced in the area of the sterncastle (Fig. 1). The stern is the likely locus of the explosion that sent the ship to the bottom, so some of the disorder may be from that event. Examination of the wreck and the photogrammetric model suggests that the port quarter is particularly disrupted. However, the lowest parts of the ship, especially along the starboard

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1 Surviving letters from the kings Hans and Christian (and others) are compiled in two volumes. This compilation includes 85 letters written by King Christian and 233 by King Hans. These data are an imperfect measure of the kings’ travels, but are suggestive of their mobility.

2 The author and Martin Hansson are thoroughly exploring this concept under a three-year grant registration #2022-02490 from Vetenskapsrådet (Swedish Research Council), ‘Floating castles: the built environment and social signalling in Medieval Scandinavia’.

3 The wreck site is approximately 50 × 30 × 1.5 m, for a total estimated site volume of 2250 cubic meters. Two excavation trenches measuring less than 27 m² in total were opened in 2019 and 2021. A 2006 test pit measured less than 1 m³.
side, appear to be largely intact and untouched. Sections of the bow seem to be collapsed but coherent, and even the disrupted aft section contains an archaeological bounty. As a result of all these factors, the site's potential for knowledge generation is immense. Not only was this one of the earliest carvel-built artillery-carrying warships sailing the Baltic, but on its final voyage, it carried the king himself and many of his possessions to a major political summit. For scholars interested in the late medieval period in the Baltic region, there is no other available site with a comparable pedigree or use history.
Recent Investigations: 2019–Ongoing

Following nearly two decades of only sporadic archaeological interventions on this site (Einarsson & Wallbom 2001; 2002; Einarsson & Gainsford 2007; Einarsson 2012; Rönby et al. 2015; Rönby 2017), in 2019 a team led by the author and colleagues from Blekinge Museum (joined in 2021 by Viking Ship Museum, Roskilde) developed a comprehensive archaeological strategy for the wreck’s investigation and raised funding to conduct the research. The first priority for the 2019 field investigation was collection of data to create an accurate and precise photogrammetric site model, from which an updated site plan and illustration were generated (Figs. 1a & 1b).4 Once this was accomplished, we opened a 2 × 6 m trench, which revealed extensive hull structure intact from the turn of the bilge and presumably the keel to above the first deck, and with upper castle structures collapsed outboard but coherent and well-preserved in the seafloor sediment (Adams & Rönby 2022, 3).5 Artefacts recovered from the 2019 trench represent several classes of objects. Martial items included wooden portions of a crossbow and an arquebus, a dagger handle, lead shot from the artillery, and latten (brass) elements of mail armour, including a very rare maker’s mark.6 Artefacts with elite social and economic connotations included a concreted purse of silver coins. Recovered foodways consisted of a wooden plate and a perfectly preserved wooden tankard. Abundant foodstuffs in the excavation trench joined similar provisions recovered in the 2006 field campaign: bones from cattle, pig, sheep, and several species of fish, casks of provisions presumed to have contained beer and other goods, and one cask containing a butchered sturgeon (Macheridis et al. 2023; Hansson et al. 2022). These limited excavations confirmed the great archaeological potential of the site and spurred continued activities.

Artefacts recovered in the stern section of the Gribshunden offer tangible connections to the elite in the late medieval period and glimpses into the life of that upper social echelon. A well-preserved tankard made from alder wood is one example. It was found close to a turned wooden plate, wedged between a woven basket and a small intact cask. These artefacts lay against the starboard interior of the hull amidst a jumble of firewood, atop a layer of flint ballast pebbles. Microscale Computer Tomography (µCT) confirms that the bottom portion of the tankard was milled from a single block, possibly using a spring pole lathe, with an integral carved handle extending from the shoulder of the body to the rim. The tankard is topped with a turned lid featuring a delicately carved wooden hinge. This handsome form was decorated. X-ray fluorescence (XRF) analysis of the tankard’s exterior surface shows it was originally coloured with a red pigment, likely mercury-based vermillion, and the drinking vessel carries an incised mark similar to a crown. The form of this tankard is unlike contemporary northern European ceramic and wooden drinking vessels, including other ‘red jugs’ in public collections in Sweden (Kjellberg & Käril 1965; Gawronski et al. 2012). It might have been an object unique to Gribshunden, or perhaps similar forms in wood or other materials have not survived.

When excavated, the tankard was upside-down with its cover in place. As the encapsulating sediment was removed, the tankard was quite noticeably positively buoyant, and the excavator had to tip out the gas contained within it to perform the recovery safely. This gas must have been produced as the beverage within the tankard degraded after the ship sank. These original contents remain unknown, but we investigated a sample taken from within the tankard with gas chromatography coupled with mass spectrometry (GC-MS) and Fourier transform infrared spectroscopy (FT-IR) and XRF. Results indicate the tankard was lined with resinous material from conifers, probably pine (Taube 2020). Even after conservation, the aroma of pine is detectable. One wonders if this pine resin might have flavoured the beverages consumed from the tankard: pine-flavoured beer? We 3D-modeled the artefact with structured light and used the resulting digital files to 3D print it in nylon, allowing researchers and the public to handle full-scale facsimiles (Fig. 2). The Gribshunden tankard’s survival demonstrates that it is a practical and robust drinking vessel, and well-suited

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4 This photogrammetric site plan is publicly accessible: https://models.darklab.lu.se/dig_excav/Gribshunden_IVS/Gribshunden IVS_21.html.
5 For a discussion of the excavation recording methods, see P. Derudas & B. Foley (this volume) ‘Managing data from maritime archaeology investigations: AIR at Gribshunden’.
6 A full study of the mail armour and maker’s mark is in preparation by the author, including multi-method trace element and structural analysis of the artefacts.
for shipboard use presumably by someone of higher stature than common crew. The remnants of the 525-year-old beverage held within it connect us directly with the person who might have dropped the tankard mid-quaff as the explosion below decks sealed the ship’s fate.

5 Prestige Artefacts: Silver Coins Offer Insight into Late Medieval Monetary Policy

Other artefacts recovered in the 2019 and 2021 campaigns are equally evocative and information-rich. Silver coins demonstrate not only the presence of elite passengers in the stern section but, more generally, the shift in the medieval European economy away from barter and in-kind payments toward specie-based purchasing. Textual evidence for this is found in the 1483 Halmstadrecess, or protocol, signed when King Hans became king of Norway. Before the Norwegian Council accepted Hans as their king, the leader, Archbishop Gaute Ivarsson, extracted a guarantee that Hans must establish mints in Oslo, Bergen, and Trondheim/Nidaros, and also allowing the church to issue its own coins. The reason for this condition was simple: there was a severe shortage of coins in Norway and increasingly throughout the Danish realm. The archbishop wished to collect rent payments in coinage rather than in kind (typically, buckets of butter). King Hans duly founded the mints in Norway (Lohne et al. 2011, passim). He also expanded the production of silver coins at existing Danish mints, particularly in Malmö. Further, he chartered new coin production centres in Ålborg and Copenhagen. This partially met the needs of clergy, noblemen, merchants, and the wealthier classes to access coinage for business, land transactions, and taxation purposes. However, another driver for the expansion of coin production was to pay for the mercenaries King Hans was...
forced to hire in response to the rising threat of war with Sweden (Gullbekk 2005, 8–10; Lohne et al. 2011, 38–42; Ingvardson et al. 2022, 5–7).

The silver coins from Gribshunden were concreted together into a few masses, arranged predominantly in stacks (Fig. 3). This suggests that the coins were carried in a purse or pouch, though the material of the purse itself deteriorated during five centuries of submersion. The concreted coins were too fragile to be separated mechanically, so instead, we relied on µCT to reveal their identities (Jahrehorn 2021, 15–18). We began with an investigation of the largest coin concretion, containing over 100 coins; a follow-on study of the smaller concretions is now underway.7 µCT data divulged that all the coins in the purse’s largest concretion originated in Danish territory, including some from Visby on Gotland and the new mints in Norway. The Norwegian coins from Gribshunden are the earliest known examples of the production of these new mints in Norway. The coins in the assemblage date to the reign of Hans (1481/83–1513), his father Christian I (1448–1481), and the Council of State (1481–1483). Some may even date to the reign of Christoffer 111 (1440–1448), suggesting that there was no recall and debasement of coinage after the coronation of a new Danish king (Ingvardson et al. 2022, 7).

Since the value of the coins in the purse was roughly equivalent to the monthly salary of a senior ship officer, perhaps it belonged to one of them. Just as likely, it could have belonged to a nobleman or a mercenary commander. That this sum of money was abandoned to sink with the ship speaks to the panic unleashed by the calamity.

6 Utilitarian Artefacts: Casks Offer Insight into Late Medieval Political Economy

Prestige artefacts always attract attention, but Gribshunden’s mundane artefacts also offer compelling information, particularly concerning the political economy of the late medieval world. The presence of many nearly complete casks in the 2019 trench and scores of disarticulated cask staves and heads on the surface of the wreck site piqued our interest (Fig. 4). We secured funding in 2020–2021 for a study focused on casks, proposing that for the Baltic and Northern European regions, cask studies could be comparable to the investigations of amphoras from ancient Mediterranean contexts. Shipping containers are an ancient technology: the first amphoras date to the Bronze Age, circa 1500 BCE. These ceramic transport jars were an invention critical to the development of long-distance trade and are information-rich artefacts in part because the styles of the amphoras, or rather their shape, were particular to their place and time of their manufacture. They allow

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7 This study is in preparation by the author, numismatic archaeologist Gitte Ingvardson, and Lund University µCT imaging expert Stephen Hall.
ready provenancing and dating and sometimes contain remnants of the goods transported in them. At a deeper level, a close examination of their volumetric standards allows insight into the politics of trade in their eras (Foley et al. 2009; 2012; Bevan 2014).

In medieval northern Europe, wooden shipping containers filled the role of amphoras. Casks are ubiquitous in Baltic shipwrecks but rarely receive much scholarly consideration. (Fawsitt 2010, 1; Ratchiffe 2012, 3–4). This is a lacuna that must be addressed by maritime archaeologists, particularly since cask studies from other places and periods have demonstrated the value of such inquiries (Staniforth 1987; Loewen 1999; 2007).

Combined with dendrochronology, casks offer insight into myriad historical problems. At the most basic level of resource utilization, they present hard data about the regional sourcing of timber products. With time series studies, they can demonstrate the depletion of forests through shifts in geographic patterns of use. Further, the volumetric standards (or lack thereof) apparent in casks track the efforts of various regions or entities to control aspects of trade and exchange. The imposition of volumetric standards is a key aspect of any era’s political economy.

As an example, 14th-century Hanseatic League merchants from Rostock involved in the Baltic herring trade settled on a standard barrel size. This barrel originally contained 830–840 herring, but this number fluctuated over time as herring diminished in size. However, the weight of the barrel and contents remained constant at approximately 117 kg. Rostock merchants attempted to impose this volumetric standard on herring shipped from the Scanian market, but achieved only mixed results; a variety of cask volumes continued in use throughout the late medieval period (Holm 2016, 15; Jahnke 2009, 38).

No comparable Nordic cask volume standard is known. We hypothesize that if a Danish volumetric standard for casks was employed during King Hans’ reign, the casks from Gribshunden would present the best opportunity to identify it.

Measurements from a statistically significant sample of cask components from the ship could provide the raw data necessary for this determination. During a two-day field activity in autumn 2020, we collected 72 disarticulated cask components from the 2019 excavation locus. In spring 2021, we opened a new excavation trench in the stern of the vessel and from it collected 48 components from four intact casks. Some of the staves in the overall population were broken, so their length could not be determined, but the distance between the ‘crozes’ (the groove cut into the interior of the staves near their ends, to receive the head) was preserved on a total of 49 staves. The croze length of this sample showed two distinct cask sizes. The first, represented perhaps by only one or two casks, was 42 cm. The second, representing all four intact casks and several disarticulated staves, averaged 65 cm. Combined with measurements of intact cask heads with average diameters of 43 cm, and taking into account the bulge in the middle of the cask, a possible Danish cask standard volume of slightly less than 100 litres emerges (Foley 2021, 15; 2022, 15; Hansson et al. 2022, 13). The Gribshunden cask study is only a first step. A larger sample size is necessary to confirm this as a Danish standard, and comparison to other contemporary casks would indicate if this standard was shared by other economic and political actors.

Another feature of the cask study directly relevant to maritime archaeology is the possibility of more narrowly dating unidentified wrecks. The average age of the casks of Gribshunden was two years or less. If casks’ lifespans were always so brief, then dendrochronology of cask components from wrecks could determine the date of the vessels’ losses more accurately than most other methods. There is a caveat: it is possible that casks for the king’s personal use were newly coopered for Gribshunden’s Kalmar voyage in the summer of 1495.
and this could skew the lifespan approximation for casks from this site (Hansson et al. 2022, 14).

7 Weaponry: Artillery as Transitional Enabling Technologies for Empire

Alongside the collection of cask components, the second in-water activity in autumn 2020 consisted of a site survey using Aquascan AQ1B metal detectors and with navigational tracking via the UWIS acoustic long baseline system. A catalyst for this exercise was our examination at Blekinge Museum of the nine wooden gun beds that were recovered in 2002. One of the gun beds (BLM 2831412) differed from the others in that it had no rebates carved to receive the strengthening bands typical of wrought iron gun barrels. We hypothesized that this gun may have been cast from either iron or bronze; of course, it might simply have been a different style of wrought iron gun. A ‘best fit’ overlay of the 2002 rough plan onto the photogrammetric model suggested that this gun bed was recovered from the port side, slightly aft of amidships. We hypothesized that it and other guns may be present on the site, awaiting discovery. During our November 2020 diving operations, several strong metal detector hits were registered, including two that were long and linear at the port quarter. We ground-truthed one of these targets by excavation in spring 2021 and revealed that it is a very large gun bed measuring 410 cm long. It is upside down in the sediment, and some of its wrought iron barrel is contained within it, hence the strong metal detection signal. Alongside this gun were two intact breech chambers concreted to large masses; one was recovered for study. Subsequently, during the 2022 field campaign, a second gun bed was identified two meters forward of this gun. It, too, was upside-down and contained some wrought iron gun barrel remnants. Both of these semi-intact guns were not further disturbed, as any exposure to the wrought iron could result in rapid deterioration. Discussions are ongoing regarding the desirability and expense of recovering, conserving, exhibiting, and curating these guns. For now, in situ recording and preservation suffice for scientific purposes (Fig. 5).

Gribshunden is a valuable case study for medieval artillery. The combination of gunpowder weapons and ships able to carry them was a key enabling technology for European domination of the planet after 1492. The artefacts from the wreck at Stora Ekön are the best examples of late fifteenth-century naval armament ‘as deployed’ on a medieval warship. One contemporary account claims that for a voyage to England in 1493, one of the royal ships carried 68 guns (Barfod 1990, 81). We may speculate that this refers to – or at least is representative of – Gribshunden. No doubt many of the ship’s guns were recovered during salvage operations immediately after it sank (Zeeberg, forthcoming), but the fourteen gun beds discovered so far offer an unrivalled view of this transitional period for gun-carrying warships. Gribshunden’s guns are all small-bore breech-loading swivel guns mounted on wooden beds. The exclusive use of these types of guns at sea was fleeting. By the middle of the 16th century, heavier guns with greater shot diameter were adopted alongside the smaller guns, as evidenced by the mixed armament of Mary Rose (Hildred 2011, passim). A full investigation of the gun beds, guns, and artillery accoutrements is a forthcoming publication by the author, in collaboration with medieval artillery expert Kay Smith.

The nine gun beds recovered from Gribshunden in 2002 were conserved and are now curated at Blekinge Museum. A tenth bed was recovered in 2021, and the eleventh in 2022 (Einarsson & Wallbom 2002, 4; Foley 2021, 7–8; 2022, 34; Björk 2023, 15). Lund University dendrochronologist and wood anatomy expert Hans

**FIGURE 5** Left to right: Diver navigation plot overlaid on site plan; Paolo Iglic looks over the large gun discovered in 2020/2021 with gun bed A237 repositioned next to it for comparison; preparing breech chamber with attached concretion for CT scanning at Lund University.

PHOTOS LEFT TO RIGHT: BRENDAN FOLEY, KLAS MALMBERG & CAROLINA LARSSON
Linderson examined the beds and determined that all were fashioned from oak (Fig. 6). Similarity in the tree ring patterns suggests that all the trees grew in the same general location. The beds were made from the third timbers of trees above the trunk at the base of the canopy. Core samples extracted for dendrochronology from four of the gun beds delivered between 14 and 33 year-rings. This is not sufficient to date and prove- nance the wood, but the gun beds recently discovered are larger. If investigated, they may provide the requisite number of rings for dendrochronology (Hansson & Linderson 2023, 1).

We 3D-modeled each of the recovered gun beds with structured light scanners. From those data, we created digital reconstructions of the gun barrels and breech chambers. We 3D printed the reconstructed battery along with other elements of the wreck at a 1:10 scale. These 3D prints are useful ‘objects to think with’, granting immediate comparison to the entire collection of artillery. Their small scale and tactility convey interpretative information in a way that even the actual objects cannot. The digital models are publicly shared through Lund University’s Digital Collection, and the printable files are available for download upon request, granting anyone interested the possibility of generating their own prints (Fig. 7).

8 2021 Campaign: Small Arms and Personal Items

The 2021 field campaign consisted of excavation in a trench just aft and slightly inboard of the 2019 locus. Two strong metal detection hits in that sector proved to be a badly oxidized iron anchor that was either the ship’s equipment or was lost during salvage operations and a modern steel spherical object. The trench contained the usual Gribshunden assortment of firewood.

8 The origin of this modern steel object is unknown. It was not deposited by the archaeological team that was present on the site periodically from 2001–2012, nor by the group who dived on the site in 2013, 2015, and 2016. It may be indicative of unsanctioned activity on the site (Lars Einarsson and Mikael Björk, pers. comm. 20 April 2023).
cask components, and semi-intact casks. Other utilitarian containers in the trench consisted of a woven basket and an intact wooden pail. Among numerous additional finds in the trench were personal items: a stave-built cup (crude in comparison to the tankard), a boxwood comb, and the remains of three leather shoes.

The trench also produced a number of crossbow fragments and some semi-intact crossbow tillers, along with accoutrements including a wooden quiver and several bolts, some of which retained their wooden fletching. Notable in the same context were two 330 x 110 mm birch bark panels, pressure-printed with an identical motif of mythical and wild beasts. These panels may have been decorative wrappings for the prod of a hunting crossbow or embellishments for some other undiscovered object (Fig. 8). The concentration of hand weapons suggests this area was a storage for small arms. In later Swedish naval vessels, small arms and gunner’s stores were kept in the stern (Eriksson 2017, 142). Apparently, that specific layout began with ships of Gribshunden’s generation. The Gribshunden handgun artefacts are still undergoing conservation, but the crossbow elements are fully conserved as of spring 2023. In-depth studies of these artefacts are now underway, with manuscripts in preparation.

The crossbow is a thoroughly medieval weapon in Europe, and its centuries-long use overlapped with the adoption of gunpowder weapons. The reason for its longevity was in part due to its accuracy and comparatively rapid rate of fire. For late 15th-century sharpshooting in hunting or war, crossbows were still far superior to gunpowder weapons. Records of 15th-century shooting tournaments in German cities document the effective range of both types of weapons. Musketeers shot at 160–170 cm targets that were 168–216 m downrange. Crossbowmen shot at targets 12 to 18 cm in diameter at ranges of 70 to 105 m (Kusudo, 1999, 66–72). It is possible to gauge this level of accuracy by comparing it to modern sharpshooting competitions. In the modern Olympic biathlon, the shooting range for small bore .22 calibre rifles is 50 m long, and the target diameter for the standing position is 11.5 cm. In competition pistol shooting in the USA, the National Match outdoor course of fire uses two targets and ranges: the slow fire range is 50 yards (46 m) and the black ‘bullseye’ section of the target is 20 cm (8 inches) diameter; the timed and rapid fire strings are shot at 23 m (25 yards) with a target bullseye of 14 cm (5.5 inches) (NRA Precision Pistol Rules 2020, 12–16). Skilled medieval crossbowmen were hitting similarly sized or smaller targets at greater ranges than today’s elite shooting sports participants. The accuracy of 15th-century crossbows would rival that of modern handguns. It is possible that while in Kalmar in the summer of 1495, the noblemen engaged in shooting competitions and hunting. Had they not been lost en route, the crossbows from Gribshunden likely would have served in both of these activities, in addition to their military roles aboard the warship.

**FIGURE 8** Top left to right: Birch bark panel, with unicorn element; Marie Jonsson displays a crossbow tiller with nut and horn elements intact, recovered in 2021 & one of the many bolts recovered from the same context (artefact #A125). Bottom: Top and side view of a well-preserved crossbow tiller with nut and other elements (artefact #A249).

Photos top left to right: Åke Nilsson, Staffan von Arbin, Gothenburg University & Paola Derudas; bottom: Max Jahrehorn
Distant Trade: Spices as Indicators of Globalization

Perhaps the most surprising finds yet from Gribshunden are a variety of spices and other exotic foods, most of which have no archaeological precedent (Fig. 9). The 2021 excavation revealed concentrations of saffron, ginger, clove, peppercorns, and almonds (Larsson & Foley 2023, Table 1). These expensive luxuries are tangible evidence of the economics, politics, culture, and social structure in the Nordic region during the late medieval period. The weeks-long summit in Kalmar would have included feasts for the senior members of the Danish, Norwegian, and Swedish Councils. Feasts were an integral part of treaty-making in the medieval period (Pape 2022, 53). King Hans' tables would have been laid with the large sturgeon recovered in 2019, meats and fish, and dishes seasoned with the most expensive and difficult-to-procure spices from the Far East (Macheridis et al. 2020, 8; Larsson & Foley 2023, 23). The presence of these spices on Gribshunden suggests that the Nordic region's social elite had a vibrant culinary culture of its own, rivaling that of other regions on the continent. The consumption of saffron in 1495 is particularly interesting given the modern Swedish taste for lussekatter and other saffron-infused baked goods. Perhaps this tradition started during the reign of King Hans.

Conclusion

The primary reason for King Hans' sojourn to Kalmar in the summer of 1495 was to convince the Swedish Council to elect him king of Sweden, thereby fulfilling his ambition to re-unify the entire Nordic region: a new Kalmar Union. The tactics Hans employed in his attempt to achieve this goal were many. The fleet delivering noblemen of the Norwegian and Danish Councils, along with their retinues, would have been an impressive site, particularly if Gribshunden had been at its centre. The men-at-arms conveyed by those ships would have signalled the military strength of King Hans' forces. The wealth available to the Danish crown, indicated by newly minted coins, might have swayed some of the lower Swedish nobility. Lavish meals featuring new tastes from the East would have scintillated the senses. Even the uniformity of the casks from which some provisions

![Figure 9](image1)
were doled out would have telegraphed the power of the Danish throne. However, in the actual event, King Hans must have been somewhat diminished, as his prize ship and some portion of his wealth lay mired in the sediments off Stora Ekön. Could this be one factor in the refusal of the Swedish delegation to accept Hans as king in the summer of 1495? Excavation and study of this wreck will continue, and the site is expected to offer an unceasing stream of connections to the past.

Acknowledgements


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