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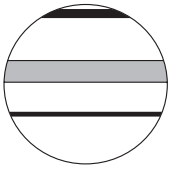

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Storms, ships, and shovels: A trans-Holocene history of the Gullåkra wetland

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Abstract

The Gullåkra wetland is located around 5 km south of the modern city of Lund and around 2.7 km east of the important Iron Age settlement of Uppåkra in Scania, southern Sweden. In the 1840s, a remarkable discovery was made in the wetland: a bronze lur dated to c. 1300 BCE, along with a boat and the bones of a large animal offering. As Bronze Age boats are exceedingly rare, this discovery makes the site highly significant for early Scandinavian maritime history. In 2023, excavations were carried out with the goal of relocating the boat discovered in the 19th century and assessing any additional remains within the wetland. Unfortunately, peat mining in the early 20th century drastically altered the landscape, obscuring its pre-industrial form and limiting further study. Although the boat could not be found, interdisciplinary methods, including dendrochronology, carbon dating, and sediment analysis, enabled the reconstruction of the wetland's trans-Holocene history. Evidence of significant human and natural events was identified spanning the Stone Age, Bronze Age, Iron Age, and early modern periods. The investigation underscores the enduring importance of wetlands as sites of human activity and ritual throughout prehistory. While the boat remains elusive, the Gullåkra wetland continues to demonstrate its potential for future discoveries relevant to the early history of southern Sweden. The study also highlights the value of interdisciplinary approaches in reconstructing long-term human and environmental histories.

Keywords

Bronze age, maritime archaeology, mesolithic, paleoecology, peatlands, wetlands

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Introduction

Peat producing wetlands (including rain-fed bogs and ground or surface water fed fens) are important locations on the landscape that have been centers for human activity across the Late Pleistocene and Holocene (Larsson, 2001; Menotti and O'Sullivan, 2012; Ramsey and Rosen, 2016). To different societies and at different times peatlands have been sources of foods, impediments to travel, centers of ritual activity, garbage dumps, sources of fuel, wilderness refuges, and parks (Corradini et al., 2023; Filipović et al., 2019; Groß et al., 2018; Hallgren, 2017; Koch, 1998; Koivisto, 2017). The anaerobiotic environments in peatlands provide excellent preservation of material objects, making them fantastic locations for archaeological investigations. Peatlands are often anthropomorphically disturbed environments, however, especially in regions where peat was collected for fuel in early modern times. Here we use a combination of interdisciplinary approaches to reconstruct the trans-Holecene history of the Gullåkra wetland (technically a fen, hereafter peatland), located in southern Sweden. Specifically, we evaluate the archaeology of an area of the peatland where an exciting find of a Bronze Age lur was made in the 19th century with the goal of determining if any archaeological evidence of this famous find might remain.

Gullåkra is located just north of the modern city of Staffanstorp and approximately 5 km south of the city of Lund, which has been an important religious and academic center since the Middle Ages (Figure 1). "Gull" is an old word for gold, and scholars have suggested that the peatland may have gotten its name either from the richness of the agricultural lands that surround it or from the finds of ancient offerings that have been found in the peatland's waters (Hårdh and Larsson, 2007: 95). The site is well known as an offering place for the nearby Iron Age settlement of Uppåkra, located just 2,7 km away. Several Iron Age finds, including a skull from a possible human sacrifice, have been previously found at Gullåkra (Fredengren, 2018; Stjernquist, 1998, 2001). Several earlier finds, including auroch bones (*Bos primigenius*), and stone and bronze objects have also come from the peatland (Baudou, 1960; Karsten, 1994; Liljegren, 1975; Moberg, 1954; Stjernquist, 2001).

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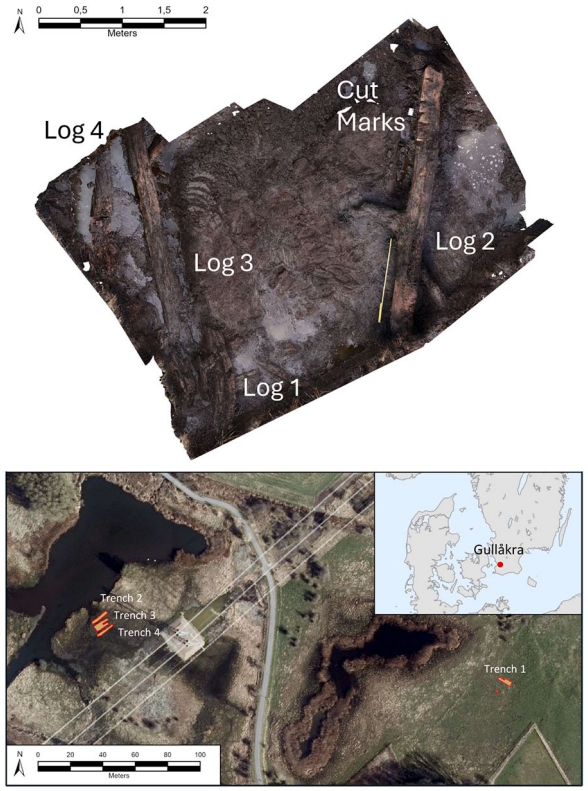

Figure 1. Photogrammetry model of trench 2 showing the location of the four logs discussed in the text. A map showing the location of each trench with respect to the surrounding landscape is provided in the bottom section of the figure. Note the cut marks on Log 1. Orthophoto copyright owned by Lantmäteriet.

Figure 2. The Gullåkra Lure, curated at the Historical Museum at Lund University. Image presented courtesy of the museum. Photo by Brendan Foley.

The most remarkable discovery at Gullåkra peatland is a bronze lur, one of only 12 such artifacts found in Sweden. In comparison, Denmark has yielded as many as 37, with additional finds reported from northern Germany and Norway (Broholm, 1965; Sognnes, 2017; Figure 2). While most bronze lurs from Bronze Age Scandinavia date to the Late Bronze Age, 1100–500 BCE, only a few can be securely attributed to the Early Bronze Age, 1700–1100 BCE (Broholm, 1965). Nevertheless, representations of lurs appear in Early Bronze Age rock art, particularly in depictions of boats, as well as on a slab from the famous Kivik cairn, also dated to the Early Bronze Age (Ling, 2014).

The lur is typologically dated to 1300 BCE (Broholm, 1965) and was found in combination with peat digging sometime between 1840 and 1848. Reports of the excavation describe it as being found inside of a boat together with the remains of a large animal tentatively identified as a horse skeleton (Bruzelius, 1860; Engström, 1927). While no other written information is available, the combination of the lur and the horse sacrifice strongly suggests that the boat in which they were found may have been a Hjortspring style plank-built boat. If so, it would be the only example of a Bronze Age sewn plank boat ever found in Scandinavia. While not recognized by its excavators in the 1840s, the Gullåkra boat may have been one of the most important archaeological discoveries ever made for the early maritime history of Scandinavia. Due to the importance of the find we decided to return to the Gullåkra peatland in 2023 to determine if any remnants of this boat could be found.

Methods and results

Fieldwork at the Gullåkra peatland was conducted in two phases, including a ground penetrating radar (Malå MIRA HDR 22-channel 500 MHz GPR), metal detecting, and foot survey conducted in September of 2022 which covered around 1.5 hectares of the peatland. Based on the results of this survey, we decided to excavate one large subsurface anomaly on the east side of the Gullåkra peatland as well as a targeted area in the middle of the peatland which would have been near middle of the northern shore of the peatland during prehistoric times (Figure 1). The targeted excavation area in the middle of the peatland overlapped with the registered find location for the bronze lur (L1989:2035). We returned to excavate these areas in September of 2023. Excavation was carried out using an 8.5 ton backhoe to expose geological and cultural layers and also by hand where needed. The backhoe had a 1.5 meter-wide bucket and excavated in 1–2 cm layers. A total of four trenches were excavated, three in the middle of the peatland and a fourth near the GPR anomaly. The GPR anomaly in trench 1 was quickly determined to be a natural geological feature and excavations there were terminated. In the other three trenches we found peat layers extending to a depth of around 130 cm (Figure 3). Most of our investigations were focused on trench 2, in which we found two flint nodules and a log feature with anthropogenic cut marks (Figure 4; see discussion).

Core samples were taken using a Russian corer in the areas surrounding trench 2. From these soundings, a main sampling point was selected for detailed analysis. From this core stratigraphic layers were identified and small samples (0.05–0.10 l) from seven different levels were sieved (mesh size 0.4 mm) and analyzed under a microscope for macrofossil and other identifiable content. Macrofossils from six samples were then selected for ^{14}C dating. To obtain reliable dates and to avoid a reservoir effect, only macrofossils of land-living plants that obtain their carbon dioxide directly from the atmosphere were dated (Figure 3; Supplemental Appendix A). The majority of the ^{14}C dates from this core sample ranged from 7600 to 6400 BCE, with the uppermost dates (from a depth of 25–30 cm) dating to between 4344 and 4082 BCE (Figure 3). This indicates that the only intact peat and sediment layers from the peatland dated to the Mesolithic, and that Neolithic and Bronze Age peat layers had been removed by early modern peat miners.

Analysis of the core samples showed that the deepest layers of greenish muddy clay were deposited in a lake with open water during the Early Mesolithic. These results are consistent with previous investigations at Vesum's Peatland, located around 1 km to the east, suggesting that the entire region was united by a large shallow open water lake during the Early Mesolithic (Stark and Miaris Sundberg, 2017). The muddy clay transitions to more organic lake mud (gyttja) at a depth of around 214 cm, indicative

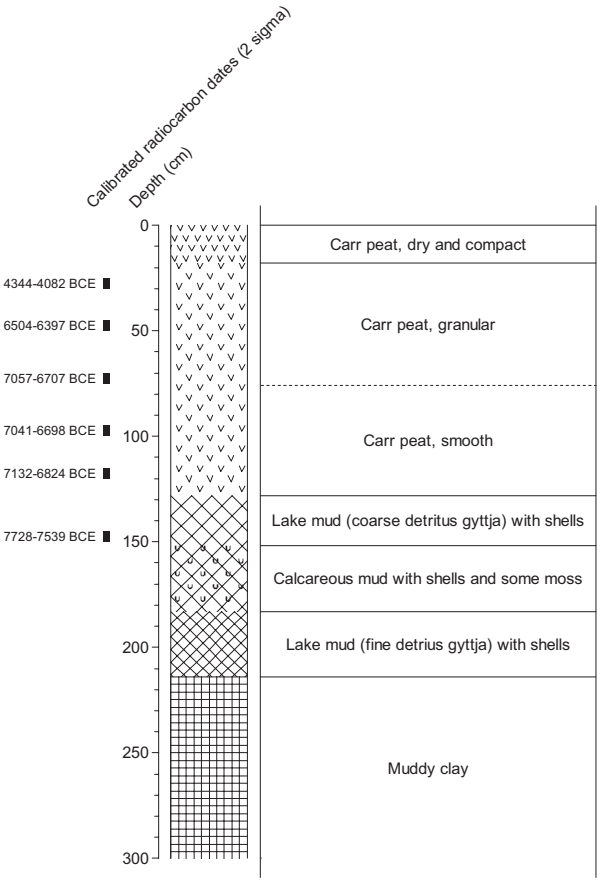

Figure 3. Core diagram.

Figure 4. In situ photo of log with cut marks found in trench 2.

of algal production in an increasingly warm climate. The mud in this layer was partly calcareous and contained preserved shells of species including the faucet snail (*Bithynia tentaculata*), the European valve snail (*Valvata piscinalis*), the wandering pond snail (*Ampullaceana balthica*), the margined ram's horn (*Planorbis planorbis*) and the fingernail clam (*Sphaeriidae*; Supplemental Appendix B). There were also seeds of aquatic plants, such as white water lily (*Nymphaea alba*), rigid hornwort (*Ceratophyllum demersum*) and spiny naiad (*Najas marina*). A perch scale (*Perca fluviatilis*) and a throat tooth, probably from a carp (*Cyprinidae*), were also noted in this layer. Above these mud layers we see a gradual transition from lake to peat carr, which was likely complete after around 7200 BCE. Abundant seeds from alder trees (*Alnus glutinosa*) indicate that this was an alder carr, which is confirmed by the analysis of wood logs discussed below. Seeds from birch (Betula sp.), rowan (*Sorbus aucuparia*), and alder buckthorn (*Frangula alnus*) were also noted. In the lower part of the carr peat, there were also occasional seeds of white waterlily, which shows that the marsh at least initially had areas of open water.

In the lowest layers of the carr peat, corresponding to the time when the lake was developing into an alder marsh, we identified a feature comprised of four parallel alder logs all oriented in a northwest by southeast direction (Figure 1). In between these logs two flint nodules were also found. One of these logs had a series of broad and deep cutmarks on it (Figure 4). The combination of the logs' parallel orientation in combination with the anthropomorphic cutmarks led us to speculate during excavation that this feature might have corresponded to a neolithic trackway. Further investigation of the cutmarks in the laboratory, however, showed that they were made by forceful impacts by a wide metal tool, likely a broad-headed shovel (Supplemental Appendix C, D). Crucially, these cutmarks are considerably wider than would be expected for a peat digger's spade (see discussion below). C14 dating of the four alder logs returned nearly identical dates of between 7895 ± 55 and 7960 ± 50 BP (between circa 7050 and 6640 BCE; Supplemental Appendix A). The relatively wide calibrated intervals for these ^{14}C dates may be explained by a wide plateau on the radiocarbon calibration curve at this time. Therefore, an attempt was made to narrow down the calibrated age for the log containing cut marks using ^{14}C "wiggle matching," which yielded a felling year between 6947 and 6649 BCE. The close matching of these dates suggests the possibility that these trees were felled during the same event (see discussion below). The interpretation that these trees lived and died at the same time was confirmed by matching tree ring sequences on three of the logs (the fourth log was not analyzed for dendrochronology). Unfortunately, an exact dendrochronological date was not able to be determined due to the age and species of the wood.

As a part of this project we also subjected the Bronze Lur discovered in the peatland to x-ray fluorescence analysis to determine its tin and copper content. We used a Niton XL5PLUS handheld pXRF to take this measurement. The results show that the lur is composed of 96% copper and 4% tin, a significantly higher copper-to-tin ratio compared to lurs from later periods. This result is consistent with the Early Bronze Age typological dating of the lur.

Discussion

Based on the results presented above we can begin to piece together the trans-Holocene history of the Gullåkra peatland. Here we present our interpretation of the sequence of events that transpired at Gullåkra based on our investigations.

Stone Age

Based on our investigations, we can start to build a narrative for the Gullåkra peatland at the dawn of the seventh millenium BCE, when the peatland was in the process of transitioning from an open lake to an alder carr. The extent of the lake is not known, but it probably included what is now the Vesum Peatland to the east. In the lake there were limnic plants like water lily, rigid hornwort and spiny naiads, limnic molluscs, and fishes like perch and carp. The succeeding carr phase was characterized by alder woodland, possibly with some birch, and wetland plants, like marsh-marigold, nodding bur-marigold and sedges. At some point during the first few centuries of the seventh millenium we suspect a large northwesterly storm swept through the region, knocking down many trees in the same direction, including the four alder trees that we found in trench 2. Our suggestion that a storm knocked down these trees is based on the fact that all the trees fell in the same over a short span of time. Another possibility could be that multiple northwesterly storms swept through the region over the span of several years, creating a similar pattern. Future research will be needed to confirm if similar patterns can be identified in other wetlands in the region. Trees in the Gullåkra peatland during this period had recently been thinned, either due to human activity or previous storms, as indicated by new growth shoots found on the tree trunks. The presence of these shoots further suggests that the trees were felled within 2 years of the forest being thinned, likely after or during the summer or autumn. At some point either before or after this storm, stone age people used the peatland, most likely for fishing. Two flint nodules, possibly used as fishing weights, were lost in the peatland at this time. Several Stone Age sites have been recorded nearby, including two settlements and one dolmen (Stjernquist, 2001).

Bronze Age and Iron Age

The peatland took on a special significance during the Bronze Age, when it was used as an offering site. Our investigation determined that most of the Bronze and Iron Age peat layers in the vicinity of our excavation trenches were removed in modern and early modern times by peat mining and other human activity. The most famous Bronze Age offering made in the peatland is the lur and boat find discussed above. A pre-Roman Iron Age bronze neck ring was also found in the vicinity of the lur. Previous work has identified numerous potential offerings in the peatland from the Iron Age, including iron spearheads, a human skull, and a sword, and an axe (Baudou, 1960; Fredengren, 2018: 5; Moberg, 1954; Stjernquist, 2001). During the Iron Age, the peatland's proximity to the major settlement of Uppåkra ensured that it continued to be used as an offering location. While we did not identify any new offerings in our excavations, the broad-headed shovel marks on the Early Mesolithic logs suggest that trench 2 may have been the site of a previous excavation for the retrieval of ancient objects.

Medieval and early modern period

As Scania became increasingly Christian and the center of political power shifted from Uppåkra to Lund, the ritual significance of the Gullåkra peatland decreased. Items continued to be lost to the peatland, however, and the surrounding region continued to be used for agriculture during the Medieval period (Hårdh and Larsson, 2007: 88–89). During the Early Modern period increasing amounts of peat started to be dug from the peatland to heat homes in the surrounding area. It was while digging for peat in the 1840s that the boat and bronze lur were found. Peat digging continued during the 20th century and intensified due to fuel shortages during World War 2, contributing to a massive transformation of the landscape. During the postwar period the peatland was partially drained and turned into a wildlife park, taking the form that we see it in today.

Possible location of the bronze lur and Bronze Age boat find

The metal cut marks on the Early Mesolithic logs found at the bottom of the peat layer present potential clues for evaluating the location of the Bronze Age lur and boat find. The condition of the interior surface of the cuts suggests that they are at least several decades old, if not considerably older. Furthermore, the cuts were made with a broad headed metal tool striking with considerable force. This makes it unlikely that the cuts were made with peat spades, which typically use narrow blades. The tool that would be most consistent with the cut marks would either be a broad headed axe or a broad headed shovel. This strongly suggests that someone was digging in the vicinity of trench 2 at some point in historic times, possibly in search of ancient offerings. The fact that we could not discern evidence of this prior digging during our excavations further suggests that whoever left the cut marks was not digging in recent history.

One possibility is that the cut marks were left in the 1840s during the discovery of the Bronze Lur. While the lur was found during peat digging it is likely that after its discovery other local people would have been recruited to search for additional offerings in the same area using whatever tools available, including broad headed shovels and axes. The lur is recorded as having been discovered at a depth of 3 alnar (circa 1.8 m). This is deeper than the current depth of the peat layer, but it must be considered that large amounts of peat were removed from the peatland during the 20th century, lowering the present surface level. It is possible that the finders of the lur would have dug to the bottom of the existing peat layer in search of more treasures, stopping when they hit the layer of alder logs deposited some 9000 years earlier. If this was the case it is likely that they would have excavated and discarded the entirety of the Bronze Age boat, not knowing or recognizing its scientific significance. While this scenario would explain the presence of the cut marks on the Early Mesolithic logs, it is a difficult hypothesis to prove. Unfortunately, we found no artifacts associated either with peat digging or any other historic activity in our trenches that could have corroborated such a possibility.

Conclusions

The Gullåkra peatland has been an important location for human activity throughout the Holocene. Our new investigations of the peatland have allowed us to piece together a history for part of the peatland, including a storm that caused a large number of trees to simultaneously fall when the peatland was forming as an alder marsh, to the ritual offering of a Bronze Lur and boat, to the later recovery of the lur during the 19th century. Our results show the strength of interdisciplinary approaches to uncovering the stories told by ancient wetlands and showcase the importance of investigating peatlands as critical places for prehistoric activity. While the full story of the deposition of the Gullåkra lur may never be known, we have also presented an interpretation of the possible location of the lur offering based on the current evidence available to us. Hopefully future investigations will continue to piece together the history of the Gullåkra peatland.

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Author contributions

Mikael Fauvelle: Conceptualization; Formal analysis; Funding acquisition; Investigation; Methodology; Writing - original draft; Writing - review & editing
Johan Ling: Conceptualization; Funding acquisition; Investigation; Methodology; Project administration; Writing - original draft; Writing - review & editing
Magnus Artursson: Investigation; Methodology; Project administration; Writing - original draft; Writing - review & editing
Per Lagerås: Formal analysis; Investigation; Methodology; Writing - original draft; Writing - review & editing
Richard Potter: Investigation; Visualization; Writing - review & editing
Hans Linderson: Formal analysis; Methodology; Writing - review & editing
Mats Rundgren: Formal analysis; Methodology; Writing - review & editing
Danilo Campanaro: Formal analysis; Software; Visualization; Writing - review & editing
Paulina Blaesild: Formal analysis; Investigation; Methodology; Writing - review & editing
Staffan von Arbin: Investigation; Methodology; Writing - review & editing
Anne Birgitte Nielsen: Formal analysis; Methodology; Writing - review & editing
Christian Horn: Conceptualization; Funding acquisition; Investigation; Project administration; Writing - review & editing

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Ethical approval and informed consent statements

None

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Data availability statement

Data used in preparing this research has been made available through the supplementary data included with the paper.

Supplemental Material

Supplemental material for this article is available online.

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