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Grain, greed and green wood: the late sixteenth-century Scheurrak SO1 shipwreck and the use of double hull planking in the early modern Netherlands

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Citation

Lettany, H. (2026, October 1). *Grain, greed and green wood: the late sixteenth-century Scheurrak SO1 shipwreck and the use of double hull planking in the early modern Netherlands*. Retrieved from <https://hdl.handle.net/1887/4310475>

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Summary

This dissertation focuses on the construction of the Dutch late sixteenth-century merchant ship known as Scheurrak SO1, and its peculiar feature of double hull planking. For the first time, all available archaeological data related to the ship's construction is brought together and analytically assessed. The findings are compared with never-before-studied late sixteenth-century shipbuilding contracts. The interdisciplinary approach challenges and ultimately falsifies long-standing hypotheses about Scheurrak SO1's construction, leading to a new, integrated narrative for the application of double hull planking in the early modern Netherlands. The study demonstrates that, in the late sixteenth-century Netherlands, merchant ships were not built with two layers of hull planking. Instead, the application of a second layer of hull planking only occurred as part of specific types of hull conversion. These include the lengthening of a hull to increase capacity, or the doubling of a hull to improve balance. The assessment of Scheurrak SO1 demonstrates that this ship was built in 1590 and was rebuilt again shortly after, probably around 1591 already, to resolve poor sailing qualities and stability problems. Its cargo of grain, a hull design shaped by greed, or the use of green wood in the construction all may have contributed to these problems. The modifications required to mitigate these problems may in turn have inspired the development of a new type of cargo carrier around the mid-1590s, known as the fluyt ship. As such, the Scheurrak SO1 shipwreck provides a unique insight into adaptive ship design in the changing maritime cultural landscape of the late sixteenth-century Netherlands.

Discovery and excavation

The Scheurrak SO1 shipwreck was found in 1984 in the Dutch part of the Wadden Sea, south-east of the island of Texel, and was named after its location in the Scheurrak tidal channel near buoy SO1. The site played a pioneering role in the emergent field of underwater archaeology in the Netherlands. It was one of the first and, to this day, one of the longest running underwater excavation projects in this country. Substantial parts of Scheurrak SO1's hull were preserved, including its near complete bottom and starboard side. Over the period 1987–1997, the construction was recorded *in situ* by means of trilateration. Loose finds, belonging to the ship's crew, inventory, cargo or rigging, were brought to land. This assemblage demonstrated that the ship was sailed by a Dutch crew and had carried a main cargo of grain, presumably destined for Italy, before it sank in the early 1590s. Over time it became a popular hypothesis that Scheurrak SO1 was one of the ships that sank on Christmas Eve 1593. That night, a severe storm hit the Texel roads and over 40 ships sank or were damaged. Many of these ships were freighting grain to Italy, where crop failure had caused an acute need for foodstuffs. As a consequence, freighters could make exceptional profits by transporting grain to Italy in the early 1590s. Presumably, Scheurrak SO1 was one of them.

Dutch flush and double Dutch

A notable feature of Scheurrak SO1's hull construction was that it featured two layers of hull planking. At the time of excavation, this observation was interpreted in the light of the so-called "Dutch flush" discourse. This discourse had become highly popular among nautical archaeologists from the early 1980s onwards. "Dutch flush" refers to the specific building sequence used to construct flush-planked hulls in the north of Holland during the early modern period. Based upon historical and iconographical evidence, it became clear that Dutch shipbuilders in this specific region built flush-planked hulls by first assembling the bottom planking. Only afterwards, this empty shell was reinforced with frame timbers. This building sequence deviated from contemporary European shipbuilding traditions in France or England, where frames were erected prior to adding any hull planking. In fact, it was the development of the Dutch flush discourse which acted as a catalyst for the excavation and recording of Scheurrak SO1's in the first place.

Maritime archaeologist Thijs Maarleveld, the first official underwater archaeologist in the Netherlands and the initiator of the Scheurrak SO1 excavation, soon associated the feature of double hull planking with the peculiarities of Dutch flush shipbuilding. He suggested that, when maritime expansion in the late sixteenth-century required larger seagoing ships, shipbuilders would strengthen what in their building conception was most important: the hull planking. Based upon the analysis of a 1x2-meter section of Scheurrak SO1's bottom, he concluded that the ship had initially been built with two layers of hull planking, and he referred to it as a "double Dutch" solution. Maarleveld believed that "double Dutch" shipbuilding reflected a brief, transitional phase in Dutch shipbuilding history, limited to the late sixteenth and early seventeenth centuries.

Although Maarleveld's findings were only based upon the analysis of a small section of Scheurrak SO1's hull, his preliminary interpretation became a dominant narrative within the field of nautical archaeology. As a consequence, alternative hypotheses for the interpretation of double hull planking have rarely been explored. Over time, some shipwreck finds were even attributed a presumed Dutch origin merely based upon the presence of double hull planking. In more recent years, though, double planked hulls dating to the late seventeenth and even eighteenth centuries have been found, challenging Maarleveld's hypothesis.

Lengthening and furring

For a long time, scholarly consensus held that no explicit explanation for the practice of double hull planking could be found in historical sources. Therefore, interpretations were deduced from the archaeological record only. Reassessment of those historical writings which introduced the Dutch flush discourse in the first place, however, reveals that these writings in fact do address the practice of double hull planking. In combination with the analysis of late-sixteenth century shipbuilding contracts, it becomes clear that merchant ships in this period were never built with two layers of hull planking, regardless of their size or proportions. A second layer of hull planking was only applied as part of the conversion of a hull. Two main reasons could be identified: the lengthening of a hull to increase its capacity, or the furring of a hull to improve its balance.

Lengthening refers to the practice of adding a new section to an existing hull. This results in a longer ship with increased capacity. Other than a single archaeological example, knowledge about the practicalities of lengthening was limited up to now. Scholars believed that lengthening was a practice limited to the late sixteenth and early seventeenth centuries. The main understanding was that a hull would be cut in half and pulled apart, after which a second layer of hull planking was applied. This resulted in a ship with double hull planking in the fore and aft sections, yet with a single layer of hull planking in the middle. This dissertation disputes some of these former insights. The earliest references to the practice of lengthening could be traced back to 1512 and presumably the practice goes back in time even further. Evidence is brought forward that, at least in the late sixteenth century, lengthening often resulted in a double layer of hull planking over the full extent of the hull. This must have been enabled by the gradual shift from lapstrake construction to Dutch flush shipbuilding throughout the sixteenth century. Suddenly, it became possible to integrate planking strakes into the original construction, allowing for new, innovative lengthening strategies. When, around 1590, tremendous profits could be made by

freighting grain to Italy, the number of lengthened vessels increased considerably. Simultaneously, the practice introduced new (single-planked) ships which were also built to the innovative proportions of lengthened vessels.

A second explanation found in historical sources for the application of double hull planking, was to mitigate stability problems. This practice must have been somewhat similar to what was known as “furring” in England. In the north of Holland, the Dutch manner of furring was referred to as “*verdubbelen*” or “doubling”. It was achieved by applying a second layer of hull planking from the keel upwards over either the entire extent of the hull or part of it. Presumably, this mitigation strategy was not very effective, as additional hull planking could also render a boat more buoyant. In the south of Holland, a practice known as “adding a *buik*” served a similar purpose and may have been more successful. In this case, the conversion focused on increasing the ship’s beam specifically, for which additional hull planking was mainly added to the ship’s sides. Possibly, the latter method superseded the less effective practice of “*verdubbelen*” over time.

Many reasons could cause a ship to be unstable, such as insufficient or poorly distributed ballast, flawed design or abundant topweight. Historical sources also refer explicitly to the use of green wood for ship construction in the Netherlands, as a reason for stability problems. When such unseasoned timber dries, it can tear or even change weight, which in turn could lead to stability problems. In such a case, the respective ship required furring or other modifications and repairs. It is notable that historical sources also explicitly associate the transport of grain with stability problems. With its low angle of repose, grain will easily move when the hold is not fully loaded. This can lead to a shifting center of gravity, known as the free surface effect, and even lead to capsizing.

The Scheurrak SO1 construction

To understand how Scheurrak SO1’s construction may relate to the practices of lengthening or furring, it was subjected to an analytical assessment. First, all individual construction features were analyzed and discussed. Based upon this information, the main dimensions of the ship were reconstructed, and different modifications of the original hull were identified. These findings were compared to a dataset of 61 late sixteenth-century shipbuilding contracts from the city of Enkhuizen (north of Holland, the Netherlands), which allowed for interpreting Scheurrak SO1’s construction features in a wider context of contemporary shipbuilding practices.

Based upon dendrochronological analysis, Scheurrak SO1 was built in 1590, or shortly after. Its hull had a length of *ca.* 29.1 m, a maximum width of *ca.* 7.62 m and a depth in the hold of *ca.* 3.34 m. Given these dimensions, Scheurrak SO1 must have been among the longest vessels of its time. Yet, its length-to-width ratio of 3.8:1 also demonstrates that it was more slender than most contemporary ships, which were generally situated in the 3:1 to 3.5:1 range. Scheurrak SO1 could not be positively identified as a lengthened vessel, yet its proportions suggest that its construction was inspired by the dimensions of contemporary lengthened ships. As such, Scheurrak SO1 can be considered to have been built to a relatively innovative design. Contemporary parallels suggest that the ship may have had a capacity of 135–145 last.

Not long after Scheurrak SO1’s hull was completed, the vessel underwent multiple modifications during a second building phase. Dendrochronological data suggest that these modifications occurred as early as 1591 or shortly thereafter. In the bow, a gripe was worked into the original stem and keel. At the stern, the original gudgeons were removed, and a false sternpost was installed together with new gudgeons. Afterwards, a second layer of hull planking was applied. Inside the hull, the mast step was moved backwards and presumably eleven futtock riders were installed, as such a feature was uncommon in newly built merchant ships. The lower deck must have been temporarily removed to install these riders, and possibly the upper deck was altered to some extent too. In addition, several repairs could be observed, including graving pieces and caulked tears, yet they could not be attributed to a specific building phase.

Grain, greed and green wood

The analysis of Scheurrak SO1 falsifies the former “double Dutch” narrative and confirms, as historical sources already indicated, that merchant ships in the late sixteenth-century Netherlands were not built with two layers of hull planking. Instead, Scheurrak SO1’s second layer of hull planking was the result of a later conversion. The question arises now as to why this was done. It is notable that Scheurrak SO1’s initial construction coincides with the start of the lucrative Dutch grain trade to Italy, known as the *Straatvaart*. Especially in the first half of the 1590s, exceptional profits could be made by freighting grain to Italy. This was probably the reason why Scheurrak SO1 was built according to the new and innovative proportions of lengthened vessels, as the increased capacity of its design could lead to considerable profits. Calculations demonstrate that the expenses of building a ship of Scheurrak SO1’s dimensions could easily be covered by a single voyage to Italy in these years. This market opportunity must have been an important incentive to build ships of increased capacity in this period.

Yet, Scheurrak SO1’s conversion also suggests that building ships to these new proportions was somewhat of a trial-and-error process, as the hull was subject to modifications soon after it was first built. The applied conversion strategies reveal that Scheurrak SO1 initially suffered from poor sailing qualities. Adding a gripe and moving the mast step can both be associated with mitigating excessive lee helm. This suggests that Scheurrak SO1 initially had the tendency to turn away from the wind. The application of a second layer of hull planking indicates that it also suffered from stability problems. The fact that the hull was converted soon after its initial construction supports this interpretation. Historical sources mention that profit and greed were considered important reasons for poor ship design and stability problems. As ships were built with profit and not navigability in mind, more than once a vessel had to return home before reaching its destination, only because it did not have proper balance. Scheurrak SO1’s cargo of grain also made it susceptible to stability problems. It is notable that many of the ships that sank on Christmas Eve 1593, carried a cargo of grain but were not loaded to their full capacity. This could cause a free surface effect, which would be especially dangerous for a ship with poor stability like Scheurrak SO1. The caulked tears observed in Scheurrak SO1 may indicate that it (partly) was built with green wood, which also may have affected its stability.

Which of these factors – grain, greed or green wood – caused Scheurrak SO1 to have poor sailing qualities cannot be conclusively determined. Possibly, it was a combination of all three, as all are relevant to the context in which Scheurrak SO1 was built and operated. What we do know, though, is that not long after the storm of Christmas Eve 1593, a new type of ship was introduced in the Netherlands. This merchant vessel had a distinct length-to-width ratio of 4:1 and could be recognized by its strong tumblehome. Tumblehome refers to the inward inclination of the hull’s sides above its widest beam. This new type, known as the *fluyt*, seems to have overcome the need to add extra hull planking for stability reasons, simply by making the inflated sides inherent to its design. The *fluyt* would become instrumental in Dutch maritime trade in the seventeenth century and is often credited with contributing to Dutch commercial success in this period. It would appear that, over less than a decade, the market opportunities caused by the *Straatvaart* resulted in a new type of ship with innovative proportions, increased capacity, and proper stability. Scheurrak SO1 and its remarkable feature of double hull planking can be considered one small piece of the puzzle reflecting these larger changes in the late sixteenth-century shipbuilding industry.