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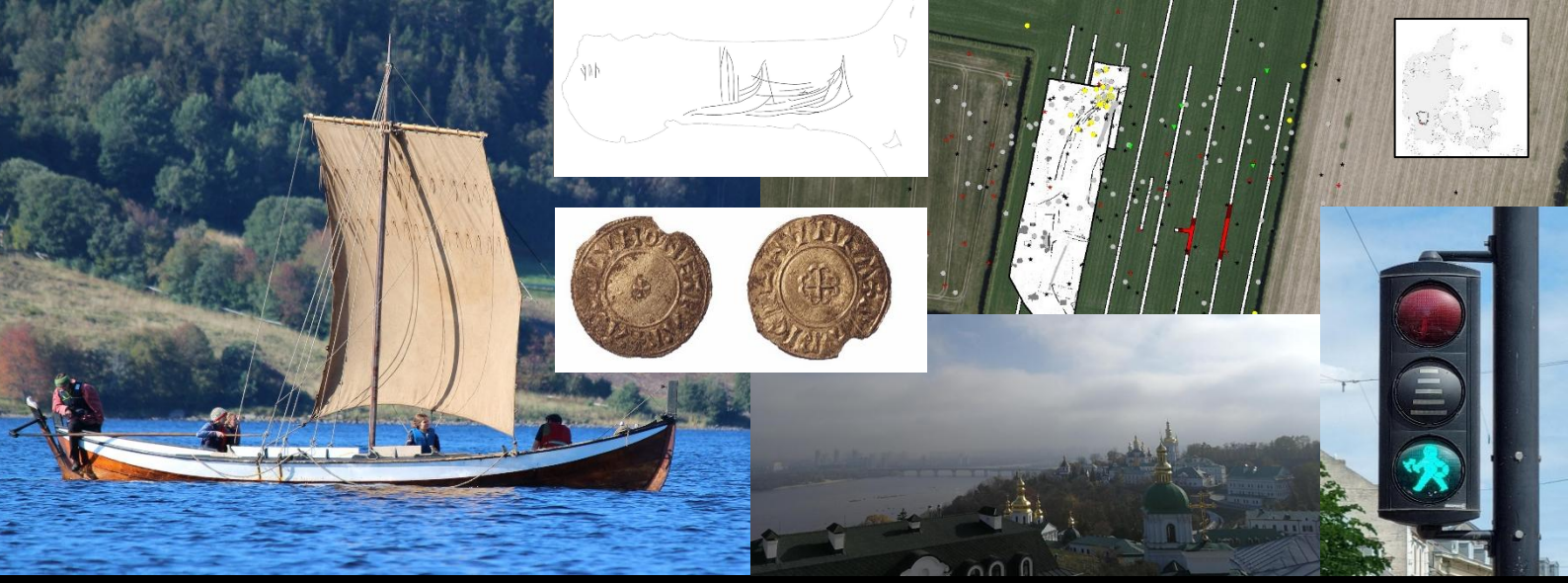
Published in:
Travelling Viking Age

2026

Document Version:
Publisher's PDF, also known as Version of record



TRAVELLING VIKING AGE

40th INTERDISCIPLINARY VIKING SYMPOSIUM

Edited by Dorthe Dangvard Pedersen & Jesper Hansen

Museum Odense and University Press of Southern Denmark

TRAVELLING VIKING AGE
40th INTERDISCIPLINARY VIKING SYMPOSIUM
in Odense, May 3rd, 2023

Published by:
Research Center Centrum
Museum Odense
University Press of Southern Denmark

ISBN 978-87-90464-39-4
2026

Scientific editors: Dorthe Dangvard Pedersen & Jesper Hansen
Graphical design: Museum Odense, Dorthe Dangvard Pedersen

Distributed by:
Museum Odense
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DK-5000 Odense C
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www.museumodense.dk

University Press of Southern Denmark
Campusvej 55
DK-5230 Odense M
press@forlag.sdu.dk
www.universitypress.dk

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Proceedings of the
40th INTERDISCIPLINARY VIKING SYMPOSIUM
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Kulturhistoriske studier i centralitet
Archaeological & Historical Studies in Centrality,
vol. 11, 2026

Research Centre Centrum
Museum Odense
Syddansk Universitetsforlag/University Press of Southern Denmark

Content

Maritime Mindscapes: using experimental archaeology to reconstruct Viking Age seafaring routes

Greer Jarrett

Fig. 1. The Norðvegr. The black rectangle indicates the area within which the sailing trials took place. The two major voyages conducted for this study are indicated by red and green lines. The names in bold indicate havens that are known to have been used during the Viking Age or High Middle Ages, whilst those in cursive are put forward as potential additions in the light of the project's trials.

Abstract

In this paper I evaluate the feasibility of reconstructing Viking Age sailing routes through experimental and ethnographic fieldwork onboard traditional Norwegian boats, focusing on aspects of Viking Age route choice, risk judgement, and the location of possible anchorages and harbours. The goal with this approach is to reconstruct the 'scapes' of Viking Age seafaring: the seafaring routes and environments, as well as the practices and worldviews of a maritime society. It is argued that through this approach, we can discover not only where people travelled, but also what these journeys were like, what understandings of the world they were entangled in, and how these afforded the practices observable in the surviving evidence. Some elements and aspects of these scapes survived in relatively unaltered form into the 20th century, allowing us to employ them as analogies for Viking Age affordances, and reconstruct possible maritime itineraries along the Norwegian coast.

Introduction

By the Viking Age, the western coast of the Scandinavian Peninsula was a profoundly interlinked region, dominated by magnates and petty rulers whose power was founded upon agricultural lands and the control of the sailing route known as the *Norðvegr* (Iversen, 2020: 290; Skre, 2014: 42–43; Storli, 2007: 86) (Figure 1). This route continued to play a determining role in European history over the next twelve centuries, transporting people, animals, ideas, and goods from reindeer antler to natural gas. The evidence for its use during the Viking Age comes from a range of disciplines (history, archaeology, place-name studies, genetics), but is usually limited to a point of origin and destination for the data in question, rarely shedding any light on the voyages and voyagers that bound the Viking world together across its vast seascapes (e.g. Heen-Pettersen, 2014; Hedenstierna-Jonson, 2016; Margaryan et al., 2020).

Here, I would like to present an approach that attempts to address these gaps in our knowledge by exploring the *Norðvegr* from the perspective of the sailor (Heide and Planke, 2019). I have recently taken part in a series of experimental voyages along the Norwegian coast in traditional Norwegian boats, descendants of the clinker tradition that underlay the maritime character of the Viking Age. The aim of this paper is to evaluate whether the perspective of the traditional sailor, gained (albeit only partially) through these voyages, can be used as a window on the travelling Viking Age. This evaluation is presented as a tentative 'proof of concept' from which further experimental and analytical research will follow. First-hand sailing experiences are compared with archaeological, historical, toponymic, and environmental evidence for Viking Age seafaring. I argue that traditional Norwegian seafaring practices can serve as analogies for similar activities from the Viking Age, allowing us to reconstruct the most frequented sailing routes from this period, and even suggest which harbours and anchorages were used.

A shared maritime worldview in the Viking Age?

The first step for this study should be to establish whether sufficient evidence exists to speak of a shared maritime culture along the *Norðvegr* in the Viking Age. Only if this is the case will it be possible to compare this with the experimental and experiential results from the recent trial voyages. Despite the large geographical area under consideration and the hindrances to travel posed by the harsh climate, the coastal communities of western Scandinavia seem to have been thoroughly interlinked since at least the Late Iron Age (Iversen, 2020, p. 295; Østmo, 2020, p. 10). By the time the merchant-explorer Ottar visited the court of King Alfred of Wessex in the late 9th century, the inhabitants of this region had a common name, *Norðmaðr*, reflecting a conception of geographical unity either in the mind of the scribe or in the account given by Ottar himself (Bately, 2007: 40–50; Storli, 2007: 85; Skre, 2014: 35). In either case, it seems likely that a "feeling of community" existed throughout this seascape, based on shared practices and movements (Storli, 2007: 85). Such connections would have been strengthened by a similar range of subsistence patterns, considerable genetic continuity since the Bronze Age, and the use of a common language (Ling et al., 2018: 509).

A shared maritime heritage is also evident in the creations of the Viking world, be they place-names, writings, or artefacts. Several scholars have pointed to the use of unique names for important landmarks both in Scandinavia and in the territories settled overseas, reflecting a common maritime cosmology throughout these areas (Stylegar and Grimm, 2003; Westerdahl, 2005; Kruse, 2020).

Fig. 2. Stad from onboard Båra, June 2022. The Åfjordsbåt used during this voyage was surprisingly comfortable in the large swell common around exposed headlands like this one, and throughout this project's fieldwork it proved safer to sail further out to sea rather than directly under the land, as this minimised the risks of katabatic gusts and strong currents.

Fig. 3. Such unpredictable winds recently resulted in the capsize of a fembøring off Kunna in Northern Norway. Photograph courtesy of HRS Nord-Norge (No. 330 Squadron RNoAF).

Norse creations such as the ship-prow engravings presented by Heen-Petersen in this volume, the common maritime motifs and *kennings* in the surviving poetic corpus (Jesch, 2015), and the mental geography of Icelandic medieval writers (Jackson, 2009), all point to a shared tradition of maritime practice, and intertwined with this, a common understanding of maritime space.

Seafaring worldviews then and now

The data-gathering exercises for this project consisted of a series of experimental sailing trials and trial voyages throughout the *Norðvegr*. These were undertaken onboard traditional clinker-built, square-rigged fishing and trading boats from Trøndelag known as *Åfjordsbåter* (Figure 4). The trials ran between September 2021 and July 2022 and ranged from one-day excursions to multi-week expeditions, covering the Norwegian coast from the Lofoten archipelago to Bergen (Figure 1). The aim of this fieldwork was to identify the primary factors that influenced navigational choice before and during sailing voyages onboard *Åfjordsbåter*, as an understanding of these would allow for the reconstruction of sailors' decision processes. If sufficient parallels between the practices of *Åfjordsbåt* sailing and those of the Viking Age could be established, then an understanding of these traditional decision processes might serve as a foundation for suggesting which routes and havens were most likely to have been frequented in the Viking Age. To fulfil the research

objective, I gathered qualitative and quantitative data regarding how and why certain routes were chosen, focusing on environmental and technical factors (wind and sea conditions, visibility, boat performance) as well as cognitive and social ones (experience, morale, skill, judgement). Data-gathering followed the guidelines set out by Englert (2006) and Bischoff et al. (2014), with the assembled dataset consisting of field notes, photographs, and video footage, interviews, wind and weather readings, 3D models of the boats, and a GPS track of each voyage.

A fundamental finding from this fieldwork was the observed development both within myself and among the crew of a new way of thinking and doing at sea, tightly bound to the practices and environments of traditional Norwegian sailing. I would argue that this occurred through the gradual, collective attunement to a new way of perceiving, acting in, and thinking about the seascape, what Eldjárn and Godal refer to as a *veremåte* (1988a; 17) (Ingold, 2000: 166). This 'maritime cultural mind-scape', as I have called it elsewhere (Jarrett, 2025, forthcoming), seemed to be intimately tied to its context of use, with a strong inter-dependence between understandings of maritime space and the traditional practices of *Åfjordsbåt* sailing (Hutchins, 1995). The conception of travel, for example, was bound to the inherent uncertainty of sailing a boat without an engine, creating a conditional and tangential attitude to route-planning and navigation which anticipated changes of itinerary and destination at any moment. Mental attitudes and sailing practice were also evidently connected in the relationship between the boats' sailing capabilities and the risks posed by different areas of the Norwegian coast. *Åfjordsbåter* are built with light and flexible hulls with very shallow draft, allowing them to ride over the large swell typical along exposed coastlines, but making them very vulnerable to strong currents and katabatic winds (*fallvind*), which are most prevalent in narrow sounds and fjords (Figures 2 and 3). This points to a different assessment of danger and risk than that which might be made when travelling in a modern sailing boat.

The data gathered during this project revealed that the primary affordance of route choice before and during the voyages was a judgement of perceived risk, which was often made collectively, or at least in consultation with the most experienced crew members.

Fig. 4. A smaller Åfjords-båt known as a *fyring*, in Rissa, Trøndelag, September 2021. The parallels with the surviving evidence for Viking Age boatbuilding are apparent in both the hull shape and the rig. Photo courtesy of Tora Heide.

When considering different routes, individuals conceived of possible itineraries as a sequence of named landmarks, with their own associated level of danger taken from previous experience or second-hand information. In this way, navigating the *Norðvegr* became a qualitative assessment of potential pathways, reliant on the collective wisdom necessary for success in the face of uncertainty. The clear relationship between this judgement-based navigation and the vessels upon which it occurs, and in turn, the similarities between these craft and the boats of the Viking Age, makes it very tempting to apply this 'mindscape' to studies of Viking Age seafarers and seafaring. However, such direct and uncritical application may be unwise; instead, I believe it will be more fruitful to take a comparative approach, considering both continuity and change in attitudes and approaches to the sea and sailing throughout the history of maritime travel along the *Norðvegr*.

The Maritime Cultural Mindscape and the evidence for Viking Age sea-faring

So far I have suggested that Viking Age communities throughout the *Norðvegr* shared an understanding of maritime space and mobility, and have briefly described some aspects of the traditional sailing perspective that emerged during the project's trials. In the following section, I examine the core elements of maritime heritage along the *Norðvegr*, comparing the data gathered during the project's voyages with our evidence from the Viking Age and Early Middle Ages. The aim here is to identify which aspects of traditional seafaring may represent continuities or at least enduring agents that would have also afforded mobility patterns in the Viking Age. These can then be used to reconstruct sailing routes and itineraries from this period.

The seascape

The sea is a constant, all-encompassing presence for those living along the west coast of Scandinavia. Since long before Ottar's time, the sailing route along this coast had provided access to the wealth of the Arctic and a connection southward into European networks, creating an axis of trade, travel, and interaction that remains in use today (Meulengracht Sørensen, 1995: 48–49; Storli, 2007). When compared to agricultural and industrial landscapes, the maritime environment displays less signs of recent transformation, and this apparent stability may have contributed to other cultural continuities along its length. The actual extent of environmental change is often hard to assess: marine temperatures and salinity levels seem to be similar today to those of the Early Middle Ages (Haine, 2012: 104–105), but notable changes in relative sea-level have occurred, primarily due to isostatic rebound (see Changes, below). In terms of prevailing wind and weather patterns throughout the year, the summer is dominated by successive low-pressure systems circulating up the coast, bringing south-westerly gales interspersed with brief periods of light and often unstable northerly and north-easterly winds (Binns, 1980: 193). Spring and autumn sailing involves rougher conditions, with frequent rain, sleet, and even snow, but also stabler winds due to more frequent high-pressure windows (Englert, 2007). In winter, the short daylight hours and frequent storms, along with the increased strength of katabatic gusts (due to the greater change in temperature between the sea and the snow-covered mountains) means that both the effort and danger involved in covering even shorter distances is greatly increased.

Wind and air pressure patterns from the Viking Age are difficult to reconstruct, but written sources such as The King's Mirror describe similar weather and seasonal windows as those experienced during this project's voyages (Larson, 1917: 87–90). The King's Mirror and the Vinland Sagas also present a remarkable understanding of currents and tides, as well as the movement of whales, fish, walrus, seals, and sea-ice (Larson, 1917: 90–102; Pálsson and Magnusson, 1965). This deep acquaintance with marine life and environmental patterns echoes the knowledge recorded among whalers and fishermen in the North Atlantic in the 19th century (Scoresby, 1820). The evidently long

tradition of attendance to such rhythms was likely due to the equally enduring affordances and risks inherent when sailing in square-rigged, clinker-built boats.

The documentary sources also refer to the great danger of sailing near land, suggesting a possible preference for outlying havens in this period (Kruse, 2020, pp. 176–177; Marcus, 1980, pp. 104–105). This seems to align well with the location of the royal manors linked to Harald Fairhair in Hordaland, which display a marked preference for outlying coastal areas when compared to centres of mobility and trade from before and after the Viking Age (Skre, 2014, pp. 37–38). This preference may be tied to the aforementioned risks posed by narrow fjords and sounds when sailing in vessels of the kind used in the Viking Age. From this perspective, we may wish to imagine that the preferred location for a harbour or anchorage in the Viking Age was one that served as a safe haven between exposed and sheltered sections of the sailing route. These different kinds of seascapes posed different but equally serious challenges and may have often involved waiting for favourable conditions and the help of local pilots before proceeding with the voyage.

Boats

Norway possesses a rich and diverse heritage of traditional boatbuilding, with different regions displaying diverse but related responses to the needs of maritime life (Godal, 1986). This diversity is undoubtedly not a recent phenomenon, and it would be unwise to imagine a common *Urform* from which all recent boat-types descend (Frog, 2020, p. 571). Instead we should envision an equally wide variety of vessels existing in the Viking Age, but with certain physical features being shared across space and time (Eldjárn, 1995, p. 28). The boats used in this study are reconstructions of fishing and trading vessels from the late 19th century, but their basic structural elements already existed in the Viking Age (Figure 4). Boats from both periods were built from the keel up as a double-ended shell of overlapping planks, into which frames are inserted to provide strength and stability. The rig consists of a loose-footed square sail controlled by sheets, the *bolina* and the *priar*, and hung upon a yard which is attached to the single mast with a parrel. The mast rests upon a sturdy mastfish and can be lowered easily by loosening the shrouds or the forestay. Aside from the sail, the boat is equipped with several pairs of oars, allowing for travel against the wind and for manoeuvring in an out of harbours (Christensen, 2007; Eldjárn and Godal, 1988a, 1988b; Engvig, 2001a, 2001b).

Structural similarities are matched by remarkable continuity in performance and handling. Several scholars have identified common estimations of average rowing and sailing speed for various kinds of vessel from medieval written sources, along with a common understanding of average distances covered, just like the modern idea of "an hour's drive". These estimates are similar to the average speeds attained during the voyages conducted for this study: average rowing speeds oscillated around 2 knots, while average downwind or broad-reach sailing speeds were approximately 5 knots for the *fembøring* and 4 knots for the *fyring* (c.f. Englert, 2015, 2007; Indruszewski and Godal, 2006, p. 24; Morcken, 1978, p. 56; Sæther and Eldjárn, 2002). When these voyages lasted more than a day, a system of watches was established by dividing the crew into two halves: this too is documented in medieval sources as being a long-established custom (*sjømenns skikk*, Salvesen, 1969, p. 116), and Ravn (2016) has argued that such a system was in place onboard the *Skuldelev 2* longship in the 11th century.

The enduring nature of Norse seafaring practices is also evident in the survival of specific terminology across time and space. Many of the terms used onboard Åfjord boats have clear Old Norse roots (the classic example being *styrbord*, from ON *stjórnborði*), but even more

remarkable is their survival up to this day in a wide range of European languages (Martese, 2019; Sayers, 1997). In some regions where Norse influence was particularly enduring, unchanging terminology was accompanied by equally long-lasting practices: the medieval Gaelic poem *Birlinn Chlann Raghnaill*, for example, describes similar practices onboard Highland galleys as those known from traditional Åfjord boat sailing, even mentioning the same slipknot for securing the mainsail halyard (Macaulay, 1996; Parsons, 2013, p. 31).

Places and mnemonic names

Evidence for continuity in naming traditions extends beyond the boats to include the land- and seascape as well. The ancient origin for names of prominent landmarks along the *Norðvegr* has recently been discussed by Østmo (2020). Westerdahl (2010a, 2010b, 2005) has also argued for strong toponymic continuities, and has identified a naming pattern for prominent maritime landmarks that seems to apply across Scandinavia. Placenames were used by sailors as mnemonic anchors through their incorporation into songs, poems and stories, which often presented places sequentially, providing a way to remember entire itineraries without the need for a map (Brink, 2019). This can be seen in poems collected by ethnographers in the last century (e.g. Morcken, 1978, p. 46), but such mnemonic techniques may also appear in medieval texts, such as the *Landnámabók* (Pálsson and Edwards, 1972): from the perspective of a mobile, seafaring society, the opening chapters of this book can be read as a series of stories designed to give meaning to land- and seamarks across Iceland.

Navigation

Although the importance of oral culture and unique placenames is a largely accepted part of Viking Age navigation, other elements of this tradition have been more divisive. The results of this project's voyages and the evidence for environmental and toponymic continuity point to a set of navigational methods that neither encouraged nor required the development of instruments. The primarily coastal nature of navigation along the *Norðvegr* seems instead to have promoted a tradition based on memorised sequences of landmarks, which was then exported into the North Atlantic, where islands served as similar directional aids (Schnall, 1975, p. 181). This can be seen, for example, in the famous description of the voyage from Norway to Greenland found in the *Landnámabók* (Pálsson and Edwards, 1972:16). The argument for non-instrumental navigation is reinforced by other experimental voyages in Scandinavia and the North Atlantic, which have proven that time can be estimated while at sea to within 15 minutes (Börjesson, 2009). This allows for accurate estimations of midday, allowing sailors to follow a particular line of latitude by measuring the height of the sun above the horizon at this time. In areas that lack the monumental landforms of the Norwegian coast, an equally rich toponymic tradition seems to have existed, but in this case related to underwater features such as sandbanks, as evidenced by Roger of Howden's 12th century description of the sailing route along the east coast of England (Hughes, 2012; Kemp and D'Olier, 2016). The strong magnetic variation noted in high Atlantic latitudes by William Scoresby in the early 19th century (1820) may have contributed to maintaining this non-instrumental tradition into recent times.

Risk-based judgements

We can now turn to the factor that was identified as the primary determinant of route choice during this project's sailing trials, namely the judgement of perceived risk. Although Ottar's account (Bately and Englert, 2007: 40–58) does not refer to this kind of judgement directly,

several second-hand sources do highlight wise judgement and reasoned choice as important traits of skilled navigators. In the entry for the year 862, the *Annals of St Bertin* tell of the Danish fleet that had been raiding along the Seine, which upon reaching the sea, "split up into several flotillas which sailed off in different directions according to their various choices" (Nelson, 1991, p. 98). The variety of directions chosen indicates that route-choice was not environmentally determined and included an element of human choice. The word for choice used here is *visum*, which may indicate the importance of perceived phenomena in making these decisions. The narrator of *The King's Mirror* also emphasises the importance of attendance by advising his son to "mark the movements of the ocean and to discern how its turmoil ebbs and swells". In this way he will "learn thoroughly when to look for dangerous seasons and bad routes, or when times come when one may risk everything" (Larson, 1917: 83, 90).

But perhaps the most direct evidence of risk judgement in a Norwegian seafaring context comes from the anonymous *Historia de profectione Danorum in Hierosolymam*, an account of a Danish expedition in the late 12th century to take part in the Third Crusade. The author compares the ill-fated Danish crusaders, who shipwrecked off the coast of Norway after departing impatiently under unfavorable weather conditions, with their more successful Norwegian contemporaries, "whose ability to rightly judge the route and the sea was reliable thanks to their long experience and frequent sailing" (Gertz, 1922: 480, translation by Stephan Borgehammar, personal communication 2022). First-hand, practical experience seems, therefore, to have been a central and long-lasting requirement for accurately judging and managing risk throughout this challenging seascape (Figure 5).

Fig. 5. Collective judgement of perceived risk in action. The author and crew on Trondheimsleia, June 2022.

Changes

This range of remarkable continuities should not blind us to some major changes that affected seafaring both during and after the Viking Age. Following the same themes as above, we can begin with environmental change: here the most notable transformation along the *Norðvegr* is the result of post-glacial land upheaval, resulting in a coastline that is currently 3-5m below the level known from 1000 AD (Creel et al., 2022; Påsse and Daniels, 2015). The greatest changes have occurred in the inner fjords, but even along the outer coast some of the shallower channels and sounds used in the Viking Age could not be

explored during this project's trials. I intend to follow up this preliminary study with a reconstruction of relative sea-levels from the Viking Age to further evaluate possible routes and havens.

Travelling along the *Norðvegr* a thousand years ago involved a range of risks, both real and imagined, that were not present during the recent trials. This region was a thoroughly militarised zone in the Viking Age, with the sea-kings and the haphazardly-emerging kingdom exercising their power through naval dominance (Iversen, 2020, p. 290; Østmo, 2020, p. 17; Skre, 2014, p. 39). Certain harbours would have been unsafe or at least unwelcoming for shipping from opposed regions, and hostile ships or fleets must have been an additional, unpredictable threat at all times (Heebøll-Holm, 2020). Other entities that today would be considered mythological were clearly also present in Viking Age mental geographies, although it is difficult to assess the extent to which experienced sailors like Ottar believed these to be tangible elements of reality (Frog, 2020, p. 680; Meulengracht Sørensen, 1995, p. 53). Despite the cosmological changes introduced by Christianity, some of these entities survived into recorded tradition, such as the figure of the *draug* (Mathisen and Sæther, 2018). However, we should not presume to understand the complex entanglement of mythological forces in the everyday practices of Viking Age sailors, but we can at least recognise the role of different cosmologies in shaping conceptions of seascape then and now.

As for the boats and their sailing, the striking continuities outlined above must be weighed against several technological developments that occurred in Norwegian boatbuilding between the Viking Age and the late 19th century. Of these, the shift in the position of the rudder is perhaps the most discussed (Nielsen, 2009: 265; Thorseth, 1986: 82), with modern authors concluding that this marks a notable improvement in performance (although it is interesting to note that Andersen, whose transatlantic voyage aboard *Viking* in 1895 employed professional sailors, considered the difference in steering capabilities between a side-rudder and a stern-rudder to be minimal (Christensen, 1986)). Other changes that have been less discussed and are harder to quantify include the differences in stem-carving (Heide and Planke, 2019), the varying levels of hull flexibility when using rivets versus cleats and lashings (Morrison, 1978), and the use of hemp line and linen sailcloth rather than the lime-bast, walrus hide, and wool which seem to have been staple materials for Viking Age rigging (Christensen, 1979). In terms of practices onboard, the most anachronistic and transformative element of this project's trials was the use of the weather forecast. The constant availability of accurate meteorological information provided a level of certainty and security when making navigational decisions that cannot have been present in the minds of Viking Age sailors. This was considered to be a necessary anachronism, as ignoring the forecast would have represented an unacceptable risk to the vessel and the crew. The largely educational or scientific purpose of these trials and the modern and literate cultural background of the crew also contrasted with the experiences of Viking Age sailors (Meulengracht Sørensen, 1995).

Applying the Maritime Cultural Mindscape to the Viking Age: risks and potentials

The comparison above is intended to pinpoint which elements of the seafaring 'mindscape' revealed in the recent trials may have had parallels in the maritime worldview shared throughout the *Norðvegr* in the Viking Age. It is this worldview that promoted and constrained culturally-specific patterns of movement, and therefore understanding it is a vital foundation for discussions about Viking Age routes and itineraries (Bekker-Nielsen, 1988: 160). In our attempt to reconstruct this Viking Age worldview and its afforded movement patterns, we may be aided by the inherently conservative nature of fishing and sailing culture. As

Westerdahl (2005: 40) argues, maritime traditions are more resistant to change than land-based ones due to the comparatively stable environment upon which they rely. It is therefore more likely for ancient cosmologies and worldviews to survive in maritime environments than in the more volatile contexts of elite, urban, or industrial culture. The communities inhabiting the *Norðvegr* experienced several major changes during the lifespan of traditional sailing and boatbuilding discussed here (ca 800-1920 CE), with some of these beginning during the Viking Age itself, such as Christianisation and the development of the stockfish trade (Solli, 1996: 90; Bagge, 2005; Storli, 2007; Perdikaris and McGovern, 2009; Wickler and Narmo, 2014). But as has been recently discussed by Frog (2020), practical and cognitive elements of Viking Age culture may have survived if they remained applicable in their context of use, with their constant application enshrining them in trans-generational knowledge despite broader changes in society and culture occurring around them. Cases of this phenomenon, which may be useful for reconstructing Viking Age maritime movement patterns occur in the evidence presented above. These can be collected into three categories:

1. The tradition of building and sailing clinker-built, square-rigged boats, and the consequent similarities in relative risk and opportunity in different kinds of seascape;
2. The surviving corpus of placenames for important land- and seamarks, and their sequential and storied incorporation into oral culture;
3. The navocentric orientation and navigation system, the conditional and tangential conception of sea voyages, and the process of route-choice based on judgements of perceived risk.

With the addition of a seemingly similar natural environment (although with a changed coastal topography), these represent the primary parallels that exist between the affordances of traditional Norwegian sailing and those of Viking Age seafaring. At this very preliminary stage, I have employed these parallels to identify a number of anchorages and natural harbours along the Norwegian coast that may have been attractive for seafarers from the Viking Age, but that have received little attention from Viking Age research. I have presented these in Figure 1, along with several known sites that display evidence for maritime activity during the Viking Age or shortly thereafter, selected for comparison. These possible havens were all visited during the project's voyages but require further analysis in relation to documentary and cartographic sources, as well as an accurate reconstruction of their physical topography during the Viking Age (Figure 6). For now, the location of these havens seems to fit well with other studies of interaction from the Viking Age, such as Sindbæk's (2013) network analysis approach, as well as displaying parallels in other seascapes of the Viking world, such as the west coast of Scotland (Macniven, 2020).

Finally, it may be worth considering how the maritime worldview of Viking Age seafarers clashed with contemporary land-based ontologies, embedded as they were in such profoundly different worlds of practice, belief, and experience. Alcuin's shock at the Lindisfarne raid, and his belief up until this event that no "such inroad from the sea [*navigium*] could be made" (Whitelock, 1955: 776), may be more than dramatic hyperbole, pointing instead to the way in which different worldviews present different possible courses of action. Adam of Bremen's confusion in recording the sailing times from Ålborg to Iceland (2002: 217) may also derive from a misalignment between different understanddings of space and travel (Morcken, 1978: 12). Such ontological clashes are evident today in the conflicting understandings of space and place that underlie struggles for indigenous land in many areas of the globe (Chao, 2017; Hirt, 2012; Pearce and Louis, 2008). It may therefore be fruitful to explore patterns of movement and action in the Viking Age as being afforded by equally diverse

worldviews, shaping the record that we study today by constructing a range of understandings of possible choice and action. To do this we will need to look beyond the conventional techniques of representation and mapping that prevail in western science, and explore other ways of recording, analysing, and communicating Viking Age seafaring as a thoroughly dynamic, attentive, uncertain, storied, and peopled experience.

Fig. 6. Tarva, one of the potential havens suggested by this study. It is located at the entrance to the Trondheimsleia from the North, and offers sheltered mooring and access to fresh water, making it a possible destination for Viking Age seafarers. May 2022.

Acknowledgements

The voyages that form the backbone of this study would not have been possible without the fearless, skillful, and constantly positive crews with whom I had the joy to sail. Initially these were done in collaboration with the sailing class at Fosen Folkehøgskole, so my thanks go to all the staff and students there. I am also very grateful to the organisers of the Interdisciplinary Viking Symposium for the stimulating discussion that formed the basis of this article, and to my supervisors Nicolò Dell'Unto and Jan Bill for their support and expertise in my endeavours on land and at sea. Finally, I would like to thank Professor Stephan Borgehammar for his help with the translation cited above.

Supplementary Data

The complete dataset from the sailing trials and trial voyages conducted for this study will be included in the author's doctoral thesis, which will be published in 2025.

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