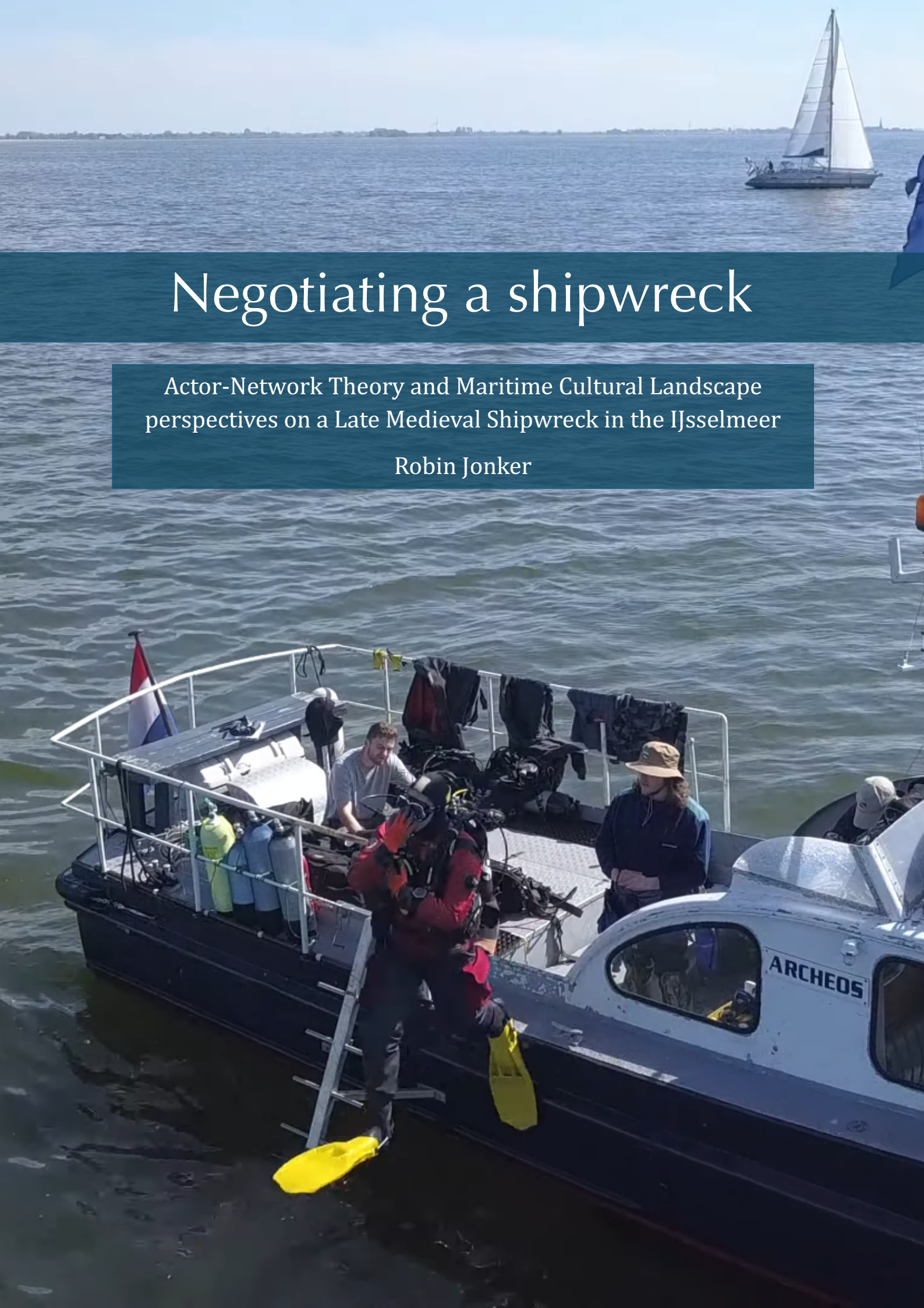

Negotiating a shipwreck

Actor-Network Theory and Maritime Cultural Landscape perspectives on a Late Medieval Shipwreck in the IJsselmeer

Robin Jonker

Frontpage: A diver entering the water to dive on the W149 wreck site. (Drone photograph made by Ernie de Jong).

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Actor-Network Theory and Maritime Cultural Landscape perspectives on a Late Medieval Shipwreck in the IJsselmeer

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Abstract English

This thesis focuses on late medieval shipwrecks in Northwestern Europe, emphasizing the recently discovered wreck W149, dated to the second half of the 15th century. While people might associate shipwrecks with treasure hunting, maritime archaeology demonstrates that shipwrecks offer far more than material wealth, they are unique sources of historical knowledge and its material remnants. Ships represent both technological innovation and human decision-making, and studying them provide insights into the maritime, economic, and cultural landscapes of past societies. This research highlights the role of shipwrecks not only as physical remains but also as an active participant and result of broader tangible and intangible networks.

Since the 1960s, maritime archaeology has struggled to establish a widely accepted theoretical framework. Much research has concentrated on identifying known historical ship types, such as cogs and hulks, and tracing their supposed evolvement over time. Although typologies provide useful historical narratives, they can also restrict the interpretive potential of archaeological remains, oversimplify technological differences, and ignore the human choices involved in ship construction. This thesis argues for a move beyond these typological narratives, showing a perspective that emphasizes context and function and treats shipwrecks as active participants in complex maritime systems.

To achieve this, the study combines Westerdahl's Maritime Cultural Landscape (MCL) framework with Latour's Actor-Network Theory (ANT). The MCL shows the connections between harbours, sea routes, shipyards, and wrecks within maritime and terrestrial landscapes, while ANT regards ships, timbers, and artefacts as actors within dynamic networks. By integrating these frameworks, W149 is studied both as a material object and as a mediator connecting social, technological, and external environmental factors. This approach provides a more nuanced view of the ship's construction, purpose, and interactions within historical trade and navigational systems in the Northern Zuiderzee.

The research focusses on questions concerning W149's construction techniques, structural features, and operational history, placing the wreck within a broader maritime and economic landscape. It explores how ANT and MCL can be used to interpret archaeological remains, revealing the links between human decisions, shipbuilding traditions, and the maritime environment. Comparing the shipwreck with other late

medieval shipwrecks and providing historical allows for a detailed understanding of its significance.

A multidisciplinary methodology is executed, combining underwater survey, photogrammetry, and historical research. Multibeam recordings and diving documentation shows W149's timbers, fastenings, and repairs in more detail. These findings are analysed within a new theoretical framework to show the ship's operational role and the networks it participated in and what network it was constructed of.

Ultimately, this thesis proposes a new way of looking at shipwrecks within maritime archaeology, moving away from rigid typologies toward a dynamic, context-driven interpretation of shipwrecks. By treating W149 as both a network and an actor within its Maritime Cultural Landscape, this research expands knowledge of late medieval shipbuilding, trade, and seafaring practices, while providing the first steps in developing a replicable framework for studying historical artefacts in ways that highlight their functional, social, and environmental significance.

Keywords: Late Medieval Shipwrecks, Maritime Archaeology, Maritime Cultural Landscape (MCL), Actor-Network Theory (ANT), Northern Zuiderzee.

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Chapter 1: Introduction

Exploring the underwater world is often associated with the discovery of long-lost shipwrecks filled with pirate treasure. Exploring and finding these shipwrecks is a concept that has only recently become a reality with the development and accessibility of diving equipment. However, this submerged realm holds more than just glittering riches; it is also a vital source of knowledge, potentially more valuable than treasure itself. This new reality has sparked interest among people from all walks of life and has ultimately led to what we now call maritime archaeology. But what exactly does this field entail? And how can we discover our past from shipwrecks?

Since the 1960s, scholars have debated the definition of maritime archaeology, and the definition remains divisive. A universally accepted definition that applies globally seems unrealistic, perhaps even far-fetched. However, what has become clear is that there are many different approaches available, each offering a distinct perspective. Maritime archaeology, underwater archaeology, nautical archaeology, marine archaeology, and even fluvial archaeology are just some of the terms used in this field. While some describe a specific context, others refer to a methodology or technique. This research defines maritime archaeology as the archaeological study of man-made remains that have an intended connection to any type of waterbody.

This thesis focuses on maritime archaeological theories applied to the study of late medieval (15th–16th century) shipwrecks. It explores innovative approaches to researching late 15th century shipwrecks by constructing a new theoretical framework, incorporating concepts from the maritime cultural landscape and actor-network theory. The newly discovered late 15th century shipwreck, named W149, serves as a case study for this research.

1.1 Research Significance

Throughout history, ships have represented the pinnacle of innovation within societies, serving as essential tools that addressed various challenges. Studying them provides valuable insights into the technological capabilities and decision-making processes of past societies, bringing us closer to understanding and illustrating human achievements. One of the most debated topics in archaeology concerns late medieval ships from Northwestern Europe. During the decline of the Hanseatic League, a significant shift

in shipbuilding techniques occurred, coinciding with the increasing availability of written records. This period allows researchers to connect historical ship typologies, such as the well-known cog and its presumed descendant, the hulk, to archaeological remains, facilitating their categorization and the study of their evolution.

However, archaeologists have criticized this typological approach and the linear representation of ship development (Hirte, 1987, p. 721; Maarleveld, 1995, p. 4). Research on Late Medieval shipwrecks often focuses on identifying familiar ship types, such as cogs and hulks (Belasus, 2019, p. 176; Crumlin-Pedersen, 2000, p. 235; Weski, 1999, pp. 366–370). While these classifications are useful for historical narratives, they can also limit the interpretive potential of archaeological evidence, which has the capacity to provide new insights beyond simple categorization. This presents an opportunity for the development of a new theoretical framework.

Maritime archaeology has often struggled to establish its own theoretical frameworks, particularly in shipwreck research (Zwick, 2013, p. 46). Although significant theoretical developments have taken place since the 1960s, shipwreck studies remain largely confined to the search for historical typologies, such as the cog, in the archaeological record (Belasus, 2019, p. 183; Crumlin-Pedersen, 2000, pp. 234–235; Weski, 1999, pp. 366–373; Zwick, 2013, pp. 62–64).

Beyond the archaeological site and theoretical background, the geographical location also adds to the significance of this research. The shipwreck W149 is located in Dutch domestic waters and aligns with the Dutch National Archaeological Research Agenda 2.0 (NOaA 2.0). It specifically addresses question 11, which focuses on the development of wooden shipbuilding; question 12, which examines the find context of shipwrecks; and question 99, which explores the functioning of medium- to long-range trade during the Hanseatic period. This alignment ensures the relevance of this research within the Dutch academic framework, highlighting the necessity and value of further studies on these topics.

1.2 Research Position

This research focuses on a historically significant period that continues to provide unique insights into early ship construction. The opportunity to research ships and shipwrecks from the Late Medieval period in Northwestern Europe is therefore of great

importance. In Europe, during much of the 20th century, studies primarily centred on ship typologies and their evolution, particularly focusing on the cog and hulk (Belasus, 2019, p. 176; Crumlin-Pedersen, 2000, p. 235; Weski, 1999, pp. 366–370). Perhaps out of habit, this approach continues to shape the methodology of shipwreck research. Many studies have treated the identification of historical ship types as their ultimate goal (Maarleveld, 1995, p. 5; Zwick, 2013, p. 49). This focus has sometimes resulted in considerable variation among ships classified under the same type. For instance, differences between vessels identified as *cogs* and their supposed predecessors or relatives highlight the limitations of rigid categorization (Belasus, 2019, p. 183; Crumlin-Pedersen, 2000, pp. 234–235; Weski, 1999, pp. 366–373; Zwick, 2013, pp. 62–64).

Typologies have not only been used to categorize wreck sites but also to define change, often interpreted as a linear progression. The history of ship typology research has frequently depicted historical ship types as evolving directly from one another over time (Belasus: 2019, p. 175; Maarleveld, 1995, p. 4; Zwick, 2013, pp. 47–49).

This typological approach presents another issue: the reliance on biological metaphors to describe artefact development. Terms like "evolution" can unintentionally frame technological change as a natural process rather than as the result of human decision-making. This perspective risks overlooking the deliberate choices that influenced the development and continuity of shipbuilding traditions over time (Maarleveld, 1995, p. 4).

Consequently, there is a need to move shipwreck archaeology beyond a purely typological approach without becoming lost in overly abstract theoretical debates. Historically, Dutch archaeologists have had limited engagement with theoretical frameworks in maritime archaeology. However, a shift towards more theoretically grounded research has recently emerged, largely influenced by the adoption of Westerdahl's Maritime Cultural Landscape (MCL) framework in academic studies see for example: Manders (2017), van Popta (2020), and Waldus (2021). Full-scale shipwreck excavations that incorporate a developed theoretical framework have only recently been conducted for the first time in the Netherlands. A re-evaluation of the Scheurrak SO1 shipwreck excavation and its artefacts, grounded in the MCL framework, has led to new conclusions (Burger, 2025, pp. 40–45).

This study proposes a new approach to shipwreck archaeology, emphasizing contextual and functional interpretation over typological or evolutionary classification. It

challenges the perception of shipwrecks as closed finds and integrates Westerdahl's Maritime Cultural Landscape with Latour's Actor-Network Theory (ANT). This combined framework facilitates an exploration of the networks associated with the ship itself, its wreck site, and its artefacts. These networks will be analysed within the layers of the Maritime Cultural Landscape to provide a more nuanced understanding of the ship's role and context, with a focus on its functionality.

The discovery of W149 presents a rare opportunity to examine late medieval shipbuilding beyond typological constraints, viewing W149 as both a product of and an active participant in the Maritime Cultural Landscape.

Ultimately, this study aims to deepen our understanding of late medieval maritime systems by offering new insights into shipbuilding practices, economic networks, and the cultural landscapes of the Northern Zuiderzee. This approach not only enhances our knowledge of W149 but also serves as a model for studying historical artefacts in more dynamic and contextually meaningful ways.

The Shipwreck as a Mediator

The wreck of W149 is conceptualized as a mediator that links various elements that can be identified through the maritime cultural landscape analysis, both in the past and in the present. For example, the maritime cultural landscape analysis reveals how the shipwreck is connected to historical trade routes and navigation strategies. Additionally, the shipwreck shows the influences of shipbuilding technologies. Every one of these elements influences the ship, how it is perceived, its function, and how it is constructed. Thus, the ship itself mediates all these influences from these individual elements.

Interconnected Networks

Using ANT, W149 is analysed as a network of construction elements, materials, and human decisions. This smaller network is then placed within the larger Maritime Cultural Landscape framework, enabling a comprehensive analysis of its role in historical maritime systems.

This combined framework provides a more nuanced approach to shipwreck archaeology, highlighting the complex relationships between people, objects, and landscapes.

1.3 Research Questions

The W149 wreck preliminary dates to an intriguing period (A.D. 1450–1500), research on sites like these were, as mentioned above, often dominated by typological research. To move beyond the limitations of traditional typologies, this research adopts a new theoretical framework based on Actor-Network Theory (ANT) and the Maritime Cultural Landscape (MCL). By applying these perspectives, the study explores new ways to interpret shipwrecks, emphasizing their functionality and contextual significance over rigid classification schemes.

While this idea functions as the backbone of the research the question that remains central in this thesis is 'How can the shipwreck W149 be positioned within the social and natural environment of the Northern Zuiderzee in the second half of the 15th century?'.

The following sub-questions will help to answer the main research questions:

- How does shipwreck W149 compare to other known medieval shipwrecks in terms of construction techniques and structural characteristics?
- What do the constructional features and dimensions of shipwreck W149 reveal about its function and operational life within medieval shipbuilding traditions?
- How can ANT and MCL contribute to the identification and interpretation of the archaeological elements of W149?
- What does the archaeological evidence from shipwreck W149, including its origin and find location, reveal about trade networks, regional connections, and navigational routes in the Northern Zuiderzee during the 15th century?

1.4 Dataset

The research questions outlined above will be addressed using specific theories, methodologies, and a case study. While these have already been briefly introduced in previous paragraphs, they will now be further contextualized and organized into key themes. This section provides a concise explanation of the theories, methodologies, and case study, which will be explored in greater depth in the following chapters.

Research Area: Northern Zuiderzee

The Zuiderzee can be broadly divided into two regions: the basin and the estuary (Waldus, 2021, p. 53). The estuary, located in a transitional zone, not a fixed boundary, between the open sea, the Waddenzee, and the Zuiderzee basin, functioned as a key transit area (van Popta et al., 2019, p. 181; Waldus, 2021, p. 53). This thesis focuses on the estuary region of the Northern Zuiderzee during the late medieval times. During this time the Zuiderzee had had reached its greatest extent (van Popta et al., 2019, p. 176; MaSS, Wrecks of Flevoland, 2025).

Historically, economically, and culturally, the Zuiderzee played a crucial role. It served as an important and efficient route for transporting goods and people, as well as a center for fishing (van Popta et al., 2019, p. 173, 182; Waldus, 2021, p. 20, 51). However, its vast shallows, shifting sandbanks, and silting waterways made it a hazardous inland sea, where storms often caused damage (Waldus, 2021, p. 17). Countless ships were lost, yet many remained preserved in the soft seabed, including the shipwreck that serves as the case study for this thesis.

The Shipwreck W149

The shipwreck under investigation, named W149, was discovered in the abovementioned region during a sonar survey of the IJsselmeer near the southwestern coast of Friesland in 2021. Multibeam recordings revealed that the ship's bottom was remarkably well-preserved, with a significant portion of its timbers still in their original construction. During two days of diving at the wreck site, researchers uncovered intriguing construction details and recovered a limited number of samples and artifacts (Manders et al., 2024, p. 61). Preliminary dendrochronological analysis dated the wreck to the second half of the 15th century.

Further research will be conducted on the shipwreck, including the use of underwater photogrammetry to create a 3D digital model of the wreck. This technique will capture construction details, spatial relationships, and the ship's current state. Additionally, divers will document features that cannot be captured by remote sensing, such as timber joineries, fastenings, and evidence of repairs or modifications through direct observations and detailed drawings.

Furthermore, analyzing wear patterns on timbers and artifacts hopefully will provide a better understanding of the ship's operational life and the challenges it faced.

The integration of these newly acquired data into the research framework makes W149 an ideal case study for this type of investigation.

Contextualization

However, to fully understand this shipwreck, a broader perspective is necessary. Contextualization, interpreting findings within a wider framework, is essential. Archaeological material can only be fully understood through context, which is constructed using theory. Theory serves as a guiding tool, helping archaeologists interpret material evidence. Therefore, later chapters will examine the role of theoretical approaches in maritime archaeology.

Equally important is the research context, which provides a foundation for evaluating past conclusions and prevailing explanations. This involves critically assessing how archaeology has categorized medieval shipwrecks using historical typologies, as well as addressing the challenges and limitations inherent in defining ship typologies and so-called evolutionary developments. Relevant literature will be used to compare similar shipwrecks from the same period in Northwestern Europe, where differences in interpretations are actively debated.

Additionally, analysing historical shipbuilding traditions, trade records, and port customs logs will ensure that W149 is situated within its broader maritime context. Understanding these connections will contribute to a more comprehensive interpretation of the shipwreck and its significance.

1.5 Theoretical Concepts

Since the dawn of seafaring, ships have enabled people to explore distant lands, creating vast networks that connected different parts of the world. Regardless of who sailed them, ships inevitably became crossroads of cultures, objects, languages, and religions. The following theories form the foundation of this research, ensuring the identification of these aspects within shipwrecks.

Actor-Network Theory (ANT), developed amongst others by Latour and Woolgar (1979) and Callon (1986), provides a theoretical framework for identifying and illustrating these elements, treating them both as individual actors and as networks in their own right. In turn, these networks can be understood as part of Westerdahl's

Maritime Cultural Landscape (MCL), where they can be contextualized and analysed to illustrate their influence on one another.

Westerdahl's Maritime Cultural Landscape (MCL)

Since the 1990s, maritime archaeology has increasingly adopted new theoretical approaches. One such concept that significantly influenced the field is the Maritime Cultural Landscape (MCL), introduced by Westerdahl (1992). This framework has been widely embraced in maritime archaeology (Flatman, 2011, p. 311). Westerdahl defines the MCL as "the network of sea routes and harbours, indicated both above and under water, and its related constructions and other remains of human activity" (Westerdahl, 2012, p. 4). His definition highlights the interconnectedness of maritime and terrestrial worlds, viewing them not as separate entities but as interdependent components of a shared cultural landscape (Westerdahl, 1992, p. 6; Westerdahl, 2012, pp. 734–735, 743).

Harbors, sea routes, shipyards, and shipwrecks all form part of this landscape. For instance, the location of shipwrecks can reveal their relationship to historical sailing routes, which linked different cultural centres (Westerdahl, 2012, p. 735). The MCL framework offers more than just physical evidence; it also provides insights into why certain maritime sites were established in specific locations.

The MCL can be further subdivided, with one key concept being historical transport zones. These zones illustrate how different areas interacted through trade and travel (Westerdahl, 2012, p. 748). Studying them allows archaeologists to analyse physical remains such as ship design evolution, harbour functions, and even place names.

However, a potential challenge of the MCL framework is its inclusivity: almost anything, from physical evidence to intangible cultural elements, can fall under its scope. This broad applicability has been the topic of further papers such as van Popta et al (2019) and Caporaso (2017) and will be explored in more detail in the following chapters of this thesis as well. To address this issue, the research also incorporates complementary ideas from Actor-Network Theory (ANT) to refine the analysis of the material within the theoretical framework.

Actor-Network Theory (ANT) – Latour

Latour's Actor-Network Theory (ANT) provides a dynamic approach to understanding shipwrecks by treating them as both networks and actors within broader

systems. ANT has gained traction in archaeology for its ability to move beyond static, object-based categorizations (Dolwick, 2009, p. 39; Mills, 2017, p. 387; van Oyen, 2015). It challenges traditional distinctions between human and non-human entities, proposing that objects, like humans, actively shape the networks they belong to. This perspective emphasizes the interaction between actors (humans) and actants (non-humans) in forming and sustaining networks (Latour, 2005, pp. 43–62).

For example, individual timbers within a ship can be seen as a network in themselves, while the ship as a whole functions as an actor within a larger network, such as trade routes. This dual perspective highlights how ships are both shaped by and contribute to the networks they are part of.

In this research, ANT is used to examine the functionality of W149, moving beyond static typologies to explore its dynamic role within historical maritime networks. This approach not only considers the ship as an isolated artefact but also investigates its interactions with people, trade, and the environment.

1.6 Structure of the Thesis

Chapter 2 will provide a historical overview of theory building in maritime archaeology, offering context for the research. It will trace the development of maritime archaeology in the Netherlands and analyse how theoretical advancements have shaped the field. Additionally, the history and legacy of ship typologies will be discussed, highlighting their significance and limitations. The chapter will conclude with an overview of late medieval shipwreck research in Northwestern Europe, focusing on shipbuilding traditions.

In Chapter 3, the theoretical framework, which forms the backbone of this research, will be outlined. This chapter will establish the lenses through which the archaeological material is analysed. First, Westerdahl's Maritime Cultural Landscape (MCL) will be introduced, emphasizing its added value to the research. Second, Latour's Actor-Network Theory (ANT) will be discussed in detail, highlighting its applications in archaeology and assessing its relevance to this study Finally, the combined theoretical framework will be explored, to examine how MCL and ANT interact and what interpretative insights they offer for this shipwreck.

In Chapter 4, the research methodology will be detailed, outlining the methods and techniques used to investigate shipwreck W149.

Chapter 5 will present the case study of shipwreck W149, including a detailed analysis of its structural and material characteristics.

In Chapter 6, the archaeological material will be interpreted within the theoretical framework, demonstrating a new approach to shipwreck archaeology.

This will be followed by the thesis conclusion, summarizing the key findings and their implications for maritime archaeology and a discussion evaluating the framework, and thesis in general in Chapter 7.

Chapter 2: Background

Maritime archaeology has always struggled with its legacy that was popularized with the public; the image of discovering treasure-filled pirate ships. This image was also used to introduce this thesis. While in a way, this was the cradle in which the discipline was born, it always played a crucial role when maritime archaeologists had to develop theory and practice. Some remarked that Maritime archaeology has "grown up in the eyes of the cameras" (Sperry, 2008, p. 335). To stray away from its past, maritime archaeologists (especially those researching shipwrecks) fetishized methodological innovations and technophilic approaches (Flatman, 2008, p. 121). Ultimately, in the research of shipwrecks, this resulted in identifying historical ship typologies in the archaeological record. While there are pros and cons to this type of research, key clues can be missed, resulting in an untruthful categorization of shipwrecks.

Before we start exploring anything else, an introduction to the birth of the discipline of maritime archaeology, providing context, is needed. Maritime archaeology is quite a young profession with a troubled origin. Its roots lie in the 1950s, when diving became accessible to the broader public with the invention of the aqualung, and the underwater world could finally be explored. Long-lost shipwrecks awaited discovery. Here, the image of adventure-seeking treasure hunters and shipwreck salvagers was brought to life, an image that the public had come to associate with archaeologists in the underwater world (Adams, 2007, p. 50; Gately & Benjamin, 2018, p. 22). Publications such as Diving for Pleasure and Treasure (Blair, 1961) and Shipwrecks, Skin Divers and Sunken Gold (Horner, 1965) only strengthened this view.

In combination with projects undertaken by self-named archaeologists such as Cousteau's (1954) report of the Grand Congloue wreck and Peterson's (1955) expedition in Looe Reef, Florida, these efforts legitimized this image. Cousteau's infamous comment about an amphora blocking the airlift was resolved by destroying the object with a hammer (Cousteau, 1954, p. 13). An image emerged of cowboys, roaming on the prairie of the seas.

While this was the mainstream focus of public imagery, pioneers such as Frost (1963), Du Plat Taylor (1965), and Bass (1966) attempted an intrinsically honest attempt at constructing the basis of an academic research discipline. Goggins strongly questioned past archaeological excavations, such as those from Peterson (1955) and Cousteau (1954),

and provided a first definition of underwater archaeology defined by a professional archaeologist (Goggins, 1960, p. 350).

From these publications onwards, the field of archaeology slowly started to accept maritime archaeology as a part of "mainstream archaeology." It is only then that the need for a technical handbook showcasing archaeological methods and how they can be applied underwater became apparent. Muckelroy's (1978, p. 150) reaction extended the archaeological debate to theory, thereby ensuring the place of maritime archaeology as an archaeological discipline. This resulted in the opportunity for professional archaeological excavation to enter the stage.

2.1 Paradigms in Maritime Archaeology

However, maritime archaeology continued to struggle with its past as a romanticized profession (Bass, 1983, pp. 91–93; Flatman, 2007, p. 78). Professionals thereby tried their best to detach themselves from this legacy; still, theory for maritime archaeology was lacking (Veth, 2006, p. 16). After the death of Muckelroy in 1980, efforts were made by archaeologists to distinguish themselves from their earliest stereotypes, as attempted by Gould, who introduced shipwreck anthropology (1983). Later attempts, especially focused on shipwrecks, built upon these previous academic endeavours, such as including the concept of a social element and the ship as a symbol (Gately & Benjamin, 2018, p. 19). From the 1980s onwards, three distinct research directions have been observed by Gibbins and Adams (2001, pp. 284–286) in maritime archaeology, which can be contextualized within the overarching paradigms recognized in archaeology in general: Historical archaeology, Processual Archaeology (or New Archaeology), and Post-Processual Archaeology.

Cultural-Historical Archaeology

This historically particularistic view in maritime archaeology is best known through the works of George Bass, where shipwrecks are placed within a conventional framework and the focus is mostly on acquiring data that ties the archaeological site to a historical event or on categorizing archaeological material in relation to other historical or archaeological phenomena (Gibbins & Adams, 2001, p. 285). These projects focused mainly on well-preserved shipwrecks, and excavations of them were done with a lot of

detail and care. This meticulous work is observed not only during excavation, but also in post-excavation programmes, such as preserving and reconstructing hull remains (Steffy, 1994, pp. 5–6) and detailed artefact categorizations (Bass and van Doorninck, 1982) (Gibbins & Adams, 2001, p. 285). Similarly, Hasslöf famously observed, illustrated, and described Nordic boatbuilding traditions, showing two primary traditions found in Norway: those built frame-first and those built shell-first (Campbell, 2023, p. 16; Hasslöf, 1958, 1963, 1972).

Another example of this theoretical approach is the intensive excavation of the Uluburun shipwreck, a Bronze Age shipwreck where the conducted research encompassed almost all aspects of late Bronze Age trade and society in the Aegean and Levant (Gale, 1991; Gibbins & Adams, 2001, p. 285).

However, this approach received a lot of critique from archaeologists after the development of new paradigms (Campbell, 2023, p. 16). The main critique was centred around the fact that maritime archaeology was too fixated on linking famous places, famous people, and famous events, to shipwrecks. Therefore, the focus laid at the excavation and research of well-preserved wrecks, such as the Uluburun wreck (Gibbins & Adams, 2001, pp. 285–285). Thus, only producing research to illustrate a historical event or period, primarily seeing the ship in isolation rather than being part of a broader and wider human evolutionary history (Adams, 1993, p. 23; Campbell, 2023, p. 16; Veth, 2006, pp. 13–14).

Perhaps in retrospect, all of this critique was unfair. Bass, who remained a strong supporter of this approach, published his “A Plea for Historical Particularism in Nautical Archaeology” in the Processual Archaeology–oriented edited book Shipwreck Archaeology, edited by Gould (1983) (Bass, 1983, pp. 91–104). Arguing that shipwrecks should be seen as a one-of-a-kind historical source. Whose constructional remains should be seen in isolation, moulded in its own cultural context, instead of generalized typological models (Bass, 1983, pp. 94–97). Criticizing these broader models where shipwrecks are being placed within a typological or evolutionary framework, resulting in vague generalities (Bass, 1983, pp. 100–101). Possibly overlooking historical context, and regional cultural choices.

However, his plea went unnoticed by his peers (Campbell, 2023, p. 16). Maritime archaeology had moved on.

Processual Archaeology or New archaeology

Best named as New Archaeology in this case, due to the fact that mainly scholars based in America followed this trajectory. Originating from the beta sciences such as Willey and Phillips (1958, p. 2) and Caldwell (1959), together with the implementation of anthropology in archaeology by Binford (1972, pp. 2–13) and Trigger (2006, pp. 294–300), this hypothetico-deductive approach introduced hypothesis-testing to (maritime) archaeology (Campbell, 2023, p. 17; Gibbins & Adams, 2001, p. 285). Within this theoretical school, there are two often-cited publications: Muckelroy's Maritime Archaeology (1978, pp. 155–247), which focuses on site-formation processes, and the previously mentioned Gould's Shipwreck Anthropology (1983).

However, its influence on a practical level can be highly contested; only a few major shipwreck excavations were the focus of hypothesis testing, mainly shipwrecks in the UK such as the Kennemerland (Muckelroy, 1976, as cited in Gibbins, 1990, p. 379; Muckelroy, 1978, pp. 159–214) and in the shallow waters of the Mediterranean (Raban, 1973; Parker 1979; 1980; 1981, as cited in Gibbins, 1990, p. 379) (Gibbins & Adams, 2001, p. 285). In addition, the singular nature of shipwrecks and their unpredictable assemblages makes these sites less well-suited for processualism. For example, it is difficult to test hypotheses on shipwrecks when the researcher does not know what is down there on the site. Consequently, hypothesis-testing archaeology is obligated to focus only on certain types of datasets, potentially leading to a doubtful or debatable selection of datasets (Gibbins & Adams, 2001, pp. 285–286). Ultimately leading to missed opportunities and the pitfall of conducting cherry-picking research (Bass, 1983, pp. 94–101). Nevertheless, processualism did contribute to the coming of age of theory-building in maritime archaeology (Gibbins & Adams, 2001, p. 285). Only a few tangible effects can be observed in maritime archaeological projects, mostly focusing on site-formation processes, experimental archaeology, and, in this century, underwater cultural heritage management can also be included.

Post-Processual Archaeology

Finally, and perhaps one of the most influential new directions in maritime archaeology, is the arrival of post-processual archaeology. It was the response of archaeologists who noticed that processual archaeology was lacking the ability to explain the intangible side of history, such as symbolism and meaning (Hodder, 1985, p. 1).

Shedding light on the distinction between automatic/habitual actions and intentional meaningful actions, between reaction, responding to something passively, and construction, requiring shaping or creating something, and, lastly, between societal actions and individual actions (Hodder, 1985, p. 2). This shows the close intertwining of function and meaning (Hodder, 1985, p. 2). Emphasizing the human focus: culture, meaning, instead of material structures, which were the focus of processualism (Campbell, 2023, p. 17; Gibbins & Adams, 2001, p. 286). Obviously, critique came from the processualism camp, notoriously from Binford's 1988 book chapter: Science to Seance, or Processual to "Post-Processual" Archaeology (Binford, 2009, pp. 27–40). The movement through which archaeology has shifted from beta sciences toward researching/identifying the intangible realm ensures a great tension between the two paradigms (Campbell, 2023, p. 18).

One of the first usages of post-processualism in maritime archaeology was during a session at a conference of the Society for Historical Archaeology in 1990, led by Spencer-Wood (1990a, pp. 30–34). Here, the need to question the unconscious acceptance of established models in archaeological interpretation in order to develop new ones came to light (Spencer-Wood, 1990a, p. 30). This reflective stance shows the archaeologist as an observer, responsible for building theory, while shedding light on the inherent biases of these individuals with all their own worldviews (Campbell, 2023, p. 18). These prejudices can never be completely ignored but always should be acknowledged; Spencer-Wood supplied five recommendations to keep its qualitative nature in check (Spencer-Wood, 1990b, p. 32). Namely "1. Reveal political implications of models and paradigms, 2. Tolerate dissonance, 3. Value questions, 4. Tolerate ambiguity, and 5. Emphasize and publish unexplained data and unanswered questions" (Spencer-Wood, 1990b, p. 32, as cited in Campbell, 2023, p. 18).

Now, the unique and individual nature of shipwrecks truly comes to light. The notion of the ship, its design, and structure as a symbol can be explored, with the ship also becoming a social agent (Campbell, 2023, p. 18; Gibbins & Adams, 2001, p. 286; Rönnby, 2013, pp. 14–15). This shifts current ideas of conducting research in maritime archaeology drastically, opening the way to countless new theoretical frameworks (Campbell, 2023, p. 18). Two ways of thought have drastically impacted research in maritime archaeology and have often been applied in research across the globe: these are the Annales school and the Maritime Cultural Landscape.

The Annales school framework

Noteworthy to mention is the application of the Annales school to maritime archaeology, done by Staniforth (1997, 2003), who coined the term archaeology of the event (Staniforth, 1997, pp. 17–18). This approach crosses multiple disciplines, such as history, anthropology, geography, sociology, psychology, and, of course, archaeology (Staniforth, 1997, p. 17). Originating from the ideas of French historians such as Braudel (e.g., 1981), Ladurie (e.g., 1979), and Le Goff (e.g., 1980), it was largely ignored by archaeologists in the late 1970s and the early 1980s. From the late 1980s onwards the possible application of the Annales school in archaeology became apparent (e.g., Bintliff, 1991) (Staniforth, 1997, p. 17). In particular, archaeologists were keen on using Braudel's *événement* and *longue durée* concepts (Gibbins & Adams, 2001, p. 287; Staniforth, 1997, p. 18l; Veth, 2006, p. 19). The former describes a specific event, the latter a timeframe. Thus, the Annales school places an event within time, therefore analysing specific cases within wider contexts, while using multiple scales of time (Gibbins & Adams, 2001, p. 287; Staniforth, 1997, p. 18l; Veth, 2006, p. 19).

The Maritime Cultural Landscape

However, more importantly, Westerdahl's (1992) ground-shaking Maritime Cultural Landscape developed within this paradigm (Campbell, 2023, p. 18). Developed during Westerdahl's fieldwork in Sweden, he constructed a framework where the sociality of maritime communities could be explained, which was just what post-processualism was developed to do: understanding the intangible aspects of our history (Campbell, 2023, p. 18). Thus, he created 'Man in landscape, landscape in man' (Löfgren, 1981, as cited in Westerdahl, 1995, p. 5). This theoretical framework will also be part of the foundation of this research. In Chapter 3, more details will be given on the MCL.

Generally, theory-building in maritime archaeology also followed the general trends observed throughout archaeology a century earlier (Maarleveld, 1998, p. 28). However, its legacy and youthfulness played a significant role in its development and application (Flatman, 2007, p. 78). Globally, three generations can be observed.

The first-generation maritime archaeologists were divers who taught themselves archaeology or at least a feeling of historical/cultural importance.

The second generation involves archaeologists who learned to dive, taking the first steps in developing methods, techniques, and low-range theory.

The third generation were the students who graduated from universities specializing in maritime archaeology (Gibbins & Adams, 2001, p. 286). With their academic background, newly established mid- to high-range theories were developed.

Now, in the 21st century, maritime archaeology has successfully evolved towards an academic discipline, which is also concerned with its theoretical basis, opening the way to use and adapt these existing theories in the field and bridging the gaps between the paradigms. The paragraph above provided a general state of maritime archaeology's theory-building legacy, but how did maritime archaeology come into being in the Netherlands, and how have these three generations behaved there?

2.2 Maritime archaeology; Shifting tides in the Netherlands

The shifting of paradigms is noticeable in the research landscape. Theory is the basis for research and interpretation. In the Netherlands, generally four growth stages can be observed (Manders, 2017, p. 17).

In the 1970s, when it was dominated by explorers and adventurers, just like in maritime archaeology generally, e.g., Cousteau and Peterson. There was also a tendency towards historical particularism, as can be seen in the almost goldrush of finding the Lutine (Hislam, 1913, pp. 450–451; van der Molen, 1970).

During the 1980s, when second-generation maritime archaeologists entered the stage, developing methods and techniques (Manders, 2017, p. 17).

And from 1990 to 2007, the establishment of an organizational system ensured the protection and research of shipwrecks. This phase is characterized by the NISA dive team, focusing on inventorying underwater archaeological sites and taking protective measures on them.

Recently, the third generation of maritime archaeologists has joined the field, mainly portrayed through a handful of doctoral dissertations that interact with post-processual theories, particularly the maritime cultural landscape and the Annales school.

Maritime archaeology; a discipline born

While the Netherlands had the first professor in non-classical archaeology in the world, Caspar Reuvens, the focus of archaeology was not really on the "maritimity" of the Netherlands; however, it did not go completely unnoticed, see Figure 1. Reuvens and Navy

engineer Glavimans' observations of a shipwreck found in a tidal branch of the Meuse near Capelle in Noord-Brabant were executed in a modern academic manner, see Figure 2 (Maarleveld, 1998, p. 38; Reinders, 1986, p. 20).

Figure 1: Prof. mr. Caspar Reuvens, the first professor in non-classical archaeology. Portrait by Louis Moritz 1835 (Leiden University, Icones Leidenses 230, http://hdl.handle.net/1887.1/item:1582045).

Figure 2: Cornelis Jan Glavimans portrait by Cornelis Cels, 1841(Maritime Museum Rotterdam, inv./cat.nr. P2137, https://rkd.nl/images/54085).

The report included detailed drawings, stratigraphic observations, and interpretations were made. It was observed that the shipwreck was likely to be part of a shipbridge, and its sinking could be tied to the siege of Geertruidenberg in 1583 (Reinders, 1986, p. 20). This shipwreck, together with the excavation of a ship in Vechten near Utrecht, is significant. The Vechten excavation has not been researched at a high level. Glavimans' observations were among the few maritime studies made during the 19th century. For this reason, he could rightfully be considered the founder of maritime archaeology in the Netherlands (van Holk, 2009a, p. 14). However, his research did not get a follow-up; through the first half of the 20th century, these excavations were exceptions rather than the rule.

Shipwreck archaeology gained an influx after the poldering in the Netherlands during the 1930s and 1940s. Now numerous shipwrecks could be found on land. In 1932, when the first polder in the Wieringenmeer was created, 16 shipwrecks were found; however, interest was still limited (Reinders, 1986, pp. 22–23). Their potential was recognized; that is why the shipwrecks were left untouched in their location (Reinders,

1986, p. 23). In essence, these discoveries were incidental. When the Noordoostpolder was created in 1941–1942, this changed drastically (van Holk, 2009a, p. 15). Under the supervision of A.E. van Giffen, director of the Biologisch-Archaeologisch Instituut in Groningen, and his scientific assistant P.J.R. Modderman, the archaeology in the Noordoostpolder received academic interest from the University of Groningen (van Holk, 2009a, p. 16). Respectively, Modderman wrote his doctoral dissertation on a shipwreck which he identified as a cog (van Holk, 2009a, p. 16). Unfortunately, these observations also can be seen as exceptions. Later research in the polder was primarily focused on the use of shipwrecks to date stratigraphic layers (van Holk, 2009a, pp. 16–17). From 1947 onwards, shipwreck archaeology moved to the Rijksdienst voor het Oudheidkundig Bodemonderzoek (ROB) (Maarleveld, 1993, p. 43; van Holk, 2009a, p. 16). Later efforts in shipwreck archaeology included, but were not limited to, the excavation of the Roman Zwammerdam ships in 1971–1974 and the excavations of the museum in Ketelhaven from 1971 onwards up until their fusion with the underwater archaeological department in 1994 (Reinders, 1986, p. 33; van Holk, 2009a, pp. 17–18).

Still, research on shipwrecks underwater had to wait. Its realm was still out of reach for archaeologists. As discussed in the first paragraph of this chapter, underwater archaeology was already being practiced as early as the 1960s (Vos, 2009, p. 26). However, the development of the archaeological component it had in the Mediterranean could not be found in the Dutch cold, mucky waters (Maarleveld, 1984, p. 7; Vos, 2009, p. 26). Nevertheless, divers continued to dive on shipwrecks in Dutch territorial waters, and the locations of these wrecks were often reported by fishermen who had snagged them with their fishing gear (Maarleveld, 1993, p. 32; Vos, 2009, p. 26). These locations were kept within sport diver social circles, to avoid rivalries (Vos, 2009, p. 26).

Simultaneously, from 1967 onwards, commercial salvagers could obtain contracts with the government to gain the right to salvage shipwrecks which were of Dutch ownership, which, however, was completely against the Monumentenwet (1961) (Maarleveld, 1993, p. 34). Often, the interests were in rare materials that could be found in objects from shipwrecks, such as anchors and cannons, or in presumed riches, such as the search for the infamous Lutine (Vos, 2009, p. 26). Archaeologists' interest was completely lacking, leading to excellent archaeological objects ending up on the private commercial antiquity market (Maarleveld, 1993, p. 32).

However, sometimes these contracts were acquired due to the historical interests of the finders, such as those who had gained the rights to a shipwreck called Scheer I (Maarleveld, 1993, p. 34; Manders, 1993, pp. 20–21). This excavation was done in a responsible manner, with intrinsic motivation, resulting in a relatively well-documented excavation (Manders, 1993, pp. 20–21). However, the rules for these amateur archaeologists were the same as those for commercial salvagers, and thus these individuals were labelled as salvagers operating in isolation (Maarleveld, 1993, p. 34).

During the first steps of maritime archaeology in the Netherlands, the discipline was marked by its adventure-seeking treasure hunters and shipwreck salvaging legacy. Since it was still common practice for commercial salvagers to gain rights to salvage historical Dutch shipwrecks, this created a paradigm of the unlimited collecting of finds for the sole purpose of selling (Maarleveld, 1993, p. 34).

While archaeological foundations tried to gain traction in underwater archaeology, in practice, it appeared difficult. In the 1960s, a short-lived effort consisted of the Stichting Onderwater Onderzoek (S.O.W.O.) and Submarine Archeologisch Onderzoek (S.A.O.), which focused on research at, among others, Brittenburg near Katwijk and multiple locations in the Meuse (Maarleveld, 1984, p. 11). Both could not gain traction and lost interest quickly. A later attempt, in 1978, had more impact: the founding of the Stichting Onderwater Archeologie (Stoa), consisting of an enthusiastic group of divers. However, from the archaeologists' side, they did not receive much attention (Maarleveld, 1984, p. 11).

Underwater cultural heritage sites only began to receive the attention they deserved in 1980, when the Ministry of CRM appointed Thijs Maarleveld as a diving archaeologist (Maarleveld, 1984, p. 12).

A change of course

Thus, during the 1980s in the Netherlands, the tides in maritime archaeology changed, and the focus shifted towards underwater archaeology. The discipline was still struggling, since it was still common practice for commercial salvagers to gain rights to salvage historical Dutch shipwrecks (Maarleveld, 1993, p. 34). While attempts were made to do honest archaeology within this framework, such as the excavation of Scheer I, it was hard for academics and archaeologists to accept the acquiring of commercial salvage rights as the *modus operandi (*Maarleveld, 1993, pp. 34–35).

It became apparent that this needed to be changed. However, for a change like this to occur, a significant discovery of a wreck is often needed to shift the abovementioned paradigm towards scientifically based archaeological research, such as that of the Batavia wreck in Australia (Maarleveld, 1993, p. 34). In the Netherlands, the discovery of the Aanloop Molengat wreck opened the doorway to archaeology-based shipwreck excavations, which set the tone for future research while also highlighting the troubled past of uncontrolled salvage (Maarleveld, 1993, p. 34).

A push in the right direction

On Sunday, the 8th of July 1984, divers of the Texel-based dive-and-salvage company Eelman discovered an anomaly on the seafloor. There, they found "wonderful things," according to them: an archaeological shipwreck filled with lead and tin, which were at the time considerably valuable (Maarleveld, 1993, p. 35). Soon after the discovery of the wreck, it was reported to the ministry; however, at the same time, an application for a permit to commercially salvage the wreck was sent to the ministry (Maarleveld, 1993, p. 35). The salvagers were keen on having an archaeologist onboard; still, the archaeology would play no substantial part in the excavation of the ship. Considering this was the "normal way of doing things," it seemed that the Aanloop Molengat wreck would be commercially salvaged like any other shipwreck at the time.

Nonetheless, on 10 June 1985, the Minister of Welfare, Public Health, and Culture (W.V.C.) concluded that the 1961 National Monuments Law should be applied in the Netherlands. As a result, the Aanloop Molengat wreck was designated a cultural heritage monument, preventing its commercial salvage (Maarleveld, 1993, p. 35). This decision ended the explicit permission for commercial salvage of shipwrecks in Dutch waters, as well as of Dutch shipwrecks located abroad, a restriction that was later formally incorporated in the renewed Monumentenwet (1988), thereby ensuring the involvement of heritage professionals during the decision-making process (Maarleveld, 1993, p. 35; Manders, 2017, p. 17; Vos, 2012, p. 24). While lawfully it is still possible for Dutch shipwrecks to be salvaged commercially, since 2007 these decisions have needed to go through the RCE as well, so in practice this is no longer done.

The discovery and subsequent excavation of the Aanloop Molengat and Scheurrak SO1 shipwrecks provided a concrete example of a scientifically based archaeological approach, in contrast to the commercial salvage practices previously known to the public.

What followed was the establishment of a separate department with a professional dive team, whose primary concern was the research of underwater archaeological sites.

Archaeologists at the helm

The department of underwater archaeology, AAO (Afdeling Archeologie Onderwater), was sparked to life in 1985 and eventually became part of the ROB (Rijksdienst oudheidkundig bodemonderzoek) (Maarleveld, 1998, p. 52). A group of pioneers was mainly responsible for the development of the underwater archaeology discipline, encountering numerous technical challenges, starting with the safety procedures and excavation techniques suitable for the cold, mucky waters of The Netherlands (Vos, 2009, p. 26).

Ultimately, in 1995, this led to the establishment of the NISA in Lelystad, a merged organisation that consisted of the underwater archaeological department in Alphen aan de Rijn, and the department of shipwreck archaeology (focused on shipwrecks found on land) in Ketelhaven (Vos, 2009, p. 30). More importantly, in 1997, a professional archaeological diving unit was created as part of the NISA, led by Arent Vos (Vos, 2009, p. 27). A fixed working structure was established, and systematic solutions were found regarding working conditions, pragmatic logistical matters, as well as policy issues (Vos, 2009, p. 28–30). Up until this point in history, underwater archaeology policy can best be defined by its reactive nature: archaeological research was always a result of a discovery that needed to be researched or excavated, while methods and techniques were figured out along the way. Excavations illustrating this research stance include the Scheurrak SO1 and Aanloop Molengat projects.

However, this changed in 1998, when the research focus shifted from a reactive to a proactive approach, best illustrated by the project *Waardestellende onderzoeken in de westelijke Waddenzee (Burgzand)*, in which multiple wrecks, over the course of seven years until 2005, were explored within a defined geographical area (Vos, 2012, pp. 25–26, 29–30). The goal was to inventory the research potential of individual shipwrecks; therefore, standardized research questions were applied during the investigation of these sites (Vos, 2012, p. 31).

Simultaneously, theories of protecting underwater cultural heritage sites were developed through experiments and cooperation (processual archaeology). Such as European projects for example MoSS, that focused on mapping the processes of

deterioration of underwater cultural heritage sites and their consequences and Bacpoles which looked at the bacterial influences on wood underwater (Manders, 2004, pp. 279–290, 285–286) MACHU, where the management of underwater cultural heritage sites stood central (MACHU Project Team, 2009, p. 10). The project WreckProtect, focussing on protecting shipwrecks in the Baltic (Björdal et al., 2012, pp. 202–204). While the development of new techniques and tools to preserve, monitor and assess underwater archaeological sites were part of the SASMAP project (Manders & Gregory, 2015, p. 7)

Involvement in the theoretical debate, and in developing or applying it, was limited in the Netherlands. Due to its nature and development, the lack of continuity delayed the emergence of third-generation maritime archaeologists, as coined by Gibbins and Adams (2001, p. 286). However, more recently, a limited, more theoretical angle has developed in the Netherlands, most prominently reflected in multiple Ph.D. dissertations. These projects mainly focus on the MCL or underwater cultural heritage management. A dissertation including a full-scale shipwreck with a developed theoretical framework is currently in progress through the new Scheurrak SO1 project.

The theoretical backbone of maritime archaeology has experienced a similar evolution as archaeology in general did a century earlier. Around the globe, trends in maritime archaeology can be identified within their paradigms, which obviously do not have fixed borders, but still influence the course of research. Focusing on the Netherlands, maritime archaeology perhaps had its earliest beginnings with Glavimans under the supervision of Reuvens; however, this was short-lived. Eventually, the discipline evolved out of necessity, as a response to salvaging. Through trial and error, a pioneering group established a foundation for the potential flourishing of maritime archaeology. Still, this tumultuous start, combined with a lack of continuity, resulted in a delay of mid-to-high-level theory focused on Dutch sites, of which there are many. However, more recently, theory-based projects have emerged, resulting in multiple dissertations. This development is generally seen as not unique.

Maritime archaeology, and especially shipwreck archaeology, has often struggled to build its own theoretical frameworks; yet this is no less important (Zwick, 2013, p. 46). Archaeological material must be contextualized within theory to provide meaningful insights into the past; otherwise, research is no better than the “pull it up” mentality of salvagers (Delgado, 2000, p. 12). Context is everything, and what better way to explore this than through one of the most intriguing and contested archaeological debates: that of

north-western ship construction in the late Middle Ages, closely linked with the cog dilemma, but approached from a different viewpoint, a new theoretical framework, a different context.

2.3 Late Medieval ship typologies in Northwestern Europe

Since the dawn of archaeology, creating typologies has been a foundational element of the discipline. During the 19th and 20th centuries, types of objects were created to identify a chronology, an evolutionary model in which one type evolves into the next, connecting a sense of time to the shape of the objects (Adams and Rönnby, 2013, p. 5; Sørensen, 2015, pp. 85–86). The evolutionary argument for the use of typologies has been applied since Montelius (1899). Montelius focused on the classification of typologies for the European Bronze Age and drew the analogy between manmade objects and the evolution of biological species (Montelius, 1899, as cited in Sørensen, 2015, p. 86). He illustrated his argument with the evolving appearance of cars, observing how types evolve over time (Montelius, 1885, p. 48, 1899, as cited in Sørensen, 2015, p. 86). Closely linked to this is seriation, an analytical technique used to describe the significance of a unit's position, see Figure 3 (Marquardt, 1978, pp. 258–260; O'Brien and Lyman, 2009, pp. 236–237).

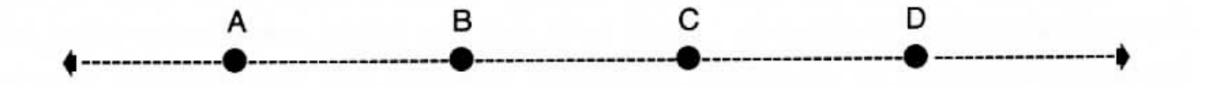

Figure 3: Showing the process of seriation, where similar objects are placed together. The closer the objects are located to each other, the more similar they are. (Marquardt, 1978, p. 258, Figure 8.1).

In archaeology, it is used as a tool to identify a relative chronology; objects that are closer in time appear more similar (O'Brien and Lyman, 2009, pp. 236–241). It has been common practice for archaeologists to create typologies for objects and cultures, such as prehistoric lithic tools, earthenware, and prehistoric cultures, e.g., the Bell Beaker culture, see Figure 4.

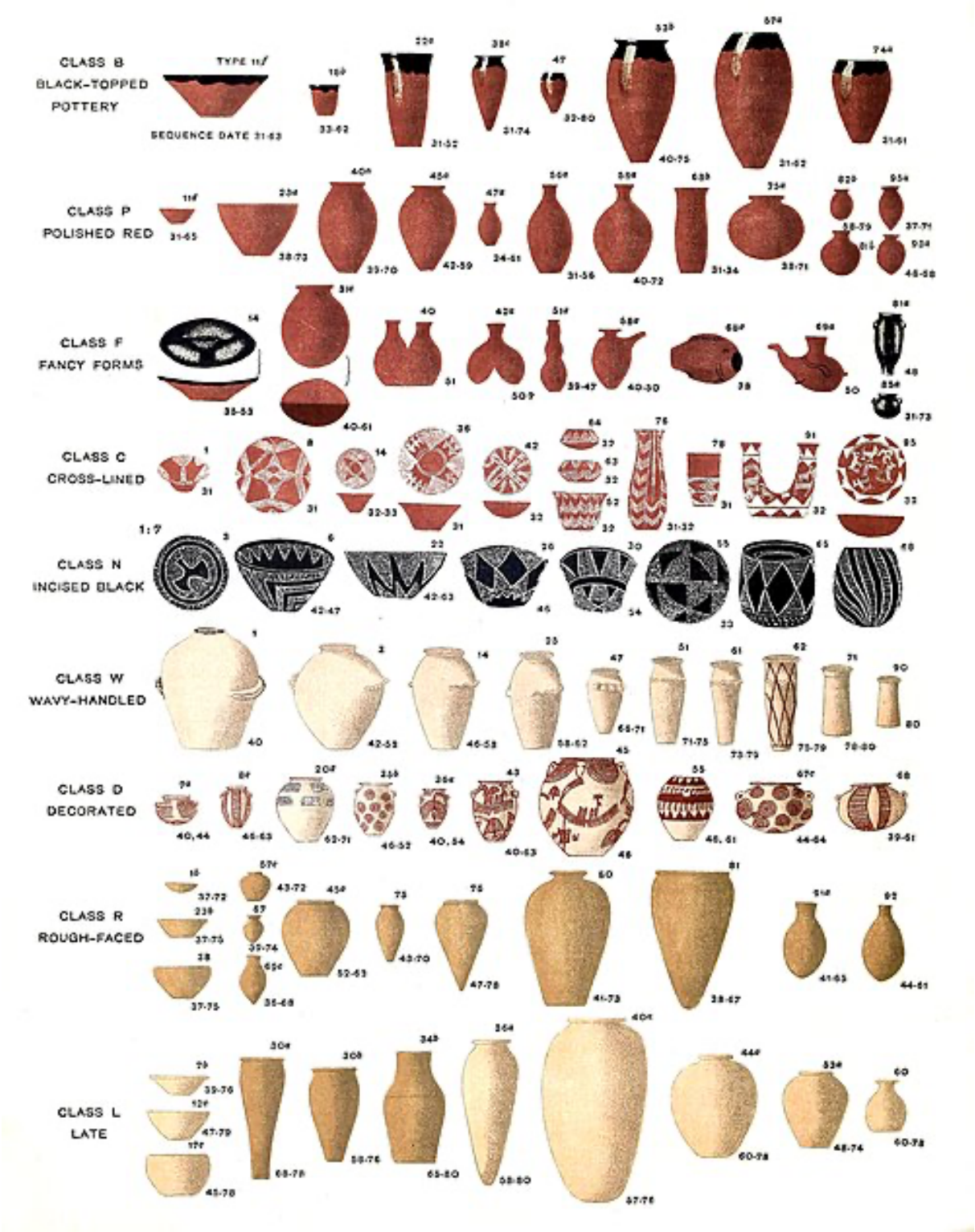

Figure 4: Seriation of Prehistoric pottery form Naqada I, II,and III. (Flinders & Mace, 1901, p. 6, Figure 1).

However, ships also underwent this trend, ensuring that almost all shipwrecks excavated in the 20th and even in the 21st century were linked to a typology that fitted the narrative. Shipwrecks appearing similar are not necessarily so, highlighting the problematic nature of typologies, a challenge shared widely across all fields of archaeology. This resulted in the identification and categorization of different shipwrecks as the same type by archaeologists, perhaps focusing too much on similarities rather than differences, which Hodder had already warned about (Hodder, 1986, p. 127). An intriguing period regarding the use and subsequent limitations of ship typologies is that of those defined in the late medieval period in Northwestern Europe.

Link to historical typologies

It must be said that typologies are not useless; it is not for no reason that classification schemes have been used by archaeologists for centuries. However, shipwreck archaeology of the Late Medieval period holds a unique position due to the introduction of (written) historical documents on a large scale, mentioning certain ship type terminologies. An interesting situation arises with this development: an opportunity to connect historical typologies to archaeological material, making it possible to relate literary proof of specific ships and their stories, to archaeological remains, providing random unnamed remains with a name, a context, a story (Dhoop, 2016, p. 59). This eventually leads to a powerful snapshot of our history, when a shipwreck can be identified in the historical record (Rönnby, 2013, p. 17). That said, shipwreck archaeology may have become too dependent on these historical records to interpret archaeological sites (Maarleveld, 1995, p. 5).

There is a fundamental conceptual difference within the study of Medieval ship typologies and those from post-medieval times. Ship types cannot be consequently found in historical documentation of the Late Medieval period, and to classify them in the same manner as post-medieval wrecks results in misconceptions (Belasus, 2019, p. 176; Zwick, 2013, p. 61).

Specific written evidence regarding detailed structural clues to these ships is almost non-existent, such as construction drawings, ship models, a register of shipwrecks, and payrolls (Dhoop, 2016, p. 48; Zwick, 2013, p. 61). Thus, using indirect sources, like iconography or sightings, in the same manner as the previously named sources of post-medieval ships can lead to a wrong link between historical typologies and archaeological

ones (Dhoop, 2016, p. 48; Zwick, 2013, p. 61). These typological frameworks make clear that the major conceptual gap between medieval and post-medieval shipwreck studies is often overlooked or underestimated (Belasus, 2019, p. 176; Zwick, 2013, p. 61).

Ship typologies, their use and limits

Not only do these typologies serve a narrative function, but they also open the way to structure, at first glimpse, rather random complex data, making it possible to compare similar shipwrecks with each other (Zwick, 2013, p. 46). Identifying key structural elements opens the door to cluster data and interpret them within a broader context, as an assemblage. Unavoidably, these key characteristics are used to create typologies and their fitting conceptual lineages (Zwick, 2013, p. 46, where one set of characteristics, i.e., type, evolves into another.

This biological analogy has been criticized by some archaeologists (e.g., Hirte 1987; Maarleveld, 1995), emphasizing too much on the linear improvement of ships, while ignoring active human decision-making and choice because of conscious intent (Maarleveld, 1995, p. 4). Others have defended this evolutionary approach with a strong theoretical backbone and a change of terminology from type towards tradition (e.g., Zwick, 2013, p. 49). Zwick (2013) shows the intricate concepts that can be used to describe shipwrecks, while working within the framework of an evolutionary approach. He also acknowledges that similar environments with similar resources can lead to similar solutions to shipbuilding techniques (Weski, 2003, pp. 281–282; Zwick, 2013, p. 56).

More importantly, typologies often oversimplify reality. The classification of ships is either too complicated, risking hiding patterns, or too simple, meaning conclusions can be drawn that might not actually be justified (McGrail, 1995, p. 139). In other words, there is no perfect typology, only compromises. These compromises are influenced by archaeological paradigms, as mentioned above. Complementary to these paradigms are the researcher's stance on their view of ships. On the one hand, there is the essentialist view, where ships have an intrinsic and fixed identity (O'Brien and Lyman, 2009, p. 229; Zwick, 2013, p. 62). On the other hand, there is the materialist view, where ships emerge from practical and contextual factors (O'Brien and Lyman, 2009, p. 229; Zwick, 2013, p. 62). The essentialist regards the type as real, and any variation as the exception, while the materialist sees the type as the illusion and the variation as reality (O'Brien and Lyman,

2009, p. 229). The theories used in this thesis will help to find a compromise between these two stances, trying to bridge this conceptual gap.

Beforehand, what needs to be clarified is the difference between homologous and analogous features. Similar constructional elements may not occur always in the same way; similar illustrations can be found differing from each other due to the cultural, technical, and environmental differences or limitations (Maarleveld, 1995, p. 6; Zwick, 2013, p. 50). What looks the same does not necessarily need to be the same or have the same origin.

Homologous vs Analogous

These terms are widely used in archaeological research, trying to explain the origin of certain features on objects, such as pottery, as well as on constructions, such as houses (O'Brien and Lyman, 2009, p. 233). Mostly, homologous and analogous features are used within evolutionary archaeology (Lyman, 2001, p. 74; O'Brien and Leonard, 2001, pp. 2–4; O'Brien and Lyman, 2009, p. 227). Analogous features are developed independently, but can look similar, see Figure 5 (O'Brien and Leonard, 2001, p. 5; O'Brien and Lyman, 2009, pp. 234–236). Homologous features are, when speaking in biological terms, inherited from the same lineage, being a continuation (Lyman, 2001, p. 71). For example, the wings of eagles and crows exhibit both structural and superficial similarity and therefore represent a homologous similarity. In contrast, the wings of eagles and bats resemble one another only superficially; they are both wings used to fly but differ fundamentally in their structural composition, making this an example of analogous similarity (O'Brien and Lyman, 2009, pp. 234–235).

However, these differences are not only the result of environmental or natural causes alone, but also of anthropogenic causes. See, for example, Zwick's (2013, pp. 51–54) case study of the Grace Dieu, which was a result of both mechanisms.

Figure 5: Showing the difference between homologous features (left) and analogous features. (By Ju's, nd.).

Fictitious typology

Archaeologists are used to make typologies out of other archaeological finds. It has been done time and again to name specific object types after the location they were first found (Crumlin-Pedersen, 2000, p. 236; Weski, 1999, p. 367). However, these homologous features and other indicators of continuity become problematic once they are arranged within a typological framework, particularly when lineages are grouped under historical typologies (Zwick, 2013, p. 60). Meaning they are part of a seriation framework which limits the researcher's analysis, ultimately being way too focused on similarities than these differences, which might be fundamentally important, thus leading to these misconceptions (Dhoop, 2016, p. 50; McGrail, 1995, p. 139; Zwick, 2013, p. 60).

Obviously, typologies will be affected by numerous aspects, such as an unbalanced representation in certain types of wrecks that were excavated within certain areas or wrongfully identifying the different homologous and analogous features (Crumlin-Pedersen, 2000, pp. 235–236; Dhoop, 2016, p. 56; Zwick, 2013, p. 61).

Ultimately, this leads to a limited understanding of the conceptual lineages of shipbuilding traditions (Weski, 2003, p. 281; Zwick, 2013, p. 61). Sometimes these fictitious typologies are rewritten into tradition (Dhoop, 2016, p. 56). Still, this is saying nothing different in the same words. It remains a construct of archaeologists.

Similarly, on a meta-science level, research itself is steered towards this typological thinking simply out of habit or because some buzzwords sell better than others. Projects regarding terminologies such as Hanseatic and Cogs, but similarly VOC, WIC, Pirates, Gold, and treasure tend to be more covered by mainstream media, the generally interested public, or national heritage canons (Belasus, 2017b, pp. 222, 226–233; Belasus, 2019, p. 176; Dhoop, 2016, pp. 50–52; Weski, 1999, p. 360).

To detach the research from these influences and pitfalls, archaeologists should work with fictitious typologies. These remain flexible enough to move with the constant improving of the database and their perimeters (Zwick, 2013, p. 61). Ideally these fictitious typologies would match the historical typology (Zwick, 2013, p. 61).

Vernacular Nomenclature

These historical categories, which Zwick (2013, p. 61) refers to as "real typology", may not have always existed. Not all these historical typologies were technologically defined in contemporary writings (Maarleveld, 1995, p. 6). It may very well be the case

that some historical types are simply the result of vernacular nomenclature (Dhoop, 2016, p. 57).

Vernacular, a regional language form and a product of regional belief systems, and nomenclature refers to the name given to species, and sub-species (Eisenmann & Poor, 1946, p. 210; Heath, 1988, pp. 1, 4). Problems with the use of vernacular nomenclature often occurred in biological studies, especially related to naming species and sub-species. For example, in America, where this problem was addressed regarding the naming of bird species by local people (Eisenmann & Poor, 1946). A few problems were identified here. First, some names of birds were misleading; secondly, some birds which were part of the same species were named differently in other regions (Eisenmann & Poor, 1946, pp. 210–211). Then, it is for no reason that the academic biological community opted to use scientific names, which often have an origin in classical Greek and Latin (Palma & Heath, 2021, p. 3). In the same paper, Palma and Heath (2021) acknowledge the problems of vernacular nomenclature for species. Often the vernacular names of species are based on myths, what the species is used for, or threats, where the same biological species might have different names (Palma & Heath, 2021, p. 2). They show how the vernacular name-giving lacks any analytical aspect, does not follow any rules, in contrast to scientific nomenclature which follows very specific rules that can be found in Codes of nomenclature (Palma & Heath, 2021, pp. 2–3).

Now moving towards ships, where biological terminologies are used as well, such as ribs, backbone, skin, and skeleton, to name a few, also encounter problems with name-giving to typologies and, as mentioned above, these names might very well have been a result of this vernacular nomenclature phenomenon. Leads to this confusion in name-giving can be found in the historical archives (Belasus, 2019, p. 176; Zwick, 2013, pp. 62, 64). For example, in 1422, when two warnings of pirate activity were given to sailors from Wismar involving ships, in one of them a ship was described as a Kreyer and in the other as an Ewer (Wolf, 1986, p. 21). So, it is not surprising that similar ships were called differently in other regions (Weski, 1999, p. 366).

Some of the problems mentioned above will be explained through the typologies of the late Medieval times in Northwestern Europe.

Late Medieval ship typologies

As explained above, the historical ship typologies of the Late Medieval period in Northwestern Europe hold a special place in archaeological and historical research. Not only are these ships technologically interesting, but also the social component of their use, and their portrayal in the historical archives and iconography is equally interesting. To illustrate some of these problematic components, two of the most prominent ship types during this late Medieval period in Northwestern Europe will be explained, respectively the cog and hulk types.

Cog

The cog is one such type used for ships, see Figure 6. In the Low Countries, subsequent research has focused on identifying predecessors and descendants of this ship type (Weski, 1999, p. 361). Nevertheless, archaeologists have critiqued the typological approach and the linear interpretation of ship evolution (Hirte, 1987, p. 721; Maarleveld, 1995, p. 4; Weski, 2003, p. 281).

Initially, the cog was only known historically through text and iconography by the work of German historians Hagedorn and Vogel, see Figure 7 (Belasus, 2019, p. 176). However, the term 'cog' had a broad meaning among contemporaries when referring to ships, ranging from general trade vessels to specifically one-masted ships (Weski, 1999, pp. 361–362).

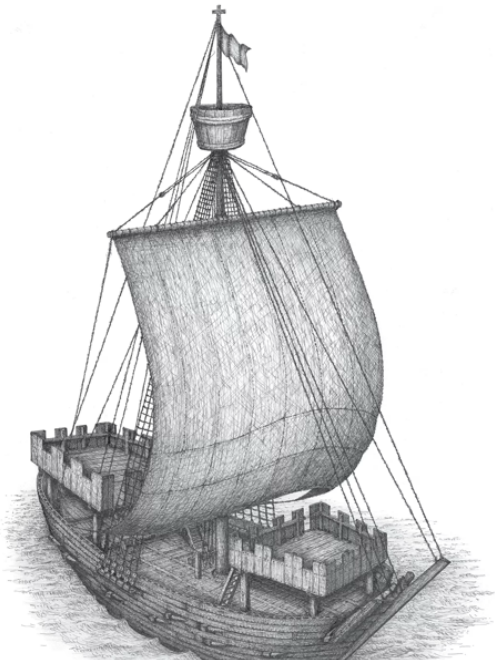

Figure 6: Reconstruction drawing of a cog. (Vlierman, 2021, p. 30).

Figure 7: A depiction of a cog in the seal of Stralsund, 1329. (Vlierman, 2021, p. 67, Figure 4.2c after Ewe, 1972).

Before research into cogs and the Hanseatic League became a hot topic in archaeology, the first cog was already identified by Modderman in 1944 (Blok, 2014, pp. 15–17; Holk, 2009a, p. 16, 2009b, pp. 127–133). Modderman compared the archaeological remains of the NM107 wreck in the Noordoostpolder to iconographic material and concluded that the NM107 was a cog (van Holk, 2009b, pp. 129, 133). It was a decade later when research into the Hanseatic times became a well-known focus of research. In 1956, Heinsius' work reignited the scholarly and public interest in the cog and the Hanseatic League, which was seen by earlier German historians as purely German and of national pride (Weski, 1999, p. 360). Perhaps then, not surprisingly, after the Second World War, historians looked at their history to find a peaceful national canon; they found this in the Hanseatic League and their ships such as the cogs (Dhoop, 2016, p. 51). These cog ships were seen as the primary ship type used in the trade conducted by and with Hanseatic towns (Zwick, 2013, p. 62).

So, Heinsius tried to identify technical aspects of cogs by combining iconographic evidence, mostly seals of towns, and medieval texts. He identified four primary technical aspects of the cog (Heinsius, 1956, p. 109):

- Stern and stem-post have a sharp angle on a keel
- Straight and high stern and stem-post
- High sides/boards
- Overlapping outer hull strakes

However, obviously, technical details could not be distilled from these seals or determine how the ship looked below the waterline. So, it was only after the first archaeological excavation of a cog that these aspects came to light. This first archaeological excavation, when the excavators knew, partly because of the characteristics established by Heinsius, it was a cog, was the excavation of a shipwreck in the Bremen region in 1962 (Crumlin-Pedersen, 1999, p. 231; Dhoop, 2016, p. 51; Zwick, 2013, p. 62). Later referred to as the Bremen cog type, it was seen as a template for “the” Hanseatic ship, the cog. Now, this shipwreck was seen as an archaeological prototype of the cog ship, and more characteristics were added to typify a cog ship (Zwick, 2013, p. 62). In the 60s, different variables and characteristics were developed by archaeologists as a result of this excavation (Belasus, 2017a, p. 179). An updated characteristic list was made by Crumlin-Pedersen (1965). He added the keel plank and the carvel flat bottom of the ship to the

typical characteristics of a cog ship (Crumlin-Pedersen, 1965, pp. 87–88). In the following years, more and more characteristics were added, even making a distinction between primary and secondary features (Dhoop, 2016, pp. 51–54). For a complete and more detailed list and explanation, see Dhoop (2016, pp. 51–54). Importantly to highlight is the connection between cog ships and the Hanseatic League. This says something explicit about the timeframe and primary use of these ships.

What is more interesting to note is the zeal with which researchers try to place the cog outside of other contemporary ships, to place it on a pedestal, to really make it exceptional (Dhoop, 2016, p. 54). Not only has this led to characteristics which are doubtful and misleading, but it also resulted in a tick-the-box list, where even if some wrecks had these characteristics, they could have been categorized as cogs (Blok, 2014, p. 15; Crumlin-Pedersen, 1999, pp. 233–234; Dhoop, 2016, pp. 54–55; Weski, 1999, p. 367). Suggesting it is harder to identify cogs that was previously thought.

While with these newly formed characteristics, many ships were identified as cogs, but where some boxes were ticked, archaeologists now tend to opt for cog-like when it comes to smaller vessels, which already shows small cracks in the well-established list of characteristics that some archaeologists have made (Dhoop, 2016, p. 55; Vlierman, 2021, p. 25; Weski, 1999, p. 367; Zwick, 2013, p. 64).

Also illustrated by the infamous Poeler cog and Gellen cog, which were identified as cogs, as their names suggest. However, only after dendrochronological work in 2011, it became apparent that these ships were not from the Medieval period; the Poeler cog was built around 1773 AD and the Gellen cog around 1831 AD, which makes them definitely not cogs even with a full list of checkboxes of the so-called key characteristics (Belasus, 2017a, pp. 180–182). Since the other key characteristic of the cogs, the time frame, is not correct. Ultimately not fitting the narrative.

So why were these and many other shipwrecks identified as cogs? Were archaeologists that far off? As mentioned above, outside influences can have a great impact on the direction of research. As in the next chapter, Actor-network theory will explain in more detail, research and academic facts are also influenced by these outside forces, such as mainstream media and national heritage canons, see Figure 8, 9, and 10 (Belasus, 2017b, pp. 222, 226–233; Dhoop, 2016, pp. 50–52).

Figure 8: The label of the beer company Störtebecker. (Last dodo, 2017).

Figure 9: The emblem of the football club in Rostock: F.C. Hansa. Showing a depiction of a cog. (Wikipedia, 2026)

Figure 10: Signs on the front of a restaurant in Rostock; Zur Kogge. Using the cog as advertising tool. (Zur Kogge, n.d.).

In Germany, archaeologists' experience this when a ship related to the Hanseatic League is excavated; the first question they will receive from the media, and the public is: "Is this a cog?" (Belasus, 2017b, p. 233). However, archaeologists themselves are equally responsible for this. Names such as "the" Bremen cog and the IJssel cog only emphasize their alleged connection to their historical narrated counterpart, before any research or arguments are provided (Belasus, 2017b, p. 233).

Ultimately, in Germany, archaeological and historical research was greatly influenced by nationalism and might not always have been the topic of critical thinking (Belasus, 2017b, p. 235).

That might also be the reason why the cog that is named in historical sources is still used, while it is acknowledged that this word might not have had the meaning that it has in today's archaeological records. It might simply reflect a broader terminology used for ships that sailed in specific zones, such as coastal sailors, or when the same ship is named differently during the same attack, which can be a result of vernacular nomenclature (Vlierman, 2021, p. 65). For example, during the attack on Lutke Sten's ship, the ship was called a cog by the group from Hamburg and a hulk by the English, while the Hamburg chronicler called the ship a small carvel (Baasch, 1889, p. 103, as cited by Belasus, 2019, p. 179). One argument that is used to explain this confusion is that characteristics of both cogs, hulks, and Nordic rapid ships rapidly interchanged during the 1400s, resulting in the fact that in some harbours a ship was called a cog while in the other a hulk (Fliedner, 1969, p. 67).

Taken together, the examples above show how the cog typology is defined, influenced by all sorts of aspects rather than a stable fact that is out there to be discovered by archaeologists. Its descendant, the hulk, might even be more problematic; this ship has not even been identified in the archaeological record.

Hulk

Archaeologists, who use these biological metaphors that were so strongly critiqued by Hirte (1987, p. 721) and Maarleveld (1995, p. 4), think that the cog evolved into the hulk, using contemporary sources that mention that cogs were replaced by the hulk as the most important trading ship around 1400 AD (Overmeer, 2006, p. 63). Some consider it the type that connects the cog ship to the fluyt ship (Overmeer, 2006, p. 64).

Again, a terminology originating from historical archives, just like the cog (van de Moortel, 2011, pp. 97–98). The hulk, a trading ship that can be found in historical documentation from the late 10th century onward, see Figure 11 (Fliedner, 1969, p. 59). While some archaeologists have tried to identify these iconographically, there exists a danger that similar conclusions will be drawn in the archaeological records as had happened with the cog.

Figure 11: A presumed depiction of a hulk. Showing Henry I returning to England in the Chronicle of John of Worcester, c.1118-1140. (Corpus Christi College, DMO no. 775, fol 383r, https://digital.bodleian.ox.ac.uk/objects/93b83416-7972-40d7-9789-18f54e17ae25/).

In the archaeological records, this ship has not been found yet, or rather, not yet identified. Some have argued that iconographical hulks might be the archaeological Utrecht-type ship, an expanded logboat (van de Moortel, 2003, p. 188; van de Moortel, 2011, pp. 97–98). Interestingly, archaeologists' belief is that features of cogs and hulks have been merged from 1400 AD onwards. This is surprising because the hulk is only known from iconographic sources. What are these characteristics, and how are they merged? Here, the danger exists that research is made to fit the narrative instead of researching what this narrative truly is. The primary characteristic that can be found in the iconography is the banana-shaped hull, like the Utrecht-ship, of which even archaeologists say is an unrealistic depiction of reality (van de Moortel, 2003, p. 188; van de Moortel, 2011, p. 97).

Other evidence of this lineage has to do with the word hulk itself, which might come from "holh," which means in German "hollowed out," providing a link with the Utrecht-type ship (Fliedner, 1969, p. 56).

Another example of the historical hulk type can be found much later, on a map of 1582, where a ship with three masts is called a "hollandche Hulck," a Dutch hulk (Weski, 2003, p. 84). Both historical terminologies, that of the cog and hulk, are therefore perhaps victims of vernacular nomenclature.

The search for this missing link, the ship that connects the cog and the fluyt, illustrates the eagerness that researchers feel to finally be the one to find it.

How to proceed

As outlined above, typological thinking of archaeologists has a logical origin and remains influenced by outside factors. They are trying to either fit the historical typology, which in Late Medieval times appears to be impossible, either because of the great variations in shipwrecks or simply because of vernacular nomenclature processes. Researchers are dealing with fictitious typologies, which need to be clearly defined when these appear to be similar to their historical or "real" typological counterpart, as is the case with cogs and hulks.

So, research asks for a flexible theoretical framework that offers the researcher a frame in which he or she can define a type and explain the social and natural processes that are part of creating this typology, because typologies remain a helpful analytical and narrative tool.

The next chapter will use concepts of the Maritime Cultural Landscapes and Actor-Network Theory to present an approach that can be used in the future to actively construct a potential typology and simultaneously showing how and why these characteristics have been developed, which is a result of social and natural phenomena. However, this will not be done within the scope of this thesis.

The bottom of the W149 shipwreck shows similarities with that of the Bremen cog and will provide a basis to test these concepts, trying to move the academic discussion from typological thinking to one about functionality, which was for contemporaries the most important aspect of ships; how they were used.

Chapter 3: Theory

Research on shipwrecks has been conducted many times since the 1950s, and also well before that. Mostly, it was a pioneering endeavour, nothing too scientific or academic. Archaeology has been an academic discipline in the Netherlands since 1818, when the world's first professor of archaeology, Caspar Reuvens, was appointed in Leiden, see for more information Chapter 2 of this thesis. While maritime archaeology, and specifically shipwreck archaeology, has been moving towards maturing as an academic discipline, creating and using a theoretical framework remains a hurdle to cross. However, theory creates a context for the shipwreck to be interpreted in, making sense of the past.

The main focus of the thesis is the shipwreck W149, located in the IJsselmeer. The choice to use this shipwreck in a thesis like this one can be explained by the fact that it dates to an interesting time period for shipbuilding, as well as having interesting construction details that were discovered in an earlier survey.

Literature on Late Medieval shipbuilding shows that new theories are needed, or rather old ones are not sufficient anymore, best illustrated through the cog dilemma as well as the search for the missing link, the hulk ship, which has sparked extensive discussions among archaeologists.

With the recent implementation of middle- to high-range theory in maritime archaeology, it opens the way to shed new light on these shipwrecks. In no way whatsoever does this thesis try to provide a finalized new theoretical framework ready to take over the maritime archaeological world; however, it does try to show the multitude of possibilities when one tries to understand these shipwrecks using middle- to high-range theory, ultimately providing new insights which perhaps differ from older ones, but are not necessarily better or worse.

There is an intricate legacy of theory building in maritime archaeology and the application of it, changing between generations and geographical borders. An overview of this process can be read in chapter 2.

This chapter will focus on the building blocks of the new theoretical framework through which the remains of W149 will be interpreted, primarily using concepts of two theories: The Maritime Cultural Landscape and Actor-Network Theory.

3.1 Maritime Cultural Landscape

In 1992, research in maritime archaeology changed fundamentally with the arrival of a new working theoretical frame, or rather a new way of looking at and analysing the past (Flatman, 2011, p. 311). While most archaeological work has a primarily land-orientated view with, if even existent, at best a bystander role for the influence of water in our past. As can be seen in the nature and setup of research, but also in the first editions of indicative archaeological value maps of the Netherlands (Deeben, 2008, p. 8). The MCL provides researchers with a viewpoint that sees the world from the water, giving it the main stage. This viewpoint can be exemplified by some truly Dutch towns in the Netherlands. Their infrastructure can be seen from the streets, but perhaps more importantly from their canals, providing a different perspective showing different stakeholders, reasoning, and connections. Revealing the potential of seeing maritime sites as part of the broader landscape, instead of viewing them in isolation (Westerdahl, 2012, pp. 735–736). It links how these sites were used to why they existed and to their wider context, showcasing how the maritime space is used by humans (Westerdahl, 1992, p. 6).

Maritime cultural landscape, what does it entails?

Defining the MCL is quite difficult, as Westerdahl explains it as "the network of sea routes and harbours, indicated both above and under water, and its related constructions and other remains of human activity" (Westerdahl, 2012, p. 736). This definition highlights how the maritime and terrestrial worlds are connected, viewing them not as separate but as interdependent parts of a shared cultural landscape, as equal dance partners in science (Westerdahl, 1992, p. 6; Westerdahl, 2012, pp. 734–735, 743).

The maritime world can be identified through physical elements in the landscape, which are of primary concern for archaeologists. Such elements are harbours, shipyards, shipwrecks, quays, but also buoys and everything related to ships, shipping, and coastal communities. A different approach than that of Muckelroy (1978, p. 6), who does not include these coastal elements. He believed that these sites were more connected to their terrestrial counterparts, and their relation to the maritime world was limited (Muckelroy, 1978, p. 6). However, as Westerdahl and others have proven, coastal communities do in fact have a strong connection to the maritime world, having stronger ties to other coastal communities rather than to terrestrial sites.

Importantly, the landscape exists at a crossroad between culture and space. A cultural landscape only exists when people use it and give meaning to it. Only when people utilize the landscape does it transfer from being a space towards a place, that is, what holds meaning (Ford, 2011, p. 1). And this process of making places is constantly changing, physically and cognitively (Stelten, 2019, p. 32). This includes physical features, the literal space people act in, and intangible features such as noises, smells, and feelings. Perhaps best illustrated through the feeling that almost everyone experiences: the feeling of home.

To understand the complexity of the maritime cultural landscape, which has been criticised for being too inclusive, the maritime cultural landscape can be divided into categories as done by Stelten (2019, p. 33) in his dissertation. The first category, which is the primary focus of this thesis, is the underwater archaeological sites, including shipwrecks and their belongings, submerged harbours, etc. The second category consists of archaeological sites that can be found on land: bridges, ports, lighthouses, etc. The natural world is the third category, including the topography, geomorphological and geological aspects, but also flora and fauna. The last category was coined by Westerdahl as the tradition of usage: the mental map of coastal people (Westerdahl, 1992, p. 8). Almost completely intangible, it does so echo into the tangible world. This maritime knowledge lies at the foundation of the use and distribution of settlements. These intangible aspects are intrinsically tied to the construction of and expression in the physical landscape, thus directly influencing the use of space (Caporaso, 2017, p. 3; Duncan & Gibbs, 2015, p. 10). It shows that the maritime cultural landscape does not only consist of tangible elements, but includes the entirety of tangible and intangible elements, breaking the boundaries of binary oppositions in the form of terrestrial vs maritime, showing the irrelevance of these dualities. Furthermore, these past communities that used these landscapes perceived these elements as being part of a collective landscape, rather than as opposites (Stelten, 2019, p. 34).

Different kinds of "landscapes"

The abovementioned categories are the building blocks of the maritime cultural landscape. However, these can be divided into different individual landscapes, an analytical unit or category in which these components act. A purely systemic and

analytical tool to understand these studied components (Caporaso, 2017, p. 3; Westerdahl, 2011, p. 339).

Westerdahl has divided the maritime cultural landscape into five landscapes, which can be used in archaeological research. However, as Westerdahl also acknowledges, these are very much dependent on the context. They can differ from geographical location to geographical location but also depending on the focus of research (Caporaso, 2017, p. 3; Stelten, 2019, p. 35; Westerdahl, 2011, p. 339). Westerdahl's elements originate from prehistoric research in Scandinavia, which encompasses different themes than those of research on the European expansion on St. Eustatius (Stelten, 2019, p. 35). The thematic landscapes originally developed by Westerdahl are the economic landscape, the resource landscape, the transport landscape, the cognitive landscape, and the ritual landscape (Caporaso, 2017, p. 3; Westerdahl, 2011, p. 339).

Interestingly, recent research on the late medieval maritime cultural landscape of the north-eastern Zuiderzee has identified and divided these thematic landscapes differently (van Popta et al., 2019, pp. 181–185). The researchers identified the following landscapes:

- Economic landscape
- Transport (communicative) landscape
- The outer resource landscape
- The inner resource landscape
- The territorial landscape
- The cognitive landscape
- The ritual landscape
- Leisure landscape of today

While all are part of the maritime cultural landscape, this collection is simply too large to be part of this thesis. So, choices must be made, and while it is certain that they all influenced ships in the area, this research will focus on the inner and outer resource landscape. The exclusion of landscapes, especially the intangible and social ones, in archaeological research has been criticized (van Popta et al., 2019, p. 176). They believe that the misuse of maritime cultural landscape research has corrupted its terminology. A key feature of the maritime cultural landscape is the involvement of both physical and

tangible elements, such as archaeological remains, as well as social and intangible elements, such as folklore. Secondly, the research needs to be interdisciplinary, not only using archaeological remains, but also historical and cartographic records, as well as geomorphological data, among others (van Popta et al., 2019, p. 176). A new term has been introduced to overcome this problem when there is a lack of interdisciplinary involvement. This might be the case with this thesis, as the focus is on archaeological remains. The maritime archaeological landscape thus might be a better fit. However, due to the complementary use of Actor-Network Theory by Latour (2005), the social realm is not excluded directly.

Thus, the maritime cultural landscape will be used to define this research, but it will not cover all landscapes that can be identified in the area, as mentioned above. The focus will remain on two, which complement each other: the inner and outer resource landscape.

The inner and outer resource landscape

These two layers describe the resources that supported the maritime culture in the northeastern Zuiderzee during the late Middle Ages but can also be easily applied to the northwestern Zuiderzee. These landscapes reflect the provenance of resources and their application in relation to primarily shipbuilding, shipping, and trade (van Popta et al., 2019, pp. 182–183).

The outer resource landscape encompasses resources that came from abroad, or outside the region (Westerdahl, 2012, p. 747). These were mainly used for shipbuilding and fitting out ships. It includes, for example, ship timbers, especially oak, which the lands located directly east and west of the Zuiderzee lacked. These were imported from Germany, the Baltic, Scandinavia, and sometimes even the northern part of the Netherlands, where oak was available in abundance (van Holk, 2009b, p. 138). However, some shipwrecks from the Zuiderzee are constructed from timbers coming from the Netherlands and Westphalia, suggesting that these ships were built near the Zuiderzee region (van Popta et al., 2019, pp. 182–183). Sometimes even complete ships were bought and imported to the Zuiderzee, for example to Kampen. Kampen had its own ships or cogs; however, they were not constructed there. Merchants purchased these from other larger Hansa cities, for example Hamburg or Lübeck, and imported them to Kampen (Jager, 2015, p. 377). The provenance of these materials, such as the forestry areas, no matter their

distance from the northwestern Zuiderzee, are part of the outer resource landscape and thus maritime.

The inner resource landscape is therefore defined as the materials that came from, or were produced in, the region itself (van Popta et al., 2019, p. 183; Westerdahl, 2012, p. 747). It mainly entails a production of surplus for trade or to upkeep shipping expeditions. While tangibly this landscape does not influence the economic supremacy of the Zuiderzee towns that much, they gained their wealth through trading the surplus of other regions and towns (Frankot, 2012, p. 77; van Popta et al., 2019, p. 183). However, some of the surpluses created regionally might have been transported from these Zuiderzee towns towards other Zuiderzee towns, a regional shipping endeavour (Reinders & Mulder, 2025, pp. 117–119, 130–132). Intangible resources play a bigger role within the inner resource landscape during the late medieval times. During this time, ship crews consisted of local peoples, and shipping relied on good seamanship and excellent regional knowledge, including knowledge of where to sail and where not to sail (Waldus, 2021, p. 71). This local labour, as well as knowledge and expertise, are the main resources that influenced the inner resource landscape. It ensured the functioning of maritime activities.

Transport zones

While Westerdahl's maritime cultural landscape consists of these different landscapes within landscapes, there is another aspect that is highly important in defining the maritime cultural landscape of an area: transport zones and transit points.

It is important that this theory keeps in mind two concepts: the earlier mentioned Longue Durée by Braudel (1981) as well as the means of transport (Westerdahl, 1998, para. 5, 6). This means the zones must be seen within a long perspective. The transport corridors tend to be used to move goods over a long period of time, meaning they are long-lasting (Westerdahl, 1998, para. 5). They are not narrow lines with fixed borders but are more like broader zones and often originate due to environmental opportunities. Still, ships have the capability to move beyond the intended corridor, which may result in wrecks of a type of ship that is not typical for the corridor. This is connected to the second concept that is important: the means of transport. This means that the construction of ships is closely related to their natural environment or zone, such as shallow waters, strong currents (Westerdahl, 1998, para. 7). Additionally, their intended use of cargo influenced their shape. Intangible themes also influenced the shape of ships in a zone, due

to how people saw their ship and the reasoning, such as tradition, behind certain constructional elements of ships.

So, a transport zone consists of a specific relation between different aspects, for example: place names, ship designs, shipping nature, vocabulary, and the nature of coastal settlements (Caporaso, 2017, p. 8; van Popta et al., 2019, p. 180; Westerdahl, 1998). It is not a single route or a one-way exchange. While researching a shipwreck, the most important element of the transport zone is the nature of shipping and the specific constructional details of ships that can be found within the same zone. It is important to mention that these transport zones consist of natural elements as well as culturally embedded ones (Caporaso, 2017, p. 8; van Popta et al., 2019, p. 180).

Natural elements such as river routes, sandbanks, naturally deeper channels used by ships, and natural harbours can be defined as transport patterns. They exist naturally due to the environment, and often not through human intervention. Then there are transport systems which are man-made or authority-imposed, such as roads that have been built, channels that have been dug, or intangibly, through navigational regulations. They exist as the result of political, economic, or administrative control of an area. The umbrella term for the collective interaction of the two, transport patterns and transport systems, is the transport structure, which exists within the transport zone.

Importantly, these zones do not have fixed borders; they can interconnect and overlap with each other but are very much influenced by the borders of maritime cultural areas (van Popta et al., 2019, p. 180; Westerdahl, 1998, para. 14–20). Therefore, Westerdahl has identified seven transport zones:

1. Trans-Isthmian
2. “Ferry” Corridors
3. Zones based on river valleys
4. Coastal transport zones
5. Estuary lagoon zones
6. Lake zones
7. Zones of the open sea

Trans-Isthmian zones

This zone is typified as being a land-route between waterways. These corridors over narrow necks of land are a common feature of early maritime trade, ultimately joining up rivers and other waterbodies (Sherratt, 1996, p. 211).

"Ferry" Corridors

Consisting of routes of regular transportation across water. However, it does not necessarily have to be a short ferry across a river or bay (Westerdahl, 1998, para. 15). The main goal of this kind of transport zone is to transport people on a regular basis. Regularity is key to this zone.

Zones based on river valleys

Each river system or other far-reaching waterway can be a transport zone on its own (Westerdahl, 1998, para. 16). Often these ships have a flat bottom and a mast that is placed towards the front, making it possible to be towed upstream (Westerdahl, 1998, para. 16). Towns alongside the same river or waterway will express similarities in culture, language, and shipbuilding techniques, while differences exist between individual rivers (Westerdahl, 1992, pp. 11–12). For example, in Poland, each waterway has a specific boat type and name (Westerdahl, 1992, p. 11).

Coastal transport zones

This zone is defined by a typical manner of navigation: hugging the coast (Westerdahl, 1998, para. 17). Westerdahl shows this is the only type of zone that can be depicted on a standard-size map of Europe for graphical reasons, see Figure 12. It is often the result of navigational limitations, to avoid ships going into the open sea where no navigational markers are visible. It can be well applied to the trade routes between the Baltic and the Zuiderzee, through the Sound.

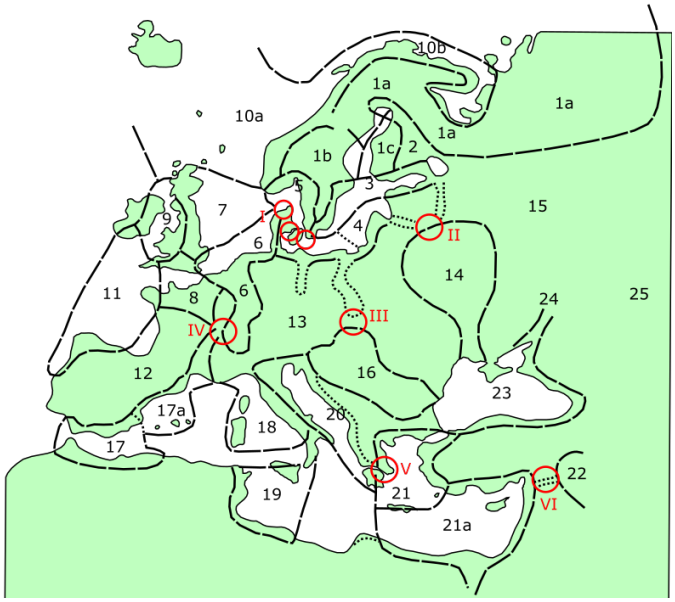

Figure 12: The coastal zones depicted on a map of Europe. (Map by Westerdahl, 1998, para. 17, adapted by Robin Jonker).

Estuary lagoon zones

Often an intermediate zone connecting river zones and coastal transport zones (van Popta et al., 2019, p. 180). They are located along lagoons and estuaries enclosed by beach ridges and dunes (Westerdahl, 1998, para. 18).

Lake zones

A unique zone where shipping is limited to the borders of a lake (Westerdahl, 1998, para. 19).

Zones of the open sea

Lastly, the zone of the open sea. Mostly, ships use seasonal winds, such as monsoons (Westerdahl, 1998, para. 20). Ships needed to be fit for long-distance travel and changing weather conditions, thus often having a deep draft and an S-shaped hull.

Transit point and Transit enclaves

As said above, these transport zones do not have fixed borders. However, in between these defined zones, which can change over time, transit points are located (Westerdahl, 1992, p. 6). They highlight maritime changes and the transition from one transport zone to another (van Popta et al., 2019, p. 181). Often, they change the manner of transportation, from seagoing vessels to river vessels, to carriages. However, again,

they should not be seen as fixed borders. Some ships were specifically designed to be able to sail across different transportation zones, thus moving through transit points. For example, the cog, which was able to sail along coastlines but also estuaries and rivers, as can be distilled from wrecks that have been found in these areas (van Holk, 2009b, p. 127–133; van Popta et al., 2019, p. 181).

Complementary to the transit points, transport enclaves can be identified. Here, a concentration of maritime-orientated settlements can be found (van Popta et al., 2019, p. 180). These towns have specific harbour functions, and the inhabitants are mainly working in the maritime industry, such as skippers, dockworkers, and shipbuilders (Westerdahl, 2013, p. 749).

3.2 Actor-Network Theory:

Archaeologists are obsessed with context, as can be seen within this thesis, providing context on the history of the discipline as well as medieval ship typologies. For archaeological remains, context is equally important; however, what is meant by context? Focusing on shipwreck sites, a range of possibilities can be named, such as the find location, if the construction is still there, and the finds on board which can give meaning to the kind of voyage the ship undertook. However, all these tangible elements can be included in the intangible realm of the 'social context'. To define this rather vague and non-descriptive term, Actor-Network Theory will provide the descriptive method to indicate this social realm within the maritime cultural landscape.

The starting point of applying Latour's Actor-Network Theory (ANT) was the rather interesting paper of Dolwick (2009) named "'The Social' and Beyond: Introducing Actor-Network Theory." The paper is mainly aimed at exploring how the, much needed, discipline can move beyond the mere study of vessels. Ultimately, straying away from the technical and typological thinking of ships as the main purpose of research, and providing the social context in which these tangible remains sailed.

The theory of ANT is explored to facilitate this change in the archaeological study of shipwrecks. Recently, Campbell (2023, p. 22) showed the potential of ANT and other theories that have built on it. To show the use and potential that has been illustrated for ANT in other disciplines of archaeology will provide the foundation of its application in

this thesis. Before we delve any deeper into the potential use of ANT in archaeology, the theory itself, developed by Latour and Callon amongst others, will be explained.

Actor-Network Theory: Its usage

The social realm is defined in ANT as relational/relativity/association and can be understood through networks including animate as well as inanimate, heterogeneous objects or actors and actants (Dolwick, 2009, p. 36). ANT ensures that humans and nonhumans have a relational effect on each other (Latour, 1999, as cited in Dolwick, 2009, p. 36). This does not imply that humans and objects are identical in nature, but rather that objects are inherently part of the social realm and, therefore, of networks (Dolwick, 2009, p. 39; Latour, 2005, p. 76). In this view, both objects and humans affect one another; there is no clear division between the living and the non-living.

Primarily, the focus of ANT is to understand and indicate how this relationship is conceived, emphasizing the description of these relational phenomena, such as power relations, instead of using these elements themselves as explanations (Czarniawska, 2006, p. 1554). Dolwick (2009, p. 36) illustrates this through the example of power relations and equality: to say, "some people are rich and powerful because they have capital is a tautology." This makes it in nature more a descriptive method instead of a theory, which tends to focus on the why and not the how, making it a good fit to be used in combination with MCL.

This descriptive nature is also what makes ANT stand out from all other classical network approaches. These assume that networks consist of pre-fixed elements, or so to speak, types, i.e., social class, certain shapes of pots, or ship-types. The keyword here is pre-fixed (Van Oyen, 2016, p. 37). ANT does recognize the existence of these typologies and categories, but it does not take them for granted as naturally existing subjects. It shows how these things are created, and what influences their shape, instead of assuming them from the beginning and thus is not bound by their limits.

Since ANT examines more than only the relation between different categorical attributes but also questions their very composition, how these typologies are defined, it can be considered to engage with ontology (Mol, 2002, pp. 1–27). Consequently, ANT is as much sociology, as it does not wish to add more or different social networks to social theory; rather, it wants to construct social theory out of networks.

This immediately shows its potential use in shipwreck archaeology, where often ship typologies or traditions are researched and identified, approaching these shipwrecks as "greater super-assemblages of actions, events, people, places, and relationships" (Vadala and Duffy, 2020, p. 1029). Before ANT is applied in this manner, first let us explore how ANT came into existence and how these concepts were applied in the first place.

The original intent of ANT and its application

As said earlier, ANT naturally engages with ontology, examining how categories and typologies are constructed in reality, and how such constructs are created with borders that have been used to be seen as fixed and naturally given truths. It is then not surprising that one of the first works that moved towards the development of ANT was that of Latour and Woolgar (1979), where they studied the everyday events in a scientific laboratory and how scientific facts are created. They are, nonetheless, often seen as naturally given facts which are discovered through science (van Oyen, 2016, p. 37). While Latour and Woolgar showed these outcomes were very much dependent on heterogeneous networks, including non-scientific elements, for example, the machines that were used, patents that were involved, the type of test tubes used, as well as gossip and pride of the researchers themselves (van Oyen, 2015, p. 64; van Oyen, 2016, p. 37).

Complementary, Mol (2002, p. 157) showed that scale was also very much influential in the outcome of medical observations, once again illustrating the eccentric web of elements resulting in scientific facts.

Thus, ANT shows all the elements involved that ultimately result in scientific facts, enabling them to become stable entities that can be transferred to other laboratories and articles, becoming natural givens (Law, 1999, p. 8; van Oyen, 2016, p. 37).

This approach views scientific facts as "greater super-assemblages" and focuses on how these come into being. It adopts a non-essentialist ontology; that is, it rejects the idea that things possess a fixed, unchanging essence or nature (van Oyen, 2015, p. 64). If things are already fully defined, there's no space to ask how they became that way.

ANT argues that things don't have a built-in essence that defines them. Instead, their identity comes from what they do and how they relate to others in specific contexts (Mol, 2002; Vadala and Duffy, 2020, p. 1029; van Oyen, 2015, pp. 64–65; van Oyen, 2016, pp. 37–38). In other words, people, objects, and facts become what they are through their roles and connections; they are part of larger networks, or "super-assemblages" made up

of many interacting elements (Vadala and Duffy, 2020, p. 1029). Consequently, this is the network in ANT, see Figure 13 (Latour, 1999; 2005). How this works, through networks, or more precisely, work-nets, in which individual actors and actants act, will be explained in the next paragraph.

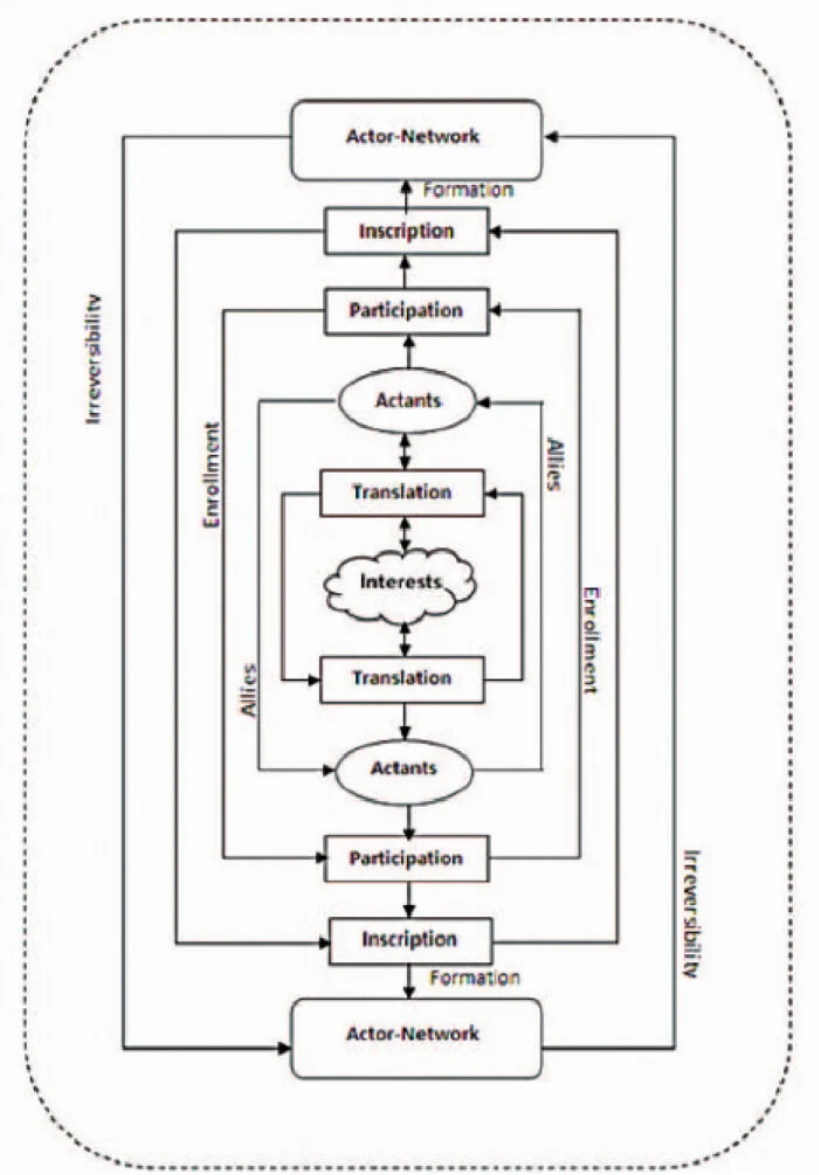

Figure 13: An overview of the ANT analysis. (Carrol et al., 2012, p. 61, Figure 1).

Work-net versus networks

Latour has argued, as have other social researchers, that the meaning of networks in modern scholarship might have lost its impact (Latour, 2005, p. 132; van Oyen, 2016, p. 36). A network has become a stable group of intermediaries, a concept, not something that exists naturally; it is superimposed (Latour, 2005, p. 131). It is an analytical end result, while work-nets emphasize the active agency actors have in creating the network,

observing the labour that goes into constructing one (Latour, 2005, p. 132). Rather than linking elements with each other, resulting in a web of these linked elements ultimately resulting in a network

In other words, these individual actors do not simply transfer the action and let it pass through them. On the contrary, they actively engage with the action and alter it, becoming mediators; therefore, a work-net. An active constantly changing and influencing entity. Within the work-nets of ANT translation occurs, as Latour would call it (2005, p. 128).

Translation consists of the interaction and alignments among different actors within the network, allowing them to work together to achieve their common goal (Mutasa and Iyamu, 2025, p. 3; Verhoeven, 2018, p. 102). Four stages exist within the moment of translation between actors; this is the mediation process, see Table 1 (Latour, 2005, pp. 39, 128; Mutasa and Iyamu, 2025, p. 3).

1. **Problematization,** when a vocal actor identifies an initial problem and solution
2. **Interessement,** when different roles and responsibilities of actors are defined
3. **Enrolment,** actors accept their roles
4. **Mobilization,** ensures that the enrolled actors perform their roles as intended and continue the support of the overall objectives of the network

Table 1: Overview of the stages during translation. (Table by Robin Jonker).

Stage	Meaning	Key Action
Problematization	Define the problem	"This is an issue we must solve."
Interessement	Attract actors	"Join us, this affects you too."
Enrolment	Assign roles	"Here's what each of us will do."
Mobilization	Full collaboration	"Let's implement the solution."

However, these stages should not be taken too literally, because non-speaking actors, such as objects, are still very much able to give consent and thus accept their roles, (Mutasa and Iyamu, 2025, p. 3). For a more detailed example of identifying these stages within translation, see Mutasa and Iyamu (2025) or Callon (1986).

Actors and actants of ANT

A fundamental notion of ANT is that it states that non-human actors, such as animals, objects, organizations, as well as intangible concepts such as ideas, i.e., actants, can and are equally involved in making networks (Dolwick, 2009, p. 39; Latour, 2005, p. 76). Although this doesn't mean that objects are equal to humans, they are, in their own regard, part of the social sphere and consequently networks. Thus, making no real separation between the living and non-living; the social and natural world are not separate but part of the same one world (Dolwick, 2009, p. 37). While not being equal to humans, objects, in their own way, play an active role in the creation and being part of networks, meaning they are both able to influence one another within the network, thus having agency (Dolwick, 2009, p. 39; Latour, 2005, pp. 43–62, 76).

Actors and actants (from now on shortened to actor) can be anyone and anything. More importantly, ANT's motto, "follow the actors," shows the carefulness with which these actors/actants should be approached and worked with (Callon et al., 1986, p. 4).

So, who are these actors within a network? Well, that is ultimately up to the researcher. However, this does not mean that the researcher can cherry-pick actors; they should listen to the actors involved and follow their direction (Dolwick, 2009, p. 39). Actors can be seen as persons, ideas, objects, and so forth, being the source of the action which can be perceived (Latour, 2005, pp. 71, 129). These actors can influence one another; this is called agency (Latour, 2005, pp. 43–62).

An (inter)active web of these actors can be named a network (Dolwick, 2009, p. 39; Latour, 2005, p. 128). Another fundamental aspect of ANT is that networks and actors can be used interchangeably (Dolwick, 2009, p. 39). An actor can be understood as a small-scale network, while a network itself can function as an actor (Dolwick, 2009, p. 39). For example, a Portuguese Carrack, a typical ship used during the Portuguese expansion, can be seen as an actant, one that plays a role in a larger network of trade, religious, and cultural interactions, crossing borders of nations and cultures (Law, 1986, pp. 237–238). Nonetheless, it can also be seen as a network itself, a network of different timbers, rope, and sails, but also of people from different social classes and cultures, all coming together on the vessel (Dolwick, 2009, p. 39; Law, 1986, pp. 238–241).

As might be noticed, the concepts of actors and networks can be quite vague and all-encompassing. While simultaneously this is a strength of ANT, it makes analysing the social quite difficult, not even acknowledging the difficulties in applying it in archaeology.

Latour (2005) identified five sources of uncertainty, which will, when combined, show the actors' intentions, implications, and provide an accurate representation of them. To learn from these actors, the researcher has to be concerned with the nature of 1) groups, 2) actions, 3) objects, 4) facts, and 5) the construct of writing research accounts, i.e., the network analysis. Through a careful analysis of these sources, social relations will become clear.

five sources of uncertainty

1st source: Groups

The first uncertainty concerns the nature of groups. Groups do not exist as fixed entities; they are formed through ongoing interactions among actors. There is only group-formation (Latour, 2005, pp. 27–42; Verhoeven, 2018, p. 109). For example, take a shipwreck as a case study. Here, archaeologists, divers, conservation specialists, local authorities, and even technical instruments are temporarily assembled into a collective focused on the study and preservation of the wreck, which, on its own, is also part of the actors. Public interest or institutional guidelines may join or leave this group over time, highlighting that the collective is constantly negotiated rather than stable.

2nd source: Actions

The second uncertainty is the nature of actions (Latour, 2005, pp. 43–62; Verhoeven, 2018, p. 109). Actions are never performed by a single actor alone; they emerge through associations among many actors (Latour, 2005, p. 44). Surveying and documenting a shipwreck, for instance, depends not only on human effort but also on instruments like cameras, sonar devices, and measuring equipment, as well as national/international guidelines and the natural environment, such as depth, current, and visibility. These non-human actors act by producing data and shaping how human actors respond. Thus, what appears as an individual action is a networked event co-produced by multiple actors.

3rd source: Objects

The third uncertainty concerns the nature of objects (Latour, 2005, pp. 63–86; Verhoeven, 2018, p. 110). Objects can have agency; they are not merely passive (Latour, 2005, pp. 70–74). The shipwreck itself, its timbers, anchors, and scattered artefacts, have

influence by constraining possibilities, requiring specific conservation methods, or directing the course of research because only a limited part of the wreck is preserved. The wreck speaks through its material properties, ensuring that human actors have to adapt their actions, strategies, and interpretations.

4th source: Facts

The fourth uncertainty involves the nature of facts (Latour, 2005, pp. 87–120; Verhoeven, 2018, p. 110). They are not simply discovered; rather, they are more constructed and stabilized through these negotiations (Law, 1999, p. 8; van Oyen, 2016, p. 37). A shipwreck's age, origin, or use is debated among archaeologists, historians, and conservators before being accepted as knowledge. These debates highlight the transition from matters of concern, which are uncertain and contested, to stabilized knowledge recognized as scientific or historical fact.

5th source: The construct of writing research accounts

Finally, the uncertainty of the study itself (Latour, 2005, pp. 121–140; Verhoeven, 2018, p. 110). Research is an experimental process that can fail or succeed. A study of a shipwreck should not merely be descriptive but a tracing of networks, following how actors, both human and non-human, interact and shape each other. The resulting narrative makes the social visible by showing how groups, actions, objects, and facts are assembled into a temporarily stable network, showing that a shipwreck is not simply an artefact to be studied, but a focal point around which humans and objects mutually shape one another. Providing a new viewpoint from which answers on the research questions can be distilled from.

ANT's use in Archaeology

While ANT has not been used on a large scale in archaeological work, there are a few research projects that are worth mentioning that have used it. As Campbell (2023, p. 22) shows, ANT has had a significant influence on archaeological research, especially mentioning the application in maritime archaeology led by Dolwick (2009) and Tuddenham (2010, 2012).

Dolwick (2009, p. 43) showcased how the analytical and new social view of ANT can be used in shipwreck archaeology, while Tuddenham (2010, 2012) examines the

maritime cultural landscape and bridges the gap between land and sea (Campbell, 2023, pp. 22–23). Additionally, he uses ANT as a tool to manage underwater cultural heritage sites, and to preserve, research, and manage specifically shipwrecks in Norway (Tuddenham, 2010, pp. 11–14; Tuddenham, 2012, pp. 235–241).

Deal et al. (2015) used the ANT perspective to expand the theoretical framework of aviation archaeological research. Using a World War II plane that crashed in Newfoundland as a case study, they used ANT to construct a socio-technological framework of aviation archaeology in the field, illustrating the social network between objects, historical texts, and film material, see Figure 14 (Deal et al., 2015, p. 24). Simultaneously, they show how knowledge is produced in aviation archaeology, as well as the use of multiple different kinds of evidence to construct that knowledge (Deal et al., 2015, p. 24).

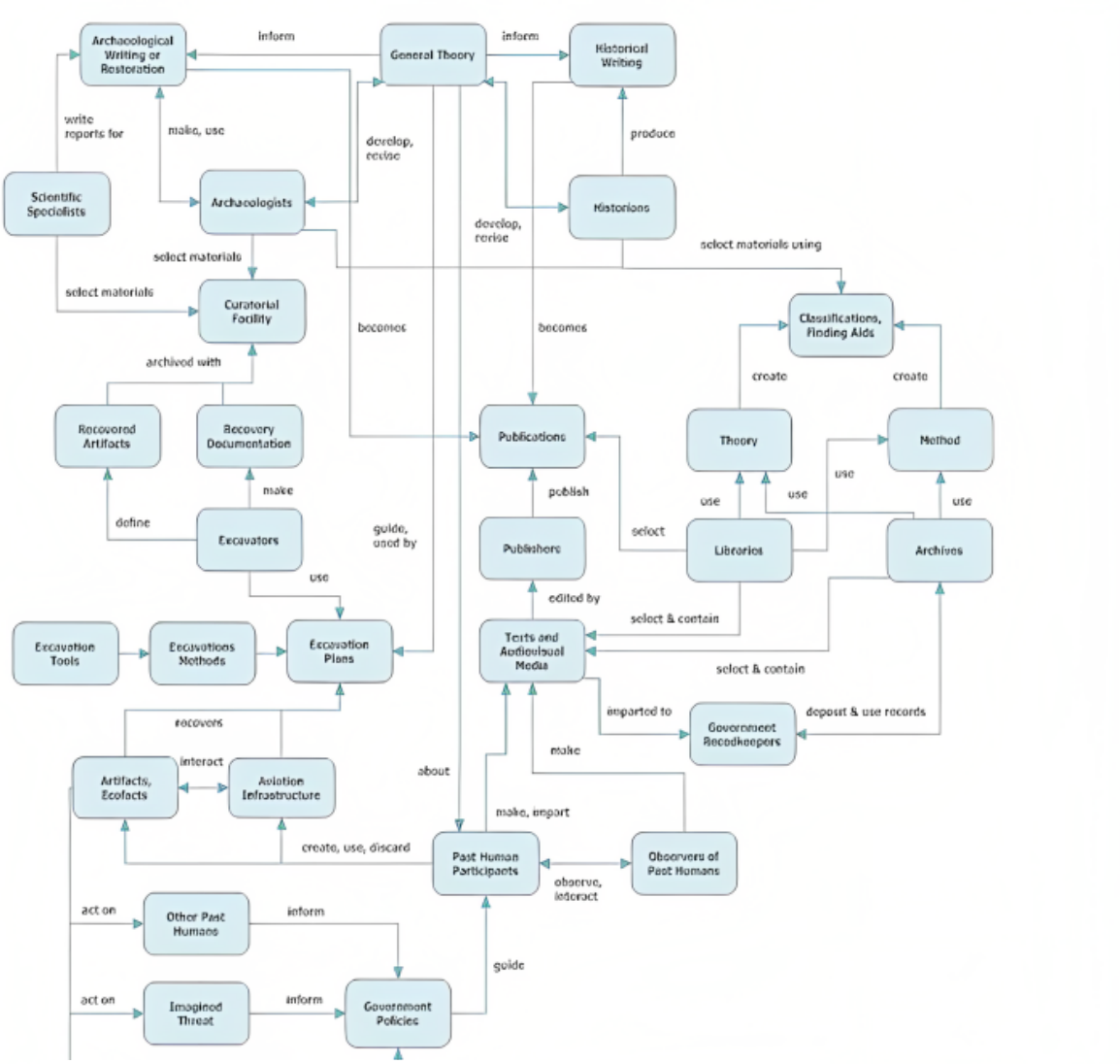

Figure 14: The ANT network identified during a project in aviation archaeology. (Deal et al., 2015, p. 8, Figure 4).

Caching events at Cerro Maya in Belize were analysed through ANT to understand their production in Ancient Mayan societies by Vadala and Duffy (2020). They applied a working archaeological ANT framework to explore object and human relationships within these ritual caching contexts (Vadala and Duffy, 2020, pp. 1028, 1030).

Lastly, a more profound use of ANT in archaeology is that of Van Oyen (2015, 2016), researching Terra Sigillata. Specifically, using ANT to describe and even categorize Terra Sigillata, also providing context and guidelines on how to proceed using ANT in archaeology (van Oyen, 2015, pp. 64–65; van Oyen, 2016, pp. 40–47).

So how can it then be applied in shipwreck archaeology? Law (1986, pp. 237–238) already applied this to a historical narrative, that of a Portuguese Carrack, which will be explained shortly below, providing more specific examples showcasing its potential use in the shipwreck archaeology realm. This example is also used by Dolwick (2009, pp. 39–42).

Case Study: A 16th-Century Portuguese Carrack through the Lens of Actor-Network Theory

Actor-Network Theory (ANT) encourages us to look beyond the Portuguese carrack as a simple maritime vessel and instead to understand it as both an actor and a network. As an actor, it participates in broader systems such as the 16th-century spice trade and Portuguese imperial expansion. As a network, it is composed of a collection consisting of both human and nonhuman elements, such as sailors, materials, winds, instruments, and institutions, all of which together make the ship function.

Groups: The Formation and Dissolution of Collectives

The carrack exists within several overlapping and constantly shifting groups. It operates within vast trade networks, linking ports, merchants, and markets from Lisbon to Goa and beyond. Onboard, a shipboard society is formed, composed of officers, sailors, cooks, and soldiers, an assemblage that changes from voyage to voyage as crews are replaced and restructured, sometimes even during voyages (Law, 1986, p. 240). The vessel also represents a material collective, constructed from components that originated in diverse regions: timber from Iberian forests, iron from northern Europe, and canvas from Mediterranean workshops (Law, 1986, p. 240).

From an ANT perspective, the researcher asks how these heterogeneous actors, people, materials, and ports, were enrolled to make the ship function. What traces of their

presence remain in documents such as ship logs, manifests, or even in the material remains?

Within ANT, agency is not a property of individuals but is distributed across a network of relationships. The carrack's voyages depended on the coordination of human skill and nonhuman forces alike (Law, 1986, pp. 240–242). Sailors relied on their knowledge of the rigging and navigation, but wind, ocean currents, and the responsiveness of sails and hull equally shaped the course of the voyage (Law, 1986, pp. 241–242). Instruments such as astrolabes and compasses mediated decision-making and perception, while financiers, officials, and shipowners engaged in logistical negotiations over cargo and contracts (Law, 1986, pp. 242–244). In this view, agency extends far beyond the captain's command; it emerges through the combined actions of charts, stars, human hands, and social agreements.

Objects: The Agency of the inanimate

The carrack itself can be seen as a network of interacting objects (Dolwick, 2009, p. 41). Masts, sails, and rigging respond to the wind; the cargo, spices, silver, provisions, all affect the ship's stability and its economic value (Law, 1986, pp. 251–254). While the hull and planking protect the vessel, they are vulnerable to decay and shipworm. These material components possess their own forms of agency, influencing the ship's behaviour and fate. When one part fails, a broken rudder, a rotted beam, the entire network is disrupted. ANT thus directs attention to the role of these nonhuman participants.

Facts: Negotiated Realities

From an ANT perspective, facts are not static truths but negotiated outcomes (Dolwick, 2009, p. 41). The ship's seaworthiness, for instance, is continually tested at sea; the value of its cargo fluctuates between Lisbon and Indian ports; and ownership and identity may become contested in legal disputes over insurance or wreckage. Even the carrack's name or classification can shift depending on who defines it, a merchant, sailor, or modern archaeologist. ANT thus urges the researcher to investigate these controversies: which aspects of the ship's reality were stabilized, which were questioned, and by whom?

Writing the Network: Tracing the Carrack

Studying the carrack through ANT means writing a research account that traces connections rather than describing a finished object (Law, 1986, pp. 251–254). This involves following the trajectories of materials from forests and farms; mapping the movements of people from shipyards to ports; and examining documents such as contracts, court records, and letters. In doing so, the ship emerges not as a fixed artifact but as a process, a temporary outcome of ongoing negotiations between diverse actors.

The Carrack as Actor and Network

The 16th-century Portuguese carrack embodies the principles of ANT. It acts within expansive systems of commerce and empire while simultaneously existing as a fragile network of humans, materials, technologies, and environments (Law, 1986, pp. 254–258). Its successes and failures result not from a single dominant cause but from the intricate web of relationships that compose it. Viewed through ANT, the carrack ceases to be merely a historical or archaeological object; it becomes a vivid example of how human and nonhuman actors assemble, interact, and together shape the material and social world.

3.3 Connecting the dots

So, it is valuable to combine these two theoretical approaches to study a Late Medieval shipwreck in the Zuiderzee. The MCL provides a framework to place the shipwreck within its broader maritime environment, focusing both on the tangible and intangible elements that shaped Late Medieval shipping practices. The shipwreck is no longer an isolated object but part of a network of resources, routes, settlements, cultures, and practices that defined the maritime culture of the late medieval Zuiderzee, emphasizing the maritime landscape as a lived and used space. As Löfgren (1981) would say, “man in landscape, landscape in man” (as quoted in Westerdahl 1992, p. 5). This provides a hand-reach in explaining why ships followed certain channels, estuaries, or coastal corridors, and why some shipwrecks ended up in unexpected locations.

Especially, focusing on the inner and outer resource landscapes allows us to look at the provenance of shipbuilding timber, locally produced materials, and the expertise of

local crews, highlighting how material and social resources, such as guidelines and laws, resulted in the shipping and trade in the region.

ANT complements this perspective by providing a method to analyse the shipwreck as both an actor and a network, emphasizing the interactions among human and nonhuman entities. Through ANT, the shipwreck itself, its timbers, fittings, and cargo, is understood as actors with agency, interacting with sailors, shipwrights, navigational instruments, currents, and regulations. ANT allows the researcher to follow these actors and trace their interactions.

Together, MCL and ANT offer a multi-scalar approach. MCL situates the shipwreck within its physical and social maritime landscape, emphasizing its connections to harbours, shipyards, trade routes, and local communities.

ANT, in turn, traces the network of interactions that produced and sustained the ship, highlighting the roles of both human and nonhuman actors in its construction, operation, and eventual wrecking. This also includes elements that may not appear maritime at first glance, such as the forestry infrastructure that enabled shipbuilding, but which nonetheless formed essential parts of the wider maritime landscape.

By applying both theories, the shipwreck emerges as more than a static object: it becomes a nexus of cultural, material, and environmental processes. This dual approach emphasizes the interdependence of landscape and network, showing how natural conditions, human choices, and material agency together shaped the life, use, and ultimate fate of ships in the archaeological record, providing the essential context in which these archaeological remains can be researched.

Using the recently discovered shipwreck W149 within this theoretical framework provides new analytical tools and a different way of looking at shipwrecks. These results can be used to gain answers to the past, which can be accomplished by documenting in detail shipbuilding aspects, which in their own way reflect the social realm in which they were built, used, and ultimately lost.

To enable this research, first-hand details of the shipwreck needed to be collected in the first place. Together with the survey details of the archaeological team of the RCE and complemented by a full day of diving to the wreck, these details were acquired. How this theoretical framework is built and how these details are observed in the field will be explained in the next chapter.

Chapter 4: Methods and techniques

Methods and techniques are terminologies often used in similar contexts. However, these two concepts do mean different things. It is important to mention the difference in the abstraction level. The methods focus on the what and why part of the story, while the techniques tell the how of the story. The primary two methods of this thesis are the use of the theoretical framework, and first-hand surveying and documenting of the remains of the ship.

4.1 The Theoretical Framework

The theoretical framework laid out in the previous chapter is a vital method in this research. Using these new abstract terms and new pathways leads to perhaps a new manner of understanding shipwrecks and their physical and natural contexts. This will be applied in Chapter 6.

This framework is built upon the two theories explained before and on the history of underwater archaeology and ship typologies. It provides a context in which the newly discovered wreck, W149, can act in.

The use of ANT as a method

As explained in the previous chapter, the concepts of ANT in archaeology are not new, nor awkwardly deployed. As with the case study of the Portuguese carrack, the ANT analysis starts with identifying the five sources of uncertainty. Starting with the actors and their groups. This will be the starting point of this analysis as well. While ANT allows an analysis that is way more inclusive than this master's thesis can be, choices need to be made. However, these need to be justified, but for the sake of this thesis the research will be limited to the ship's construction and objects. These actors, their groups, and their actions are identified, and their relations are known. The network can be shaped. That of the ship itself, as well as the wider, constructed, network where the ship itself acts in. These actors are not only identified during the dives on the shipwreck, but equally in the context of the environment and historiography of the wreck. These can be read about in the next chapter but will be actively involved in the analysis in Chapter 6.

After Latour's five sources of uncertainty are identified, they can be placed within this wider context of sociality; these are seen from the MCL perspective.

The use of MCL as a method

The ANT analysis works complementary to the MCL approach used in this thesis. While ANT acts on a micro-level, helping to identify actors and their networks, the MCL offers a broader view of these interactions. The MCL serves as a method to place these actors and their relations in the physical, environmental, and cultural setting of the shipwreck.

In this thesis, the MCL is used as a way of looking: it frames the wider landscape in which W149 existed. By establishing this contextual foundation, the MCL helps to clarify how the networks described through ANT fit within larger patterns of maritime activity, such as within Westerdahl's transport zones. It therefore provides the background against which the ship, its construction, and its associated objects and actors can be understood as active participants in a broader, historically grounded maritime landscape.

4.2 Survey and Documentation of the Wreck

To analyse the shipwreck through the newly developed theoretical framework, it is essential to collect new, first-hand data from the site. This necessitates a dedicated fieldwork campaign as part of this thesis. The upcoming dive campaign will therefore serve to supplement the data gathered during the 2022 expedition.

The 2022 survey had already revealed several intriguing aspects of the wreck, which became one of the motivations for a more detailed investigation. However, a first-hand examination is necessary to provide context for the earlier observations and to evaluate them critically. This is particularly important as the shipwreck will serve as a case study in the application of the theoretical framework outlined in Chapter 3.

The primary focus of the thesis lies in the ship's construction. As such, the main goal of the fieldwork is to achieve a deeper and more precise understanding of the structural remains. Special attention will be paid to constructional connections and how various elements were assembled and joined.

As one of the limitations of the fieldwork is the budget and the timespan of research, specific areas of interest were highlighted before the field campaign. Furthermore, the methods and corresponding techniques will be explained in detail.

General

The goal of the fieldwork was to gain a deeper understanding of the ship's construction. Documenting the ship's remains and the dives played a vital role in acquiring this complementary information to that of 2022.

Field documentation will mainly consist of analogue notes, sketches, and drawings. Standardized forms will be used for the dive logs and a daily report will be made by the project leader, which can be read later in this chapter. The fieldwork will mainly consist of diver-based recording techniques. If possible, digital techniques such as video and photos will be used as well as photogrammetry.

Locating the wreck

Before the most important aspect of the fieldwork could begin, the divers' work, the shipwreck W149 had to be located and marked. To locate the wreck the GPS coordinates were used, and once arrived in the area of the wreck, the side-scan sonar was used to locate the wreck in more detail.

A side-scan sonar uses a wide-angle sound pulse to calculate the depth and the distance between the tow-fish (the apparatus which collects the signal) and the seafloor, see Figure 15 (Bowens, 2009, p. 107; Green, 2004, p. 76). It detects the intensity of the signal that is received by the tow-fish, and the intensity of the signal varies between the different materials or sediments that the signal reaches (Green, 2004, p. 77). The seafloor sediment will feed back a different intensity than that of wooden elements.

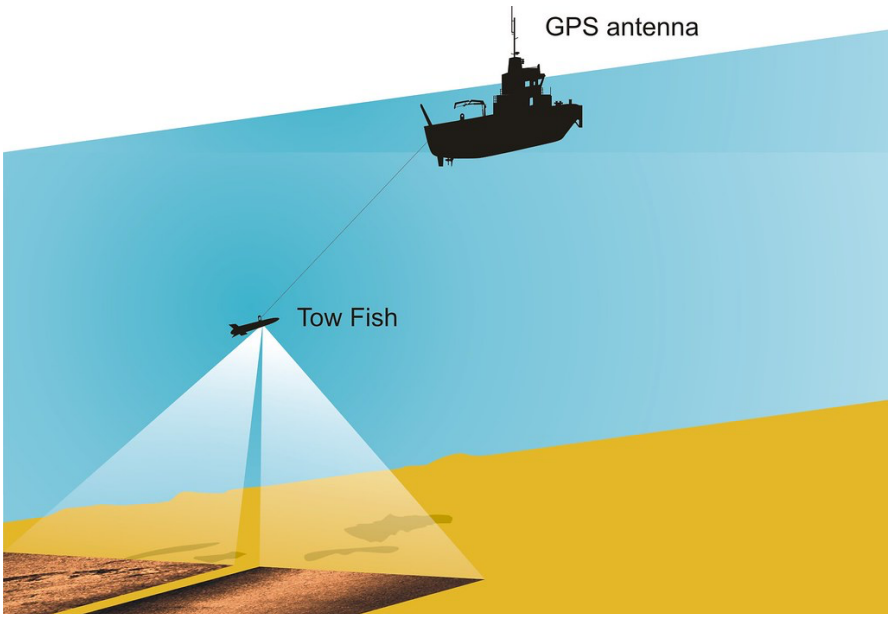

Figure 15: Diagram of a sidescan sonar. (Popescu & Iordan, 2018, p. 179, Figure 7 after Hiveminer.com).

The information from the side-scan sonar can be processed in real time, providing live footage of the seafloor directly under the side-scan sonar, and in this instance under the ship (Bowens, 2009, p. 107). When the wreck was visible on the side-scan sonar footage, multiple buoys were placed, one at the stern of the ship, one at the bow of the ship, and one near the presumed rudder, see Figure 16.

With these three buoys in place, the first diver went in to adjust these buoys to their correct position, and the diver-based recording operation could begin.

Figure 16: Live footage from the sidescan sonar during the field campaign of 2025, showing the location of W149. (Photograph by Trinko Rijs).

Diving

Divers used SCUBA (Self-Contained Underwater Breathing Apparatus) equipment to work on the shipwreck site. With this technique, the divers use an air-filled cylinder on their backs which supplies the diver with air and thus they are fully independent of the surface. Instead of a surface-supplied system, which ensures a physical connection, in the form of hoses, to the surface and ship.

The SCUBA system was used to have divers independently dive on the wreck, making sure multiple divers could work on the site simultaneously. Likewise, the SCUBA system is the only form of sport diving that is done, so the divers were most familiar with this system.

The SCUBA equipment consists of a steel gas cylinder of 12 litres and 200 bar, filled with a normal air mixture (21% oxygen, 78% nitrogen). All divers used drysuits, a system where the dive suit is filled with air, controlling buoyancy and ensuring the diver stays dry and warm inside their suit. Other personal dive equipment included fins, a BCD (Buoyancy Control Device), half-masks, one Ocean Reef full face mask, snorkels, and gloves.

Diver-Based Recording

Divers played a central role in documenting specific structural features that cannot be captured through remote sensing. The aim is to better understand constructional elements such as timber joinery, fastenings, and signs of wear, repair, or modification. Additionally, a critical review of earlier drawings can be made.

Before any observations could take place, timbers were cleaned using brushes and scrapers to reveal their true shapes. Once cleaned, the timbers were measured and drawn in detail. Specific features were sketched and measured to capture detailed construction insights.

Often, a site plan is made of the complete wreck site, such as suggested in Bowen (2009, p. 127); however, it was chosen not to make one due to two considerations. First, there was only one day of diving and measuring the whole wreck would have taken most of the dive day, if not completely. Second, because of the photogrammetry model that was made of the whole wreck, an overview site plan was already created in 2022 using this model.

However, if there were any interesting finds or observations made, they had to be measured to provide context. The chosen measuring technique was the offset recording technique. This provided an easy and quick measuring technique that was easily applicable to the site within the available timespan. Therefore, a baseline was created in the middle of the wreck, from which interesting locations could be measured relative to the baseline. Making sure that the location is measured at a 90-degree angle ensures a correct distance between the measuring point and baseline, see Figure 17. This measuring technique can be found in different technical handbooks and training manuals such as Bowen (2009, p. 120–121), Green (2004, p. 95–96), and the UNESCO Training Manual (Underwood, 2021, pp. 2–8).

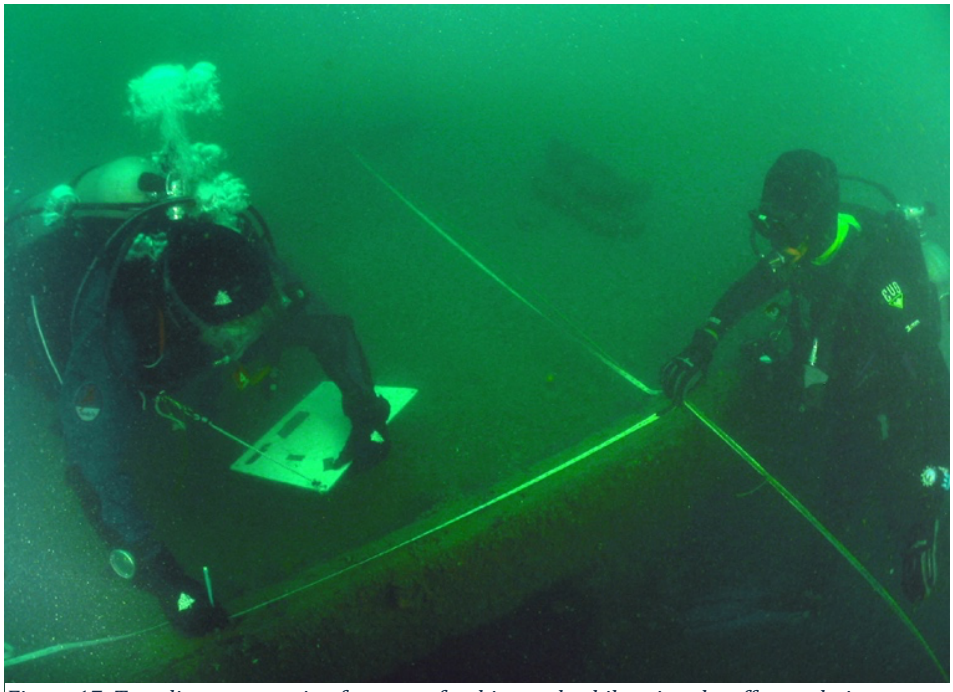

Figure 17: Two divers measuring features of a shiwpreck while using the offset technique. (National Museum of the Great Lakes, n.d.).

Ultimately, the main goal of the fieldwork was to provide more insights into certain constructional elements that could be found within the W149 shipwreck. Therefore, sketches and drawings were made of certain places on the site which were pinpointed before the fieldwork. As a result, this fieldwork can be seen as an additional survey to that of the 2022 survey.

A survey can be seen as illustrating key features and their three-dimensional relationships in a relative and symbolic way, resulting in two-dimensional drawings and sketches (Bowen, 2009, p. 120).

The materials used for making these drawings and sketches were pencils, a plastic slate, measuring sticks, and tapes. More specifically, Poppet pencils were used; these consist of multiple short pencil leads which are stacked on top of each other. When the pencil tip breaks, it can be easily fixed by pulling this pencil lead out of the pencil and placing it back into the pencil via the other side, pushing a new tip out of the pencil. These materials are used as standard in underwater archaeological fieldwork (Green, 2004, p. 261).

Digital Recording

Digital tools were employed where possible such as photographs and videos, but also additional photogrammetry models of specific locations on the wreck. The videos and

photographs played a complementary role, used to document specific features. Additionally, they are used as illustrations, showing the working environment.

Additionally, 3D photogrammetry models of specific features of the wreck were made, showcasing constructional elements, relative relationships, and the general conditions of these features.

Safety

Sports diving in the IJsselmeer is not done on a regular basis. Due to the strong dependency on the weather and lack of visibility, it is not a popular dive site, unlike the inland lakes. However, archaeologically, the IJsselmeer is an interesting diving location due to the number of shipwrecks located there, especially near the coast of Friesland (van den Brenk, 2021, p. 6). These wrecks have been the focus of multiple archaeological research projects, conducted mainly by the foundation Archeos Fryslân. Due to the distance between the shore and the shipwreck site, and the water activity in the region, such as recreational sailing, it was necessary to work with people who were strongly familiar with the natural and social environment. The personnel of Archeos Fryslân were very familiar with the site and surroundings, so they assisted in that regard. The project used the ship Archeos of Archeos Fryslân, which the personnel regularly used.

Additionally, all personnel have dive certificates with a level of PADI Advanced Open Water or equivalent. All divers had a valid medical certificate as well as insurance and used their own equipment, which they were familiar with and knew had been tested. The cylinders used by the students were rented from a certified dive shop, Wobbegong in Amersfoort.

4.3 Concluding

This thesis clearly shows what archaeology makes so unique, the direct integration of theoretical and practical strategies in the field to study an archaeological complex of finds. In this case, this dialogue is used to study the W149 shipwreck in detail. First and foremost, the distinction between methods and techniques has been made, demonstrating that the methods are used to understand the shipwreck in a conceptual and analytical manner, whereas techniques are used to operate these methods, supplying interpretation, detailed recordings, and new observations. The backbone of this research is constructed

through the combination of elements from ANT as well as the MCL. These complementary theoretical lenses offer a different approach in which W149 can be examined. ANT allows for a detailed micro-level analysis, identifying the ship's construction elements, associated objects, and their interactions as actors within a network, while MCL situates these interactions within the broader environmental, cultural, and historical context. Together, these approaches provide a flexible yet structured framework that transforms the wreck from a static archaeological object into an active participant in its maritime and social environment. This duality ensures that its broader historical and spatial elements are taken into account, as well as the object and ship itself. Providing this in Chapter 5, the environmental and historical stage of the shipwreck will be explained, alongside the research history of W149 and an account of the most recent campaign. Ultimately, this lays out a strong foundation for the analytical work whose results will be shown in Chapter 6.

These results needed to be obtained first to operationalize the abovementioned theoretical framework, achieved through the practical component of the thesis, consisting of a first-hand survey and documentation of the wreck. The 2025 campaign is based on the 2022 survey, providing interesting areas and gaps of knowledge within the shipwreck, giving it a second look. Diver-based recordings, such as sketches, drawings, and offset measurements, allowed for complementary and additional information and observations to supplement the 2022 survey, supported by digital recording techniques such as photos, videos, and new 3D models. These techniques were subject to logistical and personnel constraints, as well as time and funding limitations, once again highlighting the meticulous planning that greatly influenced these choices.

Additionally, beyond the intrinsic explanation, the chapter also touched upon the value of local expertise as well as safety when conducting archaeological fieldwork. Using standardized diving protocols, SCUBA equipment, and drysuits, coupled with working together with experienced personnel from Archeos Fryslân, ensured that the documentation of the site was safe, efficient, and as precise as possible.

Overall, this new theoretical framework, consisting of the duality of theories with carefully chosen field techniques, provides a new approach for the study of W149. The methods and techniques outlined in this chapter establish the foundation for a detailed and critical analysis of the shipwreck's construction, its objects, and its place within a broader maritime landscape. More importantly these techniques make it possible to

identify multiple actors that need to be used within the ANT analysis. By linking theoretical concepts to practical documentation, it allows a nuanced understanding of W149 as both a material and social actor and network. The stage on which the site, W149, acts will be outlined in the next chapter, delving deeper into the case study of W149 and its environmental and historical context, providing the canvas on which the analysis of the results will be sketched in Chapter 6.

Chapter 5: The Shipwreck W149 Case Study

The shipwreck of W149 can be found just off the coast of the province of Friesland in the northern part of the Netherlands. However, to understand the shipwreck and its surroundings, the context of the site needs to be explained. This will be done in this chapter, rather than in the second chapter, the background section, of this thesis, because that outlines the general backbone that constructed the idea of this research. This context is needed to understand the case study, the W149, and the broader environment. Therefore, the formation, geographical extent, and cultural-historical importance of the (Northern) Zuiderzee will be explained.

Later in this chapter, the research history of the wreck will be explained, as well as the new campaign that was part of this thesis in 2025.

5.1 The (Northern) Zuiderzee, Landscape and Historical Context

The Zuiderzee, later transformed into the Ijsselmeer, represents a dynamic and evolving maritime landscape. From its initial development as a series of inland lakes in the Holocene to its morphological formation by the 14th century, this region provided both opportunities and challenges for coastal communities. Its changing geography directly influenced patterns of settlement, resource exploitation, and trade, creating a foundation for the emergence of significant economic networks such as the Hanseatic trade. Understanding the formation and geography of the Zuiderzee is therefore crucial for contextualizing the shipwrecks found in its waters, including W149, as these vessels were active participants within this historically and economically significant maritime environment and their different and changing transport zones.

Formation and Geography of the Zuiderzee

A paleogeographic landscape reconstruction of the area is made and plotted on charts (Vos et al., 2018). On these maps, the landscape development can be seen, see Figure 18. The northern Zuiderzee used to be a cover-sand landscape; however, from 5500 BC onwards, due to rising sea levels, the area got wetter through dynamic creeks and inland waterways (Vos et al., 2018, pp. 42–45). Peat formed in the Ijsselmeer area, and on the map of 2750 BC it can be seen that larger lakes emerged within the peat (Vos et al., 2018, p. 52).

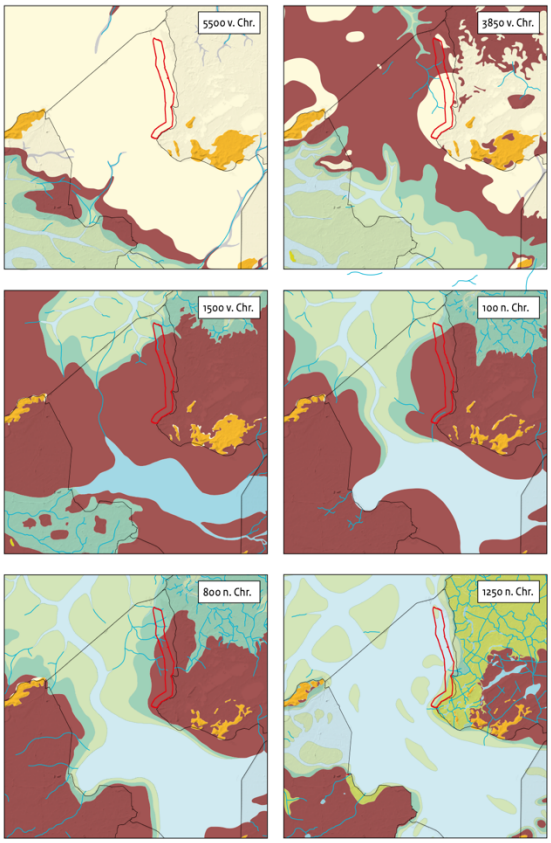

Figure 18: Palaeographic evolution of the IJsselmeer area. The red area shows the survey research done by van den Brenk 2021. (Opdebeeck, 2024, p. 14, Figure 2.1).

The Zuiderzee developed into multiple dynamic lakes that flooded and eroded their shores due to wave action. During this time, continuous peat was deposited in the area up until A.D. 100 (Menke & Lenselink, 1998, p. 27; Opdebeeck et al., 2024, p. 13).

Additionally, around 500 BC, two major lakes existed. These can be divided into the northern and southern lake (Vos et al., 2018, pp. 59–60). Furthermore, these two lakes correspond to the divide that can be made with the contemporary Ijsselmeer, namely the basin (southern lake and estuary) and the northern lake. The specific borders of the lakes are not known, and similarly, the drainage of the northern lake is unsure; however, the scientific consensus says that it drained its water into the Waddenzee (van Popta, 2020, p. 25; Vos et al., 2018, p. 60).

In 100 AD, after a series of major flooding events, linking inland waterways to the North Sea through a network of estuarine channels and tidal inlets, the northern lake was connected to the Waddenzee; later, this waterway would be known as the Vlie (van Popta, 2020, p. 25; Vos et al., 2018, pp. 63–64; Waldus, 2020, p. 53). While simultaneously, the southern and northern lakes were connected, forming one lake. Thus, during this first

century AD, the openings of these Holocene lakes towards the Waddenzee became larger, eventually leading to tidal movement within these lakes. The tidal movement and wave action led to the erosion of the peat shores (van Popta, 2020, p. 25; Vos et al., 2018, p. 68).

Around 1350 AD, the Zuiderzee was morphologically formed, with brackish waters in the northern region where the outlet was, and in the southern region it remained freshwater (Menke & Lenselink, 1998, p. 27; van Popta, 2020, p. 26). While historically, the Zuiderzee was already mentioned in the 12th century (van Popta, 2020, p. 25), it remained a dynamic area with eroding peatlands, fluctuating water levels, the formation of sand plateaus, and changes in water inflow (Menke & Lenselink, 1998, p. 27; van Popta, 2020, p. 26; Waldus, 2020, pp. 53–54).

From the 17th century onwards, the extent of the Zuiderzee remained somewhat stable (van Popta, 2020, p. 26), up until the closing of the Zuiderzee in 1932, when it transformed into the Ijsselmeer, a freshwater inner lake changing the flora and fauna (Vos et al., 2018, p. 78). However, the Ijsselmeer coastline of Friesland remained relatively stable during the transfer from Zuiderzee to Ijsselmeer, as can be seen with aerial photographs of the coastline (Pavlicek, 1993).

Thus, most importantly, what can be distilled from this paragraph is that the formation of the Ijsselmeer, formerly known as the Zuiderzee, was extremely dynamic, setting the scene for human involvement within this area. This dynamic nature directly influenced its economic and cultural importance. However, after the closure of the Zuiderzee, the area near the Frisian coast where shipwreck W149 is located remained stable.

Economic and Cultural Importance

Because of its dynamic nature, a general relation can be seen between coastal communities and the Zuiderzee. Generally, land surfaces continued to erode over time due to flooding and storms, and communities responded by constructing dikes along the shores of the Zuiderzee from the 12th century onward. The earliest of these are believed to have been built locally in the 12th and 13th centuries, and on a regional scale in the 14th century (Houkes et al., 2014, p. 44; Menke & Lenselink, 1998, pp. 27–28; van Popta, 2020, p. 26). Later floods further reinforced the need to protect the population from the Zuiderzee. Ultimately, major floods occurred in the Zuiderzee area in 1916, which was one of the main reasons for the closure of the Zuiderzee (Verduijn, 2011, pp. 85–87).

Communities not only saw a danger in the Zuiderzee but also recognized it as a resource. Peat extraction and fishery played a significant cultural and economic role within these coastal communities (Janssen, 1976, p. 285; Waldus, 2020, pp. 26–29). Many other researchers have discussed this, but for this thesis, we will focus on the role the Zuiderzee played in trade, specifically the Hanseatic trade.

Hanseatic trade

The Hanseatic trade, which is already a problematic term, especially considering ANT's premise, was organized primarily by Northern German towns. These merchants expressed great economic influence during the 13th to 16th centuries, ranging from the west to England, east to Novgorod in present-day Russia, and northward from the coast of Norway, and south-eastwards to Cracow in Poland, see Figure 19 (Czaja, 2012, p. 235; Opdebeeck et al., 2024, p. 16).

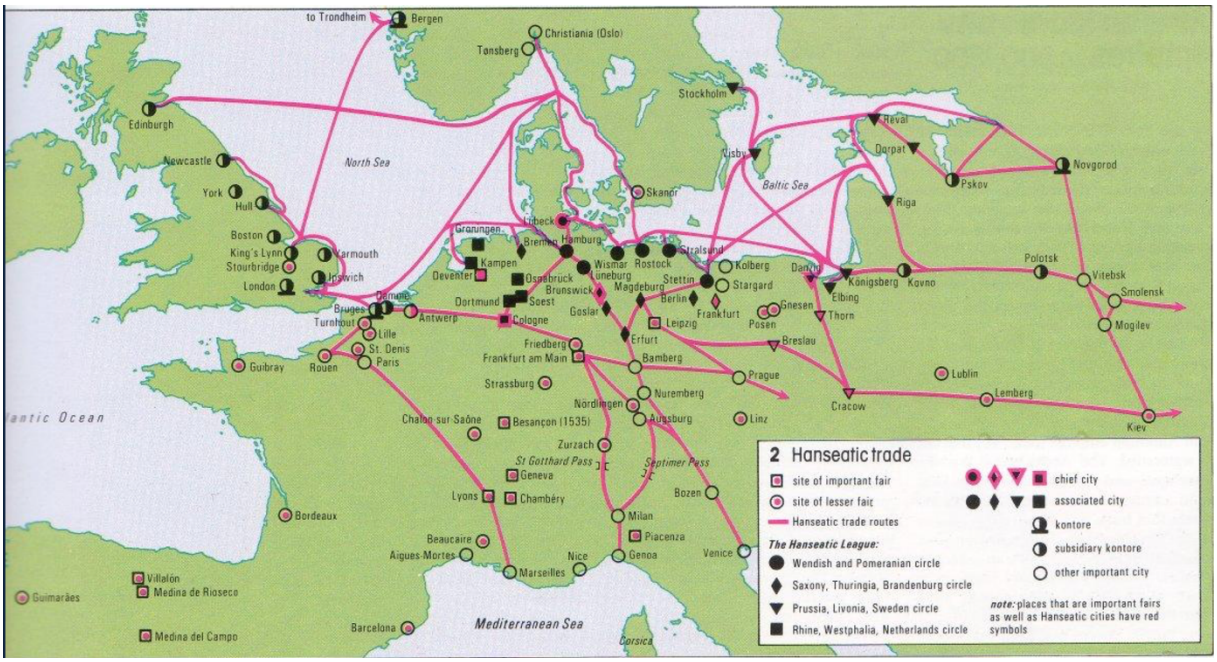

Figure 19: A map showing the Hanseatic league, with its towns and trading routes. (Kimball, 2015).

It can be divided into two economic zones: in the west there were urbanized and industrialized towns, while in the east the Baltic region was less populated but still able to provide natural goods such as forest products, raw materials, and agricultural products (Czaja, 2012, p. 239).

Problematically, Hanseatic times and/or the Hanseatic trade might give the impression that a uniform and centralized, almost government-like, organization existed and that fixed borders existed between these two economic zones. However, recent

research shows that the Hansa trading agreement only functioned because of overlapping interests of individual regions and towns, mostly the safekeeping of vessels from pirates and other dangers (Blockmans et al., 2017, pp. 1–3; Czaja, 2012, p. 236; Jahnke, 2017, p. 235). These local identities were paramount to those of the Hanseatic community, which even the Hansa themselves opposed in 1449 (Jahnke, 2017, p. 235).

Before the 15th century, the trade epicentre lay in the eastern part of the Zuiderzee, where Hanseatic cities could be found, such as Deventer, Zwolle, Zutphen, Stavoren, and Kampen. While the latter two were important port cities, they only became formal members of the Hanseatic trading agreement in 1441 (Jansen, 1976, p. 261). Ships leaving from these towns, located on the coast of the Zuiderzee or river mouths, sailed towards Poland and the Baltic states to import mainly forest products, grains, and metals; this trade is better known as the Hanseatic trade (Czaja, 2012, pp. 238–243; Malowist, 1958, p. 29).

While the Hansa trading agreement was mostly a northern German endeavour, with its centre in Lübeck, the Netherlandish towns played an increasingly significant role over time (Jahnke, 2017, p. 232). During the 15th century, imported and exported products to and from Danzig, a primary stable market, were dominated by Dutch ships (Czaja, 2012, pp. 240–241). Being the lead in exporting cloth, silks, wines, spices, herring, and salt, concurrently, the Netherlands became increasingly dependent on the import of raw materials such as timber, tar, and grease, as well as its food supply, consisting of Baltic grain such as rye (Czaja, 2012, pp. 239–241; Malowist, 1958, p. 29). In 1492, 80% of Dutch exported goods from Danzig consisted of grains, showcasing its importance and scale (Czaja, 2012, p. 241). Infamously, this trade would later be called the “mother of trade” (*Moedernegotie*) by Johan de Wit, forming the foundation upon which the later United Provinces would build their global rule (Malowist, 1958, p. 37; Pach, 1968, pp. 298–301).

A uniform Hanseatic trade

Simultaneously, from the fifteenth century onward, the centre of trade gradually shifted towards the Hollandish towns along the western coast of the Zuiderzee (Jansen, 1976, pp. 261–262). As stated above, not all merchants involved in this trade were part of Hanseatic towns. The towns on the west coast of the Zuiderzee, Holland, were not members of the Hansa. However, they became involved in this trade from east to west and even became dominant at the turn of the 15th century due to various socio-economic

influences (Jansen, 1976, p. 265; Malowist, 1958, p. 37). The Hansa tried to prevent their decline in influence with rules and regulations for Hanseatic towns, which were not always ratified (Czaja, 2012, pp. 264–247; Jahnke, 2017, p. 242; Jansen, 1976, p. 265). They also waged wars against the Hollanders, notably between 1438–1441 and 1473–1474 (Jansen, 1976, pp. 265–266; Jahnke, 2017, p. 235). The rise of Hollandish towns can be seen as a mix of cheap labour, new ships, and new routes (Jahnke, 2017, p. 237; Jansen, 1976, pp. 264–267; Malowist, 1958, p. 27; Pach, 1968, p. 292), eventually becoming masters of shipping these bulk commodities (Pach, 1968, p. 293). This Atlantic coast trade, from the Sound to the Strait of Gibraltar, ensured the eventual subduing of the influence of the Hansa and Venetians (Pach, 1968, pp. 298–299).

Navigation and sea routes

An important part of the trade with the Baltic was the trade routes themselves, which became one of the reasons for the rise of the Hollandish towns. The northwestern coast of Friesland, the northern part of the Zuiderzee's estuary, was an important gateway, especially through the Vlie, towards the Sound straits already from the late 14th century onwards (Czaja, 2012, p. 238). Moreover, the Dutch were the first ones to use this route on a regular basis (Pach, 1968, p. 292).

Using ships with a relatively low draught, and specifically designed for bulk cargo, they were able to navigate through shallow waters and along the coast (Czaja, 2012, p. 245; Jansen, 1976, pp. 261–262; Unger, 2017, pp. 19, 22–26).

While compasses were known in the Netherlands during the 15th century, they didn't provide safety from dangers beneath the waves (Marcus, 1956, pp. 20–21). The route remained treacherous, and due to the proximity to the coast, the chances of wrecking increased, see Figure 20 (Czaja, 2012, p. 245; Unger, 2017, p. 19). Sailors needed to have a trained eye, and uniquely recognisable features on land were drawn from the seaside to help locate the vessel's position (Schilder & Bruyns, 1976, p. 240; Unger, 2017, pp. 19–20). One of the earliest examples of a compiled book of these drawings and instructions is the *Seebuch*, dating from around 1450. It provides descriptions primarily of routes that were used for trade from east, Zuiderzee, to west, the Baltic area (Schilder & Bruyns, 1976, p. 240). The Hanseatic cities combined their forces as well for the safety of navigating these sea routes and sandbanks (Czaja, 2012, pp. 245–246; Jahnke, 2017, p. 235). However, not all accidents could be prevented, and some ships were lost to the

water. Examples of relevant ships that were lost can be found below, including shipwreck W149.

Figure 20: An historical map of the Zuiderzee area, made by Christiaan Sgrooten 1568. (Opdebeeck, 2024, p. 18, Figure 2.5).

5.2 Some examples, other actors on the stage

Multiple shipwrecks have been researched in the area where W149 is located, in the estuary part of the IJsselmeer. Research has been conducted by volunteers, such as Archeos Fryslân and the LWAOW, as well as the Dutch Heritage Agency (RCE). Two other shipwrecks that have similarities with W149 will be shortly explained below.

Medemblik 1

A shipwreck that has similar features as that of W149, is Medemblik 1. It was one of the first, if not the first, shipwrecks that was researched underwater systematically (Maarleveld, 1984, p. 45). In 1980, when the shipwreck was researched for the first time, methodologies were invented and applied (Maarleveld, 1984, pp. 45–48; van den Akker et al., 2007, p. 40). Similar constructional elements were discovered to those of W149 and other shipwrecks that were identified as cogs. Therefore, it is no surprise that the shipwreck, Medemblik 1, was called a cog (Maarleveld, 1984, pp. 49–61). The site is designated as a national monument because of its uniqueness and importance; however, it is not physically protected (Maarleveld, 1984, p. 62; van den Akker et al., 2007, pp. 40–41). Since 1983, no archaeological work has been done, with the exception of a check-up on the site and taking additional samples for dendrochronology by the LWAOW in 2005 (van den Akker et al., 2007, pp. 40–41). They concluded that the sand on top of the site was slowly disappearing and that the samples taken were unfit to be used for dendrochronology (van den Akker et al., 2007, p. 41). Since then, no further actions have been taken on the site, and thus its precise dating remains a mystery.

Stavoren 17

More recently, the RCE researched a shipwreck near Stavoren in 2012 (Opdebeeck et al., 2014, p. 7). Discovered by volunteers in 2000, it became clear that it was an old shipwreck potentially of high archaeological value (Opdebeeck et al., 2014, pp. 7, 11; van den Akker et al., 2007, p. 35). Dendrochronological research dated the wreck to after 1501 ±8 (Opdebeeck et al., 2014, p. 12; van den Akker et al., 2007, p. 36). While constructional elements are quite different between Stavoren 17 and the other wrecks, namely the hull construction, Stavoren 17's hullstrakes are completely built overlapping each other, while Medemblik 1 and W149 have a carvel bottom and overlapping boards (Maarleveld, 1984, p. 54; Opdebeeck et al., 2014, p. 23; Manders et al., 2024, p. 63). It is worthwhile to mention this because of the similarities in date, location, and possible function of the ships.

5.3 The Shipwreck W149

In 2021, during a sonar survey in the municipality of Súdwest-Fryslân, 22 new shipwrecks were discovered, as well as nine loose ship construction elements (van den Brenk, 2021, pp. 29, 40). Amongst these shipwrecks was W149, located off the coast between the Frisian towns of Makkum and Stavoren, see Figure 21 (Manders et al., 2024, p. 61). The shipwreck is located at a depth between 3 and 4 meters and is orientated northwest-southeast.

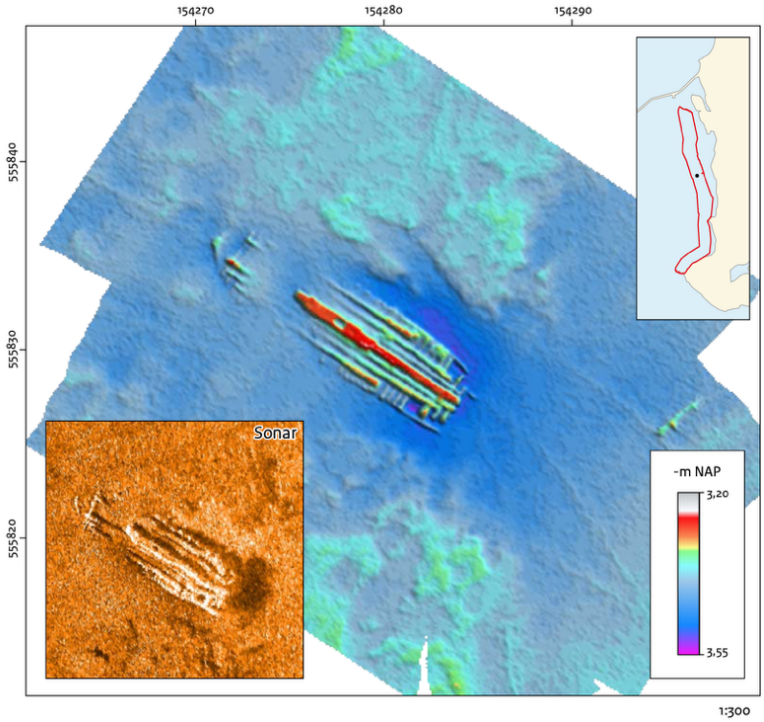

Figure 21: Side scan sonar footage as well as the multibeam sonar image of W149. (Manders et al., 2024, p. 61, Figure 5.24).

On the multibeam footage, it is clear that the wreck only consists of the bottom part of the ship and is 15.8 meters long and 4.9 meters wide (van den Brenk, 2021, p. 41). However, the bow of the ship is preserved, while the aft has not been found yet. It possibly lies deeper in the sediment. Additionally, an object can be seen east of the wreck, at the aft-end, likely to be the sternpost of the ship. Because the shipwreck was only identified by multibeam sonar, meaning it was not observed underwater, but only from the surface, the RCE decided in 2022 to dive on these shipwrecks that were identified during this survey.

Previous research

In 2022, the Dutch Heritage Agency (RCE), during a campaign of two weeks, had researchers dive on eight of these shipwrecks, including W149 (Opdebeeck et al., 2024, p.

27). On the 13th and 14th of April 2022, the researchers dived on the shipwreck. They concluded that the bottom part of the ship was preserved and was lying flat on its keel in a sandy layer with shells (Manders et al., 2024, p. 61). The researchers concluded that the shipwreck measured just over twenty meters in length, which is a bit longer than was concluded from the multibeam footage, and was maximally five meters wide (Manders et al., 2024, p. 62). The object that was found east of the site was also interpreted as the sternpost, most likely part of W149 (Manders et al., 2024, pp. 63–65). What the researchers concluded will be highlighted in two sections: the basic characteristic construction elements, and the objects that were found in the wreck.

Ship construction

The researchers quickly noted that these were the remains of a rather large vessel, which was heavily built. It had heavy straight frames and a large keelson. Unfortunately, only the bottom part of the ship remains, with two to three overlapping outer hull strakes, see Figure 22 (Manders et al., 2024, p. 62). The bow-end narrows toward the front but curves outward slightly towards the aft, while the aft itself tapers more sharply toward midships (Manders et al., 2024, p. 63).

The bottom consisted of planking that was built in a carvel manner, meaning that the planks are laid edge-to-edge, creating an even surface. The board planking consisted of overlapping strakes, meaning these planks are partly laid on top of each other, like roof tiles (Manders et al., 2024, pp. 62–63). The ceiling planking consisted of a few planks, resulting in an open inner hull; this was intended (Manders et al., 2024, pp. 62–63).

The frames of the ship were well preserved and heavily built (Manders et al., 2024, p. 63). As can be seen on the 3D photogrammetry model, the frames are uniformly built with similar sizes and shapes. Where the overlapping strakes start, rabbets accommodate these overlapping outer hull planks.

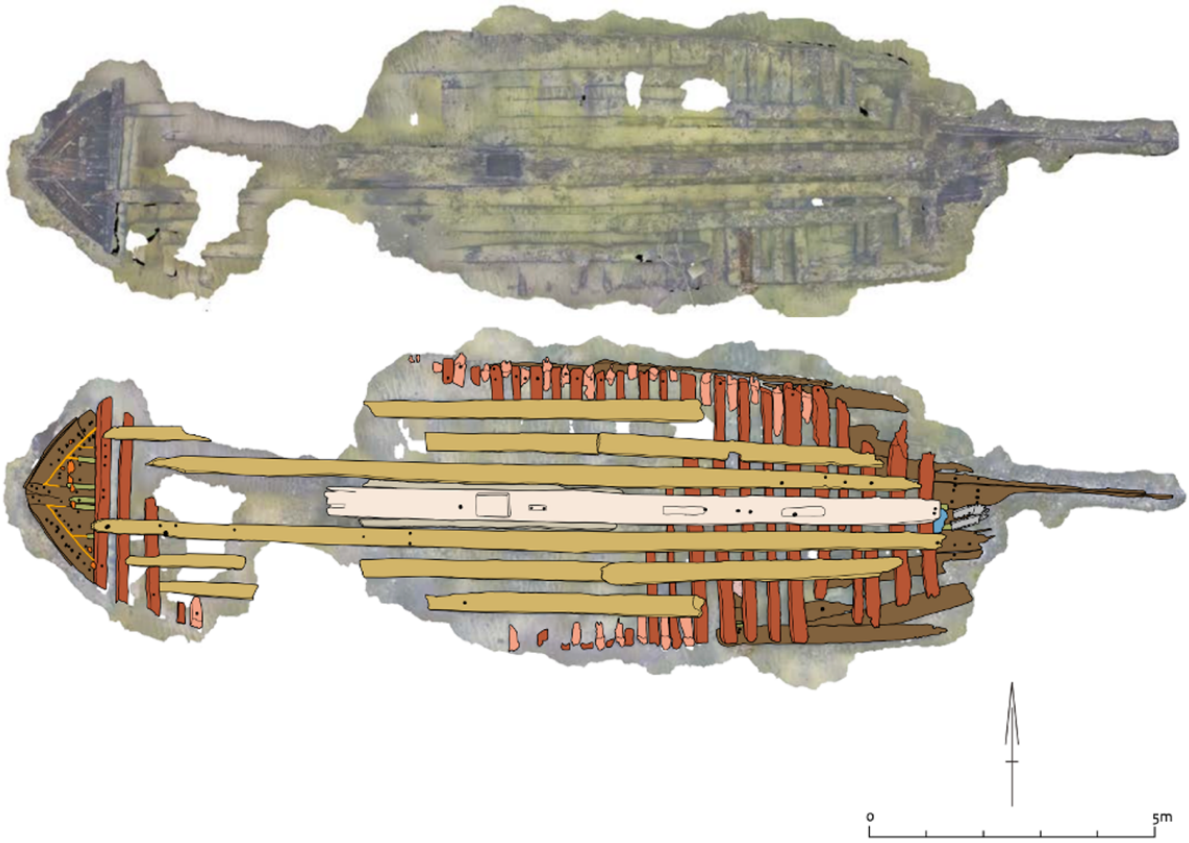

Figure 22: Top image shows the 3d photogrammetry model. Below the site plan of W149. (Manders et al., 2024, p. 62, Figure 5.25 & 5.26).

A very heavy keelson was also identified; this could already be seen on the multibeam sonar recording. Within the keelson, eight meters from the stempost, a mast step was found; it was also recorded on the multibeam sonar image (Manders et al., 2024, p. 63). At the level of the mast step, two side keelsons were identified (Manders et al., 2024, p. 63), supporting the forces projected via the mast on the hull, once again showing how heavily this ship was built. Within the keelson towards the aft, three more rabbets were found. These are cut-outs where other constructional elements were inserted. Potentially, these were used to support the upper deck or inner bulkheads dividing the cargo hold (Manders et al., 2024, p. 63).

The object twelve to fifteen meters east of the wreck was identified as the sternpost of the ship, including two futtocks (Manders et al., 2024, pp. 63–65). It consists of two parts and is 3.75 meters high (Manders et al., 2024, p. 64).

Additionally, regarding the wooden constructional elements, the caulking of the ship is equally important. According to the researchers, the vessel was caulked with sintels, both for the overlapping and the carvel-laid planks, but in different ways (Manders et al., 2024, p. 62). The overlapping strakes were only caulked with sintels, while the

carvel-laid planks were sintelled with an additional lath to cover the seams between the planking (Manders et al., 2024, pp. 62–63). Samples were taken from the caulking material of the bottom of the ship, where the carvel planks are located (Manders et al., 2024, p. 63). The caulking material turned out to consist of an unidentified leaf moss (Brinkkemper, 2024, p. 119).

During these two days, the construction was not the only thing that was researched; some artefacts and additional samples were also taken.

Objects and Additional samples

To date the ship more accurately, four dendrochronological samples were taken (Manders et al., 2024, p. 66). From two ceiling planks, one frame, and one outer hull planking, only one of them was suitable for the dendrochronological analyses: the outer hull planking sample, which was dated to after 1450 and most probably came from northeastern Germany (van Daalen, 2022, p. 1).

Another sample that was taken was located in the aft end of the ship. Within the intact archaeological layer underneath the frames, a sample of the presumed cargo of the ship was taken (Manders et al., 2024, pp. 65–66). This botanical sample, of 0.5 litres, was analysed; first, it was sieved using standardised sieves with mesh sizes of 1.0, 0.5, and 0.25 mm. It turned out that the sample consisted of 99 percent Secale *cereale*, in other words, rye (Brinkkemper, 2024, p. 119). Moreover, the analysed botanical remains of rye were all intact seed coats, meaning that it was likely to be part of a bulk cargo of grain kernels (Brinkkemper, 2024, p. 119). Other botanical remains that were part of the sample could not be determined in more detail; samples of the other seeds were destroyed in a house fire of the researcher (Brinkkemper, 2024, p. 119). Some of these field weeds were identified and recalled from memory by the researcher; however, these should not be considered true per se, and can best be excluded from the analysis. Thus, a more detailed provenance of the rye could not be given.

One of the ballast stones was lifted and examined in more detail (Manders et al., 2024, p. 65). The stone was lifted from the bow-end of the ship and consisted of a dark flint; however, its provenance could not be determined further (Manders et al., 2024, p. 65). Additionally, in between some frames, a basalt stone was seen (Manders et al., 2024, p. 65). These stones have been found in other shipwrecks in the IJsselmeer and Waddenzee, so these cannot be used to analyse the origin of the ship.

Moreover, smaller objects were also found within the shipwreck. In the bow-end of the ship, a lead cannonball was found; the cannonball is 3.6 centimetres in diameter and weighs 243 grams, see Figure 23 (Manders et al., 2024, p. 65). Furthermore, a smaller calibre bullet was found in the aft end of the ship. Most probably, this is a bullet for a pistol; it has a diameter of 1.1 centimetres and weighs 6.2 grams (Manders et al., 2024, p. 65).

Lastly, the researchers observed two leaden sheets. These were found in the aft-end, on top of the presumed keel or keelson (Manders et al., 2024, p. 65). These were not lifted but were interpreted as possible repair patches.

Figure 23: The lead cannonball that was found in the wreck during the 2022 campaign. (Manders et al., 2024, p. 65, Figure 5.32).

Concluding

The earlier field campaign executed by the RCE in 2022, and consequently the report in 2024, provided a solid foundation for a new underwater archaeological survey. In April 2025, this new campaign aimed to expand upon these observations, verifying previous interpretations, collecting further structural measurements, and documenting the wreck in greater detail to enable a comprehensive analysis of W149's construction and use. The following section provides an overview of the preparation and execution of this fieldwork.

5.4 Dive campaign 27th of April 2025

As part of the ANT analysis, it is equally important to describe in detail how the research was conducted, as well as the choices that were made during the process. Therefore, a phenomenologically inspired research account of the field day is provided. Showing all personnel and materials involved, all being actors. During this field day, first-hand data were gathered, described, and interpreted. The conduct of the field day is outlined below.

Thorough preparation was required not only from a research perspective but also logistically. Approval for both the research and funding was obtained simultaneously through the annual budget of the "13 Provinciën" project. A detailed project plan was submitted, securing approval and €1,500.00 in funding, see Appendix A.

Due to time and resource limitations, the campaign focused on specific areas of interest, identified based on the 2022 survey, including a photogrammetry model that served as the foundation for the site plan. The primary areas of focus were located near the bow and stern, where breaks in the structure offer cross-sectional views of the hull. The inner keel is also a key area, especially where the mast step and additional rabbets are located.

Prior to the fieldwork, a presentation was given to the research team, outlining the campaign's objectives and highlighting the target areas using visuals from the 2022 survey. Tasks were divided among the team members, and it was emphasized that no samples or artefacts were to be removed from the site during the April 27th campaign. Since April 1st, 2025, any such action has required a special exemption, which was not applied for as the project is focused solely on documenting ship construction.

Expedition Members:

- Bert Kremer *(Archeos Fryslân)*
- Ernie de Jonge *(Archeos Fryslân)*
- Marijn van den Bos *(Leiden University)*
- Trinko Rijs *(Leiden University)*
- Robin Jonker *(Leiden University)*

General recap fieldwork

On Saturday the 26th of April, I and two other students (Trinko Rijs and Marijn van den Bos) headed to Stavoren. From this harbour our diving expedition would start; however, we would sail out only the next day. Due to the long drive to Stavoren, it was decided to stay somewhere near Stavoren. We stayed in the Sportshotel Iselmar in Lemmer. This was 25 min from the harbour.

On the 27th of April, we arrived at the harbour of Stavoren. When we arrived around 08:15, Bert and Ernie were already present; they had stayed the night on the ship. When all equipment was loaded from the cars onto the ship, we were ready to head out. Most of the equipment that was used was personal equipment; only the six dive cylinders were rented at dive shop Wobbegong in Amersfoort. Around 08:30, we went through the sluice; it was still 1.5 hours sailing to the site.

When we approached the site, the first task was to locate the wreck. The GPS coordinates were already programmed into the software, so the shipwreck could be found fairly easily. While we were sailing on top of the site, we made some additional sonar images. To make the shipwreck visible on the surface, for the divers, to locate the wreck, some buoys were placed on the bow-end of the shipwreck as well as the aft-end, see Figure 24. Part of the stern section of the ship was located east of the shipwreck; here, an additional buoy was placed. The buoys were thrown into the water from the front deck of the ship. When the sonar image as well as the GPS location showed the correct part of the ship where the buoy was supposed to be placed, it was placed in the water. The first diver checked the location of the buoys and, if necessary, relocated them.

Lastly, a guideline was placed between the three buoys so divers could easily navigate from one end of the ship to the other. The first diver who was responsible for this underwater infrastructure was Ernie.

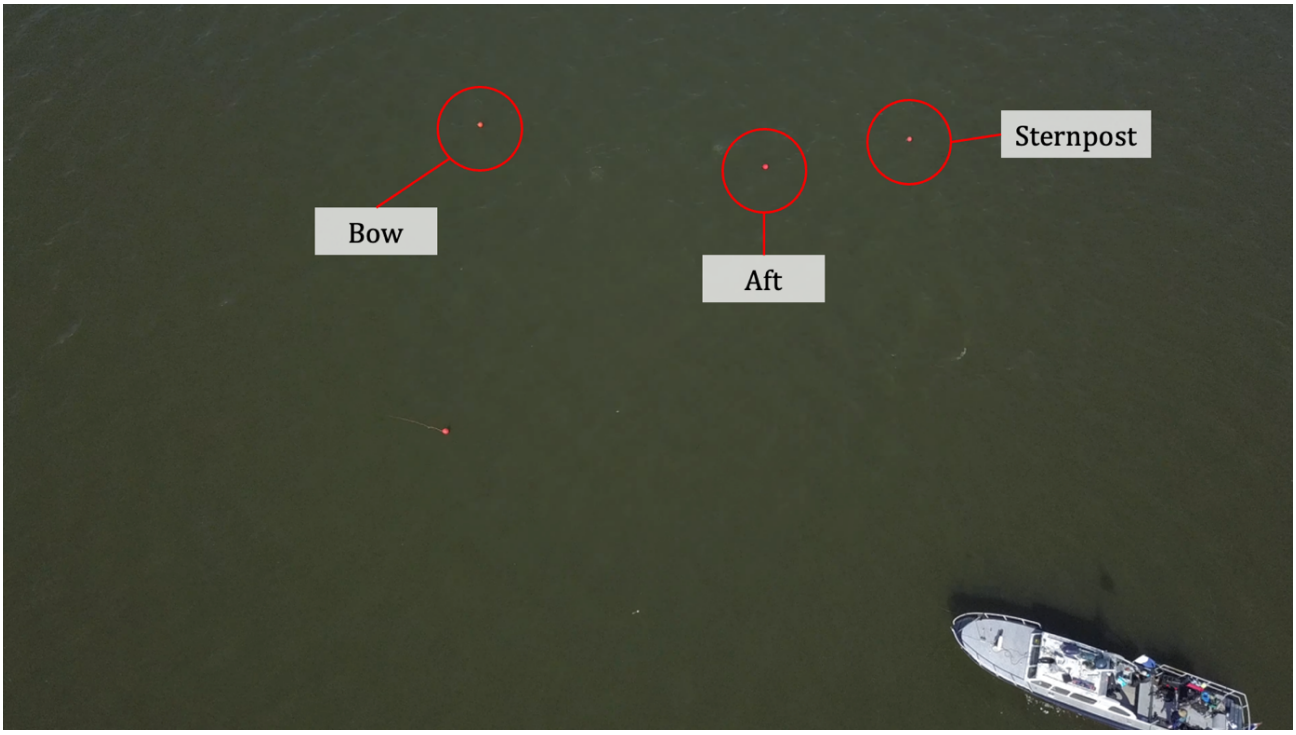

Figure 24: Drone footage of wreck site W149. (Drone photograph by Ernie de Jonge, adapted by Robin Jonker).

Once the underwater logistics were arranged, the first reconnaissance dives were undertaken. These were short dives in order to get a feel for the layout of the wreck. It often looks different from the models that were made and studied on land, unlike the small slice you can see underwater. After the first dive, the measurements and scale of the wreck became truly noticeable. I was the first one to see the wreck, and after a quick dive of around 20 min, I came back to the ship to brief the other divers. It was decided that work should be conducted at the bow-end of the ship as well as near the aft-end, where the starboard construction of the ship was clearly visible. The bow end of the ship had a rather interesting construction which needed to be drawn and sketched in more detail.

Additionally, work at the keelson and the presumed sternpost was conducted. These details were sketched and measured to gain a clearer understanding of the ship's construction. Photogrammetry models were made of the sternpost and the sandwich of the starboard. After every dive, a report was written, and the respective divers finalized their drawings.

Near the end of the day, a round stone object was found on the port side of the ship, around 17 m from the bow. This cannonball-like object was measured and is still located at its original find location. At 12 m on the starboard side, part of the presumed cargo could be observed. Within the fill of the ship's construction, reed branches were found. These were standing in a vertical position; however, they were not excavated. Therefore,

the context or the layer in which they were located is not known. Possibly these were part of the ship's cargo or are a belong of the natural environment.

After completing a total of 11 dives, it was time to leave the site. We needed to return to the harbour of Stavoren before the final closing of the sluice, which occurred around 19:30.

Description of the dives

The maximum air temperature was 18 degrees Celsius, while the water temperature was around 12 degrees Celsius. There was a northeastern wind of an average of 2.8 m/s. This was helpful because there is a higher chance of better visibility underwater when there is a northeastern wind. The visibility was quite good for the Ijsselmeer, which is notorious for bad visibility. There was a maximum visibility of 1 meter at some stage during the day. However, the average visibility was around 80 centimetres. The dives were done at a maximum depth of 3.8 meters.

The dive campaign was structured to ensure efficient documentation of shipwreck W149, see Table 2. On the first dive, Ernie focused on locating the wreck, placing the buoys, and establishing a baseline to serve as a reference for subsequent measurements.

During the second dive, Robin performed site orientation, familiarizing the team with the shipwreck's layout and key features. After this short dive, Robin briefed the team on what needed to be done, then continued his dive to start drawing and measuring the bow area.

Table 2: The dive schedule and tasks done during each dive. (Table by Robin Jonker).

Dive #	Divers	Goal / Task
1	Ernie	Locating wreck, placing buoys, establishing baseline
2	Robin	Orientating on site, Drawing and measuring constructional elements (Bow)
3	Marijn & Trinko	Trinko: drawing and measuring constructional elements (starboard side) Marijn: drawing and measuring the three rabbets in the keelson
4	Bert	Surveying
5	Robin	Drawing and measuring constructional elements (Bow)
6	Robin	Drawing and measuring constructional elements (Bow)
7	Marijn & Trinko	Drawing and measuring constructional elements (starboard side)
8	Ernie	Filming, Cleaning / packing up

Dives three to seven were dedicated to detailed drawing and measuring of the starboard side, carried out by Marijn and Trinko, ensuring precise recording of constructional elements. Trinko focused on the hull construction, while Marijn made additional measurements of the three rabbets located in the keelson towards the aft.

Bert surveyed the wreck during the fourth dive, documenting the overall site and relative positions of key elements. Robin continued to focus on drawing and measuring the bow during dives five and six.

Finally, the last dive, conducted by Ernie, involved filming some interesting features, cleaning up, and packing the equipment. This systematic division of tasks allowed the team to balance orientation, detailed documentation, and site management efficiently.

Results of the 2025 campaign/Concluding remarks

The campaign resulted in primarily observing two areas of the shipwreck, see Figure 20. First, the sandwich of the starboard side, primarily measured and drawn by Trinko and Marijn. Second, the bow-end of the ship, which was of high interest and was measured and drawn in detail, resulting in two additional drawings and observations compared to the 2022 field campaign.

<u>The starboard hull construction</u>

Firstly, the hull construction was looked at in more detail and with additional measurements. The new observations of 2025 confirmed the presence of both overlapping strakes and carvel-laid planks, confirming the 2022 observation. The overlapping outer hull planking is 5 centimetres thick and tapers downwards. The grain of the planks shows that these planks were split along the grain and not sawn. The overlapping strakes were 34 and 36 centimetres wide. The ceiling planks were measured midships at 10 centimetres and towards the bow and stern at 5–6 centimetres. The lead sheets were also noticed in this area.

<u>The three rabbets in the keelson</u>

Some basic measurements were taken from the three additional rabbets located towards the aft of the mast step. The rabbet located most towards the aft is 14 centimetres wide, 9 centimetres deep, and 60 centimetres long. Within the rabbet, a treenail with a

diameter of 5 centimetres is located. The middle rabbet is 70 centimetres long, 14 centimetres wide, and 3 centimetres deep. The rabbet located closest to the mast step is 30 centimetres long, 10 centimetres wide, and 3 centimetres deep. This rabbet showed two treenails of a diameter of 3 centimetres.

The bow construction

However, the bow-end was the focus of this research. More detailed sketches and drawings were made of the bow of the ship, see Figure 25. Some of these observations will be highlighted. The central plank, possibly the keelplank or keelson, is 31 centimetres wide at the bow-end. The thickness remains unclear. The plank that tapers outwards towards the starboard is 210 centimetres long and roughly 37 centimetres thick.

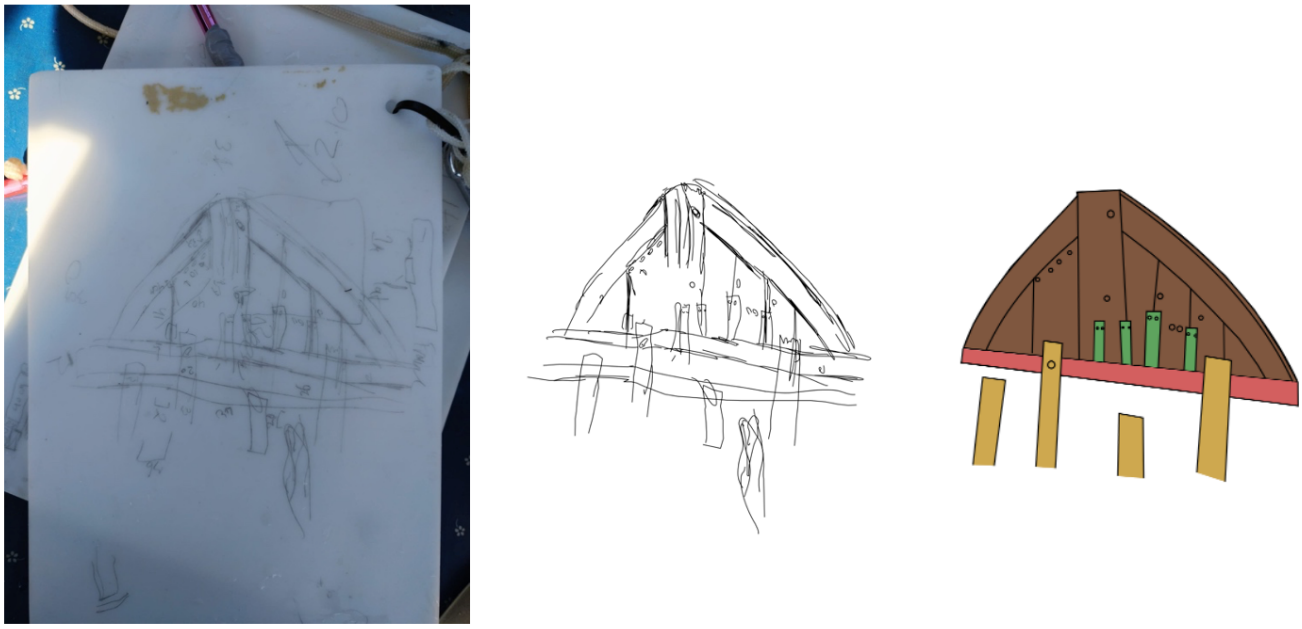

Figure 25: The sketching process of the bow area of W149. Left: The underwater sketch. Middle: The digitalized sketch. Right: A clean interpretate drawing. (Drawings by Robin Jonker).

More interestingly were the caulking laths that were identified in the 2022 campaign. The researchers noticed these were fastened with sintels. In 2025, these laths were once more examined. These laths were larger than normal sintel laths; some measured up to 14 centimetres wide and well over a centimetre thick, becoming more like small planks, or battens, rather than laths. However, these battens covering the seams between the outer hull planking were not fastened with sintels but were fastened with nails on top of the seams, see Figure 26.

Further research on W149 should identify if the caulking battens are interrupted by frames, or if they are continuously running over the seams between the planking, see Figure 27 (Belasus, 2019, pp. 181–182).

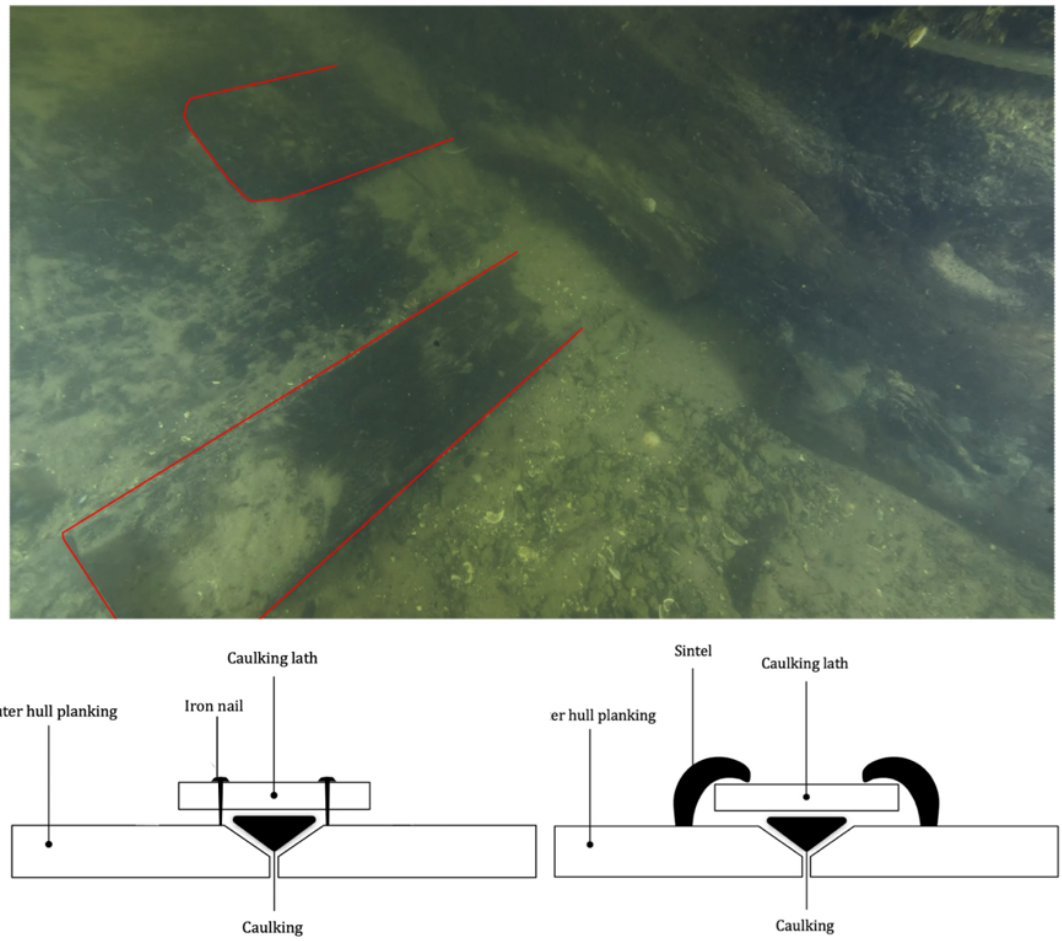

Figure 26: Top: The caulking battens, in red, of W149 in situ. (Underwater photograph made by Ernie de Jong, adapted by Robin Jonker). Bottom left: Showing the iron nails connecting the caulking battens with the outer hull planking. (Manders et al., 2024, p. 63, Figure 5.28, adapted by Robin Jonker). Bottom right: The interpretation of the 2022 campaign, where the caulking battens were attached to the outer hull planking with sintels. (Manders et al., 2024, p. 63, Figure 5.28).

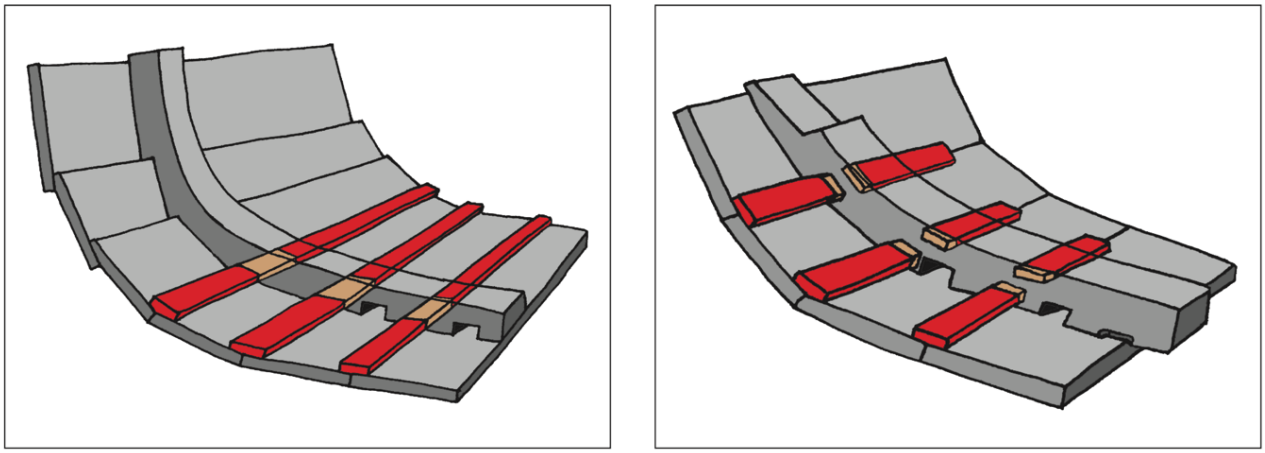

Figure 27: Caulking batten that have been found in other shipwrecks. Left: The caulking battens run over the complete lengths of the seams, continuing under the frames. Right: The caulking battens do not cover the entire seams but run only parrtially underneath the frames. (Belasus, 2019, p. 182, Figure 8 & 9).

Additional observations

New photogrammetry models were made. One model was made of the presumed sternpost of the wreck, see Figure 28. Another model was made of the aft end of the ship, showing the hull construction, the so-called sandwich, see Figure 29. These models were made to map the site in more detail.

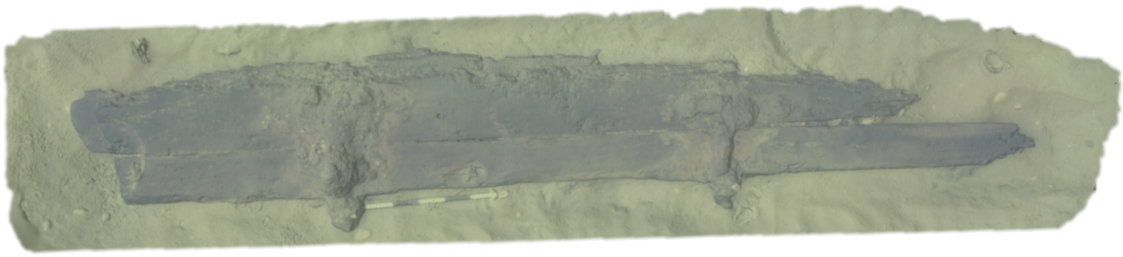

Figure 28: 3d photogrammetry model of the sternpost of W149. (Model made by Ernie de Jong).

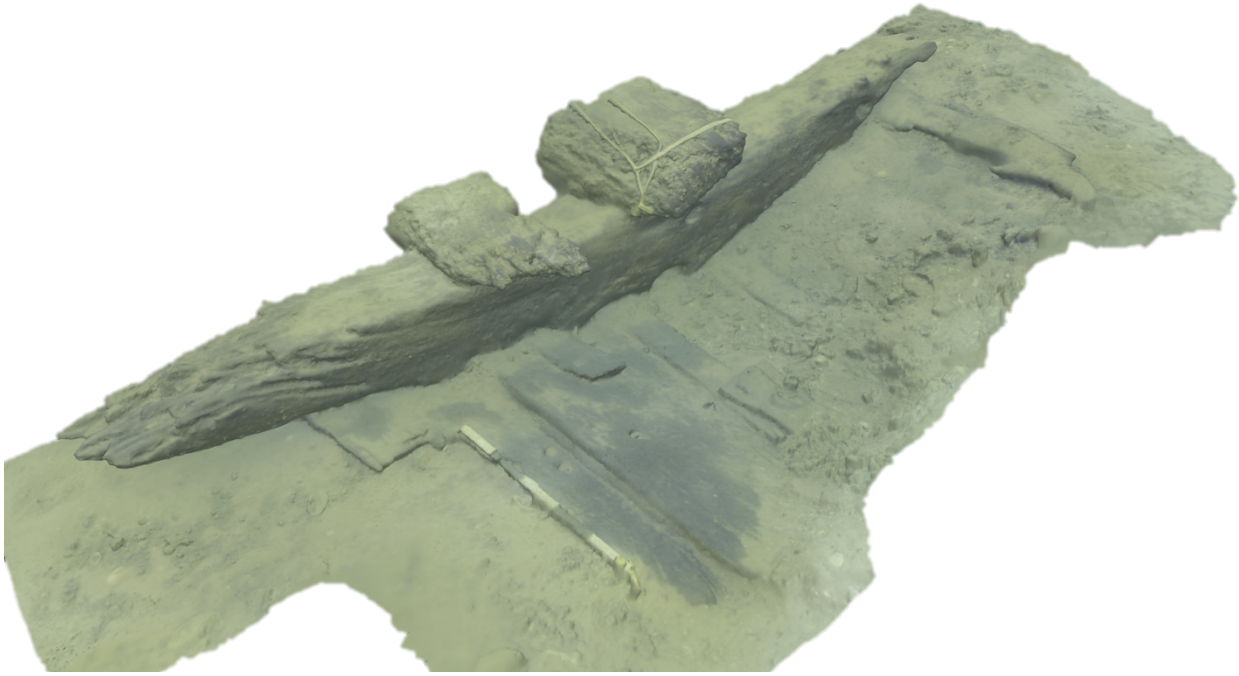

Figure 29: 3d photogrammetry model of the stern sections of the W149. (Model made by Ernie de Jong).

Additionally, besides the constructional details, other objects were also seen during the campaign, such as a round stone object. This object was measured in situ and was not lifted due to legislative restrictions. On the portside, 17 metres from the bow, this object was seen. It was measured underwater at its original findspot; the stone ball had a diameter of 8.1 centimetres and a circumference of 25.5 centimetres, see Figure 30.

Additionally, botanical remains were found within the shipwreck. Twelve metres from the bow, lying on the starboard side, reed branches were observed. These were standing in an upwards position. Their function or species could not be identified further. These may have been part of the ship's cargo or originate from the surrounding natural environment.

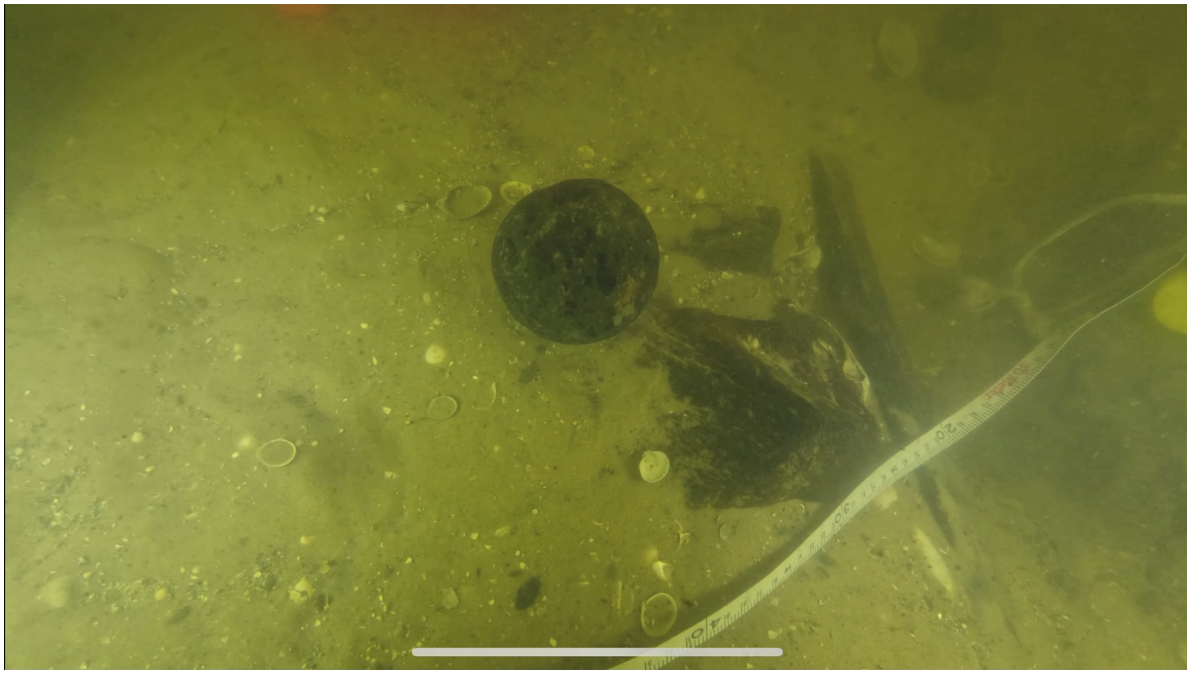

Figure 30: The stone cannonball, found during the 2025 campaign. (Underwater picture made by Ernie de Jong).

Concluding

This chapter aimed to provide context and introduce the W149 shipwreck, the primary case study of this thesis. The historical, environmental, and archaeological context helps to understand the landscape in which the shipwreck is located. The ever-changing conditions of the Zuiderzee showed how humans and their ships must have adapted constantly.

The historical background delved deeper into the political and social landscape of the Hansa period. The naming of this period has been criticized, and it showed that a

uniform Hansa was not a reality, and that trade of bulk goods, such as rye, was conducted by many different peoples and towns, resulting in important trading routes and port cities.

The W149 will be used to apply the theoretical framework for trying to understand this past, which has been notoriously seen as homogenous. Building upon the 2022 campaign, a new dive campaign was conducted in 2025, both to prove the observations that were made earlier and to make new observations, adding new drawings, sketches, and measurements as non-invasive documentation techniques. At the same time, the lack of invasive techniques during the 2025 campaign might be a limitation.

While the preserved remains of W149 are incomplete, most notably due to the absence of the aft section and the existence of only the bottom of the ship, this does not lower the interpretative value of the site. The interesting aspects, such as the bow-end, outer hull constructions, and caulking battens, remain to be interpreted and contextualized. These elements will be used in the analysis, together with the foundational groundwork established above. These observations will be explored in the theoretical framework outlined in Chapters 3 and 4, providing a new and different framework in which W149 will be placed in its maritime cultural landscape.

Chapter 6: Analysis and Results

This chapter provides an analytical approach to the observed features highlighted in Chapter 5, moving beyond the mere descriptive accounts. It applies a combination of Actor-Network Theory (ANT) and Maritime Cultural Landscape (MCL), focusing on the interpretation and contextualization of the observations and results. These observations and results have been thoroughly discussed and described in Chapter 5; here, the relations, processes, and formation and stabilisation of these results will be identified through the ANT and MCL concepts explained in Chapter 3. The ANT analysis will work on a micro-level, while the MCL approach will zoom out and function at a macro-level.

The goal of this chapter is therefore not to provide a typological classification or a further description, but to understand the ship's function and use, its social context, and formation, seeing the W149 as a result of interactions, negotiations, and mediations.

6.1 Suspending typological certainty

The W149 and its observations will serve as a case study for this new analytical approach. However, it is not a complete shipwreck. The incomplete preservation of the W149, namely only the bottom part of the ship and the missing aft-end, does provide enough possibilities to interpret the observations made during both field campaigns.

The preserved remains of the ship will be approached as a dynamic assemblage, rather than as remains of characteristics that belong to a specific fixed ship typology, as is one of the main pillars of an ANT approach. Thus, the analysis starts without assuming a priori categories, rejecting a preset essence in the materiality. This starting point is used to understand the work-net, the active actors that influence each other and shape each other, of W149.

However, here the analysis will start with some of the observations described in Chapter 5, which are open for interpretation, such as the hull construction, caulking battens, and the objects.

6.2 Tracing the actors and work-net of W149

As shown in Chapter 3, ANT is a way of analysing and interpreting networks or rather work-nets as argued earlier. While the ship W149 can be seen as an actor itself, as well as a heterogeneous assemblage of human actors and material actors; actants, the interactions between those actors ultimately resulted in the ship as a working, functioning entity. Clearly focusing on the hull construction, repair, and material practices, such as the different hull planking techniques, the observed lead patches, but most influentially, the caulking battens, these are ultimately a result of both practice, choice, and negotiations.

This is what the so-called work-net of W149 consists of, a wide selection of heterogeneous actors. There are multiple actors that can be identified within a shipwreck. A few have been outlined above, but these can be divided into different types of actors. Here we will divide the actors into three different origins/provenances of actors: the physical remains of the shipwreck itself; the environment, physical as well as social; and the researchers themselves, including their intrinsic motivation and tools used to conduct the analysis, see Table 3.

Table 3: Actors that have been identified during the ANT analysis. (Table made by Robin Jonker).

Shipwreck	**Historical natural and social environment**	**Researchers**	**Present day Environment**
Hull planks	Water depth	Intrinsic motivation	Visibility
Caulking battens	Sediment	Tools used to conduct analysis	Time
Caulking itself	Currents	Methods	Wind
Fastenings (treenails and nails)	Trade	Techniques	
Lead patches	Material accessibility	Budget	
Objects found	Ship building tradition/knowledge		

Every single one of the actors mentioned above has influenced and will influence the outcome of the analysis. Below, Latour's sources of uncertainties, as explained in

Chapter 3, will be used to identify a more detailed account of the work-net and its interacting actors of W149. Looking at three primary actors that have their origin in the physical shipwreck itself, the primary topic of archaeological research will thus be the main focus of the analysis. While other actors, such as the historical and physical environment, have been somewhat explained, they will be the topic of a separate paragraph, not only identifying them as actors but also connecting them to concepts of Westerdahl's MCL. Lastly, primarily in the discussion chapter, the influence of the writing of this research account, the fifth source of uncertainty, will be discussed, explained, and justified in more detail.

However, the ANT analysis will start with the hull construction, followed by the caulking battens, and lastly the archaeological objects and samples collected during the two field campaigns.

The archaeological remains of W149 as result of translation

As was observed during the diving campaigns on W149, the hull was constructed using two techniques, what we identified in shipbuilding as carvel and overlapping strakes. The central lower section of the hull, the part below the bilge, was constructed using carvel-laid planks. Five carvel planks were lying next to each other, while on both sides, going outwards towards the boards and bilge, the planking changed to overlapping strakes.

The ANT approach urges us not to see these techniques as categories, such as carvel-ships or clinker-ships as fixed ship types, nor when using both techniques as a hybrid type. These observations need to be seen as practices, a shipbuilder's choice rather than a category, thus being a result of functional and environmental demands, equally influenced by knowledge of adaptation, finding solutions, and the spreading and transition of this knowledge, ultimately being a result of a negotiated reality, or in ANT terms, a result of translation. For this ANT analysis, the research assumes that the ship was built in the Netherlands. Based on its construction and location, this is highly likely. However, this has not been definitively proven. In W149, the shipbuilders, planks, fastenings, and environmental and social pressures can be seen as actors within a network negotiating a solution:

1. Problematization: The Challenge of Hull Construction

During the 15th century, maritime dominance within northern Europe shifted from the core town of the Hanseatic League towards Holland. The decline of the Hansa and the rise of Hollands towns and trade reflected changes in geography, industry, and trade organization (Hocker, 1991, p. 101; Jansen, 1976, p. 265; Malowist, 1958, p. 37). Dutch merchants could offer cheaper alternatives and lower prices by cutting out the middleman, the Hansa, and sailing a different route; through the Sound, avoiding the Lübeck-Hamburg stable market (Czaja, 2012, pp. 246–247; Hocker, 1991, pp. 100–101; Jahnke, 2017, p. 242; Jansen, 1976, p. 265; Malowist, 1958, p. 27; Pach, 1968, p. 292).

This shift in trade route created a new navigational challenge. The trickiest part of the journey from east to west was not navigating the Baltic or North Sea itself, but the shallow waters of the Waddenzee, with the Frisian coastal barrier island chain. These waters required ships with flat bottoms and a low draft to enable grounding capabilities if necessary (Hocker, 1991, p. 108). While these ships also needed to carry enough cargo over long distances to both supply the demand and make these voyages economically viable.

Within this context and social needs, a new problem arises: how to accommodate this fresh demand and to create a ship that combines both stability and flexibility, and within the social and environmental limits.

The main actors, the vocal actors, defining this as a problem, are the shipbuilders, who needed to come up with a specific solution while having certain limitations such their craft knowledge, available materials, and the socio-economic pressures of dangers and commercial rivalry. These vocal actors constitute the problem at hand, defining it through their tradition, knowledge, capacities, and limitations, setting the stage for the work-net formation and the negotiated roles played by actors and actants.

Within ANT, this represents the problematization phase (Callon, 1986, pp. 180–185; Latour, 2005, p. 39; Mutasa & Iyamu, 2025, pp. 3, 9). The shipbuilders of W149 are the main vocal actors, and the work-net is a result of the detailed challenges faced when constructing its hull, illustrating technical, material, environmental and socio-economic influences.

2. Interessement: Attracting and Assigning Roles to Actors

Once the problem is defined, various other actors need to be drawn into the work-net and should join the stage. Ultimately, having the goal of stabilizing a solution to the defined problem above. These other actors included human actors such as the labourers, sailors, investors; and actants; these can be non-human as well as intangible. Such as materials, objects, environmental conditions, social conditions, and traditions. Here they are assigned potential roles in the work-net (Callon, 1986, pp. 185–189; Latour, 2005, p. 39; Mutasa & Iyamu, 2025, pp. 3, 9–10). A few of these actors and actants will be highlighted.

Shipbuilding in this period was deeply rooted in tradition, such as the long-standing bottom-based technique existing in the Netherlands (Hocker, 1991, pp. 91–127). When analysing W149, the influence of tradition should therefore not be discarded or ignored and should be mentioned as an active actor within the work-net. This craft knowledge and tradition also shaped the work-net: shipbuilders recognized which practices were effective, including the combination of carvel planks for the central lower hull and overlapping strakes toward the sides and bilge. Tradition determined not only what was possible but also what was logical to them, ensuring continuity of skills while simultaneously ensuring functional needs. Here, tradition operates as an interessement device, aligning shipbuilders' choices with familiar, workable, and trusted practices.

Equally important are the materials that are attracted as actors. Their anticipated roles range from the wood used for the main construction, to the fastenings holding all these elements together, and the caulking materials maintaining a watertight hull. The provenance of these materials is also relevant. Wood was primarily sourced from Northeastern Germany and transported to Dutch shipyards. This material network links both this trading network and the distant forests to the shipyards. Additionally, the physical characteristics of the materials used enable or constrain the active roles they are proposed to play.

Lastly, the external influences all help to define the roles that other actors and themselves potentially assume, such as piracy, trading disagreements with the Hansa, the specific environmental conditions of the Waddenzee, and the socio-economic need to transport rye due to famines and a growing population, which occurred locally and Europe wide.

For example, the risk of attack showed that the ship needed defensive features, while the shallow waters required hull elements that allowed grounding and a low draft. These needs were already considered and fitted into the network, even before they became visible in the ship's material remains.

In ANT terms, this stage visualises and illustrates the potential roles of actors. Roles are proposed, stabilized, and held in place while awaiting their active contribution to the work-net (Callon, 1986, pp. 185–189; Latour, 2005, p. 39; Mutasa & Iyamu, 2025, pp. 3, 9–10). Interessement involves strategies that bind both human and non-human actors to these proposed roles, meaning that their participation is acknowledged and aligned, even though it is not yet fully realized in practice. At this point, the material properties of wood, fastenings, and other elements already shape what each actor can and cannot do, defining the limits of their future contribution to the work-net.

3. Enrolment: Assigning and Coordinating Actor Roles

Now the roles identified in the previous stage will be assigned and actively filled in. In archaeological research, this might be the most interesting stage, because here the archaeological remains are used.

The actors drawn into the work-net take on a specific role in the construction of W149. Each actor works toward the common goal, the solution to the above defined problem, of constructing a functional ship suitable for its intended use.

Oak planks that were split along the grain were used to provide a strong and durable hull. The carvel-laid planks ensured a lower draft and grounding characteristics, while the overlapping strakes were used to allow flexibility and maintain traditional building ideas.

The fastenings act as a coordinating actor, ensuring that the actors, the planks, maintain their assigned roles under stress and do not fail. The carvel-laid planks were connected with wooden treenails, while the caulking battens were held together by iron nails.

Watertightness was acquired by enrolling caulking materials such as moss and the wooden caulking battens. Moss was applied within the seams of the carvel planking and held in place by wooden caulking battens that were nailed on top of the overlapping strakes, particularly in this flat lower section of the hull that was prone to abrasion.

Human actors, such as shipbuilders, operated according to their traditions and potential new adaptations. The provenance of materials also influences enrolment. The oak sourced from Northeastern Germany was shaped and selected according to their grain and strength, assigning an active functional role to the material instead of a mere physical presence.

Archaeological objects further show the intricate enrolment of actors within the work-net. The three projectiles found within the shipwreck; a bullet, a cannonball, and a stone cannonball, suggest that the socio-political landscape required defensive capabilities during its operational life. The lead repair patches in the aft indicate maintenance practices and the enrolment of repair materials as actors in sustaining hull integrity and functionality. The presumed rye cargo adds yet another dimension, enrolling capacity and storage needs into the work-net of design choices and considerations.

In ANT terms, enrolment is the stage in which actors take on and carry out the roles that were previously defined (Callon, 1986, pp. 189–193; Latour, 2005, p. 39; Mutasa & Iyamu, 2025, pp. 3, 10). Through coordination and negotiation, the work-net becomes stable, and each actor actively contributes to the constructional solution as intended.

4. Mobilization: Performing the Network

In the mobilization stage, the work-net of actors is actively operationalized, producing the hull as a tangible result of the negotiated relationships among the components, the functioning work-net. It does not, however, imply that the work-net is permanently perfect, but that a temporarily stabilised work-net is created, sufficient for the ship's intended function. A working solution to the defined problem.

The carvel and overlapping strakes function together as a cohesive structural system, distributing stresses while preserving the low draft necessary for shallow-water navigation. Its archaeological remains, ultimately, allows researchers to study its sailing capabilities.

Fastenings, such as treenails and iron nails enforce the coherence of the planking, while caulking ensures the hull remains watertight during use. The builders' traditions guide the sequence and methods of constructing, mediating between inherited techniques; traditions, and contextual adaptations; environmental and socio-political.

Oak planks, moss, and battens function as active participants, performing their roles in real time, with the provenance and quality of materials directly affecting performance and potential outcomes.

External pressures also shaped the realized network, as can be seen from objects found in the shipwreck, such as projectiles and repair patches. These interactions show that mobilization is not simply the execution of a pre-planned design, but the active negotiation of roles between actors and actants under real environmental and operational constraints. Archaeological evidence both validates the work-net and provides feedback to the actors' roles, confirming that the problem defined in the first stage has been effectively addressed through coordinated action.

In ANT terms, mobilization demonstrates that the network is fully functional, and its actors effectively represent and perform their roles (Callon, 1986, pp. 193–199; Latour, 2005, p. 39; Mutasa & Iyamu, 2025, pp. 3, 10–11). The remains of the ship itself becomes a spokesperson for the work-net, stabilizing the relationships among human and non-human actors and showing the success of translation, while also communicating the integrity and coherence of the work-net to its wider context.

Concluding

Therefore, the archaeological remains of W149 are a material manifestation of translation: a negotiated reality in which carvel and lapstrake techniques, materials, environmental pressures, cargo requirements, and defensive concerns are selectively combined to meet functional goals. W149's mixed hull is not a typological hybrid, but the networked outcome of translation, in which practices, materials, and actors are dynamically aligned to produce a vessel adapted to its time, place, and purpose.

6.3 The Maritime Cultural Landscape of W149, the venue for the actors.

While the ANT analysis of W149 demonstrates how the ship emerged through negotiations between actors at a micro-level, this alone does not explain why these negotiations resulted in this particular result. To place the ship within its broader spatial, cultural, and environmental context, the Maritime Cultural Landscape (MCL) approach is applied. This shift in scale moves the analysis from the internal functioning and becoming

of the ship toward the external landscape in which its actors operated, providing a contextual framework within which the work-net of W149 can be understood.

Within MCL, maritime space is not treated as a neutral or purely physical environment, but as a socially constructed landscape shaped by collective knowledge, repeated practice, and shared perceptions of risk and opportunity. Central to this approach is Westerdahl's concept of transport zones: enduring yet dynamic zones of movement that structure maritime behaviour. Although transport zones exist in physical space, their boundaries, directions, and usage are cognitively recognized and socially maintained. Therefore, they function as large-scale actors that condition the operation, design, and adaptation of maritime technology. Most importantly, it gives the research a framework to view the remains of the ship through a particular set of binoculars.

The Coastal Transport Zone: Definition and Characteristics

The coastal transport zone is characterized by navigation close to shore, frequent interaction with shallow waters, and reliance on landmarks, tides, and sheltered routes, hugging the coast (Westerdahl, 1998; Westerdahl, 2006, pp. 96–97). Rather than representing a fixed or uniform route, it is a flexible zone whose extent and usability vary according to seasonal conditions, weather, technological capability, and social organization (Caporaso, 2017, p. 8). Navigation within this zone commonly involves grounding, beaching, and short-distance movements between coastal nodes, estuaries, and hinterland connections (Westerdahl, 2006, pp. 100–103).

Westerdahl emphasizes that transport zones require community consent and cognitive recognition (van Popta et al., 2019, pp. 179–180). Thus, the community of the coastal transport zones must recognize the challenges that the zone brings. As a result, maritime technology functioning within this zone is expected to be adapted to its specific constraints, such as shallow depths, shifting sandbanks, and sudden changes in the environment (Westerdahl, 1994, pp. 267–268). These conditions also make coastal transport zones riskier, particularly at points of transition such as estuaries, shallow areas, and tidal inlets.

<u>The Zuiderzee Estuary as a Coastal Transport Zone</u>

The Zuiderzee presents an example of a maritime landscape that can be divided into multiple transport zones, which may very well overlap each other. As noted earlier,

the region can be separated into two main regions: the northern funnel-shaped zone and the southern basin. While this separation reflects both natural differences, for instance differences in salinity between brackish and freshwater, it equally mirrors the distinction from a cultural and economic perspective. While applying Westerdahl's framework, the northwestern part of the Zuiderzee, where W149 is located, can be best understood as primarily a coastal transport zone, while the southern basin aligns more closely with a lake transport zone and the northeastern part as an estuary/lagoon zone (van Popta et al., 2019, p. 181).

This coastal transport zone functioned as a critical corridor along the east–west route connecting the Zuiderzee to the Wadden Sea and, beyond it, the North Sea and Baltic region, but the zone is not limited to this route. This zone was marked by shallow waters, strong tidal dynamics, and the necessity of navigating along coasts and barrier islands (Westerdahl, 1994, pp. 267–268). It was also a space where maritime and inland transport systems intersected, linking seagoing routes with riverine and hinterland networks. As such, it formed a highly dynamic socio-natural system in which maritime practices, risks, and technologies were continually negotiated (van Popta et al., 2019, pp. 179–180; Westerdahl, 2006, pp. 100–103).

Positioning W149 within the Coastal Transport Zone

The location of W149 within the northwestern part of the Zuiderzee suggests that its primary operational environment was this coastal transport zone. When viewed through the MCL lens, the constructional details identified through the ANT analysis can be understood as responses to specific conditions and demands of this zone. The low draft and grounding capability demonstrated by the hull construction align closely with shallow, sediment-rich waters, which are characteristic of coastal navigation. These features reflect a wider adaptation to the landscape, defined by tidal movement, navigational hazards, and coastal variety, rather than being a result of solely technical or accidental choices.

Thus, the operating actors shown in W149's work-net are placed within the coastal transport zone, providing a contextual landscape. Here, shipbuilders, materials, and construction techniques negotiated, while landscape-imposed limitations and possibilities show that the actors did not operate in isolation.

Now the transport zone acts as a macro-level actor, influencing and being influenced by the internal dynamics, the micro-level actors, of the ship.

Contextualizing the remains of W149 within the Transport Zone

Some of these actors identified in the work-net of W149 thus gain an extra layer of information when placing it in its transport zone. For example, the use of the caulking battens can be seen as a specific solution to shallow-water navigation and frequent grounding. These ships might scrape or impact the seabed, increasing the risk of leakage. Therefore, these caulking battens might be a solution to maintain the watertight integrity of the ship in this environment, showcasing the wider landscape logic of the coastal transport zone on the ship's material.

While the lead repair patches indicate the construction was not without its flaws, the continued maintenance practices show that it is likely the ship operated in a higher-risk and dynamic environment. In this ecodynamic maritime landscape, as described by McGlade (1999, p. 462), repairs like these can be seen as a response to energetic pulses events such as sailing accidents and their mitigation/repair, or the introduction of new shipping methods, which destabilize the environment only temporarily (Caporaso, 2017, p. 9; McGlade, 1999, p. 464).

These repairs, therefore, may suggest a routine or normal engagement with the risks, showing that temporary practices were used to deal with these kinds of problems (Caporaso, 2017, p. 9). Because the society lived in the coastal transport zone, this again acknowledges the transport zone in which they operated (van Popta et al., 2019, pp. 179–180), showcasing the capacity of these actors to adapt and stabilize the system once again through targeted solutions, such as the repair patches, instead of representing a unique or exceptional moment in time.

Rye, the presumed cargo, also reinforces the positioning of W149 within the coastal transport zone. These agricultural goods, such as rye, were often transported in large quantities, in bulk, along coastal, estuarine, and riverine zones (Westerdahl, 2006, pp. 100–101), linking both hinterland production areas and stable markets, as well as maritime trade routes.

W149's construction is therefore negotiated through the actors in the work-net, reflecting both the cultural/political need to carry this cargo, as well as the environmental requirement of being able to navigate coastal waters. In this way, cargo requirements

become additional actors within the network, actively influencing the tangible outcome of the ship.

Inner and Outer Resource Landscapes of W149

Within the framework of the Maritime Cultural Landscape, the activities of W149 can be further contextualized through its involvement in both the outer and inner resource landscapes. These sub-landscapes extend the analysis beyond the immediate transport zone, showing that the vessel operated in a wider network involving production, resource provenance, and exchange. While the ANT analysis has demonstrated how materials, repairs, and cargo function as actors within the work-net of W149, the resource landscape perspective clarifies where these actors originate from and how they connect different regions and communities (van Popta, 2019, pp. 182–183).

The outer resource landscape

W149 is primarily expressed through shipbuilding materials and technical equipment. The hull construction and fastenings indicate reliance on resources that were not locally available in sufficient quality or quantity within the Zuiderzee region itself. As demonstrated by dendrochronological research, the oak used to build W149 was sourced from Northeastern Germany. The provenance of the oak planking, the iron fastenings, and other objects are embedded in a transregional material network consisting of forests, stable markets, and shipyards. This outer resource landscape shows that W149 was not only operating in the area where it was found, the Zuiderzee, but also consisted of materials that connected it to places far beyond. These landscapes, although distant, were cognitively and economically present through the ship's construction and maintenance, connecting and reinforcing the maritime character of these other regions.

The inner resource landscape

The inner resource landscape concerns the production of surplus goods, labour, and knowledge necessary for sustaining shipping activities. For W149, this landscape is reflected most clearly in its maintenance and shipping expeditions.

While the provenance of the rye on W149 could not be determined in detail, either from the Netherlands or northwestern Europe, it can function in both these resource landscapes.

For example, during the late Middle Ages, the agricultural surplus from the surrounding hinterlands of the Zuiderzee was an important economic driver for coastal and interregional transport (van Popta et al., 2019, p. 183). The cargo of rye could therefore mean that W149 functioned as an actor connecting the agricultural production centres of the Zuiderzee to the coastal regions, as well as the Baltic regions. Or vice versa, depending on the provenance of the rye, which is unknown.

Additionally, the human actors, such as shipbuilders and sailors, must be considered part of the inner resource landscape as well. Their knowledge and skill ensured the operation and construction of the ship.

Repairs, such as the lead patches observed on W149, further demonstrate the interaction between inner and outer resource landscapes. Lead, tools, and technical knowledge required for maintenance reflect access to specialized resources and expertise. The act of repairing itself shows the local investment made to ensure the continuation of the ship's functioning within the transport network. In this sense, W149 is not just merely part of the resource landscapes but is actively mediating between them, showing that the technical materials, agricultural surplus, and human labour are actively illustrating maritime mobility and connection.

Taken together, the inner and outer resource landscapes situate W149 within a layered maritime environment. Through ANT, the ship emerges as a negotiated assemblage of actors; through MCL, these actors are anchored in spatially distributed but interconnected landscapes. W149 thus becomes both a product of its resource landscapes and an active agent in maintaining and reshaping them, reinforcing its role within the coastal transport zone and the wider socio-natural system of the Zuiderzee.

From Work-Net to Maritime Landscape

By combining ANT and MCL, W149 can be understood both as a product of localized negotiations and as an active participant within a broader maritime landscape. The ANT analysis reveals how specific constructional solutions emerged through translation among human and non-human actors, while the MCL approach situates these solutions within the long-term patterns of maritime landscapes, coastal areas, risks, and exchange that characterize the northwestern Zuiderzee.

The coastal transport zone thus provides more than a geographical backdrop: it is a dynamic, socially constructed landscape that helps explain why the work-net of W149

stabilized in the form observed archaeologically. Through repeated operation, maintenance, and interaction with this zone, W149 contributed to the ongoing reproduction of the maritime cultural landscape, reinforcing the very structures that shaped its own design and use.

6.4 Analogous and Homologous Constructional Features within the Coastal Transport Zone

Having situated W149 within both its internal work-net and the broader Maritime Cultural Landscape, it becomes possible to assess how its constructional features relate to those observed on other vessels operating in comparable environments. Rather than pursuing typological classification, this section adopts the distinction between homologous and analogous features as an analytical tool. This distinction allows similarities to be understood either as the result of shared traditions and knowledge transmission (homology) or as independent adaptations to similar environmental and operational conditions (analogy).

Within an ANT framework, such similarities are not assumed a priori but are traced through networks of practice, material availability, and environmental constraints. The MCL approach further contextualizes these networks by situating them within transport zones that structure maritime behaviour over the long term. Together, these perspectives allow constructional features to be compared without reducing them to fixed ship types.

The Mixed Hull Construction: Homology and Analogy

The dual construction technique observed on W149, the carvel planking in the central lower hull combined with overlapping strakes toward the bilge and sides, can be interpreted as both homologous and analogous, depending on scale and context. On one hand, this combination reflects a shared shipbuilding tradition within the Low Countries, where bottom-based construction and mixed planking practices were part of an established repertoire of craft knowledge. In this sense, the technique can be considered homologous with other vessels built within the same cultural and technological lineage, drawing on similar practices transmitted through apprenticeship, regional shipyards, and shared maritime experiences.

At the same time, similar mixed construction techniques are observed in vessels from other regions operating in shallow-water or coastal environments, where grounding capability, flexibility, and structural resilience were required. In these cases, the resemblance is better understood as analogous: independent solutions emerging through translation processes in response to comparable environmental pressures within coastal transport zones. From an ANT perspective, this analogy emerges not from imitation but from comparable negotiations between shipbuilders, materials, and landscapes.

Thus, the mixed hull of W149 is neither a hybrid type nor an anomaly. It is the stabilized outcome of a work-net operating within a coastal transport zone, where similar constraints repeatedly favour comparable constructional solutions, whether through shared tradition or convergent adaptation.

Caulking Battens as a Functional Analogy

The caulking battens observed on W149 provide an even clearer example of functional analogy shaped by landscape conditions. While caulking methods vary regionally, the use of battens to protect and stabilize caulking material is repeatedly attested on vessels operating in shallow, sediment-rich waters. Within the coastal transport zone, frequent grounding and tidal movement place continuous stress on hull seams, increasing the likelihood of leakage and damage.

In this context, caulking battens can be understood as an analogous response to shared environmental challenges rather than as a marker of a specific shipbuilding tradition. Their appearance on W149 reflects the enrolment of materials and techniques specifically suited to the risks and maintenance demands of coastal navigation. From an MCL perspective, this suggests that the coastal transport zone actively conditions the emergence and persistence of such features, encouraging similar solutions across different regions and cultural contexts.

For example, in a fluvial maritime environment, remains of a ship dated to A.D. 1426 were found in the river Canche, France, presenting similar caulking battens, see Figure 31 (Rieth, 2017, pp. 145–146). Additionally, the Wismarbucht 6, dated to A.D. 1476, represents a similar use of caulking battens, see Figure 32 (Belasus, 2019, pp. 181–182).

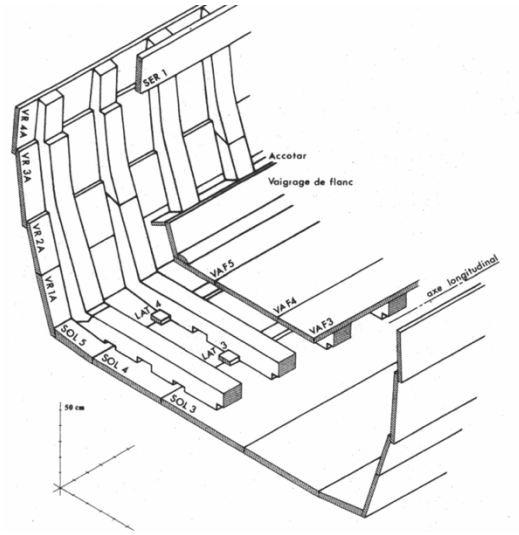

Figure 31: Drawing of the EP1-Canche (A. D. 1426) shipwreck. Showing the caulking battens as well, see lat 3 and 4. (Rieth, 2017, p. 146, Figure 1).

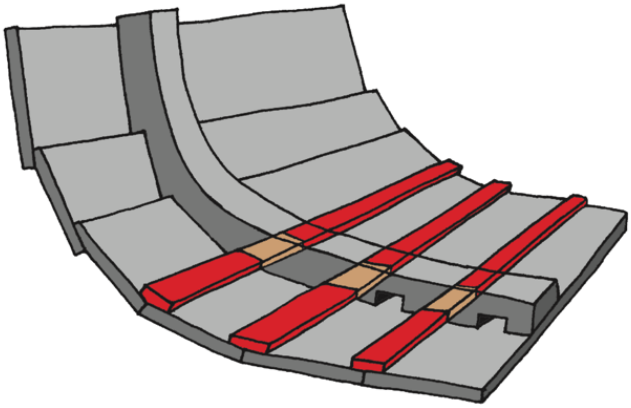

Figure 32: Caulking battens that were found in the Wismarbucht 6 (A. D. 1476) shipwreck. (Belasus, 2019, p. 182, Figure 8).

ANT further highlights that caulking battens are not passive elements but active actors within the work-net, mediating between hull planking, caulking materials, and environmental forces. Their repeated use across comparable maritime landscapes reinforces their role as stabilized solutions within the socio-natural system of coastal transport.

From Comparison to Contextual Understanding

By differentiating between homologous and analogous features, the construction of W149 can be seen relationally and functionally rather than typologically. Similarities with other ships do not imply fixed categories but reflect overlapping networks of knowledge, material flows, and environmental limitations. Some features point to shared traditions within the Zuiderzee and Low Countries, while others reveal more broader patterns of adaptation within coastal transport zones across northern Europe.

This approach reinforces the combined ANT and MCL framework adopted in this chapter. W149 is not explained through resemblance alone, but through the processes and landscapes that made certain solutions meaningful, viable, and repeatable. In this way, analogy and homology become tools for understanding maritime practice, rather than endpoints of classification.

Chapter 7: Conclusion and Discussion

The research focused on understanding how shipwrecks, particularly from the late medieval period, can be examined beyond typological classification schemes. This thesis argued for combining concepts of two theoretical frameworks to analyse the ship as both an assemblage and a spatial actor: both the Maritime Cultural Landscape (MCL) and Actor-Network Theory (ANT). It uses W149 as a case study to understand its construction, maritime network, and maritime landscape of the Northwestern Zuiderzee in the second half of the fifteenth century, aiming to develop a theoretical framework that sees W149 not as a closed find, but as an outcome of human decision making and outside influences such as socio-economic need and the landscape itself, thus showing the interpretation of shipwrecks more contextually and functionally. Thereby adding new insights into the ongoing debates in maritime archaeology, especially regarding shipwrecks, on typological classification, building theoretical frameworks, and interpreting late medieval ships.

7.1 An overview of the research

Before these concepts can be meaningfully applied, the evolvement of maritime archaeology as a discipline needed to be explained, providing context of the development and application of research paradigms, different generations of researchers, as well as developed and used theories.

Additionally, to provide context to the shipwreck, a brief historical background was shown to understand the social and natural environment in which the ship was part of, showing research strategies of late medieval shipwrecks in northwestern Europe and their implications on the outcomes of past research. Consequently, this shows the trouble and difficulties of researching these shipwrecks, which have for the first time a broader and more in-depth historical written counterpart.

When the stage had been set, the two theories could be explained, showing their origin, how they function, as well as their application in archaeology to date. Showing the impact MCL had on maritime archaeology, how it was applied, but also its limitations and critiques. Similarly, ANT's sociological origin has been explained, along with its potential use in archaeology. Ultimately, this shows how these two theories can be used to analyse the archaeological remains of W149.

To enable this process, the shipwreck W149 needed to be researched. While building upon an earlier survey research, an additional dive campaign was organised within the scope of this thesis, gathering additional data which was used within the theoretical framework to analyse and interpret the wreck.

7.2 Key finding; answering the research question

The main goal of this thesis was to answer the following main research question: How can the shipwreck W149 be positioned within the social and natural environment of the Northern Zuiderzee in the second half of the 15th century? The following answers to the sub-questions are the result of all the combined elements of this thesis, all serving as building blocks to answer the main research question. This question will be answered at the end of this paragraph, after all sub-questions have been addressed.

How does shipwreck W149 compare to other known medieval shipwrecks in terms of construction techniques and structural characteristics?

In terms of construction techniques and structural characteristics, W149 shows both similarities to and variations from other known medieval shipwrecks in the Zuiderzee and surrounding regions, such as the Stavoren 17 and Medemblik 1. Comparative analysis of elements such as planking methods both carvel and overlapping planks, fastenings, and caulking battens suggests that W149 fits within broader medieval shipbuilding traditions, while also displaying features that may reflect regional practices or chronological variation, such as the fastening of the caulking battens with nails, which were observed in the Wismarbucht 6 and the EP1-Canche. These similarities and differences allow W149 to illustrate problems with existing typological frameworks specifically of cogs and hulks, contributing to a more nuanced understanding of late medieval ship construction.

What do the constructional features and dimensions of shipwreck W149 reveal about its function and operational life within medieval shipbuilding traditions?

The constructional features and dimensions of shipwreck W149 indicate that it was designed for practical use in the maritime environment of the Northern Zuiderzee and beyond. Its hull form, size, and internal structure; using carvel laid planking and the

lack of a large keel, point to a vessel adapted to shallow waters and regional transport, optimized for local navigational and trade conditions. While its size and heavy construction point towards transport beyond the scope of rivers and inland seas. Signs of repairs such as the led patches suggest that the ship had an extended operational life, during which it was adjusted to meet continuously changing functional demands.

When examined in terms of homologous and analogous features, W149's construction reveals more about relational and functional practices than rigid typologies. Certain characteristics, such as the use of both carvel and overlapping planks in the hull construction, align with regional shipbuilding traditions in the Zuiderzee and the Low Countries, reflecting shared knowledge and material culture, while others demonstrate adaptive strategies common to coastal transport zones across northern Europe.

Together, these features show that W149 was a practical, resilient vessel whose design and use were shaped by both human decision-making and environmental conditions, providing insight into the operational realities of late medieval shipbuilding, specifically in the coastal transport zone.

How can ANT and MCL contribute to the identification and interpretation of the archaeological elements of W149?

Analysing W149 with the MCL framework shows the ship was part of a broader network of routes, harbours, and maritime traditions, and was more than a mere isolated event or find. ANT emphasises the relationships between human actors, material components, environmental forces, and research practices, allowing constructional features to be understood as the result of dynamic interactions.

The framework of ANT and MCL shows that ship construction can be understood as a result of social and environmental influences. This combined approach offers maritime archaeology a dynamic and context-sensitive framework for analysing shipwrecks.

What does the archaeological evidence from shipwreck W149, including its origin and find location, reveal about trade networks, regional connections, and navigational routes in the Northern Zuiderzee during the 15th century?

The location of W149 show that the Northern Zuiderzee is a dynamic and hazardous maritime landscape. Positioning the wreck within this maritime landscape shows a glimpse of the historical trade routes, landscape limitations, and associating risks.

The archaeological evidence from shipwreck W149, including its location near the Frisian coast, reveals its role in the Northern Zuiderzee's 15th century trade networks. Its low-draught design suited shallow waters, enabling navigation between regional ports and access to the Vlie and Sound straits, key routes to the Baltic. W149's presence reflects the integration of Dutch towns into both local and long-distance commerce, linking the Zuiderzee to broader European trade while navigating a dynamic maritime landscape.

How can the shipwreck W149 be positioned within the social and natural environment of the Northern Zuiderzee in the second half of the 15th century?

With the answers to the sub-questions laid out above, the main research question can be answered as follows:

Shipwreck W149 can be positioned within the social and natural environment of the Northern Zuiderzee as a functional maritime object that is part of a network, as well as consisting of one. Being an active element within late medieval systems of navigation, trade, and environmental interaction. Its constructional features, along with its environment, reflect the active dialogue between human decision-making and natural processes.

Analysing the physical remains of W149 in the theoretical framework showed that typological classification schemes alone are not sufficient to explain shipbuilding during late medieval times and that this typological research stance might even directly influence the outcome of research. Characterizing features that look similar do not necessarily have a similar origin. Traditionally, these elements were associated with specific historical ship types. Therefore, the existence of these features does not always mean or indicate that they are a part of a fixed category. Here, it is argued that these features show the functional choices by shipbuilders that responded to intrinsic as well as outside forces such as navigational limits, the physical landscape, demand of trade, and also traditional and societal values, directly influencing the shape and use of the ship W149.

7.3 Theoretical contribution and implication

This theoretical approach is, therefore, also an addition to the field of maritime archaeology. The MCL approach allows for a macro-analysis explaining the broader landscape context in which these activities took place, while ANT provided the micro-analysis, identifying the actors that all actively participated in creating the physical outcome of W149, seeing the shipwreck as a network that is constantly and actively negotiated by its actors.

Not only does it contribute to the development of middle- to high-range theories, but the research also showed how this new viewpoint has broader implications when studying late medieval shipwrecks in northwestern Europe, demonstrating that the focus on identifying historical ship types carries risks of drawing wrong conclusions and therefore obscuring important differences within archaeological complexes. Therefore, this framework provides a contextual and functional approach that is more in line with current archaeological theoretical discussions.

Lastly, the framework stresses that shipwrecks should not be seen as closed, passive finds. When the shipwreck is placed in the maritime cultural landscape and the actor-network is identified, W149 becomes a mediator of active and passive, tangible and intangible elements that reach far beyond the shipwreck itself.

7.4 Evaluation of the framework, its limitations and recommendations

Thus, the framework enables researchers to identify all these elements that influenced a ship. However, there are limits to this framework, but also to this research itself. As ANT urges, the research self is also an important component of creating these scientific facts. As is highlighted in this research, multiple limiting factors were present, ranging from time and budget constraints to environmental constraints such as the level of preservation of W149 as well as underwater visibility. Therefore, it is of key importance that these limitations are known, taken into account, and written down, ensuring that the analysis can be traced to these elements respectively, such as the field day research account. Additionally, this analysis assumes a Dutch origin for the W149 shipwreck. Due to the scope of this thesis, it was not possible to provide a definitive answer regarding its

origin. However, through this analysis and future research, it may be possible to establish this more conclusively.

Nevertheless, this thesis has provided a case study that has been analysed in as much detail as possible. Additional research is needed to understand the workability and application of the combined framework. Ultimately, the framework can be used to define similarities and differences between shipwrecks, and to categorize them according to the framework, with categories, or as one might say, types that have a strong theoretical backbone and therefore can be traced in detail.

Nonetheless, this research provides insight into a better understanding of analysing late medieval shipwrecks and their maritime context. Hopefully, this will provide a foundation, a starting point, so to speak, for future research to work actively with theory-building and application of theories within maritime archaeology.

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Appendix A: 13 provinces research proposal

ONDERZOEKSVOORSTEL 13 PROVINCIËN PROJECT 2025

Graag alle onderdelen, incl. in de beschrijving, vermelden in de aanvraag.

Vereniging en / of contactpersoon
Robin Jonker **Martijn Manders** (Mogelijkheid om MAPS; een studenten organisatie, erbij te betrekken).
Contactgegevens teamleden *naam, functie en e-mail, wel/niet in bezit van Basiscursus maritieme archeologie (BMA, LWAOW)*
Robin Jonker; Research Master student; Project Leider; geen BMA Mogelijk diverse studenten van Universiteit Leiden mee tijdens veldwerk.
Welke provincie *(persoonlijke) onderbouwing van de onderzoekslocatie en de maritieme connectie*

In 2021, a sonar investigation of the IJsselmeer, near the southwestern coast of Frisia, revealed an unknown shipwreck. Multibeam recordings indicated that the ship was remarkably well-preserved, with a significant portion of its timbers remaining in their original construction. During two days of diving at the wreck site, researchers discovered intriguing construction details and recovered a limited number of samples and artefacts. Preliminary dendrochronological analysis dated the wreck to the second half of the 15th century.

Research on late medieval shipwrecks is rare and, when undertaken, often focuses on identifying established ship typologies, such as cogs and hulks. While these typologies are valuable for storytelling, they can limit the interpretive potential of archaeological evidence, which holds the capacity to provide insights beyond simple classification.

The concept of "ship evolution" is widely understood as metaphorical; ships, of course, cannot reproduce. However, the use of evolutionary terms subtly frames ship development as an autonomous process rather than one shaped by deliberate human decisions about design, functionality, and cultural needs.

This study proposes a new approach to shipwreck archaeology, emphasizing contextual and functional interpretation over typological or evolutionary classification. It challenges the view of shipwrecks as "closed finds" and draws on Reinder Reinders' Ship Artefact Categorizations framework, integrating Latour's Actor-Network Theory (ANT) and Westerdahl's Maritime Cultural Landscape (MCL). This combined framework allows for an exploration of the networks associated with the ship itself, its wreck site, and its artefacts. These

networks will be analyzed within the layers of the maritime cultural landscape to provide a more nuanced understanding of the ship's role and context, focusing on its functionality.

Using the W149 wreck as a case study, this research aims to explore an innovative methodology for studying medieval ship construction and its broader implications.

Soort onderzoek
Meerdere opties zijn mogelijk

- □ **Archiefonderzoek**
- □ **Duikinspectie - identificatie**
- □ **Duikinspectie - monitoring**
- □ **Duikinspectie - fotogrammetrie**
- □ **Survey**
- □ **Opleiding**
- □ **Anders, namelijk:**

Beschrijving onderzoek
onderzoeksvragen, duur van het onderzoek, verslaglegging onderzoeksresultaten

Dit onderzoek zou fungeren als een belangrijk onderdeel van mijn Researchmaster scriptie aan de Universiteit Leiden. De resultaten van dit veldwerk zullen dan ook gebruikt worden in de scriptie en daarin gepubliceerd worden. Waar nodig geacht kan er extra verslaglegging plaatsvinden. Het veldonderzoek is gefocust op de scheepsbouw van het wrak.

1. Research questions

What does the W149 shipwreck contribute to our understanding of medieval shipbuilding, maritime networks, and the maritime landscape of the Northwestern Zuiderzee in the second half of the 15th century?

Medieval Shipbuilding

- What construction techniques and materials were used in building W149?
- How does W149 compare to other known medieval shipwrecks in terms of design and construction?
- What do the size, shape, and structure of W149 reveal about its purpose and use?
- What evidence of modifications or repairs can be found on W149, and what do these reveal about its operational life?

Maritime Networks

- What evidence from W149 suggests its involvement in specific trade routes or economic activities?
- How do the ship's origin and design indicate connections between different regions and shipbuilding traditions?
- What does the wreck's location reveal about navigational routes and hazards in the Northwestern Zuiderzee during the 15th century?

Methode en technieken
beschrijving van onderzoeksmethodiek en benodigd materiaal, benoemen van benodigde procedures en beschrijven van omgang met eventueel vondstmateriaal (alleen mogelijk indien BMA is afgerond)

Methods

Survey and Documentation of the Wreck

- *Photogrammetry:*
  - Employ underwater photogrammetry to create a 3D digital model of the wreck. This technique captures construction details, spatial relationships, and the wreck's current state.
- *Diver-Based Recording:*
  - Use divers to measure and document specific features of the shipwreck that cannot be captured by remote sensing. This includes detailed timber joinery, fastenings, and evidence of repairs or modifications.

Material Analysis

Dendrochronology (If possible):

- Continue using dendrochronology to refine the dating of the timbers. This can also help trace the geographical origin of the wood used in the ship's construction.

Species Identification (If possible):

- Conduct wood species analysis to identify the types of trees used and infer choices related to functionality, availability, or cultural preferences.

Wear and Repair Analysis:

- Study wear patterns on timbers and artefacts to understand the ship's operational life and the challenges it faced.

Contextualization

Historical Contextualization:

- Analyze historical shipbuilding treatises, trade records, or port customs logs to place the wreck in its broader maritime context.

Archaeological Contextualization:

- Analysing other known medieval shipwrecks.

Social and Theoretical Analysis

- *Actor-Network Theory (ANT) Application:*
  - Use ANT to examine the ship as a network of relationships between timbers, tools, crew, cargo, and trade routes. This involves identifying how each element influenced the ship's design, functionality, and its broader interactions.
- *Maritime Cultural Landscape (MCL) Application:*
  - Place the wreck in its landscape by exploring how its location, design, and operation reflect cultural, economic, and social factors of the time.

Onderbouwde begroting
maximale bijdrage vanuit de RCE bedraagt €1.500,-

Kostenpost	Aantal	Per stuk prijs	Totaal Prijs	Opmerkingen
Benzine	882km	0,21 per km	185,22	Met 2 auto's, 3 keer op en neer van Leiden naar Makkum.
Accommodatie	1x	165,90	165,90	Camping, tenten plaatsen voor 5 personen. https://www.hollepoarte.nl/nl/overnachten/kampeerplaats-basic?booking_adults=2&booking_children=0&booking_babys=0&booking_pets=0&booking_arrival=04-04-2025&booking_duration=3&booking_departure=07-04-2025&booking_level=12
Totaal			351,12	

Duikspullen

Kostenpost	Aantal	Per stuk	Prijs	Opmerkingen
Duikflessen 12L	10	17,50	175	Duikflessen huur bij Wobbegong duikschool, Amersfoort
Bijvullen perslucht 12L	12x2 = 24	4,00	96	Bijvullen na dag 1 en na dag 2 van alle duikflessen
Totaal			271	

Huur boot

Kostenpost	Aantal	Prijs	opmerkingen

https://zuidwaard.nl/4-5-meter-open-motorboot/ Motorboot huur	5 dagen	500	Dit is voor een sloep met 5 personen.
Benzine kosten boot		100	
Totaal		600	

Onvoorziene kosten	277,88	Mochten er nog onverwachten kosten plaatsvinden, zoals met de huur van de boot en/of dagen extra nodig, materiaal nodig. Kan er gebruik gemaakt worden van deze pot.

Totaal 1500,00

Het voorstel vóór 4 maart 2024 opsturen per e-mail naar: maritiem@cultureelerfgoed.nl.