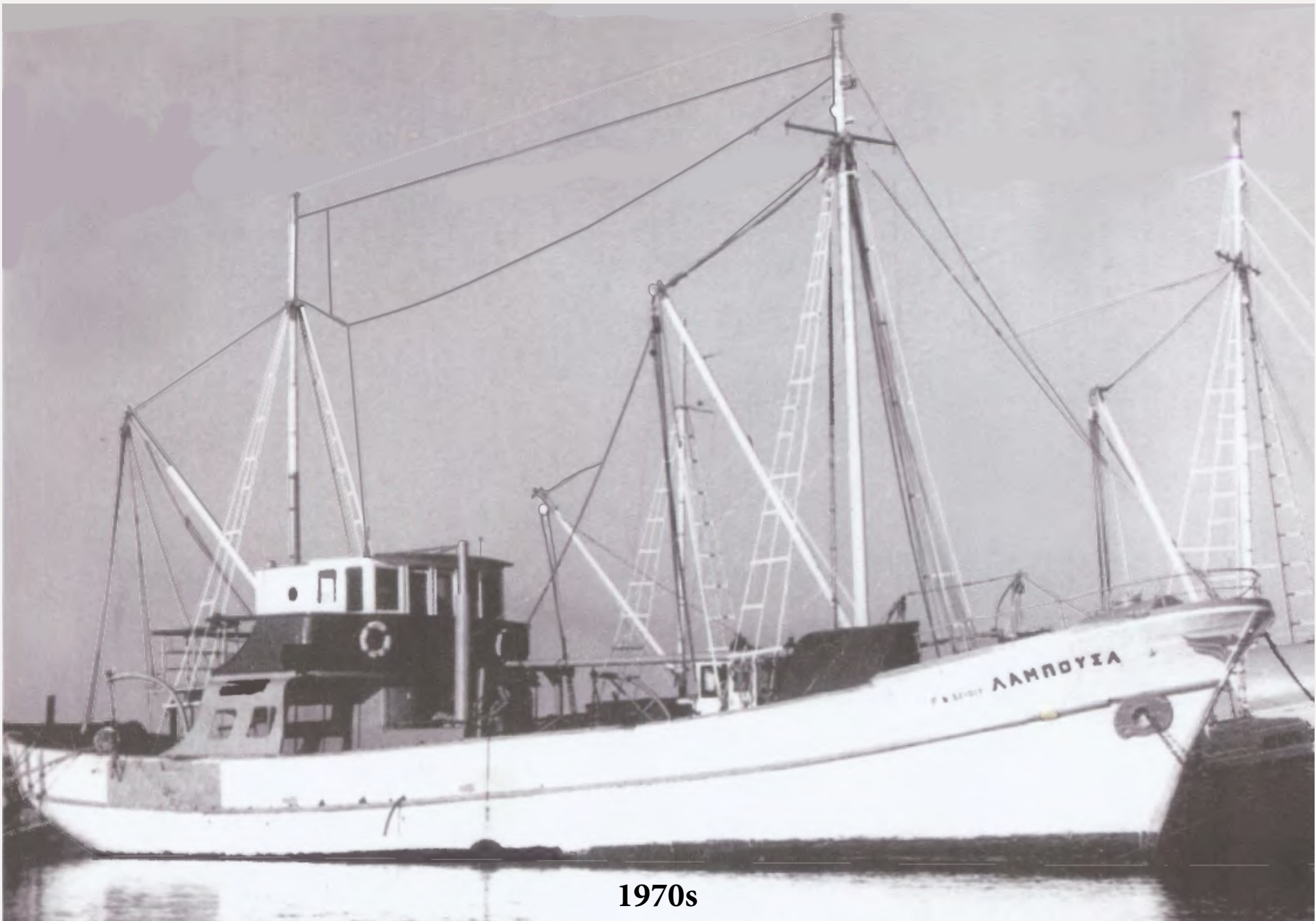


Restoring a 20th Century Wooden Boat at Risk: The Case of Lambousa Project

Constantinos Nicolaou*,
Marinos Ioannides, Panayiotis N. Panayiotou, Petros Siegkas, Athos Agapiou, Stelios Fotiou, Giorgos Neofytou, Elena Karittevli, Drew Baker**

* Independent Researcher

** UNESCO Chair on Digital Cultural Heritage at the Cyprus University of Technology



Pattihion Historical Archive, Limassol



The Vessel's Biography

Lambousa is a 25-meter long wooden boat the type of liberty, built in 1955 in Greece. It was registered in Cyprus in 1965 and was used as a fishing trawler until 2004, when it was withdrawn according to EU Fishing Policy. The boat was preserved as a monument of the local cultural heritage by the municipality of Limassol and kept in the sea. In 2020, the boat was dry docked for advance maintenance purposes and after a lot of efforts by the municipality, a European fund was acquired for her full restoration. The project began in January 2023, undertaken by a local marine maintenance company, it was completed in March 2024 and finally cost about one million and 300 thousand euros. In June 2024 the vessel returned to the sea as a floating museum of the local maritime heritage.



Dry-docked in Limassol shipyard, 2022



The Restoration Project

Work Planning

The project was under the supervision of municipal engineer's team in collaboration with Constantinos Nicolaou as a consultant-archaeologist. The archeological scope of the project was to preserve all the biographical and constructional information of the boat and follow the same traditional shipbuilding technics-characteristics during the restoration. The boat's condition assessment, especially for the wooden parts, was not possible without extensive and destructive interventions on the construction. Thus, an accurate knowledge of the construction condition was not available at the beginning of the project. During the restoration, it emerged that the accessible for maintenance parts were in good condition, however, the not accessible parts were mainly in very bad condition. Finally, less than 10 in total basic wooden parts of the boat were found good enough and kept on the construction. Therefore, the initial schedule of the restoration procedures was not fully applicable, creating the need of constant changes on the program, more craftsmen, and more wood supply.

Restoration Procedures

A combination of simultaneous works, was undertaken by more than 20 craftsmen of different specialties including shipwrights, blacksmiths, mechanics and others, who completed the restoration of the boat in one year! The procedure began with the remove of the superstructures, the mechanical and fishing equipment which were then transferred to a workshop for maintenance simultaneously with the rest of the works. Then the rotten wooden parts of the hull and the deck were gradually replaced from the bow to the stern, in an 'overlapping' process that the construction coherence was not disturbed. The exact shape and the position of the different parts was kept and checked through hundreds of notes and photographs, whereas the shape of the hull (frames and posts) was kept with the use of patterns. After the hull completion, the superstructures, the mechanical and fishing equipment were placed on the boat and the restoration finished with the caulking and painting. During the restoration, more than 50 special parts of the boat's construction that where replaced, saved and will be kept by the Pattichion Historic Archive at Limassol in order to be available for study and for wood species analysis.

A Research Question

The almost total replacement of the wooden parts of the boat raises a scientific question, identified as 'the Paradox of Theseus's Ship' which has existed since ancient times. The question mainly focuses whether an object is the same object after having all of its original components replaced over time. Based on the purpose of preserving the specific boat for use at sea and its documented restoration procedures, the project constitutes a continuation of its biography and thus the only choice.



Lambousa during restoration



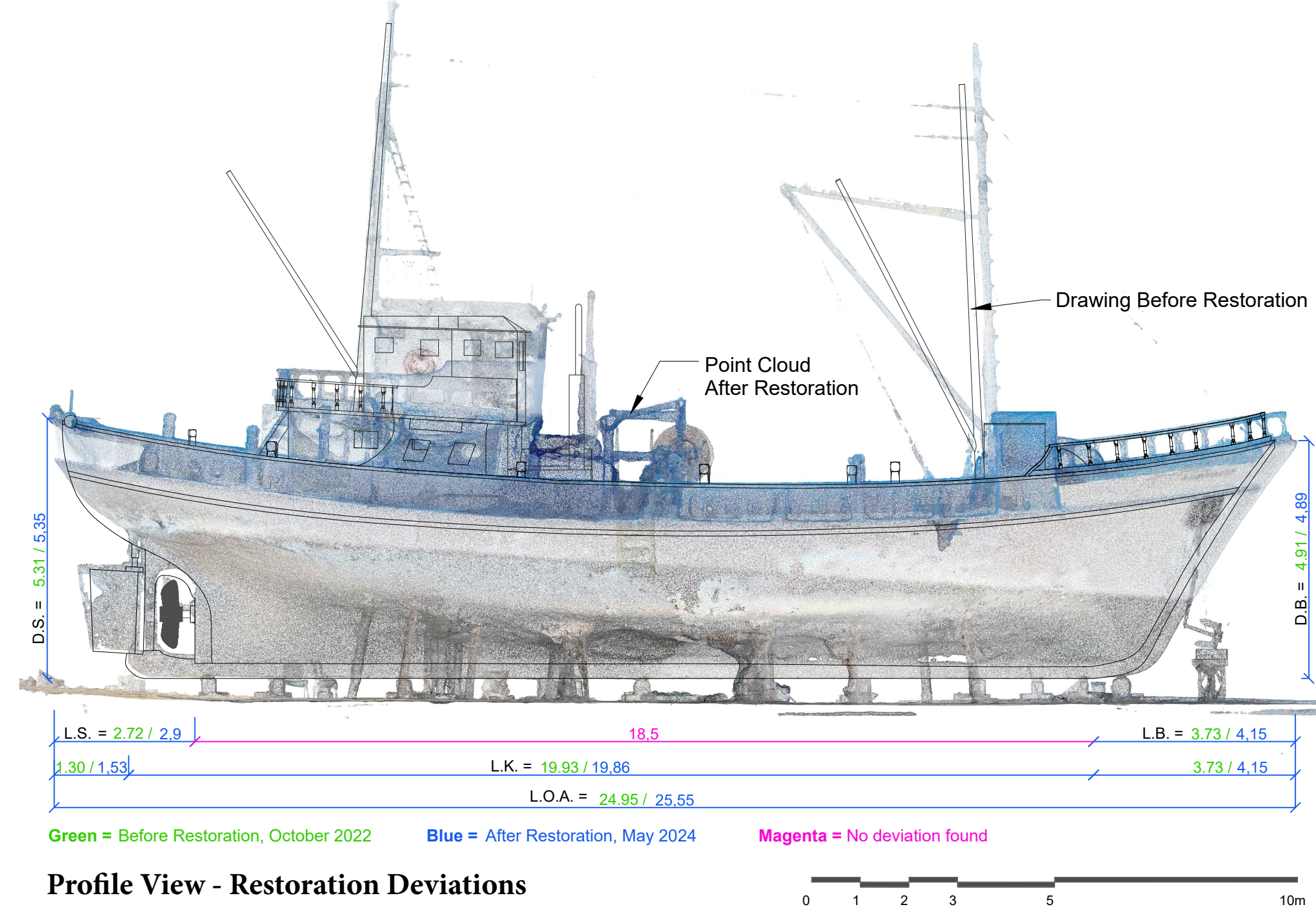
Lambousa docked in the old harbour, Limassol



Photogrammetry Point Cloud - Before Restoration



Terrestrial Laser Scanning with Photogrammetry Point Cloud - During Restoration



Profile View - Restoration Deviations

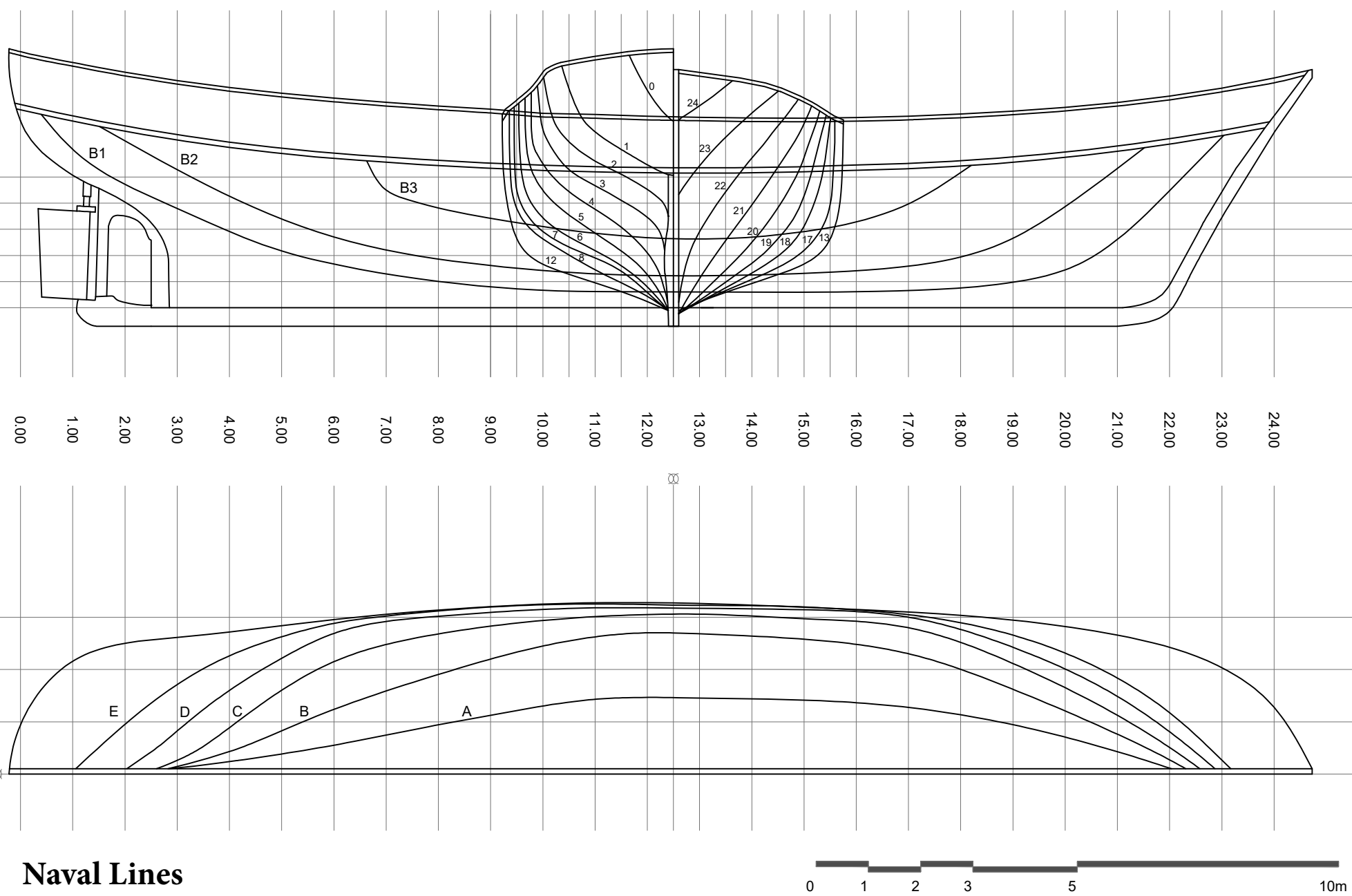
Digital Recording of the Vessel

The digitisation of this Trawler began in January 2023 when a UAV photogrammetric survey was made to the exterior. The results of this survey include a georeferenced point cloud that is further downsampled to 5,000,346 points to allow the data to be further processed. In addition, a survey was conducted in October 2023 through TLS, during the restoration works. The purpose was to capture the geometry of the timber frames, the deck beams, the keel, and the stern with a result of 14,164,403 points. Moreover, an alignment was made of the TLS with the photogrammetric point cloud, to let the formation of a total point cloud. This data is processed in CAD software, to produce closed 3D NURBS geometries of all the components of the vessel. Specifically, the network of curves for the hull is created based on vertical point cloud sections. According to these curves a solid surface of the hull is made which allowed the creation of the deck, the frames, the deck beams, the railcap, the keel, and the stern. Additionally, the rest of the elements such as the fishhold, cabin, and mast are produced by tracing curves across the point cloud. The result is a 3D model of the vessel with 440 components. Furthermore, naval architectural drawings are made based on the 3D geometry as well as a deviation analysis to compare the vessel before and after its restoration. Additionally, an online platform has been developed to aggregate the unique memory of this trawler. This gives the opportunity to the multidisciplinary community to have in-depth knowledge and understanding of the very controversial past of the vessel. The platform can be accessed by activating the QR Code.



Aknowledgements

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- Petronav Ship Management Ltd
- Pattihion Historical Archive



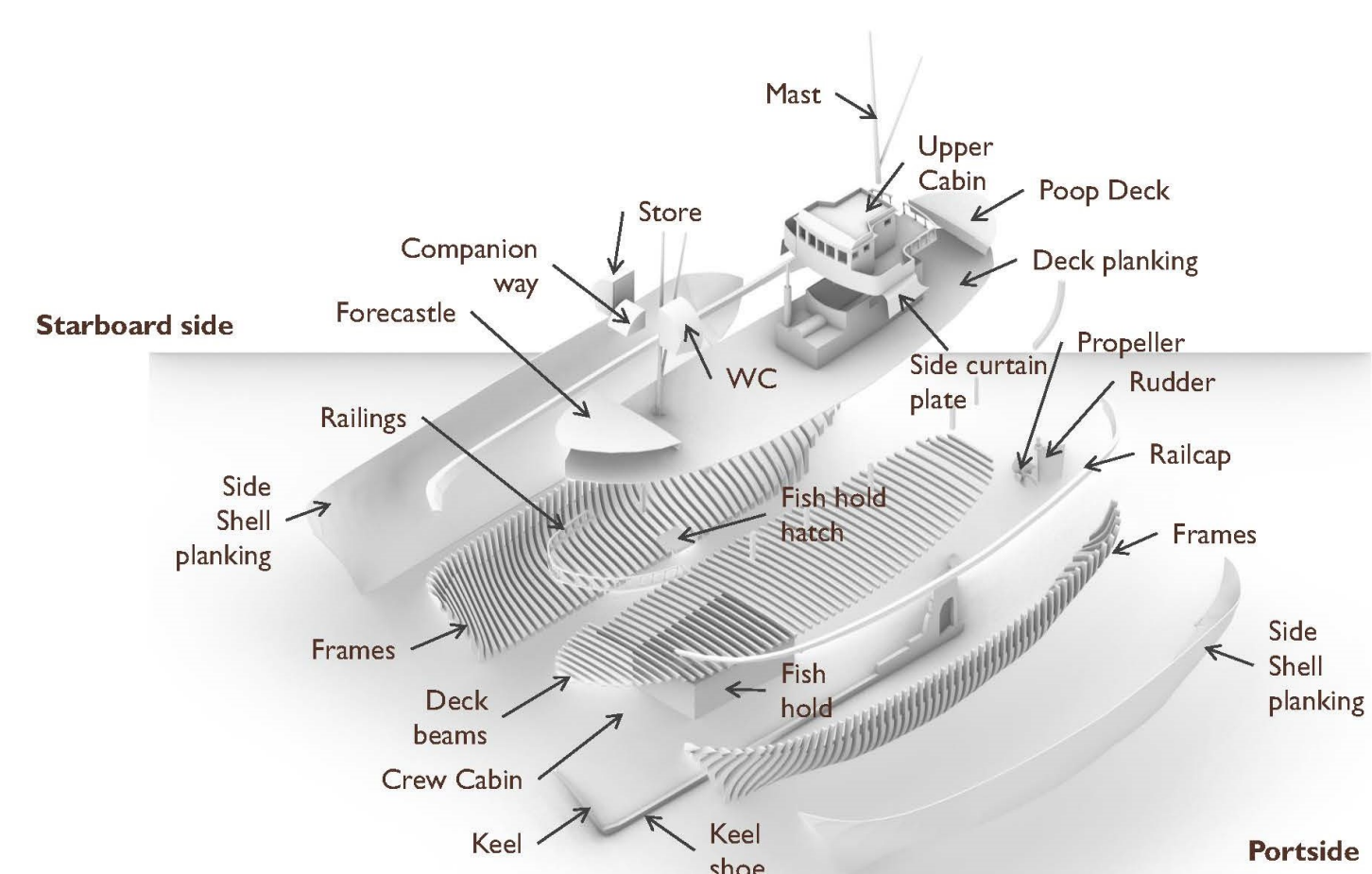
Naval Lines



Terrestrial Laser Scanning at the shipyard



3D CAD Model - Axonometric



3D CAD Model - Exploded Axonometric

Basic Dimensions - Construction Deviations		
	Before Restoration	After Restoration
Length Over All (L.O.A)	24,95m	25,55m
Maximum Breath (M.B.)	6,54m	6,54m
Length of the Keel (L.K.)	19,93m	19,86m
Length of Bow (L.B.)	3,73m	4,15m
Length of Stern (L.S.)	2,72m	2,90m
Depth of Bow (D.B.)	4,91m	4,89m
Depth of Stern (D.S.)	5,31m	5,35m
Height of the Mid-frame (M.D.)	4,02m	4,02m



Owner:	Municipality of Limassol	Monument Name:	Traditional Fishing Trawler "Lambousa"
Stakeholder:	Municipality of Limassol	Location:	34°39'41.7"N 33°01'27.9"E
Digitisation by:	UNESCO Chair on Digital Cultural Heritage, Cyprus University of Technology	Drawing Name:	Digital Survey and Naval Arch. Drawings
		Scale:	1:100 Date: July 2024