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The ancient Stone Ship. Integrated investigations on the original morphology of the Tiber Island, between legend and material consistency

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***Abstract* – The present study, through a methodology of integrated representation and survey, constitutes a contribution aimed at preserving the memory of a site of great historical, cultural and landscape value, monitoring its evolution over time. It is an integrated investigation of the original conformation of the Tiber Island in Rome, in particular of the remaining ancient portion of the so-called 'Stone Ship'. The research aimed to compare historical iconography with two- and three-dimensional models derived from acquisitions performed with current methodologies and instruments. Through the study of the proportions of the fragments still observable in situ, it was possible to hypothesise certain architectural conformations that could evoke the primitive form. In that manner, the traces that are still evident, analysed and studied, make it possible to grasp the material and immaterial information that is useful for an overall approach to the work.**

I. INTRODUCTION

The present contribution aims to investigate a segment of the morphological evolution of a site of great archaeological-architectural and landscape value, located in the centre of the consolidated city of Rome: the Tiber Island, defined as the 'ancient Stone Ship' due to its conformation and the few fragments still present *in situ* [1]. The morphometric analysis of fragments, which can still be found along one bank of the river (at the south-eastern edge of the island), contributes to the understanding of the ancient conformation. Unfortunately, due to their exiguity, it is only possible to imagine a hypothetical reconstruction, while an in-depth analysis of the composition of the remaining fragments and a stylistic comparison with the countless available iconographic and documentary sources is possible.

The study conducted through an integrated representation and survey methodology constitutes a valid tool for preserving its memory, monitoring both its evolution over time and its current state of conservation. It is therefore necessary to provide, in advance, a systematisation of the historical data found, useful for understanding the different phases the site has gone through over the centuries.

By consulting historical and archival drawings, conducted in parallel with the data acquisition phase, any scholar interfacing with the case study in question can in fact grasp both tangible (morphological) and intangible (historical, perceptual) data, guaranteeing a total approach to the work.

II. ANALYSIS OF HISTORICAL BACKGROUND

The Tiber Island has always been a significant part of the urban landscape of the city of Rome. Indeed, it has both historical and functional importance within the city. Connected to the city by two bridges (the Fabricio Bridge and the Cestio Bridge), it has an elaborate evolutionary history, which is manifested in the heterogeneity of the buildings that compose it. It has a multifaceted role in the urban landscape of Rome as it possesses historical and cultural significance and at the same time has a functional role as a connection between two realities. Between history and legend, the events of the origin and vocation of the island itself, whose natural physical conformation (of sedimentary origin) has always evoked that of a ship in the act of navigating the Tiber river, are articulated [2].

The so-called 'Stone Ship' (fig. 1), whose precious peperino and travertine remains can still be observed today, served as the base for a temple system dedicated to Aesculapius. The origin of the cult derives from an episode concerning a very serious plague that occurred in Rome in 292 BC, for which a ship was sent to Epidaurus,

at the sanctuary of Aesculapius, to consult the oracle on how to save the city. It is said that ambassadors received a snake, an animal sacred to the God, and that on the return journey, near the Tiber Island, the snake would nest on the shores of the island, choosing it as a sacred place (as described by Livy and Plutarch). From that moment on, the island's vocation as a place of healing was clear. The existence of the temple of Aesculapius is attested by written and graphic sources (among other coins, the *Forma Urbis*, Rodolfo Lanciani). The Stone Ship was most probably the physical representation, translated into stone, of the *trireme* that would have travelled to Epidaurus. The morphology of the *triremes*, with a characteristic culminating curl shape at the prow, has often been attributed by scholars to the remains still *in situ* today. The travertine block elements, connected to the walling apparatus behind in tuff, in addition to the mouldings that outline the hull of the ship, show partially preserved sculptural decorations. These are symbolic elements belonging to the cult of Aesculapius: the God himself, the serpent and caduceus, the bull [3].
The observation of what remains of the Stone Ship cannot be managed without investigating the temporal and physical stratification of the architectural elements that host it, which need to be analysed in their construction phases, taking into account a fundamental element that is the change in the height of the walking level, raised further by the construction of the quay around the 1920s.
The stratification of over two thousand years of the sacred area of Aesculapius has seen the superimposition and incorporation of the foundations of the temple below the current Church of St Bartholomew and countless further transformations of the adjacent buildings. Of particular interest is the overlapping construction, organic with the original remains, of the 1883 building and the probable and repeated subsequent restoration and consolidation of the ancient structures.

Fig. 1. Current image of the remains of the Stone Ship.

The integrated survey, carried out using digital acquisition techniques, allows for the re-reading of the current consistency of the ancient structures, including overlapping restoration work and the original masonry stratification; it also provides for the assessment of instabilities and offsets, allowing for the quantification of the obliteration of the portions facing the lower elevation. The restitution studies form the graphic basis on which comparisons can be made between drawings of different typology, belonging to different periods. Among others, it is worth mentioning the views by Giovan Battista Piranesi and the elaborations by the young french students of the *Grand Prix de Rome*, who analysed, surveyed and reconstructed the Tiber Island.
In these drawings, it is possible to read the curvature of the ancient ship, albeit insufficiently for the determination of its overall hypothetical morphology, repeatedly proposed later by various scholars, both past and contemporary.
Of considerable interest is the comparison between the actual survey and these historical graphical representations, in particular the two engravings by Piranesi from the "Vedute di Roma"[4] and "Le Antichità Romane"[5] (figs. 2-3), which suggest, although not metrically defined, the elements and their arrangement, and a survey drawing of ancient ship fragments by René Patouillard-Demoriane from 1899 (fig. 4), made during his stay at the French Academy in Rome [6].

Fig. 2. G.B. Piranesi, View of the Tiber Island, "Vedute di Roma", no. 56, 1748.

It is a survey carried out before the execution of the quay and therefore shows a larger part of the complex now visible. It also provides documentation of the state of the masonry just after the construction of the building above, dated 1883 (inscription on the attic), which frames, protects and freezes the old parts.
The drawing is characterised by colour treatment - with definition of the materiality - and shadows (useful for understanding the projections of the blocks); colour is omitted in certain parts of the drawing, which correspond to the section and an outline of the plan.

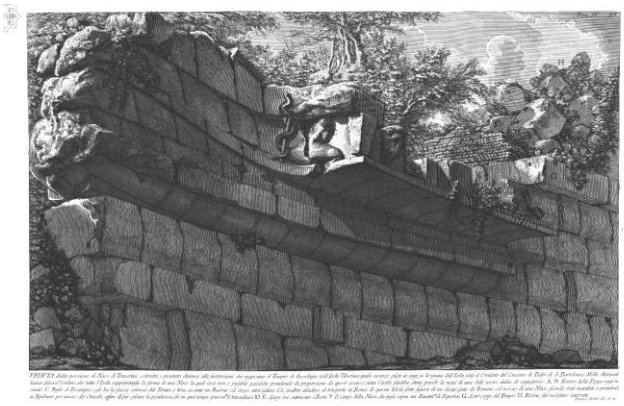

Fig. 3. G.B. Piranesi. View of the portion of the Travertine Ship built and planted in front of the substructures that supported the Temple of Aesculapius. From "Le antichità romane", 1784, Tomo 4, Tav. XV.

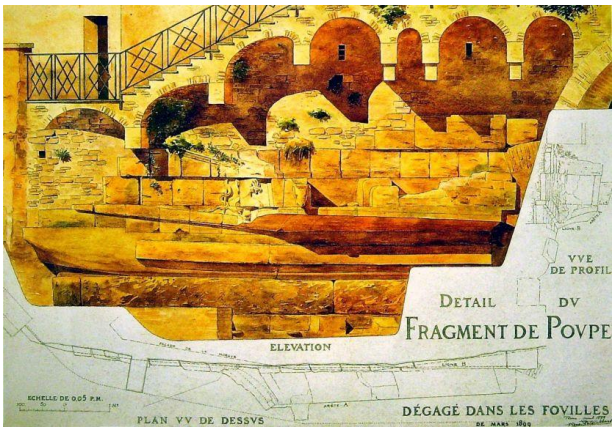

Fig. 4. René Patouillard-Demoriane, 1899, Fragment de Poupe, Detail, Elevation, Vue de profil.

III. THE SURVEY OF FRAGMENTS

In order to understand the diachronic evolution of a case study, an approach can be followed from the particular to the general (or vice versa), with the clear objective of narrating the state of fact in which it is embedded and the context in which it is inserted, producing useful drawings describing all its morphological characteristics, both at a quantitative and qualitative level [7]. In this way, it will be possible to proceed to an analysis of the proportional relationships of the parts and a characterisation of the materials that compose the still visible fragments [8].

The metric-dimensional and morphological acquisition of the selected theme constitutes in fact a central chapter of the entire knowledge process, but requires a continuous comparison with the analysed historical sources. The survey of the entire complex, aimed at describing the fragments found and their localisation in space, was articulated in two phases, and was planned to provide answers to the needs inherent in understanding the original conformation, witness to a reality that is no longer so evident today [9-10].

Due to its complex and articulated nature, and in particular with the desire to document both the context and the individual fragments testifying to its ancient ship-shaped structure, it was necessary to plan a specific integration of different tools and methodologies for the massive acquisition of data, such as 3D laser scanner for the survey of the entire area (Faro Focus 3D S 120 Laser Scanner) and terrestrial photomodelling for the recognisable fragments. Concerning the massive acquisition of the context, it was decided to start from the urban void that characterizes the square in front of the Church of St. Bartholomew, and then continue in the part below, related to the docks, turning around the so-called "prow" of the Island, performing the in-depth analysis related to the area that host the remaining fragments (fig. 5). In order to understand the morphology of the artifact and the profiles that constitute its characteristic overhang, sections of the point cloud were executed proceeding transversely with respect to the longitudinal development of the Ship (figs. 6-7). The laser scanner survey not only ensures a geometric acquisition of the space and the buildings within it (quantitative data), but also returns an immediate registration and visualisation of the colour and materials (qualitative data) that is useful on a perceptual level, and constitutes an update on the state of conservation of the artefacts with respect to ancient iconographic documents [11]. The creation of models, will allow the complexity of the analysed case study to be immediately readable. The point cloud as a whole reconnects the emergencies present in the analysed site, anchoring to it further acquisitions of greater detail, useful for carrying out targeted in-depth studies.

Fig. 5. Two perspective views (general and detailed) of the point cloud from 3D laser scanner.

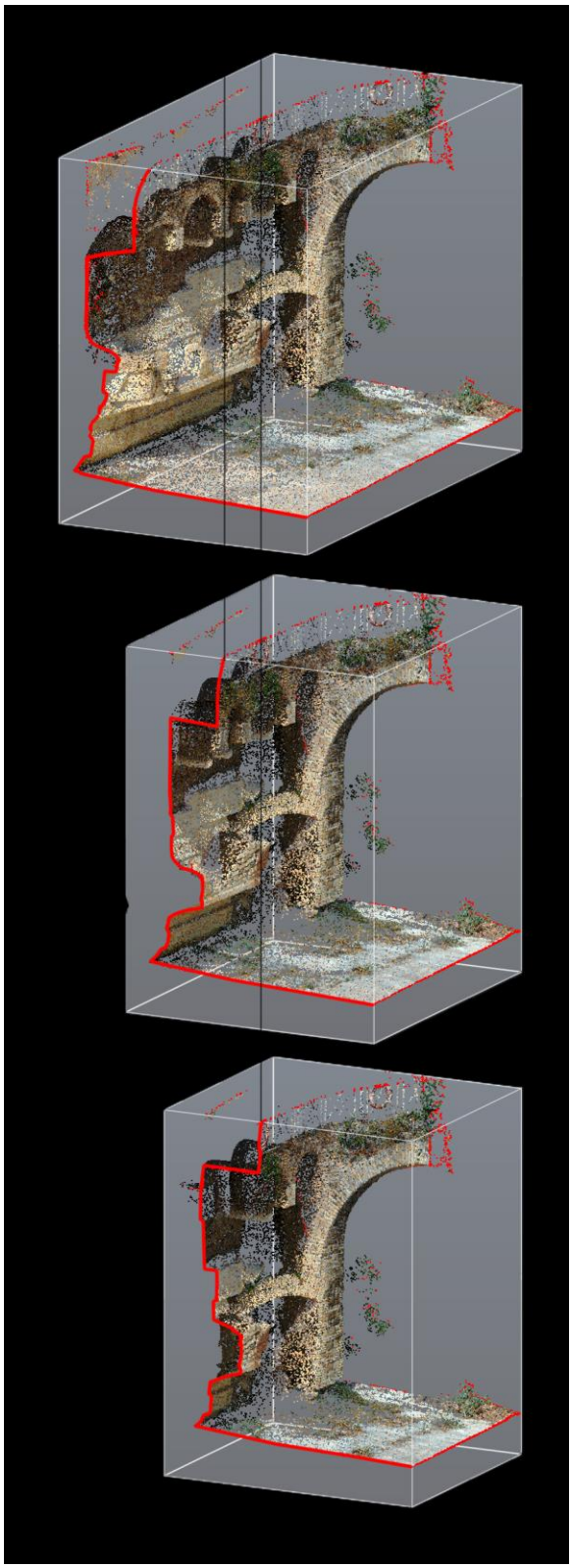

Fig. 6. Progressive profile sections extracted from the point cloud of the area with residual fragments of the Stone Ship.

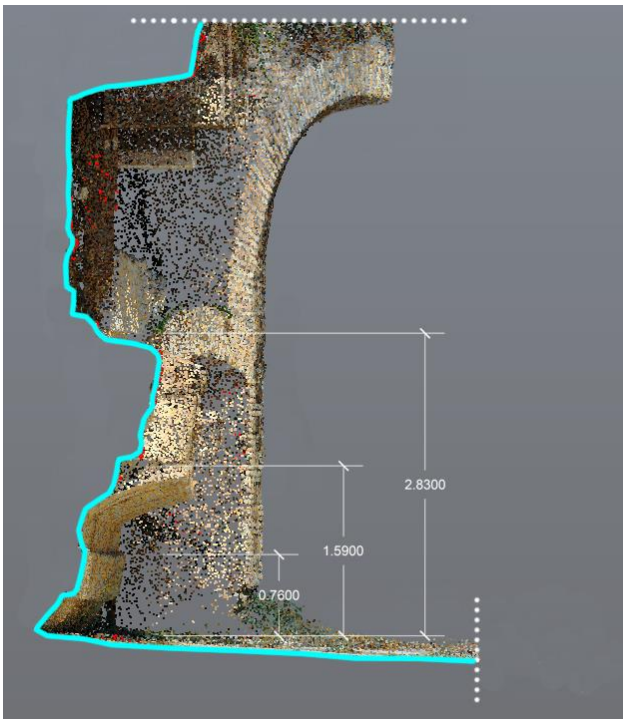

Fig. 7. Detail section of the point cloud with identification of the Stone Ship profile.

Structure from motion (SFM) acquisition allows data to be collected on the surface qualities of an object in order to subsequently define its geometric and material properties through the processing of textured mesh models (fig. 8). The transition from the urban to the architectural, or detailed, scale survey is necessary for the objective set by the research, that is, to start from the material traces of the Stone Ship that are still visible, in order to retrace the various interpretative hypotheses suggested by scholars over the centuries.

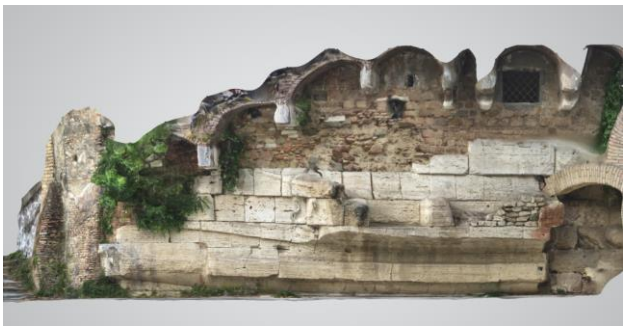

Fig. 8. Orthographic projection of the textured mesh model (from SFM) of the stone ship fragments

The analysis therefore focuses on the fragments that cover an area of approximately 10 metres in length and 3.30 metres in height at the highest point, decomposed into several travertine blocks of various sizes (each block measuring approximately 70-80 x 50-60 cm). Some

blocks show decorative motifs still clearly visible while others show the material carved to form the hull. The partitioning of the slabs, with a constant and well-defined rhythm, follows the curved geometry necessary to render the profile of the Ship. It is evident how the dimensional module of the square-shaped travertine block (of about 59 x 59 cm, equal to two Roman feet) is repeated several times in the elevation, dividing it into five horizontal strips, those currently above ground. For some elements, in the lower band, the module is doubled, while in other cases divided into equal parts. This probably corresponds to a proportional metric logic that remains unchanged in rhythm, despite the carving of the blocks probably performed on site to shape the curvature of the ship (fig. 9). A different rhythm can also be seen in the structure behind in tuff blocks, which is still visible in the parts where the travertine slabs are no longer evident (in particular at the major arch to the right of the fragments). The proportional study of the constituent elements of the analysed surface, through comparison with the historical drawings of the same, allows the immediate perception of its evolution over time.

Fig. 9. Orthophoto of the point cloud with the rhythm of block composition highlighted, with identification of the module and its subdivisions.

IV. CONCLUSIONS

Investigating the morphological evolution of a place of great value, such as the Tiber Island, constitutes a great challenge, therefore the reflections and critical readings that derive from it are multiple and of a different nature. The research, in a broader perspective, constitutes a path in development, useful to analyse the millenary and overall stratification of the entire urban complex.

The aim of this contribution is to understand an event suspended between reality and legend, re-evoking its memory from the present architectural traces, passing through a global, historical and current knowledge [12]. The raw data obtained, by integrated massive acquisitions, can be transformed into structured information by connecting the historical graphic material gathered to it. The fragment is in this case a preponderant element for the preservation and knowledge of the historical memory of a place. In fact, the 'material' of which the legend is made becomes an essential node, constituting a narrative expedient capable of shedding light on an archaeological heritage that is often inadequately known and valued.

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