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Preliminary results of the Monitoring Preservation Program (2015-2017) of the Roman barge Arles Rhône 3 (Arles, France).

An innovative approach for the monitoring of ancient wooden shipwrecks in Museum exhibitions

Marie-Laure Courboulès*, Daniela Peloso**, Vincent Dumas***

The Arles-Rhône 3 (AR3) barge raised from the Rhône river in 2013 and exhibited in 2014 in the new hall of the Musée Départemental Arles Antique (MdAa), has been the subject of an intense maintenance and monitoring program developed by the conservation team of the Museum, in collaboration with Arc'Nucléart and A'Corros specialists (French private companies specialized in conservation of waterlogged and metal artifacts). The study of the conservation conditions and of the constraints presented in the Roman maritime-fluvial barge AR3 demonstrated the necessity to develop adapted monitoring tools. This project development was initiated in 2015 and it is conducted based on the work of the Museum conservators and on the technical expertise of Ipso Facto (private underwater archeological company), as well as the technical laboratory of the Centre Camille Jullian (Aix-Marseille University, CNRS).



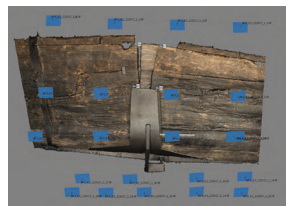
The AR3 barge in the museum the day of the inauguration

The protocol can be summarized in two steps :

In a first step, the **geometrical and 3D photogrammetric survey** records and measures the gradual deformations in the barge's wood. The derived technical data is combined with the observations registered during the annual condition report or after occasional incidents.



Topographical survey
(11 reference points ; 160 control points)



Microphotogrammetrical survey
(second reference section)

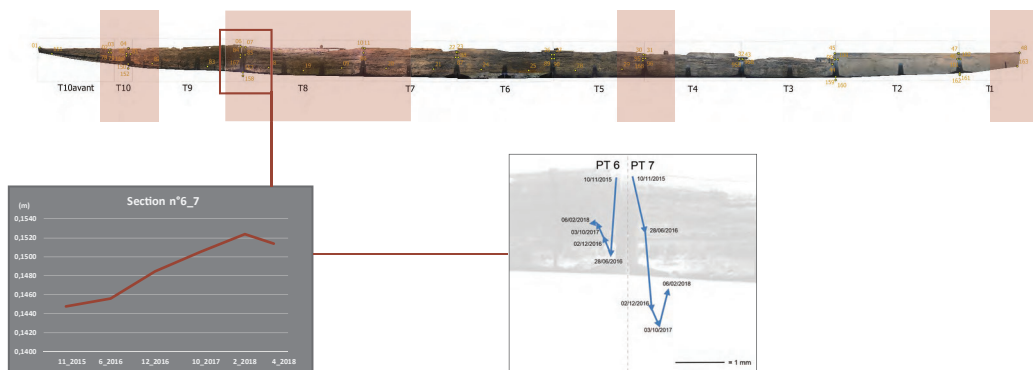
In a second protocol step, all available data are organized in a **relational and explorable database management system**. The objective is to link and interrelate the 3D monitoring results with the archaeological data, the restoration treatments and the preventive conservation data within the museum exhibition context.



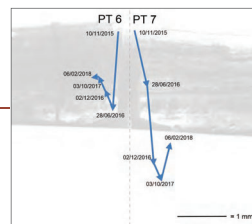
Application of the data base management system for the annual report on barge conservation



Example of one datasheet



Topographical analysis based on the control points: oblique distance between point 6 of the ninth section of the barge and the point 7 of the eighth section.



Topographical analysis of the control points: points progression in the Z axis



Data relational process of monitoring of the AR3 barge

Given the purpose of our study that is to know the behaviour of the wreck materials as regards the environmental conditions in the museum and thus prevent the risk of acidification and the deformation to ensure long-term preservation, we gathered some preliminary data. The barge Arles Rhône 3 reached equilibrium conditions after one year within his exposition environment. We observed some movements along X and Y axis and also between each section, independently to the general movement that affects the barge on his total length. The movements in Z axis have generally negative values (this trend is not easy to be interpreted).

The critical areas are now identified and they are the object of a microphotogrammetrical survey. In the same time, during the annual reports, the wood and metal pieces are monitored and the database is improved (technical glossary, layer/attribute table link) to develop a fully adapted monitoring tool for the museums hosting in their collections such fragile artefacts as ancient wooden ships.

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