The *Belinho I* Shipwreck Pewter Assemblage: From Field Conservation Protocols to Scientific Analysis

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Abstract

Metallic artifacts recovered from underwater sites face critical fragility immediately after recovery from the marine environment. Rapid changes in oxygen, humidity, and temperature trigger corrosion, leading to the rapid loss of material and historical data. Nevertheless, underwater pewter remains understudied compared to bronze or iron, hindering the development of specific conservation methodologies.

With over 400 objects, 62 of which feature hallmarks, the *Belinho I* shipwreck (Portugal) pewter assemblage represents an exceptional find within the European underwater archaeological context. This presentation outlines a risk management approach based on shared responsibility, addressing the technical challenges of a constantly expanding assemblage. A *basic field preventive conservation protocol* for non-specialists in cultural heritage is introduced, together with a temporary passivation protocol based on Pourbaix diagrams, designed to control corrosion until definitive conservation treatments are defined. This approach has enabled preliminary historical documentation leading to the identification of the 'crowned hammer' mark during treatment.

Furthermore, a multidisciplinary approach has allowed exploratory analyses using p-XRF, DM, SEM-EDS, and μ-Raman, identifying a high-quality 16th-century 'fine pewter' alloy and corrosion products like abhurite. These results confirm the benefits of scientific characterization, emphasizing the importance of early preventive conservation protocols and institutional management for the long-term safeguarding of UCH.

Keywords

Preventive conservation, Risk management, Underwater Cultural Heritage (UCH), Pewter, Metal corrosion, Passivation protocol.