Geospatial documentation of maritime endangered archaeology for enhanced marine planning and management (**MarEA Project**)

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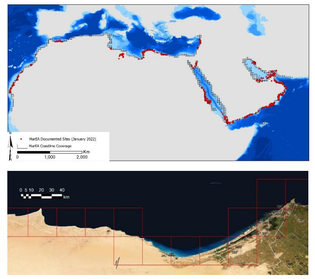
Introduction

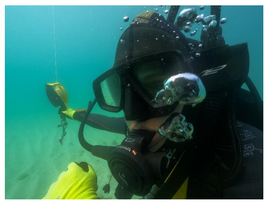
Maritime heritage sites across the world face a number of threats, from rising sea-levels, natural erosion, agricultural, urban and industrial development and frequently from conflict and looting. Recording underwater, foreshore and coastal sites is crucial for increasing our understanding of maritime connectivity and interaction. Regional diversities in heritage legislation and management strategies often results in disproportional assessment of the condition of the cultural heritage resource.



The top map is MarEA coverage to date in red and the bottom map is a close-up of the MarEA grid.

Aim

The aim of this project is to document and assess threats to the maritime (coastal and underwater) archaeology with emphasis on the Middle East and North Africa. MarEA also endeavours to establish new and reinforce existing partnerships with colleagues from the MENA region and more broadly, to form global collaborations for the sustainable management of endangered maritime heritage.

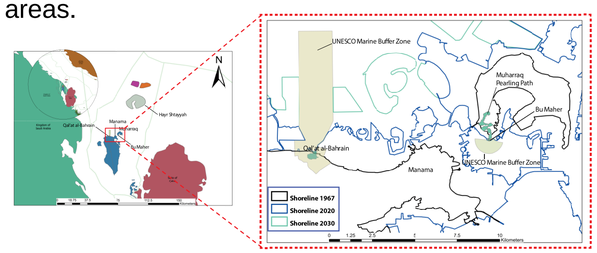


Underwater survey in Bahrain carried out in partnership with Bahrain Authority for Culture and Antiquities (BACA) (photo Rodrigo Ortiz 2022).

Documentation and assessment of the impact of wave action on Borj El Baroud, Morocco (photo and assessment by Rodrigo Ortiz, June 2020)

Methods

Our methodology combines the study of satellite imagery, incorporating marine geophysical datasets, GIS spatial analysis, published data, archival information and most importantly, collaborations and input from local heritage authorities. The MarEA team also carries out ground-truthing fieldwork with coastal, intertidal and underwater survey work in key research areas.



Coastal changes from 1967 to 2020 and projected into 2030 to the north coast of Bahrain, including UNESCO protected of Qal'at al-Bahrain and Pearling path (modified from Ortiz et al 2022: 240, fig 5).

Threats

Construction (urbanisation, tourist development offshore exploitation) conflict, natural erosion, agriculture and aquaculture are some of the main anthropogenic threats to the maritime cultural landscape globally.

23/05/2020

22/07/2020

06/09/2020

21/08/2021

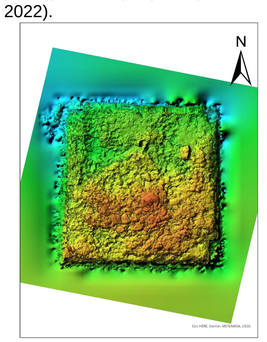
Aerial photo and satellite imagery analysis showing rapid coastal accretion in Bahrain (assessment by R. Ortiz).

Images from Google Earth showing land reclamation in Bahrain.

Case Studies

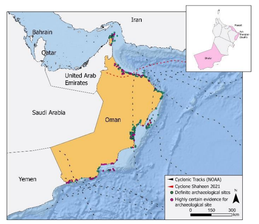
Bahrain: The coast of Bahrain has been heavily modified during the 20th Century. Affecting the intertidal area in particular with extensive land reclamation. A significant number of sites that bear testimony to inter-cultural interaction are exposed to an increasing and unpredictable rate of erosion and sea-level change.

Digital Elevation Model of lighthouse in Qal'at al-Bahrain's buffer zone, model based on photogrammetry (Rodrigo Ortiz 2022).



Land reclamation around the UNESCO buffer zone of the Ancient Harbour and Capital of Dilmun (Qal'at al-Bahrain). Close up of lighthouse (photos Rodrigo Ortiz 2022).

Oman: The coast of Oman bares significant evidence for international maritime trade and connectivity from antiquity to the modern era. The increasing frequency and intensity tropical cyclones expose Oman to an increasing rate of erosion and flooding.



Map of maritime archaeological sites in Oman documented in the EAMENA database in conjunction with major cyclonic tracks over the past 130 years (Andreou et al. 2022: 142, fig. 9).

Erosion at Al Baleed's seafront in 2013 (Picture taken and used with the permission of T. Vosmer)

Future Directions

This documentation of endangered maritime archaeology and conditional assessment for all analysed sites is consolidated within the open-access EAMENA database platform hosted by the University of Oxford. This online platform will enable integrating information on coastal and marine processes as well as submerged paleo-landscape features which provide evidence for past sea-levels and shoreline change.

MarEA builds on the successful EAMENA Arches database for heritage inventory and management.

The geospatial documentation of endangered maritime sites, seascape change and submerged features, will enable the consolidation of a substantial maritime database, unique to the MENA region.
Such a database constitutes a fundamental tool for national cultural authorities and marine planners to consult and integrate in the protection of cultural heritage and management of coastal areas and territorial seas.

Acknowledgements

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Bibliography: Andreou, G., Nikolaus, J., Westley, K., El Safadi, C., Blue, L., Smith, A., & Breen, C. (2022). Big Data in maritime archaeology: challenges and prospects from the Middle East and North Africa. *Journal of Field Archaeology*, *47*(3), 131-148.

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