

## Objective

- Determine the source of DNA recovered from ceramic transport vessels found on Mediterranean shipwrecks sites



## Context

Accurately characterising the past contents of amphorae recovered from ancient shipwreck sites would provide invaluable insight into cargo compositions and trade dynamics.

Despite this, the contents of ceramic transport containers are largely inferred from vessel shape and origin.

Is DNA the answer to understanding past vessel contents?



A series of studies claim to have successfully extracted ancient DNA from artefacts found on underwater sites including plant remains (Elbaum 2005; Manen 2003), human skeletons (Hershkovitz 2008) and shipwreck amphorae (Hansson and Foley 2008, Foley *et al.* 2012).

None thought to test the underwater deposition environment for DNA that could affect their results.

## Methods

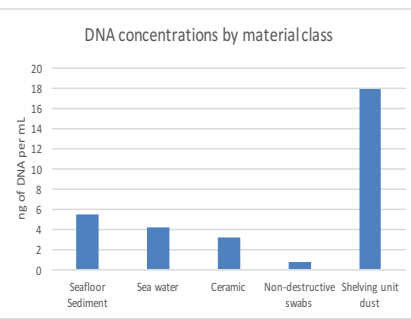
- Artefacts selected from the ULUBURUN, CAPE GELIDONYA, KYRENIA, MAZOTOS and BABULJAŠ SHIPWRECKS for destructive and non-destructive testing
- Seafloor sediment and water column samples collected for comparative analysis
- DNA extracted from artefacts, swabs, seafloor sediments, water column
- Compare proportion of taxa found in deposition environment to that found in ceramic matrix
- Determine if vessels of known contents (preserved olives, resin, almonds) show corresponding DNA evidence



## Early Results

DNA has been recovered from every class of material tested in this study. Early results (below) show averages of ng of DNA per mL by material class.

Ample DNA exists in the underwater deposition environment, and shelving units where recovered shipwreck artefacts are stored has DNA in abundance.



## Conclusions

Copious DNA exists in both the underwater deposition environment and museum storage conditions. Ongoing bioinformatics research will determine if the source of the DNA found inside the ceramic matrix is indeed derived from the past contents of the vessel, or more likely, a result of environmental contamination.

The normative approach to amphorae interpretation which assumes vessel contents based on shape and origin must be challenged. Mounting evidence suggests that amphorae were re-used, vessel shapes were imitated, and shipwreck cargoes contained a diverse array of goods.

A better understanding of ancient shipwreck cargoes could illuminate aspects of economic, agricultural, and social transformations in the past.



## Acknowledgements

### References

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