

Investigating Prehistory - A Multidimensional Approach to a Submerged Prehistoric Site in Croatia

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Introduction

Zambratija bay is located on the Northwest coast of the Istria peninsula in the Croatian Adriatic (Fig. 1). The remains of an inundated prehistoric site lay on the sea bed in the northwestern part of the bay, inside a natural geological depression, protected from the open sea with natural limestone ridges. In 2008, underwater archaeologists noticed the remains of 34 wooden piles protruding out of the seabed of the bay (Fig. 2), and the piles were surrounding an area covered with peat (Fig. 3) around 30x67 meters in size. Since then, several trenches have been excavated on site by archaeologists in 2008, 2011 and 2014. The submerged site was found at an average depth of 3m below Mean Sea Level (MSL) (Koncani Uhac 2009:263-267; Koncani Uhac&Cuka 2015:25-27; Koncani Uhac & Uhac 2012:534). To date, more than one hundred wooden piles have been identified, preserved *in situ*, due to a combination of geographical and chemical variables that have left them well preserved for 6000 years. Interdisciplinary preliminary investigations such as a bathymetric survey (Fig. 4), radiocarbon dating and a botanical analysis of the organic remains in the layers, revealed a unique and rich prehistoric site that represents an internationally significant research opportunity in the Mediterranean submerged landscapes studies.



Figure 1: A map of Croatia and the Adriatic Sea. The location of Zambratija bay is marked with a red circle.
Author: K. Jerbic 2017.



Figure 2: Wooden piles protruding out of the sea bed on site.
Photo: J. Benjamin 2015.

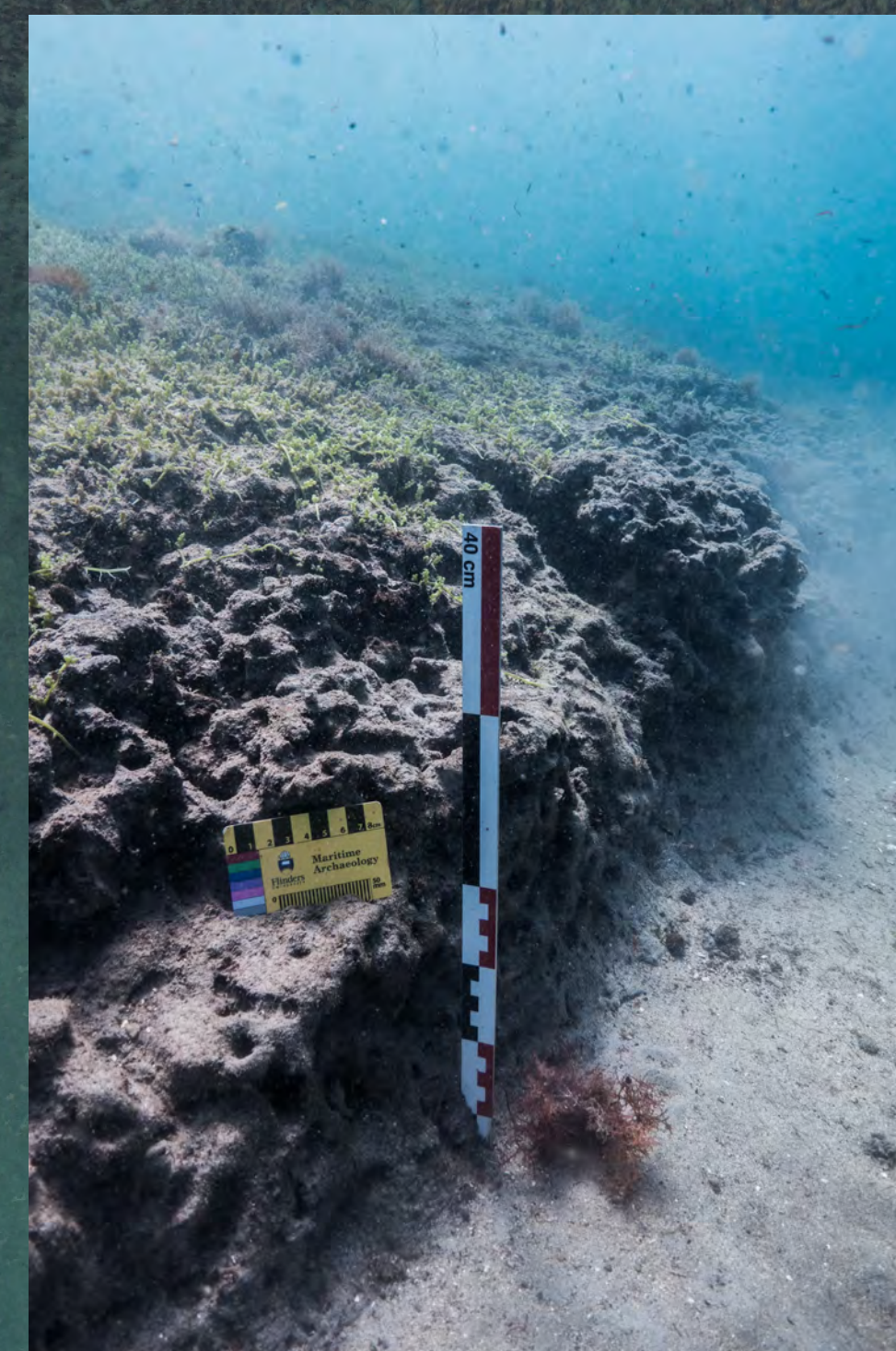


Figure 3: An area of peat on site.
Photo: J. Benjamin 2015.

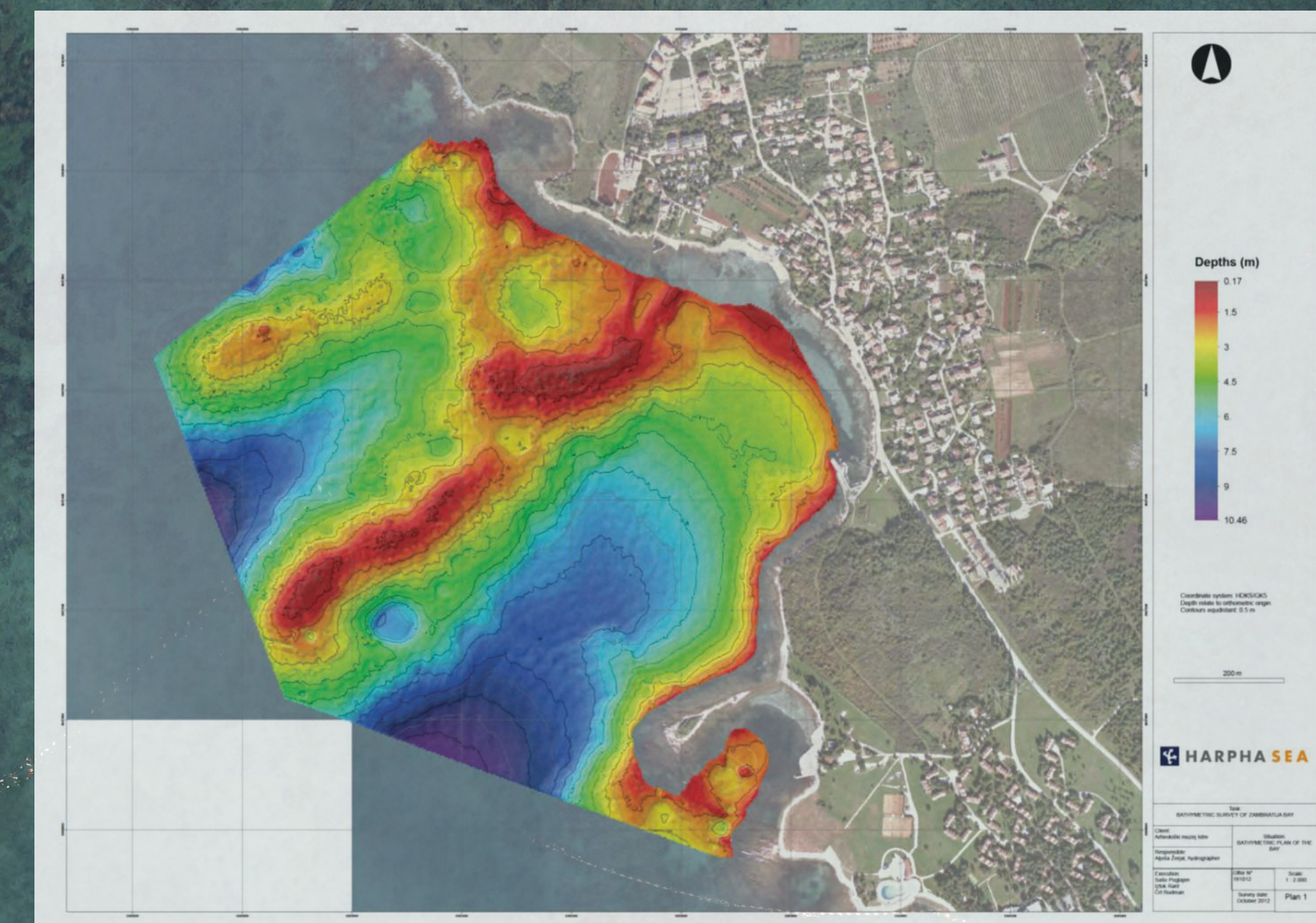


Figure 4: A bathymetric map of the bay.
Author: Harpha Sea d.o.o. Koper, Slovenia.

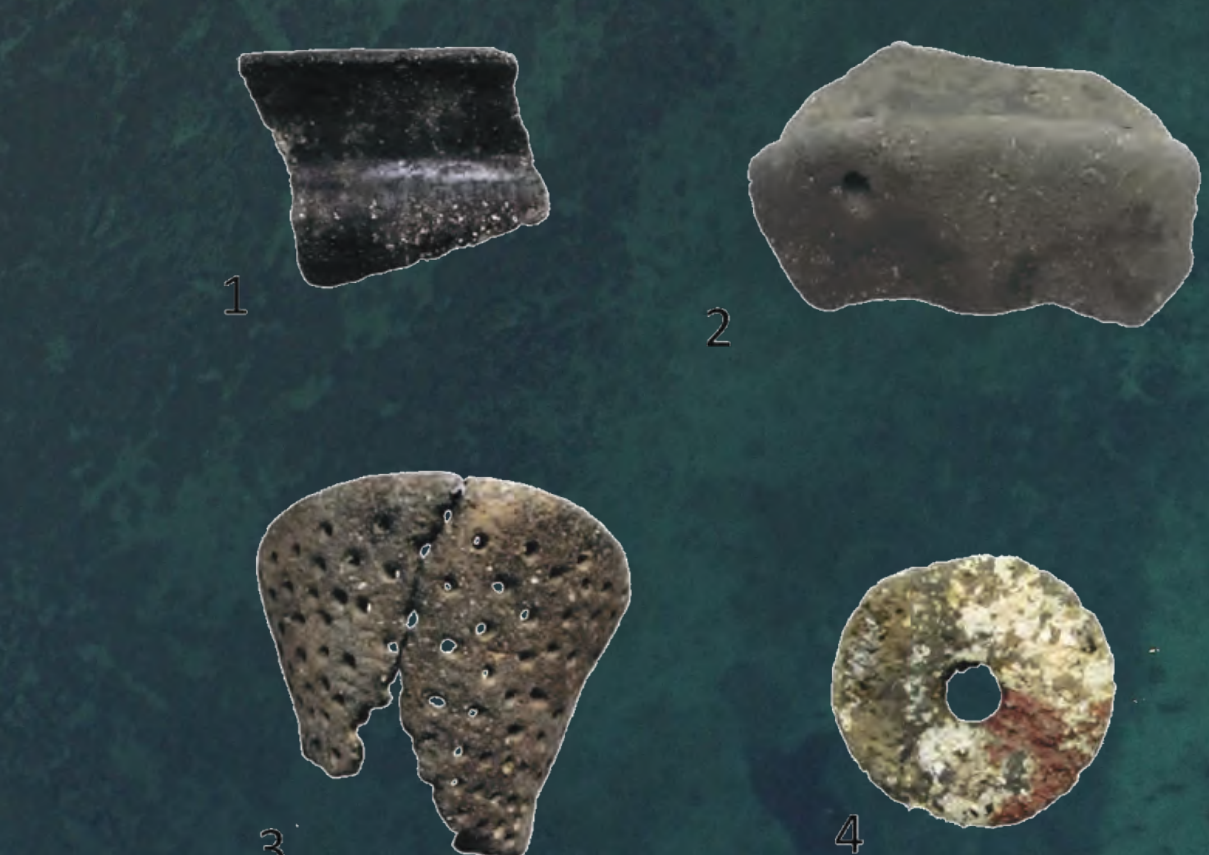


Figure 5: Ceramic finds from the Zambratija settlement. (1) Channeled pottery; (2) Sub-surfaced lug; (3) Strainer; (4) Spindle whorl.
Images from Koncani Uhac&Cuka 2015, modified by K. Jerbic.

A part of the found pottery from the Zambratija settlement is known as the Nakovana style pottery (Koncani Uhac&Cuka 2015:18). This interpretation was based on the typology of the shapes and decoration styles, such as the presence of channeled pottery (Fig. 5:1), some of which had sub-surfaced lugs (Fig. 5:2), which are traditionally attributed to Copper Age (Koncani Uhac&Cuka 2015:35-37). Fragments of ceramic strainers (Fig. 5:3) were also found on the site. Strainers are considered to be parts of sets for milk processing and/or straining beverage products. In other known sites in Istria, strainers have been attributed to the Neolithic/Late Bronze Age layers. Spindle whorls (Fig. 5:4), who have also been found in Zambratija, are attributed to the Copper Age (Koncani Uhac&Cuka 2015:38). The one known radiocarbon date from Zambratija (4230-3980 cal BC) fits into the middle of the so far know Nakovana style radiocarbon dates, the oldest being around 5000 cal BC and the youngest 3200 cal BC (Forenbaher et al. 2013:591-592). Based on the one date and the found ceramics, a conclusion has been made that the Zambratija settlement was active, either as a multilayered settlement or it was intermittently used through multiple periods, starting as early as the Late Neolithic, and ending in the Late Bronze Age (Koncani Uhac&Cuka 2015:41).

Ceramic finds

During the course of the underwater archaeological excavations in 2014, an assemblage consisting of 45 knapped flint artefacts (90,78 grams total) has been collected in Trench 5. Despite this relatively small lithic assemblage it is still possible to preliminary determine their basic technological and typological characteristics. The raw material procurement strategy is based on the procurement of high quality exogenous black chert. The technology used for this particular assemblage was the manufacture of flakes, with the presence of non-prismatic blades (Fig. 6.1). Even though the artefacts collected from Trench 5 do not show any visible signs of primary reduction, certain characteristics of the lithic finds imply that at least some aspects of the reduction process have been performed on site. Typologically, the most common types of flint tools present in the found artefacts are endscrapers (Fig. 6.2) and sickle segments, which are tools related to transformation activities and intensive vegetation cutting. Polished tools in the found assemblage are completely lacking. For now, the results show that the characteristics of lithic assemblage of the settlement in Zambratija seem to somewhat fit into the wider region of Copper Age sites. It is clear that more systematic and in-depth archaeological investigations are necessary for a deeper understanding and further interpretations.

Lithic finds



Figure 6: Lithic finds from the Zambratija settlement. (1) blade; (2) endscraper.
Photos: M. Cuka 2014, modified by K. Jerbic.

Preliminary conclusions and results:

- The archaeologists collected ceramic fragments, flint tools, faunal remains and wood. The ceramic finds belong to the terminal Neolithic and Copper Age, a period which roughly covers a timespan between 4000-3000 years cal BC (Benjamin et al. 2011:195; Koncani Uhac&Uhac 2009:266; Koncani Uhac&Cuka 2015:14-16).
 - The flint tools have preliminary been attributed to Copper Age.
- The botanical analysis of the remains found in the archaeological layers, indicates the presence of aquatic plants that are typical for natural wetland habitats, such as alkali bulrush (*Scirpus maritimus L.*), hairy sedge (*Carex cf. hirta L.*), pondweed (*Potamogeton sp.*) and the water caltrop (*Trapa natans L.*) (Koncani Uhac&Cuka 2015:28).
- A single radiocarbon date from a wooden sample showed an age of 4230-3980 cal BC (2 Sigma; Beta-296187), which corresponds to the typologically determined age of at least some of the recovered pottery (Koncani Uhac&Cuka 2015).
 - The bathymetry shows a natural depression in the area of the submerged site.
- The presence of peat (organic material deposited in a brackish environment) indicates that a wetland existed here prior to sea-level rise (Roberts 1998:29).
- The natural depression seen in the bathymetry, as well as the presence of wooden piles and peat imply that this is a submerged pile-dwelling settlement, similar to those found around the Alpine lakes of Austria, Germany, Italy, Slovenia and Switzerland (Koncani Uhac 2009:263-267). The radiocarbon date as well as the ceramic finds fit into the timeframe of the aforementioned settlements (Menotti 2004:3; Menotti 2015:25).

Recent investigations

The most recent interdisciplinary investigations performed on the site - geological coring (Fig. 7), geo-referencing and mapping a part of the site (Fig. 8), and taking samples of wood for dendrochronology (Fig. 9), will try to answer further questions through an interdisciplinary environmental and cultural approach. The main aim of the continuing project is to use the history of sea-level changes as a context for an archaeological study of an inundated prehistoric site. The past sea-levels will be established by laboratory analyses of the cores in which the microbiological remains-*foraminifera*, in the found peat will show the layers where the water switched from fresh, to brackish, and lastly to marine. In the case of finding organic remains large enough for radiocarbon dating, it will be possible to add a time dimension into the models of inundation, which will give a new and important insight into the processes that were changing the paleolandscape of the area around the prehistoric settlement. Using dendrochronology is a well established method in the field of pile-dwelling research, simply because of the vast quantities of wood preserved in a wetland anaerobic environment (Billamboz 2004:117; Menotti 2012:14). Nowadays, dendrochronology is used not only as a dating method but also as a tool for paleo-environmental and socio-economic studies (Menotti 2012:20). The settlement at Zambratija might represent the maritime form of the Alpine cultural tradition to build villages over or near water in a wetland environment, and can therefore add a unique and rich aspect to a part of European Prehistory. The presence of peat indicates that this, now submerged site, may preserve an archive of cultural and environmental changes through the Holocene (Roberts 1998:29-33). The possible new evidence that lies underwater may also shed a new light on current coastal settlement patterns and resource exploitation.



Figure 7: Coring on the site with the Croatian Geological Survey team. Photo: I. Koncani Uhac 2017.



Figure 8: Drawing of a small section of the site. The black dots represent wooden piles. Author: I. Koncani Uhac 2017, modified by K. Jerbic.



Figure 9: A sample of a wooden pile for dendrochronology. Photo: K. Jerbic 2017.

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