AMPHORAE OF OUR SEAFLOOR

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1. Abstract

The Globe Group participated in the project of local education of the Istrian County with the theme "Amphora Findings on the East Coast of Istria", so we part of this project decided to present as the Globe Project.

The research questions are:
1. How accurately can we map amphora sites?
2. How much time does it take to desalinate amphorae fragments in the school lab to be exposed later?

According to the data we received from the National Museum of Labin on land sites and geographic coordinates of the underwater site we have collected, we have mapped the map of localities of the amphorae site in the area of Labin.

In conversation with the curator of the National Museum we have confirmed the accuracy of our collected data, so our map can be used for the purpose of tourism promotion of our region, as agreed with Tourist community Labin–Rabac.

The desalination process lasted 40 weeks, which, according to accessible sources on the internet, is enough to complete the process and the fragments are dried and protected to be permanently exposed.
Working on this project, we have gained a lot of new knowledge and skills and have responded to the research questions that we have set at the beginning of our work.

2. Research questions

The research questions are:
1. How accurately can we map amphora sites?
2. How much time does it take to desalinate amphorae fragments in the school lab to be exposed later?

3. Introduction

We live in a sea surrounded environment, therefore we have a unique give and take relationship with it.The sea, besides our country's relief, reveals a rich underwater wealth.

The Secondary school Mate Blažine Labin in the local education project of the Istrian County participated with the theme "Amphora finds on the east coast of Istria".

About 70 students participated in activities aimed at discovering more about the species, sites and age of amphora in the area of Labin.

The Globe Group also participated in this project, so we part of this project decided to present as the Globe Project.

4. Research methods

4.1. PERIOD OF WORK:

School years 2016./2017., 2017./2018. and 2018./2019.

During 2016./2017. data was collected with field work - geographic coordinates of the site

During 2017./2018. the amphora fragments were desalinated in the school lab and a map of the site was created and a project was presented within the framework of the First Festival Istrian County.

During 2018./2019. The work on drying and protecting amphora fragments has been continued and on analyzing all data collected and compared with available professional sources.

4.2. PARTICIPANTS:

GLOBE GROUP: 15 members
OTHER STUDENTS: 63 students of Secondary school Mate Blažine Labin

4.3. ASSOCIATES:

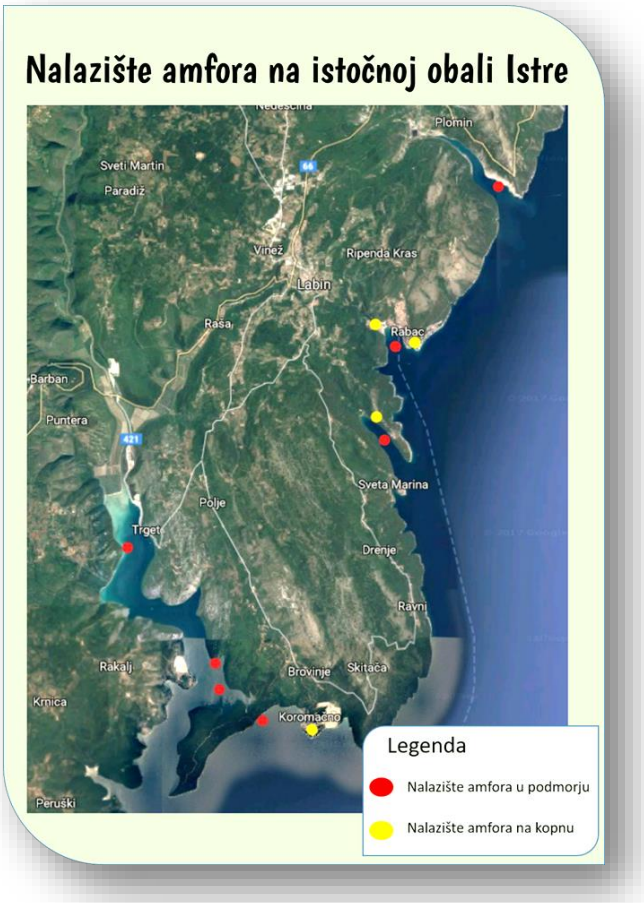
Tourist community Labin–Rabac,
Labin Healthy City association,
Daniel Mohorović, professional scuba diver „Girandella diving center”,
Vedran Kos, Curator and archaeologist of the National museum in Labin,
Karmen Milevoj Diminić, geography professor and GLOBE teacher,
Archeology museum Pula,
Archeology museum Zadar,
Archeology institute Zadar.

4.4. STAGE OF WORK AND METHODS

Table 1. Stages of work and methods

MAPPING THE AMPHORAE FINDING PLACES	
STAGES	**METHODS**
1. Determining the coordinates of the amphorae fragments	Going to archaeological sites of the southeast Istria from cape Mašnjak to cape Mulac, **Globe GPS protocols**
2. Mapping the locality	**Digital cartography, QGIS**
3. Comparing with official data	Talking with the curator
DESALINATING THE AMPHORAE	
STAGES	**METHODS**
1. Cleaning of the fragments	Washing out with tap water
2. Desalination	The amphorae fragments are left in a big tub with tap water, the water was replaced every week, and a conductivity meter was used to see the amount of salt dissolved in water, **Globe hydrological protocols**
3. Drying and protecting the fragments	After the salt amount was minimalized, the fragments were taken out, dried off and coated with a protective fluid and displayed at the school.

5. Results



MAPPING THE LOCALITIES
According to the data we received from the National Museum of Labin and geographic coordinates of the underwater site, we have collected for the first time, we have mapped the map of localities of the amphorae site in the area of Labin.

NOTE: geographic coordinates determined on the ground by the GPS method can not be published to protect the locality.

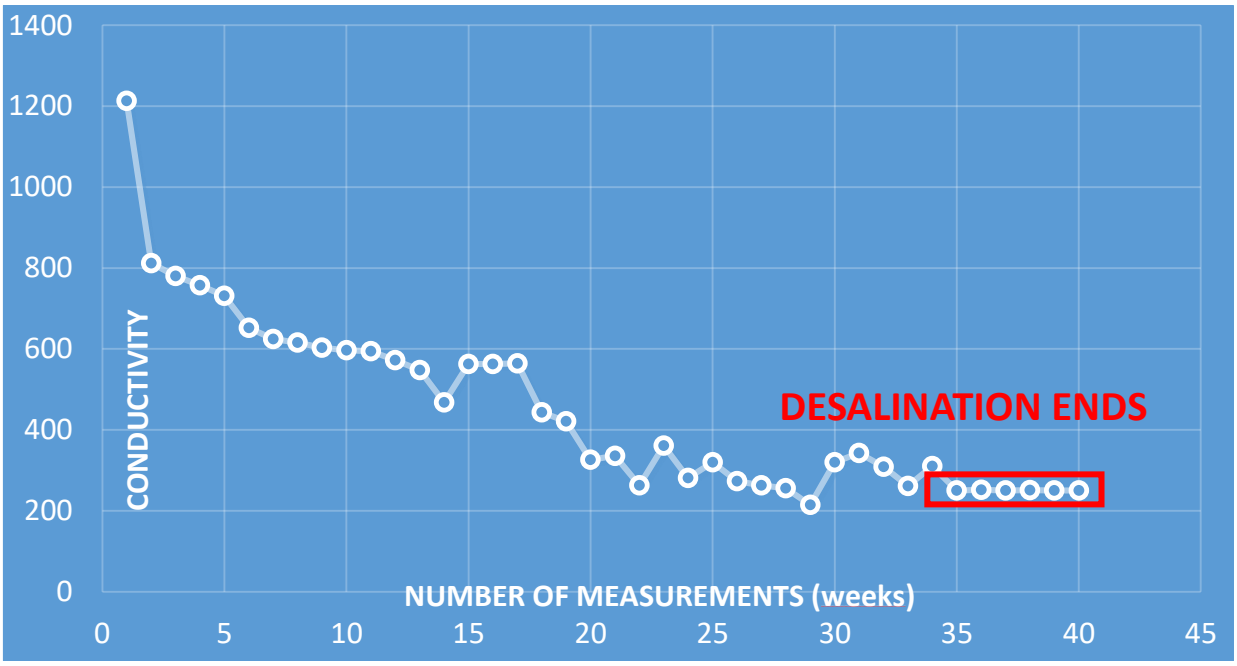
Picture 1: Map of amphorae finding sites
Source: Own Creation

DESALINATION

Table 1. Results of conductivity measurements

Weeks	Conductivity	Weeks	Conductivity
1	1213	21	336
2	812	22	263
3	780	23	361
4	757	24	281
5	731	25	320
6	652	26	273
7	624	27	263
8	616	28	256
9	603	29	215
10	597	30	320
11	594	31	343
12	572	32	309
13	548	33	261
14	468	34	310
15	563	35	250
16	563	36	252
17	564	37	250
18	443	38	251
19	421	39	250
20	326	40	250

As visible from table 1, the desalination measurements remain constant between the 35th and 40th week, meaning that the desalination process is complete.



Graph 1. Conductivity measuring results

The amphorae fragments were washed, covered with protective fluid and exhibited.

Picture 2: Amphorae fragments exhibited in the school
Source: Own Creation

Fragments will remain as a permanent exhibition in our school so we will be able to track changes in time.

6. Discussion

Locations of amphora can be mapped very precisely with the help of a GPS device.
The same maps with underwater archaeological sites exist in local museums and at the Ministry of Culture of the Republic of Croatia, but they are often unavailable to the public due to possible devastation of underwater locations.
Since the data of land locations of amphora received from the Custos of the National Museum of Labin, we compared underwater sites with land sites dating from the antiquity, and it is concluded that almost every underwater site and on the land are ancient sites.
Koncani Uhač I., Kos V., Miholjek I., (2008), Poluotok is immersed in the sea, Undersea archeology of southern Istria in ancient times,
https://www.scribd.com/document/263881287/Poluotok-uronjen-u-more -Katalog-exhibition% C5% BEbe Exhibition Catalog, Archaeological Museum of Istria - Pula (accessed 20.09.2018.)

In conversation with the curator of the National Museum Labin we have confirmed the accuracy of our collected data on the underwater sites, so our map can be used for the purpose of tourist promotion of our region as agreed with TZ Grada Labin.

Geographic coordinates determined on the ground by the GPS method can not be published to protect the locality.

A great danger to the objects taken from the sea are salts, in the case of drying objects in the air can crystallize and cause great damage. It is therefore objects from the sea to the restoration workshopthey are delivered in a wet state, where desaline.

The process of desalination and purification of the amphora needs to be done to change its original environment. About 2,000 years of amphora lay at the bottom of the sea, and so the sea salt and other minerals came into the ceramic walls of amphora itself. In order for the amphora to be exposed under normal conditions, it is necessary to perform desalinization and cleaning, otherwise, the amphora under the influence of the air will begin to decompose. An example of this was found in the Lapidarium of the National Museum of Labin, where there is an amphora which, after it was formed, dried and exposed and after two years began to be lightly peeled.

Picture 3: Amphorae
Source:Vedran Kos, Curator National museum in Labin

The desalination process lasted 40 weeks, which, according to accessible sources on the internet, is enough to complete the process and the fragments are dried and protected to be permanently exposed. Čurković M. http://www.h-r-z.hr/index.php/djelatnosti/konzerviranje-restauriranje/podvodna-arheologija/341-restauriranje-i-konzerviranje-amfore-tipa-spatheion, Hrvatski restauratorski zavod (approach 12.5.2017.)

7. Conclusion

As it is an interesting project, it has attracted a lot of interest from students.

Using globe protocols in this project, we include other students of our school in the Globe program while at the same time gathering enough data to answer the research questions that we have set at the beginning of our work.

You can see more in the video made by our group:
www.youtube.com/watch?v=c6Q402q5Jhg&t=3s&spfreload=10

7.1. MEMBERS ACTIVITIES

FIRST REGIONAL FESTIVAL PAZIN

There was a first ever Regional Festival in Pazin where 16 high school represented their work which was an extracurricular activity. Every group explained their work with presentations.

Picture 6: Presenting during the Regional Festival
Source: Own Creation

Picture 7. TV Istra – Secondary School Mate Blažine investigated amphorae.
Source: Own Creation

8. Bibliography

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9. Acknowledgements

- We thank the members of our group and other students for their dedicated work through that and we all learned a lot of environmental factors in the environment

- We thanks our mentor Olivera Tadić, Globe teacher & teacher mentor, Graduate Engineer of chemically technology, working on environmental issues for 15 years, for its support

- Thanks to scientists from Girandella diving center", National museum Labin, Karmen Milevoj Diminić, geography professor and GLOBE teacher, Archeology museum Pula, Archeology museum Zadar & Archeology institute Zadar.

10. Badges

Collaboration

We collaborated with two Globe teachers-mentors during this project.
Our mentors showed us how to use the GLOBE protocols and method of digital cartography. We also collaborated with other member of GLOBE group and other students of our school on field work. They helped us to determine the coordinates of locations using GPS method.

Community Impact

We have presented our results to the GOVERNMENT and TURIST AGENCY and they have shown great interest, so we believe that our map will be part of the tourist promotion of our region. We published our results in the media (Glas Istre i TV Istra)

Connecting with A STEM Professional

We collaborated with scientists from "Girandella diving center", National museum in Labin, Karmen Milevoj Diminić, geography professor and GLOBE teacher, Archeology museum Pula, Archeology museum Zadar & Archeology institute Zadar, from which we have learned a lot from digital cartography, oceanography and archeology