

ALL QUIET IN THE EAST? AN OVERVIEW OF THE UNDERWATER SURVEYS OFF NORTH DOBRUJA COASTLINE¹

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Abstract: The aim of this paper is to present an overview on a lesser-known aspect of the Romanian archaeology – underwater research. The field is a scientific orphan in Romania, due to the high costs of research, some restrictive aspects of Romanian legislation and the absence of a relevant training program in Romanian universities. However, in the last decade there has been a revival of underwater research along the Black Sea, on the continental shelf of the Romanian coast in the districts of Tulcea and Constanța. In the following, we will review the underwater researches carried out in the Tulcea district, from the ones conducted in the area of some ancient harbour installations of the archaeological sites on the Danube (from Noviodunum, Aegyssus, and Halmyris, to Orgame/Argamum) but also offshore, at Sulina - Bazinul Mare and off the Împuțita – Sonde Canals), and particularly at Gura Portiței. At the same time, we will analyse the potential offered by the discovery of certain archaeological materials on the shore or in shallow waters along the coast to identify areas with possible wrecks or submerged sites.

Keywords: underwater archaeology, state of research, Black Sea, Romanian continental shelf, ancient harbours, shipwrecks, Roman period, late Mediaeval, early Modern.

INTRODUCTION

In the last decade, there has been a revival of underwater research along the Black Sea, on the continental shelf of the Romanian coast in both the Tulcea and Constanța districts.² In the following, we will review the research carried out in Tulcea county (in the northern part of Dobruja), starting with ancient harbour installations at archaeological sites on the Danube (from Noviodunum in the north to Aegyssus and Halmyris in the south, and Orgame/Argamum in the south-east) but also looking offshore: at Sulina - Bazinul Mare and offshore between the Sonde and Împuțita canals), and particularly at Gura Portiței. At the same time, we will analyse the potential offered by the discovery of certain archaeological materials onshore or in shallow waters along the coast to identify areas with possible wrecks or submerged sites (Fig. 1).

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² For an excellent overview see Paraschiv-Talmațchi, Custurea 2015-2016, 241-279 and Dimitriu et al. 2019.

ANCIENT HARBOUR FACILITIES IN THE DANUBE DELTA – STATE OF RESEARCH

For better context, we consider useful a presentation of research related to ancient port facilities along the *limes Moesiae inferioris*, in the Danube Delta sector, but also on the *limes maritimus*. Very few attempts were made to identify and analyse the harbours in this sector, even in the case of legionary headquarters. One such example is the legionary base at Troesmis.³

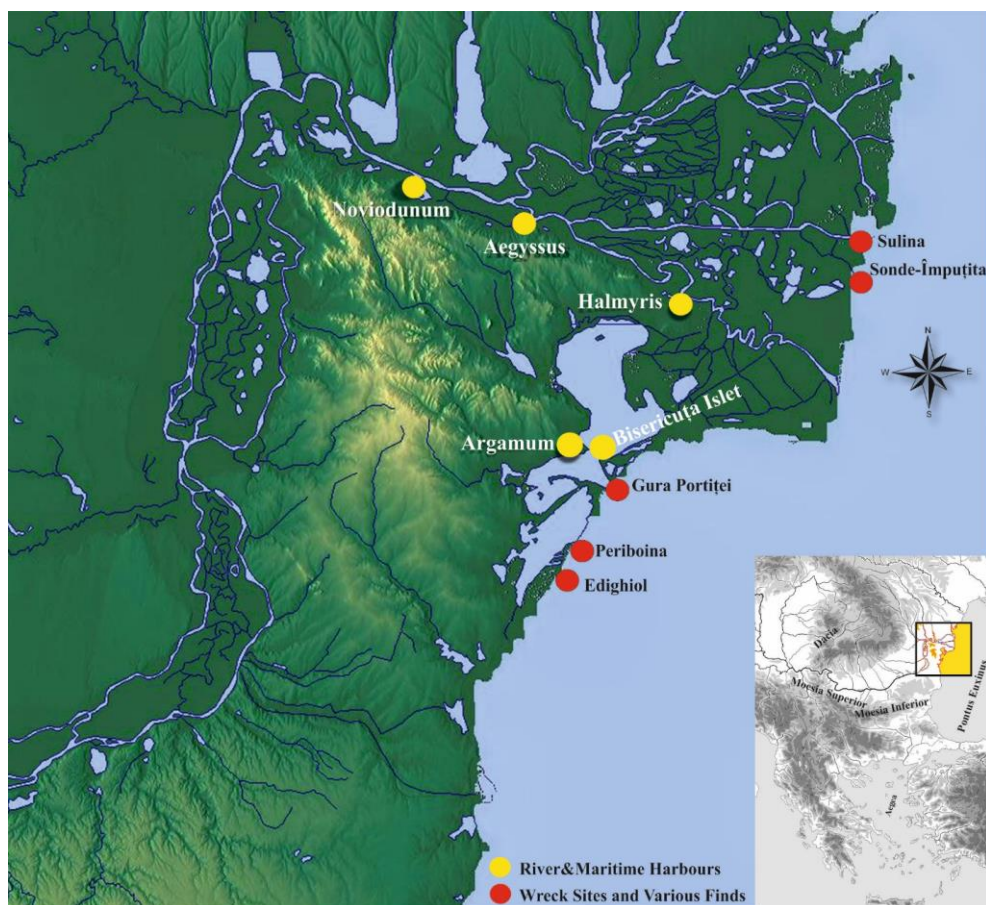


Fig. 1. River and maritime harbours, wreck sites and archaeological materials on and offshore in the Danube Delta region.

Noviodunum

However, at Noviodunum, another Roman military base and the seat of *classis Flavia Moesica* since the second half of the 1st century AD onward, several attempts aimed to identify the local harbour(s) were made. Among the archaeological discoveries related to *classis Flavia Moesica*⁴ and indirectly to a harbour, are many bricks and rooftiles marked with the abbreviation of the fleet.⁵

The local epigraphic dossier related to this topic is also very interesting, such as the inscription dedicated to *Domino et Dominae* by the *centuria* of Q. Heliodorus from *liburna Armata*. The altar was discovered close to Isacceia and dates to the first half of the 3rd century AD. Although R. Florescu initially supported the idea that the *liburna Armata* was dispatched from the fleet at Missenum, today it is accepted that it was part of the *classis Flavia Moesica*.⁶ Moreover, in the second half of the 2nd century AD and the beginning of the 3rd century AD, an altar was raised to Juppiter Optimus Maximus by a *trierarchus* – C. Candidus Germanus (Fig. 2).⁷ This altar comes, perhaps, from one of the necropolises of the ancient city, where a sarcophagus

³ Alexandrescu, Olariu 2017, 119.

⁴ For the history of the Moesian fleet see the seminal book of Bounegru, Zahariade 1996.

⁵ Bounegru, Zahariade 1996, 11-15; Matei-Popescu 2010, 248-249.

⁶ ISM V, 273; Matei-Popescu 2010, 248, 254.

⁷ Topoleanu 1992, 97-100, fig. 12; Matei-Popescu 2010, 254.

was also discovered, with an inscription in *tabula ansata* for P. Aelius Mithres, *arkarius* of the Moesian fleet around AD 170.⁸ Finally, a limestone slab discovered in the foundation of the ancient town wall attests in the 3rd century AD to the presence of one of the *praefecti* of the fleet – Postumus – at this site, who raised a funerary epigram for his *alumni* – Krystallos and Achelous.⁹



Fig. 2. The altar of C. Candidus Germanus *trierarchus* (drawing after Topoleanu 1992, fig. 12; photo by G. Dincu) and aerial view of masonry pillars hypothetically connected to a quay or even to a shed for ships (after Stănică et al. 2023, pl. 25).

Several attempts were made in the recent years to shed light on Noviodunum's harbour. The first one consisted of a side-scan sonar during the spring of 2016, when divers from the Bavarian Society for Underwater Research noticed an eroded channel-like structure measuring 19 m in depth with a vertical slope along the shoreline, indicating an access to a hypothetical harbour upstream of the ancient city.¹⁰ Later, in 2017, the first multi-proxy research project combined geomorphology, sedimentology, biological proxies and archaeology in order to identify the location of the harbour(s). This research led to the identification of two possible harbour basins functioning during the Roman period, which were also linked to the roads leading to Noviodunum's hinterland.¹¹ The hypothetical harbour basins have been located to the east (downstream) and southwest (upstream) (Fig. 3).¹² The authors of this seminal study rejected the possibility that a harbour facility would have been located directly on the riverfront due to strong river currents. However, during the 2022 field season, a structure was discovered there, along the waterfront of the ancient city. Several masonry piles were considered the substructure of a wharf for late Roman ships. The town wall in the northern part of the city was defended by seven towers with a semicircular/polygonal outer front for the protection (possibly) of some port facilities and, obviously, a gate. A polygonal tower (Tower 1) included a series (probably two rows of five each) of masonry pillars, hypothetically connected to a quay or even to a shed for warships in the 4th century AD (Fig. 2).¹³

⁸ Simion 1994-1995, 129; Bounegru, Zahariade 1996, 11; Matei-Popescu 2010, 255.

⁹ *ISM* V, 281; Bounegru, Zahariade 1996, 11; Matei-Popescu 2010, 253.

¹⁰ Fiederling, Paffgen, Pflederer 2017, 294-297, figs. 7-8. For a more accurate bathymetry see Trifanov, Mierlă, Stănică 2019, 185, pls. 15-18 and Anghel et al. 2022, 182-183, pl. 18.

¹¹ Bivolaru et al. 2022, 1-21.

¹² Bivolaru et al. 2022, 8.

¹³ Stănică et al. 2023, 159, fig. 6, pls. 18, 25.

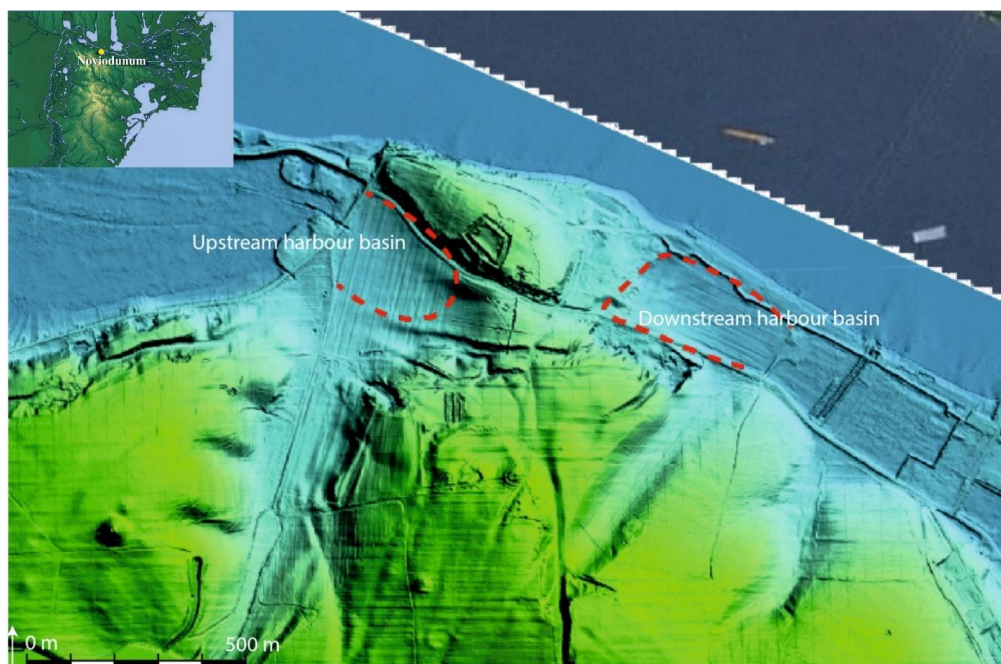


Fig. 3. The putative harbour basins at Noviodunum (after Bivolaru et al. 2022, fig. 10 with base map from ddni.ro).

Aegyssus

Moving downstream, the development of Aegyssus was relatively similar to Noviodunum. Although less important in the military geography of the Lower Danube, the ancient city was a secondary *statio* of *classis Flavia Moesica* from the second half of the 1st century AD onwards and (probably) also for the later Roman naval squadrons of *musculi Scythici* and *classis [in] Plateypegiae*. At least one brick discovered in the extramural area of the city bears the stamp of the Moesian fleet. The ancient city was a strategic location, the headquarters of several military units and the last trading centre before the delta.¹⁴ The location of the ancient harbour is still unknown. The city lay at the tip of a peninsula surrounded by the river Danube and a system of lakes today mostly drained. Some German aerial photographs of Tulcea made during World War II show clearly the peninsula taken up by the ancient city, encompassing Gloriei and adjacent streets. Also, a LIDAR capture supports this situation. Cores made in 2019 by a team from GeoEcoMar lead by Sorin Anghel eastward of the ancient city, in a low area, indicate a silted zone. On the other hand, a side-scan sonar combined with a sub-bottom profiler and magnetometer of a small sector of the Danube north of the archaeological site did not lead to relevant findings. The water in this area contains numerous anthropogenic remains, particularly metalliferous, and a thick layer of sediment due to the fact that the riverbank has been heavily modified in the last century.¹⁵ The recent investigations in the extramural area of the city, on Grădinarilor street no. 14, at the base of Monument Hill led to the discovery of the foundations of a building that may be associated with a late Roman bath.¹⁶ In the present discussion, this discovery is important because it indicates extensive habitation to the northwest of the ancient city, in an area considered floodable in antiquity. Even if today in this area the water level is at depths of 1-1.50 metres below the topsoil, in the Roman period the Danube riverbank was more secluded and allowed the development of port facilities, although these should be sought in the area located south-east of the ancient city (downstream), which offered favourable conditions (easy access and an area of refuge), the existence of two harbour basins, one just north-west of the city (upstream) cannot be excluded either (Fig. 4).

¹⁴ Nuțu 2018, 203-205.

¹⁵ Anghel et al. 2020, 400-401, fig. 7.

¹⁶ Nuțu, Cernamoriți 2022, 410.

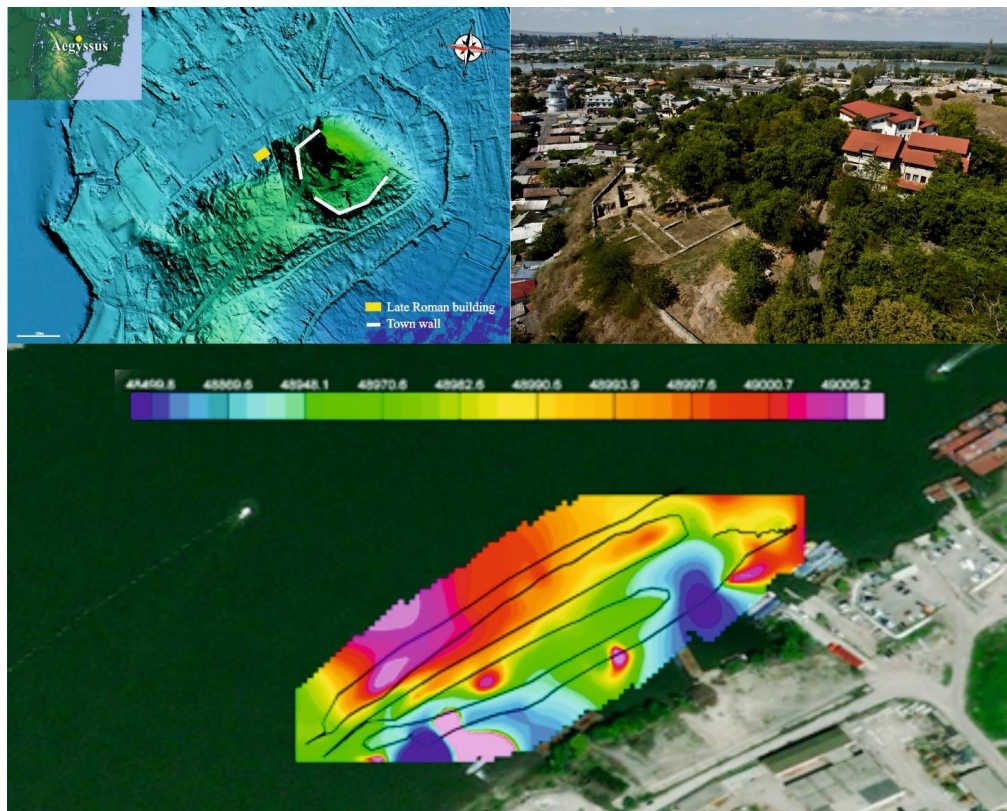


Fig. 4. LiDAR with Aegyssus area set on a peninsula (base map from ddni.ro) and aerial view of the ancient city looking north-west; below magnetometry of a sector of the Danube north-east of Aegyssus (after Anghel et al. 2020, fig. 7).

Halmyris

The fort of Halmyris was the last important bastion of Roman rule before the Pontus Euxinus and one of the *stationes* of *classis Flavia Moesica*. Several inscriptions reused as construction building material mention a *vicus classicorum* (sailors' village) there, the only one known in the Roman Empire.¹⁷ Other stamps on bricks and *tegulae* mentioned the *classis* of the Danube and western-Pontus. Due to its strategic location, the city was the headquarters of several military units and a possible base for the Late Roman naval squadrons of *musculi Scythici* and *classis [in] Plateypegiis*. Regarding the harbour of Halmyris, it was hypothetically located, based on aerial photographs and some archaeological research combined with geo-archaeological analysis towards the north and to the east of the ancient fort.¹⁸ An interdisciplinary approach indicates the existence of a channel (a paleo-meander of the Danube) to the north of Halmyris, confirming the hypothesis of a harbour facility in this area that was used throughout antiquity, until the 7th century AD.¹⁹ The paleo-cliff protected the city from the Danube's floods and the channel was fit for *liburnae* and later *navis lusoriae* – warships intended to protect the rivers of the later Roman Empire (Fig. 6). Whether the squadron of *musculi scythici* and of the *classis [in] Plateypegiis* were operating from Halmyris as their main base, as Zahariade suggested,²⁰ is still a debated topic. If we consider the geographical location and the military importance of the fortification, the likely answer is affirmative. Halmyris acted, perhaps, as the headquarters of the latter two, although it is very likely that *Plateypegia* was a place to be located somewhere in the Danube Delta (Fig. 5).²¹

¹⁷ Suceveanu, Zahariade 1986, 109-120. For a different interpretation see Matei-Popescu 2016, 217-226.

¹⁸ Bounegru, Zahariade 1996, 87-88, fig. 24; Romanescu, Miha-Pintilie, Carboni 2018, 35, fig. 3/j.

¹⁹ Giaime et al. 2019, 315-324, fig. 2; Bivolaru et al. 2021a, 536-539, fig. 4.

²⁰ Zahariade 2009, 353.

²¹ Bounegru, Zahariade 1996, 69; Nuțu 2022, 590.

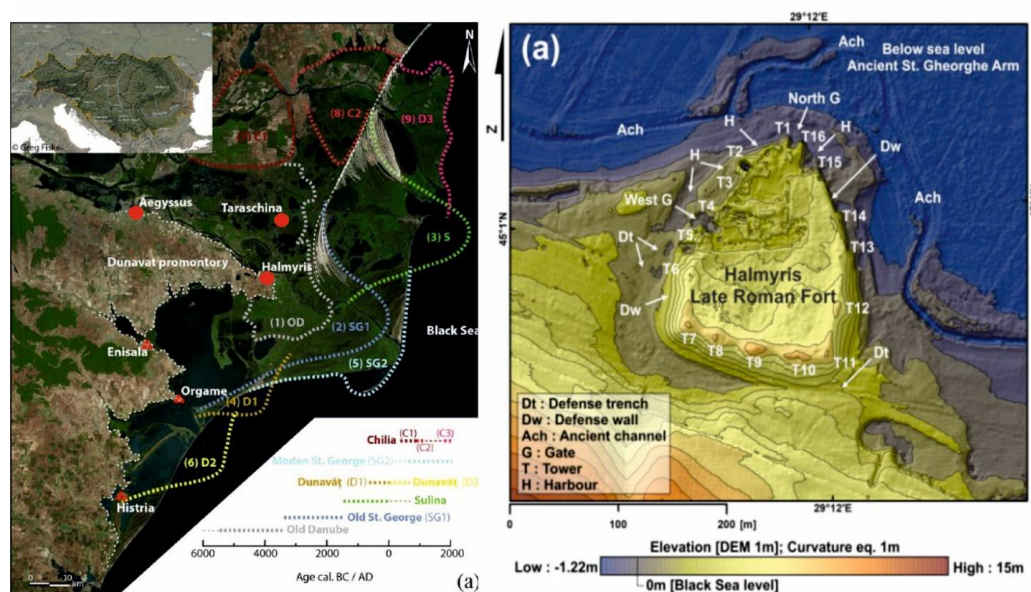


Fig. 5. The Danube Delta with Aegyssus, Halmyris and Taraschina (after Giaime et al. 2019, fig. 1); Halmyris and the putative harbour area (after Romanescu, Miha-Pintilie, Carboni 2018, fig. 4/a).

This does not exclude, however, the existence of secondary bases. Such a base may have existed at Taraschina, one of the rare dry areas of the delta, approx. 20 km north of Halmyris. This is especially true in the case of the *musculi Scythici* (from *mydion*, a Greek type of ship): their fast ships were perfectly adapted for navigating in the delta channels and the near coastal area. Besides, the archaeological materials discovered during fieldwork reveal a good number of Early and several Late Roman pottery fragments.

The ancient occupation of this dryland in the heart of the delta spanned from the Hellenistic period until the first half of the 3rd century AD, with a large majority of the pottery assemblage stemming from the Roman period.²² Among the ceramic materials, transport amphorae for wine and even fish products stand out, showing the long-distance connections between this remote place and the Pontic and Aegean areas, obviously through the Moesian cities, primarily Halmyris.²³

Orgame / Argamum

The Greek colony Orgame and later the Roman city of Argamum played a pivotal role in the seaborne commerce of north-east Moesia Inferior and later province of Scythia. Aerial photographs, cores and LiDAR approaches indicate that the harbour was probably located south of the settlement, in a lagoon naturally sheltered from the north-south longshore drift by the Cape Dolojman.²⁴ Sediment cores made south of the cape support the idea of a port facility there during the Graeco-Roman period, especially since this area is the only one that offers shelter from the north winds. Today, the area is a shallow swamp covered with abundant vegetation (common reed – *Phragmites australis*) and no archaeological research can be carried out. However, a recent project that used ultralight geophysical instruments onboard an unmanned aerial vehicle (UAV) allowed obtaining some anomalies that could be verified in the future by other methods. Although no artificial modifications (piers or jetties) were observed south of Cape Dolojman, the drone-borne magnetic survey indicates some archaeological structures buried in the silt.²⁵ Thus, in antiquity, the settlement had a natural harbour strategically located due to its access to the Danube and the Black Sea creating a connection with the Roman *limes* along the Saint George branch of the Danube and Peuce Island (Figs. 7-8).²⁶ During a 2016 underwater survey, several possible targets were identified, including some wrecks of the modern period (probably local fishing boats) both in the northern area of Cape Dolojman as

²² Nuțu 2022, 581-591.

²³ Nuțu 2022, 590.

²⁴ Bony et al. 2015, 186-203; Dimitriu et al. 2021, 3-4, fig. 3; Fiederling et al. 2023, 380-386.

²⁵ Dimitriu et al. 2021, 4.

²⁶ On the hypothetically identification of Peuce Island see Romanescu et al. 2015, 521-535.

well as in the south where the putative harbour of the city was located.²⁷ Since a segment of the town wall collapsed during the early Byzantine period (around AD 543)²⁸ into the Razim Lake (former Halmyris Bay), no submerged structures indicating anthropic activity were clearly identified.

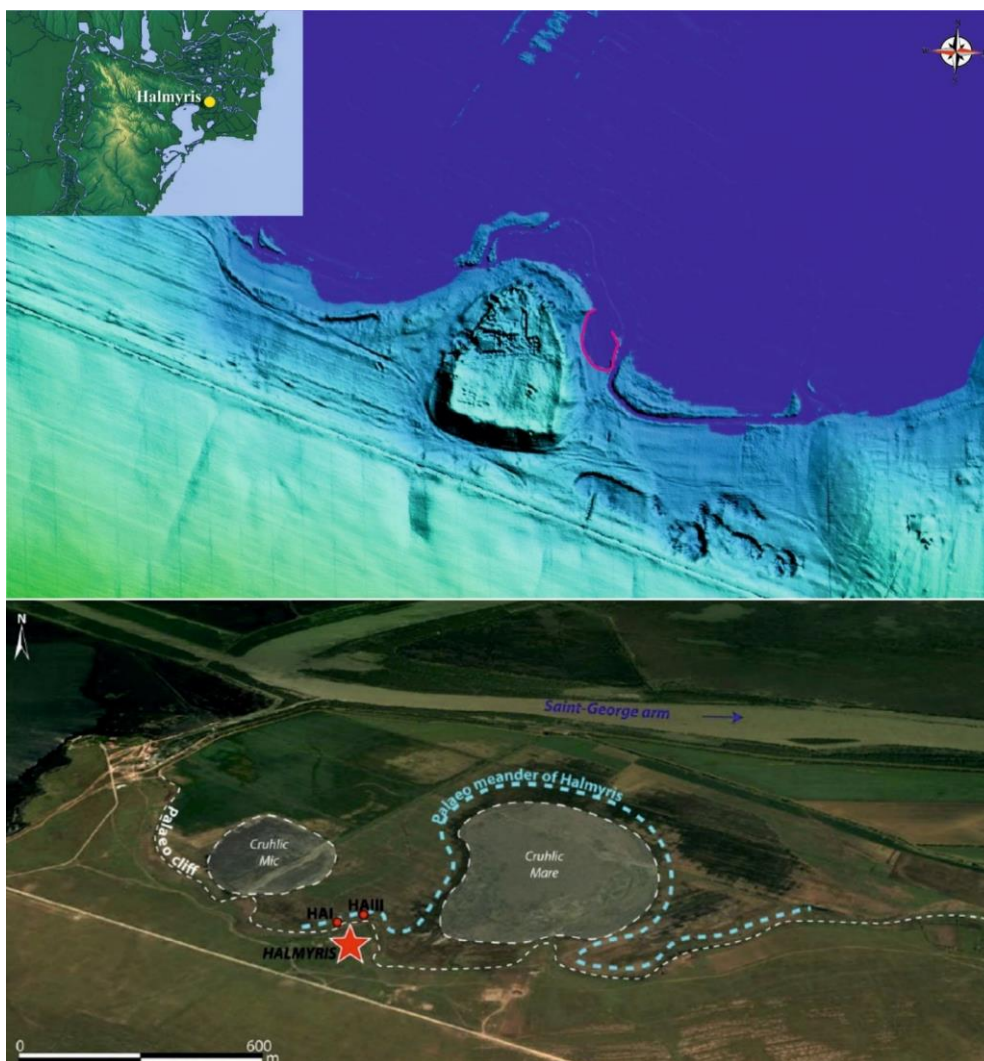


Fig. 6. LiDAR of Halmyris area (base map from from ddni.ro) – note to the north-east a land retreats suitable for a harbour (magenta); the palaeo-meander of Halmyris (after Giaime et al. 2019, fig. 2).

Bisericuța Islet

A Cretaceous remnant, Bisericuța Islet lies 2.5 kilometres east of Argamum, where a fortification was built for navigation control on its top at a height of 9 m.²⁹ This small outpost overlooked the southernmost distributary of the Danube, and archaeological materials discovered during small-scale fieldwork attest to the importance of this place from the Neolithic and Bronze Age to the Middle Byzantine period.³⁰ During field seasons 2016 and 2017 two side-scan sonar surveys took place on waters around Bisericuța Islet. Already in 2002 Ionescu & Gamureac postulated the existence of two underwater walls off the northern part of the

²⁷ Fiederling et al. 2023, 383-390, figs. 9-12. On the other hand, as in the case of Histria (Bivolaru et al. 2021, 308), other anchorages to the west cannot be excluded, perhaps in the so-called "La Zimbru" area where one of the craft areas of the ancient city was located (Coja 1977, 166-167, pls. 6-9).

²⁸ Chirvasie 2011, 101-111 for the general erosion of the northeastern cliff at Argamum; Mărgineanu Cârstoiu, Apostol 2017, 95-97, figs. 35-36.

²⁹ Romanescu, Bounegru 2009, 497; Bony et al. 2015, 200.

³⁰ Coja 1977, 165-166, pl. 5; Ionescu, Gămureac 2006, 375-395.

islet, around 8 to 10 meters from the beach, running from east to west.³¹ They connected these walls with the possible existence of a small harbour destroyed by erosion. During the 2016 field survey, the archaeological situation could be described more precisely. A structure similar to a double wall was identified and tentatively associated with a pier or even with a breakwater.³² Several other anomalies were identified during a 2017 Polish-Romanian side-scan sonar survey and will be revisited in the near future.³³

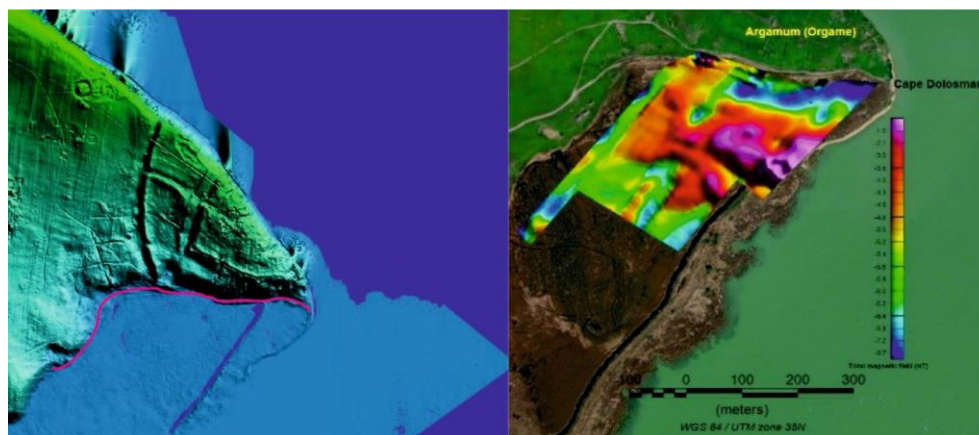


Fig. 7. LiDAR of Orgame/Argamum with the putative harbour marked with magenta (base map from ddni.ro with additions by the authors); map of total geomagnetic field in the putative harbour basin south of the ancient site (after Dimitriu et al. 2021, fig. 3/left).

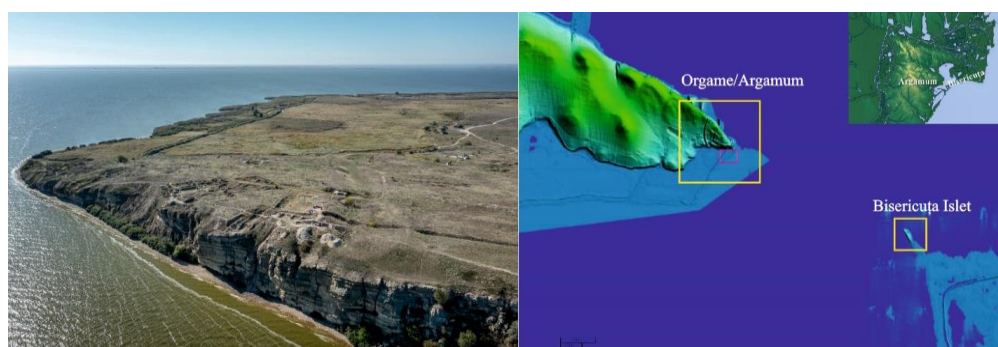


Fig. 8. Aerial view of Orgame/Argamum looking south-east; LiDAR of Orgame/Argamum – Bisericuța Islet area (base map from ddni.ro with additions).

Gura Portiței – The Early Roman shipwreck Portița A

Resuming the topic of underwater research, the Portița A wreck is, without question, the crown jewel of Romanian marine archaeology. This sea-going freighter sunk about four meters, not far from the Portița inlet in the second half of the 2nd century AD.³⁴ Gura Portiței (Engl.: the mouth of the small gate) is one of the small channels connecting until recent time the Razelm-Golovița-Sinoie lagoon system with the Black Sea and it is a remnant of the ancient Halmyris Bay. The ship's cargo consisted of so-called narrow-neck light-clay Shelov C / Vnukov SinIVC amphorae³⁵ (or C2 after Naumenko's typology).³⁶ But, above all, it is beautifully preserved, with most of the wooden structural elements still *in situ*. Whether the ship was en route to its port of origin with emptied containers is still debatable. This vessel is, however, an excellent example of the shipbuilding techniques common in the Pontic basin and one of the rare well-

³¹ Ionescu, Gamureac 2006, 380.

³² Fiederling et al. 2023, 391.

³³ Lemke et al. 2018, 94-95, fig. 8/b.

³⁴ Pflederer, Fiederling, Ahl 2016, 5-6; Nuțu et al. 2017, 56-58; Dimitriu et al. 2018, 855-862; Nuțu et al. 2019, 68-72; Nuțu et al. 2020, 154-162; Fiederling et al. 2023a, 392-407.

³⁵ Shelov 1986, 397, fig. 1/c; Vnukov 2016, 42, fig. 4/1-10; also Dyczek 2001, 215 and Paraschiv 2013, 213-217 for regional distribution.

³⁶ Naumenko 2017, 22-31, fig. 4/4.

preserved ones discovered to date. Hundreds of additional targets were identified during scan-side and magnetometer measurements in collaboration with GeoEcoMar and Respiro Diving during three years of field campaigns, but the lack of funds allowed only a small part of them to be verified. The almost 100 fully preserved amphorae retrieved from the cargo show little variations (Figs. 9-10).

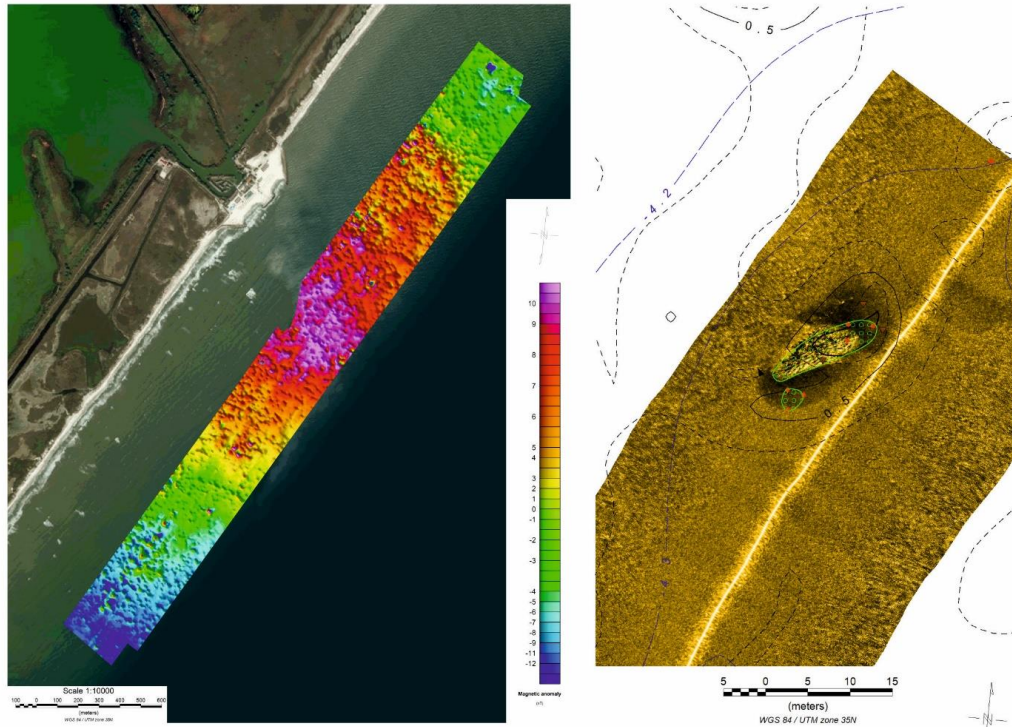


Fig. 9. Magnetic anomalies at Gura Portiței and side-scan of the ancient shipwreck *Gura Portiței* – A with integrated geophysical data (after Dimitriu et al. 2018, figs. 6/left and 7/right).

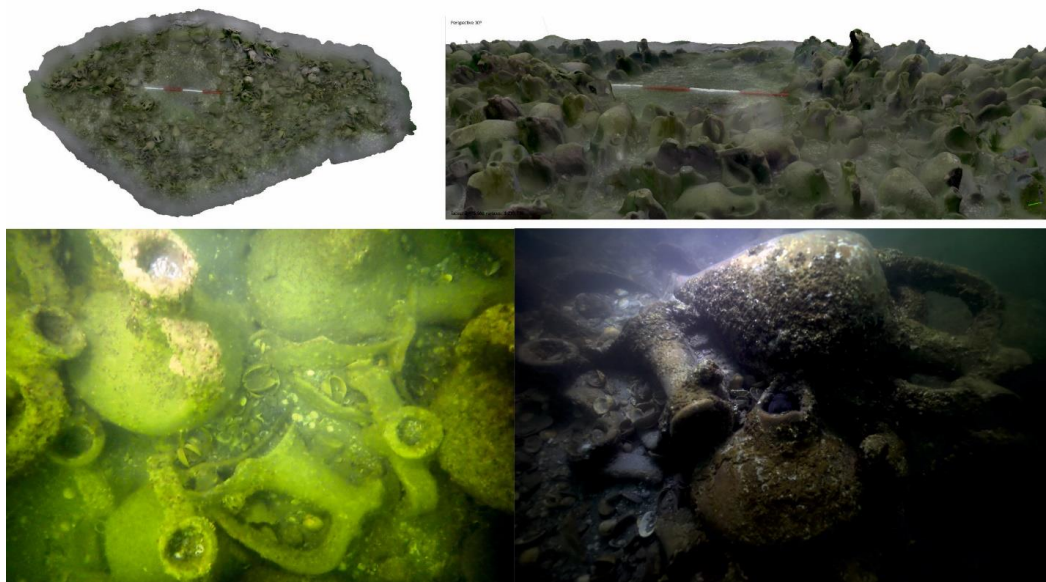


Fig. 10. Photomosaic of the shipwreck and perspective 30°; Photos of the amphorae in the hold of the shipwreck still *in situ*.

Archaeological Materials Onshore and Offshore South of Gura Portiței

The potential offered by the discovery of some archaeological materials onshore or offshore, in shallow waters along the coast, points to some areas with possible wrecks or submerged sites. One such findspot

is the waterfront between Gura Portiței and Periboina-Edighiol where over the years many pottery fragments were discovered. Most of them belong to the "light clay narrow-neck" group (Shelov C and D)³⁷, but there are also specimens of north-Pontus "fish amphorae" Zeest 75, Kăpitan 2, "carrot-shaped" from Sinope and two Agora M273 amphorae with graffiti. To these, we can add some shards from the so-called 'table' pitcher of 2nd-3rd centuries AD and several Middle-Byzantine amphora fragments. Among this assemblage, a group of twelve amphorae stands out due to the stamps on their necks. The closest analogies clusters in the north of Pontus, especially at Tanais, but also east-Carpathians were specimens bearing the Θ (perhaps the number 9), the Α(Ι?) and ΣΩΜ (Σωμένης) stamps were recorded over the years.³⁸ The clustering of these stamped amphorae and the rest of the Hellenistic, Roman and Middle Byzantine pottery south of Portița Inlet could indicate the existence of wrecks sunk over the centuries in this area due to the storms that break out quickly (Figs. 11-12).



Fig. 11. Map of Gura Portiței-Periboina-Edighiol areas (from Dinu et al. 2015, fig. 1 with additions).

³⁷ Shelov 1986, 395-400.

³⁸ Nuțu, forthcoming.

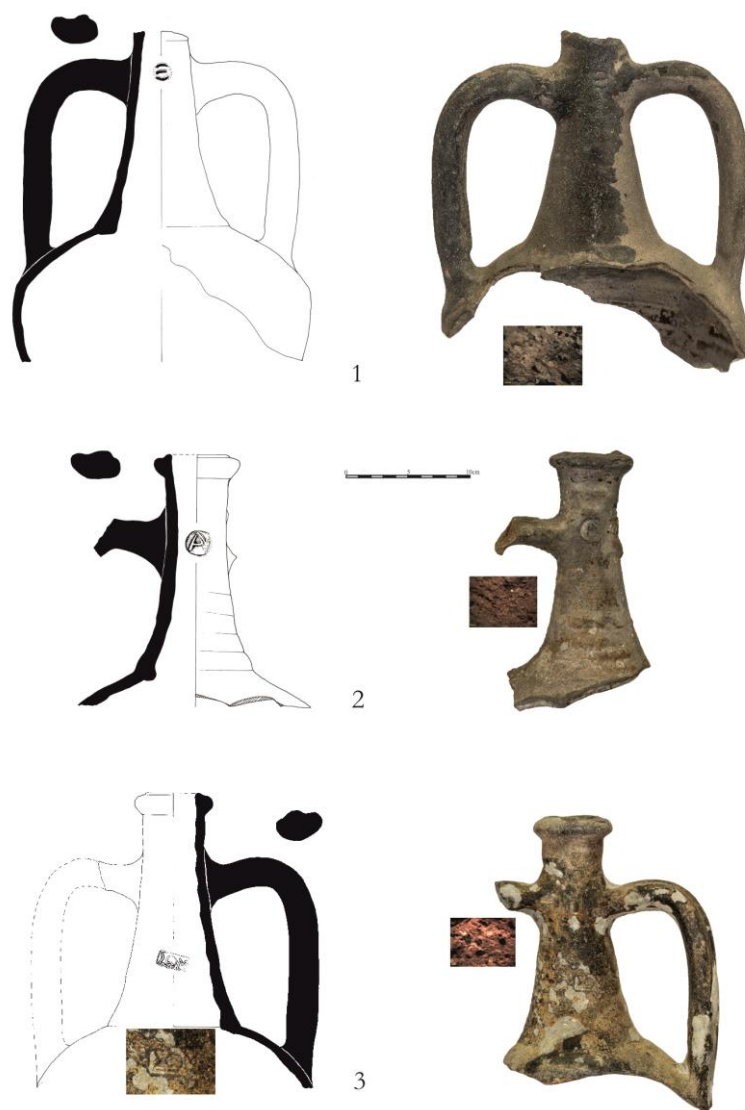


Fig. 12. Amphorae discovered south of Gura Portiței bearing the stamps Θ, A(P) and ΣΩΜ (after Nuțu, forthcoming).

Sulina – The Maritime Basin

The so-called Maritime or Great Basin of Sulina was originally a natural swamp, and later a fairly shallow reservoir with a maximum depth of 9-10 meters. It was initially a shallow bay south of the Sulina estuary,³⁹ where many ships failed to reach the entrance of the mouth of the distributary even a hundred years ago due to demanding navigational conditions.⁴⁰ In 1850, the mouth of the Sulina was, according to a very vivid description, ‘the sad sight of a forest of masts stuck in the sand and was sown with the hulls of foreign ships’.⁴¹ In 2017, a Polish-Romanian archaeological mission⁴² identified several early modern wrecks (Figs. 13-14). Of these, the most promising seemed to be Sulina A wreck, located at 6 m depth in practically zero visibility. Still, the hull could be measured at about 30 meters in length, made of wood reinforced with metal elements. Frames and planks are still visible. Cannonballs, possibly also cannons, cluster in the hold of the ship together with some cannon-wheels. The chronology is assured by a chain

³⁹ On the coastal evolution of Sulina mouth see Stănică, Dan, Ungureanu 2007, 555-563 and Budileanu 2013, 49-55.

⁴⁰ Lemke et al. 2018, 92-94, fig. 4.

⁴¹ Drăghicescu 1943, 367.

⁴² Investigating within the ArchLiMar project: <https://www.archeologia.uw.edu.pl/en/archlimar>.

patented around 1810 ensuring a *terminus post quem* (Fig. 15).⁴³ A major achievement of the mission was the inclusion of the Great Basin in the Romanian List of Monuments as an important heritage site, based on the several discovered shipwrecks.⁴⁴

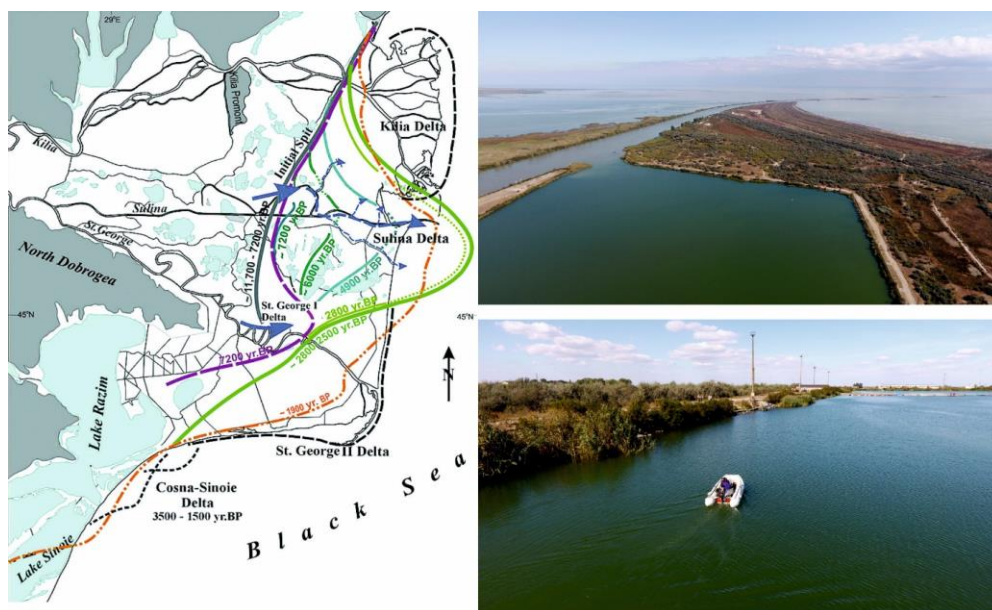


Fig. 13. Evolution of the Danube Delta during the Holocene (after Panin, Overmars 2012, fig. 3); aerial view of Sulina-Maritime Basin from the west and east (©ArchLiMar Project).

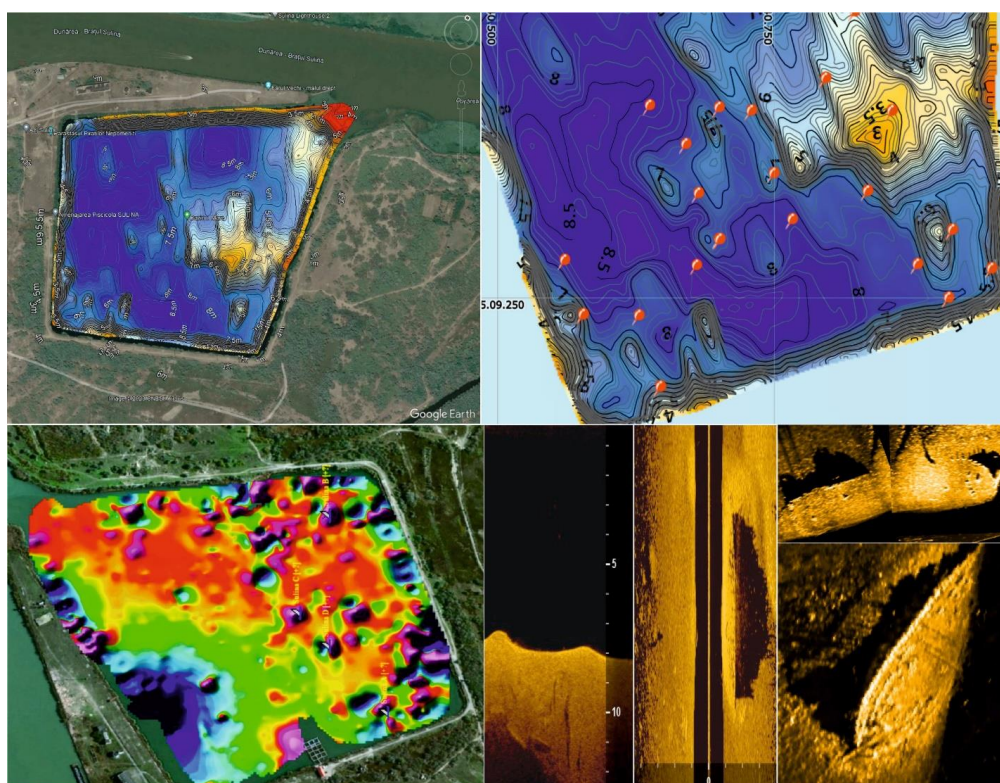


Fig. 14. Bathymetry and targets identified at Sulina-Maritime Basin (©ArchLiMar Project); magnetometry and acoustic images of the shipwrecks from the basin (after Dimitriu et al. 2019 and ©ArchLiMAR Project).

⁴³ Lemke et al. 2018, 93-94, fig. 5-7; Dimitriu et al. 2019; Lemke, Bajtler, Trusz 2019, 48, fig. 3. For the first mention of some 'wooden' ships at Sulina – Bazinul A.Z.L. (The Maritime Basin) see Roibu 2016, 30-34 and Dobre 2016, 205-206.

⁴⁴ Register of legislation: <https://legislatie.just.ro/Public/DetaliuDocument/220429>.

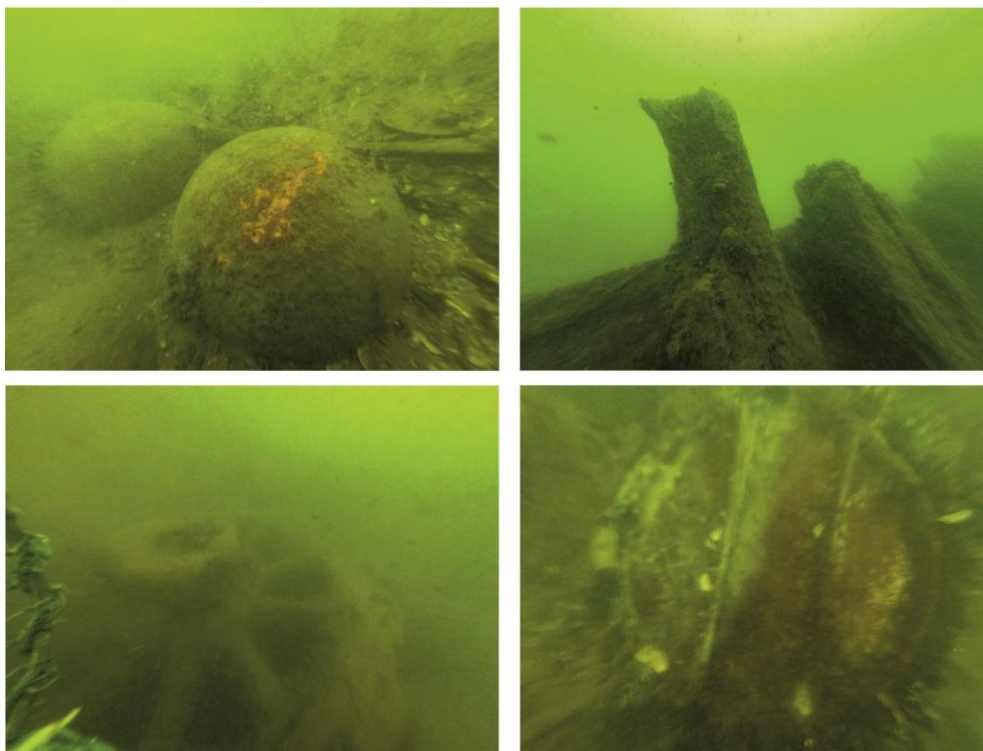


Fig. 15. Sulina-Maritime Basin – *Sulina A* shipwreck; note the cannonballs, cannon-wheels and a bull's eye *in situ* (©ArchLiMar Project).

Other areas south of Sulina, between Canal Sonde and Gârla Împușita were investigated during the 2019 season. Although in this area a large Hellenistic, early Roman and Middle Byzantine pottery assemblage was retrieved out of the water and along the coastline, no clear context was identified (Fig. 17). Most of the finds were located on sandy patches with densely grassed bottom at a depth of approximately half a meter. The strong currents and low visibility cause the rise of marine sediments, making full observation underwater difficult.⁴⁵ A non-invasive underwater survey was conducted in the selected area. The survey covered more than 1.300 hectares and revealed numerous shallows and underwater sand layers at a depth of approximately 0.5 metres (Fig. 16). Due to the substantial quantity of organic bottom sediments, it was impossible to thoroughly examine all shallows.

THE FUTURE OF UNDERWATER ARCHAEOLOGY IN ROMANIA – IS THERE ANY?

Regarding the future of underwater archaeology in Romania several dire straits have to be navigated. Among these, the lack of or insufficient funds is - as always - a real plague in archaeology. In addition, one can add several new amendments to the Romanian Law regarding diving regulations and the absence of a master's degree level on nautical archaeology in the country. Last, but not least, a governmental (national/regional) organization(s) dealing with underwater research in Romania is missing.

It is imperative to consider the environment in which underwater research is conducted. The Danube Delta is slowly but constantly changing. The challenges of underwater and harbour surveys, and the necessity of repeated research, are caused by coastal erosion, which results in depositing or landslide, and the dynamics of the sea, which currents carry and remove layers of sand and silt, covering and revealing the remains of ancient human activity.

⁴⁵ Lemke et al. 2018, 95-97, figs. 9-10.

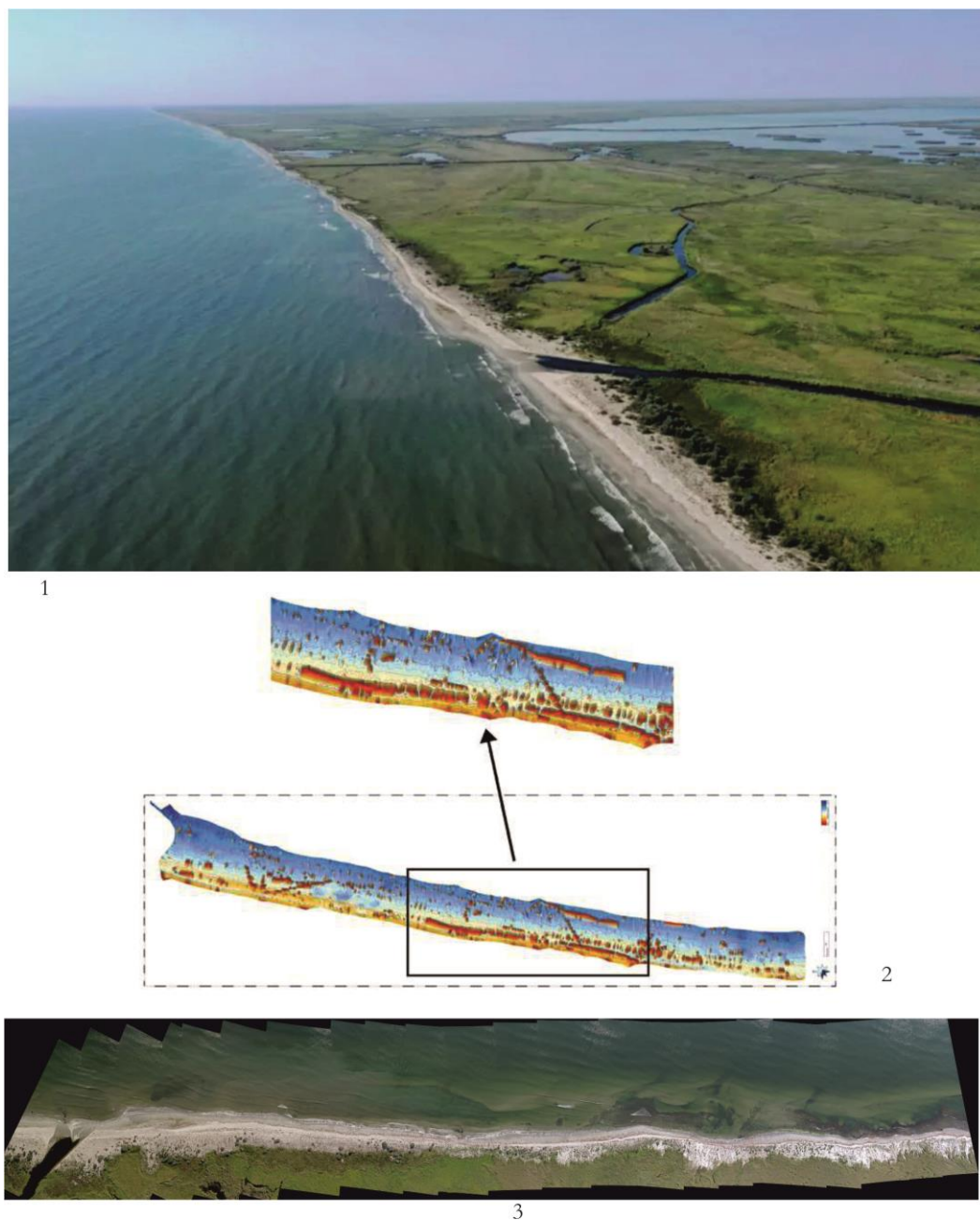


Fig. 16. South of Sulina–Gârla Împușita and Sonde Canal: aerial view, bathymetry, photogrammetry (©ArchLiMar Project).

However, the benefits of strengthening this discipline in Romania are obvious. Among them, a systematic and comprehensive survey along Romania's Black Sea coast is foreseen as a future project. It will make it possible to reconstruct the palaeo-shoreline with settlements and seaborne routes taken by ships transporting, among others, supplies for the legionary forts on the Danube.



Fig. 17. South of Sulina–Gârla Împutița and Sonde Canal: pottery discovered onshore and offshore (transport amphorae and coarseware) (©ArchLiMar Project).

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