



ISTRAŽIVANJE BRODOLOMA IZ 1. ST. PR. KR. KOD RTA LETAVICE NA OTOKU PAGU

Research of a 1st-century BC shipwreck off Cape Letavica on the island of Pag

UVOD

Brodolom kod rta Letavice za sada je jedino odlično očuvano nalazište u hrvatskom podmorju, nezaštićeno željeznim kavezom, na kojem se redovito provode turistička ronjenja, ali i arheološka istraživanja u kojima sudjeluju svi zainteresirani ronionci. Riječ je o brodskom teretu od oko četiristo amfora tipa Lamboglia 2, otkrivenom 2018. godine, koji leži na dubini od 32 do 38 m, ocrtavajući linije potopljenog broda (Radić Rossi, Dorušić 2019).

Nakon početne dokumentacijske kampanje, provedene po otkriću nalazišta, istraživanja se kontinuirano provode od 2020. godine. Financijska sredstva tijekom tri godine osigurana su iz vlastitih izvora poduzeća Foka d. o. o., Centra za podvodna istraživanja *Navalis* i Sveučilišta u Zadru, te priku-

INTRODUCTION

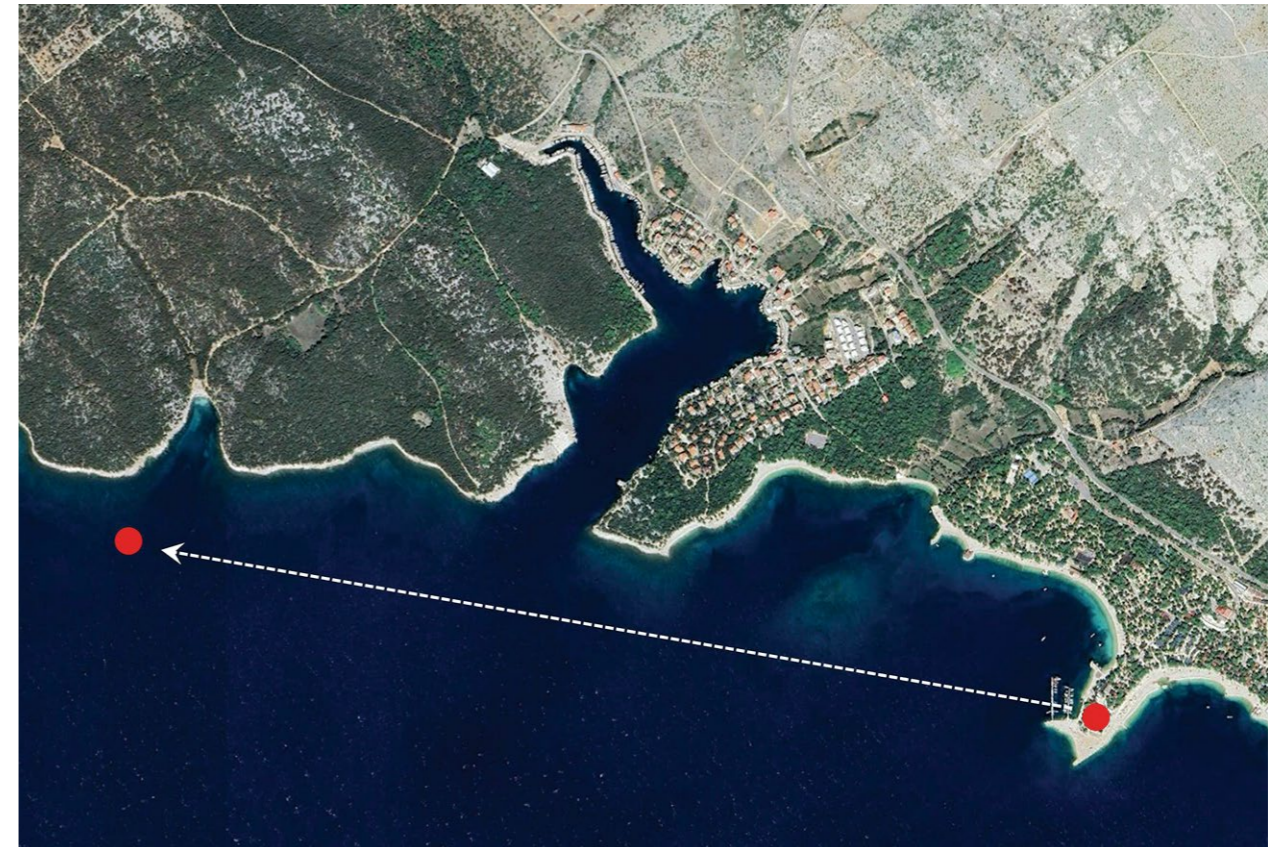
The shipwreck off Cape Letavica is currently the only well-preserved underwater site in the Croatian waters not protected by an iron cage, where tourist diving is regularly carried out, as well as archaeological research in which all interested divers participate. It is a cargo of about four hundred Lamboglia 2 amphorae, discovered in 2018, lying at a depth of 32 to 38 m, outlining the contours of the sunken ship (Radić Rossi, Dorušić 2019).

After the initial documentation campaign, carried out after the discovery of the site, research has been carried out continuously since 2020. For three years the funding was provided by the Foka Company, the Center for Underwater Research *Navalis* and the University of Zadar, as well as



Irena RADIĆ ROSSI
irenaradicrossi@gmail.com

Vedran DORUŠIĆ
fokadive@gmail.com



Položaj Ronilačkog centra Foka i nalazišta kod rta Letavice (podloga: Google Earth Pro)
Location of the Foka Diving Center and the site off Cape Letavica (source: Google Earth Pro)

pljenih donacija, uz kontinuiranu podršku Kampa Šimuni. Veći dio sredstava za istraživanja 2023. godine osiguralo je Ministarstvo kulture i medija RH.¹

REZULTATI DOSADAŠNJIH ISTRAŽIVANJA

Na nalazištu su do sada pronađene tri olovne prečke antičkih olovno-drvenih sidara, korodirani metalni predmet nalik na valosijek, petnaest čitavih ili djelomično oštećenih keramičkih posuda, keramička uljanica i jedanaest diskoidnih keramičkih čepova amfora (Radić Rossi, Yamafune 2023). Osim toga, pronađeni su ostatci metalnog lima za koji se pretpostavljalo da pripada metalnoj posudi. Tijekom konzerviranja i restauriranja na Umjetničkoj akademiji Sveučilišta u Splitu utvrđeno je, međutim, kako je riječ o dvjema metalnim posudama koje su se u trenutku potonuća nalazile jedna u drugoj. Konzervatorsko-restauratorski postupak na metalnim predmetima još je uvijek u tijeku, ali je

¹ Istraživanje je provedeno u organizaciji Odjela za arheologiju Sveučilišta u Zadru i Ronilačkog centra *Foka* iz Šimuna, uz sudjelovanje arheologa iz Arheološkog muzeja u Zadru i sa Sveučilišta na Malti, djelatnika Ronilačkog centra *Foka* i ronilaca volontera iz Hrvatske i Slovenije.

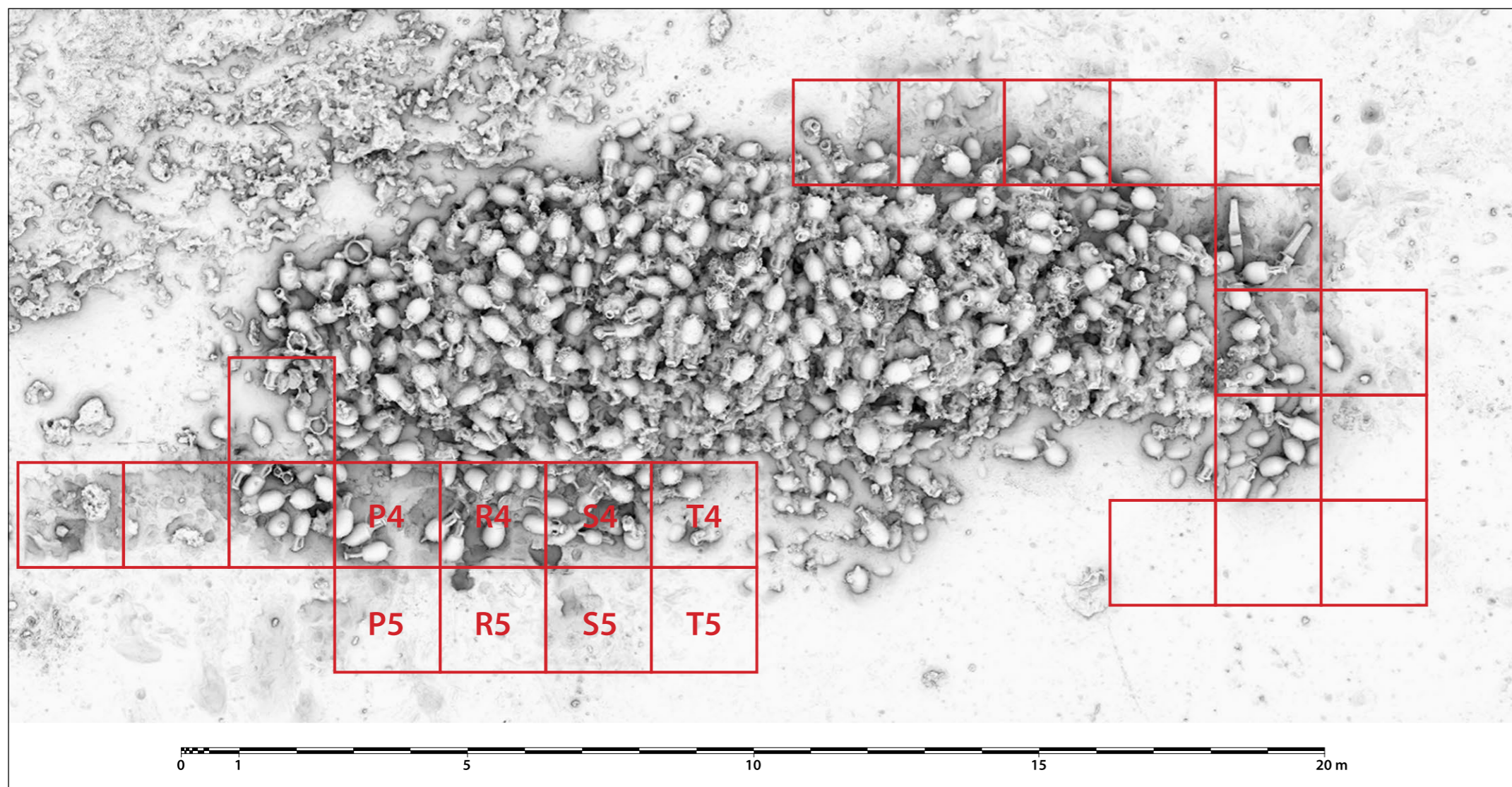
by the collected donations, with the continuous support of Camping Village Šimuni. Most of the funding for research in 2023 was provided by the Ministry of Culture and Media of the Republic of Croatia.¹

RESULTS OF THE PREVIOUS RESEARCH

So far, the site has yielded three lead stocks of ancient lead-wooden anchors, a corroded metal object similar to a cutwater, fifteen whole or partially damaged ceramic vessels, a ceramic oil lamp and eleven discoid ceramic amphora stoppers (Radić Rossi, Yamafune 2023). The remains of a metal sheet were also found, assumed to belong to a metal container. During conservation and restoration at the Art Academy of the University of Split, it was determined, however, that these were two metal containers that were inside each other at the time of sinking. The conservation-restoration

¹ The research was organized by the Department of Archaeology of the University of Zadar and the Foka Diving Center from Šimuni, with the participation of archaeologists from the Archaeological Museum in Zadar and the University of Malta, employees of the Foka Diving Center and volunteer divers from Croatia and Slovenia.





Položaj pomoćnog metalnog mrežišta; crvenom bojom označeni su novi kvadrati dodani tijekom istraživačke kampanje 2023. (podloga: K. Yamafune)
Position of the auxiliary metal grid; new squares added during the 2023 research campaign are marked in red (base: K. Yamafune)

a rather poor condition. Nevertheless, fragments of the frames and planks were recognized, and the technique of connecting the planks with the technique of mortise-and-tenon joints was also confirmed. Analyses of the wooden material showed that the found frames and planking were made of elm (*Ulmus* sp.), wooden treenails that used to connect the frames with the planking were made of olive (*Olea europaea* L.), and the tenons used to connect the planks of holm oak (*Quercus ilex* L.). In addition, a wood sample from the lead stock showed that the wooden part of the anchor was also made of holm oak.⁴

THE COURSE AND RESULTS OF THE 2023 RESEARCH

During the research campaign in 2023, the underwater excavation continued from the southwestern part of the ship structure towards the central part of the ship. Since there was no need for physical protection over the investigated part of the site at the end of last year's campaign, this year the research began with the installation of an auxiliary metal grid. It covered the western part of the position on which work had already been done during the past year, while the eastern part covered the area where no underwater excavation had been carried out so far. In squares S 4/5 and T 4/5, a large quantity of lead sheet was observed in the form of sheet metal plates connected to each other with metal nails. Although at first it looked like it was the lead sheathing of the hull, the situation at the site after a few days of research suggested that it was some other structure made of lead sheet. Given that ceramic objects are found on its upper and lower sides, the situation does not correspond to the position of the lead sheathing, but it is likely that it is an element of the galley. Since the lead has not been completely cleaned, its documentation is forthcoming.

dovršen na keramičkim nalazima.²

Tijekom dosadašnjih istraživanja s nalazišta su izvađene i dvije čitave amfore. Na amfori izvađenoj 2018. godine, tijekom postupka čišćenja, uočen je pečat ANTA.EV, utisnut na vratu. Težina amfore iznosi 22 kg, a kapacitet 38 l, što bi značilo da težina pune amfore iznosi 60 kg. Konzervatorsko-restauratorski zahvat na amfori izvađenoj 2022. godine, koja se odlikuje potpuno očuvanim izduženim šiljkom koji štiti dno posude, još je uvijek u tijeku.³

U gornjem, sjeveroistočnom dijelu nalazišta uočeni su elementi drvene brodske konstrukcije u prilično lošem stanju. Usprkos tomu, raspoznati su ulomci brodskih rebara i platica, a potvrđena je i tehnika međusobnog spajanja platica sistemom

process on the metal objects is still ongoing, but it has been completed on the ceramic finds.²

During the research so far, two complete amphorae have been removed from the site. On the amphora taken out in 2018, during the cleaning process, the stamp ANTA.EV was observed, stamped on the neck. The weight of the amphora is 22 kg, and the capacity is 38 l, which would mean that the weight of the full amphora is 60 kg. The conservation-restoration work is still ongoing on the amphora taken out in 2022, which is characterized by a completely preserved elongated spike that protects the bottom of the vessel.³

In the upper, northeastern part of the site, elements of wooden ship structure were observed in

utora i jezičaca. Analize drvene građe pokazale su da su pronađena rebra i oplata bili izrađeni od briješta (*Ulmus* sp.), drveni čavli kojima su rebra spajana za oplatu od masline (*Olea europaea* L.), a jezičci kojima su međusobno spajane platice od hrasta crnike (*Quercus ilex* L.). Osim toga, uzorak drveta iz olovne prečke pokazao je kako je i drveni dio sidra bio izrađen od hrasta crnike.⁴

TIJEK I REZULTATI ISTRAŽIVANJA 2023.

Tijekom istraživačke kampanje 2023. podmorski iskop nastavljen je od jugozapadnog dijela brodske konstrukcije u smjeru središnjeg dijela broda. Kako krajem prošlogodišnje kampanje nije bilo

² Konzervaciju i restauraciju keramičkih i metalnih nalaza provode Miona Miliša i Filip Rogošić na Odsjeku za konzervaciju – restauraciju Umjetničke akademije Sveučilišta u Splitu.

³ Konzervatorsko-restauratorski zahvat na dvjema izvađenim amforama provode Zdenka Vrgoč i Marina Čurković Madiraca u Međunarodnom centru za podvodnu arheologiju u Zadru.

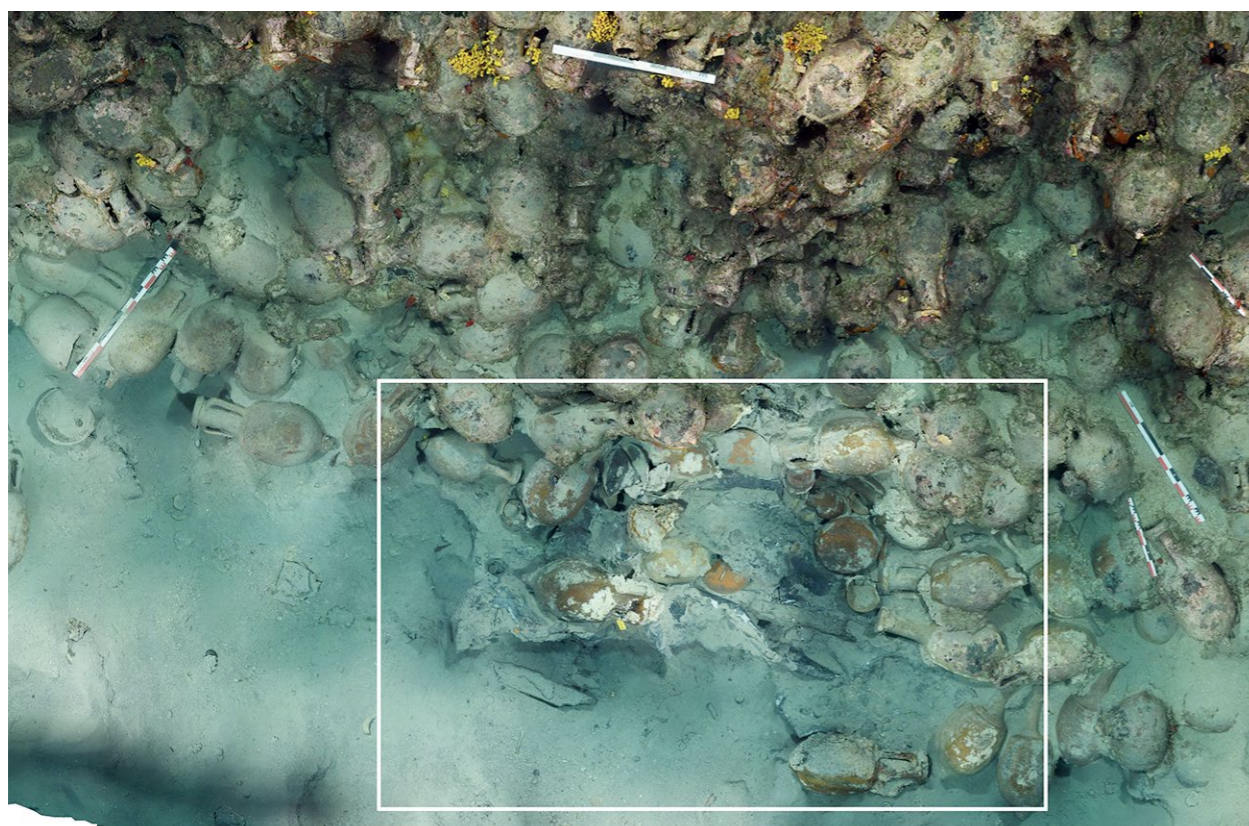
² The conservation and restoration of ceramic and metal finds is carried out by Miona Miliša and Filip Rogošić at the Department for Conservation - Restoration of the Art Academy of the University of Split.

³ Zdenka Vrgoč and Marina Čurković Madiraca are carrying out conservation and restoration work on the two collected amphorae at the International Center for Underwater Archaeology in Zadar.

⁴ Analize drvene građe provela je Alba Ferreira Dominguez iz arheološko-konzervatorske udruge Ipso Facto (Marseille, Francuska).

⁴ The analyses of the wooden material was carried out by Alba Ferreira Dominguez from the archaeological-conservation association Ipso Facto (Marseille, France).





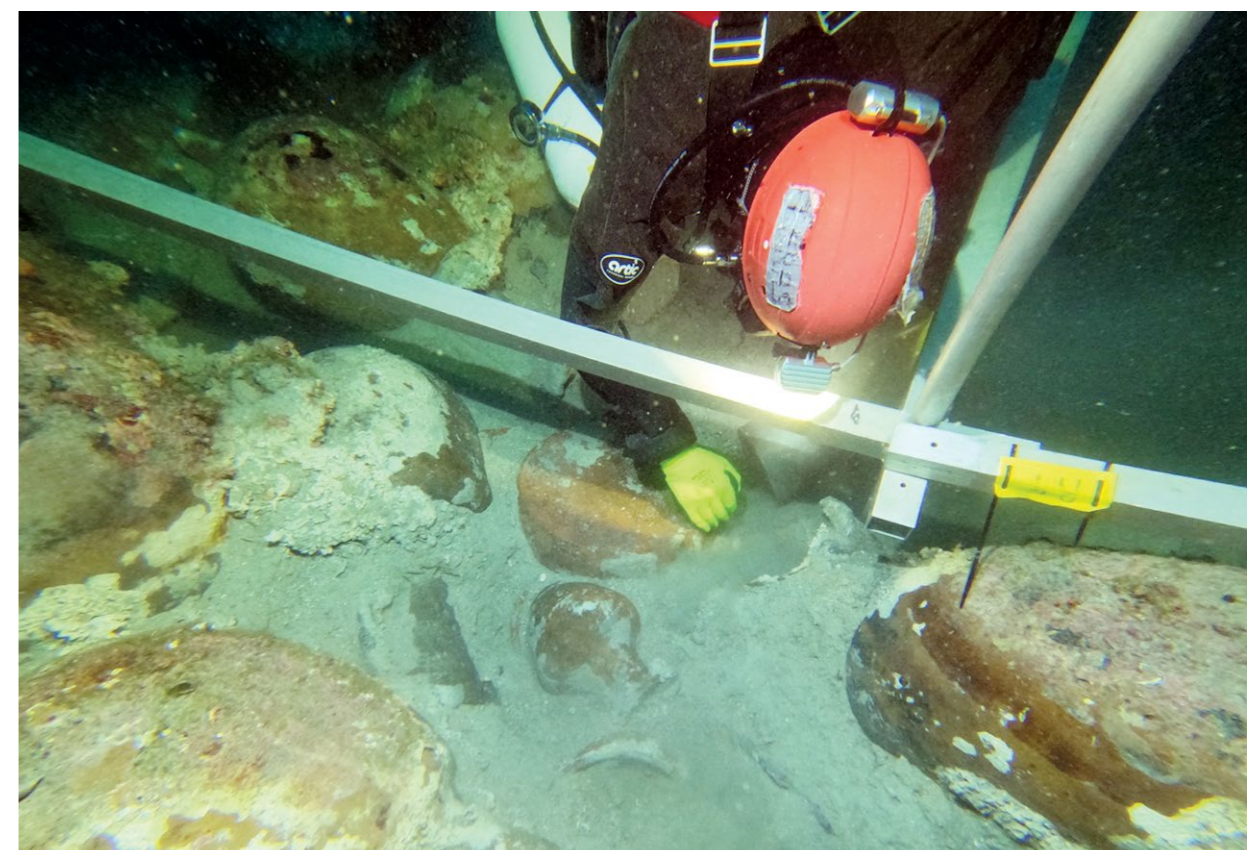
..... Površina na kojoj se proteže metalni lim, označena na fotogramterijskoj snimci istraženog dijela nalazišta (podloga: D. Taras)
 Surface where the metal sheet was found, marked on the photogrammetric image of the investigated part of the site
 (background: D. Taras)

potrebe za fizičkom zaštitom nad istraženim dijelom nalazišta, ove je godine istraživanje započelo postavljanjem pomoćnog metalnog mrežišta. Ono je zapadnim dijelom prekrilo poziciju na kojoj se već radilo tijekom protekle godine, dok je istočnim dijelom pokrilo površinu na kojoj do sada nije proveden podmorski iskop. U kvadratima S 4/5 i T 4/5 uočena je velika količina olovnog lima u obliku limenih ploča međusobno spojenih metalnim čavlima. Iako je u prvom trenutku izgledalo kako je riječ o olovnoj oblozi broskog trupa, situacija na nalazištu nakon nekoliko dana istraživanja sugerirala je da je u pitanju neka druga struktura izrađena od olovnog lima. S obzirom na to da se s njezine gornje i donje strane pronalaze keramički predmeti, situacija ne odgovara položaju olovne obloge, ali je vjerojatno da je riječ o nekom elementu brodske kuhinje. S obzirom na to da olovo nije očišćeno u cijelosti, njegovo će dokumentiranje tek uslijediti.

Iako je vladalo uvjerenje kako je brodska kuhinja u cijelosti istražena 2022. godine, iskop u kvadratima S 4 i T 4 rezultirao je otkrićem velike količine keramičkog posuđa koje zasigurno nije činilo teret potonulog broda, već je pripadalo brodskoj kuhinji. Riječ je o keramičkom materijalu iz 2./1. st. pr. Kr., koji obuhvaća razne oblike keramičkih zdje-

Although it was believed that the galley was fully explored in 2022, the excavation in squares S 4 and T 4 resulted in the discovery of a number of ceramic vessels that certainly did not belong to the cargo of the sunken ship, but to the galley. It is pottery dating to the 2nd/1st century BC, which includes various forms of ceramic bowls and jugs, platters, plates and conical lids, and one ceramic *guttus*. In addition, a small smoothed ceramic tile was found, measuring 5.6 x 7.2 x 1.2 cm, with beveled edges, which was probably used for the preparation of medicinal products. In square T 5, a small, complete pyxis was found, which had apparently rolled away from the main heap of ceramic objects during sinking. A total of thirty-six intact or damaged ceramic vessels were recovered, and twenty discoid ceramic amphora stoppers were also found in the excavation, which further confirmed that the amphorae were full and plugged at the time of sinking. All ceramic vessels, after being documented *in situ*, were removed from the site and stored for desalination, after which they were taken to the Department of Conservation and Restoration of the Art Academy of the University of Split.

During the excavation, another smaller Lam-

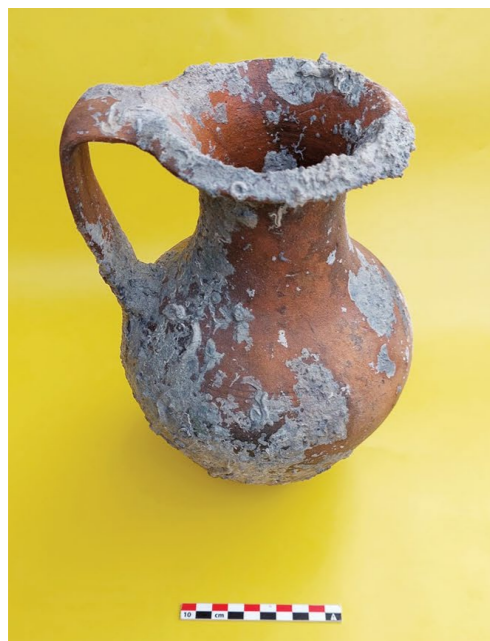


..... Čišćenje velikog tanjura iz brodske kuhinje (foto: I. Radić Rossi)
 Cleaning a large plate from the galley (photo: I. Radić Rossi)



..... Čišćenje keramičkog posuđa iz brodske kuhinje (foto: I. Radić Rossi)
 Cleaning ceramic vessels from the galley (photo: I. Radić Rossi)





la i vrčeva, plitica, tanjura i koničnih poklopaca, a pronađen je i jedan keramički *guttus*. Osim toga, pronađena je i mala zaglađena keramička pločica, dimenzija 5,6 x 7,2 x 1,2 cm, zakošenih rubova, koja je vjerojatno korištena za pripremu medicinskih preparata. U kvadratu T 5 otkrivena je mala, cjelovita piksida, koja se očigledno, tijekom potonuća, otkotrljala od glavne koncentracije keramičkih predmeta. Izvađeno je sveukupno trideset i šest cjelovitih ili oštećenih keramičkih posuda, a u iskopu je pronađeno i dvadeset diskoidnih keramičkih čepova amfora, koji su dodatno potvrdili da su amfore u trenutku potonuća bile pune i začepljene. Svo je posuđe, nakon dokumentiranja *in situ*, uklonjeno s nalazišta i pohranjeno na desalinizaciju, nakon čega je predano Odsjeku za konzervaciju – restauraciju Umjetničke akademije Sveučilišta u Splitu

Tijekom iskopa otkrivena je još jedna amfora tipa Lamboglia 2, manjih dimenzija, a jedna je manja amfora izvađena za potrebe detaljnije analize i promidžbe nalazišta. Izvađena je i još jedna amfora uobičajenih dimenzija. Težina manje amfore iznosi 11,8 kg, a kapacitet oko 13,1 l. Kapacitet veće amfore iznosi 28 l, a težina joj nije izmjerena zbog velike količine morskih priraslina. Kapacitet manje amfore poklapa se s polovicom iznosa rimske mjerne jedinice *amphora* (26,2 l), koji se naziva *urna* (13,1 l), dok kapacitet veće amfore iznosi oko dvije litre više. Kapacitet amfore izvađene 2018. godine, koji iznosi 38 l, znatno je veći te zamalo doseže mjeru od jedne i pol rimske amfore, tj. jedne amfore i jedne urne.

boglia 2 amphora was found, and one smaller amphora was taken out for the purposes of more detailed analysis and promotion of the site. Another amphora of usual dimensions was also taken out. The weight of the smaller amphora is 11.8 kg, and the capacity is about 13.1 l. The capacity of the larger amphora is 28 l, and its weight was not measured due to the large amount of marine growth. The capacity of the smaller amphora matches half of the amount of the Roman measuring unit *amphora* (26.2 l), which is called *urna* (13.1 l), while the capacity of the larger amphora is about two liters more. The capacity of the amphora taken out in 2018, which is 38 l, is significantly larger and almost reaches the measure of one and a half Roman *amphorae*, i.e. one *amphora* and one *urna*.

CONCLUSION

During the research campaign in 2023, several more complete amphorae appeared in the southernmost part of the excavation area, so it will be necessary to continue the research in the direction of the south and east during the next year. Due to the fact that parts of wooden structures appeared in several places, the area of this year's excavation is covered with geotextile and protected until the work continues.

The well-preserved shipwreck near Cape Letavica on Pag proved to be an exceptionally interesting archaeological site, where three lead stocks of

ZAKLJUČAK

Tijekom istraživačke kampanje 2023. u krajnjem južnom dijelu iskopa pojavilo se još čitavih amfora pa će tijekom sljedeće godine biti potrebno nastaviti istraživanje u smjeru juga i istoka. S obzirom na to da su se na nekoliko mjesta pojavili i dijelovi drvene građe, prostor ovogodišnjeg iskopa pokriven je geotekstilom i zaštićen do nastavka radova.

Odlično očuvan brodolom kod rta Letavice na Pagu pokazao se kao iznimno zanimljivo arheološko nalazište na kojem su do sada pronađene tri olovne prečke antičkih olovno-drvenih sidara, metalni predmet nalik na valosijek te keramičko i metalno posuđe iz brodske kuhinje. Drveni elementi brodske konstrukcije, uočeni u sjeveroistočnom dijelu nalazišta, upućuju na postojanje ostataka broda pod glavnom koncentracijom nalaza. Brodski teret amfora i tri olovne prečke sidara prezentirani su *in situ*, a na ostalim predmetima u tijeku je konzervatorsko-restauratorski zahvat.

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Izbor keramičkog posuda izvađenog 2023. (foto: D. Romanović)
Selection of ceramic vessels taken out in 2023 (photo: D. Romanović)

ancient lead-wooden anchors, a metal object similar to a cutwater, and ceramic and metal vessels from the ship's galley have been found so far. The wooden elements of the ship structure, observed in the northeastern part of the site, suggest the presence of ship remains under the main concentration of finds. The ship's load of amphorae and three lead anchor stocks are presented *in situ*, and conservation and restoration work is in progress on the other items.

