



# NASTAVAK ISTRAŽIVANJA BRODOLOMA KOD OTOČIĆA GNALIĆA (*GAGLIANA GROSSA*, 1583.)

---

## Continuation of research of the shipwreck at the islet of Gnalić (*Gagliana grossa*, 1583.)

### UVOD

Otočić Gnalić nalazi se na jugoistočnom kraju otoka Pašmana, pred južnim ulazom u Pašmanski kanal. Godine 1967. u podmorju otočića službeno su evidentirani ostatci potonulog broda koji je tijekom istraživanja koja su uslijedila neposredno po otkriću datiran u kraj 16. stoljeća. Na nalazištu su provedena zaštitna istraživanja 1967., 1668., 1972. i 1973. godine, kad su s morskog dna podignute velike količine nalaza koji pripadaju brodomskom teretu, naoružanju i opremi broda. Svi nalazi pohranjeni su u Zavičajnom muzeju Biograd na Moru. Godine 1996. istraživanje je

### INTRODUCTION

The islet of Gnalić is located at the southeastern end of the island of Pašman, in front of the southern entrance to the Pašman Channel. In 1967, the remains of a sunken ship were officially recorded on the seabed off the islet. The ship was dated to the end of the 16th century, during the research that followed immediately after the discovery. Rescue research was carried out at the site in 1967, 1668, 1972 and 1973, when large quantities of finds belonging to the ship cargo, armament and equipment were raised from the seabed. All finds are stored in the Local Heritage Museum of



**Irena RADIĆ ROSSI**

*irenaradicrossi@gmail.com*

**Kotaro YAMAFUNE**

*koutarou\_yamafune\_0321@yahoo.co.jp*

nakratko obnovljeno, što je rezultiralo daljnjim otkrivanjem i vađenjem predmeta iz broskog tereta. Nakon probnog istraživanja provedenog 2012. godine, kad je potvrđeno postojanje odlično očuvanih ostataka brodske konstrukcije i veće količine nalaza iz brodske opreme i tereta, istraživanje je poprimilo sustavni karakter i nastavilo se do danas (Radić Rossi 2023).

Tijekom dosadašnjih radova istražena je stražnja polovica broda, od krme prema središnjem dijelu u kojem se nalazi glavno rebro. Iskop po boku broda dosegnuo je razinu od oko 1 m nad prvom palubom. Prilikom uklanjanja većeg balastnog kamena, uz kobilicu je otkriven kaljužni zdenac i donji dio kaljužne pumpe. U iskopu se i dalje pronalazi velika količina ingota olovnog bjele lila (olovni karbonat), pakiranog u male bačve, te brojni predmeti iz broskog tereta, a u površinskom sloju na istočnom kraju nalazišta vidljiva je i

Biograd na Moru. In 1996, the survey was briefly renewed, resulting in further discovery and recovery of items from the ship cargo. After the trial research carried out in 2012, when the existence of well-preserved remains of the ship structure and a large quantity of finds of ship equipment and cargo was confirmed, the research became systematic and continued until today (Radić Rossi 2023).

So far, the rear half of the ship has been investigated, from the stern towards the central part where the main frame is located. The excavation along the side of the ship reached a level of about 1 m above the first deck. During the removal of larger ballast stones, the bilge pump well and the lower part of the bilge pump were discovered next to the keel. In the excavation, a large quantity of ingots of lead white (lead carbonate), packed in small barrels, and numerous items from the ship

velika količina predmeta koji su pripadali opremi broda.

cargo are still found, and in the surface layer at the eastern end of the site, a number of items belonging to ship equipment are also visible.

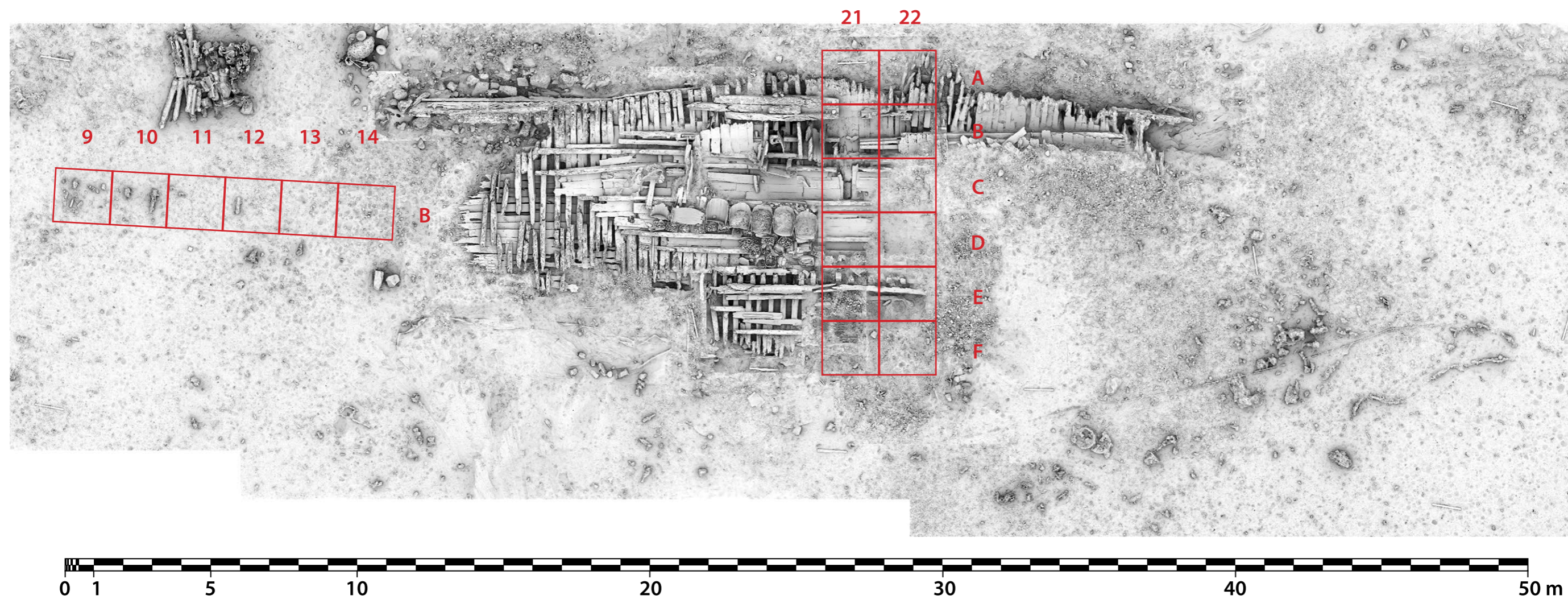
## TIJEK I REZULTATI ISTRAŽIVANJA

Istraživačka kampanja provedena je od 1. do 31. kolovoza 2023. Nekoliko dana prije započeli su pripremni radovi, a nakon terenskog istraživanja utrošena su još dva dana na sređivanje izvađenih nalaza i njihov upis u inventarnu listu. Istraživanje je započelo otkrivanjem središnjeg dijela broda, u kojem se nalazi glavno rebro koje se sastoji od rebrenice i dvaju parova rebrenih nastavaka. Nad istraživani dio nalazišta postavljeno je pomoćno metalno mrežište koje se sastojalo od dva puta šest kvadrata, sveukupnih dimenzija 4 x 12 m. Mrežište je postavljeno poprečno na brodsku konstrukciju, od kobilice na sjeveru do zone iznad prve palube

## THE COURSE AND RESULTS OF THE RESEARCH

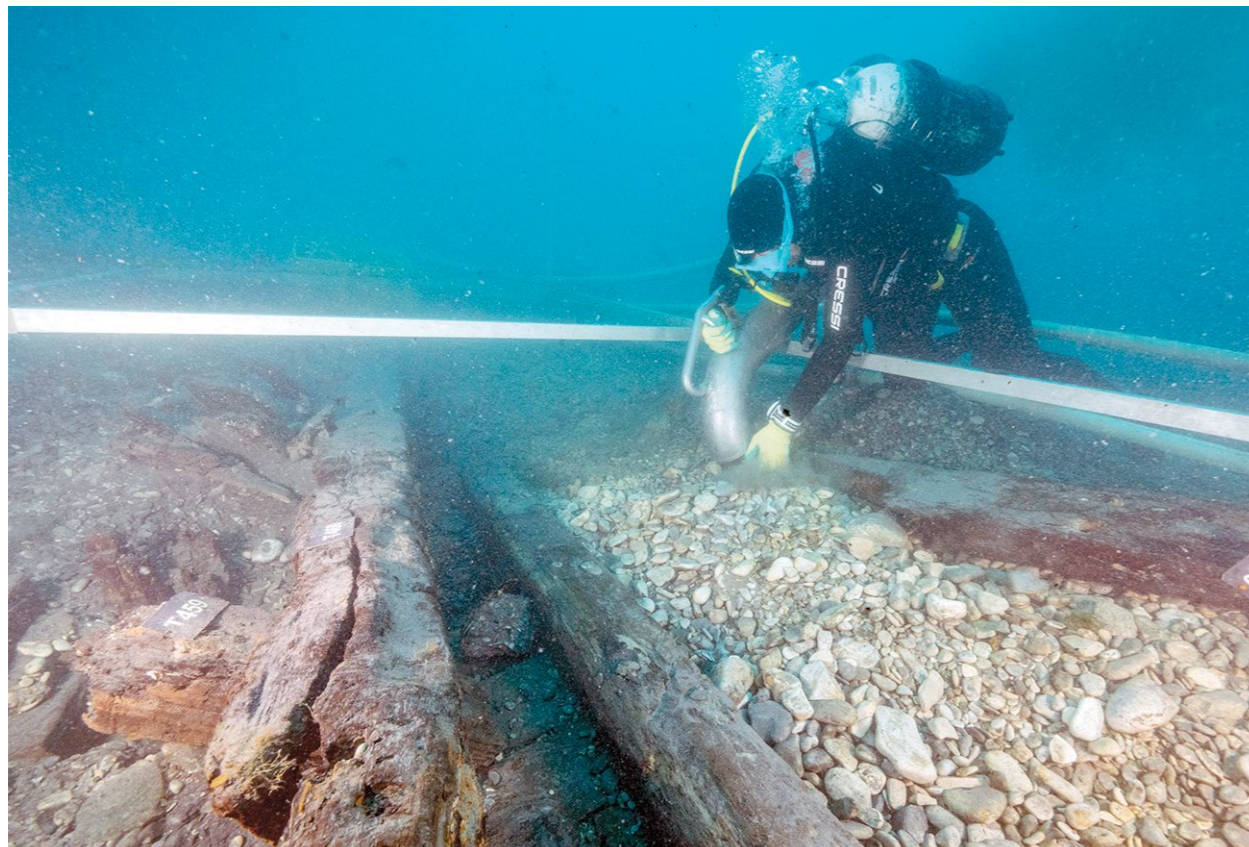
The research campaign was carried out from August 1 to 31, 2023. A few days before, preparatory work began, and after the field research, two more days were spent arranging the recovered finds and entering them into the inventory list. The research began with the discovery of the central part of the ship, which contains the main frame consisting of a floor timber and two pairs of futtocks. An auxiliary metal grid was placed over the investigated part of the site, which consisted of two sets of six squares, with overall dimensions of 4 x 12 m. The grid was placed trans-

Položaj arheoloških sondi 2023. (podloga: K. Yamafune)  
Location of archaeological trenches in 2023 (background: K. Yamafune)



Čišćenje središnjeg dijela broda (foto: A. van Zijverden)  
Cleaning the central part of the ship (photo: A. van Zijverden)





Situacija u kvadratu E21; s desne strane fotografije vide se oblutci korišteni kao balast (foto: A. van Zijverden)  
 Situation in square E21; pebbles used as ballast on the right (photo: A. van Zijverden)

na jugu.

U većem dijelu kvadrata A–C ponovljeno je fino čišćenje brodske konstrukcije, a u krajnjem istočnom dijelu kvadrata A 22–C 22 nastavljeno je uklanjanje sedimenta. Dio uz kobilicu do treće proveze bio je već ranijih godina oslobođen od poprečnih elemenata koji su priječili pristup glavnom rebro. Ove je godine iskop nastavljen u smjeru juga, na mjestu gdje je zaustavljen 2022. godine. U kvadratima D–F nastavljeno je uklanjanje sedimenta i vađenje arheoloških nalaza, s krajnjim ciljem potpunog otkrivanja drvenih ostataka broda. Tijekom iskopa istražene su i izvađene dvije djelomično očuvane male bačve ispunjene ingotima olovnog bjelila (bačva 54 i bačva 55), koje su se nalazile južno od posljednje velike bačve ispunjene hematitom (željezni oksid), gledano u smjeru istoka. Na očuvanoj glavi bačve 55 uočen je pečat u obliku muške glave u profilu s inicijalima trgovca. U čitavom prostoru malih bačava nalazila se veća količina izrazito žutog praha na bazi arsenova sulfida, koji je možda bio prevožen u istoj ambalaži, povrh ingota olovnog bjelila. Ukoliko je to doista tako, bačve su s gornje strane morale biti prekrivene nekim organskim materijalom koji se tijekom vremena raspao.

versely on the ship structure, from the keel in the north to the area above the first deck in the south.

Fine cleaning of the ship structure was repeated in the greater part of squares A–C, and removal of sediment continued in the easternmost part of squares A 22–C 22. The part next to the keel up to the third stringer had already been cleaned from the transverse elements that prevented access to the main frame in earlier years. This year, the excavation continued in the direction of the south, at the place where it was stopped in 2022. In squares D–F, the removal of sediment and collecting of archaeological finds continued, with the ultimate goal of fully uncovering the wooden remains of the ship. During the excavation, two partially preserved small barrels filled with lead white ingots (barrel 54 and barrel 55) were investigated and taken out, which were located south of the last large barrel filled with hematite (iron oxide), looking towards the east. A seal in the form of a male head in profile with the merchant's initials was observed on the preserved head of the barrel 55. In the entire area of small barrels, there was a large amount of bright yellow arsenic-sulfide based powder, which may have been transported in the same packaging, on top of the ingots of lead white. If this is indeed the case, the barrels must have been covered

U kvadratu D 22 nastavljeno je istraživanje cjelovito očuvane male bačve (bačva 69), s koje su tijekom rada uklonjeni obruči jer su se počeli raspadati. Po završetku istraživanja bačva je u dijelovima izvađena iz mora, dokumentirana i pohranjena na desalinizaciju. Na jednoj glavi primijećen je pečat u obliku križa s inicijalima trgovca, a na drugoj već spomenuti pečat u obliku muške glave u profilu, ali prekriven pomoću dvaju križno postavljenih ureza. Čini se da je bačvu sekundarno iskoristio drugi trgovac. Osim toga, jugozapadno od bačve 69 izvađeni su loše očuvani ostatci bačve 70, na čijoj su glavi također zamijećeni tragovi spomenutog pečata s križem.

U kvadratima E 21, E 22 i F 21, F 22 pronađena je velika količina oblutaka koji su činili dio broskog balasta, a sustavno su uklanjani kako bi se stiglo do brodske konstrukcije. U sjeveroistočnom kutu kvadrata E 22 uočen je dio košare izrađene od prepletenog pruča, koji je za sada ostavljen na morskom dnu.

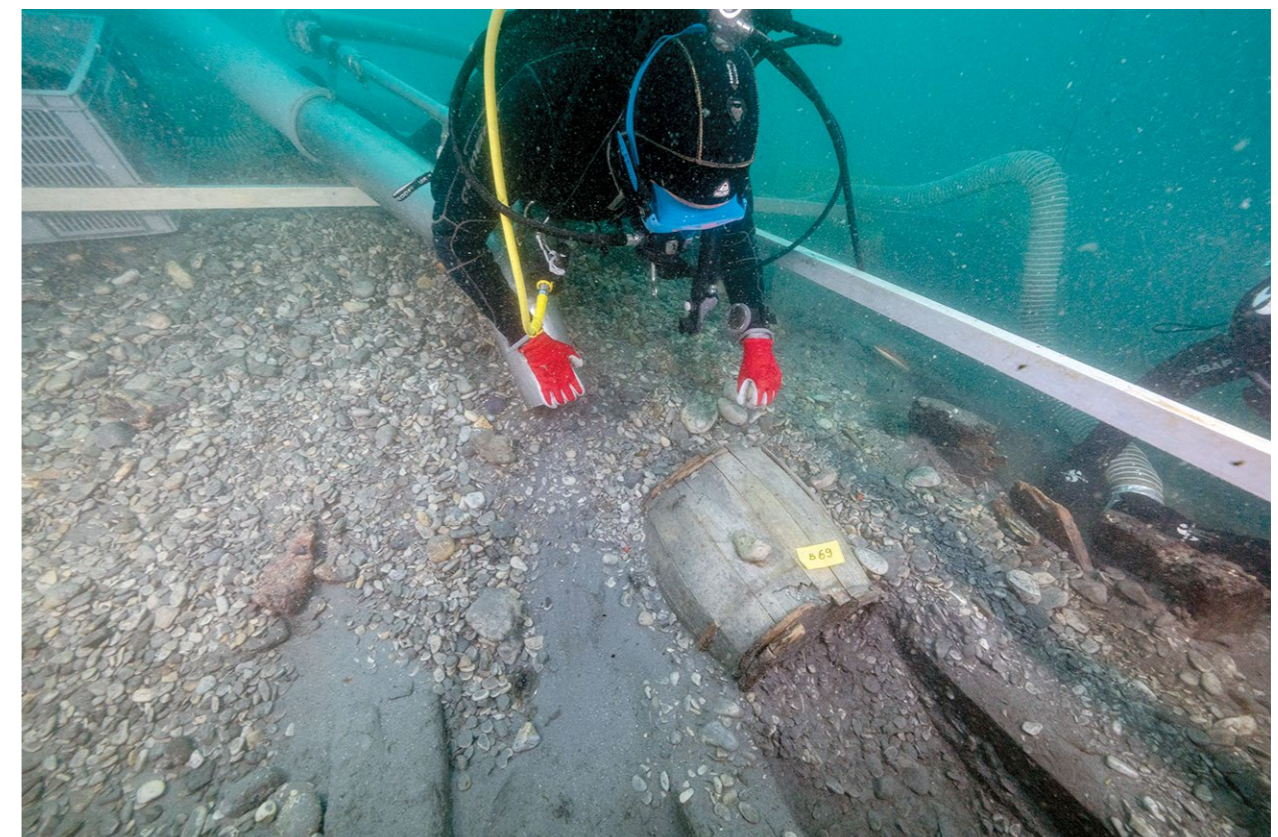
Posljednji tjedan istraživanja bio je usmjeren na izradu fotogrametrijske dokumentacije postojećeg stanja središnjeg dijela nalazišta te na uklanjanje elemenata uzdužne čvrstoće broda nad rebrenim nastavcima uz glavno brodsko rebro,

on the upper side with some organic material that decomposed over time.

In square D 22, research was continued on a completely preserved small barrel (barrel 69), from which the hoops were removed during the excavation because they had begun to disintegrate. At the end of the research, the barrel was recovered in parts, documented and stored for desalination. On one head, a seal in the form of a cross with the merchant's initials was noticed, and on the other, the already mentioned seal in the form of a male head in profile, but crossed by two incised lines. The barrel appears to have been secondarily used by another merchant. In addition, to the southwest of barrel 69, poorly preserved remains of barrel 70 were recovered, on the head of which traces of the aforementioned seal with a cross were also noticed.

In squares E 21, E 22 and F 21, F 22, a number of pebbles were found, which were part of the ship ballast, and were systematically removed in order to reach the ship structure. In the northeastern corner of square E 22, a part of a basket made of woven wicker was observed, which was left on the seabed for the time being.

The last week of the research was focused on creating photogrammetric documentation of the current



Čišćenje cjelovito očuvane bačve 69 u kvadratu D22 (foto: A. van Zijverden)  
 Cleaning of fully preserved barrel 69 in square D22 (photo: A. van Zijverden)





kako bi se taj dio konstrukcije tijekom idućih godina pokušao izvaditi iz mora. Iako je operacija tekla relativno sporo, uklonjena je većina dijelova proveza, a započeto je i uklanjanje dijela debele palubne grede. Zbog složenosti zadatka posao još nije priveden kraju.

Tijekom pregleda površinskog dijela nalazišta uz kobilicu u središnjem dijelu broda uočena je medalja u obliku rimskog sestercija s prikazom cara Hadriana na aversu i galijom pod jedrima, s Neptunom na pramcu na reversu. Takve medalje kovao je u Padovi Giovanni di Cavino tijekom treće četvrtine 16. stoljeća (Lawrence 2024). Predmet je zasigurno pripadao nekom od putnika ili članova posade koji su se u trenutku potonuća nalazili na brodu.

Pokušaj preklapanja svih ortogonalnih prikaza rezultata istraživanja od 2013. do

2023. rezultirao je zaključkom da se model niza metalnih elemenata očuvanih u krmenom dijelu broda, koji je 2021. izradila Andrea Kiss, ne uklapa savršeno u opću sliku nalazišta. Stoga je zaključeno da se ta zona ponovno očisti i dokumentira pa je, nakon uklanjanja sedimenta i geotekstila, nad nju postavljeno metalno mrežište sastavljeno od šest kvadrata u nizu.

Čišćenje na prostoru mrežišta započelo je za zapadne strane, a napredovalo je u smjeru istoka. Korodirani metalni elementi, označeni oznakama SC1-SC30 (SC = stern concretion, tj. krmena inkrustacija), sustavno su očišćeni od nabačenog sedimenta. Već tijekom istra-



Padovanska medalja, imitacija sestercija cara Hadrijana, Giovanni di Cavino (1500. – 1570.) (foto: D. Doračić)  
Paduan medal, imitation of Emperor Hadrian's sestertius, Giovanni di Cavino (1500 – 1570) (photo: D. Doračić)



Prekriženi pečat na glavi bačve 69 (foto: S. Šušnjara)  
Crossed stamp on the head of barrel 69 (photo: S. Šušnjara)

state of the central part of the site and on the removal of the elements of the ship's longitudinal stiffness above the futtocks along the main frame, in order to try to remove that part of the structure from the sea in the coming years. Although the operation was relatively slow, most parts of the stringers were removed, and the removal of a part of the thick deck beam has also been started. Due to the complexity of the task, the work has not been completed yet.

During the inspection of the surface part of the site, a medal in the form of a Roman sestertius was found next to the keel in the central part of the ship. The medal bears a depiction of Emperor Hadrian on the obverse and a galley under sail, and Neptune on the bow is portrayed on the reverse. Such medals were minted in Padua by Giovanni di Cavino during the third quarter of the 16th century (Lawrence 2024). The object certainly belonged to one of the passengers or crew members who were on board at the time of sinking.

An attempt to overlap all orthogonal views of research results from 2013 to 2023 resulted in the conclusion that the model of a series of metal elements preserved in the stern part of the ship, which was made in 2021 by Andrea Kiss, does not fit perfectly into the general picture of the site. Therefore, it was concluded that this zone should be cleaned and documented again, so, after removing the sediment and geotextile, a metal grid composed of six squares in a row was placed over it.

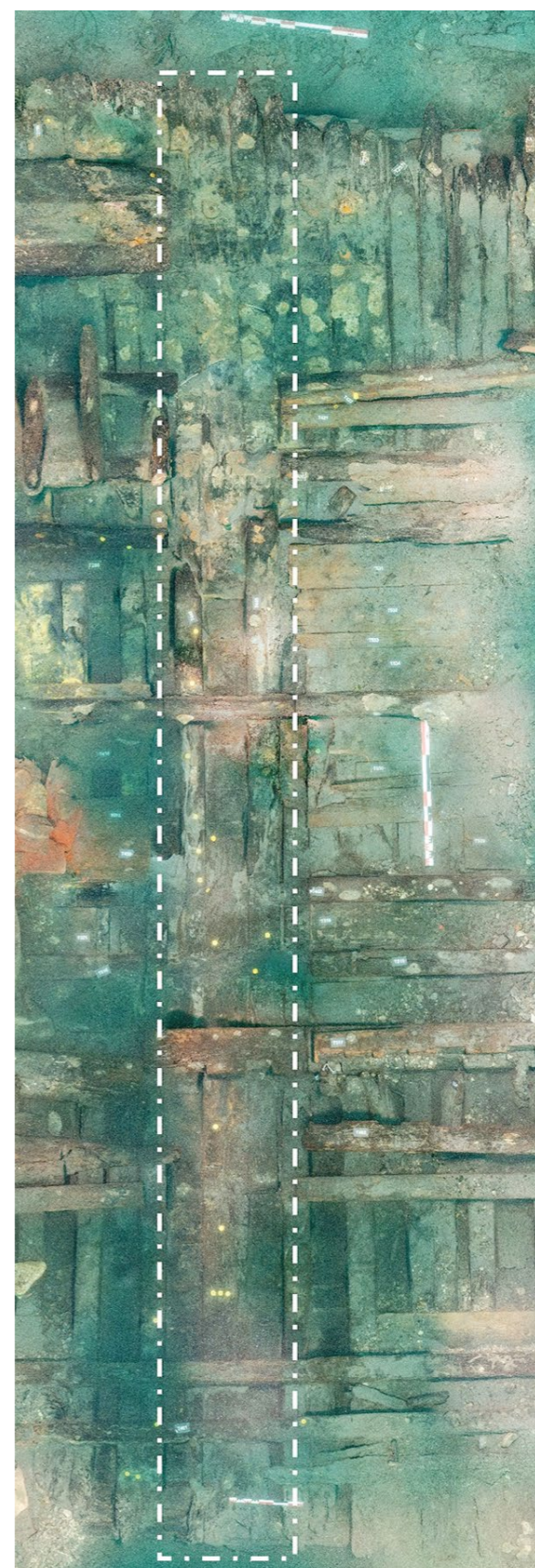
Cleaning in the area of the grid began from the western side, and progressed in

živanja provedenog 2021. godine zaključeno je da su se nekada nalazili na krmenoj statvi i služili za prihvat broskog kormila. Krmena statva očigledno se, nakon brodoloma, odvojila od ostatka brodske konstrukcije i srušila u smjeru zapada, ali se, nažalost, nije očuvala. Tragovi njezina sekundarnog položaja ostali su zabilježeni zahvaljujući rasporedu metalnih elemenata. Godine 2015. s morskog je dna podignut metalni predmet koji je vjerojatno bio pričvršćen na samo kormilo i ulazio u jedan od elemenata pričvršćenih na krmenu statvu (Radić Rossi 2015: Sl. 24). Kako u njegovoj blizini nisu primijećeni ostali elementi koji bi mogli imati sličnu funkciju, pretpostavka je da se u trenutku potonuća kormilo odvojilo i potonulo dalje od mjesta brodoloma.

Terensko istraživanje završilo je prekrivanjem središnjeg dijela broda geotekstilom i vrećama s pijeskom te postavljanjem dodatne zaštite na preostale otkrivene dijelove nalazišta. Svi su izvađeni nalazi uvedeni u inventarnu listu, a veća količina slomljenog ravnog stakla, po završetku pregleda i sumarnog dokumentiranja, vraćena je na nalazište, umotana u geotekstil i zapakirana u plastične kutije.

## ZAKLJUČAK

Uzimajući u obzir repertor nalaza, odlično očuvanu brodsku konstrukciju te izni-

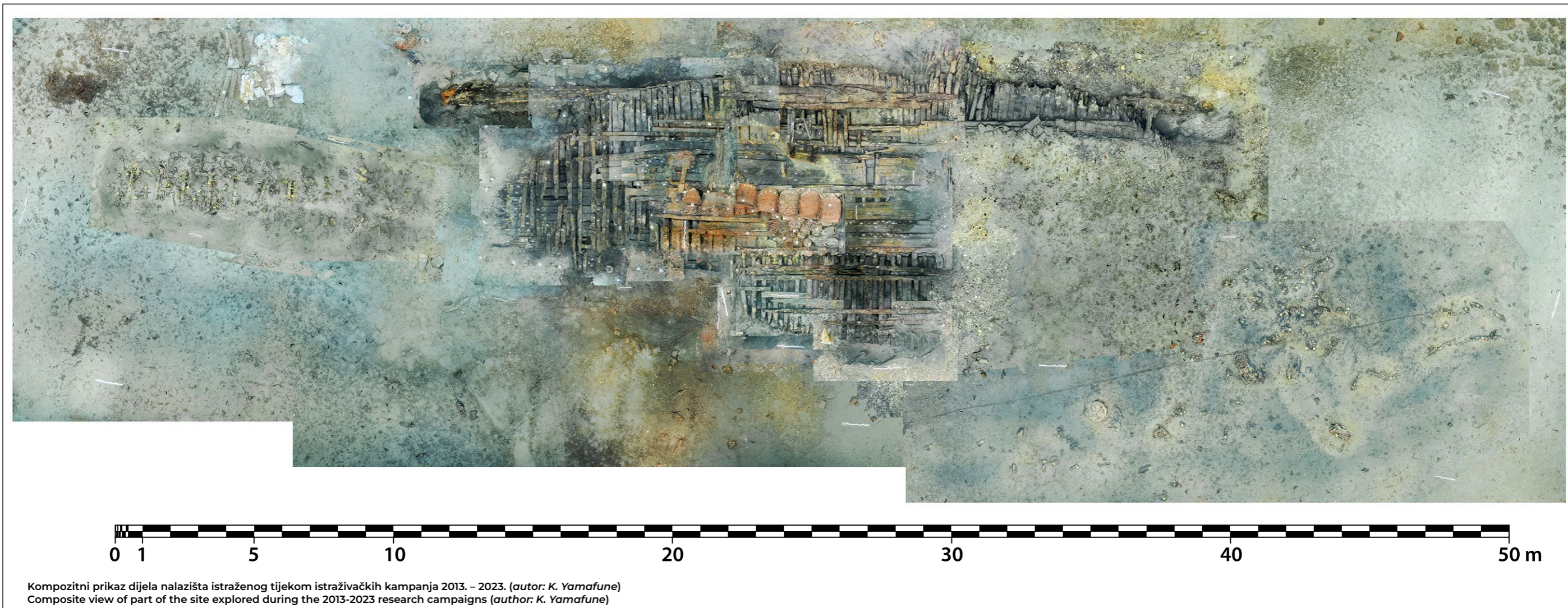


Ortogonalni prikaz modela središnjeg dijela broda s označenim položajem rebrenice i rebrenih nastavaka koji čine glavno brodsko rebro, nakon uklanjanja dijelova temeljnice jarbola i proveza (autor: A. van Zijverden)  
Orthogonal view of the model of the central part of the ship with the marked position of the floor timber and futtocks that constitute the main frame of the ship, after removing parts of the mast step and stringers (author: A. van Zijverden)

the eastern direction. The corroded metal elements, marked SC1-SC30 (SC = stern concretion), were systematically cleaned of the deposited sediment. Already during the research carried out in 2021, it was concluded that they were once located on the sternpost and were used to hold the rudder. After the shipwreck, the sternpost apparently separated from the rest of the ship structure and collapsed in the western direction, but, unfortunately, it was not preserved. Traces of its secondary position have been recorded owing to the arrangement of metal elements. In 2015, a metal object was lifted from the seabed, which was probably attached to the rudder and belonged to the elements attached to the sternpost (Radić Rossi 2015: Fig. 24). Since no other elements that could have a similar function were observed in its vicinity, it is assumed that at the moment of sinking the rudder separated and sank further from the shipwreck site.

The field research ended by covering the central part of the ship with geotextile and sandbags and placing additional protection on the remaining uncovered parts of the site. All the retrieved finds were included in the inventory list, and a larger amount of broken flat glass, after the inspection and brief





Kompozitni prikaz dijela nalazišta istraženog tijekom istraživačkih kampanja 2013. – 2023. (autor: K. Yamafune)  
Composite view of part of the site explored during the 2013-2023 research campaigns (author: K. Yamafune)

mno bogatu i raznoliku povijesnu priču, brodolom kod otočića Gnalića jedan je od najznačajnijih brodoloma iz 16. stoljeća u svijetu. Ta je činjenica višestruko potvrđena tijekom svake dosadašnje istraživačke kampanje. Posebnu vrijednost projektu donijela su detaljna arhivska istraživanja, koja su se već davno odmaknula od proučavanja samog broda, te usmjerila pozornost prema proučavanju šireg kulturno-povijesnog i gospodarsko-političkog konteksta.

S obzirom na to da su, zahvaljujući sustavnom pristupu, izmijenjene neke ranije predodžbe o tipu broda, njegovoj orijentaciji na morskom dnu i ostalim važnim pojedinostima, istraživanje ostataka drvene brodske konstrukcije od velike je važnosti za konačnu interpretaciju nalaza kao cjeline. Nužnost istraživanja očituje se i u degradaciji drvene građe koja je neizmjereno vrijedan izvor za proučavanje mletačke brodogradnje u 16. stoljeću, pa se istraživanjem sprječava nestanak bitnih informacija. S obzirom na navedene činje-

documentation, was returned to the site, wrapped in geotextile and packed in plastic boxes.

## CONCLUSION

Taking into account the repertoire of finds, exceptionally well preserved ship structure and the extremely rich and diverse historical story, the shipwreck at the islet of Gnalić is one of the most significant 16th-century shipwrecks in the world. This fact has been repeatedly confirmed during every research campaign so far. Special value to the project was brought by the detailed archival research, which had long ago outgrown the study of the ship itself, and focused on the study of the wider cultural-historical and economic-political context.

Considering that some earlier notions about the type of ship, its orientation on the seabed and other important details were altered owing to the systematic approach, the research of the remains of the wood-

nice, istraživanje brodoloma kod Gnalića i njegovu prezentaciju široj javnosti potrebno je nastaviti u sustavnom obliku.

en ship structure is of great importance for the final interpretation of the finds as a whole. The research is also necessary with regard to the degradation of wood, which is an extremely valuable source for the study of Venetian shipbuilding in the 16th century, so research prevents the disappearance of essential information. Considering the above facts, the research of the Gnalić shipwreck and its presentation to the general public should be continued in a systematic way.

## LITERATURA / BIBLIOGRAPHY

- LAWRENCE, R. H. 2024 (1883), *Medals by Giovanni Cavino, the 'Paduan'* (Classic Reprint), Forgotten Books, London.
- RADIĆ ROSSI, I. 2015, *Brodolom kod otočića Gnalića; Stručno izvješće o podmorskom istraživanju*, Konzervatorski odjel Ministarstva kulture i medija, Zadar.
- RADIĆ ROSSI, I. 2023, Istraživanje brodoloma kod otočića Gnalića (Gagliana grossa, 1583), *In Situ – Godišnjak Odjela za Arheologiju / Yearbook of Department of Archaeology*, 1, 154–159.

