An underwater photograph of a shipwreck site. The scene is dimly lit with a blue tint. In the foreground, there are large, dark, rectangular objects, possibly parts of the ship's structure or equipment, resting on the seabed. In the background, several divers are visible, some with their lights on, exploring the site. The water is slightly murky, and there are bubbles rising from the divers.

TESTIRANJE OPREME NA NOVOVJEKOVNOM BRODOLOMU OTOČAC

Testing of the
equipment on
the modern era
shipwreck at Otočac



Novovjekovni brodolom nalazi se na južnom dijelu otoka Korčule, na granici mjesta Prižba i Brna, na udaljenosti 90 metara od obale. Nazvan Otočac, prema obližnjem otočiću, brodolom zanimljivog sastava tereta – a još uvijek neistražen – poslužio je kao idealna lokacija za testiranje opreme za elektrokemiju i vizualnu dijagnostiku, s ciljem analize odabranih mikrolokacija te nadopune dokumentacije postojećeg stanja. Nalazište je 1983. godine otkrio Miha Matulj, koralar iz Slovenije koji je informaciju o postojanju lokaliteta dobio od lokalnih ribara. Nakon prvih inspekcijskih pregleda 2003. i 2006. godine, provedenih pod vodstvom Domagoja Perkića iz Uprave za zaštitu kulturne baštine Konzervatorskog odjela u Dubrovniku, nad nalazištem je postavljena trajna zaštita (Perkić 2003; 2006). Pregledi i dokumentacija postojećeg stanja obavljani su i pod vodstvom Odjela za arheologiju Hrvatskog restauratorskog zavoda (Radić Rossi 2005; Miholjek 2016) i Instituta ARS NAUTICA (2019).

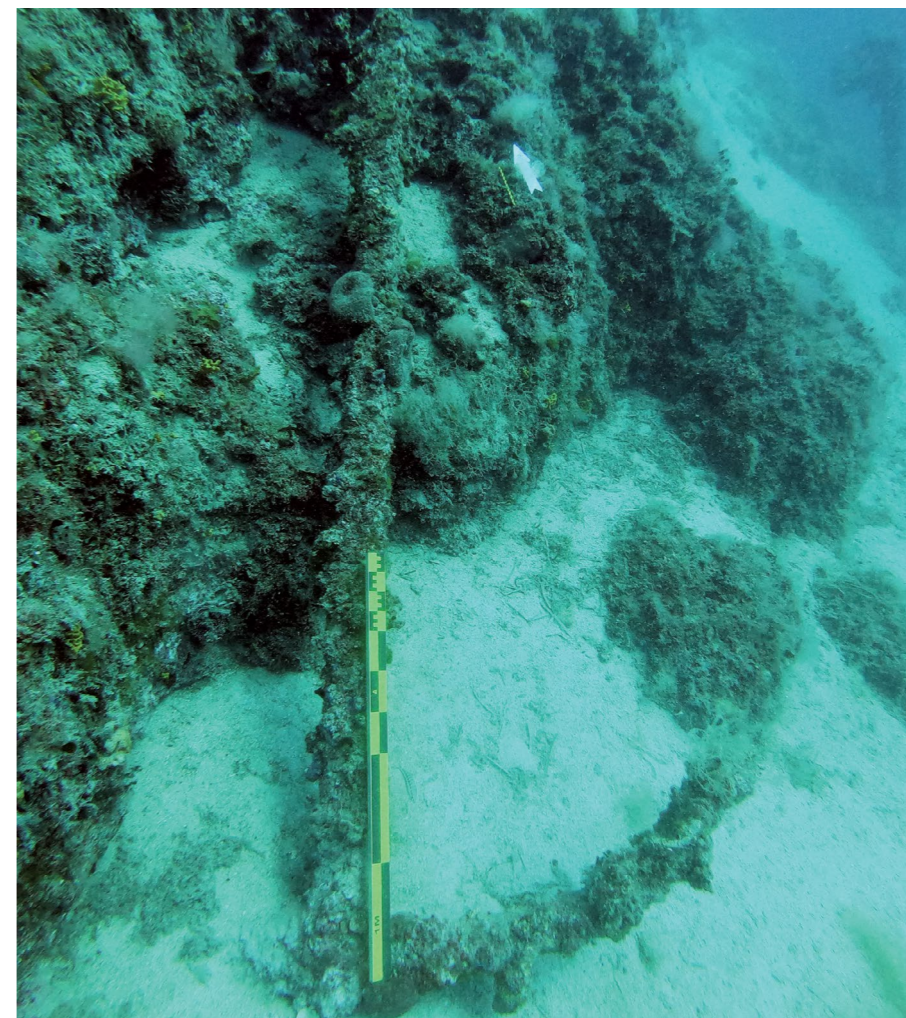
Glavnina tereta i potonuli brod nalaze se na dubini od 20 do 27 metara, na površini od otprilike 200 m². Inventar broskog tereta uključuje željezne korodirane bačve, namotaje željezne žice, željezne

A modern era shipwreck is located on the southern part of the island of Korčula, on the border of Prižba and Brna, at a distance of 90 meters from the coast. This still unexplored shipwreck named Otočac, after the nearby islet, with an interesting cargo, served as an ideal location for testing the equipment for electrochemistry and visual diagnostics, with the objective of analyzing selected micro-locations and supplementing the documentation of the current condition. The site

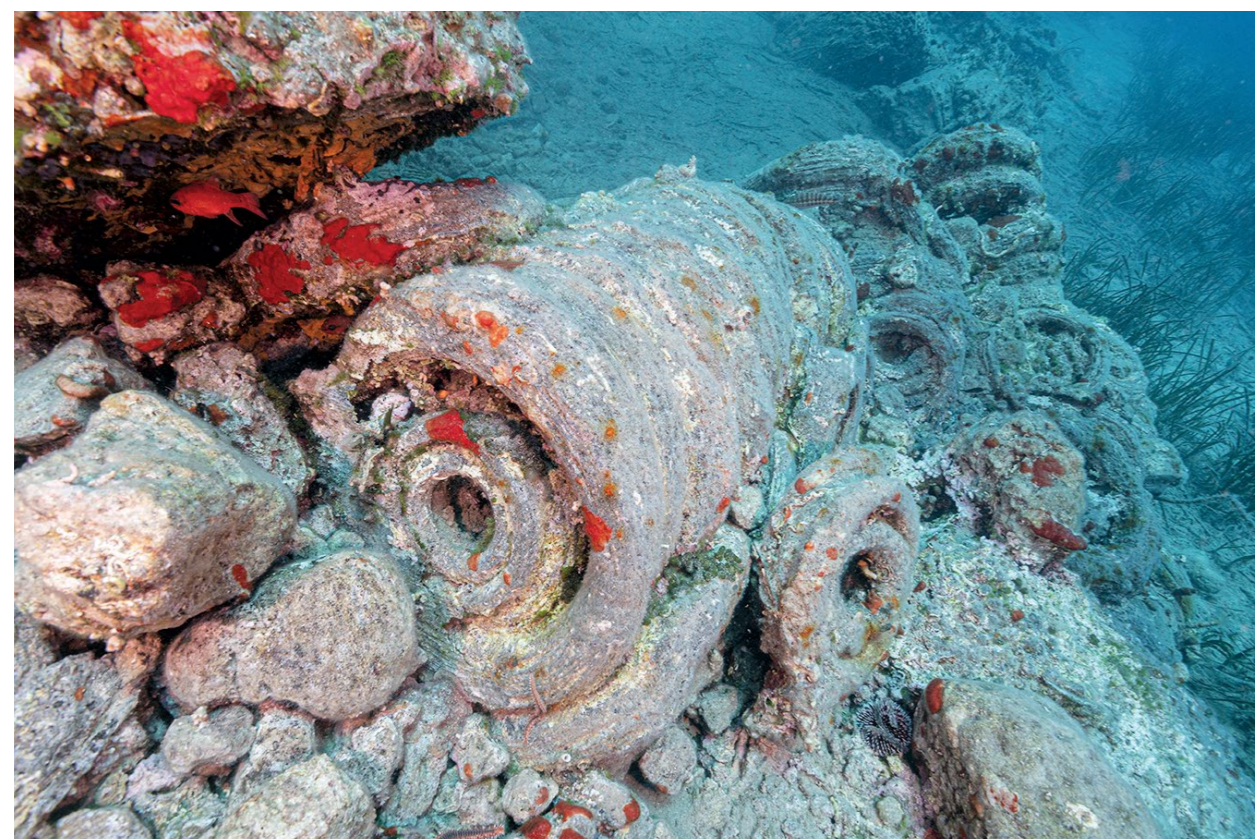

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was discovered in 1983 by Miha Matulj, a coral diver from Slovenia who was informed about the site's existence by local fishermen. After the first surveys in 2003 and 2006, led by Domagoj Perkić from the Administration for the Protection of Cultural Heritage of the Conservation Department in Dubrovnik, the site was permanently protected (Perkić 2003; 2006). Surveys and documenting of the current state were also carried out under the auspices of the Department of Archeology of the Croatian Restoration Institute (Radić Rossi 2005; Miholjek 2016) and the ARS NAUTICA Institute (2019).

The bulk of the cargo and the sunken ship are located at a depth of 20 to 27 meters, in an area of approximately 200 m². The ship's cargo inventory



Jedno od dva željezna sidra očuvana na udaljenosti od 500 m zračne linije jugozapadno od lokaliteta (foto: A. Kiss)
One of two iron anchors preserved southwest of the site at a distance of 500 m in a straight line (photo: A. Kiss)



Namotaji željeznih žica čine glavninu tereta potonulog broda (foto: A. Kiss)
Coils of iron wires make up the bulk of the cargo of the sunken ship (photo: A. Kiss)

šipke, listove lijevanog stakla u četvrtastim kutijama, nepoznate korodirane metalne predmete te grumene žute sirovine (vjerojatno arsenov sulfid – realgar ili pararealgar). Pojedini željezni metalni predmeti korodirali su do neprepoznatljivosti. Na zapadnom dijelu nalazišta iz pijeska izviruje stražnji dio topa, dok su na središnjem dijelu nalazišta, ispod glavne nakupine korodiranih bačava, vidljivi elementi drvene brodske konstrukcije. Na 500 metara jugoistočno od brodoloma, nalaze se još dva sidra visine oko 3 i 4 metra, no nesigurno je pripadaju li navedenom brodu.

ISTRAŽIVAČKA KAMPANJA U 2022. GODINI

Projekt *Primjena i potencijali nedestruktivnih metoda arheoloških istraživanja na primjeru novovjekovnog brodoloma Otočac na Korčuli* pota-

includes corroded iron barrels, coils of iron wire, iron bars, sheets of cast glass in square boxes, undetermined corroded metal objects, and lumps of yellow raw material (probably arsenic sulfide - realgar or pararealgar). Certain iron metal objects corroded beyond recognition. In the western part of the site, the rear part of a cannon protrudes from the sand, while elements of a wooden ship structure are visible in the central part of the site, under the main cluster of corroded barrels. Five hundred meters southeast of the shipwreck, there are two more anchors about 3 and 4 meters high, but it is uncertain whether they belong to the mentioned ship.

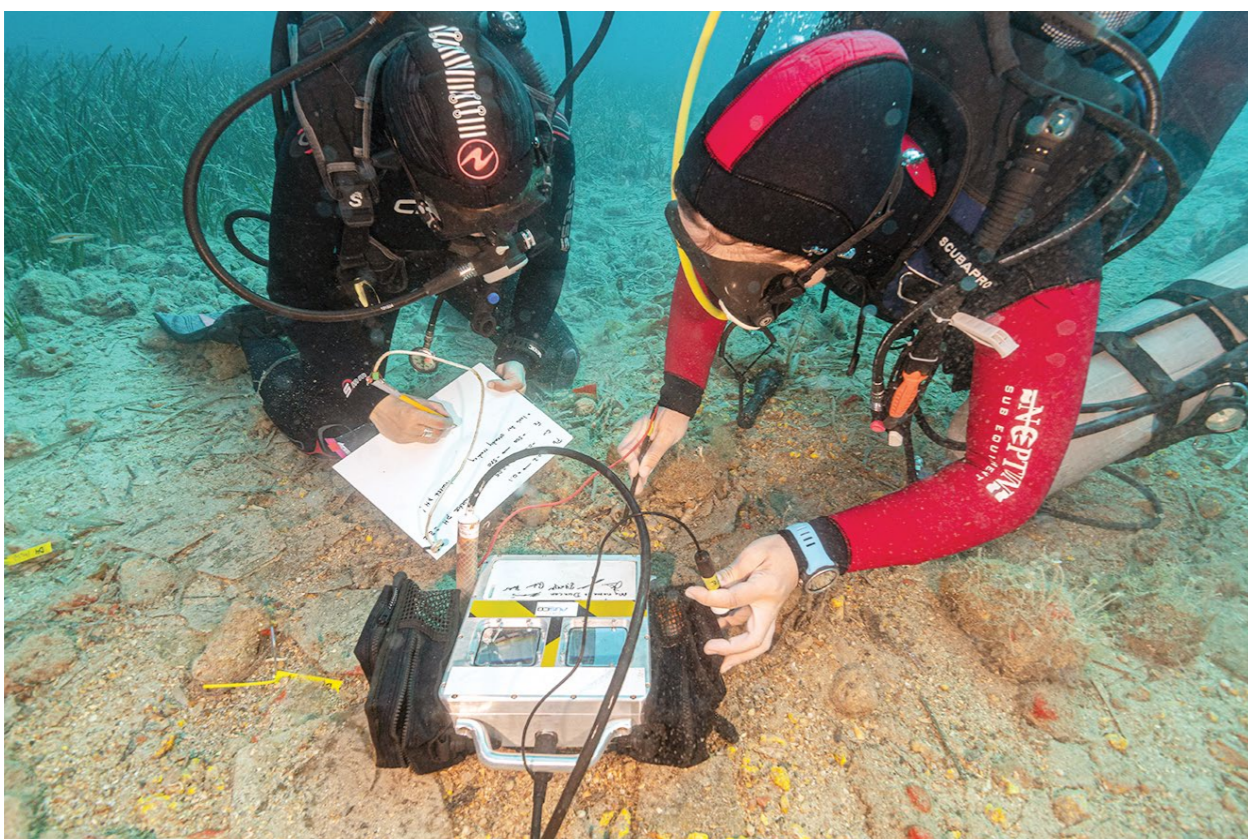
RESEARCH CAMPAIGN OF 2022

The project *Application and potential of non-destructive methods of archaeological research on the example of the post-medieval shipwreck at Otočac*





Preprava pH-metra i multimetra u podvodnom kućištu. Uređaju je dodijeljeno ime Duncan (foto: T. Davidowitz)
Preparation of a pH-meter and a multimeter in an underwater housing. The device is assigned the name Duncan (photo: T. Davidowitz)



Elektrokemijska mjerenja u podmorju (foto: A. Kiss)
Electrochemical measurements in the sea (photo: A. Kiss)

knut je idejom o prikupljanju podataka mjerenjem električnog potencijala i pH-vrijednosti te multispektralnom fotografijom. Projekt je pokrenut s ciljem testiranja nedestruktivnih, cjenovno prihvatljivih i korisniku pristupačnih metoda daljinskog istraživanja za analizu arheoloških nalazišta.

Dio projekta koji uključuje terenski rad proveden je u razdoblju od 13. do 17. lipnja 2022. godine. Za potrebe elektrokemijskih mjerenja korišteni su pH-mjerač i digitalni multimetar, smješteni u podvodnom kućištu od aluminijske legure oblikovanom po mjeri instrumenata. Za multispektralno snimanje korištene su Survey 3N kamere povezane u stereopar.

Iako je obrada podataka još uvijek u tijeku, trenutačno je ustanovljena vrsta materijala, tj. metala u sastavu brodskog tereta, debljina sloja korozije željeznih predmeta i disperzija metala u okolini na udaljenosti od 30 cm. Generirani su multispektralni indeksi i georeferencirani model nalazišta, te referentni podatci elektrokemijskih mjerenja. Podatci prikupljeni po mikrozonama od interesa obradit će se s ciljem detekcije različitih materijala na površini nalazišta.

Projekt je sufinanciran sredstvima organizacije Women Divers Hall of Fame (WDHOF Cecelia Connelly Graduate Scholarship in Underwater Archaeology), Hrvatske elektroprivrede (HEP) i Odjela za arheologiju, uz logističku potporu Ronilačkog centra Prišćapac i Međunarodnog centra za podvodnu arheologiju u Zadru.

on the island of Korčula was motivated by the idea of collecting data by measuring electrical potential, pH value and multispectral imaging. The project was launched with the aim of testing non-destructive, affordable and user-friendly remote sensing methods for the analysis of archaeological sites.

The part of the project that includes field work was carried out in the period from June 13 to 17, 2022. For the purposes of electrochemical measurements, a pH-meter and a digital multimeter were used, placed in an underwater custom-made housing made of aluminum alloy. Survey 3N cameras connected in a stereo pair were used for multispectral imaging.

Although the data processing is still ongoing, we have currently established the type of material, i.e. the metal in the composition of the ship's cargo, the thickness of the corrosion layer of the iron objects and the dispersion of the metal in the environment at a distance of 30 cm. Multispectral indices and a georeferenced model of the site were generated, as well as reference data of electrochemical measurements. Data collected in microzones of interest will be processed with the aim of detecting different materials on the surface of the site.

The project was co-financed by the Women Divers Hall of Fame (WDHOF Cecelia Connelly Graduate Scholarship in Underwater Archaeology), Hrvatska elektroprivreda (HEP) and the Department of Archaeology, with logistic support from the Prišćapac Diving Center and the International Center for Underwater Archeology in Zadar.

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