Yearbook of the International Centre for Underwater Archaeology in Zadar
Godišnjak Međunarodnog centra za podvodnu arheologiju u Zadru

Submerged Heritage
Potopljena baština

Number 5 / Broj 5, Zadar, December 2015/ Prosinac 2015.

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INTERNATIONAL CENTRE FOR UNDERWATER ARCHAEOLOGY IN ZADAR

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Second page / Druga stranica: David Badovinac and Saša Koren documenting the Vrnika logboat / David Badovinac i Saša Koren dokumentiraju monoksil kod Vrhnike (photo: M.Pešić)

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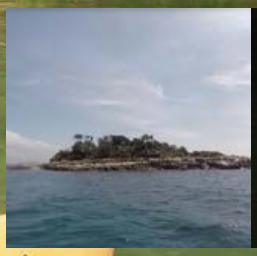

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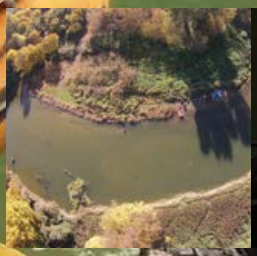

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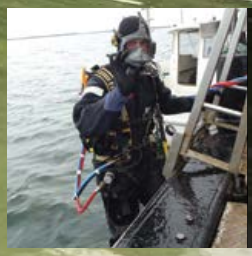

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News

1. Senior lecturers Ilkić and Borzić promote the Veštar Harbour book / Docenti Ilkić i i Borzić predstavljaju knjigu Luka Veštar (photo: M. Šimičić)

Veštar Harbour Monograph Promotion and Exhibition in Zadar

The auditorium of the International Centre for Underwater Archaeology in Zadar was the venue Friday, 27 February 2015 of a promotion of *Luka Veštar - Der Hafen von Veštar* (Veštar Harbour), a monograph of papers by ten authors. This 300-page bilingual (Croatian and German) hardback volume compiles the complete results of the multiannual investigation of this archaeological site. The book was presented by senior lecturers Igor Borzić DSc and Mato Ilkić DSc of the University of Zadar. The event also included the opening of an exhibition of the archaeological finds from Veštar by authors Roko Surić and Luka Bekić.

DEGUWA in Nuremberg This Year

In Poseidon's Realm XX, the twentieth such international congress, this year focusing on the topic of Land Underwater!, was staged in Nuremberg, Germany by organiser DEGUWA and a number of major culture institutions. The

Vijesti

U Zadru predstavljena monografija i izložba Luka Veštar

U dvorani Međunarodnog centra za podvodnu arheologiju u Zadru, u petak, 27. veljače 2015. g., javnosti je predstavljena monografija "Luka Veštar - Der Hafen von Veštar", rad skupine desetak autora. Ova tvrdo ukoričena knjiga na 300 stranica i dva jezika, hrvatskom i njemačkom, donosi cjelokupne rezultate dugogodišnjeg istraživanja ovog arheološkog nalazišta. Knjigu su predstavili doc.dr.sc. Igor Borzić i doc.dr.sc. Mato Ilkić sa Sveučilišta u Zadru. Ujedno je otvorena i prigodna izložba s arheološkim nalazima iz Veštra autora Roka Surića i Luke Bekića.

DEGUWA ove godine u Nürnbergu

I ove godine je održan tradicionalni, dvadeseti po redu, međunarodni kongres "In Poseidon´s Realm XX" s posebnom temom „Kopno pod vodom!" u organizaciji glasovite njemačke udruge

2. The DEGUWA congress was held at the well-known German National Museum / Skup DEGUWA održavao se u poznatom Nacionalnom germanskom muzeju (photo: L. Bekić)

DEGUWA i više značajnih kulturnih ustanova u Nürnbergu, Njemačka. Kongres se održavao u Germanskom nacionalnom muzeju od 16. do 22. ožujka 2015. g., a na njemu je održano preko četrdeset predavanja. Među njima su održana i četiri s temama iz Hrvatske, pa tako i jedno o novim rezultatima MCPA Zadar na istraživanjima "Velikog osječkog mosta" u Dardi.

3. Roko Surić and Marina Šimičić lecture at the DEGUWA congress in Nuremberg / Predavanje Roka Surića i Marine Šimičić na DEGUWA-i u Nurnbergu (photo: L. Bekić)

congress was held at the German National Museum from the 16th to 22nd of March 2015 and featured over forty lectures. Four lectures covered topics focused on Croatia including one on the latest results of the ICUA Zadar investigation of the *Great Osijek Bridge* at Darda.

The Great Osijek Bridge Book Promo

The Croatian Academy of Sciences and Arts' (HAZU) Institute for Scientific and Artistic Work in Osijek staged a promotion of the book The Great Osijek Bridge on Wednesday, 15 April 2015, at the Revival Stateroom of the HAZU National Hall in Zagreb. The book is the result of research conducted by

5. The book promo was held at the Revival Stateroom of the HAZU National Hall in Zagreb / Predstavljanje knjige održano je u Preporodnoj dvorani HAZU u Zagrebu (photo: L. Bekić)

the Institute of Art History on what has been dubbed the *Great Osijek* or *Suleiman's bridge*, which linked the historic settlements of Osijek and Darda, traversing an eight-kilometre expanse of marshland. Archaeological investigations and conservation of the finds from the route of the bridge were conducted by the International Centre for Underwater Archaeology in Zadar, covered in one of the book's chapters co-authored by Mladen Pešić. The book has been published with the support of the Turkish Embassy in Croatia and the Turkish Institute of Nautical Archaeology (TINA) in Istanbul.

Veštar Harbour Exhibition in Rovinj

The comprehensive bilingual *Luka Veštar - Der Hafen von Veštar* monograph, discussing the results of the archaeological investigations conducted by ICUA Zadar in collaboration with a number of institutions, was presented at the Rovinj Heritage Museum on the 15th of May 2015. The event also included the opening of an exhibition of archaeological finds recovered in the course of the six years of underwater investigation at his important site. The exhibition features Antiq-

6. The results of six years of investigation at Veštar are presented in Rovinj / Nakon šest godina istraživanja Veštra rovinjskoj javnosti predstavljeni su rezultati (photo: L. Bekić)

4. TINA's Oğuz Aydemir spoke at the presentation of The Great Osijek Bridge / Na predstavljanju knjige Osječki most govorio je i Oğuz Aydemir iz TINA-e (photo: L. Bekić)

Predstavljena knjiga o Velikom osječkom mostu

U organizaciji Zavoda za znanstveni i umjetnički rad HAZU u Osijeku, u srijedu, 15. travnja 2015. g. u Preporodnoj dvorani Hrvatske akademije znanosti i umjetnosti u Zagrebu predstavljena je knjiga "Veliki Osječki most". Knjiga je rezultat istraživačkog rada Instituta za povijest umjetnosti o tzv. Velikom osječkom ili Sulejmanovom mostu, koji je kroz močvarna područja u dužini od oko 8 kilometara povezivao povijesna naselja Osijek i Dardu. Arheološka istraživanja i konzerviranje nalaza s trase mosta obavio je Međunarodni centar za podvodnu arheologiju u Zadru, čemu je posvećeno i jedno poglavlje knjige, koautora Mladena Pešića. Knjiga je objavljena uz potporu Veleposlanstva Republike Turske u Republici Hrvatskoj i Turskog instituta za podvodnu arheologiju iz Istanbula, TINA.

Izložba "Luka Veštar" stigla je u Rovinj

U Zavičajnom muzeju grada Rovinja, 15. svibnja 2015. g. predstavljena je opširna dvojezična monografija "Luka Veštar - Der Hafen von Veštar", koja prikazuje rezultate arheoloških istraživanja koja je provodio MCPA Zadar uz suradnju više institucija. Također je svečano otvorena izložba arheoloških nalaza pronađenih tijekom šest godina podvodnih istraživanja na ovom značajnom nalazištu.

uity period finds and those from the post-medieval period during which time Veštar was evidently a significant maritime hub. The exhibition ran through to the end of August 2015 and was visited during the summer by many tourists.

Jørgen Dencker Lectures at ICUA Zadar

In the frame of collaboration between the International Centre for Underwater Archaeology and the Danish Agency for Culture a lecture was staged in Zadar featuring Danish underwater archaeologist Jørgen Dencker on 9000-Year-Old Submerged Stone Age Sites in Denmark. The lecture was given on Wednesday, 9 September 2015 at the lecture hall of the International Centre for Underwater Archaeology in Zadar. Many experts in the field and students attended the lecture, followed by an informal Q&A session with this well-known archaeologist.

Na izložbi su prikazani antički nalazi, ali i oni koji potječu iz novojekovnog doba, kada je Veštar očito bio značajan pomorski punkt. Izložba je bila otvorena do kraja kolovoza 2015. g., pa ju je tijekom ljetne sezone posjetio i velik broj turista.

Predavanje Jørgena Denckera u MCPA Zadar

U sklopu nastavka suradnje Međunarodnog centra za podvodnu arheologiju i Danske agencije za kulturu, u Zadru se održalo predavanje danskog podvodnog arheologa Jørgena Denckera pod naslovom "9000 years old submerged Stone Age Sites in Denmark". Predavanje se održalo u srijedu, 9. rujna 2015. g. u učionici Međunarodnog centra za podvodnu arheologiju u Zadru. Predavanju je nazočilo mnogo stručnjaka i studenata koji su se nakon predavanja zadržali u razgovoru s ovim poznatim arheologom.

7. Jørgen Dencker speaks at the ICUA Zadar lecture hall / Predavanje Jorgena Dencker u učionici MCPA Zadar (photo: R. Surić)

Post-Medieval Glass Exhibition Opens in Pula

An exhibition of post-medieval glass from underwater sites in the Istria and Dalmatia regions opened on the 25th of September 2015 at Gallery C8 of the Archaeological Museum of Istria in Pula. The exhibition authors are Luka Bekić and Roko Surić of ICUA Zadar. The exhibition showcases numerous fragments of various glassware dated from the fifteenth to twentieth century. Prominent among the exhibits on display are some bottle and glass drinking vessel forms previously entirely unknown to the public

Otvorena izložba o novovjekovnom staklu u Puli

Dana 25. rujna 2015.g., u galeriji C8 Arheološkog muzeja Istre u Puli svečano je otvorena izložba "Novovjekovno staklo iz podmorja Istre i Dalmacije". Autori izložbe su Luka Bekić i Roko Surić iz MCPA Zadar, a izložba prikazuje brojne ulomke različitih staklenih posuda koje datiraju od 15. do 20. st. Među izlošcima izdvajaju se i neki oblici boca i čaša dosada sasvim nepoznati široj publici, pa i stručnoj javnosti. Na otvaranju je bilo prisutno mnoštvo posjetilaca te nekoliko novinarskih ekipa.

8. The exhibition in Istria County of post-medieval glassware recovered in underwater research / Izložba o novojekovnom staklu iz podmorskih istraživanja stigla je i do Istre (photo: M. Šimćić)

at large and even to the expert community. Many visitors and several news teams were on hand for the opening.

ICUA Stages Introductory Conservation and Restoration Courses

Introductory courses in the conservation and restoration of underwater archaeological finds, organised by ICUA Zadar and supported by the UNESCO office in Venice, were held in November and December of 2015. Eight participants were accepted for the international course coming from Albania, Croatia, Greece, Lebanon and Macedonia. They spent two weeks working in the workshops specialised in metal, ceramics, glass and organic materials. Along with theoretical instruction, the participants were afforded the opportunity to try their hand at conservation techniques on original artefacts. New courses will be staged in the beginning of the coming year.

UNESCO
United Nations Educational, Scientific and Cultural Organization
Venice Office
Regional Bureau for Science and Culture in Europe

Održani početni tečajevi konzerviranja i restauriranja

U organizaciji MCPA Zadar, a pod pokroviteljstvom UNESCO-vog ureda u Veneciji, tijekom studenog i prosinca 2015.g. održani su početni tečajevi konzerviranja i restauriranja podvodnih arheoloških nalaza. Na međunarodni tečaj je primljeno osmero polaznika, koji dolaze iz Albanije, Hrvatske, Grčke, Libanona i Makedonije. Njihov boravak i rad u radionicama specijaliziranim za metal, keramiku i staklo, te organsku građu je trajao dva tjedna. Osim teoretske izobrazbe, svi polaznici su imali mogućnost isprobati tehnike konzerviranja i na originalnim predmetima. Početkom naredne godine provoditi će se novi tečajevi.

9. Studenti promatraju proces odsoljavanja metalnih predmeta / Students observing process of desalination of metal objects (photo: M. Šimičić)

Fourth Shipwreck Found at Cape Uljeva near Ližnjan

Pronađen četvrti brodolom na Uljevi kod Ližnjana

Luka Bekić ● lbekic@icua.hr, Roko Surić ● rsuric@icua.hr

From the 15th to 26th of September 2015 the International Centre for Underwater Archaeology conducted underwater archaeological investigations at Cape Uljeva, where the remains of four shipwrecks are found standing at a small distance from one another. Investigation has been conducted of three of the shipwrecks, while the fourth, newly discovered wreck, has been subjected to a surface inspection. This year's investigation was conducted as a continuation of multiannual research that has been on-going since 1998.

Serving as expert leader of the archaeological research campaign is Luka Bekić DSc, with deputy leader Mladen Pešić, both of the International Centre for Underwater Archaeology in Zadar. The other members of the expert team are archaeologists Marina Šimičić and Roko Surić of the International Centre for Underwater Archaeology in Zadar (ICUA), and participants of an underwater archaeology course Jelena Čelebić (Montenegro), Veronika Zerzánová (Czech Republic), Barbora Machová (Czech Republic), Bartlomiej Grzywniak (Poland) and Ahmed Ali Mohamed Al-Siyabi (Oman).

Unlike the western shores, the eastern shores of the Istrian peninsula offer few coves suitable for anchorage in times of strong and dangerous winds. It was for this reason that Kuje Cove was attractive to all seafarers when navigating the waters of this side of the Istrian peninsula in unfavourable winds, facing Vela Vrata, the main channel leading into

1. The Bura wind kicks up powerful waves at Cape Uljeva / Tijekom bure rt Uljeva zapljuskuju snažni valovi (photo: M. Pešić)

Međunarodni centar za podvodnu arheologiju u Zadru proveo je od 15. rujna do 26. rujna 2015. godine podvodno arheološko istraživanje na rtu Uljeva gdje se na maloj udaljenosti nalaze ostaci četiri brodoloma. Istraživanja su provedena na tri brodoloma, dok se na novootkrivenom, četvrtom izvršio površinski pregled. Ovogodišnja istraživanja provedena su u nastavku na višegodišnja istraživanja koja se provode od 1998. godine.

Stručni voditelj arheološkog istraživanja bio je dr. sc. Luka Bekić, a njegov zamjenik Mladen Pešić, oboje iz Međunarodnog centra za podvodnu arheologiju. Ostatak stručne i tehničke ekipe činili su arheolozi Marina Šimičić i Roko Surić iz Međunarodnog centra za podvodnu arheologiju u Zadru (MCPA), te polaznici tečaja podvodne arheologije Jelena Čelebić (Crna Gora), Veronika Zerzánová (Češka), Barbora Machová (Češka), Bartlomiej Grzywniak (Poljska) i Ahmed Ali Mohamed Al-Siyabi (Oman).

Istočna obala istarskog poluotoka je za razliku od zapadne, siromašna uvalama pogodnim za sidrenje u slučaju jakih i nepogodnih vjetrova. Upravo iz tog razloga uvala Kuje bila je privlačna svim moreplovcima koji su se u trenutku nepovoljnih vjetrova našli s te strane Istre, prema Velim vratima Kvarnerskog zaljeva. Na samom ulazu u uvalu, s lijeve strane, nalaze se plitke kamene hridine ispred rta Uljeva, koje su predstavljale opasnu prepreku za sve koji su namjeravali ući u uvalu. Podvodne hridi protežu se u dužini od oko 200 m i širine su 50–ak m. Teren karakteriziraju visoke stijene, škrape i jame s pijeskom među njima. Na ovim hridinama do ovogodišnjih istraživanja prepoznata su tri brodoloma, a ove godine otkriven je i četvrti brodolom nedaleko od prethodnih. Brodovi koji su doživjeli havariju na ovim hridinama vjerojatno su se uslijed jakih valova (naročito bure koja na tom dijelu stvara izrazito velike valove) raspali, a teret im se rasuo po morskom dnu. Zbog već opisanih karakteristika morskog dna, nalazi su se zaglavili su škrapama među stijenama, a dio je naknadno zatrpan pijeskom i sitnim kamenjem.

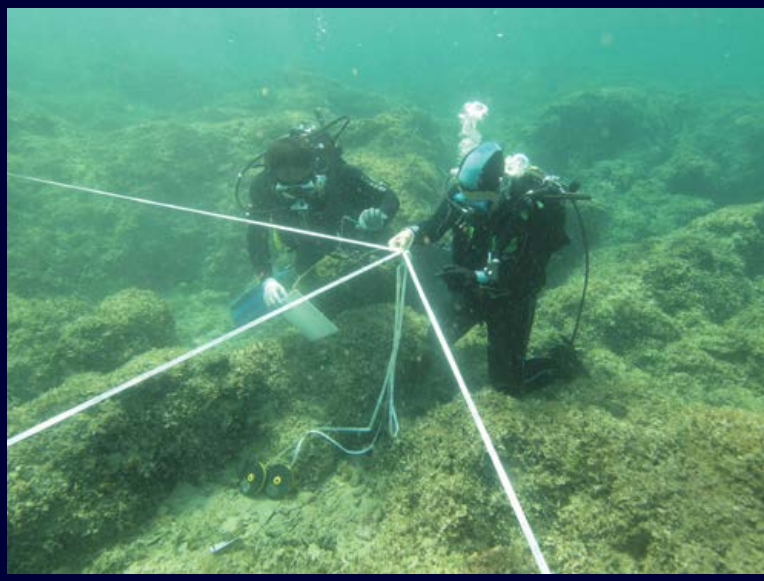
2. Instructor Surić explains the working principle of the water pumps to course participants / Instruktor Surić objašnjava polaznicima tečaja princip rada s vodenom pumpom (photo: M. Šimičić)

Kvarner Bay. There are shallow submarine rocks at the very mouth of the cove, to the left side of Cape Uljeva, constituting a treacherous obstacle to those intending to enter the cove. The submarine rock stretches across a distance of about 200 metres and is about 50 metres wide. The terrain is characterised by high rocks with crevices and sand-filled cavities between them. Up to this year's investigation three shipwrecks had been identified on these rocks – a fourth was discovered this year not far from the others. The ships wrecked on these rocks likely fell apart on account of the action of the powerful waves (especially those driven by the north-easterly Bura wind), with their cargoes strewn across the seabed. As a result of the above noted characteristics of the seabed, the finds were trapped in the crevices between the rocks, part of which were subsequently filled with sand and small stones.

The remains of the Uljeva A shipwreck are closest to the mouth of the cove, on the northwest section of the rocks, while Uljeva C is located some 50 metres to the south. Shipwreck Uljeva B is located on the southeast termination of the rocky terrain at a distance of about 150 metres from A and C. The remains of the newly discovered shipwreck Uljeva D are located some 150 metres to the east of Uljeva B.

The objective of the investigation being conducted at this site is to collect the greatest possible quantity of information pertaining to the shipwrecks. Archaeological excavation of the cavities between the rocks is carried out with the aim of finding all, even the smallest finds. All archaeological material is collected during excavation and brought up to the surface, i.e. the boat, where they are documented, weighed and counted. The data procured by this method is logged in tables prepared in advance. Typologically significant finds are segregated and packed, while the remainder are restored

Ostaci brodoloma Uljeva A najbliži su ulazu u uvalu, a nalaze se na sjeverozapadnom dijelu hridina, dok se Uljeva C nalazi 50-ak metara južnije od njega. Brodolom Uljeva B nalazi se na jugoistočnom završetku hridinastog terena na udaljenosti od 150 m od prethodna dva. Ostaci novootkrivenog brodoloma Uljeva D nalaze se 150-ak metara istočno od Uljeve B.



3. Course participants practice classic underwater measurements / Polaznici tečaja vježbaju klasično podvodno mjerenje (photo: M. Pešić)

Cilj istraživanja koja se provode na ovom nalazištu jest prikupiti što je moguće više informacija o samim brodolomima. Stoga se arheološki iskopavaju jame između hridina kako bi se našlo sve, pa i najmanje nalaze. Prilikom iskopavanja prikupljaju se svi arheološki predmeti, koji se iznose na površinu, odnosno na brod, gdje se dokumentiraju, važu i prebrojavaju. Podaci dobiveni tim metodama unose se u unaprijed pripremljene tablice. Tipološki značajni nalazi se izdvajaju i pakiraju dok se ostatak nalaza vraća u jamu u kojoj su i pronađeni. Na taj način se važniji arheološki nalazi

4. Many of the finds at Uljeva A are found between the rocks / Na Uljevi A mnoštvo je nalaza između stijena (photo: M. Pešić)

5. All finds are raised from the seabed to the boat for documentation / Svi nalazi podižu s dna na brod radi dokumentacije (photo: M. Pešić)

to the cavity in which they were found. In this manner the more significant archaeological finds are set apart for further study and also preserved from looting or devastation, while the locality remains visually attractive with a large quantity of archaeological finds in the cavities.

Submarine documentation was conducted with the aid of a fixed grid. The grid consists of numbered fixed points (spikes) – after several measurements are taken the grid is entered into the Site Recorder software application as a documentation basis. The chief role of the grid is to provide a spatial reference for the cavities, and thereby for the finds.

6. Inspected sherds are returned to the seabed in nets / Pregledani ulomci vraćaju se na dno u mrežama (photo: L. Bekić)

odvajaju za daljnja proučavanja, a ujedno su sačuvani od krađe ili devastacije, dok je lokalitet i dalje vizualno atraktivan s velikim količinama arheoloških nalaza u jamama.

Dokumentacija pod morem vršena je pomoću fiksne mreže. Mreža je načinjena od fiksnih točaka (klinova) s brojevima, a nakon što je nekoliko puta izmjerena, postavljena je kao dokumentacijska osnova u kompjuterski program Site recorder. Glavna uloga mrežišta bila je pozicioniranje jama u prostor, a time i nalaza.

Osim izmjerom lokanog mrežišta, pozicioniranju jama i nalaza uvelike je pomoglo skeniranje morskog dna višesnopnim sonarom koje je 2014. g. provela Harpha Sea iz Slovenije. Snimanjem morskog dna izrađena je batimetrijska, georeferencirana, karta podmorja Uljeve. Naknadom računalnom obradom te karte izrađuju se posebni nacrti jama pojedinog brodoloma.

Svrha mapiranja jama je u tome što se na taj način svaki pronađeni predmet može pripisati određenoj jami, a time se automatski pozicionira unutar brodoloma, što bi u konačnici moglo dovesti do jasnije slike o samoj veličini broda, teretu i načinu na koji se on raspao.

Istraživanja su se zbog povremenih vremenskih neprilika vršila i južno od rta Uljeva, u uvali Kuje. Tako se na mjestu na kojem se na površini pronalaze novovjekovni nalazi opeke, stakla i keramike, iskopao jedan arheološki probni rov veličine 3 x 1 m.

Besides the survey of the local grid, the positioning of cavities and finds was greatly assisted by multibeam sonar scanning of the seabed conducted in 2014 by the Slovenian company Harpha Sea. Recording of the seabed produced a bathymetric, geo-referenced map of the seabed of Uljeva. Further computer processing of the map produced separate drawings of the cavities pertaining to individual shipwrecks.

The purpose of mapping the cavities is to attribute every recovered artefact to a given cavity, automatically positioning it within the shipwreck location, which, in the final tally, should provide us with a clearer image of the size of the vessel, its cargo and the manner in which it fell apart.

Due to intermittent inclement weather investigation was also conducted to the south of Cape Uljeva, in Kuje Cove. An archaeological exploratory trench of 3 by 1 metres was excavated at a location with surface finds of post-medieval brick, glass and pottery.

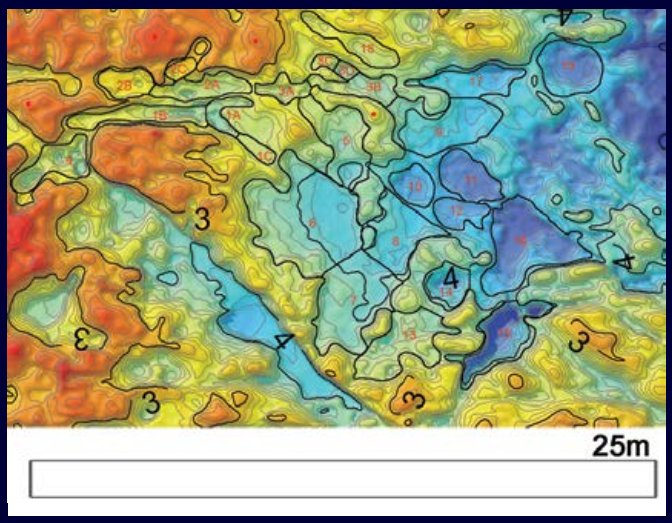
The investigation of the Uljeva C shipwreck was conducted from land such that the divers and equipment entered from the shore, with a water pump located on the shoreline rock to power the dredges. In order to enable trenching of the site the piping and dredges were extended to a length of almost eighty metres. This was shown to be a good method by which to continue the investigation when large waves precluded boat-launched investigation.

In terms of the archaeological material it is evident that Uljeva A has yielded a significantly greater quantity of finds than has Uljeva B. The great majority of the recovered finds are ceramic, predominant among which are amphorae, while Uljeva B has yielded a much greater quantity of cooking ware. Post-medieval shipwreck Uljeva C yielded finds of brick, ceramic ware and glass.

Among all of the shipwrecks at Uljeva, shipwreck Uljeva A is certainly the most abundant in terms of archaeological finds. This year we investigated cavities AJ5, AJ6, AJ9 and AJ10. The contours of the cavities were evident from the bathymetric maps and we were able to undertake excavation with the greatest possible measure of precision. Sherds of amphorae – neck, base, handle and amphorae plug sections – were recovered from the cavities. Along with amphorae sherds some of the cavities also yielded sherds of various cooking ware. Fifteen pits have been excavated

8. An example of the amphorae plugs from Uljeva A / Primjer čepova amfora s Uljeve A (photo: L. Bekić)

Istraživanje brodoloma Uljeva C izvršilo se s kopna i to na način da su ronioci i oprema ulazili s obale, a na stijeni na samoj obali nalazila se vodena pumpa za mamute. Kako bi se moglo izvršiti sondiranje na nalazištu, crijeva i mamuti razvučeni su u dužini od gotovo 80 m. Pokazalo se da je to dobar način da se istraživanje nastavi unatoč velikim valovima koji su sprječavali istraživanje pomoću broda.



7. The current state of investigation at Uljeva A / Stanje istraženosti Uljeve A (author: Harpha sea / R. Surić)

Što se tiče arheološke građe, očito je kako se na Uljevi A pronalazi znatno više nalaza od Uljeve B. Velika većina pronađenih nalaza je keramička, a među njima prevladavaju nalazi amfora, dok se na Uljevi B pronalazi i značajno veći broj kuhinjskog posuđa. Novovjekovni brodolom Uljeva C sadrži nalaze opeka, keramičkih posuda i stakla.

Među svim brodolomima na Uljevi, brodolom Uljeva A zasigurno je najbogatiji arheološkim nalazima. Ove su se godine istraživale jame AJ5, AJ6, AJ9 i AJ10. Obrisi jama izvučeni su s batimetrijske karte, pa se moglo s najvećom dozom preciznosti stupiti u iskopavanje. U jamama su pronađeni ulomci amfora, dijelovi grla, dna, ručaka i poklopaca za amfore. U nekim su se jamama osim ulomaka amfora mogli pronaći i ulomci raznog kuhinjskog posuđa.

Na Uljevi A je dosada iskopano 15 jama u kojima se nalazilo sveukupno 1731,9 kilograma nalaza, koji su izvađeni na brod. Od toga je zabilježeno 3636 ulomaka amfora od kojih 34 šiljaka, 40 čepova, 89 dijelova ručaka i 42 dijela oboda. Uz njih tu su i brojni drugi nalazi pojedinačnih oblika posuđa brodske kuhinjske keramike, čavala, ulomaka tegula i stakla.

U ovogodišnjoj arheološkoj kampanji na Uljevi B istraženo je 6 jama: BJ27, BJ32, BJ33, BJ52, BJ53 i BJ54. Za plan nalazišta iskorištene su batimetrijske karte, što je rezultiralo preciznim obrisima jama. Iako se u istraženim jamama pronalaze

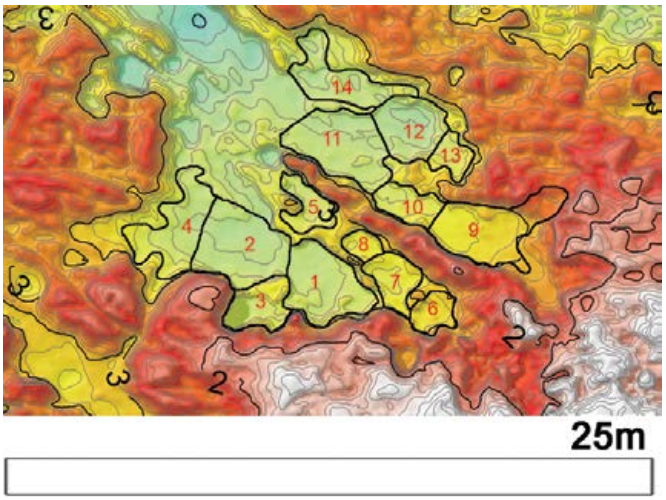
10. The rim of a Spatheion amphora from Uljeva B / Obod Spatheion amfore s Uljeve B (photo: L. Bekić)

at Uljeva A so far, yielding a total of 1,731.9 kilograms of finds that were brought up to the boat. Of that we registered 3,636 amphorae sherds, of which 34 amphorae spikes, 40 plugs, 89 handle sections and 42 rim sections. Besides these there are numerous other finds of individual forms of ship's galley ceramic cooking ware, nails, tegulae sherds and glass.

Six pits were investigated in this year's archaeological campaign at Uljeva B: BJ27, BJ32, BJ33, BJ52, BJ53 and BJ54. The bathymetric maps were used to produce the site map, which resulted in precise pit contours. Although we do find amphorae sherds in the investigated cavities, the bulk of the finds is made up of numerous sherds of cooking ware of the Aegean Coarse Ware type.

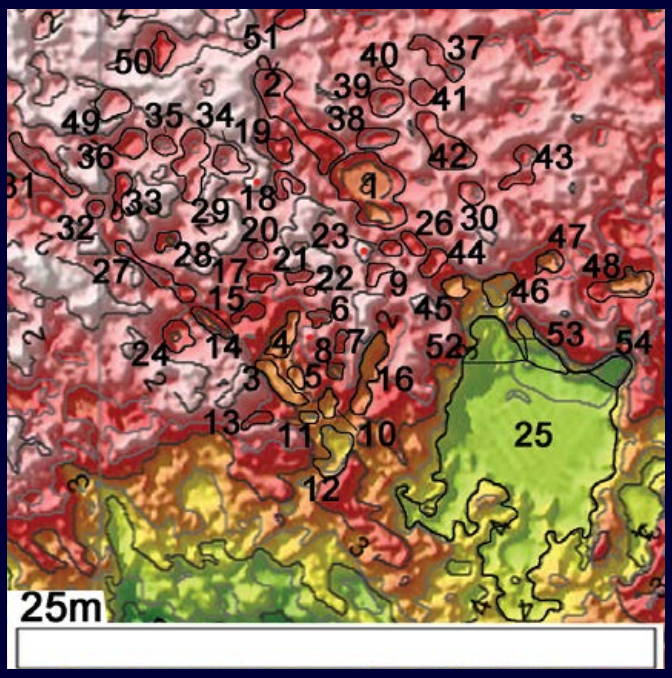
A total of 267.5 kilograms of finds were inspected at Uljeva B, including 1,813 amphorae sherds, of which 35 amphorae spikes, three plugs, 65 handle sections, 52 rim sections and seven spikes, eight ballast stones and three fragments of glass.

Pits CJ3, CJ5, CJ6, CJ7 and CJ8 were investigated at Uljeva C, while investigation of CJ9 has not been completed. The bulk of the finds consists of brick, which was not collected, followed by sherds of glazed post-medieval ware, two iron nails while the most interesting find is that of a section of a perforated wooden beam.



11. The current state of investigation at Uljeva C / Stanje istraženosti Uljeve C (author: Harpha sea / R. Surić)

The find of a worked wooden beam with a hole/slot deep in the sediment of CJ6, together with archaeological finds we attribute to the seventeenth century, bear witness to the wooden ship that sank here with its cargo. Radiocarbon analysis of the wood's age was conducted at the Adam



9. The current state of investigation at Uljeva B/ Stanje istraženosti Uljeve B (author: Harpha sea / R. Surić)

ulomci amfora, glavninu nalaza predstavljaju brojni dijelovi kuhinjskog posuđa koje pripada tzv. egejskom kuhinjskom posuđu (Aegean Coarse Ware).

Na Uljevi B pregledano je sveukupno 267,5 kilograma nalaza, među kojima se izdvaja 1813 ulomaka amfora od čega 35 šiljaka, 3 čepa, 65 dijelova ručki, 52 dijela oboda, 7 klinova, 8 balastnih kamenova i 3 ulomka stakla.

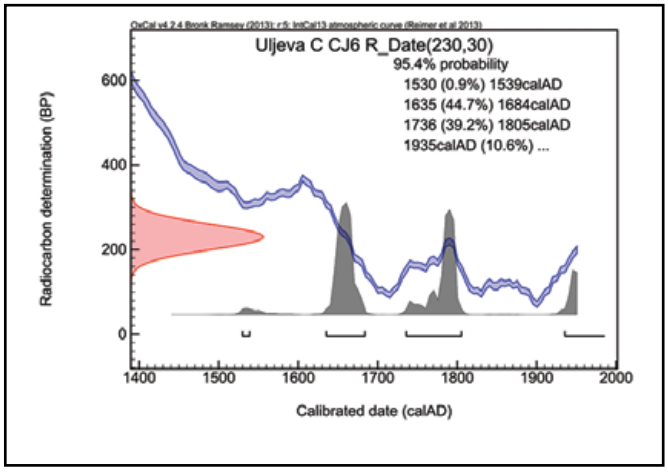
Na Uljevi C istražene su jame CJ 3, CJ5, CJ6, CJ7, CJ8, a CJ9 je ostala nedovršena. Glavninu nalaza čine opeke, koje se nisu prikupljale, potom fragmenti glaziranog novovjekovnog posuđa, dva željezna čavla, a najzanimljiviji nalaz predstavlja dio drvene grede s rupom.

Nalaz obrađene drvene grede s rupom - utorom duboko u sedimentu CJ 6 zajedno s arheološkim nalazima koje pripisujemo razdoblju 17.st., svjedoči o drvenom brodu koji se ovdje potopio zajedno sa svojim teretom. U međuvremenu je izrađena c-14 analiza starosti drveta na Adam Mickiewicz laboratoriju u Poznanju u Poljskoj. Rezultat mjerenja uzorka pod oznakom POZ 76254 je BP 230+30 što kalibrirano iznosi AD 1719+71.g. Veliki raspon mogućih vrijednosti je zbog nepravilne krivulje, koja ukazuje na dvije mogućnosti - ili je riječ o brodolomu iz druge polovine 17.st. ili s kraja 18.st. Stoga će tek precizna tipološka analiza arheoloških nalaza pomoći u odluci da li je riječ o brodu iz 17. ili 18.st.

Dio drvene grede trenutno je u postupku konzerviranja i restauriranja u MCPA Zadar, a tijekom postupka odrediti će se i vrsta drveta od koje je bio građen brod.
Koliko su hridine ispred rta Uljeva za drevne moreplovce bile pogubne, svjedoči nam pronalazak još jednog brodoloma,

12. A wooden beam from the Uljeva C shipwreck / Drvena greda s brodoloma Uljeva C (photo: L.Bekić)

Mickiewicz laboratory in Poznań, Poland. The result of the measurement of the sample designated as POZ 76254 is BP 230+30, yielding a calibrated result of AD 1719+71. The broad range of the value is due to an irregular curve, indicating two possibilities – the shipwreck is either from the second half of the seventeenth or the end of the eighteenth century. A precise typological analysis of the archaeological finds will, then, be required to ascertain whether the ship is from the seventeenth or eighteenth century.



13. The carbon 14 dating curve of a section of the wooden ship / Krivulja C14 datacije dijela drvenog broda (OxCal 1.7.4.)

The wooden beam section is currently undergoing conservation and restoration treatment at ICUA Zadar – the type of wood used in the construction of the boat will be determined in the treatment process.

Just how perilous the rocks off Cape Uljeva were for ancient seafarers is evidenced by the find of yet another shipwreck, designated as Uljeva D. It is an Antiquity period shipwreck as characterised by the cargo it bore – Roman roofing tiles, tegulae, imbreces and pipes tubi fittili. The ship ran aground to the southeast end of the Uljeva rocks and sank with its cargo in nine metres of water. It was found by L. Bekić during holiday recreational diving. For this investigation the ICUA

14. Imbreces and tegulae at the Uljeva D shipwreck position / Imbreksi i tegule na poziciji brodoloma Uljeva D (photo: L. Bekić)

koji se naziva Uljeva D. Radi se o brodolomu iz vremena antike, a karakterizira ga teret koji je prenosio, odnosno veliki rimski krovni pokrov – tegule, imbreksi i cijevi *Tubi fittili*. Brod je udario o stijene na jugoistočnom kraju uljevskih hridina, i s teretom je potonuo na 9 m dubine. Pronašao ga je L. Bekić prilikom rekreativnog ronjenja na godišnjem odmoru. Pri-

15. A Roman tubi fittili pipe from the Uljeva D shipwreck / Rimski Tubi fittili s brodoloma Uljeva D (photo: L. Bekić)

likom ovih istraživanja, istraživački tim MCPA obavio je površinski pregled brodoloma, a posebno se pazilo da ostane intaktan, odnosno da se što manje nalaza pomiče. Što veća izvorna očuvanost brodoloma bitna je u koliko će se za slijedeću kampanju izvesti fotografiranje brodoloma u svrhu izrade fotomozaika ili fotogrametrije, ovisno o sredstvima koja će biti na raspolaganju.

Osim iskopavanja koja su provedena na trima brodolomima na hridima sjeverno od rta Uljeva, provedena su

investigation team conducted a surface inspection of the shipwreck, taking particular care that it remains intact, i.e. that as few finds as possible are moved. The highest possible level of the preservation of the shipwreck is critical if a follow-on campaign is to conduct photography of the shipwreck to produce a photo-mosaic or photogrammetry, depending on the available financing.

16. The water pump and attendant equipment on a small inflatable boat / Vodena pumpa i pripadajuća oprema nalazila se na manjem gumenjaku (photo: R. Surić)

Besides those conducted at the three shipwrecks on the rocks to the north of Cape Uljeva, excavations were also conducted to the south of the cape, within Kuje Cove. Excavations in the cove were carried out when strong wind and waves precluded effective and safe excavations to the north of Cape Uljeva.

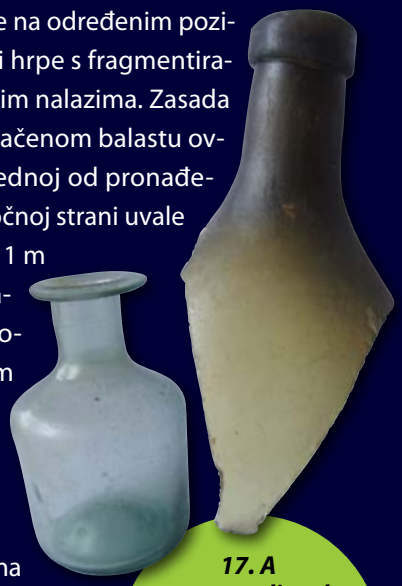
The archaeological survey of Kuje Cove conducted in previous years established that piles of fragmented brick and post-medieval finds are found at certain positions in the cove. For now it is presumed that this is ballast ejected from ships anchored here. At one of the found "ballast heaps" on the east side of the cove a 3 by 1 metre trench was excavated to provide insight into the stratigraphy. The stratigraphy confirmed that this is a thin deposit with a depth of about twenty centimetres beneath which there are no further finds.

Excavation of the trench yielded a number of post-medieval finds. For the most part these are fragments of brick and construction rubble in general, but we also found a large quantity of sherds of post-medieval ware, glass and metal. Prominent among the special finds are two fused glass beads, bearing witness to manufacturing defects.

The archaeological investigation of the three shipwrecks at Uljeva to date, in spite of a high level of devastation, has generated significant data related to their history. Besides the devastation committed by humans in the very recent past, a significant factor that has contributed to the poor state of

iskopavanja južno od rta Uljeva, unutar uvale Kuje. Iskopavanje u uvali provelo se kad je zbog jakog vjetra i valova bilo nemoguće izvršiti efikasno i sigurno iskopavanje sjeverno od rta Uljeva.

Rekognosciranjima uvale Kuje koja su provedena prijašnjih godina, ustanovljeno je da se na određenim pozicijama u uvali mogu pronaći hrpe s fragmentiranim opekama i novovjekovnim nalazima. Zasada se smatra kako je riječ o odbačenom balastu ovdje usidrenih brodova. Na jednoj od pronađenih „balastnih gomila" na istočnoj strani uvale iskopao se rov dimenzija 3 x 1 m kako bi se dobio uvid u stratigrafiju. Stratigrafijom je potvrđeno da se radi o tankom "zasipu" debljine oko dvadesetak centimetara, ispod kojeg nema daljnjih nalaza.



17. A post-medieval bottles from Kuje / Novovjekovne boce iz Kuja (photo: L. Bekić)

Iskopavanjem rova naišlo se na niz novovjekovnih nalaza. Pretežno se radi o fragmentima opeka i općenito građevinske šute, no pronađena je i velika količina ulomaka novovjekovnog posuđa, stakla i metala. Od posebnih nalaza ističu se dvije staklene perle koje su se slijepile jedna za drugu, koje svjedoče o grešci u proizvodnji.

18. Post-medieval glass beads from Kuje / Novovjekovne staklene perle iz Kuja (photo: L. Bekić)

Arheološka istraživanja na trima brodolomima na Uljevi do sad su, unatoč velikom stupnju devastiranosti, iznjedrila značajne podatke vezane uz njihovu povijest. Osim devastacije koju su načinili ljudi u ne tako davnoj prošlosti, bitan čimbenik koji je utjecao na slabu očuvanost je i karakter same lokacije, odnosno, stjenovito dno na plitkoj obali izloženoj jakim udarima valova. Arheološka iskopavanja pokazala su se tako kao idealno rješenje za dobivanje podataka o ostacima brodoloma.

Posebno je važno da se brodolomi istraže u cijelosti, no isto tako bitno je da ostanu in situ kako lokacija ne bi izgubila na atraktivnosti u slučaju da se pripremi za organizirane posjete. Pokazalo se da je sustav istraživanja i dokumentiranja koji se provodi prilikom istraživanja na Uljevi najbolji način da se ova dva pravila ispoštuju i provedu u cijelosti. Osim otkrića novog brodoloma – Uljeva D, ovogodišnja kampanja pokazala se kao izuzetno korisna u vidu

19. The Uljeva 2015 team: standing from the left / Ekipa Uljeva 2015. Stoje slijeva: Ahmed Ali Mohamed Al-Siyabi, Roko Surić, Marina Šimičić, Jelena Čelebić, Veronika Zerzánová, Bartlomiej Grzywniak, Barbora Machová; squatting from the left / čuče slijeva: Luka Bekić, Mladen Pešić (photo: M. Pešić)

preservation is the nature of the location itself, i.e. the rocky bottom of a shallow shore exposed to powerful wave action. The archaeological excavations have been shown to be the ideal solution for obtaining data on the remains of the wrecked ships.

It is particularly important that the shipwrecks are investigated in their entirety, but it is likewise important that they remain in situ so that the location does not lose its attractiveness in the event that it is set up for organised visits. It has been shown that the system of investigation and documentation being conducted at Uljeva is the best means whereby these two rules are respected and implemented in full.

Besides the discovery of a new shipwreck – Uljeva D, this year's campaign has proven to be exceptionally beneficial in terms of the use of data obtained in last year's production of bathymetric maps of Uljeva in everyday work in the field. Also prominent in this campaign were excavations at Kuje Cove with the objective of completing the picture of Cape Uljeva and Kuje Cove as connected contexts.

One part of the investigation was joined by students attending the advanced level underwater archaeology course organised by ICUA parallel to this year's investigations. This afforded them a first-hand opportunity to learn about underwater investigation and about site and find documentation.

The archaeological investigation of this area has provided us with a clearer picture of the potential of the seabed in this location on the western Istrian coast. These localities could acquire special significance if they were to be utilised in supplementing the tourism offer of southeast Istria.

implementacije podataka dobivenih prošlogodišnjom izradom batimetrijske karte na Uljevi, u svakodnevni rad na terenu. Kampanju je obilježilo i iskopavanje u uvali Kuje, čime se nastoji upotpuniti slika rta Uljeve i uvale Kuje kao povezane cjeline.

Jednom dijelu istraživanja priključili su se i studenti koji su polagali Napredni tečaj za podvodnu arheologiju, a kojeg je MCPA organizirao paralelno s ovogodišnjim istraživanjima. Na taj način dala im se prilika da iz prve ruke uče o podvodnim istraživanjima, ali i o dokumentaciji nalazišta i nalaza.

Arheološkim istraživanjima ovog prostora dobila se jasnija slika potencijala koji se krije u podmorju ove lokacije na zapadnoj istarskoj obali. Poseban značaj ovi lokaliteti bi dobili u koliko bi se oni iskoristili za popunjavanje turističke ponude u jugoistočnoj Istri.

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Investigation of Županski Zaljev and Lokrum

Istraživanje Županskog zaljeva i Lokruma

Luka Bekić ● lbekic@icua.hr, Roko Surić ● rsuric@icua.hr

1. Separating amphorae fused to the rock at the Sveti Petar A shipwreck / Odvajanje amfora sraslih sa stijenom na brodolomu Sv. Petar A (photo: L. Bekić)

From the 31st of August to the 7th of September 2015 the International Centre for Underwater Archaeology in Zadar (ICUA) in collaboration with the Archaeological Museum of the Dubrovnik Museums (DUMUS) conducted underwater archaeological investigation in the area of Županski Zaljev (Župa Bay) and the island of Lokrum. Serving as expert leader of the archaeological research campaign was Luka Bekić DSc. The other members of the specialist and technical team were underwater archaeologists Mladen Pešić, Marina Šimičić and Roko Surić of ICUA Zadar, Domagoj Perkić of DUMUS and Mirko Maslać of the Župa Dubrovačka diving club.

Međunarodni centar za podvodnu arheologiju u Zadru (MCPA) u suradnji s Arheološkim muzejom Dubrovačkih muzeja (DUMUS) proveo je podmorsko arheološko istraživanje na području Županskog zaljeva i Lokruma u razdoblju od 31. kolovoza do 7. rujna 2015. Stručni voditelj radova podvodnog arheološkog istraživanja bio je dr. sc. Luka Bekić, a ostatak stručne i tehničke ekipe činili su podvodni arheolozi Mladen Pešić, Marina Šimičić i Roko Surić iz MCPA Zadar, Domagoj Perkić iz DUMUS i Mirko Maslać iz ronilačkog kluba Župa dubrovačka.

Višegodišnja međunarodna suradnja s američkim timom RPM Nautical Foundation (RPMNF), s kojima smo svake godine vršili istraživanja dubrovačkog podmorja s brodom Hercules ove godine je izostala zbog kašnjenja nadležnih državnih tijela prilikom izdavanja dozvole. Iz tog razloga odlučeno je da

Our international collaboration with the US-based RPM Nautical Foundation (RPMNF) team, with which we have investigated the waters of the Dubrovnik area aboard the research vessel Hercules for a number of years, was missed this year due to the lateness of the competent state authorities in issuing licences. As a result it was decided that, in place of the customary inspection of the seabed using the advanced technology provided by RPM, we would conduct a visual inspection of already discovered shipwrecks and areas at lesser depths along the shore for which it is hypothesised that they may hold submerged archaeological heritage.

We inspected the shipwrecks discovered in investigations conducted in previous years located in the waters of Cape Sveti Petar (rt Sveti Petar) in Kupari, designated Sveti Petar A and Sveti Petar B, and we also inspected the shipwreck Kostur B, located in the waters just off Cape Kostur (rt Kostur) at Mlini. Besides the shipwrecks, we also inspected the shoreline area along Cape Sveti Pelegrin (rt Sv. Pelegrin) and the waters of the Lokrum channel to the eastern and northern side of the island of Lokrum.

Two of the shipwrecks located in previous years are situated near Cape Sveti Petar near Kupari. The objective of this year's investigation was to collect as much information as possible on the nature of the shipwrecks.

The remains of the shipwreck designated as Sveti Petar A are found to the eastern side of the promontory, at a depth of two to five metres on a rocky seabed that drops towards a sandy bottom covered with Mediterranean tapeweed. The objective was to ascertain the character of the site, the area of distribution of the finds and to locate typologically identifiable finds.

An inspection of the site revealed amphorae sherds that have become incrusted onto the surrounding rock. The fact that the pottery was thus adhered to the rock meant that typologically identifiable sherds had to be separated from the rock with the spiked end of a hammer. The separation of the sherds from the rock revealed three amphorae neck sections, two amphorae bases, a fragmented small bowl and the base of a vessel. For one amphorae neck we have yet to find an analogous example, one base is from a Forlimpopoli type, while the other two are North African types manufactured from the third to early fifth century.

It was established that the finds are distributed for the most part on a rocky, relatively steep part of the seabed at a depth of from two to five metres and that they stretch across an area of some 60 metres along the shoreline. Although we did conduct a surface inspection of the

2. Extracting part of a still plugged amphora at Sveti Petar A / Vađenje dijela još začepljene amfore s Sv. Petra A (photo: R. Surić)

će se umjesto uobičajenog pregleda morskog dna naprednom tehnikom koju posjeduje RPM, izvršiti vizualni pregledi već otkrivenih brodoloma i područja na manjim dubinama uz obalu, za koja se pretpostavlja da kriju potopljenu arheološku baštinu.

Pregledani su brodolomi koji su otkriveni u istraživanjima provedenim prethodnih godina, a nalaze se u podmorju ispred rta Sv. Petar u Kuparima, pa ih nazivamo „Sv. Petar A" i „Sv. Petar B", a također je pregledan i brodolom „Kostur B" koji se nalazi u podmorju ispred rta Kostur u Mlinima. Osim brodoloma izvršen je pregled priobalnog područja uz rt. Sv. Pelegrin te pregled podmorja Lokrumskog kanala, uz istočnu i sjevernu stranu otoka Lokruma.

Dva brodoloma koji su locirani prethodnih godina, nalaze se u blizini rta Sv. Petar u Kuparima. Cilj ovogodišnjih istraživanja bio je prikupiti što više informacija o karakteru samih brodoloma.

Ostaci brodoloma koji se naziva Sv. Petar A nalaze se s istočne strane rta, na dubini od 2 – 5 m na stjenovitom dnu koje se spušta prema pijeskovitom dnu obraslom posidonijom. Cilj je bio utvrditi karakter nalazišta, područje rasprostiranja nalaza i pronaći tipološki odredive arheološke nalaze.

part of the seabed with a dense cover of Mediterranean tapeweed, no archaeological finds were observed there. It is to be expected that they are to be found in the sand here, covered in the dense roots of the tapeweed.

The investigation has led us to conclude that these are the remains of a late Antiquity ship and its cargo. The ship most likely ran aground the eastern side of Cape Sveti Petar, blown by a strong northerly wind, scattering its cargo along the seabed. Few sherds are preserved on the bottom that have become incrusted with the rock while the remainder, easily accessible as it was, was likely looted in the second half of the twentieth century.

Shipwreck Sveti Petar B was located on the silty bottom to the southeast of Cape Sveti Petar at a depth of from 36.5 do 37.5 metres. The shipwreck was discovered during scanning of the seabed aboard the research vessel Hercules in 2013. The scan revealed a large heap of ovoid perimeter consisting of incrusted rock and amphorae. The heap of stones is about 15 metres long and eight metres wide. Two dives were conducted at this site in order to as best as possible document it and to collect as much information as possible about the character of the site. Once it had been established that the amphorae on the seabed were firmly fused to the heap and could not be moved, it was decided that the surrounding terrain, i.e. silty seabed be inspected in hope of perhaps locating a solitary amphora or some other find of archaeological interest. Because of the depth, i.e. the short period of time (15 minutes) that could be spent on the bottom, we were unsuccessful in finding solitary amphorae outside the heap.

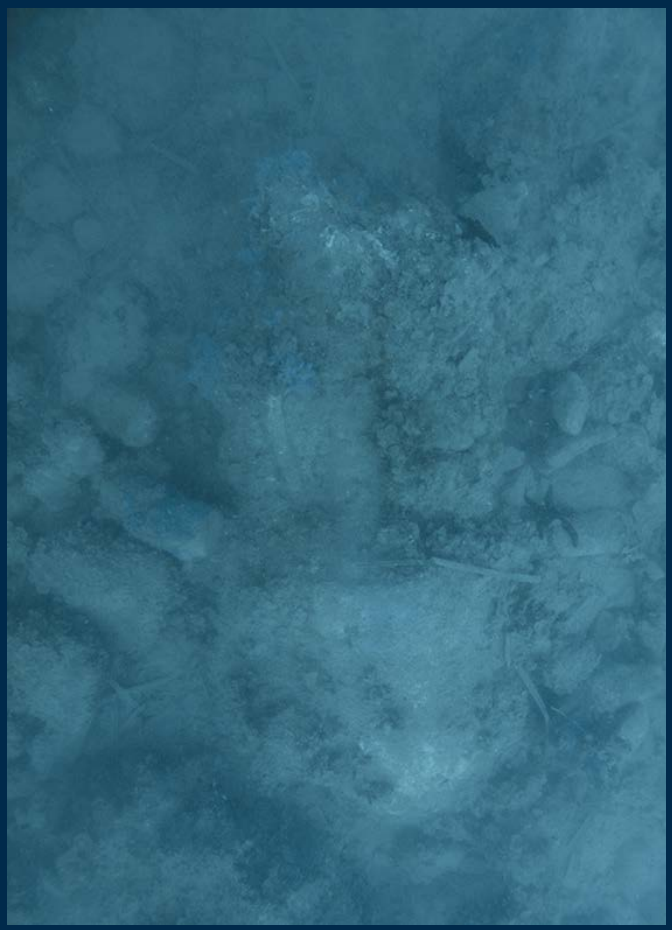
3a. An African amphora from the Sveti Petar A shipwreck / Afrička amfora s brodoloma Sv. Petar A (photo: L. Bekić)

3b. A rare amphora from the Sveti Petar A shipwreck / Rijetka amfora sa brodoloma Sv. Petar A (photo: L. Bekić)

It was decided then to draft site drawing documentation of the site. An aggravating circumstance for precise documentation was the poor visibility predominant for some rea- son at this depth and we opted to draw up a sketch of the site. While drawing this up it was established that there are 16 amphorae visible on the surface of the heap – on one we observed a flat strap-like rim, long

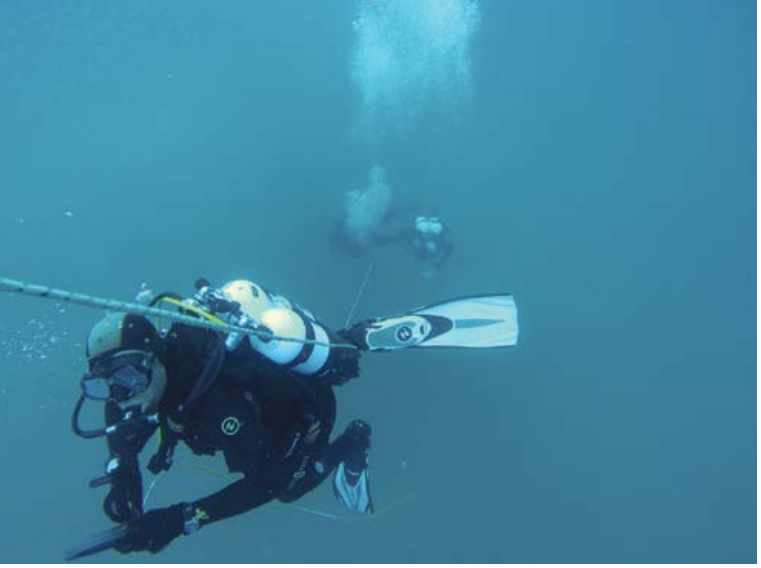
Pregledom nalazišta uočeni su ulomci amfora koji su se inkrustrirali s okolnim kamenjem. Zbog tog stanja slijepljenosti keramike i kamena tipološki odredivi ulomci morali su se od kamena odvajati šiljastim dijelom čekića. Odvajanjem ulomaka od stijena pronašla su se tri grla amfora, dva dna amfora, fragmentirana zdjelica i dno posude. Za jedno grlo amfore se za sada nije pronašla analogija, jedno dno pripada tipu Forlimpopoli, dok druge dvije pripadaju sjevernoafričkim tipovima koji se proizvode od 3. do početka 5. st.

Utvrdilo se da se nalazi rasprostiru pretežno na kamenitom, relativno strmom dijelu dna na dubini od 2 do 5 m, a protežu se na prostoru uz obalu u dužini od 60-ak metara. Iako je izvršen površinski pregled morskog dna obraslog gustom posidonijom, na tom dijelu nisu uočeni arheološki nalazi. Za očekivati je da ih ima i ovdje u pijesku, prekrivenih gustim korijenjem posidonije.



4. An amphora incrusted with the ballast stones at Sveti Petar B / Amfora inkrustrirana u balastno kamenje na Sv. Petru B (photo: R.Surić)

Istraživanjem se došlo do zaključka da se na ovom lokalitetu nalaze ostaci broda iz kasnoantičkog razdoblja i ostaci njegovog tereta. Brod je najvjerojatnije uslijed jakog sjevernog vjetra udario u istočnu stranu rta Sv. Petar, nakon čega je teret rasut po morskom dnu. Na dnu su sačuvani samo rijetki ulomci koji su se inkrustacijom spojili sa stijenom, dok je ostatak zbog svoje dostupnosti najvjerojatnije opljačkan tijekom druge polovine 20. st.



5. The ascent from the Sveti Petar B site at 36m depth / Izron sa nalazišta Sv. Petar B na 36m dubine (photo: M.Šimičić)

handles and a prominent shoulder on another and a very elongated spike at the base of a third (Fig. 6). Consistent with these details it can be said with a high measure of certainty that this is the wreck of a ship that was transporting Dressel 6A amphorae, which are dated to the period from the late first century BCE to the first century CE. A particularly interesting situation at this shipwreck is that the rounded ballast stones are found on the surface of the entire heap and that they cover the amphorae. We can conclude from this that the ship sank to the bottom keel up.

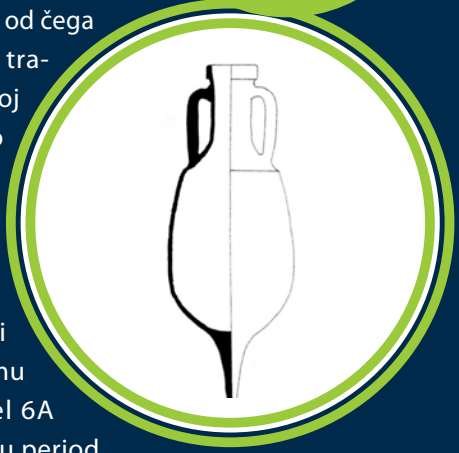
Following on a report that there was another shipwreck on the seabed not far from Cape Kostur (besides the sailboat

7. The team of archaeologists dive at Cape Kostur / Arheološka ekipa nakon urona kod rta Kostur (photo: M. Šimičić)

located in 2014), it was decided that this area should also be inspected. We dove to the shipwreck in the company of local diver Nikola Duper, who knew the exact position. The shipwreck is located at a depth of 25 metres, some 300 metres to the northwest of Cape Kostur. The remains of the shipwreck are not prominent on the seabed, rather the position is recognised by the finds that are scattered

Brodolom Sv. Petar B lociran je na muljevitom dnu jugoistočno od rta Sv. Petar, na dubini od 36,5 m do 37,5 m. Brodolom je otkriven Herculesovim skeniranjem morskog dna 2013. g. Radi se većoj nakupini jajolikog tlocrta koja je načinjena od inkrustriranih kamenja i amfora. Gomila kamena je dugačka oko 15 m a široka oko 8 m. Na ovom nalazištu izvršena su dva zarona kako bi se on što bolje dokumentirao i kako bi se izvuklo što više informacija o karakteru nalazišta. Nakon što je utvrđeno da se amfore koje se nalaze čvrsto srasle na gomili ne mogu pomaknuti, odlučeno je da se pretraži okolni teren, odnosno, muljevito dno, u nadi da će se možda locirati neka osamljena amfora ili neki drugi arheološki zanimljiv nalaz. Zbog dubine, odnosno kratkog vremena (15 min.) koje se moglo provesti na dnu, nije se uspjelo pronaći osamljene amfore izvan gomile.

Nakon toga odlučeno je da se izradi nacrtna dokumentacija samog nalazišta. Otegotna okolnost za precizniju dokumentaciju bila je loša vidljivost, koja iz nekog razloga vlada na toj dubini, pa je odlučeno da se napravi skica nalazišta. Prilikom izrade skice ustanovljeno je da se na površini gomile nalazi vidljivih 16 amfora, od čega je na jednoj primijećen trakasti ravni obod, na jednoj duge ručke i naglašeno rame te na trećoj izrazito dug šiljak na dnu (Sl.6). Sukladno tim pojedinostima, s velikom vjerojatnošću može se ustvrditi kako se radi o brodolomu koji je prevozio Dressel 6A amfore, koje se datiraju u period od kasnog 1.st.pr. Kr. do 1. st. Na ovom brodolomu posebno je zanimljiva situacija da se oblo balastno kamenje nalazi na površini cijele gomile i zatrpava amfore. Slijedom toga je najlogičniji zaključak kako je brod na morsko dno potonuo okrenut naopako.

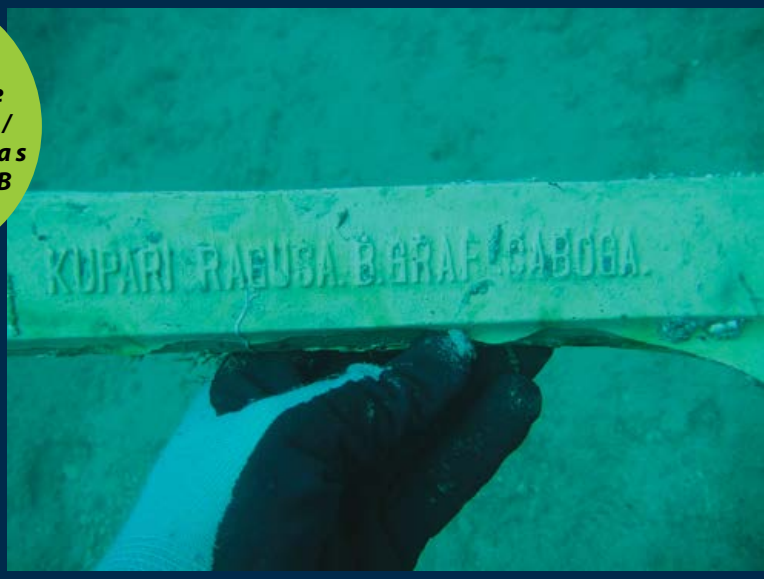


6. The ideal appearance of the amphorae at the Sveti Petar B shipwreck / Idealan izgled amfora na brodolomu Sv Petar B (L. Bekić)

Nakon dojave da se u podmorju nedaleko rta Kostur nalazi još jedan brodolom (osim pronađenog jedrenjaka iz 2014. g.) odlučeno je da će se i to područje pregledati. Na brodolom se zaronilo uz pomoć lokalnog ronioca Nikole Dupera, koji je znao točnu poziciju. Brodolom se nalazi na dubini od 25 m, 300-tinjak metara sjeverozapadno od rta Kostur. Ostaci brodoloma ne ističu se na morskom dnu, već se pozicija prepoznaje po nalazima koji se rasprostiru na površini od preko 100 m^2. Pregledom lokaliteta ustanovljeno je kako je glavnina tereta koji je ovaj

over an area of over 100 square metres. An inspection of the site determined that the bulk of the cargo transported by this ship consisted of roof tiles and brick. This is a specific, broad roof tile that usually bears the relief stamps "KUPARI RAGUSA B.GRAF CABOGA – ANTICA FORNACE KUPARI – FONDATE ANNO 1200".

8. Part of the inscription on a roof tile from the Kostur B shipwreck / Dio natpisa sa crijepa s brodoloma Kostur B (photo: R. Surić)



We also found one amphora neck sherd, but we cannot associate it with this post-medieval shipwreck, most likely dating from the early twentieth century. Besides the roof tiles and bricks we did not discover any other finds associated with this vessel and we did not find any artefacts or remains of a wooden structure that we could attribute to this ship. This puts the very character of the site into question as it is likely attributable to the deliberate ejection of cargo from a ship to prevent its sinking. Without more precise investigation, however, we cannot entirely reject the theory that the remains of the ship could be somewhere in the vicinity of the site.

This year's investigations, besides on the inspection of shipwrecks, was also focused on the surveying of locations along the shoreline. This shoreline zone of a depth of up to 20 metres remains uninvestigated in the campaigns with RPM, as the research vessel Hercules cannot safely navigate this close to the shoreline. The time constraints did not allow us to fully survey the entire shoreline zone of Konavle and Župski Zaljev and we therefore selected those locations that are archaeologically of greatest interest.

The first location to be thus surveyed was the area around Cape Pelegrin. All three sides of the promontory were surveyed. Large stone and construction rubble was dumped along most of the shallow coastal belt (0 to 10 metres) to the western side during some recent episode, evidently during the construction or reconstruction of buildings on the seafront, such that the original seabed is not accessible. We find dense growth of Mediterranean tapeweed at a depth of some 20 metres in which we did not observe any archaeological finds.

Although we did find several isolated amphorae sherds and a sherd from an Antiquity period pot, at no part did we observe a greater concentration of finds that would be indicative of an archaeological site. To the east side of the promontory, however, we did collect two sherds from the upper section of one amphora with handles. This is an Agora K114B amphora, dated to the period from the first century BCE to the fourth century. Along with the amphora we also discovered a sherd from an *Aegean coarse ware* pot that is dated to the second to fourth century.

brod prevozio bio krovni crijep i opeka. Radi se o specifičnom, širokom krovnom crijepu koji najčešće na sebi nosi i reljefne pečate „KUPARI RAGUSA B.GRAF CABOGA – ANTICA FORNACE KUPARI – FONDATE ANNO 1200 ".

Pronađen je i jedan ulomak vrata amfore, no njega ne možemo dovesti u vezu s ovim novovjekovnim brodolomom, koji najvjerojatnije datira s početka 20. st. Od nalaza vezanih uz ovaj brodolom, osim krovnog crijepa i opeka, nisu pronađeni drugi nalazi, a isto tako, nije pronađen niti jedan predmet ili ostatak drvene konstrukcije koje bismo mogli pripisati brodu. Iz tog razloga karakter samog nalazišta dolazi u pitanje, a vjerojatno se radi o namjernom izbacivanju tereta iz samog broda kako bi se izbjeglo potapanje. Bez preciznijeg istraživanja ne može se u potpunosti odbaciti ni teorija da su ostaci broda prisutni u okolici nalazišta.

Ovogodišnja istraživanja su se, osim na pregledu brodoloma, bazirala i na pregledu lokacija uz obalu. Taj priobalni pojas do 20-ak m dubine ostaje neistražen u istraživanjima s RPM-om, jer se brod Hercules zbog sigurnosnih razloga ne približava tako blizu obali.

Zbog nedostatka vremena nije se mogao u potpunosti pregledati cijeli priobalni pojas Konavala i Župskog zaljeva, pa se odlučilo izabrati određene lokacije koje su arheološki bile najzanimljivije.

Prva lokacija koja je pregledana na taj način bilo je područje uz rt Pelegrin. Pregledane su sve tri strane rta. Veći dio plićeg priobalnog pojasa (0 – 10 m) na zapadnoj strani je u nekom novijem vremenskom periodu zasut većim kamenjem i građevinskom šutom, očito prilikom izgradnje ili rekonstrukcije objekata na samoj obali, pa originalno morsko dno nije dostupno. Već na dubini od oko 20 m javlja se gusta trava posidonija, u kojoj nisu uočeni nikakvi arheološki nalazi.

9. An Agora K114B type amphora from Cape Pelegrin / Amfora tipa Agora K114B s rta Pelegrin (photo: L. Bekić)

The following locations we surveyed lie along the island of Lokrum. The island has served as a natural seawall of sorts throughout history and its coves offered favourable conditions for anchorage from the prevailing southwesterly.

The survey of Bočina Cove was conducted primarily to evaluate the condition and potential finds associated with the 1859 sinking of the Austro-Hungarian warship Triton, from which several cannon were extracted back in the 1970s. Unfortunately no trace was found of this shipwreck in spite of the fact that the dive was conducted on the basis of the oral instructions of one of the living divers from that campaign.

10. A post-medieval jug from Bočina Cove on Lokrum / Novovjekovni vrč iz uvale Bočina na Lokrumu (photo: L. Bekić)

Bočina Cove was inspected in its entirety to a depth of some 20 metres. Most of the cove is covered by fields of Mediterranean tapeweed. Although this has been an anchorage for a long time the surface inspection yielded only a few finds prominent among which are two almost entirely preserved post-medieval glazed jugs. Also found was a sherd from the upper section of a glazed post-medieval bowl with handle and the upper part of a glass post-medieval bottle. The finds were discovered on the surface of the seabed and there is no doubt that there is an abundance of finds under the sand.
We also inspected a smaller cove to the northeast side

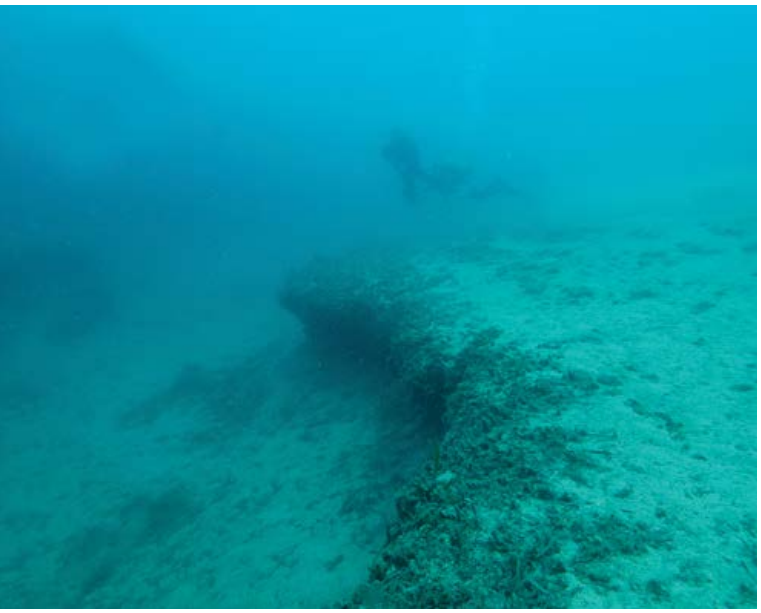
lako je pronađeno nekoliko usamljenih ulomaka amfora, te ulomak antičkog lonca, na niti jednom dijelu nije uočena veća koncentracija nalaza koja bi upućivala da se radi o arheološkom nalazištu. Ipak, s istočne strane rta, prikupljena su dva ulomka gornjeg dijela iste amfore s ručkama. Radi se o amfori Agora K114B koja se datira od 1. st. pr. Kr. do 4. st.. Osim amfore pronađen je i ulomak takozvanog *Aegean coarse ware* lonca, a koji se datiraju od. 2. do 4. st.

Slijedeće lokacije koje se odlučilo pregledati nalaze se uz otok Lokrum. Sam otok činio je svojevrsni prirodni valobran tokom čitave povijesti, a njegove uvale stvarale su povoljne uvjete za sidrenje za vrijeme puhanja jugozapadnih vjetrova.

Pregled uvale Bočina proveden je prvenstveno zbog provjere stanja i potencijalnih nalaza povezanih uz potapanje austrougarskog ratnog broda Triton 1859. g., s kojeg su još sedamdesetih godina 20.st. izvađeni neki topovi. Nažalost od ovog brodoloma nije pronađeno nikakvih tragova, mada se ronilo prema usmenim uputstvima jednog od živućih ronilaca iz tadašnje akcije.

Uvala Bočina pregledana je u cijelosti do dubine od 20-ak m, a na većem dijelu uvale prostire se polje posidonije. lako se radi o dugotrajnom sidrištu, površinskim pregledom pronađeno je tek nekoliko nalaza, od čega se ističu dva, gotovo potpuno sačuvana novovjekovna glazirana vrča. Pronađen je i ulomak gornjeg dijela glazirane

of Lokrum facing Dubrovnik. We find sherds of post-medieval ceramic ware along the entire length of the cove. An interesting situation was discovered at a depth of 15 metres where we came across a trough of over two metres in depth, about 100 metres long and five metres wide. The manner and cause for the occurrence of this trough is unknown, but thanks to it we gained insight into the horizontal stratigraphy. At a half metre depth in the profile of the trough, for example, we found a sherd from a small post-medieval bowl, while at the bottom of the profile, at a depth of about two metres, we found most of a late Antiquity amphora. We also surveyed the area to the north of the promontory where we found the upper section of a Lamboglia 2 amphora, several sherds of post-medieval ceramic ware and two glass bottles from the first half of the twentieth century.



11. A puzzling trough in the seabed off Lokrum / Zagonetan kanal ukopan u morskom dnu kod Lokruma (photo: M.Pešić)

Finally, we should note that the archaeological team once again inspected the known location of a late Antiquity shipwreck protected by a cage and a shipwreck with dolia alongside the island of Supetar not far from Cavtat. Both sites are in the concession system of "underwater museums" and are visited annually by a great number of tourist divers under the guidance of the Epidaurum diving centre. The new cage is in excellent condition in spite of the seaweed that has begun to grow on it and there are no signs of devastation at both sites.

The research vessel Hercules and its team of specialists were greatly missed and their absence is a regretful loss to us all, above all to Croatia's cultural heritage. We did, nevertheless, applying classic investigation methods, achieve a measure of success in our results. We made the best of it and, using a small powerboat and a more modest team, did what we could to maintain the continuity of the research of the Dubrovnik area. Thus we documented and characterised the shipwreck off Cape Sveti Petar,

novovjekovne zdjele s ručkom i gornji dio staklene novovjekovne boce. Nalazi su pronađeni na površini morskog dna, a zasigurno se još mnoštvo nalaza krije ispod pijeska.

Pregledana je i manja uvala na sjeveroistočnoj strani otoka Lokruma, nasuprot Dubrovnika. Po cijeloj dužini uvale pronalaze se ulomci novovjekovnog keramičkog posuđa. Zanimljiva situacija otkrivena je na 15 m dubine, gdje je uočen rov dubok preko 2 m, dužine oko 100 m i širine oko 5 m. Nepoznat je način i razlog zbog kojeg je rov nastao, no zahvaljujući njemu dobili smo uvid u horizontalnu stratigrafiju. Na primjer, na pola metra dubine u profilu pronašao se ulomak novovjekovne zdjelice, dok se na dnu profila, na dubini od oko 2 m, pronašao veći dio kasnoantičke amfore. Pregledano je i područje do sjevernog rta na kojem je nađen gornji dio amfore Lamboglia 2, nekoliko ulomaka novovjekovnog keramičkog posuđa i dvije staklene boce iz prve polovice 20. st.

12. An African amphora from the submarine trough off Lokrum / Afrička amfora iz podvodnog kanala kod Lokruma (photo: L. Bekić)

Na kraju, valja napomenuti kako je arheološka ekipa ponovo pregledala i poznate lokacije kasnoantičkog brodoloma prekrivenog kavezom, te brodoloma s dolijama uz otok Supetar nedaleko Cavtata. Oba nalazišta su u sustavu koncesijskih "podvodnih muzeja", te ih godišnje posjeti velik broj turističkih ronilaca, uz vodstvo iz ronilačkog centra Epidaurum. Novi kavez je u odličnom stanju, usprkos tome što je na njemu počela rasti morska trava, a na oba nalazišta nema tragova oštećivanja.

Usprkos tome što sa žaljenjem možemo konstatirati da smo zbog nedolaska istraživačkog broda Hercules i njegove stručne ekipe svi izgubili, a najviše kulturna baština RH, ovakvim istraživanjima klasičnom metodom ipak su postignuti određeni rezultati. Pokušalo se s manjim gliserom i skromnijom ekipom učiniti sve što se može da se kontinuitet istraživanja dubrovačkog područja ipak zadrži. Tako su dodatno dokumentirani i okarakterizirani brodolomi oko rta Sv.Petar, koji se svakako mogu istraživati klasičnom, ronilačkom metodom, te je pronađen i još jedan potencijalni brodolom s početka 20. stoljeća, s teretom crijepa (kupa) iz nekadašnje tvornice Caboga - Kupari.

Daljnjim pregledom podvodnih terena isključena je mogućnost pronalaska daljnjih brodoloma uz sam rt Pelegrin, na što se sumnjalo zbog prethodnog pronalaska dva brodoloma u dubljim vodama uz njega.

Pregledom okolice Lokruma nisu pronađeni ostaci brodoloma Tritona, međutim, istraživanja na sjeveroistoku otoka potvrdila su da se na muljevitim područjima morskog dna u zavjetrini

13. Inspection of the large dolia off the island of Supetar / Pregled velikih dolija kod otoka Supetar (photo: L. Bekić)

which can certainly be investigated applying the classic diving method and discovered another potential early 20th century shipwreck with a cargo of roof tiles (barrel tiles) from the former Caboga-Kupari factory.

Further inspection of the submarine terrain excluded the possibility of finding other shipwrecks in the immediate vicinity of Cape Pelegrin based on the previous finds of two shipwrecks in deeper waters near the promontory.

We did not find the remains of the Triton shipwreck during a survey of the Lokrum area. The investigation of the northeast of the island did, however, confirm that here and at similar places on the Adriatic, on silty parts of the seabed to the leeward side of natural barriers, we can find well preserved finds even on two metres of sediment. For this reason precisely we should in the future afford particular attention to rescue archaeological work at former anchorages in spite of the fact that archaeological finds are not observed on the current surface.

In the coming year we hope to once again be able to host the American research vessel Hercules and its specialist team in exploring the depths of our sea – an effort beyond our current technical capacity and training, and certainly outside the scope of our research financing. The lion's share of the funding of this research in Croatia has so far been borne by the RPM Foundation, amounting to in excess of one million kuna (over 130 thousand euro) per year – an evident loss for Croatia. It is, therefore, to be hoped that the significance of this international research will overcome the excessive bureaucratic procedures that hamper it.

neke prirodne barijere može, upravo ovdje, ali i na sličnim takvim mjestima na Jadranu, pronaći dobro očuvani nalazi čak i pod dva metra sedimenta. Upravo zbog toga, u budućnosti bi valjalo posvetiti posebnu pažnju prilikom zaštitnih arheoloških radova na nekadašnjim sidrištima, usprkos tome što se na sadašnjoj površini ne uočavaju arheološki nalazi.

Nadamo se da će slijedeće godine ponovo biti mogućnosti da američki znanstveno - istraživački brod Hercules i njegova stručna ekipa istražuju dubine našeg podmorja, za što mi u Hrvatskoj nismo opremljeni i obučeni, a svakako nismo u mogućnosti takva istraživanja financijski pokriti. Najveći udio troškova takvih istraživanja u Hrvatskoj do sada je snosila sama RPM zaklada, a oni iznose preko milijun kuna godišnje, pa je očito riječ o značajnom gubitku za RH. Stoga se valja nadati da će značaj ovog međunarodnog istraživanja nadjačati suvišne birokratske procedure koje ga opterećuju.

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New Developments in the Archaeological Survey of Zadar County Waters

Nove zanimljivosti s rekognosciranja podmorja Zadarske županije

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For four years running the International Centre for Underwater Archaeology has conducted an archaeological survey programme in Zadar County. The programme is financed by the Ministry of Culture and has as its core objective to survey registered sites in order to ascertain the level of their preservation and possible threats, and to survey new locations on the basis of collected information on submarine archaeological heritage finds that we have gathered in the course of the year.

As previously the programme was conducted on the basis of reports from divers that have assisted us for many years – we wish to take this opportunity to once again thank them, in particular Mr Marinko Uglešić. Information concerning some of the locations has also come from diving clubs. Notable this year is our collaboration with the Pangea diving club of Starigrad. Joining the entire ICUA diving team in the archaeological survey was long time associate Borna Krstulović.

This year we established a new practice: ICUA staff joins the staff of the various ministries in carrying out some of the dives undertaken in the frame of the archaeological survey programme. This is commonly referred to as the Coordination at the sea. This pertains to collaboration with the Zadar Conservation Department of the Ministry of Culture, the Maritime and Border Police (Ministry of the Interior), the Harbourmaster's Office (Ministry of Maritime Affairs, Transport and Infrastructure), the Coast Guard (Croatian Navy, Ministry of Defence), the Zadar Customs Administration (Ministry of Finance) and the Fisheries Inspection (Ministry of Agriculture), the purviews of which are directly associated with the sea and the inspection of various activities at sea. In the frame of the Coordination, ICUA divers join the cited authorities on their vessels in the course of their regular activities – this gives us an opportunity to survey underwater locations on prearranged routes. It also reduces the cost of transporting divers to locations and at the same time develops cooperation in the protection of underwater heritage at the inter-ministerial level and improves the overall protection and surveillance of the maritime environment.

Već četiri godine za redom Međunarodni centar za podvodnu arheologiju provodi program rekognosciranja Zadarske županije. Program je financiran od strane Ministarstva kulture, a osnovna mu je svrha pregled registriranih nalazišta radi uvida u stanje njihove očuvanosti i ugroženosti, te pregled novih lokacija na osnovu prikupljenih informacija o nalazima arheološke baštine u podmorju koje prikupljamo tijekom godine.

I ovaj put program je obavljen na osnovu dojava podvodnih ronioca koji nam pomažu već niz godina te im se ovim putem zahvaljujemo, posebno gosp. Marinku Uglešiću. Neke od lokacija smo saznali i uz pomoć ronilačkih klubova od kojih ove godine ističemo suradnju s ronilačkim klubom „Pangea" iz Starigrada. Uz čitavi ronilački tim MCPA, u rekognosciranjima je sudjelovao i dugogodišnji suradnik Borna Krstulović.

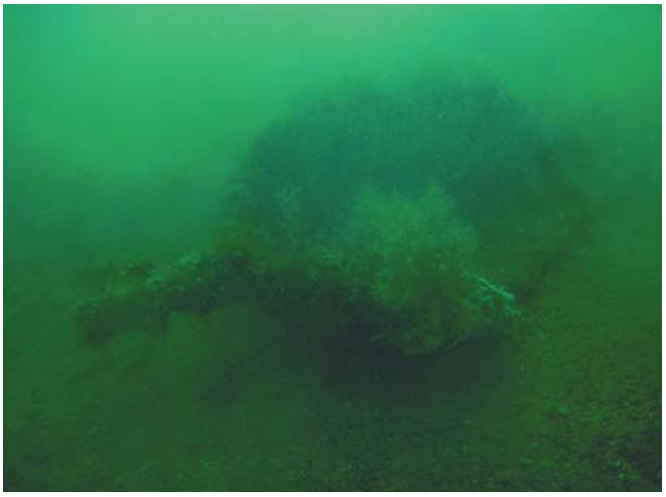
Tijekom ove godine ustalila se nova praksa obavljanja dijela ronilačkih urona po programu rekognosciranja koju djelatnici MCPA obavljaju sa djelatnicima različitih Ministarstava, a koja je popularno nazvana Koordinacija na moru. Radi se o suradnji s Konzervatorskim odjelom Ministarstva kulture u Zadru, Pomorskom i graničnom policijom (Ministarstvo unutarnjih poslova), Lučkom kapetanijom (Ministarstvo pomorstva, prometa i infrastrukture), Obalnom stražom (Hrvatska ratna mornarica, Ministarstvo obrane), Carinskom upravom Zadar (Ministarstvo financija) i Ribarskom inspekcijom (Ministarstvo poljoprivrede), čije djelatnosti su direktno povezane s morem i inspekcijom različitih aktivnosti na moru. U sklopu Koordinacije se ronioci MCPA pridružuju navedenim službama na njihovim plovilima tijekom obavljanja redovnih djelatnosti, te na taj način dobivaju mogućnost pregleda podvodnih lokacija koje se nalaze na dogovorenim rutama. Na ovaj način smanjuju se troškovi transporta ronioca na lokaciju, a ujedno se i razvija suradnja na zaštiti podvodne kulturne baštine među Ministarstvima, ali se općenito i poboljšava zaštita i nadzor nad podmorjem.

Nastavak rekognosciranja tijekom ove godine donio je zanimljive rezultate te otkrivanje novih brodoloma, ali i sidrišta

The continuation of the archaeological survey this year produced interesting results and the discovery of new shipwrecks and anchorages on the navigation routes of ancient seafarers. For two of the shipwrecks that have been located we can say with certainty that they transported amphorae of the Lamboglia 2 type.

The first of these was identified in the far southern section of the Velebit Channel. An area up to a depth of 26 metres was inspected at Četvrta Cove to the south of Vinjerac. The seabed drops in gentle steps and at a depth of 12 to 13 metres, on a silty bottom, we found amphorae sherds the concentration of which increases to a depth of 16 metres. Although a broader area to the west of the cove was inspected, the finds can be located on the seabed immediately off the tip of the cape. Immediately upon arriving at the position with the amphorae we observed that they can be characterised as being of the Lamboglia 2 type, but it was also observed that there are a number of different rims that all belong to the same type. Further analysis should determine whether these are in fact multiple sub-types and what the differences between them are. The large quantity of finds belonging to the same chronological and typological frame allow us to ascertain that this was a smaller ship that was wrecked in the period from the second century BCE to the first century CE. Based on the characteristics of the silty bottom, there is a possibility that deeper layers may hold sections of the ship's structure.

The configuration of the terrain at the location of the second shipwreck with the same amphorae type affords no likelihood for the discovery of parts of the vessel's structure. Amphorae sherds were observed across a broad expanse of the shallow waters immediately off the shore of the islet of Mežanj, situated to the western side of the island of Dugi Otok. They are for the most part highly fragmented sherds that the action of the sea, and certainly of human hands, has now reduced only to the remains of the cargo of a ship that was once visible here. Besides the large quantity of belly sherds and the odd rim or base section, it is interesting to note that we can still find a large num-



2. An amphora base at Četvrta Cove / Dno amfore u uvali Četvrta (photo: M. Šimičić)

na rutama plovidbe drevnih pomoraca. Za dva brodoloma koja su locirana sa sigurnošću se može tvrditi da su prenosili amfore tipa Lamboglia 2.

1. Part of a ship's cargo at Četvrta Cove / Dio brodskog tereta iz uvale Četvrta (photo: M. Šimičić)

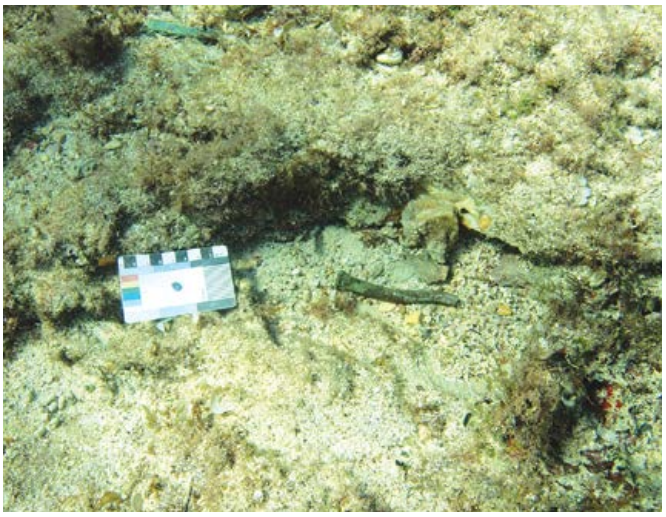
Prvi od njih prepoznat je na krajnjem južnom dijelu Velebitskog kanala. U uvali Četvrta južno od Vinjerca pregledan je prostor do 26 metara dubine. Morsko dno pada u blagim stepenicama, a na dubini od 12 – 13 m, na muljevitom dnu, naišlo se na ulomke amfora čija se koncentracija povećava prema dubini od 16 metara. Iako je pregledan širi prostor zapadno od uvale, sami nalazi mogu se locirati u podmorju neposredno u nastavku rta. Odmah po dolasku na poziciju na kojoj su se nalazile amfore uočilo se da se radi o ulomcima koji se mogu okarakterizirati kao Lamboglia 2 amfore, no može se primijetiti da postoji više različitih oboda koje sve pripadaju istom tipu. Daljnje analize bi trebale pokazati da li se doista radi o više podtipova i koje su razlike među njima. Veća količina nalaza koji spadaju u isti vremenski i tipološki okvir, daju nam za mogućnost potvrditi da se ovdje radi o jednom manjem brodolomu koji je nastradao u rasponu od 2. st. pr. Krista do 1. st. nakon Krista. Na osnovu karakteristika muljevitog dna, postoji mogućnost da je u dubljim slojevima moguće naći i dijelove brodske konstrukcije.

3. An amphorae section from Četvrta Cove / Dio amfore iz uvale Četvrta (photo: R. Surić)

Konfiguracija terena na kojem je lociran drugi brodolom s istim tipom amfora ne daje za mogućnost otkrivanja dijelove brodskih konstrukcija. Na malom otočiću Mežnju koji se nalazi na zapadnoj strani Dugog otoka, u plitkom moru uz sam otočić, na širokom prostoru se mogu uočiti fragmenti amfora. Većim dijelom su to sitniji ulomci, koji su djelovanjem mora, a zasigurno i

ber of amphorae plugs among the rocks. All of these sherds are from a ship with a cargo of Lamboglia 2 type amphorae that ended its voyage on the rocks of Mežanj.

A little to the east of the shipwreck with amphorae, and partially overlapping it, we find sherds of post-medieval pottery. For the most part these are the bases of bowls, a few specimens of the bases and rims of jugs, and sections of ware of large size reminiscent of dolia. At one part of the site, over an area of about 20 square metres, we find bits of bronze, mostly 10 centimetre long bronze nails, that certainly are the remains of the ship's structure that were preserved when the wooden parts decayed. We see ballast stones of various sizes, from small pebbles with a diameter of two to three centimetres to larger stones with a diameter of some 30 centimetres within the broad area of both shipwrecks.



5. Bronze nails are the only remains of the ship's structure at Mežanj/ Brončani čavli jedini su ostatak brodske konstrukcije na Mežnju (photo: M. Pešić)

As with the wreck at the islet of Mežanj, the shipwreck at Cape Lopata is now hardly recognisable among the submarine rocks and crevices surrounding the cape. We see sherds of Forlimpopoli type amphorae in the shallow waters that testify to yet another unsuccessful voyage undertaken by antiquity period seafarers in the first century.

We can also confirm Antiquity period maritime navigation in the area of Sakarun Cove with other finds discovered in the area attributed to amphorae of the Dressel 2-4, Late Roman 1 and Byzantine ribbed types, which indicates that this favourable position was used as an anchorage for many years.

We find information of the shipwreck at Veli Lagan in the literature and the data tells us that complete amphorae could once be found here, while now we see only fragments in the shallow waters. An amphora that was found intact originating from the

6. Sherds of Forlimpopoli type amphorae from the shipwreck at Lopata / Fragmenti amfora tipa Forlimpopoli s brodoloma na Lopati (photo: M. Pešić)

ljudskih ruku, danas svedeni samo na ostatke brodskog tereta koji je tu nekad bio vidljiv. Uz veliku količinu trbuha, te poneki dio oboda ili dna zanimljivo je da se i danas može između kamenja naći veća količina čepova amfora. Svi ovi fragmenti pripadali su brodskom teretu amfora tipa Lamboglia 2, koji je svoje putovanje završio na škrapama Mežnja. Nešto istočnije od brodoloma s amforama, djelomično i preko njega, nalazimo fragmente keramike novovjekovne data-

4. Amphorae plugs from the seabed off Mežanj / Čepovi amfora iz podmorje Mežnja (photo: M. Pešić)

cije. Većinom su to dna zdjelica, tek nekoliko primjeraka dna i oboda vrčeva, ali i dio posude velikih dimenzija koja nalikuje na doliju. Na jednom dijelu nalazišta, na 20-ak metara kvadratnih površine moguće je naći komade bronce, a ponajviše brončane čavle dužine oko 10 centimetra, koji zasigurno predstavljaju ostatke brodske konstrukcije, koji su se očuvali nakon što je drveni dio propao. Unutar širokog prostora obaju brodoloma vidljivo je balastno kamenje različitih dimenzija, od manjih kamenčića promjera 2-3 centimetra do većeg kamenja promjera 30-ak centimetara.

Slično kao i na otočiću Mežnju, brodolom na rtu Lopata danas je teško prepoznatljiv među podmorskim stijenama i škrapama koje okružuju rt. U plitkom moru vidljivi su fragmentirani ostatci amfora tipa Forlimpopoli koje nam svjedoče o još jednom neuspjelom putovanju antičkih pomoraca tijekom 1. stoljeća. Tragove plovidbe na području uvale Sakarun kroz antički period možemo potvrditi i drugim nalazima koji se uokolo pronalaze,

7. A post-dive preliminary inspection of the archaeological finds at Cape Lopata / Preliminarni pregled arheoloških nalaza nakon izrona na rtu Lopata (foto: M. Šimičić)

Lagnići island group has been identified as a Dressel 6A type (Uglešić, Parica 2013, 153). The southern section of the waters of the islet of Veli Lagan was surveyed in order to confirm these data and to gain insight into the level of preservation of the site for the purpose of its registration.

The only archaeological finds observed were at the southern cape of Veli Lagan – a broad field of highly fragmented amphorae sherds found in the crevices between the rocks. For the most part these are belly sherds and very few amphorae rim and base sherds. Based on these finds, however, and comparison with the intact specimen from the literature, we observed typological differences and there is a possibility that they are not from the same shipwreck. The preliminary analysis conducted on the basis of the fragmented rims opens the possibility that this was a shipwreck with somewhat earlier amphorae, more precisely late Greco-Italic amphorae dated to the period from the late third to mid second century BCE (Caravale, Toffoletti 1997, 97).

Along with shipwrecks, anchorages too have a very important role in defining the waterways and favourable navigation routes used by sailors. Some of these anchorages were determined by the distribution of settled places on the maritime routes that were frequented by merchants and travellers, while others were determined by a favourable geographic position that caused them to be continually used by ships in inclement weather or at night when sailing was avoided. Soline Cove on the western part of the island of Pašman was certainly one such place – its elongated northwest—southeast orientation makes it an excellent protection from the Bura and southerly winds to this day. Across the entire area

9.Typologically identifiable sherds from Veli Lagan / Tipološki odredivi fragmenti s Velikog Lagna (photo: R. Surić)

a pripisuju se tipovima amfora Dressel 2-4, Late Roman 1 te bizantskim narebrenim amforama, što nam daje naznake da se ova pogodna pozicija koristila kao sidrište dugi niz godina.

Informacije o brodolomu na Velom Lagnu moguće je naći u literaturi, i podatci govore da se tu nekada moglo naći cijelih amfora, a danas samo krhotine u plitkom moru. Amfora koja je nađena cjelovita i potječe s prostora Lagnića prepoznata je kao Dressel 6A (Uglešić, Parica 2013, 153). Radi utvrđivanja ovih podataka i uvid u stanje očuvanosti nalazišta u svrhu njegove registracije, pregledao se južni dio podmorja otočića Veli Lagan.

Jedini arheološki nalazi uočeni su na južnom rtu Velikog Lagna, a radi se o širokom polju krhotina amfora koje su dosta fragmentirane i nalaze se u pukotinama između stijena. Najvećim

8. At Veli Lagan the sherds are found between the rocks / Na Velikom Lagnu krhotine se nalaze među stijenama (photo: R. Surić)

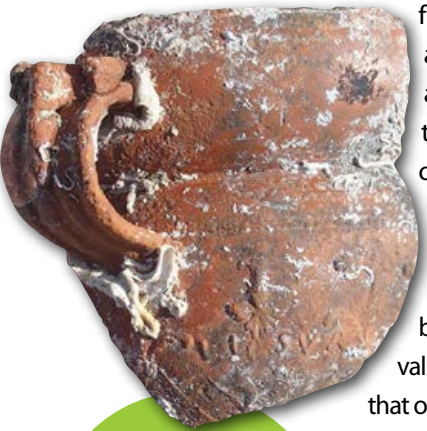
dijelom su to ulomci trbuha, te rijetki obodi i dna amfora. Ipak, na osnovu ovih nalaza, i usporedbom s cjelovitim primjerkom iz literature, uočene su tipološke razlike te postoji mogućnost da se ne radi o istim brodolomima. Preliminarne analize koje su izvršene na osnovu fragmentiranih oboda daju mogućnost da se ovdje nalazi brodolom s nešto ranijim amforama, točnije o kasnim grčko-italskim amforama koje se datiraju u period kraja 3. i polovice 2. stoljeća prije Krista (Caravale, Toffoletti 1997, 97).

Osim brodoloma, i sidrišta imaju vrlo važnu ulogu u definiranju plovnih putova i povoljnih plovidbenih ruta kojima su se služili moreplovci. Neka od tih sidrišta uvjetovana su rasporedom naseljenih mjesta na pomorskim trasama koje su posjećivali trgovci i putnici, a neka od njih uvjetovao je povoljan geografski položaj koji je bio uzrokom kontinuiranih zadržavanja brodova na njima za lošeg vremena ili tijekom noći kada se plovidba izbjegavala. Jedno od takvih mjesta je zasigurno i uvala Soline na zapadnom dijelu Pašmana, koja radi svoje izduženosti u smjeru SZ-JI i danas predstavlja dobru zaštitu od bure i južnih vjetrova. Na čitavoj površini uvale od 10-18 metara ustanovljeni

10. The finds at Soline Cove are dispersed across a broad area / Nalazi u uvali Soline raštrkani su na širokom području (photo: M. Pešić)

of the cove of ten to eighteen metres we observed finds from a broad chronological period. For the most part these are finds of amphorae sherds, for example of the Forlimpopoli type, but also of various small handles and bases of post-medieval dating. The layering of the site was determined by manual excavation, showing that there are fragmented finds beneath the surface, which further supports the hypothesis of the long term use of this cove as a favourable anchorage.

Of similar character is Podgarbe Cove on the island of Molat, in the southern section of which we find a large quantity of finds from various periods. The finds are spread across of broad area at a depth of from six to ten metres and are undeniable proof of an anchorage used here by ships. For the most part these are amphorae fragments, rims of Lamboglia 2 amphorae, various bowls and sherds of post-medieval ware. The most interesting find is that of a partially preserved Sarius type cup, a rotund cup pinched at the middle of the recipient with a strap handle. The lower section was fabricated in a mould and bears vegetative motif decorations and part of an inscription of which the letters L L S V R are preserved. The manufacture of these cups is dated to the period of the first century BCE to the first century CE and was located in northern Italy. They are named after the best known manufacturer, and our specimen also bears a part of his name, L(VCIUS) SARIVS L(VCI) L(IBERTUS) SVRVS, and falls within the first production phase, dated to the first century BCE (Brusić 1999, 23-25). To date they have been found in Liburnia at a dozen locations, such that this find is a further contribution to the quantity of luxurious Roman merchandise of this type in Croatia.



11. A cup bearing the inscription L L S V R from Podgarbe Cove / Čaša s natpisom L L S V R iz uvale Podgarbe (photo: R. Surić)

su nalazi iz širokog vremenskog raspona. Većinom se radi o nalazima fragmenata amfora, primjerice tipa Forlimpopoli, ali i različitih ručkica i dna novovjekovne datacije. Slojevitost nalazišta je ustanovljena ručnim iskopom, te se uvidjelo da i ispod površine postoje fragmentirani nalazi, što ide u prilog tezi o dugogodišnjem korištenju uvale kao pogodnog sidrišta.

Sličan karakter ima i uvala Podgarbe na otoku Molatu, na čijem je južnom dijelu pronađena velika količina nalaza iz različitih razdoblja. Nalazi su raštireni po širokom području na dubini od 6-10 metara i nedvojben su dokaz sidrišta koje su ovdje koristili brodovi. Najvećim dijelom radi se o fragmentima amfora, obodu Lamboglia 2 amfore, različitih zdjela te fragmentima novovjekovnih posuda. Najzanimljiviji nalaz je djelomično sačuvana Sarius čaša, trbušasta čaša stisnuta po sredini recipijenta s trakastom ručkom. Donji dio je rađen u kalupu i ima ukrase u vidu niza vegetabilnih motiva, te dio natpisa od kojeg je očuvano L L S V R. Proizvodnja ovih šalica smještena je u period 1. stoljeća pr. Krista do 1. stoljeća nakon Krista, a proizvodile su se u Sjevernoj Italiji. Ime su dobile po najpoznatijem proizvođaču, a i ovaj naš primjerak nosi dio njegovog imena koje se restituira L(VCIUS) SARIVS L(VCI) L(IBERTUS) SVRVS, te spada u prvu proizvodnu fazu koja je datirana u 1. stoljeće pr. Krista (Brusić 1999, 23-25). Do sada su u Liburniji pronađene na desetak mjesta, tako da je ovaj nalaz daljnji prilog količini luksuzne rimske robe ovog tipa koja se nalazi kod nas.

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12. An amphora sherd from Podgarbe Cove is evidence of anchorage throughout the Antiquity period / Ulomak amfore iz Uvala Podgarbe dokaz je o sidrenju kroz antiku (photo: M. Pešić)

Babuljaš Waters Investigation Continues

Nastavak istraživanja podmorja Babuljaša

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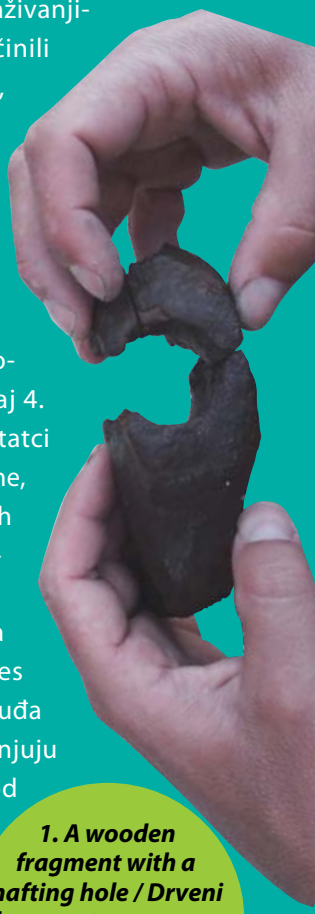
For the third year running the International Centre for Underwater Archaeology has conducted underwater archaeological investigation of the waters of the islet of Babuljaš. The work is part of a long-term collaboration with the Tourism Board of the Municipality of Pakoštane, which is providing financing for archaeological investigation and support in the further valorisation of the underwater cultural heritage of Pakoštane. A basic level underwater archaeology course was also held in the frame of the investigation in collaboration with the Han Vrana Agency and the University of Zadar's archaeology department. Marko Meštroc and Mate Parica of the university joined ICUA staff in staging the lectures on theory and the hands-on training of participants. Participating in the course this year were Czech nationals Veronika Zerzánová and Barbora Machová. The international team conducting the archaeological investigation included ICUA staff and Milan Rodić (Bosnia-Herzegovina), Jelena Čelebić and Nemanja Čavlović (Montenegro) and Saša Koren (Slovenia).

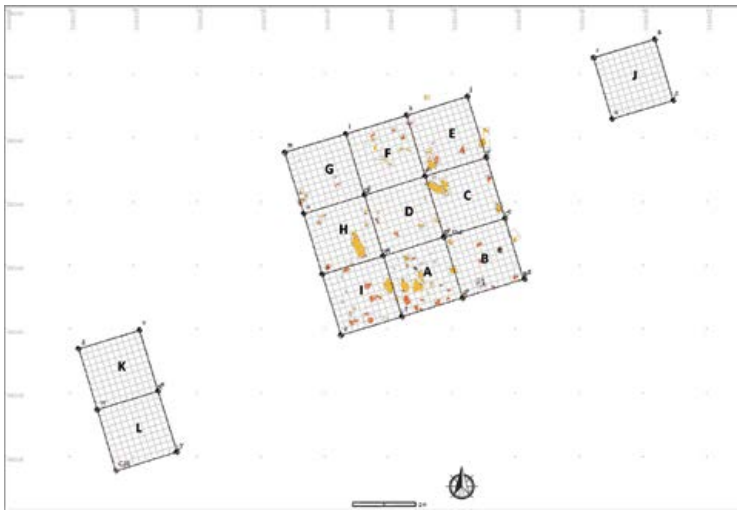
The research to date has yielded a number of finds providing data on a shipwreck with a cargo of North African amphorae and ware that, based on typology, can be dated to the very end of the fourth and early fifth century (Pešić 2014). Remains of the shipwreck's cargo were also found this year, although in somewhat lesser quantity than in previous years. This includes primarily rims of Keay XXV amphorae, several fragments of amphorae bases, and sherds of coarse cooking ware of the Hayes 195 and 197 types and fine North African ware of the Hayes 50 B type. These finds further supplement what we already know of the cargo carried by this ship and are consistent with the time period of the creation of the archaeological material recorded at the site of the shipwreck. With the objective of finding the ship's structure, which had not been located at the site in the previous years, this year we placed trenches away from the central position we had thus far investigated. This placement of trenches is the likely cause of the smaller quantity of finds recovered in comparison with previous archaeological campaigns. Again this year we did not, unfortunately, find wooden sections of the ship's

Treću godinu za redom Međunarodni centar za podvodnu arheologiju provodi podvodna arheološka istraživanja podmorja otočića Babuljaša. Nastavak je to dugogodišnje suradnje s Turističkom zajednicom općine Pakoštane koja financira arheološka istraživanja i pruža nam podršku u daljnjem valoriziranju podvodne kulturne baštine Pakoštana. U sklopu istraživanja održava se i Početni tečaj podvodne arheologije koji se odvija u suradnji s Agencijom Han Vrana i Odjelom za arheologiju Sveučilišta u Zadru, čiji djelatnici Marko Meštrov i Mate Parica uz djelatnike MCPA provode teoretska predavanja i praktične vježbe za sudionika. Ove godine na tečaju su sudjelovale Veronika Zerzánová i Barbora Machová iz Češke. Uz djelatnike MCPA, na arheološkim istraživanjima međunarodnu ekipu istraživača činili su Milan Rodić (Bosna i Hercegovina), Jelena Čelebić i Nemanja Čavlović (Crna Gora) i Saša Koren (Slovenija).

Tijekom dosadašnjih istraživanja niz otkrivenih nalaza dali su nam podatke o brodolomu s teretom sjevernoafričkih amfora i posuđa koji se na osnovu tipologije može datirati u sam kraj 4. ili početak 5. stoljeća (Pešić 2014). Ostatci tereta brodoloma nađeni su i ove godine, ali u nešto manjem obimu nego prošlih godina. U prvom redu se radi o obodima amfora Keay XXV, o nekoliko fragmenata dna amfora, te fragmentima grubog kuhinjskog posuđa tipa Hayes 195 i 197 i finog sjevernoafričkog posuđa tipa Hayes 50 B. Svi ovi nalazi nadopunjuju već poznatu sliku o teretu koji je brod prenosio i uklapaju se vremenske okvire nastanka arheološkog materija zabilježenog na njemu. Radi pokušaja pronalaska brodske konstrukcije koja na nalazištu tijekom prošlih godina nije bila locirana, ove godine smo sonde udaljili od centralne



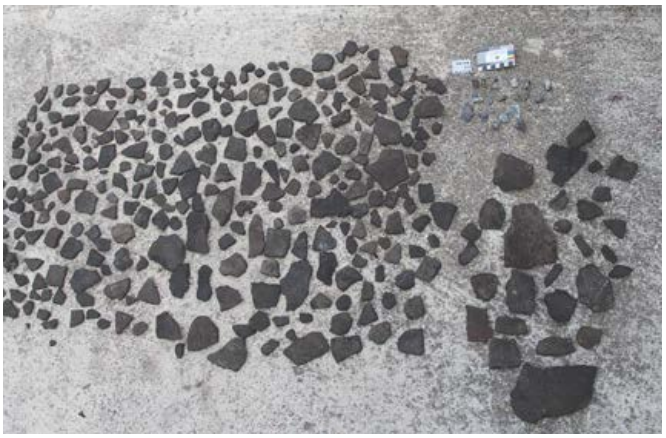
1. A wooden fragment with a hafting hole / Drveni fragment s rupom za nasad (photo: R. Surić)



2. The distribution of investigated trenches in the waters of Babuljaš/ Raspored istraženih sonda u podmorju Babuljaša (author: M. Pešić)

structure and it does appear that the actions of the marine environment have destroyed them over the years – the discovered bronze nails appear to constitute the sole preserved evidence of the ship's structure. A number of rounded stones of small size were found in and around the trenches that are certainly not local in origin and for which we can say with certainty that the were part of the ballast used to provide stability when sailing.

Roman period finds make up only a part of the archaeological material we are finding in the waters of Babuljaš. They are present only in a relatively shallow layer of sand, such that they can be placed in the first two layers we identified in the course of the investigation. These are a surface layer forming a single context with a depth of ten centimetres that is characterised by soft sand, and a second layer at a depth of from ten to twenty centimetres with sand of greater hardness and lighter in colour. We find sherds of prehistoric pottery sporadically in both layers. The third layer is found at a depth of twenty to fifty centimetres and is very uniform, consisting of hard, compact sand with irregular small broken stones, an admixture of seagrass of brown colour and a large quantity of prehistoric pottery. All of the prehistoric pottery is



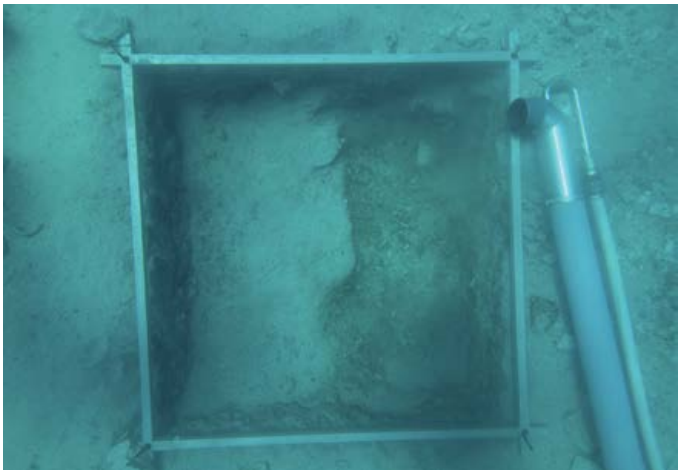
4. A large quantity of prehistoric pottery was found in the trenches/ U sondama je nađena velika količina prapovijesne keramike (photo: R. Surić)

pozicije na kojoj smo do sada istraživali. Takav razmještaj sondi vjerojatan je uzrok manje količine antičkih nalaza nego što je nađeno u prethodnim arheološkim kampanjama. Na žalost, ni ove godine nisu pronađeni drveni dijelovi brodske konstrukcije, i izgleda da je ona tijekom godina uništena radom mora, te nam brončani čavli koji su nađeni predstavljaju jedini očuvani dokaz o brodskoj konstrukciji. U sondama i uokolo njih pronađeno je i više komada oblog kamenja manjih dimenzija, koje zasigurno nije lokalnog karaktera, te se za njega sa sigurnošću može reći da je dio balastnog kamenja koje je brod prenosio radi stabilnosti tijekom plovidbe.

Antički nalazi čine samo dio arheološkog materijala koji

3. The finds are sorted and packed at the end of the day's diving / Nalazi se sortiraju i pakiraju nakon završenih dnevnih ronjenja (photo: M. Šimičić)

se pronalazi u podmorju Babuljaša. Oni su prisutni jedino u relativno plitkom sloju pijeska, tako da je njih moguće smjestiti u prva dva sloja koja smo odvojili prilikom istraživanja. Radi se o površinskom sloju koji čini jedinstvenu cjelinu sa slojem dubine do 10 cm kojeg karakterizira meki pijesak, te drugom sloju koji se nalazi na dubini od 10-20 cm sa svijetlim i nešto tvrđim pijeskom. U oba sloja se sporadično javljaju i fragmenti prapovijesne keramike. Treći sloj se nalazi na dubini od 20-50 cm, vrlo je jednoličan i sastoji se od tvrdog, kompaktnog pijeska sa nepravilnim manjim lomljenim kamenjem, primjesama morske trave smeđe boje te velikom količinom prapovijesne keramika. Sva prapovijesna keramika je dosta izlizana po rubovima, loše fakture i slabe postojanosti, te prema tome zaključujemo da se ovdje našla sekundarno, uslijed ispiranja s otočića Babuljaša. Ovaj sloj je također prisutan u svim istraženim sondama, ali njegova debljina varira i smanjuje se približavanjem obali otočića, tako da je primjerice u sondi L njegova debljina manja od 10 cm. Najveću uslojenost tijekom dosadašnjih



5. The greatest prehistoric layering was recorded in trench J / U sondi J zabilježena je najveća uslojenost prapovijesnog sloja (photo: R. Surić)

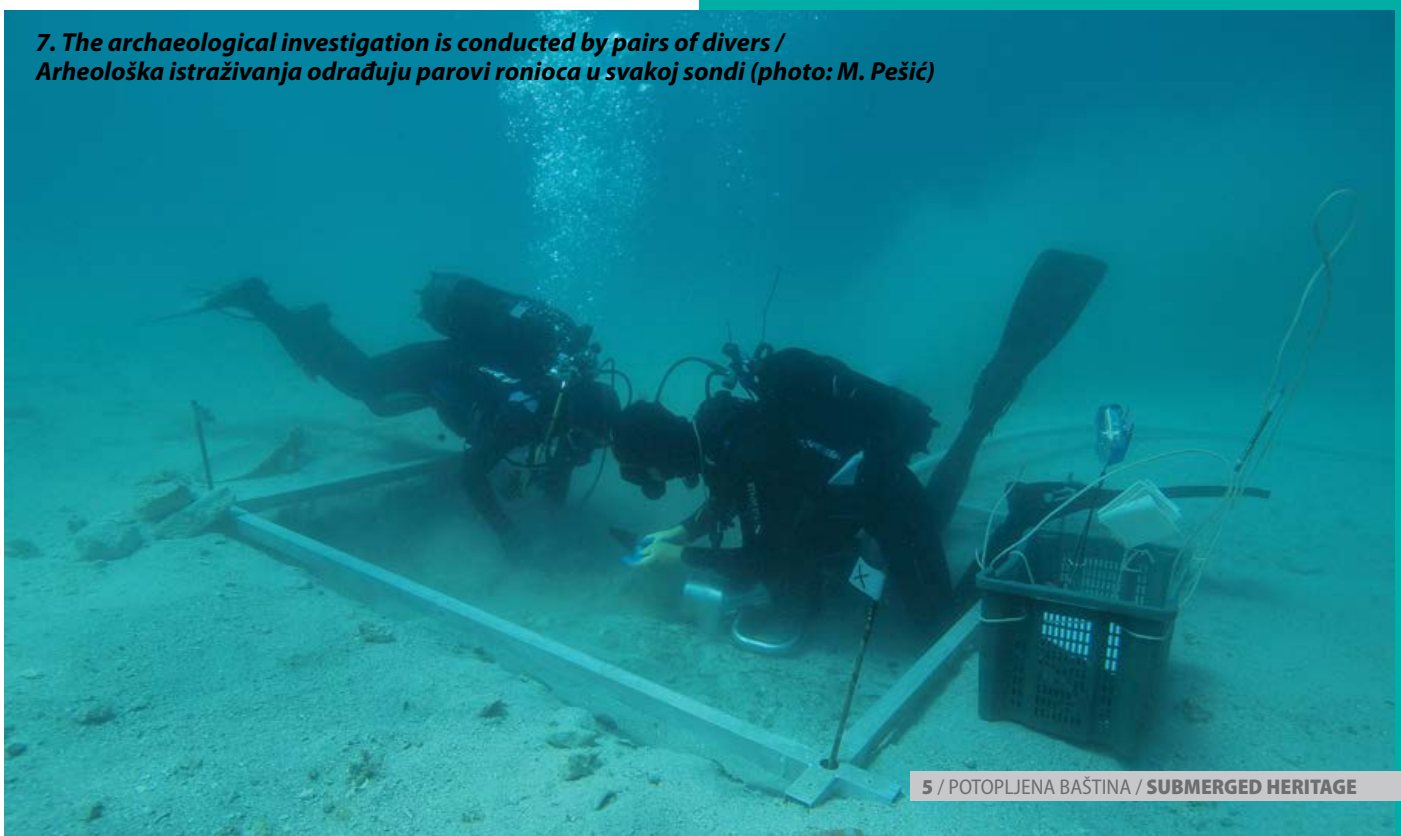
quite worn on the edges, of poor fabric and low durability, based on which we conclude that it came here as a secondary deposit, washed down from the islet of Babuljaš. This layer is also present in all of the trenches investigated, but its thickness varies and drops as we approach the shore of the islet, such that, for example, its depth is less than ten centimetres in trench L. The greatest layering found in the course of the investigations to date was in trench J, located in the deepest sea in the area investigated so far. Besides the first three layers we have identified, which are identical in content across the entire site, we have one other layer here. It is found at a depth of from fifty to sixty centimetres and, along with the finds of prehistoric pottery that are typologically very similar to those from previous layers, it is characterised by a large quantity of smaller stones and the find of larger quantities of animal bones and shells.

6. A flint arrowhead with hafting tang / Kremena strelica s trnom za nasad (photo: R. Surić)

istraživanja dobili smo u sondi J, koja je smještena i u najdubljem moru na do danas istraženom području. Osim prva tri sloja koja smo razdvojili, i koja su u identičnom sastavu prisutna na čitavom nalazištu, ovdje je odijeljen još jedan sloj. On se nalazi na dubini od 50-60 cm, a osim prapovijesnih keramičkih nalaza koji su tipološki vrlo bliski onima iz prethodnih slojeva, karakterizira ga velika količina sitnijeg kamenja, te nalazi veće količine životinjskih kostiju i školjaka.

Iako očuvani u lošem i fragmentiranom stanju, prapovijesni keramički nalazi imaju karakteristike koje se okvirno mogu smjestiti u brončano doba. Radi se uglavnom o fragmentima loptastih posuda koje karakteriziraju široke trakaste ručke od kojih se poneki primjerci razlikuju što imaju poviše ručke uzdignuti dio koji izlazi izvan oboda, zatim horizontalne masivne ručke te ručkice u obliku reljefnih polumjesečastih aplika. Na pronađenim fragmentima posuda se javljaju i različiti ukrasi u vidu urezanih paralelnih linija, niza utisnutih kružića ili niza ukrasa nalik otiscima prstiju na rubu oboda. Prapovijesni slojevi sadrže i nalaze manjih kremenih fragmenata od kojih se većinom prepoznaju kremeni odbitci, ali se može naći i pokoji djelić kremenog nožića. Najzanimljiviji nalaz je svakako vršak kremene strelice ss krilcima i širokim trnom za nasad. Iako zanimljiv, nalaz nam ne može pobliže dati vrijeme njegova nastanka, budući da ovaj tip streljiva nije kronološki osjetljiv, te se koristio u dugom vremenskom periodu od neolitika, eneolitika te kroz rano brončano doba. Jedan veći komad kamena svojim oblikom podsjeća na dio ručnog žrvnja, točnije dio kojim se pritiskalo i mljelo zrnje žitarica. Zadnji sloj koji je istraživan sadržavao je i veću

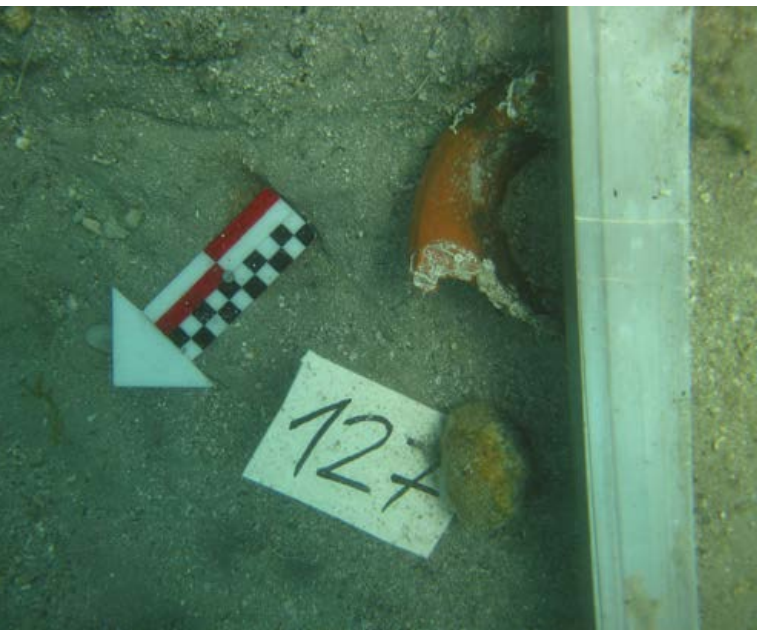
7. The archaeological investigation is conducted by pairs of divers / Arheološka istraživanja odrađuju parovi ronioca u svakoj sondi (photo: M. Pešić)



Although preserved in a poor and fragmented state, the prehistoric ceramic finds possess characteristics that place them roughly in the Bronze Age. These are for the most part spherical vessels that are characterised by broad strap handles with some of the specimens differentiated by the fact that they have a section above the handle that extends beyond the rim, massive horizontal handles and small handles in the form of relief crescent-shaped appliqués. We also find various decorations on the recovered sherds in the form of incised parallel lines, rows of small impressed circles or rows of decorations similar to fingerprint impressions on the edge of the rim. The prehistoric layers also contain finds of small flint fragments, most of which can be identified as flint flakes, although we do find sporadic sections of bladelets. The most interesting find is certainly the tip of a flint barbed arrowhead with a broad hafting tang. Although certainly interesting, this find cannot assist us in roughly dating its creation, given that this type of projectile point is not chronologically sensitive and was in use over an extended period of time, from the Neolithic, the Eneolithic and through to the early Bronze Age. One larger stone is reminiscent in form to a quern-stone, more precisely the upper handstone used to apply pressure to and grind cereals.

The last layer to be investigated also contained a large quantity of bone, mostly the teeth of ruminants, and other bones for which an archaeozoological analysis will provide precise data on the species they originate from. Evidence of the use of flint bladelets is evident on one of the bones which bears parallel traces, coarse incisions created as the result of the removal of meat from the bone.

The prehistoric layer also contains small fragments of burned wood of about one to two centimetres in size that appear only sporadically – during the investigation one larger piece of wood

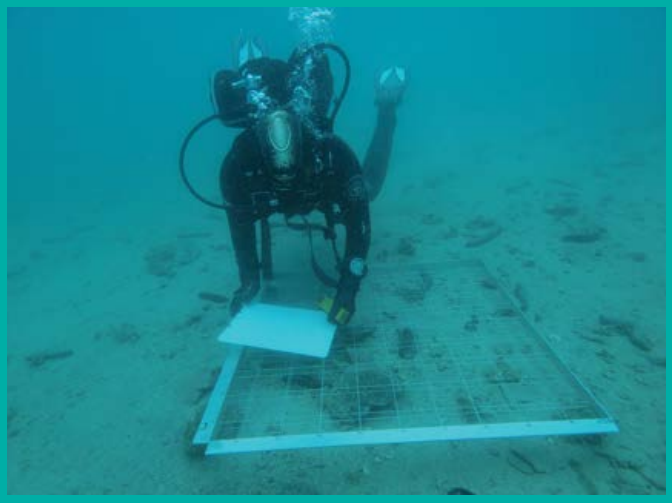


10. Every find was recorded in detail and positioned within the trench / Svaki nalaz detaljno je snimljen i pozicioniran unutar sonde (photo: R. Surić)

količinu kostiju, a najviše se radi o zubima preživača, te drugih kostiju za koje će nam arheozoološka analiza dati točne podatke kojim vrstama su pripadale. Dokaz upotrebe kremenih nožića vidljiv je na jednoj od kostiju koja nosi niz paralelnih tragova, grubih zareza koji su nastali kao posljedica skidanja mesa s nje.

8. Traces of cutting on a bone / Tragovi rezanja nožem na kosti (photo: R. Surić)

Prapovijesni sloj sadrži i male fragmente nagorenog drva veličine 1-2 centimetra, koji se javljaju tek sporadično, ali prilikom istraživanja nađen je i jedan veći komad drva. Gornji dio mu je zadebljan dok se prema donjem dijelu sužava. Iako je fragmentarno sačuvan, na gornjem širem dijelu se može prepoznati rupa za nasad, tako da je pretpostavka da se mogao koristiti kao držak za kamenu sjekiru.



9. Surface finds were documented during underwater drawing practice / Prilikom vježbe crtanja pod morem dokumentirani su površinski nalazi (photo: M. Pešić)

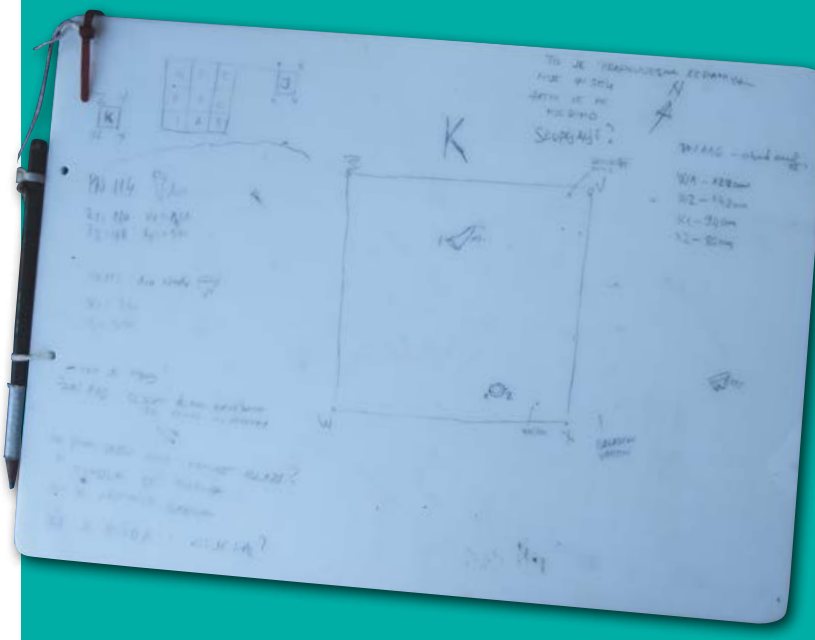
Široka lepeza nalaza, kako iz antičkog, tako i iz prapovijesnog razdoblje svrstavaju podmorje otočića Babuljaša u jedno od zanimljivijih nalazišta koje smo do sada istraživali. Novi nalazi koji su ove godine otkriveni obogaćuju sliku o kulturnim slojevima, osobito onima iz brončanog doba za koje smo do sada imali malobrojne informacije. Zasigurno je velika zanimljivost da se u prapovijesnim slojevima u dubljem pijesku pronalaze i relativno dobro očuvani fragmenti organskog materijala, što nam daje nadu da bi se u nastavku istraživanja mogli naći i novi drveni nalazi koji se na kopnu rijetko mogu otkriti u tako očuvanom stanju kao pod morem.

11. Keay XXV amphorae constituted the bulk of the cargo of the / Amfore Keay XXV činile su glavninu tereta brodoloma na Babuljašu (photo: M. Pešić)

was, however, found. The upper section is thickened and tapers towards the lower end. Although preserved only as a fragment we can identify a hafting hole on the upper, broader part, such that the presumption is that it may have been used as the handle of a stone axe.

The broad array of finds, both from the Antiquity and the prehistoric period, make the waters of Babuljaš one of the compelling sites we have investigated to date. The new finds recovered this year enrich our insight into the cultural layers, especially those from the Bronze Age, for which we have so far had only sporadic information. Certainly of great interest is the fact that we find relatively well preserved fragments of organic material in the prehistoric layers of the deeper sand, which gives us hope that the continuation of this investigation could yield new wooden finds that would rarely be preserved on land in a state of preservation as good as that found in the submarine environment.

13. Sherds of prehistoric decorated pottery / Fragmenti prapovijesne ukrašene keramike (photo: R. Surić)



12. Finds and their positions are sketched underwater on plastic dive slates / Nalazi i njihova pozicija se skiciraju pod morem na plastičnim pločicama (photo: R. Surić)

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16. Part of the team of this year's investigation / Dio ekipe s ovogodišnjih istraživanja. Standing from the left / Stoje s lijeva: Veronika Zerzanova, Mladen Pešić, Barbora Machova, Tino Zrilić, Roko Surić; squatting / čuče: Marina Šimičić, Nemanja Čavlović, Luka Bekić. Missing/Nedostaju: Saša Koren, Milan Rodić, Jelena Čelebić (photo: L.Bekić)

1. The west side of the islet of Veliki Piruzi / Zapadna strana otočića Veliki Piruzi (photo: M. Fiederling)

The *Shipwrecks of Rovinj* Project – The Piruzi Rocks: First Shipwreck

Projekt *Rovinjski brodolomi*. Hrid Piruzi, prvi brodolom

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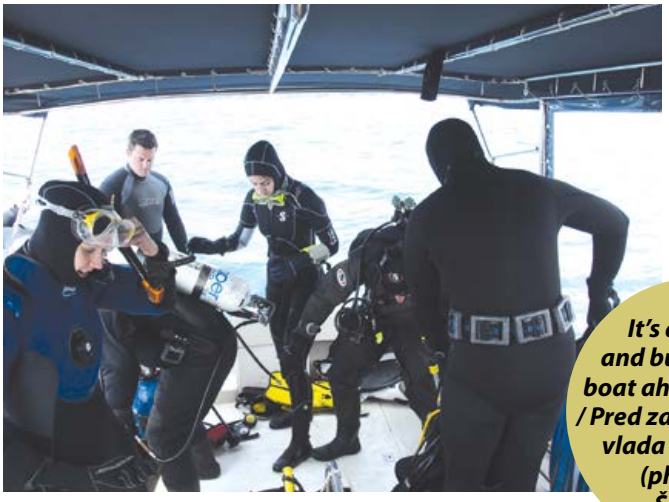
The Shipwrecks of Rovinj research project is in its second year. The project aims to find and study all of the shipwrecks in the waters of Rovinj, with the objective of learning as much as possible about the oldest maritime history of this town. The first of the four shipwrecks known of so far is the one at the Veli Piruzi rock.



2. It's all hustle and bustle on the boat ahead of a dive / Pred zaron na brodu vlada komešanje (photo: M. Šimičić)

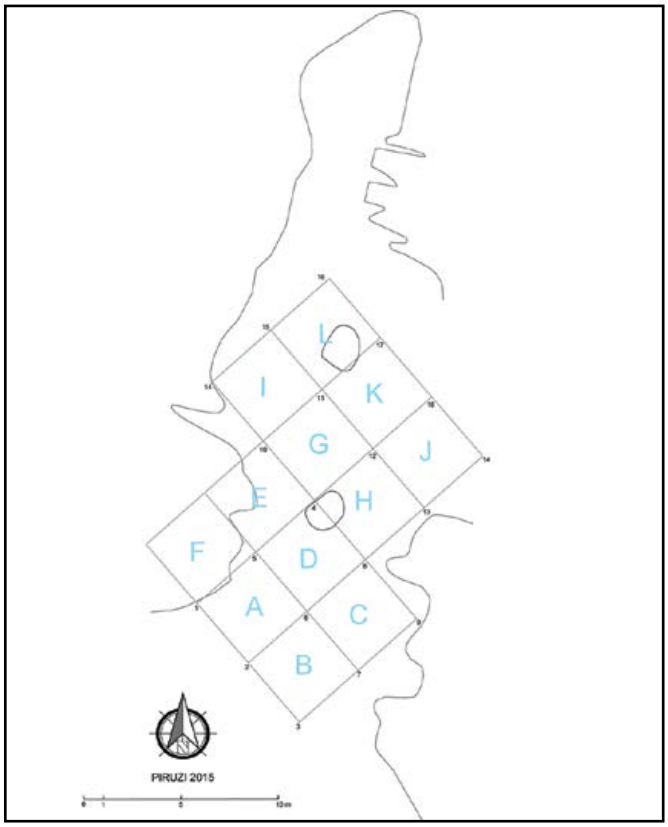
Već drugu godinu za redom, u rovinjskom akvatoriju provodi se istraživački projekt "Rovinjski brodolomi" koji ima za cilj pronaći i istražiti sve brodolome tog područja, kako bi se više saznalo o najstarijoj pomorskoj prošlosti ovoga grada. Prvi od za sada četiri poznata brodoloma je onaj kod Hridi Veli Piruzi.

Međunarodni centar za podvodnu arheologiju u Zadru (MCPA) u suradnji s Bavarskim društvom za podvodnu arheologiju (Bayerischen Gesellschaft für Unterwasserarchäologie, BGfU) iz Njemačke te Zavičajnim muzejem Grada Rovinja proveo je podmorsko arheološko istraživanje na Piruzima u travnju ove godine. Radi se o nastavku istraživanja koje je započelo u travnju 2014. g., u kojem se istražuju skromni ostaci kasnoantičkog brodoloma. Na ovaj način nastavljena je višegodišnja suradnja između ove tri ustanove, koja je započela još 2009. g., prilikom istraživanja luke Veštar, uz pomoć Turističke zajednice Grada Rovinja.

The International Centre for Underwater Archaeology in Zadar (ICUA), in collaboration with the Bavarian Society for Underwater Archaeology (Bayerischen Gesellschaft für Unterwasserarchäologie, BGfU) from Germany and the City of Rovinj Heritage Museum conducted underwater archaeological investigation at the Piruzi rocks in April of this year. This continues on the investigations launched in April of 2014 of the modest remains of a late Antiquity shipwreck. It furthers the multiannual collaboration of these three institutions, which began back in 2009 during the investigation of the port of Veštar with the support of the Tourism Board of the City of Rovinj.

Serving as expert leader of the underwater archaeological research campaign at the Piruzi rocks is Luka Bekić DSc. The other members of the expert and technical team are underwater archaeologists Mladen Pešić, Marina Šimičić and Roko Surić of ICUA, Max Fiederling, Michael Heinzlmeier, Anna-Sophie Fuchs and Peter Handwerker of the BGfU, and outside associates, participants of a NAS programme-based course, Plešnar Stojan of Slovenia, Milan Rodić of Bosnia-Herzegovina, Schott Aline of Luxembourg and Kateřina Kozáková, David Vondrašek, Milan Ais and Veronika Zerzanova of the Czech Republic. Also participating in the investigation was Marko Srečec, the owner of the Old Diver club in Veštar.

The remains of this late Antiquity shipwreck are found scattered between the rocks on the seabed to the southwest side of the



4. A drawing of the site indicating the quadrants between the large rocks / Nacrt nalazišta sa označenim kvadrantima između velikih stijena (author: M. Šimičić)

3. Investigation of the Piruzi rocks required teamwork / Istraživanje na Piruzima iziskuje timski rad (photo: L. Bekić)

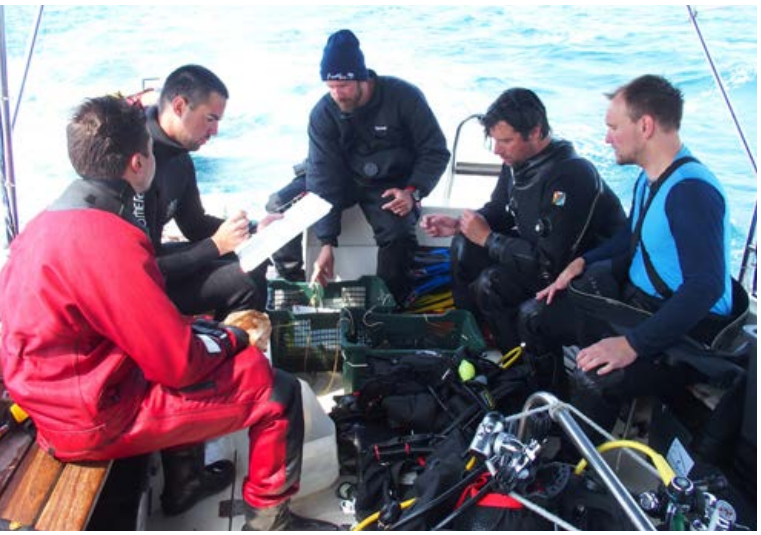
Stručni voditelj radova podvodnog arheološkog istraživanja na Piruzima bio je dr. sc. Luka Bekić, a ostatak stručne i tehničke ekipe činili su podvodni arheolozi Mladen Pešić, Marina Šimičić i Roko Surić iz MCPA, te Max Fiederling, Michael Heinzlmeier, Anna-Sophie Fuchs i Peter Handwerker iz BGfU. Također su sudjelovali vanjski suradnici, polaznici tečaja po programu NAS-a, Plešnar Stojan iz Slovenije, Milan Rodić iz BiH, Schott Aline iz Luksemburga, te Kateřina Kozáková, David Vondrašek, Milan Ais i Veronika Zerzanova iz Češke. U istraživanjima je sudjelovao i Marko Srečec, vlasnik ronilačkog kluba Old diver u Veštru.

5. Excavating the large quantities of rocky material was arduous work / Kopanje velike količine kamenog materijala je naporan posao (photo: L. Bekić)

Ostaci kasnoantičkog brodoloma nalaze se među stijenama na morskom dnu na jugozapadnoj strani otočića Veliki Piruzi. Pregledano je stanje nalazišta, nakon čega se izvršilo popravljanje klinova s brojčanim oznakama, fiksnih točaka. Potom se pristupilo postavljanju mrežišta sačinjenog od kvadranata 4 x 4 m. Iskopavanja su vršena u kvadrantima E, F, G i H. Mamutima se iskapao kvadrant po kvadrant, a

islet of Veliki Piruzi ("Greater Piruzi"). The state of the site was inspected, followed by the mending of the numbered spikes designating the fixed points. This was followed by the installation of a grid composed of four by four metre quadrants. Excavations were conducted in quadrants E, F, G and H. Dredges were used to excavate quadrant by quadrant – as one quadrant as completed, we would move on to the next one. In this manner the previously excavated quadrant was backfilled with stone material from the newly excavated quadrant. Our water pump was mounted on a small inflatable boat located above the site, while the researchers and equipment were on a larger boat that was usually some fifty metres from the actual locality.

We endeavoured to collect all archaeological material during the excavations. This allowed us to count and weigh all the finds, while for finds of particular significance (special finds, SF) we also noted the position within a quadrant at which they were recovered. At the end of a dive all data on finds was entered



7. Working out a strategy on-board the boat for work on the seabed / Dogovori oko strategije na morskom dnu obavljaju se na brodu (photo: M. Šimičić)

into tables prepared in advance. This method of documentation provided us with data on the spatial concentration of types of ware. Following documentation, the typologically identifiable sherds were packed while the remainder of the finds were restored to the seabed to the location at which they were found.

A total of 609 potsherds were extracted in the frame of this year's investigation with a total weight of 67.368 kilogrammes. Of that 585 pieces are sherds from amphorae with a total weight of 43.421 kilogrammes. The positions of special finds (SF) within quadrants were recorded in order to later enter these into the site map. Every special find was photographed underwater along with the number by which it was designated. This year we identified a total of 48 special finds, designated by numbers 27 through 73.

Only typologically identifiable finds were packed for further processing, while the rest were restored to their original posi-

6. A rest after a taxing diving shift / Odmor nakon teške ronilačke smjene (photo: M. Pešić)

kako je koji kvadrant završen, prelazilo bi se na slijedeći. Na taj način prethodno iskopani kvadrant bivao bi zatrpan kamenim materijalom iz novozapočetog kvadranta. Pumpa za vodu nalazila se na manjem gumenom brodu koji se nalazio iznad nalazišta, dok su se istraživači i oprema nalazili na većem brodu koji je najčešće bio 50-ak m udaljen od samog lokaliteta.

Prilikom arheološkog iskopavanja nastojali su se prikupiti svi arheološki nalazi. Na taj način svi su se nalazi mogli prebrojiti i izvagati, a nalazima od osobite važnosti (posebni nalazi, PN) bilježila se i pozicija pronalaska u kvadrantu. Svi podaci o nalazima su se nakon ronjenja unosili u unaprijed pripremljene specijalne tablice. Ovom vrstom dokumentacije dobiveni su podaci o prostornoj koncentraciji tipova posuđa. Nakon dokumentacije su tipološki odredivi ulomci zapakirani, dok je ostatak vraćen u more, na isto mjesto odakle je izvađen.

8. The daily inspection and documentation of the finds / Dnevno pregledavanje i dokumentiranje nalaza (photo: M. Šimičić)

tions on the seabed. In this year's investigation we separated seven base sherds, nine handle sherds, 13 amphorae rim sherds and one amphora plug. We also discovered 43 ballast stones. This method of processing the material provided us with data on the spatial concentration of types of ware. The potsherds are predominantly parts of late Antiquity amphorae of African types. Prominent among the other finds are a half-section of a small pot with handle (SF 37), part of a ceramic oil lamp (SF 68), a rim section of large sigillata plate (SF 64) and the base of a small sigillata plate (SF 71). All of the archaeological finds are currently at the workshop of the underwater archaeology department of the International Centre for Underwater Archaeology in Zadar. Scientific analysis will follow the desalinisation and conservation-restoration treatment.

10. Spikes of African amphorae / Šiljci afričkih amfora (photo: L. Bekić)

12. A rare find of a small pot with handle / Rijedak lončić s ručkom (photo: L. Bekić)

The site map was expanded to the north this year. Last year we excavated quadrants A, B, C, D and a part of quadrant H. This year we excavated F, E, H and most of quadrant G. The layers in G and H were particularly thick and contained an abundance of archaeological finds. The site drawing documentation was produced by Marina Šimičić on the basis of last year's drawings by Marcus Prell. The site drawings are spatially placed within the large rocks to the left and right side of the excavation field. Some thirty square metres of the site were investigated in this year's campaign.

Parallel to this research project we conducted a three-day underwater archaeology course at Camp Veštar based on the programme of the Nautical Archaeological Society (NAS), these being the NAS Introduction to Foreshore and Underwater Archaeology and the NAS Part I Certificate in Foreshore and Underwater Archaeology. The premises of the Old Diver diving club at Camp Veštar were used for the theoretical section of the course, while practical underwater training was staged along the northern and southern shore of Veštar Cove. The courses were successfully completed by seven participants from Slovenia, Bosnia-Herzegovina, the Czech Republic and Luxembourg, after which they joined the underwater archaeological excavations at the islet of Veliki Piruzi.

U sklopu ovogodišnjih istraživanja ukupno je iz mora izvađeno 609 ulomaka keramike ukupne težine 67,368 kilograma. Od toga su 585 komada ulomci amfora ukupne težine 43,421 kilograma. Za posebne nalaze (PN) zabilježen je položaj u kvadrantu kako bi se kasnije mogao unijeti na plan. Pod morem je svaki posebni nalaz fotografiran zajedno s brojem kojim je označen. Ukupno je ove godine izdvojeno 48 posebnih nalaza, označenih brojevima 27-73.

9. Rims of African amphorae / Obodi afričkih amfora (photo: L. Bekić)

Zapakirani su za daljnju obradu samo tipološki odredivi nalazi, dok je ostatak vraćen u podmorje na isto mjesto odakle je izvađen. U ovogodišnjim istraživanjima izdvojeno je 7 dijelova dna, 9 ulomaka ručki, 13 dijelova oboda amfora i jedan čep amfore. Pronađeno je i 43 komada balastnog kamenja. Ovakvim načinom obrade materijala dobiveni su podaci o prostornoj koncentraciji tipova posuđa. Ulomci keramike uglavnom su dijelovi kasnoantičkih amfora afričkih tipova. Od ostalih nalaza ističu se polovica lončića s ručkom (PN 37), dio keramičke uljanice (PN 68), dio oboda velikog sigilatnog tanjura (PN 64) i dno sigilatnog tanjurića (PN 71). Svi arheološki nalazi trenutno su u radionici Odjela za restauriranje podvodnih arheoloških nalaza Međunarodnog centra za podvodnu arheologiju u Zadru. Znanstvena obrada nalaza može uslijediti nakon desalinizacije i konzervatorsko-restauratorske obrade.

13. We also found finer late Antiquity pottery / Pronalazi se i finija kasnoantička keramika (photo: R. Surić)

Ove godine proširen je i nacrt nalazišta u smjeru sjevera. Prošle godine iskopani su A, B, C, D i dio kvadranta H. Ove godine iskopani su F, E, H i veći dio kvadranta G. Slojevi u G i H bili su posebno debeli i sa mnoštvom arheoloških nalaza. Nacrtnu dokumentaciju je izradila Marina Šimičić na bazi prošlogodišnjeg nacrta Marcusa Prella. Nacrt je u prostoru određen velikim hridima s lijeve i desne strane iskopnog polja. U ovogodišnjoj kampanji istraženo je oko 30 m2 nalazišta.

Uz ovaj istraživački projekt, u kampu Veštar proveden je trodnevni tečaj podvodne arheologije prema programu Nautical Archaeological Society (NAS) i to NAS Uvod u priobalnu i podvodnu arheologiju i tečaj NAS I stupanj priobalne i podvodne

14. The water pump was mounted on a small inflatable boat / Vodena pumpa postavlja se na mali gumenjak (photo: M. Fiederling)

During the practical training we inspected the seabed along the southern shore of the cove, primarily with the objective of identifying possible devastation or unauthorised excavation since the last inspection (2014). The inspection did not reveal any submarine devastation – on the on land section of the southern shore, however, we observed a block of stone that had, due to the abrasive action of the sea, "fallen out" of the elevated area of soil immediately adjacent to the shore. Considering the form and characteristics of the block we concluded that this was likely the base (pedestal) of a statue installed alongside a wall (Bekić 2015). We notified Damir Matošević, curator at the Rovinj Heritage Museum, and the Pula Conservation Department to have the worked block stored at a safe location.

15. An Antiquity period stone pedestal was also discovered at Veštar, possibly for a statue / U Veštru je otkriveno i antičko kameno postolje, moguće kipa

arheologije. Za teoretski dio tečaja korištena je prostorija u ronilačkom klubu Old Diver u kampu Veštar, a praktične podvodne vježbe su održane uz sjevernu i južnu obalu veštarske uvale. Tečajeve je uspješno završilo sedmero polaznika iz Slovenije, Bosne i Hercegovine, Češke i Luksemburga, nakon čega su se priključili podvodnim arheološkim iskopavanjima na otočiću Veliki Piruzi.

Za vrijeme praktičnih vježbi pregledano je podmorje uz južnu obalu uvale, prvenstveno radi utvrđivanja mogućih devastacija ili neovlaštenih iskopavanja nastalih u periodu od zadnjeg pregleda (2014. g.). Pregledom nije uočena nikakva podmorska devastacija, no na kopnenom dijelu na samoj južnoj obali uočen je kameni blok koji je zbog abrazivnog djelovanja mora „ispao" iz zemljanog uzvišenja neposredno uz obalu. S obzirom na formu i karakteristike bloka došli smo do zaključka kako se vjerojatno radi o bazi (postolju) kipa koji se postavlja uz zid (Bekić 2015). O takvom stanju obaviješten je kustos Zavičajnog muzeja Grada Rovinja Damir Matošević, te Konzervatorski odjel u Puli, kako bi se obrađeni blok spremio na sigurno.

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16. The Rovinj research team in 2015. Upper row from the left / Rovinjski istraživački tim 2015. g. Gornji red slijeva: Damir Matošević, David Vondrašek, Milan Ais, Milan Rodić, Aline Schott, Roko Surić, Max Fiederling, Marko Srečec; bottom row from the left / donji red slijeva: Mladen Pešić, Stojan Plešnar, Kateřina Kozáková, Veronika Zerzánová, Marina Šimičić, Luka Bekić, Anna-Sophie Fuchs, Michael Heinzlmeier, Peter Handwerker (photo: L. Bekić)

Project Ljubljanica River Experience and Exhibition Site, acronym Ljubljanica

Projekt Doživljajsko razstavišče Ljubljanica, akronim Ljubljanica

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The research of the logboat was part of a large project partly financed by the EEA Financial Mechanism Programme 2009-2014 and conducted by the Municipality of Vrhnika (Občina Vrhnika), the Museum and galleries of Ljubljana (Muzej in galerije mesta Ljubljane) and the Biotechnical Faculty of the University of Ljubljana (Univerza v Ljubljani, Biotehniška fakulteta). The project's mission is to solve the most acute threat to the unique monument in Slovenia, threatened due to its location, degree of degradation and type of material. Our further objective is to allow a considerably easier access to the cultural heritage and natural attractions of the Ljubljanica River to the public and develop an efficient platform for a revitalisation of heritage in Vrhnika and the wider region.

Raziskava deblaka, ki je potekala pod vodstvom Mestne občine Vrhnika in v sodelovanju z Muzejem in galerijami mesta Ljubljane ter Biotehniško fakulteto Univerze v Ljubljani, je bila del projekta Doživljajsko razstavišče Ljubljanica, delno financiranega s strani Finančnega mehanizma EGP 2009-2014. Namen projekta je reševanje najbolj akutne ogroženosti edinstvenega spomenika v Sloveniji, ki mu zaradi lege, stopnje degradacije in vrste najdišča grozi uničenje. Naš nadaljnji cilj je javnosti omogočiti bistveno lažji dostop do kulturne dediščine in naravnih znamenitosti reke Ljubljanice in ustvariti učinkovito platformo za izvedbo celovite revitalizacije kulturne in naravne dediščine Vrhnike ter širše regije v prihodnosti.

ZAVOD ZA PODVODNO ARHEOLOGIJO

1. The site on the river Ljubljanica / Najdišče deblaka v reki Ljubljanici (Photo: D. Pavlovič)

All results of the project are intended for the general public, and we strive to achieve sustainable effects by searching for long-term solutions, which allow access to the heritage to future generations. Raising awareness of the local community is one of the fundamental tasks of the project. The content and programs that concern the wider area of the Ljubljanica river create a potential for the development of tourism and an expansion of target audiences.

The Ljubljanica River, cultural monument of national significance

Besides being a natural attraction, the Ljubljanica River is also famous for its cultural heritage. Because of the abundance, quality and scientific value of its findings, the Ljubljanica riverbed between Vrhnika and Ljubljana is classified as one the most important, and highly endangered archaeological sites in Slovenia. The water flow of both the Ljubljanica and Mala Ljubljanica Rivers from their sources at Močilnik and Retovje, up to the Ljubljanica and Gruber's Channel watersheds at Špica, has been declared a cultural monument of national significance. Part of the Ljubija River (Vrhnika) and the area between Kamin and the Livada fallow complement this monument. Over 8000 ancient items have been found here so far (Photo1).

The Excavation

In the 1980s a logboat was discovered by the diver Miro Potočnik in the Ljubljanica River near the centre of Vrhnika. The first archaeological research was conducted between 6 May and 21 July 2001 by the divers from the Group for Underwater Archaeology (Skupina za podvodno arheologijo, SPA), working as part of the Department of Archaeology of the Faculty of Arts in Ljubljana. The research was supervised by Andrej Gaspari.

Vsi rezultati projekta so namenjeni širši javnosti, z iskanjem dolgoročnih rešitev pa želimo doseči predvsem trajnostne učinke, ki bodo omogočili dostopnost do dediščine tudi bodočim generacijam. Ozaveščanje lokalne javnosti je ena izmed temeljnih nalog projekta. Z vsebinami in programi, ki segajo v širše območje porečja Ljubljanice, ustvarjamo potencial za razvoj turizma in širjenje ciljnih publik.

Reka Ljubljanica, kulturni spomenik državnega pomena

Reka Ljubljanica je poleg naravnih znamenitosti pomembna predvsem zaradi bogate kulturne dediščine. Struga reke med Vrhniko in Ljubljano sodi po številčnosti, kakovosti in znanstveni izpovednosti najdb med najpomembnejše in hkrati najbolj ogrožene kulturne spomenike v Sloveniji. Za kulturni spomenik državnega pomena je razglašen vodni tok reke Ljubljanice in Male Ljubljanice z obrežji od izvirov v Močilniku in Retovju do razvodja Ljubljanice in Gruberjevega kanala na Špici v Ljubljani. Spomeniku pripada še del reke Ljubije na Vrhniki do sotočja z Ljubljanico ter razširjeno območje spomenika med Kaminom pri Bevkah in ledino Livada. Doslej je bilo na tem območju/tukaj odkritih preko 8000 predmetov iz rimskega obdobja (Slika 1).

Izkopavanja

Deblak je konec osemdesetih let, v bližini mestnega centra Vrhnika, prvi odkril potapljač Miro Potočnik. Prve arheološke raziskave je med 6. majem in 21. julijem 2001 izvedla Skupina za podvodno arheologijo (SPA), ki je delovala v okrivu Oddelka za arheologijo Filozofske fakultete v Ljubljani. Vodja raziskave je bil Andrej Gaspari.

2. Team at the finish of the project / Ekipa ob zaključku terena (Photo: J. Gasparič)

Due to the erosion of the unhardened embankment and a potential collapse, the logboat was found threatened by permanent destruction. This was one of the main reasons why its research was included in the project.

In June 2015 we began an underwater archaeological research which was focused on excavation, documentation and lifting of the logboat. The research was performed by divers from the Institute for underwater archaeology (Zavod za podvodno arheologijo) with the help from the International Centre for Underwater Archaeology in Zadar - UNESCO category II. centre and CPA Ltd. The research was led by Matej Draksler, alongside David Badovinac, Matej Školč, Saša Koren, Luka Bekić, Mladen Pešić, Aleš Tiran, Gašper Košir, Peter Grosman, Uroš Košir, Grega Sojer and Anton Vode. The assistance in land support was provided by Rene Masaryk, Daša Pavlovič, Sara Ćorković and Marina Šimičić (Photo 2).

In 2001 two large pieces of the logboat were excavated at a combined length of 11,5 m. It was estimated that only a meter or two would yet to be uncovered. Our work plan was constructed on this basis. First we started digging the land on the right bank over the area where we presumed the remaining part of the logboat lay under. The area was compromised by various river sediments covered by a thick landfill of construction material. At the same time we cleaned the underwater terrain and began documenting the situation that was excavated 14 years ago. In the meantime we removed the layers of the bank above the water, and continued with our underwater excavation. (Photo 3) We were surprised to learn that the logboat was broken in two parts and that we were dealing with at least three large pieces. The newly discovered part was aligned along the river bank and we only had to expand our dig area a little farther along the water. It was our estimation that 3 m should suffice, taken that the total length of the logboat couldn't be over 15 m, or could it? Interestingly, we soon discovered that the answer was positive! For this reason we had to expand our dig area again, which enabled us to find the logboat's bow or stern, and our excavation area was expanded from the presumed 2 m to 7m (Photo 4).

4. Mladen Pešić cleaning the sediment on the logboat / Mladen Pešić pri pri odstranjevanju sedimenta (Photo: D. Badovinac)

Zaradi spodjedanja neutrjene brežine in možnosti njene porušitve je deblaku grozilo trajno uničenje. To je bil eden glavnih razlogov, zakaj smo raziskavo slednjega vključili v projekt.

V juniju 2015 smo začeli s podvodno arheološko raziskavo, ki je bila osredotočena na izkopavanje, dokumentiranje in dvig deblaka. Raziskava je bila opravljena s strani potapljačev iz Zavoda za podvodno arheologijo v sodelovanju z Mednarodnim centrom za podvodno arheologijo iz Zadra - UNESCO centrom II kategorije in podjetjem CPA d.o.o. V raziskavi, ki jo je vodil Matej Draksler, so sodelovali še: David Badovinac, Matej Školč, Saša Koren, Luka Bekić, Mladen Pešić, Aleš Tiran, Gašper Košir, Peter Grosman, Uroš Košir, Grega Sojer in Anton Vode. Pomoč na kopnem in podporo do zagotovili Rene Masaryk, Daša Pavlovič, Sara Ćorković in Marina Šimičić (Slika 2).

Leta 2001 sta že bila izkopana dva velika dela deblaka skupne dolžine 11.5 m. Tako smo predvidevali, da je neizkopano ostalo le še meter ali dva ohranjenega deblaka in na podlagi tega pripravili delovni načrt. Z izkopavanjem smo najprej začeli nad območjem desnega brega, za katerega smo predvidevali, da skriva preostali del deblaka. Različni rečni sedimenti, prekriti z debelimi sloji gradbenih materialov, so ogrožali območje. Hkrati smo pričeli s čiščenjem podvodnega terena in dokumentiranjem celotne situaci-

3. Excavating simultaneously above and under water / Sočasna izkopavanj nad in podvodo (Photo: D. Pavlovič)

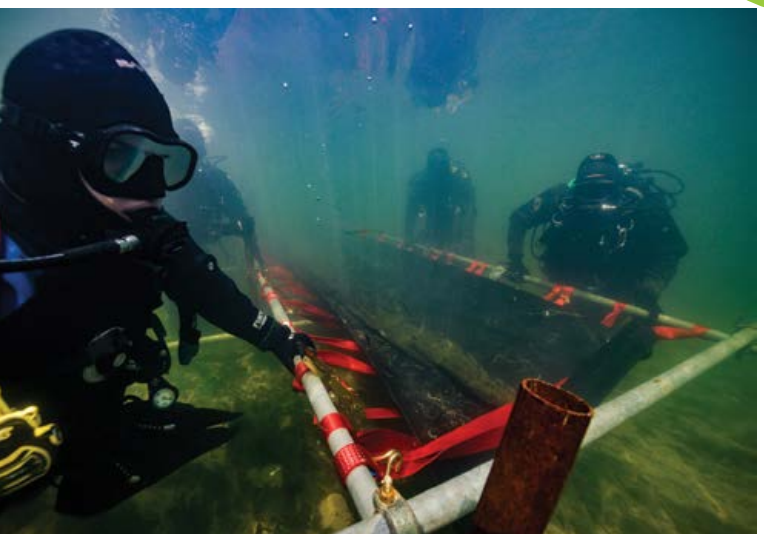
je, ki je bila opravljena že pred 14 leti. Presenetilo nas je dejstvo, da je bil deblak počen na dveh mestih, kar je pomenilo, da se ukvarjamo s tremi velikimi kosi in ne z dvema, kakor je bilo prvotno predvidevano. Nanovo odkriti del je ležal vzporedno z rečnim bregom (Slika 3). Zato je bilo potrebno še razširiti območje izkopavanj. Predvidevali smo, da bi 3 m morali zadostovati, saj skupna dolžna deblaka ne more presegati 15 m, ali pač? Kmalu smo ugotovili, da je to vsekakor mogoče! Zato smo bili primorani ponovno razširiti naše območje izkopavanj in tokrat smo odkrili bodisi premec ali krmo deblaka. Območje izkopavanj se je tako povečalo za 5 m, in sicer s prvotnih 2 m na končnih 7 m (Slika 4).

The dig site cut deep into the river bank and we first had to solidify the exposed profile for which we used wooden plaques that were fixed on metal spikes hammered into the ground, creating a sort of adaptive protection wall. Each time we progressed with the underwater excavation, we added a new line of the profile, while constantly repeating the building process in order to make the excavation area safe for the divers, and, at the same time, to protect the logboat.

Each piece of the logboat was documented with traditional sketches of the situation, measurements with the laser station and a photogrammetric 3D model of each individual part in situ. Later on we would be able to combine the different models into one general situation, covering the entire site, and taking the required measurements from there (Photo 5).

5. 3D photogrametry model of the logboat / 3D fotogrametričen model deblaka (Author: D. Badovinac, A. Pasumansky - Agisoft)

The first two parts of the logboat were exposed to the elements for quite a long time and were therefore quite poorly preserved. The excavation process exposed them even further; therefore we decided to lift those parts separately. Since they were relatively small, the divers had no trouble lifting and placing them on a pre-prepared grounding mat. The frame of the grounding mat was constructed of metal construction pipes. We used connecting strips to crisscross the interior part of the frame, therefore creating a curved but firm area for the logboat's parts that could also be tailored or adapted to match the curve of the logboat's outer surface (Photo 6).



6. Construction frame with the logboat carried by the divers to the lift site / Okvir za dvig z deblakom, nosijo potapljači na mesto dviga (Photo: D. Badovinac)

The last and the best preserved part was much more problematic, as it was deeply embedded in the river bank, making it impossible for the diver to reach the area between the logboat and the bank. Its high eastern side caused some concern, as it was uncertain if the pressure of the river banks

Območje izkopavanj se je nahajalo globoko v rečnem bregu, zato je bilo najprej potrebno utrditi izpostavljen profil. To smo naredili z lesenimi ploščami, ki smo jih pritrdili na kovinske palice zabite v tla in tako ustvarili prilagodljivo zaščitno steno. Vsakič, ko smo napredovali s podvodnim izkopavanjem, smo dodali novo linijo lesene zaščite. Na ta način smo zavarovali območje izkopavanj za potapljače, hkrati pa zaščitili deblak.

Vsak del deblaka je bil dokumentiran s tradicionalnimi skicami celotne situacije, geodetskimi meritvami in izdelavo 3-D modela posameznega dela "in situ". Na ta način smo lahko združili različne modele v eno splošno situacijo celotnega območja iz katere smo naknadno lahko pridobili natančne meritve (Slika 5).

Prva dva dela deblaka sta bila kar nekaj časa izpostavljena naravnim dejavnikom in zato v slabem stanju. Ker je proces izkopavanj za njiju pomenil dodatno grožnjo, smo bili primorani dvigniti iz vode oba dela. Glede na to, da je šlo za manjša kosa, ju je skupina potapljačev z lahkoto dvignila in ju postavila na za njiju pripravljeno ležišče. Okvir ležišča je bil narejen iz kovinskih gradbenih cevi. Za notranji del ogrodja smo uporabili vezne trakove in tako ustvarili ukrivljeno vendar trdno površino, ki smo jo lahko po potrebi prilagodili zunanji površini deblaka (Slika 6).

Zadnji in najboljše ohranjen del je bil tudi najbolj problematičen, saj je bil stisnjen tik ob rečni breg, kar je onemogočilo prost dostop potapljačem za deblak. Visoka zunanja stranica deblaka je povzročala skrbi, saj bi jo pritisk zemljine rečnega

7. Diver excavating the sediment inside the logboat / Potapljač izkopava sediment znotraj deblaka (Photo: D. Badovinac)

brega, v primeru, da se najprej izprazni njegova notranjost, lahko zlomil. Zato smo sedimente v notranjosti deblaka začasno pustili in nadaljevali z izkopavanjem med deblakom in bregom, ki smo ga prav tako utrdili z zaščitno steno. Šele nato smo lahko izpraznili deblak in dokumentirali končno situacijo (Slika 7).

sediment on it would break it in case we emptied it first. This is why we left the interior of the logboat filled with sediment and proceeded with excavations on the other side between the boat and the bank, which we also firmed with our protective wall. Once this was completed, we could finally empty the boat and document it (Photo 7).

The last part was over 6 m in length, and it lay in the most difficult position for lifting or any other activities. Additionally, we had access to it only from one side. Therefore, a well thought strategy was required. We began by constructing a custom made metal framework that would envelop the logboat perfectly. The framework essentially consisted of two separated modules – a rubber grounding mat for the bottom part of the boat, and an adjustable metal frame that would secure all sides of the logboat (Photo 8).

In order to place the mat under the logboat, we had to remove the sediment from underneath it first. At the same time, we placed pillars of bricks padded with rubber under the boat to hold it. We placed the bricks high enough for the diver to reach the area underneath it, and apart enough so that we could place the metal construction underneath. Once that was completed, we still had to slightly move the boat on the mat. Eight divers positioned themselves along the boat's length and they slowly but carefully pulled the boat on the mat. The mat was then lifted and distanced from the bank in order to make room for the placement of the metal framework over the logboat. Once that was done, we only had to adapt the framework to stabilize the sides (Photo 9).

Everything was now prepared for the lift. The people from Dvig Ltd brought a massive 70t truck crane, which they used

Novo odkrit kos deblaka je bil dolg ca. 6 m. Ker je bil dostop omogočen samo z ene strani, je kakršen koli poskus dviga ali premika zadnjega kosa zahteval dobro pripravljeno strategijo. Začeli smo z izgadnjo prilagojenega kovinskega ogrodja, ki je v celoti ovil deblak. Sestavljen je bil iz dveh ločenih modelov, in sicer iz ležišča, ki je bilo podloženo z gumo za spodnji del plovila, ter nastavljivega kovinskega okvirja, ki je stabiliziral stranice deblaka (Slika 8).

8. Divers preparing the metal frame for the lift / Potpljači pripravljajo kovinsko konstrukcijo za dvig (Photo: D. Badovinac)

Za učinkovito namestitev deblaka na ležišče smo najprej morali odstraniti sediment pod njim. Za stabilizacijo deblaka smo volumen nadomeščali s stebrički iz opek, ki smo jih oblazinili z gumo. Stebričke smo namestili dovolj visoko, da so potapljači lahko dosegli prostor pod deblakom ter hkrati dovolj narazen, da smo lahko pod njega lahko namestili kovinsko konstrukcijo. Osem potapljačev se je nato postavilo po dolžini deblaka ter ga počasi in previdno potegnilo na

9. Lift of the logboat / dvig deblaka (Photo. D. Badovinac)

for lifting the object some 40 m in distance above the Ljubljanica River. The divers fixed the steel cables on the frame holding the logboat and the lift began. The whole construction was then lifted out of the water, high in the air, and then placed on the ground, where each wooden piece was placed into five metal containers filled with water. The containers were then loaded onto the trucks and transported to the Restauration Centre that is part of the Institute for the Protection of the Cultural Heritage of Slovenia (Restavratorski center, ZVKDS). There its conservation process began. The parts are being placed in epoxy capsules, which would later be lowered in melanin (Photo 10).

10. The logboat parts are placed into the pools at the conservation center / Deli deblaka so položeni v bazene v konzervatorskem centru. (Photo. D. Badovinac)

It took almost a month for the project to be completed, while the conservation aspect has barely just begun and is projected to last five years.

The Roman Logboat

The logboat lay on the bottom of the river's east side at a slightly inclined angle from the right riverbank. Over time the northern part of the dugout became completely covered by the sediment from the river bottom and soil eroding from the riverbank, and only a smaller part of the dugout remained visible.

The power of water movement and the position of the dugout eventually led to its cracking in several places. We recovered three large parts in varying states of preservation of length: 5.15, 5.3 and 6.1 meters. The dugout was over or just about 16 meters long, however we will know for sure once the conservation is completed and we have a chance to piece it back together. In any case, it is one of the largest logboats recovered in Europe with a 1.1 meter width and ports (sides) 0.68 meters in height (Photo 11).

The logboat was made from the trunk of a single oak. Several interesting features were nicely preserved. There was a round opening in the middle with a preserved wooden

pripravljeno ležišče, ki smo ga skupaj z deblakom dvignili in ga oddaljili od brega ter tako ustvarili dovolj prostora za postavitev kovinskega stabilizacijskega okvirja nad deblak (Slika 9).

Sedaj je bilo vse pripravljeno za dvig. Pri tem nam je na pomoč priskočila ekipa iz podjetja Dvig d.o.o., ki je z ogromnim 70t žerjavom namestila teleskopsko roko nad 40 m oddaljen deblak. Potapljači so pričvrstili jekleno vrv na okvir deblaka in operater dvigala je pričel z dvigovanjem. Celotna konstrukcija je bila prestavljena na kopno in vsak posamezen kos debleka shranjen v enega izmed petih kovinskih bazenov, napolnjenih z vodo. Bazeni so bili nato naloženi na tovornjak in odpeljani v Restavratorski center Zavoda za varstvo kulturne dediščine Slovenije, na nadalnje konservatorske posege. Deli deblaka so bili tam shranjeni v kapsule iz epoksija in bodo kasneje potopljeni v melanin (Slika 10).

Projekt je trajal skoraj mesec dni, medtem ko se je konservatorski del šele začel in bo predvidoma trajal pet let.

Rimski deblak

Deblak je ležal rahlo nagnjen ob desnem bregu Ljubljanice. Sčasoma so usedline rečnega dna in erozijski material brežine popolnoma prekrile severni del deblaka, tako da je viden ostal le njegov manjši del.

Lega deblaka in moč rečnega toka sta povzročila, da se je prelomil na dveh mestih. Iz vode smo izvlekli tri velike kose v različnih stanjih ohranjenosti in dolžin: 5,15 m, 5,3 m in 6,1 m. Skupna dolžina deblaka je tako znašala okrog 16 m, vendar bomo točne dimenzije ugotovili takoj po opravljenem konservatorskem posegu ter ko bodo vsi deli ponovno sestavljeni v celoto. V vsakem primeru gre za enega najdaljših deblakov v Evropi z 1,1 m širine in 0,68 visokimi stranicami (Slika 11).

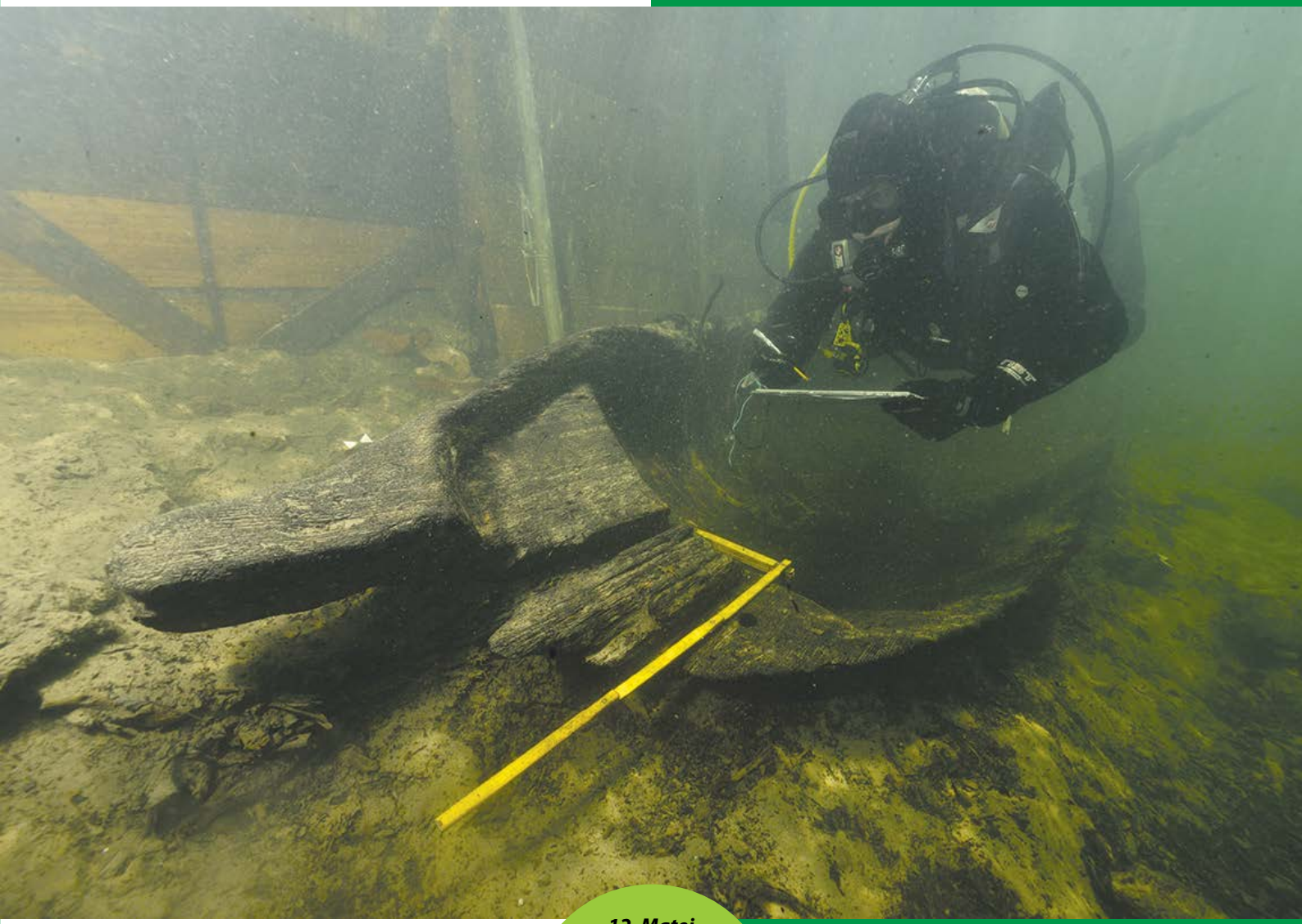
11. View of the logboat / Pogled na debla k (Photo: D. Badovinac)

plug that was fastened with a metal clamp. This opening is believed to have been used for sinking the dugout when it was not in use. The second, larger opening, was located towards the northern end of the dugout, and was also fastened by several metal clamps. The function of this opening is not completely clear, but it may have been related to the possibility of setting up a sail, or, alternatively, it was a fastening for drag ropes. A beautifully carved pointed tip of the dugout was preserved on the northern side. It was broken along its length and the port side part of the bow was completely replaced. Whether that happened during the construction or at a later time remains unclear. The remade part of the bow was sealed with woollen cloth pieces and resin, and it was fastened with 21 metal clamps. Additional metal clamps were found in several parts of the dugout's sides, fixing the cracks that occurred during the period of use. This demonstrates that the dugout was in use for a very long time, and was a very precious and valuable commodity that was regularly repaired and maintained (Photo 12).

The logboat is nearly two thousand years old, and it was probably built somewhere around the beginning of the first century AD. The samples that were taken in the year 2008

Deblak je bil izdelan iz debla hrasta. Ohranile so se številne zanimive podrobnosti. V sredini se je nahajala okrogla odprtina z lesenim zamaškom, ki je bil na deblak pritrjen s kovinsko spolijo. Ta odprtina je bila najverjetneje uporabljena za potop deblaka v času njegove neuporabe. Druga, večja odprtina se je nahajala na sevrnem delu deblaka in je bila prav tako pritjena z večimi kovinskimi spolijami. Funkcija omenjene odprtine še ni povsem jasna, morda je omogočala vgradnjo jambora ali konstrukcije za pričvrstitev vlečne vrvi. Na severni strani se je ohranil lepo izrezljan kljun deblaka, ki je očitno popokal po dolžini, zato je bil stranski del premca v celoti zamenjan. Ni še povsem jasno ali se je to zgodilo v času izgradnje ali kasneje. Predelan del premca je bil pritrjen z 21 kovinskimi sponkami stik pa je bil zatesnjen z volneno tkanino in smolo. Dodatne kovinske sponke so bile najdene na stranicah deblaka. Slednje so bile uporabljene za sanacijo razpok, ki so nastale v obdobju uporabe. To dokazuje, da je bil deblak v rabi zelo dolgo časa in je bil uporabniku zelo dragocen, zato ga je redno popravljal in skrbno vzdrževal (Slika 12).

Deblak je star skoraj dva tisoč let in je bil najverjetneje zgrajen nekje okoli začetka prvega stoletja našega štetja. Vzorci,



12. Matej Školc documenting the prow of the logboat / Matej Školc pri dokumentiranju premca deblaka (Photo: D. Badovinac)

13. Luka Bekić excavating the roman flat bottom sewn ship / Luka Bekić izkopava rimsko šivano ladjo. (Photo: D. Badovinac)

for the purpose of radiocarbon dating produced dates: 1995 ± 55 BP (Z-3294); calib. 1σ: 50 BC-70 AD (68,2%); 1930 ± 40 BP (Beta-250375); calib. 1σ: 4 -125 AD (57,8) (Erič, 2012, 399).

Approximately one meter north of the logboat we have also found a Roman flat-bottom sewn river barge. Since the boat was not part of the project, we uncovered only 2 m of its port length with the sole intention of establishing a veracity of our find and taking samples. The boat was then protected against erosion (Photo 13).

The Interactive Experience and Exhibition Site

After the conservation the logboat will be exhibited for an interactive experience in the exhibition site located in downtown Vrhnika. The site has been designed to encourage the public, including vulnerable groups, to actively participate in strengthening common responsibility for heritage and for the development of tourism, creative industries, the revival of old crafts and local traditions.

ki so bili odvzeti v letu 2008 z namenom radiokarbonskega datiranja, so določili naslednje datume: 1995 ± 55 BP (Z-3294); calib. 1σ: 50 BC-70 AD (68,2%); 1930 ± 40 BP (Beta-250375); calib. 1σ: 4 -125 AD (57,8) (Erič, 2012, 399).

Približno meter severno od deblaka smo našli tudi del šivane ladje iz rimskega obdobja. Ker slednja ni bila del projekta, smo raziskali samo 2 m levega boka trupa z namenom ovrednotenja najdbe in odvzema vzorcev. Ladja je bila po temeljitem dokumentiranju zaščitena pred erozijo brežine (Slika 13).

Interaktivno in doživljajsko razstavišče

Po opravljenem konservatorskem posegu bo deblak razstavljen na interaktvnem in doživljajskem razstavišču v središču Vrhnike. S slednjim bomo nagovorili širšo javnost in ranljive skupine, jih spodbudili k aktivnemu sodelovanju in razvijanju skupne odgovornosti za dediščino ter vzpostavili temelje za razvoj turističnih dejavnosti, kreativnih industrij in oživitev starih obrti in lokalnih tradicij.

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Underwater archeology in the Czech Republic – season 2015

Česká podvodní archeologie – sezóna 2015

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Czech Underwater Archaeology - watercourse - water area - Kozárovice – Vystrkov hillfort – Elbe river – Tříkřížová railroad - Pohansko - Thaya river

Česká podvodní archeologie – vodní tok – vodní plocha – hradiště Kozárovice – Vystrkov – Labe trať Tříkřížová – Pohansko – řeka Dyje

1. Introduction

Underwater archeology in the Czech Republic is not a tradition yet, despite the fact that in the State list of archaeological sites of the CR there are about 800 known archaeological sites under water (or partly submerged). Under the auspices of the Department of Archaeology and Museology of the Faculty of Arts, Masaryk University, we decided to change this situation. The article is focused on the origins of the Czech underwater archeology and its potential. In 2015, we conducted three Exploration surveys of archaeological sites under water. The main objective of the research was to compare the methodology of underwater archeology in different underwater conditions – a watercourse (Elbe river, Thaya river) and water area (Orlík dam).

2. The first site - Elbe river, Tříkřížová railroad (Litoměřice District)

In the second half of the 20th century, due to the regulation of the Elbe river, using a dredger, more than 100 luxury items were retrieved - luxury items belonging to the early and late Bronze Age (Zápotocký 1969). The aim of the research was to develop an applicable methodology of underwater archeology in the watercourse in order to recover any additional findings, which were not collected during dredging. On the right bank of the river there is a hillfort from the Bronze Age on the top of a large rock. On the left bank of the river can be found a pier and handling space belonging to the Lower Elbe river basin (Fig. 1). The overall conditions of the Elbe research were quite demanding: cold water, poor visibility and relatively strong current (1 - 1.5 m / s) compelled us to use rappelling equi-

1. Úvod

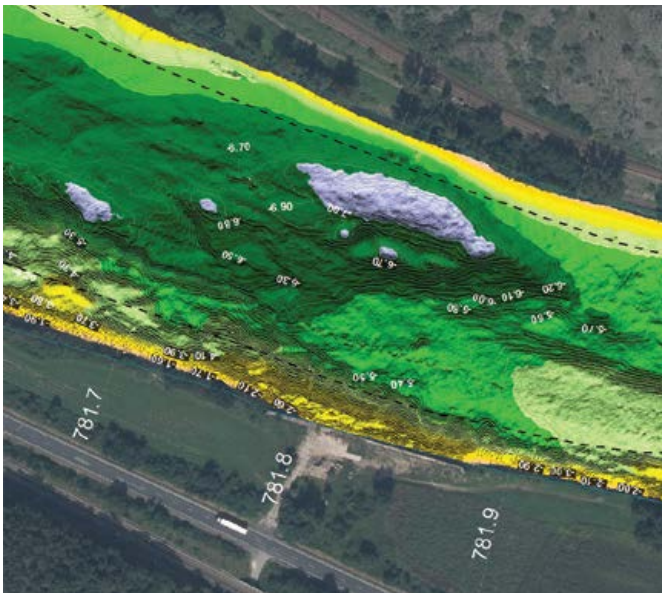
Podvodní archeologie nemá v České republice zatím tradici. Přitom ve Státním archeologickém seznamu je udáno asi 800 známých archeologických lokalit pod vodou (nebo částečně pod vodou). Pod záštitou Ústavu archeologie a muzeologie FF MU jsme se rozhodli tuto situaci změnit. Článek je zaměřený na počátky české podvodní archeologie a jejího potenciálu. V roce 2015 jsme provedli tři rekognoskační výzkumy archeologických lokalit pod vodou. Mezi hlavní cíle výzkumů patřilo porovnání metodiky podvodní archeologie v různých podvodních podmínkách na příkladu vodního toku (Labe, Dyje) a vodní plochy (VN Orlík).

2. První lokalita – řeka Labe, trať Tříkřížová (okres Litoměřice)

V druhé polovině 20. století proběhla regulace řeky Labe, kdy bylo pomocí korečkového bagru získáno více jako 100 luxusních předmětů spadajících do mladší až pozdní doby bronzové (Zápotocký 1969). Cílem výzkumu bylo jednak vyvinout aplikovatelnou metodiku podvodní archeologie ve vodním toku a dále vyzvednout případné další nálezy, které se nezachytily

1. Elbe river, excavated part/ Řeka Labe, zkoumaná část (photo: D. Berka)

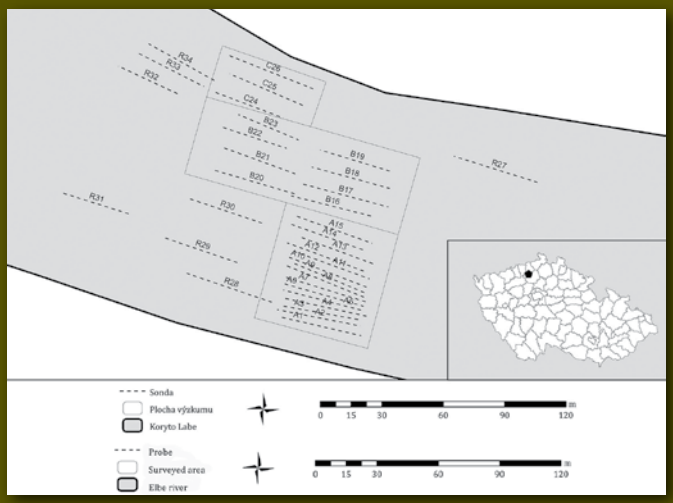
pment and personnel transported by boat to the designated place. Greatly helped us given sonar data of surveyed area of the river (Sonar data of surveyed area of the river was of great help; Fig. 2).



2. Sidescan sonar image of part of the Elbe river / Sidescan sonarový obraz části řeky Labe (author: povodí Dolní Labe, s. p. o.)

The research area was systematically divided into three sectors of interest – A, B and C, which were constituted by probes with a length of 40 m. Other probes „R" (random), were placed randomly in places outside the designated sectors (Fig. 3). Each probe consisted of a guide rope, 40 m long, on whose ends were established weights, supported by a second rope with buoys on the surface. The research was conducted in the waterway corridor, so we placed the buoy so that the width of the river was at least two-thirds open to passing cargo ships (Fig. 4).

při bagrování. Na pravém břehu řeky se nachází velká skála, na jejímž vrcholu se rozkládá výšinné sídliště z doby bronzové. Na levém břehu řeky je vybudované molo a manipulační prostor patřící závodu povodí Dolní Labe (Obr. 1). Celkové podmínky labského výzkumu byly poměrně náročné. Byla zde velice chladná voda, slabá viditelnost a poměrně silný proud (1 – 1,5m/s), ve kterém jsme museli používat slaňovací techniku a pracovníky dopravovat na určené místo člunem. Velice nám pomohla poskytnutá sonarová data zkoumaného úseku řeky (Obr. 2). Plocha výzkumu byla systematicky rozdělena do tří zájmo-



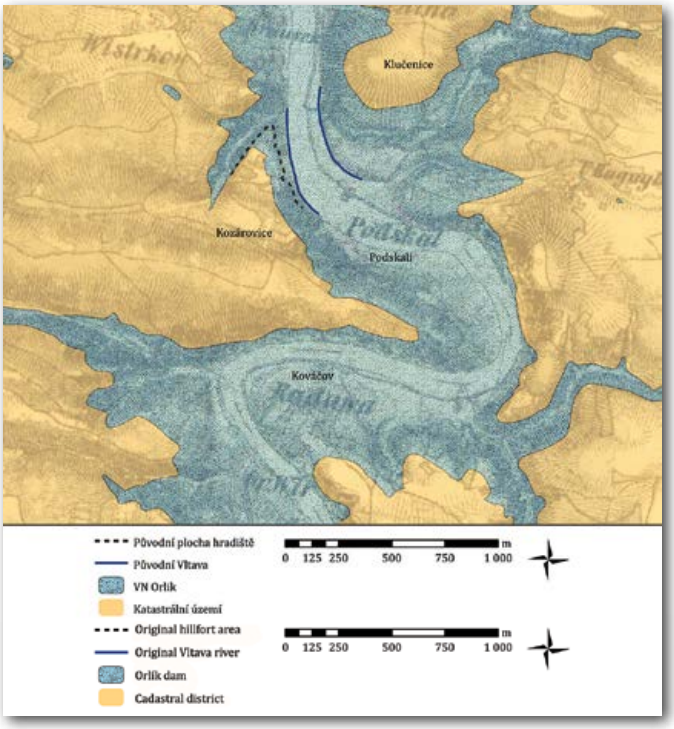
3. GIS image of surveyed area of the Elbe river / GIS výstup zkoumané plochy řeky Labe (photo: B. Machová)

vých sektorů A, B a C, které byly tvořeny sondami o délce 40 m. Další sondy „R" (random) jsme kladli náhodně na místech mimo vyznačené sektory (Obr. 3). Každá sonda byla tvořena vodícím lanem, dlouhým 40 m, na jehož koncích byla navázána závaží, od kterých byla vedena další lana zakončená plujícími bójemi na hladině. Výzkum probíhal v plavební trase, proto jsme bóje umísťovali tak, aby byl prostor koryta volný pro projíždějící nákladní lodě alespoň ze dvou třetin (Obr. 4).

4. Waterway corridor at the Elbe river / Plavební trasa řeky Labe (photo: B. Machová)

3. The second location – Orlík dam, Kozárovice – Vystrkov hillfort (Příbram District)

The hillfort was discovered in 1881. It is most likely a Premyslid center, built in a strategically and communicatively convenient location. It falls within the period 10th to 11th centuries. The hillfort probably dominated the Vltava river valley, which apparently went through an important waterway. It was located on a headland above the left bank of the Vltava river. Kozárovice belongs to one of the largest hill forts in the Republic however, no research has been conducted in this area yet. On the other hand, during the building of the Orlík dam a rescue research was conducted. They consisted of tiny probes in the years 1956, 1960 and 1961 (Buchvaldek - Sláma - Zeman 1978). In early 1999 Orlík partly drained and flood plain was revealed, so it was possible to carry out a surface collection (Fröhlich - Lutovský 1999). Our research has focused on area A, which is

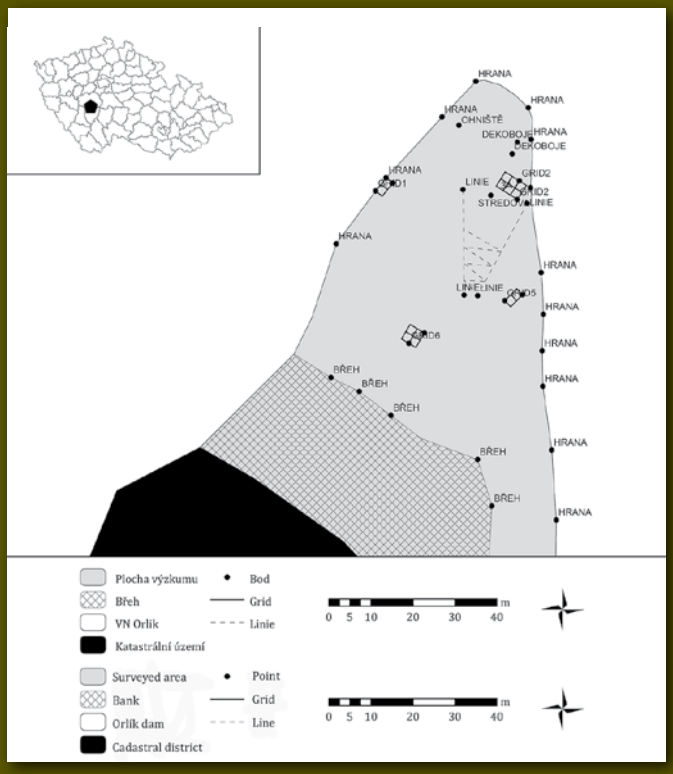


5. Comparing of the old map (II. Military Survey, 1836 – 1852) with the actual orthophoto of Kozárovice – Vystrkov hillfort /Porovnání starého mapového díla (II. Vojenské mapování, 1836 – 1852) s aktuální ortofoto hradiště Kozárovice – Vystrkov (photo: B. Machová)

the northernmost part of the hillfort. The area is now flooded at a depth of l 17 meters. It has about 0.8 ha. The original Vltava riverbed is now believed to have been 55 meters below the current surface (Fig. 5). Our research was mainly focused on detection. We have tried to pick up the findings and determine for example, the intensity of soil erosion caused by fluctuating water levels and whether or not the cultural layer was disrupted. Visibility below 5 meters was good. The problem for us was the character of the bottom, which consisted of fine sand and clay. After swirling the sediment, visibility was zero and it took quite a long time before the sediment settled again. On the site we used lines as described above, plus grid (Fig. 6).

3. Druhá lokalita – vodní nádrž Orlík, hradiště Kozárovice – Vystrkov (okres Příbram)

Hradiště bylo objeveno v roce 1881. Jedná se s největší pravděpodobností o přemyslovské centrum, vybudované ve strategicky a komunikačně výhodné poloze. Spadá do období 10. – 11. století. Hradiště pravděpodobně ovládalo část vltavského údolí, jímž zřejmě procházela důležitá vodní cesta. Nacházelo se na ostrožně nad levým vltavským břehem. Kozárovice patří k jedněm z nejmohutnějších hradišť v republice. Přesto na hradišti neproběhl žádný výzkum. Teprve stavba orlické přehrady, jejíž vody zatopily nejníže položené části hradiště, si vynutila záchranný výzkum. Ty probíhaly formou drobných sond v letech 1956, 1960 a 1961 (Buchvaldek – Sláma – Zeman 1978). Počátkem roku 1999 byl Orlík částečně vypuštěn a odhalila se tak zatopená místa, kde proběhl povrchový sběr (Fröhlich – Lutovský 1999). Náš výzkum byl zaměřen na areál A, jež je nejsevernější částí hradiště. Jeho plocha je nyní zatopená a nachází se v 17 metrech. Celý areál A má plochu cca 0,8 ha. Původní řečiště Vltavy se dnes předpokládá v cca 55 metrech pod hladinou (Obr. 5). Náš výzkum byl zejména zjišťovací. Snažili jsme se kromě vyzvednutí nálezů zjistit například intenzitu půdní eroze způsobenou kolísáním vodní hladiny, a zda dochází k narušování kulturní vrstvy.
Viditelnost byla od cca 5 metrů dobrá. Problémem pro nás byl charakter dna, které bylo tvořeno jemným pískem a jílem. Při jeho zvíření byla viditelnost nulová a trvalo poměrně dlouho, než se sediment opět usadil. Kromě výše popsaných linií jsme v areálu A používali i tzv. grid (Obr. 6).



6. GIS image of surveyed area of the Kozárovice – Vystrkov hillfort / GIS výstup zkoumané plochy hradiště Kozárovice – Vystrkov (photo: B. Machová)

7. Thaya river (excavated part) / Řeka Dyje, zkoumaná část (photo: D. Berka)

4. The third location – Thaya river, near the hillfort Pohansko (Břeclav District)

Pohansko near Břeclav is a large Slavonic hillfort from 9th century. It's situated in the southeastern part of the Czech Republic, in the vicinity of the confluence of the Morava and Thaya rivers, near the Czech-Austrian borders. In the Thaya river were occasionally found human bones and other materials. The aim of the research was to determine the possible occurrence of additional objects in the river that could be related to the hillfort or its hinterland. The location of the findings is situated in a bend of the river near the confluence of the Morava and Thaya rivers (Fig. 7). The water visibility was good, however, the current was very strong. We used the system of laid probes again. Each probe was formed by the guide rope, 40 m long, on whose ends were established weights and which was led by another rope finished by buoys on the surface. This research would not have been possible without rappelling techniques (Fig. 8).

4. 3. lokalita – řeka Dyje, poblíž hradiště Pohansko u Břeclavi (okres Břeclav)

Poblíž hradiště Pohansko teče řeka Dyje, ve které byly čas od času nacházeny lidské kosti a další materiál. Cílem výzkumu bylo zjištění možného dalšího výskytu předmětů v řece, které by mohly souviset s hradištěm. Místo nálezů se nachází v meandru řeky nedaleko soutoku řek Morava a Dyje (Obr. 7). V řece byla velice dobrá viditelnost, ale také velice silný proud. Opět jsme využili systému kladených sond, kdy byla každá sonda tvořena vodícím lanem, dlouhým 40 m, na jehož koncích byla navázána závaží, od kterých byla vedena další lana zakončená plujícími bójemi na hladině. Tento výzkum by nebylo možné provést bez slaňovací techniky (Obr. 8).

8. Divers before the documentation of the site, Thaya river; David Berka and Oldřich Švirk / Potápěči před dokumentací lokality, Řeka Dyje; David Berka and Oldřich Švirk (photor: Š. Aisová)

5. Results

In the watercourse we used the guide ropes and rappelling technique in the case of strong currents. Water area does not limit our work by the rope, but we had to deal with complications of visibility. In the whole area we made system of networks because of the orientation, and then we chose a particular method of working. In the Elbe River, we found a lot of recent material. Unfortunately, we did not detect any archaeological material. However, it is possible that some findings on the site are still under thick sediments. On the contrary, during our research at the hillfort Kozárovice - Vystrkov we managed to obtain great numbers of material. Besides the large number of pottery we also found earrings (Fig. 9) and a few iron fragments (knives?). Furthermore, we were able to assess the level of water erosion at the site. On the part of the site is now eroding cultural layer. In the Thaya River, we found two burned animal bones (Fig.10) and a few iron fragments. Furthermore, we have found a thick flood layer on the profile of the river.

9. Earring found at the hillfort Kozárovice – Vystrkov, 10. – 12th century / Záušnice z hradiště Kozárovice - Vystrkov, 10. - 12. století (foto: B. Machová)

10. Burned animal bones from the Thaya rive /Ohořelá zvířecí kost z řeky Dyje (foto: B. Machová)

In this way, it was the first season of underwater archeology in the Czech Republic (Fig. 9). Despite a few complications, underwater archeology is well feasible in the Czech Republic and surely we will soon provide interesting results.

5. Výsledky

Ve vodním toku se nám osvědčilo používat tzv. vodící lana a slaňovací techniku v případě silného proudu. Vodní plocha nás neomezovala prací na laně, ale museli jsme řešit komplikaci s viditelností. Celou lokalitu jsme z důvodu orientace zasíťovali a pak jsme pouze zvolili určitou metodu práce. V řece Labi jsme nalezli mnoho recentního materiálu. Bohužel se nám nepodařilo zachytit žádný materiál archeologické povahy. Je ale možné, že se na lokalitě nějaké nálezy stále nacházejí pod mocnými sedimenty. Na hradišti Kozárovice – Vystrkov se nám podařilo získat naopak velmi početný materiál. Kromě velkého množství keramiky jsme našli také záušnici (Obr. 9) a několik železných fragmentů (nožů?). Dále se nám zde podařilo zhodnotit stupeň vodní eroze. Na části lokality se dnes již vymílá kulturní vrstva. V řece Dyji jsme nalezli dvě přepálené zvířecí kosti (Obr. 10) a také pár železných fragmentů. Dále jsme zde zjistili mocné záplavové vrstvy v profilu řeky.

Tímto způsobem proběhla první sezóna podvodní archeologie v České republice. I přes drobné komplikace je podvodní archeologie v České republice dobře proveditelná a jistě nám brzy poskytne zajímavé výsledky.

11. Czech underwater archaeology team / Tým české podvodní archeologie; David Berka, Oldřich Švirk, Lukáš Konopiský, Ivo Havránek, David Vondrášek, Jan Vodrážka, Barbora Machová, Šárka Aisová, Milan Ais, Ladislav Voříšek

1. The Agreement is signed in Split / Potpisivanje sporazuma u Splitu (photo: T. Malm)

Croatian-Danish Underwater Archaeology Cooperation

Suradnja Hrvatske i Danske podvodne arheologije

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They say that if you dip your finger into the sea that you are connected to the entire world – the same must be true if you immerse yourself entirely. It has been the sea – more precisely work at sea – that has brought together two countries of similar size and population. One to the south, the other to the north, proud of their islands, indented shorelines, the maritime history of those shores and all that the sea has concealed and preserved over the centuries. If one considers the level that underwater archaeology has achieved in both countries then cooperation between these two lands seems an entirely logical consequence.

The agreement initiated by the Danish Agency for Culture (Kulturstyrelsen) was received with delight at the International Centre for Underwater Archaeology in Zadar. The agreement was signed in Split on the 24th of October 2014

Kaže se da ako staviš prst u more da si povezan s cijelim svijetom, valjda to isto vrijedi ako cijeli uroniš u to isto more. Povezalo je more, točnije, aktivnost u moru, dvije površinom i brojem stanovnika slične zemlje. Jedni na jugu, drugi na sjeveru, ponose se svojim otocima, razvedenom obalom, poviješću plovidbe uz te obale, a ponose se i svime onim što je to more kroz stoljeća sakrilo i čuvalo u svojoj utrobi. Kad se uzme u obzir razina na kojoj se podvodna arheologija u obje zemlje nalazi, onda je suradnja između ovih dviju zemalja sasvim logičan slijed događaja.

Sporazum koji je inicirala Danska agencija za kulturu (Kulturstyrelsen) upućen je Međunarodnom centru za podvodnu arheologiju u Zadru, gdje je dočekan s oduševljenjem. Potpisan je u Splitu 24. listopada 2014. godine, za vrijeme četverodnevnog posjeta Hrvatskoj, a potpisali su ga ravnatelj

during a four-day visit to Croatia by Luka Bekić, director of the International Centre for Underwater Archaeology, and Topholt Larsen, representing the Danish Agency for Culture. The agreement aims to achieve an exchange of knowledge in the domain of underwater archaeology in Croatia and Denmark. The initiative for this agreement came from Her Majesty the Danish Queen Margrethe II, herself an archaeologist, who also participated in the signing ceremony.

Based on the agreement Croatian underwater archaeologists with ICUA first made a two-week visit to Denmark, from the 5th to 18th of July. This will be followed by another visit to Denmark in the first half of 2016 by a Croatian team of ICUA restorers. The final phase of this cooperation will see a visit by Danish experts in the domain of underwater archaeology to Croatia in the second half of 2016. Croatian underwater archaeologists Marina Šimičić, Mladen Pešić and Roko Surić had the honour of breaking the ice in this exchange of knowledge between the two countries.

The Croatian team spent the first part of their visit on the western shore of the Jutland peninsula, in the small town of Thorsminde, with their host Kasper Sparvath of the Strandingsmuseum St. George. The plan to undertake dives at several locations in the nearby fjord was thwarted, as boats were unable to sail out of harbour due to inclement weather. Notably, while Croatia was this year hit by intense July heat, the temperature in Denmark at the same time hardly reached 20°C, and the strong cold wind made the Danish summer more akin to March in Zadar. Instead of the visit to the Danish waters, then, the Croatian team visited the nearby and truly impressive museums. It was particularly inspiring to see the number of volunteers involved in the work of some of the museums.

3. Volunteers at the prehistoric park / Volonteri u prapovijesnom parku (photo: R. Surić)

Međunarodnog centra za podvodnu arheologiju Luka Bekić i predstavnik Danske agencije za kulturu Topholt Larsen. Radi se o sporazumu koji za cilj ima razmjenu znanja na području podvodne arheologije u Hrvatskoj i Danskoj. Zanimljivo je da je inicijativa za ovakav sporazum došla od Njezinog veličanstva danske kraljice Margarete II, koja je inače i sama arheolog, a prisustvovala je i svečanom činu potpisivanja.

Dogovoreno je da će prvo hrvatski podvodni arheolozi MCPA provesti dvotjedno razdoblje u Danskoj od 5. srpnja do 18. srpnja, a potom će hrvatski tim restauratora MCPA u prvom dijelu 2016. g. boraviti u Danskoj. Kao završni čin ove suradnje dogovoren je posjet danskih stručnjaka u polju podvodne arheologije Hrvatskoj u drugoj polovici 2016. g. Hrvatski podvodni arheolozi Marina Šimičić, Mladen Pešić i Roko Surić, imali su čast probiti led u razmjeni znanja između ovih dviju zemalja.

2. Kasper Sparvath explains the specific nature of the Strandingsmuseum St. George / Kasper Sparvath objašnjava specifičnosti Strandingsmuseum St. George-a (photo: R. Surić)

Prvi dio svog posjeta hrvatski tim proveo je na zapadnoj obali poluotoka Jutland u gradiću Torsmindeu, a domaćin je bio Kasper Sparvath iz Strandingsmuseum St. George. Unatoč planu da se na nekoliko lokacija u obližnjem fjordu izvrše uroni, zbog nepovoljnih vremenskih uvjeta nije se moglo isploviti. Usput rečeno, dok se Hrvatska ove godine mučila s nesnosnim srpanjskim vrućinama, u isto vrijeme je u Danskoj temperatura jedva dosezala 20°C, a jak i hladan vjetar činili su dansko ljeto sličnije ožujku u Zadru. Umjesto posjeta danskom podmorju, posjetili su se obližnji kopneni muzeji koji su zaista upečatljivi. Posebno inspirativno bilo je vidjeti toliki broj volontera koji su uključeni u rad nekih od muzeja.

Slijedeći korak bio je posjet Moesgard Museum u Aarhusu, gdje su domaćini bili Claus Skriver i Peter Astrup, a osim razgledavanja impozantnog novootvorenog muzeja, hrvatski stručnjaci imali su priliku upoznati se s načinom rada

4. A tour of the departments at the Moesgaard Museum / Obilazak odjela u Muzeju Moesgaard (photo: M. Šimičić)

The next visit was to the Moesgaard Museum in Aarhus, where the hosts were Claus Skriver and Peter Astrup. Besides touring this imposing newly opened museum, the Croatian experts had an opportunity to learn about the investigative, documentation and restoration-conservation work methods at the Moesgaard Museum.

From Aarhus the team moved on to Middelfart, where the team was housed abroad the Mjølner ship. Along with the cordial and warm crew of the ship, the team was also received by their colleague Otto Uldum of the Langelands Museum. In spite of their great efforts and best intentions they were unable to conduct dives at any of the planned locations due to the constant and strong wind and rain. Particularly regretful was the missed opportunity to take part in the investigation of the impressive site of the remains of the prehistoric Tybrind Vig settlement. Sleeping on the improvised bunks of this beautiful 1922 wooden cargo sailboat was a challenge of its own.

6. The Croatian-Danish team on the ship Mjølner / Hrvatsko-Danski tim s Mjølnera (photo: arhiva MCPA)

istraživačkog, dokumentacijskog i restauratorsko-konzervatorskog rada koji se obavlja u sklopu Moesgaard Muzeja.

Iz Aarhusa se krenulo prema Middelfartu u kojem se ekipa smjestila na brod Mjølner. Osim izuzetno ljubazne i srčane posade broda, hrvatski tim dočekao je i kolega Otto Uldum iz Langelands Muzeja. Unatoč velikim naporima i najboljoj želji nije se moglo roniti na niti jednoj od planiranih lokacija zbog konstantno jakih vjetrova i kiše. Posebno treba žaliti zbog propuštene prilike da se sudjeluje u istraživanju impresivnog lokaliteta na kojem se nalaze ostaci prapovijesnog naselja Tybrind Vig. Treba spomenuti da je bio pravi izazov spavati, na inače lijepom drvenom teretnom jedrenjaku iz 1922. g., na kojem su improvizirani ležajevi.

5. For four days the ship Mjølner was home to the Croatian team/ Četverodnevni dom za hrvatski tim - brod Mjølner (photo: arhiva MCPA)

U Midelfartu je hrvatski tim preuzeo Andreas Bloch iz Muzeja vikinških brodova iz Roskildea. Nakon upoznavanja s kolegom, prateći njegove upute krenulo se prema luci u gradiću Bandholm na otoku Lolland. Na putu iz Midelfarta prema Bandholmu koji se nalazi na jugu Danske smjestili su se zanimljivi muzeji koji se tiču vikinškog razdoblja, pa je bilo nemoguće samo proći pored njih i ne posjetiti ih.

Na odredištu se hrvatski trojac upoznao s Jørgenom Denckerom koji je voditelj istraživanja na podvodnim istraživanjima koje provodi Muzej vikinških brodova iz Roskildea. Smještaj u Bandholmškoj luci bio je na brodu Honte, koji je bio zamjenski dom za istraživačku ekipu. Brod je inače poprilično velik i ima tri člana posade, nekoliko kabina za spavanje, kuhinju, wc i kupaonicu, a ujedno je opremljen dizalicama i pumpom s toplom vodom, što je olakotna okolnost za bilo kakva podvodna istraživanja u danskom podmorju.

Back at Middelfart the Croatian team was received by Andreas Bloch from the Viking Ship Museum at Roskilde. The team was directed by Bloch to the harbour in the small town of Bandholm on the island of Lolland. There are fascinating museums on the way from Middelfart to Bandholm in the south of Denmark covering the Viking period that simply had to be visited.

At their destination the Croatian trio met Jørgen Dencker, head of the underwater investigations conducted by the Viking Ship Museum at Roskilde. At Bandholm harbour the team was housed aboard the ship Honte, a second home to the research team. This is a quite large ship with a crew of three, several sleeping cabins, a galley, toilet and washroom and is also equipped with a crane and hot water pump, which certainly facilitates underwater research in Danish waters.

The moment the team had been waiting most for finally came! The weather calmed and they could undertake the long awaited dive in Danish waters. It was decided that the Croatian team would join the trench investigation of the remains of a submerged prehistoric site in the waters off the islet of Askø. For the occasion the Danish colleagues gave their Croatian colleagues an opportunity to try the joys of diving in a special suit with a constant flow of hot water. This suit permits divers to work unhampered on the seabed in the Danish sea where in the winter the temperature drops to as low as 3°C. The use of this hot water suit and the supply of air from the surface with full-face masks and the possibility of communicating with colleagues on the surface was a combination that turned a normal dive into an unforgettable experience.

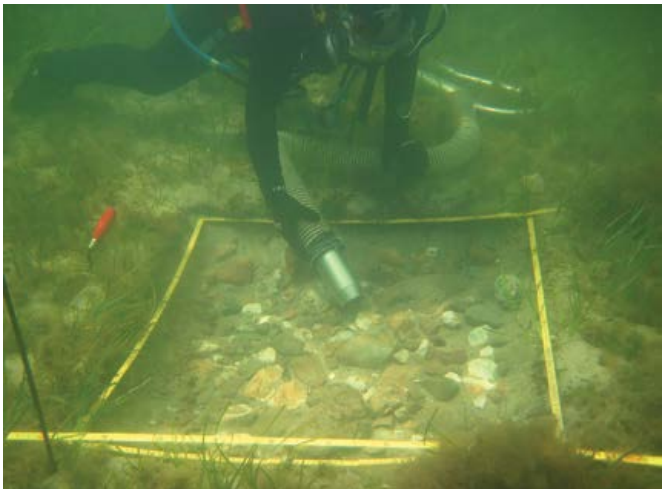
9. Excavating a trench at the Askø prehistoric site / Iskopavanje sonde na prapovijesnom lokalitetu Askø (photo: M. Pešić)

Their task was to form trenches at several locations. The excavation of trenches yielded sherds and flint pebbles, some of which have been worked by humans. Excavation was assisted by dredges with sack receptacles at their exhaust that allowed fine sand to pass and left all larger material in the sack. The sacks of material were then raised to the ship, where

7. Jørgen Dencker speaks to the Croatian team of the underwater sites and archaeological material in Denmark/ Jørgen Dencker drži hrvatskom timu predavanje o podvodnim lokalitetima i arheološkom materijalu u Danskoj (photo: M. Šimičić)

Najiščekivaniji trenutak konačno se i ostvario! Vrijeme se smirilo i moglo se otići na dugoočekivani zaron u dansko podmorje. Odlučeno je da će se hrvatski tim priključiti sondažnim istraživanjima na ostacima potopljenog prapovijesnog lokaliteta u podmorju otočića Askø. Tom prilikom danski kolege prepustili su hrvatskim kolegama da iskuse čari ronjenja u specijalnom odijelu koje ima konstantan dotok tople vode. Takvo odijelo omogućuje da se u danskom moru, kojem se, usput rečeno, u zimskim vremenima temperatura spušta i

8. Fully suited and equipped at the start of a dive / Ronilac u kompletnoj opremi kreće u zaron (photo: M. Pešić)



10. A layer with abundant flint material / Sloj s brojnim kremenim materijalom (photo: M. Pešić)

the remainder of the team would sort out the material and separate the archaeological finds. Besides the experience of diving at this specific locality, the Croatian team also gained valuable knowledge pertaining to the identification and characteristics of Mesolithic material.

From the presentation of the plan of the future exhibition space and permanent exhibits that will be dedicated to underwater archaeology at the Viking Ship Museum by curator Andreas Bloch the Croatian team garnered new ideas that could be applied in the organisation of the permanent exhibits of the future ICUA museum in Zadar. Even the long awaited dive was eclipsed by the friendship that developed over those six days between the Danish colleagues and the Croatian trio.

The final leg of the visit to Denmark was a visit to the Viking Ship Museum at Roskilde. Morten Ravn saw to a warm reception and held a presentation of Denmark's best-known Viking museum before leading his Croatian colleagues on a tour of the Museum and its departments. The shipyard is a particular impressive part of the museum. Besides learning about the process in which a medieval ship is created and observing a faithful replica of one such vessel, the Croatian team had the opportunity to sail on one of the ships built here.

12. The Danish-Croatian team on the ship Honte / Hrvatsko-Danski tim s Hontea (photo: A. Bloch)

do 3°C, nesmetano i ugodno boravi i radi na morskom dnu. Koristiti takvo odijelo, zajedno s opskrbom zrakom s površine i maskama za cijelo lice s mogućnošću komunikacije se kolegama na površini činilo je kombinaciju koja je obično ronjenje pretvorila u nezaboravno iskustvo.

Zadatak je bio napraviti sonde na više lokacija. Iskopavanjem sondi nailazilo se na ulomke i oblutke kremenja, od kojih je određena količina izrađena ljudskom rukom. Iskopavalo se mamutima na čijim su se ispustima nalazile vreće kako bi sitan pijesak mogao proći, a sav krupniji materijal ostajao bi u vreći. Vreće s materijalom potom su se dizale na brod, gdje bi ostatak ekipe prolazio kroz prikupljeni materijal i automatski izdvajao arheološke nalaze. Osim iskustva u ronjenju na tom specifičnom lokalitetu, hrvatski tim dobio je vrijedne poduke o prepoznavanju i karakteristikama mezolitičkog materijala.

11. Dencker and Šimičić inspect the contents of the sack / Dencker i Šimičić pregledavaju sadržaj vreće (foto: M. Pešić)

Kustos Andreas Bloch predstavio je u stručnom izlaganju plan budućeg izložbenog prostora i stalnog postava koji će unutar Muzeja vikinških brodova biti specijaliziran za podvodnu arheologiju, što je hrvatskom timu dalo nove ideje koje se će se moći iskoristiti za organizaciju stalnog postava u budućem muzeju MCPA u Zadru. Čak i dugo iščekivano ronjenje ostalo je zasjenjeno prijateljstvom koje se u tih šest dana razvilo između danskih kolega i hrvatskog trojca.

Završna etapa posjeta Danskoj bila je posjet Muzeju vikinških brodova u Roskildeu. Za lijep doček pobrinuo se Morten Ravn koji je održao predavanje o najpoznatijem danskom vikinškom muzeju, a potom je kolege proveo po Muzeju i svim njegovim odjelima. Posebno impresivan dio muzeja je brodogradilište. Osim upoznavanja procesa nastajanja jednog srednjevjekovnog broda i promatranja izrade vjerne replike istog, hrvatski tim iskusio je i plovidbu na jednom od brodova koji su na tom mjestu izgrađeni.

ish Agency for Culture (Kulturstyrelsen) where their host was Torben Malm. Torben was gracious enough to, besides the tour and information about the work of the agency, lead the Croatian team on a tour of Copenhagen, providing an abundance of information about the points of interest in this city they likely might not have gleaned from even the best tourist guide.

As has already been noted, the agreement foresees that restorers with the ICUA conservation-restoration department will spend two weeks working with Danish museums and restoration workshops in the spring of 2016. The arrival of our Danish colleagues in Zadar is expected in September of 2016.

This praiseworthy agreement has provided the divers of the International Centre for Underwater Archaeology an abundance of experiences they will be able to implement in their work with Croatian underwater heritage. We can only hope that the following phases of this agreement will be implemented at an equally high level and that both parties will draw significant results from them which should lead to the development of long term collaboration in the domain of underwater archaeology between two countries with so much in common.

13. A tour of the shipyard of the Viking Ship Museum at Roskilde/ Obilazak brodogradilišta u Muzeju vikinških brodova u Roskildeu (photo: M. Šimičić

Vrijedno je spomena da je hrvatski tim u svom uredu primio veleposlanik Republike Hrvatske u Kopenhagenu Frane Krnić. Osim prepričavanja dojmova o ovoj sjevernoeuropskoj zemlji, hrvatski tim objasnio je i ciljeve hrvatsko - danske suradnje na polju podvodne arheologije. Hvale vrijedna je i poticajna veleposlanikova spremnost na pomoć u ostvarivanju bilo kakve buduće suradnje koja bi se iz ovog sporazuma mogla razviti.

Za kraj dvotjednog posjeta obišla se Danska agencija za kulturu (Kulturstyrelsen), gdje je domaćin bio Torben Malm. Kako se ne bi sve svelo na razgledavanje i upoznavanje samo te agencije pobrinuo se kolega Torben koji je hrvatski tim proveo po Kopenhagenu uz objašnjenja i lekcije o znamenitostima, koje zasigurno ne bi iznijeli ni najbolji turistički vodiči tog grada.

Kako je već navedeno, prema sporazumu predviđeno je da restauratori iz konzervatorsko-restauratorskog odjela MCPA provedu dva radna tjedna u danskim muzejima i restauratorskim radionicama, što će se i odraditi na proljeće 2016. g. Dolazak danskih kolega u Zadar predviđen je za rujan 2016. g.

Hvale vrijedan sporazum donio je roniocima Međunarodnog centra za podvodnu arheologiju pregršt iskustva koje će moći implementirati u radu s hrvatskom podvodnom baštinom. Ostaje samo nada da će se slijedeći koraci ovog sporazuma provesti na jednakoj razini, i da će se ostvariti, za obje strane značajni rezultati, što bi u konačnici moglo dovesti do razvoja višegodišnje suradnje u polju podvodne arheologije između ovih dviju

4. Summer in Denmark / Dansko ljeto (photo: M. Šimičić)

The Conservation and Restoration of the Monoxylon from the Karlovac City Museum

Konzerviranje i restauriranje drvenog monoksila iz Gradskog muzeja u Karlovcu

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Wooden boats fabricated from a single piece of timber are known as monoxylons. One such boat was discovered in 1966 in the Kupa River at the village of Rečica near Karlovac. It was extracted and sold to the Karlovac City Museum by Mr Janko Nejak. The monoxylon was not conserved upon its extraction from the river – rather it was left dry on the shelves of the museum depot up to July of 2013. Given that its inappropriate handling and storage caused it to begin to deteriorate it was agreed between the museum and the International Centre for Underwater Archaeology in Zadar that the necessary conservation-restoration interventions be undertaken. In July of 2013 the monoxylon was transferred from the exhibition area on the ground floor of the Karlovac City Museum to the workshop of the restoration and conservation department of the International Centre for Underwater Archaeology in Zadar. Conservation-restoration work was initiated immediately upon its arrival. The objective of the work was to stabilise the surface layer and to consolidate the weakened wooden material.

2. Transferring the monoxylon to the premises of the conservation-restoration workshop / Prenošenje monoksila u prostorije konzervatorsko-restauratorske radionice (photo: M.Mustaček)

1. The monoxylon at the depot of the Karlovac City Museum / Monoksil u depou Gradskog muzeja u Karlovcu (photo: M.Mustaček)

Drveni čamci izgrađeni od jednog komada drveta nazivaju se monoksilima. Ovakav jedan čamac pronađen je u rijeci Kupi kod sela Rečica, blizu Karlovca, 1966. godine. Njega je izvadio i prodao Gradskom muzeju u Karlovcu gospodin Janko Nejak. Nakon vađenja iz rijeke monoksil nije konzerviran, već je ostavljen na suhom, na policama muzejskog depoa, sve do srpnja 2013. g. S obzirom kako se zbog neprikladnog rukovanja i smještaja počeo raspadati, dogovorom između muzeja i Međunarodnog centra za podvodnu arheologiju u Zadru odlučeno je provesti potrebne konzervatorsko - restauratorske zahvate. U srpnju 2013. g. monoksil je iz izložbenog prostora u prizemlju Gradskog muzeja u Karlovcu prevezen u radionicu Odjela restauriranja i konzerviranja Međunarodnog centra za podvodnu arheologiju u Zadru. Odmah po zaprimanju, na monoksilu su započeli konzervatorsko - restauratorski radovi. Cilj radova bila je stabilizacija površinskog sloja i konsolidacija oslabljene drvene građe.

Naime, nakon vađenja iz rijeke došlo je do nekontroliranog isušivanja predmeta. Uslijed isušivanja oslabljena je osjetljiva drvena struktura te su se na monoksilu pojavile brojne pukotine i započelo mrvljenje drvenih stijenki. Intervencijom tima konzervatora restauratora MCPA, Anite Jelić, Mladena

The extraction of the dugout boat from the river was, namely, followed by the uncontrolled drying of the artefact. The fragile wooden structure was weakened as a result of the desiccation leading to the appearance of numerous fissures on the monoxylon and the beginnings of the crumbling of the wooden walls. The deterioration of the monoxylon was halted by the intervention of the ICUA conservation-restoration team of Anita Jelić, Mladen Mustaček and Marina Šimičić, preventing the loss of yet another valuable cultural good facing imminent decay. The monoxylon was subjected to cleaning, stabilisation and consolidation procedures, the gluing of broken-off surface sections and integration and the toning of integrated sections. The conservation-restoration treatment aims to retard the process of the deterioration of the artefact, to conserve the condition as found, to restore its former visual identity and to provide for its long-term preservation. The rules of the profession were adhered to in the conducted treatments – reversible materials were used and the character of the artefact was not altered.

3. Impurities in the wooden structure / Nečistoće u drvenoj strukturi (photo: M.Mustaček)

Upon its receipt at the restoration workshop the condition as found of the monoxylon was documented and the objective of the conservation-restoration work determined. A preliminary inspection established the condition of the monoxylon. It is a dugout boat fabricated from a single piece of timber, of oval form, with a length of 310 centimetres and a maximum width of 63 centimetres. The stern and prow of the monoxylon are damaged, i.e. their terminations are missing, and the prow has a 46 centimetres fissure with a maximum width of two centimetres running along its centre. Palpation was used to determine the condition and level of decomposition. When received, the monoxylon was covered in layers of dirt. This dirt, mostly on the inside of the monoxylon, consisted largely of layers of dust and small pebbles of various colours, fine sand of reddish and yellowish hue, cobweb and chunks of white plaster. Traces of white wall paint were observed on the outside edges of the monoxylon.

The drying out of the wooden structure resulted in the cracking and separation of the surface layer of the monoxylon on all sides to a thickness of about one centimetre. The fissures

Mustačeka i Marine Šimičić, zaustavljena je razgradnja monoksila i spriječen nestanak još jednog vrijednog kulturnog dobra koje je bilo samo korak do raspadanja. Na drvenom su monoksilu provedeni postupci čišćenja, stabilizacije, konsolidacije, spajanja odlomljenih dijelova površine podlijepljivanjem te integracija i toniranje integriranog dijela. Konzervatorsko - restauratorskim postupkom nastojalo se usporiti proces propadanja predmeta, konzervirati zatečeno stanje, vratiti nekadašnji vizualni identitet i omogućiti njegovo dugotrajno očuvanje. Pri izvedenim radovima poštovani su zakoni struke, korišteni su reverzibilni materijali te se nije mijenjao karakter predmeta.

Po zaprimanju u restauratorsku radionicu dokumentirano je zatečeno stanje drvenog monoksila i određen cilj konzervatorsko restauratorskih radova. Preliminarnim pregledom utvrđeno je stanje drvenog monoksila. Radi se o čamcu izrađenom od jednog komada drveta, ovalnog oblika, duljine od 310 cm i najveće širine od 63 cm. Krma i pramac monoksila su oštećeni, odnosno nedostaju im krajnji dijelovi, a pramac po sredini ima i procjep duljine od 46 cm i najveće širine od 2 cm. Opipavanjem je utvrđeno njegovo stanje i stupanj razgradnje. Drveni je monoksil zaprimljen prekriven slojevima prljavštine. Tu prljavštinu, uglavnom s unutarnje strane monoksila, najvećim dijelom su činili slojevi prašine te mali kamenčići raznih boja, sitni pijesak crvenkaste i žućkaste boje, paučina, te dijelovi bijele žbuke. S vanjske strane i uz rubove monoksila uočeni su bijeli tragovi zidne boje.

Rasušivanje drvene strukture rezultiralo je pucanjem i odvajanjem površinskog sloja monoksila sa svih strana u debljini od oko 1 cm. Zbog tog stvaranja pukotina i mikropukotina

4. Removing the impurities / Uklanjanje nečistoća (photo: M.Mustaček)

na površini, površinski sloj poprimio je izgled mozaika. S unutrašnje strane monoksila površinski sloj djelomično nedostaje, dok na vanjskoj strani monoksila nedostaje po cijeloj duljini s jedne njegove strane, a s druge strane je nedostatak djelomičan. Površinski sloj se klima pri dodiru i trusi, odnosno odvaja od ostalog dijela. Čišćenje monoksila predstavljalo je izazov

and micro-fissures on the surface have given the surface layer a mosaic appearance. The surface layer on the inside of the monoxylon is partially missing. On the outer side it is missing along the entire length of one side and partially missing on the other side. The surface layer wiggles and falls off to the touch, i.e. it separates from the body. The cleaning of the monoxylon was challenging because the layers of dirt were the only bond between the cracked surface and the wooden core. The removal of impurities was done mechanically and exercising great care, using soft scrubbing brushes and paintbrushes, surgical scalpels of various profiles and small hand tools. A vacuum cleaner was used in the cleaning process set to its lowest operating power. Textile netting was applied over the nozzle of the vacuum cleaner in order to prevent the vacuuming up of the unstable surface layer. Sections of the surface layer that did separate prior to and during the cleaning process were temporarily adhered with adhesive tape in order to prevent their loss and to facilitate their later gluing. In the course of the cleaning we observed a number of thin dirt-filled gaps along the length of the monoxylon's hull.

Cleaning was followed by the stabilisation of the unstable surface layer. Stabilisation was achieved by the application of a liquid two-component epoxy impregnation for wood. The impregnation substance was applied by injection in the fissures and micro-fissures. Parallel to the application of the impregnation, the separated parts of the surface layer were repaired by gluing. The excess impregnation was removed from the surface using cotton pads impregnated with acetone. Stabilisation and repair of the entire surface layer was followed by the consolidation of the artefact.

6. Injecting the impregnation / Injektiranje impregnacijskog sredstva (photo: M.Mustaček)

A 5% solution of thermoplastic Paraloid B-72 resin in acetone was used as the consolidant. The consolidant was applied with soft paintbrushes, patting on the consolidant in order to avoid damaging the artefact. The consolidant was applied in several layers.

Cleaning, gluing and surface consolidation secured the parts of the surface layer of wood that had fallen off and strengthened the entire wooden structure of the monoxylon.

stoga što su slojevi prljavštine bili jedina veza raspucale površine s drvenom jezgrom. Uklanjanje nečistoća vršeno je mehanički uz upotrebu mekanih četkica i kistova, kirurških skalpela raznih profila i manjim ručnim alatom uz velik oprez. Prilikom čišćenja korišten je i usisavač s potenciometrom na najmanjoj snazi. Na vrh crijeva usisavača postavljena je sigurnosna tekstilna mrežica kako ne bi došlo do usisavanja nestabilnog površinskog sloja. Dijelovi površinskog sloja koji su se odvojili prije i tijekom čišćenja privremeno su pričvršćeni ljepljivom trakom čime se spriječio njihov gubitak i olakšalo njihovo naknadno podljepljivanje. Uslijed čišćenja uočeno je i više tankih procjepa po čitavom trupu monoksila koji su bili zapunjeni prljavštinom.

5. Attaching the surface layer with adhesive tape / Pričvršćivanje površinskog sloja ljepljivom trakom photo: M.Mustaček)

Nakon čišćenja pristupilo se stabilizaciji nestabilnog površinskog sloja. Za stabilizaciju je korištena tekuća dvokomponentna epoksidna impregnacija za drvo. Impregnacijsko sredstvo nanošeno je injektiranjem u pukotine i mikropukotine. Paralelno s nanošenjem impregnanta, podljepljivanjem su sanirani odvojeni dijelovi površinskog sloja. Višak impregnacijskog sredstva s površine uklonjen je vatenim tuferima natopljenim acetonom. Nakon stabilizacije i sanacije čitavog površinskog sloja uslijedilo je konsolidiranje predmeta.

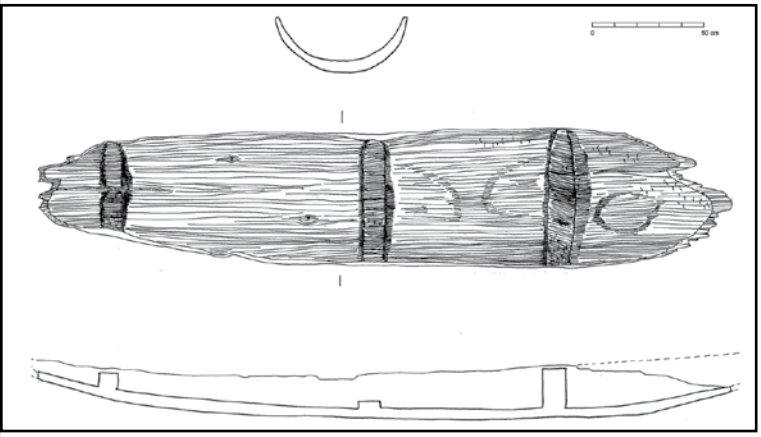
Kao sredstvo za konsolidaciju korištena je 5%-tna otopina termoplastične smole Paraloid B-72 u acetonu. Konsolidant je nanošen pomoću mekih kistova, utapkavanjem kako ne bi došlo do oštećivanja. Konsolidacijsko sredstvo nanošeno je u više slojeva.

Čišćenjem, podlijepljivanjem i površinskom konsolidacijom učvršćeni su odlomljeni dijelovi površinskog sloja drva kao i cjelokupna drvena struktura monoksila.

Integracija je izvršena na procijepu pramčanog dijela monoksila. Procjep je integriran epoksidnom smolom za drvo Araldit čime je smanjena mogućnost daljnjeg širenja pukotine i postignuta veća strukturalna stabilnost. Nakon provedenih konzervatorsko - restauratorskih radova, na drvenom monoksilu nisu uočeni znakovi daljnjeg propadanja.

7. The monoxylon near the end of the treatment / Monoksil pred kraj radova (photo: L.Bekić)

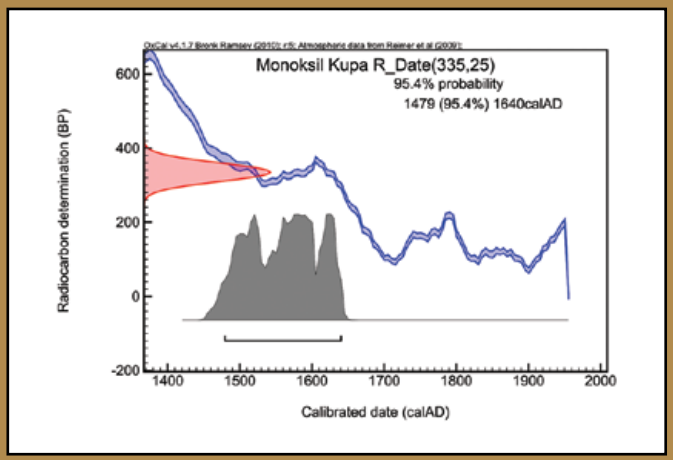
Integration was done at the gap in the prow of the monoxylon. The gap was integrated using Araldit epoxy resin for wood, reducing the possibility of the further widening of the gap and achieving greater structural stability. No signs of further deterioration were observed on the monoxylon following the conservation-restoration work.



8. A drawing of the monoxylon / Crtež monoksila (author: M.Šimičić)

Following conservation-restoration interventions on wooden finds it is important that they are stored in suitable conditions to prevent to the greatest possible extent any possible physical, chemical and microbiological changes. In the storage or exhibition of wooden finds the following physical parameters are recommended: relative humidity of from 45 to 60%, with the optimal value being 55% with a deviation of ± 2%, a tem

Nakon provedenih konzervatorsko - restauratorskih zahvata nalaze od drva važno je skladištiti u prikladnim uvjetima kako bi se maksimalno zaštitili od eventualnih fizikalno - kemijskih i mikrobioloških promjena. Za skladištenje odnosno pohranu nalaza od drva, te izlaganje istih preporučuju se slijedeće vrijednosti fizikalnih veličina: relativna vlažnost u intervalu od 45-60%, najbolje 55% uz odstupanje od ± 2%, temperatura od 18°C uz odstupanje od ± 2°C, te jačina svjetlosti ispod 200 lux-a, najbolje između 50 i 100 lux-a (Jelić 2014, 72). Prilikom rukovanja s nalazima od drva preporučljiva je i upotreba platnenih rukavica kako bi se nalazi maksimalno zaštitili od kemijskih i mikrobioloških utjecaja.



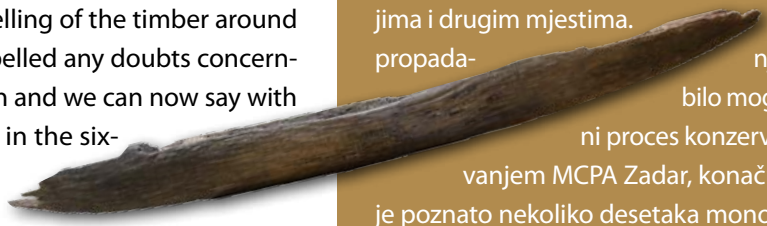
9. The results of the radiocarbon age analysis of the wood / Rezultati određivanja starosti drveta metodom 14C (OxCal v4.1.7)

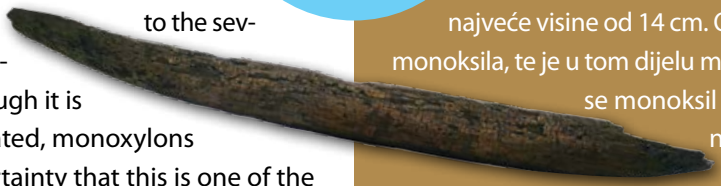
perature of 18°C with a deviation ± 2°C, and lighting of a brightness of under 200 lux, optimally between 50 and 100 lux (Jelić 2014, 72). The use of cloth gloves is recommended when handling wooden finds to best protect the wood from chemical and microbiological impacts.

The entire project began in 2013 following a preliminary assessment that this was a valuable cultural good, and the need for further evaluation of this assessment. The first step, then, was to date the dugout boat. To this end one piece of wood that had fallen off was sent for radioactive carbon isotope measurement analysis to determine its age. The analysis was conducted using the modern AMS carbon 14 method at the well-known laboratory in Poznań, Poland. A sample designated POZ 57597 yielded an age of 335 ± 25 BP years: the calibrated result indicates the felling of the timber around the year AD 1556 ± 55. This dispelled any doubts concerning the dating of the monoxylon and we can now say with certainty that it was fabricated in the sixteenth century.

Not many monoxylons from older periods have been preserved in Croatia. Most deteriorated after they were discovered, without having been extracted onto land, while others decayed during storage in museums and other sites. The cause of the deterioration lay largely in the fact that there was no possibility to carry out the demanding conservation process – the work of ICUA Zadar has finally made this possible. In all we know of several dozen monoxylons in Croatia. Most of those that have been preserved are listed in a paper penned by Irena Radić Rossi (Radić Rossi 2009), albeit without dating analysis. For some we know of the results of carbon 14 analysis. Thus only two specimens from Sisak have been dated to the Roman period (first century), while the rest are dated to the post-medieval period – one to the fourteenth century, one to the sixteenth, four to the seventeenth and three to later periods (Radić Rossi 2009). Although it is possible that other, not yet dated, monoxylons are older, we can said with certainty that this is one of the oldest preserved in Croatia.

The monoxylon from Rečica is fabricated from a single piece of timber, is of oval form, with a length of 310 centimetres and a width of 63. The stern and prow are damaged, such that it cannot be ascertained whether they were pointed or broad. At the stern of the monoxylon, 70 centimetres from its current termination, is a seat for a rower with a width of about 12 centimetres and a maximum height of 14. This is the sitting section of the monoxylon and the craft is widest





10. The monoxylon from the Kupa River at the end of the treatment / Kupski monoksil po završetku radova

Kompletan projekt započeo je 2013. g. zbog preliminarne procjene kako je riječ o vrijednom kulturnom dobru, mada se to tek valjalo provjeriti. Stoga je prvi korak bila datacija plovila. Iz tog razloga je jedan otpali djelić drveta poslan na analizu mjerenja radioaktivnog izotopa ugljika kojom bi se odredila njegova starost. Analiza je provedena suvremenom AMS 14c metodom u poznatom laboratoriju u Poznanju u Poljskoj. Uzorku pod oznakom POZ 57597 tako je izmjerena starost od 335 ± 25 BP godina, što kalibrirano ukazuje na godinu rušenja stabla otprilike u AD 1556 ± 55. g. Time su otklonjene sumnje u dataciju monoksila i sada sa sigurnošću možemo reći kako je izrađen tijekom 16. st.

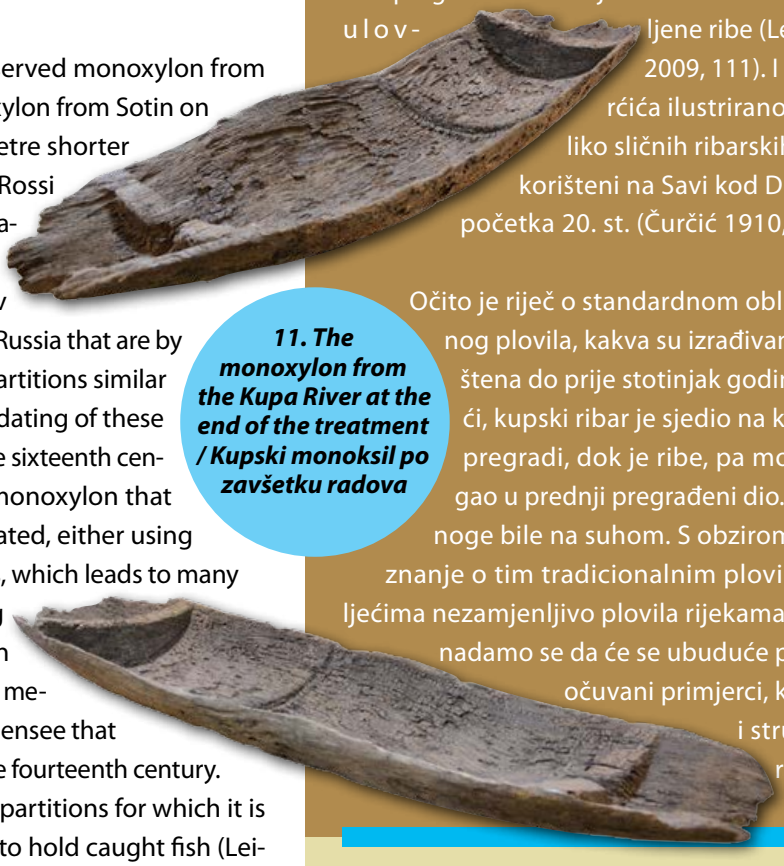
U Hrvatskoj nije sačuvan velik broj monoksila iz starijih razdoblja. Većina ih je propala nakon pronalaska, bez da su izvučeni na kopno, dok su drugi propadali tijekom ležanja u muzejima i drugim mjestima. Uglavnom je razlog propadanja bila činjenica kako nije bilo mogućnosti provesti zahtjevni proces konzerviranja, što je sada, djelovanjem MCPA Zadar, konačno moguće. Sveukupno je poznato nekoliko desetaka monoksila iz Hrvatske. Većina sačuvanih popisana je u članku Irene Radić Rossi (Radić Rossi 2009), doduše bez datacijske analize. Za nekoliko njih poznati su rezultati C14 analiza. Tako su samo dva sisačka primjera datirana u rimsko doba (1.st.) dok se ostalo datiraju u srednji i novi vijek i to jedan u 14., jedan u 16., četiri u 17. st. te tri u kasnija razdoblja (Radić Rossi 2009). Mada je moguće da su i neki drugi, zasada nedatirani monoksili stariji, možemo sa sigurnošću reći da je ovo jedan od nekolicine najstarijih sačuvanih u Hrvatskoj.

Monoksil iz Rečice izrađen je jednog komada drveta, ovalnog je oblika, duljine 310 cm i širine do 63 cm. Krma i pramac monoksila su oštećeni, tako nije moguće reći da li su bili šiljati ili prošireni. Na krmi monoksila, 70 cm od njenog trenutno postojećeg kraja nalazi se sjedalica za veslača, širine od oko 12 cm i najveće visine od 14 cm. Ovaj dio predstavlja sjedeći dio monoksila, te je u tom dijelu monoksil i najširi. Prema pramcu se monoksil sužuje, da bi na samom kraju njegova širina bila 27 cm što je ujedno i najuži dio monoksila. Između sjedalice za veslača na krmi i pramca nalazi se teretni dio monoksila koji ima dva poprečna rebra. Svako rebro širine je od 10 cm, dok je najveća visina prvog rebra 4 cm, a drugog rebra 8 cm. Prvo rebro 73 cm je udaljeno od sjedalice, a drugo rebro je 108 cm udaljeno od prvog rebra odnosno 27 cm od trenutno postojeće krajnje točke pramca. Visina monoksila mjerena je okomito na ravnu podlogu po čitavoj njegovoj dužini i minimalno varira oko iznosa od 27 cm. Trup monoksila je zaobljen tako da je stvarna visina monoksila osobito u predjelu krme i pramca puno manja.

here. The monoxylon narrows towards the prow and terminates at a width of 27 centimetres, the narrowest point of the craft. Between the rower's seat at the stern and the prow we find the cargo area with two transverse ribs. Each of the ribs has a width of 10 centimetres. The greatest height of the first rib is four centimetres, and of the second rib eight centimetres. The first rib is 73 centimetres from the seat and the second rib 108 centimetres from the first rib, i.e. 27 from the current terminal point of the prow. The height of the monoxylon was measured vertically on a flat surface and is 27 centimetres with minimum deviation along its entire length. The hull of the monoxylon is rounded such that the actual height of the craft, especially in the area of the stern and prow, is much less.

By its construction the newly conserved monoxylon from Rečica is most similar to the monoxylon from Sotin on the Danube River – it is about a metre shorter but has one more partition (Radić Rossi 2009, Fig. 9). Like the majority of Croatian specimens, the monoxylon from Sotin has not been dated. Chepelev discusses several monoxylons from Russia that are by their form and the distribution of partitions similar to ours. However the approximate dating of these vessels ranges from prehistory to the sixteenth century (Chepelev 2008). Very often monoxylon that have been found have not been dated, either using dendrological or carbon 14 analysis, which leads to many uncertainties regarding the dating of individual forms and construction solutions. A monoxylon of about four metres in length was found at Lake Ardensee that was dendrologically dated to the late fourteenth century. It is of similar shape, with wooden partitions for which it is hypothesised that they were used to hold caught fish (Leinenweber, Lübke, 2009, 111). A paper by Vejsil Čurćić also illustrated several similar fishing monoxylon used on the Sava River at Donja Dolina up to the start of the twentieth century (Čurčić 1910, Fig. 11).

This is evidently a standard form of river fishing vessel the likes of which have been crafted for centuries and used up to about a hundred years ago. By all accounts the fisherman on the Kupa River sat on the more massive stern partition while the fish and perhaps the nets, were placed in the front partition. This would have kept his feet dry. Given our modest knowledge of these traditional watercraft that have for millennia served as an essential vessel on river, lake and sea, we hope that new, well preserved, specimens will be found in the future that can now be subjected to expert conservation and restoration.



11. The monoxylon from the Kupa River at the end of the treatment / Kupski monoksil po završetku radova

Po svojoj konstrukciji svježe konzervirani monoksil iz Rečice najviše sliči monoksilu iz Sotina na Dunavu, od kojeg je gotovo metar kraći ali ima jednu pregradu više (Radić Rossi 2009, Fig.9). Monoksil iz Sotina nije datiran, kao ni većina hrvatskih primjera. Čepelev prikazuje nekoliko monoksila iz Rusije koji su po obliku i rasporedu pregrada slični našem, međutim načelno datiranje tih plovila je u rasponu od prapovijesti do 16. st. (Čepelev 2008). Vrlo često pronađeni monoksili nisu datirani niti putem dendrokronološke niti putem C14 analize, što dovodi do mnogih nedoumica oko datacije pojedinih oblika i konstruktivnih rješenja. Na jezeru Ardensee pronađen je monoksil od oko četiri metra dužine, koji se dendrokronološki datira u kraj 14. st. On je sličnog oblika, s drvenim pregradama za koje se smatra da su služile za držanje ulovljene ribe (Leinenweber, Lübke, 2009, 111). I u članku Vejsila Čurćića ilustrirano je i opisano nekoliko sličnih ribarskih monoksila koji su korišteni na Savi kod Donje Doline sve do početka 20. st. (Čurčić 1910, sl.11).

Očito je riječ o standardnom obliku ribarskog riječnog plovila, kakva su izrađivana stoljećima i korištena do prije stotinjak godina. Po svemu sudeći, kupski ribar je sjedio na krmenoj, masivnijoj pregradi, dok je ribe, pa možda i mreže, polagao u prednji pregrađeni dio. Na taj način su mu noge bile na suhom. S obzirom na naše skromno znanje o tim tradicionalnim plovilima koja su tisućljećima nezamjenljivo plovila rijekama, jezerima i morem nadamo se da će se ubuduće pronaći novi, dobro očuvani primjerci, koji će se sada moći i stručno konzervirati i restaurirati.

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The Conservation and Restoration of Organic Archaeological Finds from the Flacius Street Locality in Pula

Konzerviranje i restauriranje organskih arheoloških nalaza s lokaliteta Flaciusova ulica u Puli

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During archaeological supervision of construction work in Flaciusova ulica (Flacius Street) in Pula in February of 2013 staff members of the Archaeological Museum of Istria in Pula working under the leadership of archaeologist Ida Kocani Uhač discovered the remains of the structures of two Roman wooden boats with the accompanying parts of the ship's equipment and cargo. The sewn boats were built using a technique typical of the northern and central Adriatic in the Roman period and are dated to the period from the first century BCE to the first century CE.

Sites of this type are very rare given that, as a rule, organic materials exposed to biological and microclimatic conditions de-

Prilikom arheološkog nadzora građevinskih radova u Flaciusovoj ulici u Puli u veljači 2013. godine, djelatnici Arheološkog muzeja Istre u Puli pod vodstvom arheologinje Ide Kocani Uhač, otkrili su ostatke brodske konstrukcije dvaju rimskih drvenih brodova s pripadajućim dijelovima brodske opreme i teretom. Brodovi su izrađeni tehnikom šivanja tipičnom za područje sjevernog i srednjeg Jadrana u rimskom razdoblju, a datira ih se u vrijeme od 1. stoljeća prije Krista do 1. stoljeća poslije Krista.

Nalazišta ovakvog tipa izrazito su rijetka budući da organski materijali pod utjecajem bioloških i mikroklimatskih uvjeta

1. Roman sewn ships during excavation in Flacius street / Rimski šivani brodovi prilikom pronalaska u Flaciusovoj ulici (http://www.glasistre.hr/vijesti/pula_istra/pula-anticki-brod-vadit-ce-se-u-jednom-komadu-419666)

cay quickly. Wood, leather and textile remain preserved only in ideal conditions, i.e. in muddy anaerobic environments such as the happy circumstance of the site at Flacius street. Thanks to these circumstances various wooden artefacts have been preserved, parts of rope, leather material, peach seeds, pine nuts, walnuts and cereals. A part of this material was received in July of 2014 at the restoration workshop of the International Centre for Underwater Archaeology in Zadar. The material consists of 86 wooden and 14 leather artefacts and seven sections of rope. Notable among the finds are particularly interesting specimens of wooden ware, boxes, lids, baskets, various wooden tools, writing tools, leather soles and the like.

The first and certainly essential step in the conservation-restoration process for all artefacts found in the sea or its immediate vicinity is the desalination procedure, i.e. the removal of salts from the structure of the artefact to prevent cracking and break down during drying (Borrelli 1999, 3). The process of the desalinisation of the finds from Flacius street lasted for a little over a year and was carried out in the complex of the Uljanik shipyard in Pula.

Upon receipt of the organic material at the ICUA restoration workshop we first documented the condition as found, involving photography accompanied by detailed written reports on the condition of each artefact. It was determined that the finds are in a good state of preservation, partially covered with a layer of mud, pebbles and sand. Part of the artefact was received in multiple fragments – the sections of rope and the thin, soft leather finds are particularly fragile and subject to possible cracking.

Following a meticulous visual inspection, during which we decided on the further course of the conservation-restoration procedures and the selection of substances and materials that would be used, the finds were isolated in polyethylene nets and placed in distilled water. The following step involved the cleaning of the artefact that, due to the fragility of the material, had to be carried out carefully, slowly and layer by layer. Under controlled conditions and under magnification and a slow stream of water and with the use of soft

3. The leather soles of Roman sandals with preserved iron clasps after conservation-restoration treatment / Kožne potplate rimskih sandala s očuvanim željeznim kopčama nakon konzervatorsko-restauratorskih radova (photo: A. Jelić)

u pravilu brzo propadaju. Drvo, koža i tekstil ostaju sačuvani samo u idealnim uvjetima, odnosno u muljevitom okruženju bez prisustva kisika kao što je sretan slučaj s nalazištem u Flaciusovoj ulici. Zahvaljujući tim okolnostima ostali su sačuvani različiti drveni predmeti, dijelovi užadi, kožni materijali, koštice bresaka, pinjoli, orasi, žitarice. Dio navedenog materijala zaprimljen je u srpnju 2014. godine u restauratorsku radionicu Međunarodnog centra za podvodnu arheologiju u Zadru. Radilo se o 86 drvenih, 14 kožnih predmeta i 7 ulomaka užadi. Među nalazima valja istaknuti posebno zanimljive nalaze drvenih posuda, kutijica, poklopce, košaru, različite drvene alatke, pisaći pribor, kožne potplate i sl.

Prvi i svakako neophodan korak u konzervatorsko-restauratorskim postupcima kod svih predmeta pronađenih pod morem ili u njegovoj neposrednoj blizini je postupak desalinizacije ili uklanjanja soli iz strukture predmeta kako ne bi došlo do pucanja i raspadanja prilikom sušenja (Borrelli 1999, 3). Proces desalinizacije nalaza iz Flaciusove ulice trajao je nešto duže od godine dana i proveden je u kompleksu brodogradilišta Uljanik u Puli.

Po zaprimanju organskog materijala u restauratorsku radionicu MCPA, najprije je provedeno dokumentiranje zatečenog stanja, odnosno fotografiranje uz popratni detaljni pisani izvještaj o stanju svakog predmeta. Ustanovljeno je da su nalazi u dobrom stanju očuvanosti, djelomično prekriveni slojem mulja, kamenčića i pijeska. Dio predmeta zaprimljen je u više ulomaka, a posebno su osjetljivi dijelovi užadi te tanki i mekani nalazi od kože podložni pucanju.

2. Cleaning leather soles using small laboratory equipment / Čišćenje kožnih potplata uporabom sitnog laboratorijskog pribora (photo: A. Jozić)

Nakon pažljivog vizualnog pregleda tijekom kojeg se odlučivalo o daljnjem tijeku konzervatorsko-restauratorskih postupaka i izboru sredstava i materijala koji će biti korišteni, nalazi su izolirani polietilenskom mrežicom i stavljeni u destiliranu vodu. Uslijedio je postupak čišćenja predmeta kojeg je zbog osjetljivosti materijala bilo važno provesti oprezno, polako i slojevito. U kontroliranim uvjetima, pod povećalom i pod laganim mlazom vode te uporabom mekih četkica i sitnog laboratorijskog pribora, uklonjene su naslage nečistoća s površine predmeta.

brushes and small laboratory equipment we removed the layers of dirt from the surface of the artefacts.

The materials were then consolidated, i.e. impregnated. Consolidation of the archaeological rope was effected by the method of submersion in a 10 to 15% solution of glycerine in distilled water, while leather was submersed in a 30% solution, also of glycerine in distilled water (Hamilton 1999, File 6; Unger 2001, 399). These processes lasted a total of two weeks, followed by the dehydration of the leather artefacts. The dehydration process removes water from the structure of the material and the procedure is effected by submerging the already consolidated find in acetone for several hours. As the glycerine is not dissolved by and does not mix with acetone, it remains impregnated in the structure of the artefact.

The finds were then subjected to controlled drying in atmospheric conditions for several days. The leather was dried under pressure to ensure that the artefacts retain their original form. On account of their loose nature, all of the rope finds were affixed to polyethylene netting to ensure their integrity and to facilitate the future handling of the artefacts (Smith 2003, 60, 61). Unlike leather, the process of dehydrating and consolidating the wooden artefacts runs in the opposite sequence. The wood is first entirely dehydrated, with impregnation following only upon completion of the dehydration process. Dehydration was achieved by immersing the finds in multiple successive acetone baths. The artefacts were left for four to five days in each bath in closed containers to prevent the evaporation of the acetone and to ensure the complete removal of water from the artefacts, necessary for the consolidation with treated natural pine rosin, i.e. colophony, which does not mix with water or dissolve in it.

The process of consolidation was carried out, then, by immersing the artefact in a 67% solution of colophony in acetone in closed containers at a temperature of 52°C for four weeks. This was followed by the process of the gradual and controlled drying of the wooden finds by exposure to atmospheric conditions for several hours. The process was monitored by the weighing of the mass of each individual find prior to and following exposure to atmospheric

4. Affixing fragments with cyanoacrylate glue / Fiksiranje fragmenta cijanoakrilatnim ljepilom (foto A. Jozić)

Zatim su materijali konsolidirani, odnosno impregnirani. Za konsolidiranje arheološkog užeta korištena je metoda uranjanja u 10-15% otopinu glicerina u destiliranoj vodi, a za kožu uranjanje u 30% otopinu također glicerina u destiliranoj vodi (Hamilton 1999, File 6; Unger 2001, 399). Procesi su ukupno trajali dva tjedna nakon čega je uslijedila dehidracija predmeta od kože. Procesom dehidracije uklanja se voda iz strukture materijala, a postupak se vršio potapanjem već konsolidiranih nalaza u aceton u trajanju od nekoliko sati. Budući da se glicerin ne otapa niti miješa s acetonom, ostaje impregniran u strukturama predmeta.

Nalazi su potom podvrgnuti kontroliranom sušenju u atmosferskim uvjetima koje je trajalo nekoliko dana. Sušenje kože vršilo se pod pritiskom kako bi predmeti zadržali svoj izvorni oblik. Svi nalazi užadi su zbog rastresite prirode materijala fiksirani na polietilensku mrežicu čime se osigurala cjelovitost i olakšalo buduće rukovanje predmetima (Smith 2003, 60, 61). Za razliku od kože, kod drvenih predmeta procesi dehidriranja i konsolidiranja teku obratnim redoslijedom. Drvo se najprije u potpunosti dehidrira i tek po završetku dehidracijskog procesa slijedi impregniranje. Dehidriranje je provedeno na način da su nalazi uranjani u više uzastopnih acetonskih kupki. U svakoj kupelji i u zatvorenim spremnicima predmeti su ostavljeni četiri do pet dana kako bi se spriječila hlapljivost acetona i osiguralo potpuno uklanjanje vode iz predmeta potrebno zbog konsolidiranja obrađenom prirodnom smolom bora, odnosno kolofonijem koji se ne miješa s vodom niti se u njoj otapa.

Proces konsolidacije izvršen je, dakle, potapanjem predmeta u 67% otopinu kolofonija u acetonu u zatvorenim spremnicima i pri temperaturi od 52 °C, a trajao je četiri tjedna. Uslijedio je postupak postepenog i kontroliranog sušenja drvenih nalaza dnevnim izlaganjem atmosferskim uvjetima u trajanju od nekoliko sati. Postupak je praćen mjerenjem mase svakog pojedinog nalaza prije i nakon izlaganja atmosferskim prilikama. Po postizanju konstantne mase nalaza, proces sušenja za pojedini drveni predmet bio je završen.

Drvenim predmetima koji su zaprimljeni u više ulomaka fragmenti su spojeni cijanoakrilatnim ljepilom. Na istim predmetima mjesta spoja učvršćena su integriranjem dvokomponentne epoksidne smole za drvo, Araldit SV 427. Na nekim nalazima, kao što su drvena kutijica i poklopac, učinjena je potpuna rekonstrukcija

5. A Roman wooden box before conservation-restoration treatment / Rimska drvena kutijica prije konzervatorsko-restauratorskih radova (photo: Z. Vrgoč)

conditions. When a constant mass was achieved the process of the drying of a given wooden artefact was completed.

Wooden artefacts that were received in multiple fragments were joined with cyanoacrylate glue. The joints of these artefacts were reinforced by integration using Araldit SV 427 two-component epoxy resin for wood. A complete reconstruction was effected of some finds, such as wooden boxes and lids, using the same two-component epoxy resin. A mixture of Cosmoloid H80 and Paraloid B72 in acetone was applied to the surface of all wooden artefacts as a final protection. The integrated sections were toned using acrylic paint in a colour similar to the original colour, but a shade lighter such that the integrated surface can be differentiated but still forming a meaningful whole.

7-8. A Roman wooden basket before and after conservation-restoration treatment / Rimska pletena košara prije i poslije konzervatorsko-restauratorskih radova (photo: Z. Vrgoč)

The rules and ethical principles of the profession, which require the planning and controlled execution of every procedure in order to prevent any violation or deviation from the original appearance and form of an artefact, were entirely adhered to in the conservation-restoration treatment of the archaeological finds of organic materials from Flacius street in Pula. Only reversible materials were used that allow for possible future interventions. Photographic and written documentation was made of the condition as received, in the course of the conservation-restoration treatment and upon their completion. The conservation of organic finds is essential to their preservation and protection. In order for the material to remain protected and secure adequate conditions and storage must be ensured and the finds handled carefully to prevent chemical and microclimatic impacts.

korištenjem iste dvokomponentne epoksidne smole. Kao završna zaštita na površinu svih drvenih predmeta nanesena je mješavina Cosmoloida H80 i Paraloida B72 u acetonu. Integrirani dijelovi tonirani su akrilnim bojama u boju sličnu izvornoj, ali za nijansu svjetliju kako bi se integrirana površina blago razlikovala od originalne, ali istovremeno s njom činila jednu smislenu cjelinu.

6. A Roman wooden box after conservation-restoration treatment / Rimska drvena kutijica nakon konzervatorsko-restauratorskih radova (photo: A. Jelić)

Pri konzervatorsko-restauratorskim radovima na arheološkim nalazima od organskih materijala iz Flaciusove ulice u Puli u potpunosti su poštovana pravila i etička načela struke koja nalažu planiranje i kontrolirano izvođenje svakog postupka kako bi se spriječila bilo kakva povreda ili odstupanje od izvornosti izgleda i oblika predmeta. Korišteni su isključivo reverzibilni materijali koji ostavljaju mogućnost eventualnim budućim intervencijama. Fotografski je i pisano dokumentirano zatečeno stanje predmeta po zaprimanju, tijekom konzervatorsko – restauratorskih radova

te nakon završenih radova. Konzerviranje organskih nalaza neophodan je dio njihova očuvanja i zaštite. Kako bi građa ostala zaštićena i sigurna potrebno je osigurati adekvatne uvjete i prostor skladištenja te nalazima rukovati pažljivo kako bi se zaštitili od kemijskih i mikroklimatskih utjecaja.

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The ICUA Library - Three Libraries in One

Knjižnica MCPA - Tri knjižnice u jednoj

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The Library of the International Centre for Underwater Archaeology in Zadar is, in terms of the use and content of its collection of books, a specialised library with the core purpose of procuring, organising and ensuring the availability of its collection of scientific and specialist publications and to provide reliable information. The library was registered in the Register of Libraries at the Ministry of Culture on the 27th of August 2015.

The collection of books was begun in 2011. Over the years the material has been collected in the customary manner: through purchases, exchange and donations. The collection grew in its first days thanks to the efforts of book enthusiasts Luka Bekić DSc and Mladen Pešić, who collected donated books from many countries they visited in the course of their participation in underwater archaeology congresses and symposia. The library's collection also grew with the exchange of books with institutions and individuals and the purchase of less frequent editions. From the inception of ICUA, books directly pertaining to underwater archaeology, maritime history and the restoration and conservation of archaeological finds were specifically procured for the library.

Along with the individual efforts of ICUA staff members, the library has succeeded in establishing systems of regular institutional exchange of specialist literature with some twenty museums, institutes and other related institutions in the field of culture. Given the fruitful publishing activity at ICUA that has seen over ten publications in the past five years (www.icua.hr/hr/publikacije) we expect this exchange to further expand. The ICUA Library now, in 2015, numbers some two thousand volumes, including foreign and domestic serial publications and monographs.

The collection of the ICUA Library was significantly increased in 2013 when the Roman-German Commission (Römisch-Germanischen Kommission, RGK) Frankfurt, part of the German Archaeological Institute (Deutsches Archäologisches Institut, DAI), donated for use the specialist collection of well-known professor of archaeology Harald Von Petrikovits. The collection was presented on permanent loan to the International Centre

1. The ICUA Library / Knjižnica MCPA (photo: L.Bekić)

Knjižnica Međunarodnog centra za podvodnu arheologiju u Zadru je, prema namjeni i sadržaju knjižnog fonda specijalna knjižnica, s temeljnom svrhom nabave, organizacije i osiguravanja dostupnosti zbirke znanstvenih i stručnih publikacija te pružanja pouzdanih informacija. Knjižnica je službeno registrirana u Upisniku knjižnica pri Ministarstvu kulture dana 27.08.2015. godine.

Knjižni fond se počinje stvarati, odnosno graditi, od 2011. g. Tijekom godina građa se prikupljala uobičajenim načinima nabave; kupnjom, razmjenom i darovanjem. U samim početcima, fond je rastao zahvaljujući velikim ljubiteljima i štovateljima knjiga, dr.sc. Luki Bekiću i Mladenu Pešiću, koji su prikupljali i donosili darovane knjige iz raznih zemalja koje su posjećivali radi sudjelovanja na konferencijama i stručnim skupovima podvodnih arheologa. Također se knjižni fond uvećavao razmjenom raznih knjiga s institucijama i pojedincima te pojedinačnom kupnjom rjeđih izdanja. Od početaka postojanja centra su se za knjižnicu ciljano nabavljali naslovi koji imaju veze s podvodnom arheologijom, poviješću pomorstva ali i restauriranjem i konzerviranjem arheoloških nalaza.

Osim kroz individualne napore djelatnika MCPA knjižnica je već uspostavila sustave redovne institucionalne razmjene stručne literature s dvadesetak muzeja, instituta i drugih srodnih ustanova u kulturi. S obzirom na bogatu

2. Transferring the books from Germany / Dopremanje knjiga iz Njemačke (photo: L.Bekić)

for Underwater Archaeology in Zadar and the University of Zadar's archaeology department. The donation is covered by an agreement that stipulates that the books form a separate collection and that they are not loaned out of the premises of the ICUA Library. For this specialist collection the Croatian Ministry of Culture renovated and equipped a separate room in one of the buildings of the Sveti Nikola architectural complex.

One of the current tasks of the ICUA Library is to catalogue the very valuable five thousand volumes of the H. von Petrikovits collection. It is a very well preserved

izdavačku djelatnost MCPA u kojem je kroz pet godina izdano ili suizdano preko deset izdanja (www.icua.hr/hr/publikacije), očekuje se da će se razmjena i dalje širiti. Knjižnica MCPA do danas, u 2015. g., broji oko 2.000 svezaka knjižne građe, uključujući strane i domaće serijske publikacije te monografska izdanja.

Fond Knjižnice MCPA znatno se povećao 2013. g., kada je Rimsko-Germanska Komisija (Römisch-Germanischen Kommission, RGK) Frankfurt u sastavu Njemačkog arheološkog instituta (Deutsches Archäologisches Institut, DAI) darovala na korištenje znanstvenu knjižnicu poznatog profesora arheologa, Haralda Von Petrikovitsa. Knjižnica je darovana na korištenje i upravljanje Međunarodnom centru za podvodnu arheologiju u Zadru i Odjelu za arheologiju Sveučilišta u Zadru. Samo darovanje uređeno je ugovorom kojim je između ostalog propisano da knjige čine zasebnu cjelinu te da se ne iznose izvan prostora Knjižnice MCPA. Za potrebe ove specijalne knjižnice, Ministarstvo kulture RH je obnovilo i opremilo posebne prostore u jednoj od zgrada unutar arhitektonskog sklopa Sv. Nikole.

Jedan od sadašnjih zadataka Knjižnice MCPA je katalogizacija iznimno vrijednog fonda knjižnice H.v. Petrikovits koja posjeduje oko 5.000 naslova. Radi se o iznimno očuvanim, pretežno novijim knjigama te velikom broju skupocjenih bibliofilskih izdanja.

3. At the opening of the Petrikovits collection / S otvorenja knjižnice Petrikovits (photo: M.Šimičić)

4. The Harald von Petrikovits library / Knjižnica Harald Von Petrikovits (photo: L.Bekić)

collection, predominantly of newer editions and a large number of very costly bibliophile editions.

Along with the standard inventory, completed in mid-2014, cataloguing was initiated in May of 2015 in the ZENON integrated library system (the central online catalogue of DAI), i.e. the Aleph integrated library software (MARC 21) that was provided for the use of the ICUA Library thanks to our collaboration with the German Archaeological Institute (DAI) in Berlin. We are also now working on the translation of a thesaurus of archaeological terminology to allow for searches with Croatian language key words within ZENON (the DAI online catalogue).

Thanks to the late professor Harald von Petrikovits our library now has at its use very rare titles related to the topics of his study. H. von Petrikovits studied archaeology, history and classic philology at the University of Vienna. From 1958 to 1973 he served as director of the Landesmuseum, and from 1961 taught Antiquity archaeology and history as an honorary professor at the University of Bonn. He was also the recipient of the Order of Merit and an honorary member of the Bonner Kunstverein. The University of Würzburg awarded

Osim standardne inventarizacije koja je završena u polovici 2014. g., katalogizacija je započela s radom u svibnju 2015. g. u integriranom knjižničnom sustavu ZENON-u (centralnom online katalogu DAI-a), odnosno knjižničnom programu Aleph (MARC 21) koji je omogućen i ustupljen na korištenje Knjižnici MCPA zahvaljujući suradnji sa Njemačkim arheološkim institutom (DAI) u Berlinu. Također se trenutno radi i na prevođenju tezaurusa arheoloških pojmova, kako bi se pretraživanje pomoću ključnih riječi na hrvatskom moglo obavljati unutar ZENON-a (online katalog DAI-a).

Zahvaljujući profesoru Haraldu von Petrikovits knjižnica raspolaže iznimno rijetkim naslovima vezanim uz tematiku kojom se bavio. H. von Petrikovits studirao je arheologiju, povijest i klasičnu filologiju na Sveučilištu u Beču. Od 1958. do 1973. g. bio je ravnatelj Landesmuseum-a, a od 1961. g. predavao je antičku arheologiju i povijest kao počasni profesor na Sveučilištu u Bonnu. Također, bio je nositelj Reda zasluge i počasni član Bonner Kunstverein-u. Sveučilište u Würzburgu dodijelilo mu je počasni doktorat, a njegovi su istraživački interesi za arheologiju, povijest i kulturu antičkog Rima živjeli s njim sve do njegove smrti. Donacija Harald von Petrikovits od neprocjenjivog je značenja za Međunarodni centar za podvodnu arheologiju u Zadru i gostujuće znanstvenike, za nastavnike i studente Odjela arheologije Sveučilišta u Zadru. Dio ovog knjižnog fonda jedinstven je i u hrvatskim razmjerima.

Uz ovu vrlo vrijednu donaciju treba istaknuti i još jednu hvale vrijednu donaciju. To je donacija dr. sc. Luke Bekića koji je početkom 2015. g. Međunarodnom centru za podvodnu arheologiju u Zadru poklonio knjižnu građu iz svoje privatne knjižnice. Radi se od oko 900 svezaka stručne knjižne građe, serijskih i monografskih publikacija. Ovim putem standardni fond Knjižnice MCPA obogaćen je temama iz kopnene arheologije, kulturne baštine uopće, ali i o temama iz polja pomorstva.

Na mrežnim stranicama MCPA Zadar nalaze se popisi svih trenutno raspoloživih naslova Knjižnice MCPA, a zasebno i popisi naslova iz Knjižnice H. von Petrikovits (www.icua.hr/hr/

5. Independent ICUA editions and editions in collaboration with other institutions / Samostalna izdanja MCPA te izdanja u suradnji s drugim institucijama (photo: L.Bekić)

him an honorary doctorate, and his research of archaeology, history and the culture or ancient Rome was vibrant up to his death. The Harald von Petrikovits donation is of inestimable importance to the International Centre for Underwater Archaeology in Zadar and visiting scientists, instructors and students of the University of Zadar's department of archaeology. A part of this book collection is unique in Croatia.

Along with this very valuable donation we should also note another laudable donation by Luka Bekić DSc. In early 2015 he donated his private collection to the International Centre for Underwater Archaeology in Zadar. The collection includes some 900 specialist volumes, serial publications and monographs. This enriched the standard collection of the ICUA Library with topics in the field of land archaeology, cultural heritage in general and maritime topics.

The ICUA Internet site has a list of all of the currently available titles in the ICUA Library and a separate list of the titles in the H. von Petrikovits collection (www.icua.hr/hr/knjiznicaicua).

The library is now open to visitors for four hours a day and visitors can register with the head of the library Ivana Dobrović. The library is equipped with working tables for visitors, a computer, scanner and photocopier. All library services are free of charge.

It should be noted that the Harald von Petrikovits collection, the donation of Luka Bekić DSc and the ICUA library are small collections, but no less significant, especially since they have titles that can only be found here in all of Croatia. The already well-stocked Library of the International Centre for Underwater Archaeology aspires, and certainly has the potential, to become a communication and information hub for students, professors and researchers.

knjiznicaicua). Trenutno je knjižnica za posjetitelje otvorena četiri sata dnevno, a posjetioci se mogu najaviti elektronskom poštom voditeljici knjižnice Ivani Dobrović. Knjižnica je također opremljena s radnim stolovima za posjetitelje, računalom, skenerom i fotokopirnim uređajem. Sve knjižnične usluge su besplatne.

6. The Bekić collection donation / Donacija knjiga biblioteke Bekić (photo: L.Bekić)

Svakako treba naglasiti da su knjižnica Harald von Petrikovits, donacija dr.sc. Luke Bekića i knjižnica MCPA male knjižnice ali samim time ne i manje značajne, posebice stoga jer posjeduju određene naslove koji se u Hrvatskoj mogu pronaći samo na ovom mjestu. Već sada dobro opremljena Knjižnica Međunarodnog centra za podvodnu arheologiju u Zadru teži, i svakako ima potencijal, postati komunikacijsko i informacijsko središte studentima, profesorima i znanstvenicima.

7. ICUA library study room/ Radna soba Knjižnice MCPA (photo: L.Bekić)

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