

## PODvodNA ARHEOLOŠKA ISTRAŽIVANJA NA PRAPOVIJESNOM NALAZIŠTU PAKOŠTANE – JANICE

## UNDERWATER ARCHAEOLOGICAL RESEARCH AT THE PREHISTORIC SITE OF PAKOŠTANE- JANICE

Podvodna arheološka istraživanja rimske luke u uvali Janice provedena su u godinama 2004., 2011. i 2012. Iako su na Janicama prvo započeta istraživanja ranorimske luke, arheološki interes pomaknuo se prema obližnjem prapovijesnom nalazištu, koje je otkrio Marko Meštrov. Na početku istraživanja prapovijesnoga nalazišta identificirano je nekoliko položaja s većom gustoćom površinskih nalaza keramičkih ulomaka i kremenih alatki. Na tim položajima sljedeće su godine postavljene dvije arheološke sonde veličine 2 x 1 m. U obje sonde pronađena je velika količina ulomaka keramike, kremenih alatki i nešto ulomaka kostiju, a u sondi 1 pronađeni su drveni elementi već na 10 cm dubine. Svi ovi nalazi mogu se datirati u neolitik ili eneolitik. Značajna količina prikupljenih kremenih alatki, keramike i organskoga materijala te višeslojnost nalazišta svjedoče o naseljavanju ovoga položaja u dužem vremenskom razdoblju. Još uvijek se ne može pouzdano reći o kakvom je karakteru naselja ovdje riječ, ali po svemu sudeći to je moglo biti sojeničko naselje smješteno nad plićim morem. U svakom slučaju, do sada je ustanovljen samo mali broj prapovijesnih naselja koja su potopljena kao posljedica promjene razine mora u Hrvatskoj, a istraživanja na takvim položajima još su rjeđa.

**Ključne riječi:** Pakoštane – Janice, prapovijesno nalazište, keramika, kremene alatke, neolitik, eneolitik, sojeničko naselje

The underwater archaeological research of the Roman port in Janice Cove was carried out in 2004, 2011 and 2012. While the research was initially focused on the Early Roman port, the interest of archaeologists soon shifted to the nearby prehistoric site discovered by Marko Meštrov. In the early phase of the research on this site, a few locations with a large concentration of surface finds of potsherds and flint tools were identified. Two 2x1m archaeological trenches were placed at these positions in subsequent year. Large quantities of potsherds, flint tools and some bone fragments were found in both trenches, and wooden elements were found in Trench 1 at a depth of only 10 centimeters. All these finds could be dated to Neolithic or Eneolithic. The developed layering of the site and significant quantity of the flint tools, pottery and organic material collected indicate that the area had been settled over a long period of time. We still cannot reliably determine the character of the settlement that used to be here, but by all accounts it was a pile-dwelling settlement above shallow water. In any case, only a small number of prehistoric settlements submerged as a result of sea-level changes have been found in Croatia so far and their research has been very scarce.

**Keywords:** Pakoštane – Janice, prehistoric site, pottery, flint tools, Neolithic, Eneolithic, pile-dwelling settlement



Slika 1. Položaj Pakoštana i Janica

Figure 1. Location of Pakoštane and Janice

foto / photo: MCPA / ICUA

Pakoštane is a small town on the Adriatic coast, south of Zadar. Its most important industries today are fishing and tourism. Agriculture is also very important because Croatia's largest freshwater lake surrounded with fertile fields is located in its hinterland. While no traces of earlier prehistoric periods have been found in the greater Pakoštane area, there are a dozen hill-fort settlements, mostly from Iron Age, in the hills in its hinterland.

Numerous traces of the life from the Roman period have been identified and partly researched over a number of years on the seabed off Pakoštane: a salt works, port facilities, a sunken ship and numerous small finds.<sup>1</sup>

However, it was not until 2009 that the finds that could be dated to earlier prehistory were discovered. Marko Meštrov, a diver and archaeology student, discovered a site with numerous flint artifacts, pottery and bones on its surface and even with visible wooden piles. The site is located on a depth of 5-6 meters, just off Janice beach and

Pakoštane su malo mjesto koje se nalazi uz obalu Jadranskoga mora, južno od grada Zadra. Uz ribarstvo, danas je najvažnija grana privrede turizam. Poljoprivreda je ovdje također vrlo važna jer se u bliskom zaleđu Pakoštana nalazi najveće slatkovodno jezero Hrvatske s okolnim velikim plodnim poljima. Na širem području Pakoštana do sada nisu pronađeni tragovi iz ranijih prapovijesnih razdoblja, ali je na uzvisinama u zaleđu poznato desetak gradinskih naselja koja se uglavnom datiraju u željezno doba.

U podmorju Pakoštana prepoznato je i djelomično istraženo mnoštvo tragova antičkoga života, poput

1 D. Vrsalović, 1979, 2011; Z. Brusić, 2004; 2005; M. Parica, 2008; L. Bekić – M. Ilkić – Z. Brusić – M. Meštrov – M. Parica – M. Pešić – R. Scholz, 2011; G. Boetto – I. Radić Rossi – S. Marlier – Z. Brusić, 2012 and others.



solane, lučkih objekata, potopljenoga broda te brojnih sitnih nalaza.<sup>1</sup>

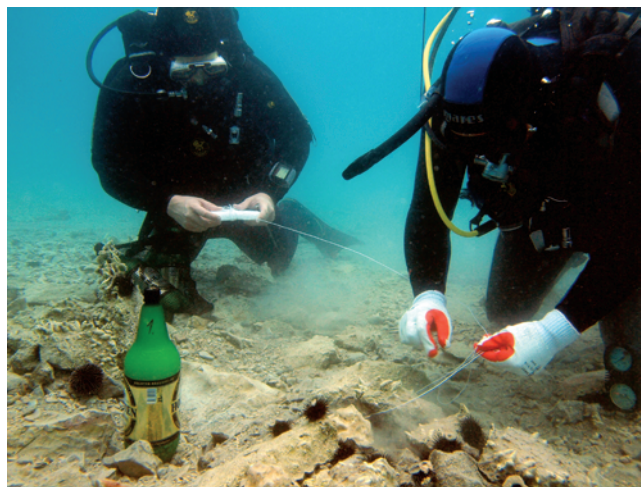
Ipak, tek 2009. g. pronađeni su nalazi koji se mogu datirati u raniju prapovijest. Tada je ronilac i student arheologije Marko Meštrov pronašao nalazište na kojem se mogu površinski prikupiti brojni kremeniti artefakti, keramika, kosti te uočiti čak i drveni stupovi. Nalazište je smješteno na dubini od 5 – 6 metara ispred plaže Janice, južno od sadašnje gradske luke. Prvu analizu tih nalaza prikupljenih na površini morskoga dna napravili su Marko Meštrov i Dario Vujević 2011. g., ali ona do danas nije objavljena.<sup>2</sup> Rezultati te analize, poput uzorka drveta iz sloja, svjedoče da se tada prikupljene alatke tipološki mogu datirati u neolitik. Uzorak je uzet iz ostataka "drvenog objekta" na dnu i analizom 14C datiran je u razdoblje od 4681. do 4539. kal. g. pr. Kr.<sup>3</sup>

Iste, 2011. g. Međunarodni centar za podvodnu arheologiju iz Zadra (MCPA), Agencija Han – Vrana i Römisch-Germanische Kommission – Frankfurt / Deutsche Archäologische Institut (RGK / DAI) pokrenuli su probna arheološka istraživanja<sup>4</sup> na ovom nalazištu kako bi ustanovili postoji li potencijal za provođenje sustavnih istraživanja u budućnosti.<sup>5</sup>

Prvo je cijelo područje ispred plaže Janice do otočića Sv. Juština preronjeno kako bi se ustanovilo gdje sve ima prapovijesnih nalaza. Otkriveno je da postoji nekoliko položaja na kojima su površinski nalazi gušće raspoređeni. Kako je podvodni teren potpuno ravan i težak za orijentaciju, u sredinu svakoga tog položaja postavljena je iz daljine vidljiva oznaka s brojem.

Nakon toga su ronionci u parovima kružnim pretraživanjem oko središta svakoga označenog položaja prikupljali sve površinske nalaze. Na svakom položaju pregledan je radijus od 10 metara od središta, a za svaki pojedini nalaz zapisane su mjere, udaljenost od središta i kurs kompasa osi od središta do nalaza. Svaki pojedini nalaz zapakiran je sa svojim brojem u PVC-mrežicu. Na taj je način naknadno bilo moguće prilično točno odrediti poziciju svakoga nalaza unutar pregledanoga kruga i izraditi kartu distribucije nalaza.

Ovaj način dokumentiranja površinskih nalaza u podvodnoj arheologiji testiran je u Njemačkoj kako bi se ustanovila razina moguće grješke. Ustanovljeno je da prosječni odmak mjerenja kod ucrtavanja nalaza na udaljenosti 2 metra od središta iznosi  $\pm 4$  cm, do 4 metra udaljenosti grješka se povećava na  $\pm 16$  cm; iznad 4 metra grješka



**Slika 2. Kružno pretraživanje podvodnih pozicija**  
Figure 2. Circular search of seabed positions

foto / photo: M. Pešić

south of the present-day harbor. The first analysis of the finds collected on the seabed surface was carried out by Marko Meštrov and Dario Vujević in 2011 but it has not been published yet.<sup>2</sup> According to its results, the tools then collected could be typologically dated to Neolithic, like a wood sample from the layer. The sample was taken from the remains of a "wooden structure" on the seabed and carbon-dated to between 4681 and 4539 calBC.<sup>3</sup>

That same year, 2011, International Center for Underwater Archaeology in Zadar (ICUA), Han-Vrana Agency and Römisch-Germanische Kommission - Frankfurt / Deutsche Archäologische Institut (RGK / DAI) launched trial archaeological excavations<sup>4</sup> on the site in order to establish its potential for systematic excavations in the future.<sup>5</sup>

Divers first surveyed the whole area between Janice beach and the islet of Juština in order to detect all the positions with prehistoric finds. They discovered there were several positions with higher concentrations of surface finds. Since the seabed area was completely flat and made orientation difficult, a mark with a number, visible from distance, was placed in the center of every position.

As the next step, the divers in pairs circled around the center of every marked position, searching for and gathering all surface finds. Every position was examined within a 10-meter radius from the center and dimensions of every individual find were registered, together with its distance and cardinal direction from the center. Every find was

1 D. Vrsalović, 1979, 2011; Z. Brusić, 2004; 2005; M. Parica, 2008; L. Bekić – M. Ilkić – Z. Brusić – M. Meštrov – M. Parica – M. Pešić – R. Scholz, 2011; G. Boetto – I. Radić Rossi – S. Marlier – Z. Brusić, 2012 i drugi.

2 M. Meštrov – D. Vujević, u tisku.

3 Uzorak DSH859 izmjeren je na 5780  $\pm$  BP (M. Meštrov – D. Vujević, u tisku), što iznosi 4637  $\pm$  44 calBC prema kalibraciji programa CalPal (Sveučilište u Kölnu, www.calpal-online.de).

4 L. Bekić – M. Ilkić – Z. Brusić – M. Meštrov – M. Parica – M. Pešić – R. Scholz, 2011.

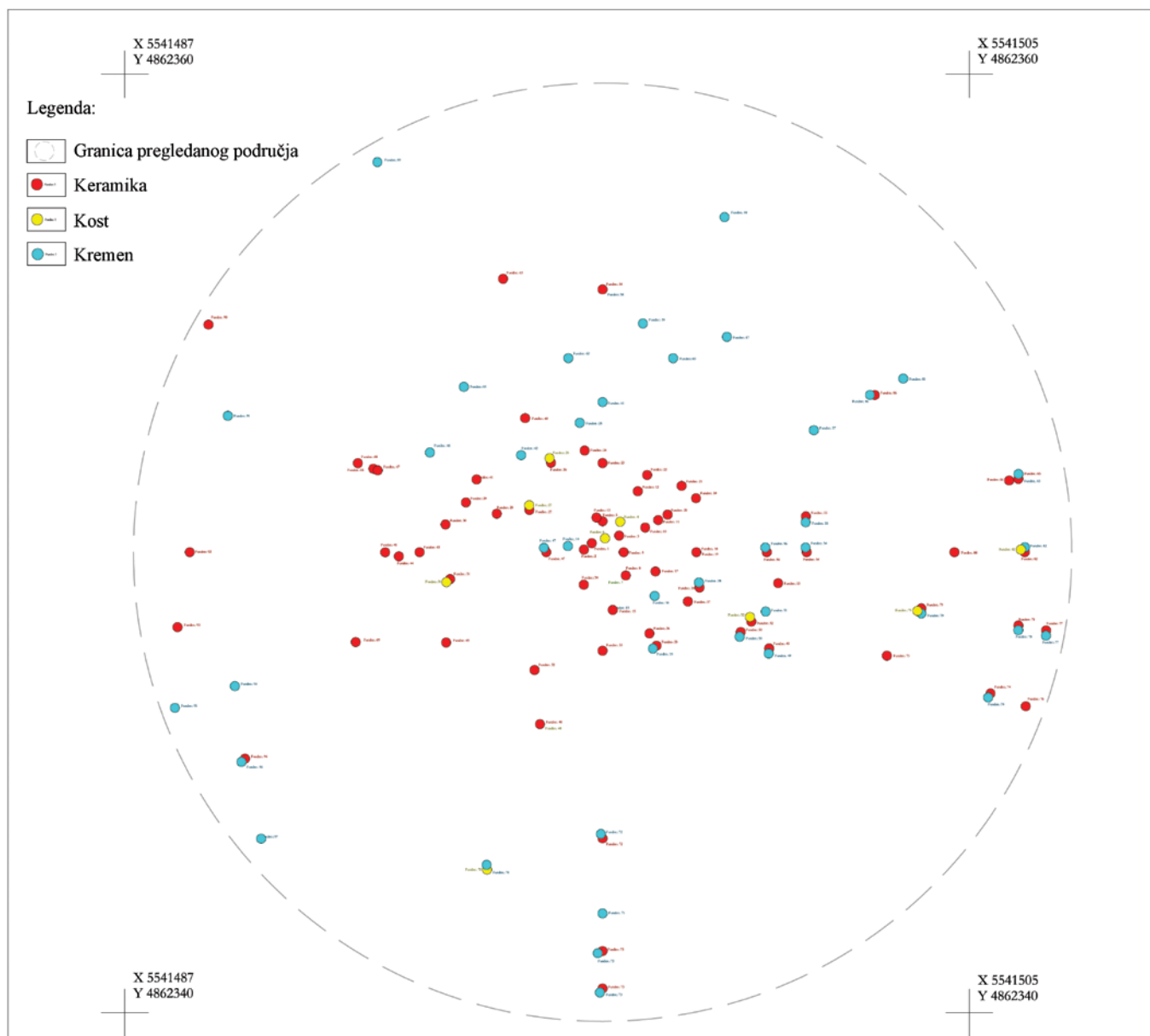
5 Zahvaljujemo Dr. Friedrichu Lüthu na iniciranju stručne suradnje između RGK Frankfurt i MCPA Zadar.

2 M. Meštrov – D. Vujević, soon to be published.

3 The result for Sample DSH859 was 5780 $\pm$ BP (M. Meštrov – D. Vujević, soon to be published), which is 4637 $\pm$ 44 calBC as per CalPal program calibration (University of Cologne, www.calpal-online.de).

4 L. Bekić – M. Ilkić – Z. Brusić – M. Meštrov – M. Parica – M. Pešić – R. Scholz, 2011.

5 We are indebted to Dr. Friedrich Lüth for initiating the cooperation between RGK Frankfurt and ICUA Zadar.



**Slika 3. Plan rasprostiranja sitnih nalaza na jednoj od pregledanih pozicija**

Figure 3. Plan of distribution of small finds on one of the positions surveyed

izradio / made by: R. Scholz

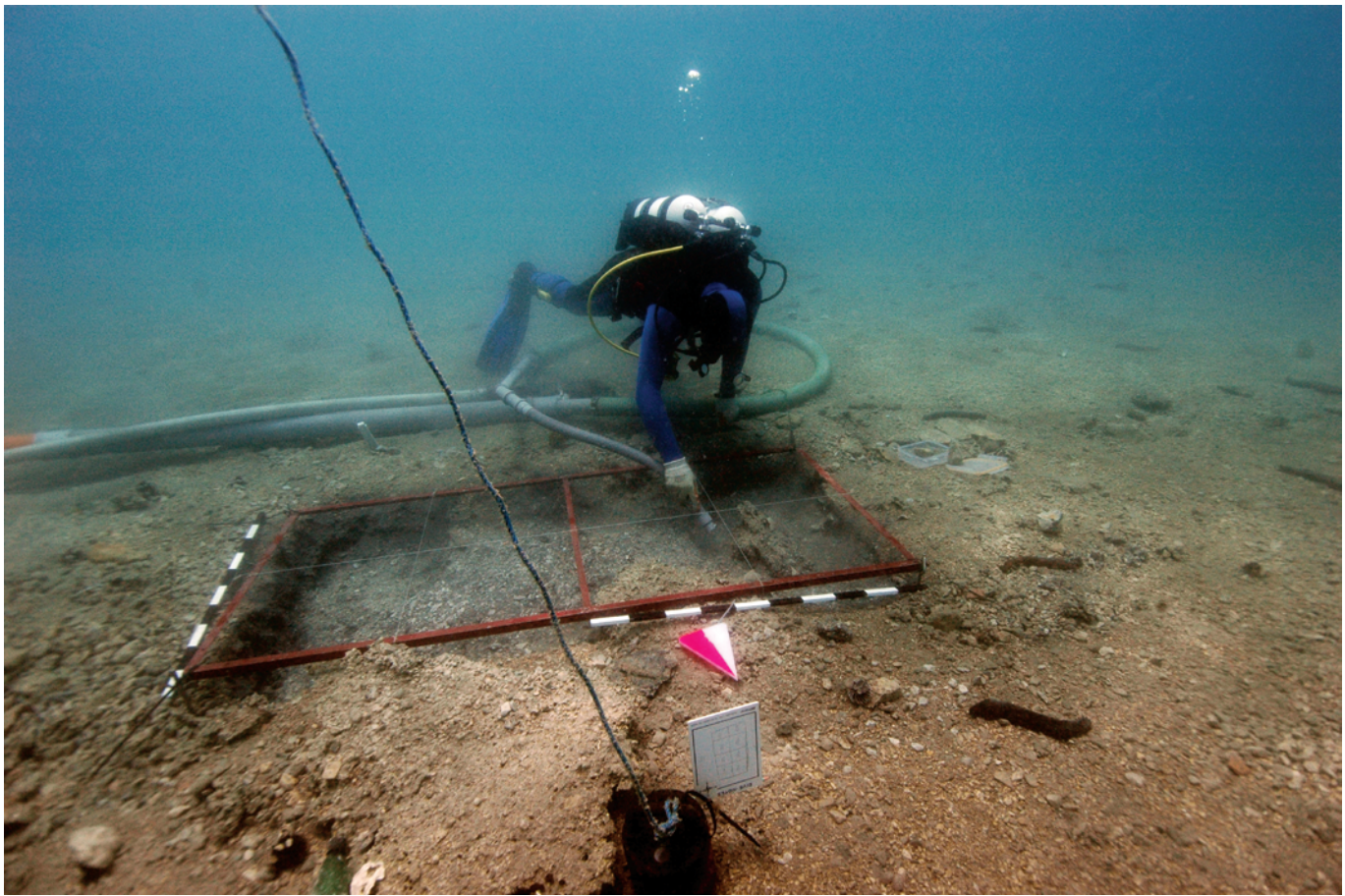
iznosi  $\pm 39$  cm i na udaljenosti do 10 m penje se na oko  $\pm 50$  cm.<sup>6</sup> Sve u svemu, može se zaključiti da je ova metoda prilično jednostavna i u tu svrhu dovoljno precizna.

Naknadno je središte svakog položaja određeno GPS-om, pa je tako i svaki pojedini nalaz postavljen u apsolutnu geodetsku mrežu. Te godine na taj je način dovršeno pretraživanje sveukupno triju položaja, koji su dokumentirani planom rasprostiranja površinskih nalaza.

packed in a small plastic mesh together with its number. That enabled rather accurate subsequent establishing of every find within an examined circle and making the map of distribution of the finds.

This way of documenting surface finds in underwater archaeology has been tested in Germany in order to establish the margin of possible error. It was established that the average departure from the measurement when charting a find 2 meters from a center is  $\pm 4$ cm. For a 4-meter distance, the margin of error increases to  $\pm 16$ cm. For more than 4 meters it is  $\pm 39$ cm and for 10 meters it is approx.  $\pm 50$ cm.<sup>6</sup> On the whole, we can conclude that this method is rather simple and accurate enough to serve the purpose.





**Slika 4. Iskopavanje sonde 2**  
Figure 4. Excavation of Trench 2

foto / photo: R. Scholz

Na temelju informacija koje su 2011. g. prikupljene rekognosciranjem sljedeće godine odlučeno je da će se postaviti dvije sonde na položajima koji su izgledali obećavajuće s obzirom na površinske nalaze. Glavni cilj početka arheoloških sondiranja u 2012. g. bio je odrediti točnu dataciju nalazišta, karakteristike naselja i uslojenost nalazišta u svrhu ocjene potencijala za buduća sustavna istraživanja.<sup>7</sup>

Sonde su bile veličine 2 x 1 m i dalje podijeljene na podkvadrante od 0,5 x 0,5 m. Uz nalaze koji su prikupljeni u sondi, mrežaste su vreće postavljene i na ispust cijevi mamuta vodene pumpe kako bi se prikupili i najmanji predmeti. Sadržaj mrežastih vreća na kopnu je naknadno pregledavan i iz njega su izdvojeni svi, uglavnom sitniji preostali nalazi.

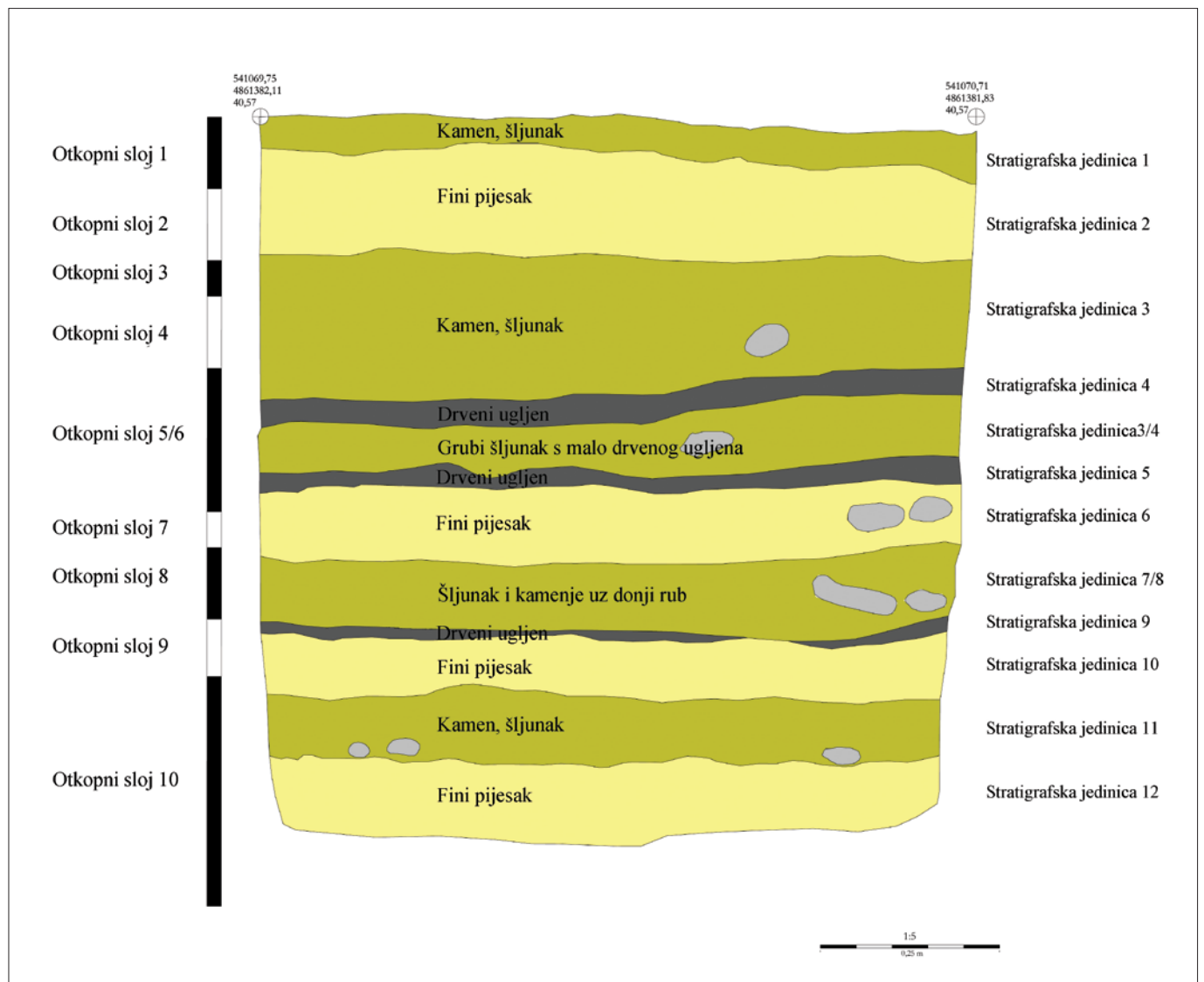
Prvo je započeto s iskopavanjem sonde 2, gdje se sediment sastojao od pijeska i sitnih kamenčića te ponekih čvršćih komada konglomerata pijeska i kamenčića. U sondi 2 iskopano je 10 slojeva, nakon čega se profil na dubini od

The center of every position was later located by GPS, thus placing every individual find in an absolute geodetic network. Surveying of 3 positions was thus completed that year. The positions were documented by drawing a surface find distribution plan.

Based on the information obtained by the 2011 survey, it was decided in 2012 that two trenches be placed at the positions that seemed promising, given the surface finds. The main objective of the initial archaeological test trenching in 2012 was to enable accurate dating of the site, characteristics of the settlement and layering of the site in order to assess the potentials for future systematic research.<sup>7</sup>

The trenches were 2x1m each and were further divided into 0.5x0.5m sub-quadrants. Besides being used for packing the finds collected in trenches, mesh nets were also placed on the outlet of a water dredger in order to collect even the smallest objects. The contents of the mesh nets were later examined on the shore and all the remaining finds – mostly tiny ones – were extracted.

Trench 2 was the first one to be excavated. It had been in the sediment consisting of sand and small pebbles, plus occasional hard pieces of pebble-and-sand conglomerates. Ten layers were excavated in Trench 2,



**Slika 5. Slojevi sonde 2**

Figure 5. Trench 2 layers

priređio / prepared by: R. Scholz

oko 1 m počeo urušavati, pa se prestalo s iskopom. Očito je da su sedimenti ovih slojeva formirani vodenom erozijom.

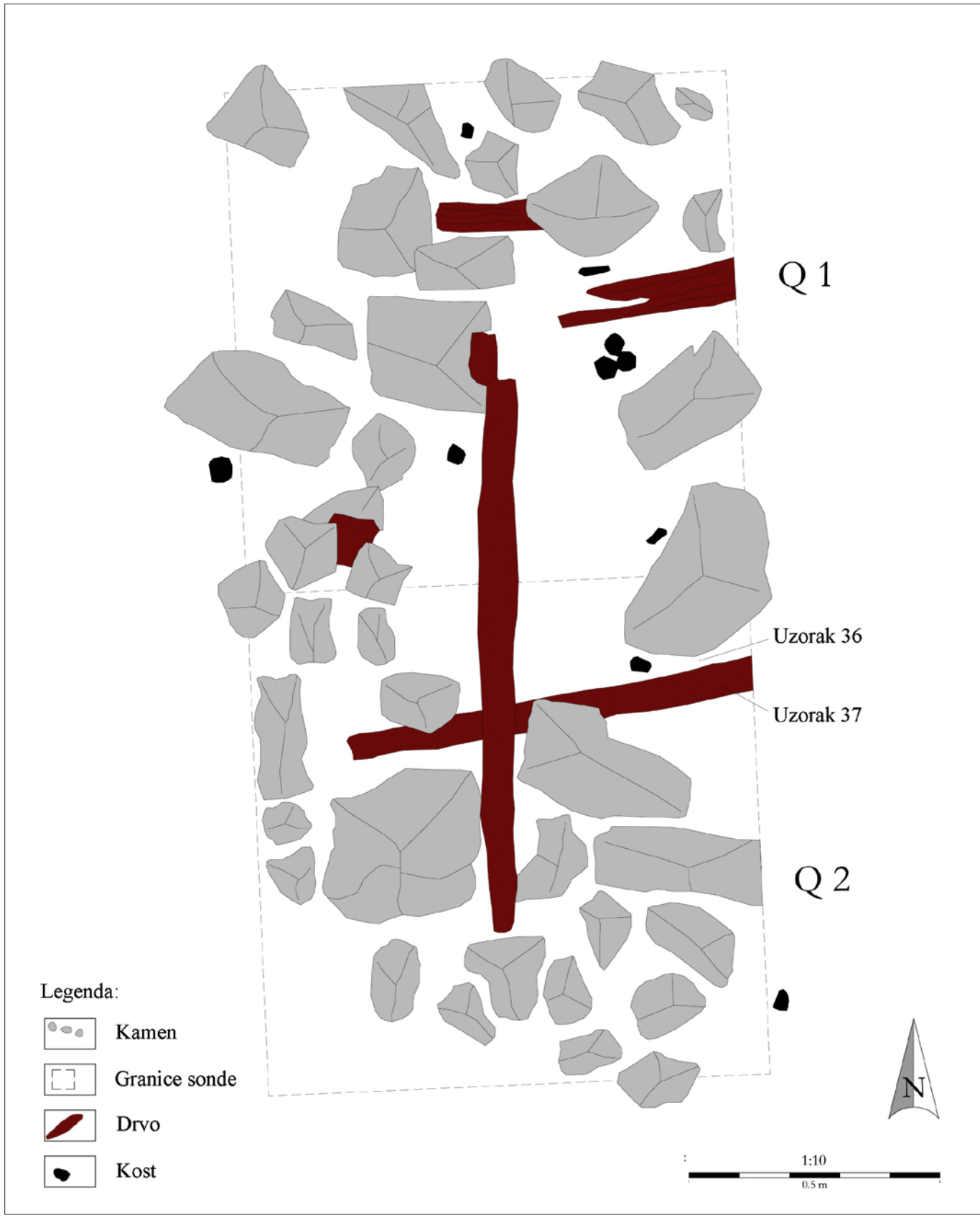
Sonda 1 smještena je na položaju gdje ima većeg nepravilnog kamenja među kojim je pješčani sediment s nalazima. Već na početku iskopavanja sonde 1 uočeno je nekoliko drvenih elemenata. Najpliće i središnje smješten drveni element izvađen je za potrebe izrade analize, ali je daljnje iskopavanje zbog postojanja ostalih drvenih elemenata i nemogućnosti njihova konzerviranja privremeno prekinuto.

Statistika nalaza govori da su bolje sačuvani nalazi oni koji potječu iz sonde 1 jer su tamo brojniji predmeti od keramike i kostiju, vrlo vjerojatno zato što su bili zaštićeni od abrazije morskih struja i valova. Moguće je i da su sitni nalazi i drveni ostatci ovdje sačuvani baš zato što su zatrpani velikim kamenjem, a ne sitnijim sedimentom.

after which the profile started caving in at a 1m depth and the excavation was discontinued. The sediments of these layers were obviously formed by water erosion.

Trench 1 is located on a position with sizable asymmetrical rocks between which is the sand sediment containing the finds. A few wooden elements were noticed in the very beginning of the excavation of Trench 1. The wooden element located centrally in the top layer was removed for the purpose of an analysis but the excavation was then temporarily discontinued because it was not possible to conserve the other wooden elements that were there.

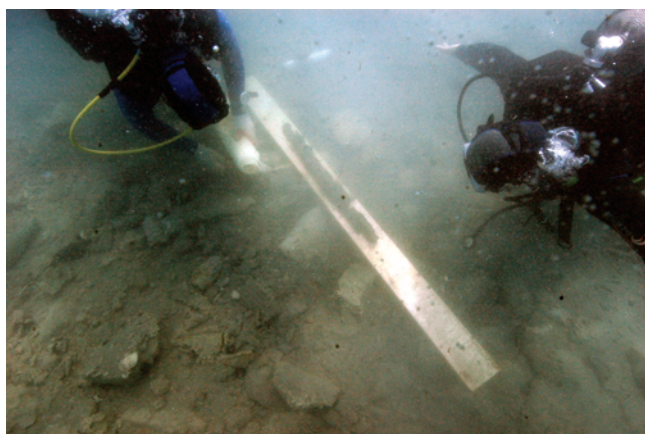
Statistically, the finds coming from Trench 1 – numerous ceramic and bone objects – are better preserved, probably because they were protected from the abrasion by sea currents and waves. It is also possible that the very small finds and wooden remains have been preserved here because they are covered with large rocks and not with a fine sediment.



Slika 6: Nacrt sonde 1 s drvenim elementima in situ  
Figure 6. Plan of Trench 1 with wooden elements in situ

priređio / prepared by: R. Scholz





Slika 7. Vađenje drvene grede iz sonde 1

Figure 7. Removal of wooden beam from Trench 1

foto / photo: A. Grundmann

Zbog izražene abrazije djelovanjem mora na keramičke nalaze od čak 2008 ulomaka keramike, dijagnostičke karakteristike nosi samo 30 ulomaka (T. 1, 2, Sl. 8). Nekoliko najbolje sačuvanih ulomaka nosi jasne tipološke karakteristike eneolitičkoga razdoblja. Na primjer, ulomci 3 i 7 nalikuju ulomcima pronađenim kod otoka Orude.<sup>8</sup> I ukrasi se mogu razaznati među nalazima s eneolitičkih naselja. Tako su plitke kanelure s ulomka 1 vidljive i na ulomcima s nalazišta Buković – Lastvine<sup>9</sup> iz srednjega eneolitika. Točkasti ukras u nizu, izveden udublivanjem prstom s gornjega dijela posude 2, pronalazi se i na nalazištu Buković – Veleševu,<sup>10</sup> ali i



Slika 8: Ulomci keramike s tipološkim karakteristikama

Figure 8. Potsherds with typological characteristics

foto / photo: L. Bekić

Due to the significant effects of the abrasion on the pottery finds, only 30 out of 2,008 potsherds can be diagnosed (Pl. 1 and 2, Fig. 8). A few among the best preserved shards show distinctive typological characteristics of Eneolithic. For example, shards No. 3 and No. 7 resemble those found off the island of Oruda.<sup>8</sup> The ornaments can also be discerned on the finds from Eneolithic settlements. Thus, the likes of the shallow canelures visible on Shard 1 can also be seen on the shards from the Middle Eneolithic Buković – Lastvine site.<sup>9</sup> The dotted ornament in line, imprinted by a finger and stretching downwards from the upper part of the Vessel 2, is also found on Buković – Veleševu site,<sup>10</sup> and elsewhere. However, besides clearly Eneolithic potsherds, there are a few exhibiting the characteristics of Late Neolithic. These are carved lines, some straight and parallel (Potsherds 19 and 22) and some round and curved, like on Potsherds 17 and 21. The thickened flat rims on Potsherds 12 through 15 appear as early as in Late Neolithic, but all these shards found at Janice are too small for a final verdict to be made.

During the survey and excavations, 1,067 pieces of flint were collected, 853 out of which were found in both trenches.<sup>11</sup> Most of the raw material is of local origin, but some of it, three obsidian fragments in particular, was imported (Pl. 3: 56, 57, 62). Only 68 out of 1,067 pieces of flint can be considered tools, including a small core and a stone hammer (Pl. 3: 61, Fig. 9: 61). It seems that only secondary processing of tools out of already prepared cores was taking place in this area. The statistical survey of their typology clearly indicates this.

A total of 339 animal bones were collected during the excavation of the trenches.<sup>12</sup> Most of the bones are very abraded due

8 J. Benjamin – L. Bekić – D. Komšo – I. Koncani Uhač – C. Bonsall, 2011, fig. 16.6.

9 Š. Batović, 1989, sl. 5.

10 B. Marjanović, 2012, T.I-5,2; T.II-2,4.

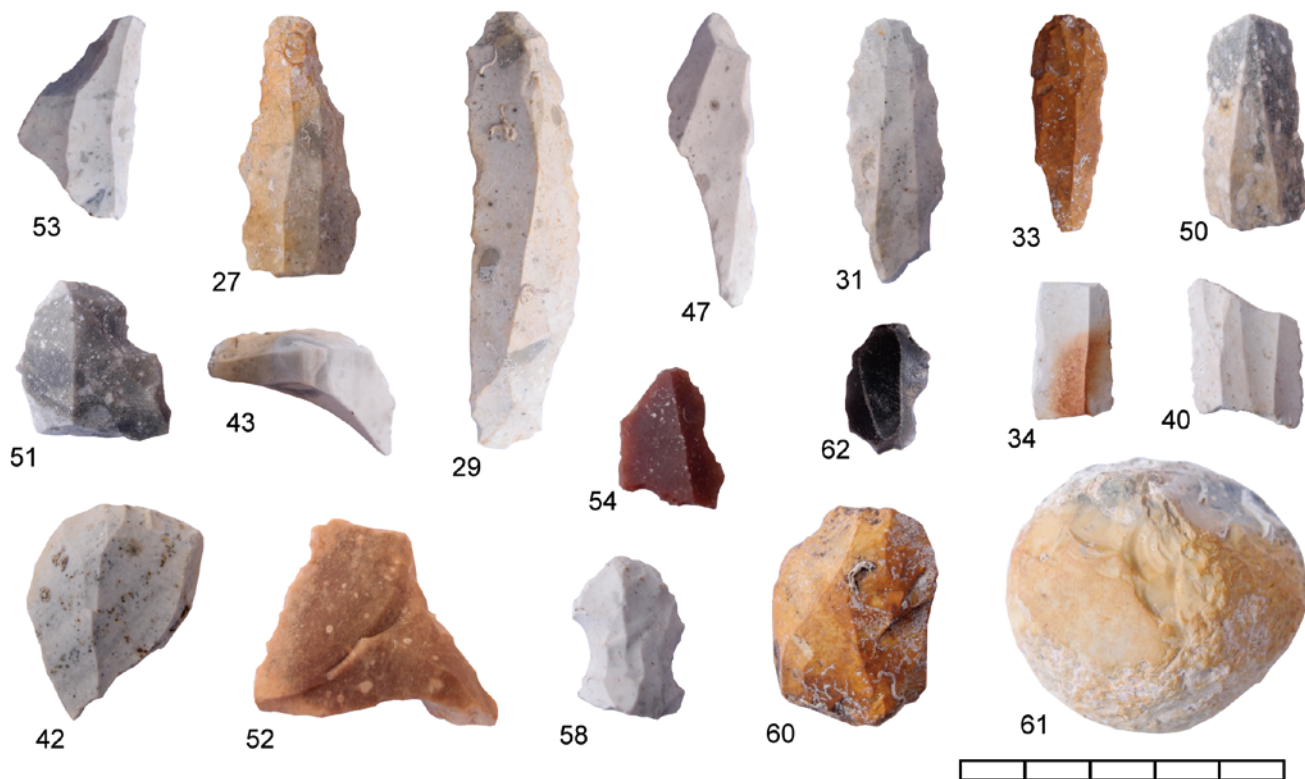
8 J. Benjamin – L. Bekić – D. Komšo – I. Koncani Uhač – C. Bonsall, 2011, fig. 16.6.

9 Š. Batović 1989, fig. 5

10 B. Marjanović, 2012, T.I-5,2; T.II-2,4.

11 We are indebted to Dr. Dario Vujević from University in Zadar for his advice and assistance in defining the lithic finds.

12 Animal bones were analyzed by Tajana Trbojević Vukičević from the Faculty of Veterinary Medicine of the University of Zagreb.



Slika 9. Primjeri litičkih nalaza

Figure 9. Examples of lithic finds

foto / photo: L. Bekić

drugdje. Ipak, uz jasno eneolitičke ulomke, na nekoliko manjih ulomaka mogu se prepoznati i karakteristike tipične za kasneolitička razdoblja. To su urezane linije, neke ravne paralelne (ulomci 19, 22) te one koje kružno zavijaju kao kod ulomaka 17 i 21. Već u kasnom neolitiku javljaju se i zadebljanja ravnoga oboda kao na ulomcima 12 – 15, ali svi ti ulomci na Janicama su previše usitnjeni da bi se mogao donijeti konačan sud.

Tijekom pregleda terena i iskopavanja prikupljeno je 1067 komada kremena, od čega 853 u obje sonde.<sup>11</sup> Većina sirovinskoga materijala lokalnoga je podrijetla, ali nekoliko njih, posebice tri fragmenta opsidijana uvozno-ga su podrijetla (T. 3: 56, 57, 62). Od svih 1067 komada kremena, njih samo 68 može se smatrati alatima, uključujući malu jezgru i kameni čekić (T. 3: 61, Sl. 9: 61). Čini se da je ovo područje korišteno samo za sekundarnu obradu alatki od već prethodno pripremljenih jezgri. Statistički prikaz tipoloških oblika ovo zorno pokazuje.

Tijekom iskopavanja sonde prikupljeno je 339 životinjskih kostiju.<sup>12</sup> Većina je vrlo abradirana djelovanjem morskih struja. Uglavnom su sačuvani zubi, a mekše su kosti očito brže propale. Najvećim dijelom kosti pripadaju govedu (*Bos taurus*) i ovci/kozi (*Ovis/Capra*). Pronađeno je i nekoliko ribljih zuba. Ti zubi pripadaju podlanici (*Sparus aurata*) i služe joj za drobljenje školjaka pa su prilično

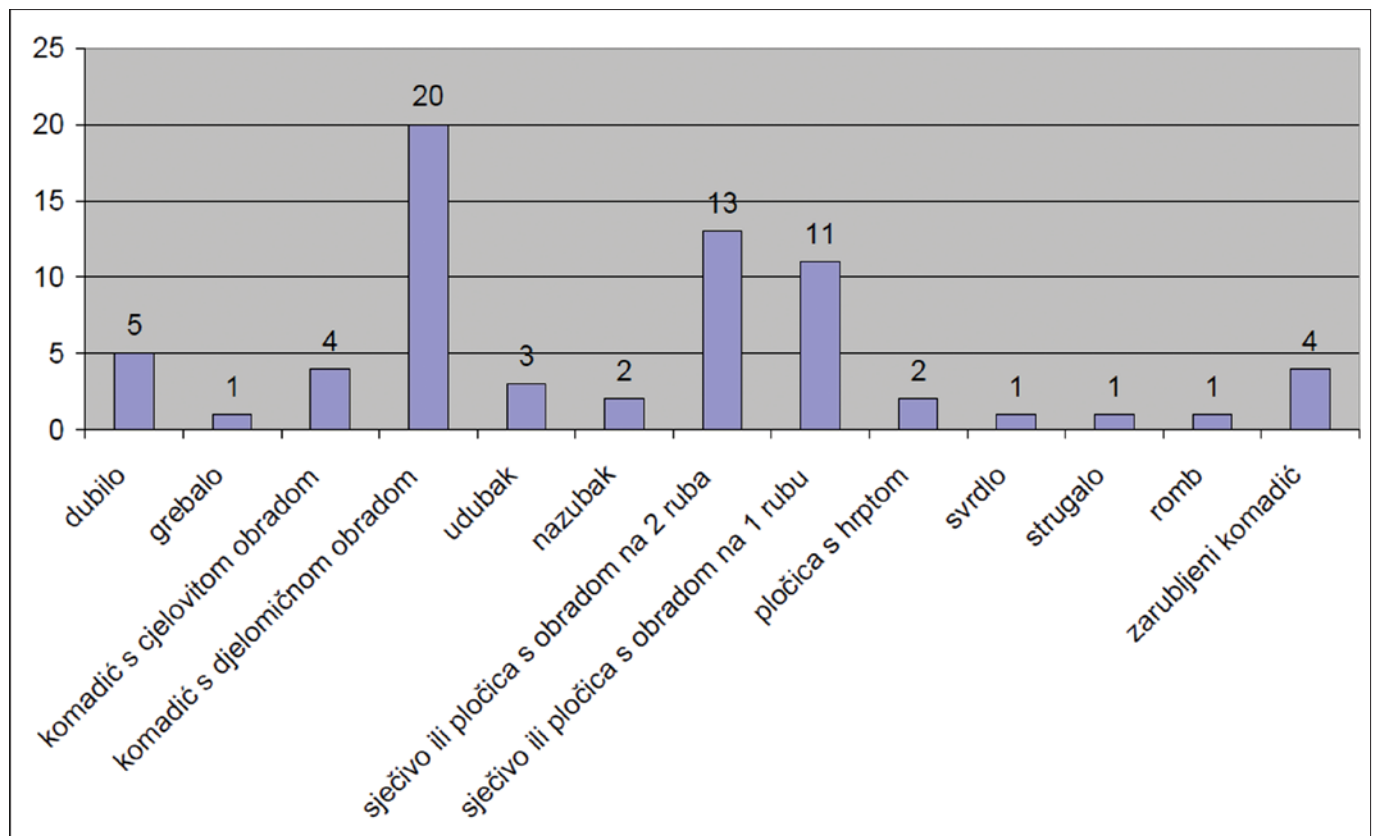
to sea-current action. Mostly teeth have been preserved and softer bones have obviously deteriorated faster. The bones mostly belonged to bovines (*Bos taurus*) and sheep/goats (*Ovis / Capra*). A few fish teeth were also found. They belonged to gilthead (*Sparus aurata*). Since the fish used them for crushing seashells, they are rather hard. Two bone fragments were perhaps turned into tools – an end-scraper and an awl.

Five wooden elements were found in the first layer of Trench 1. One was taken out and others were covered with geotextile and sand to await future excavations. It seems that the wooden pylons belonged to a dwelling. Perhaps some of the pylons were driven into the seabed in situ, but no positive claims can be made without deeper digging. A small wooden beam was found in poor condition because it was partly exposed on the seabed and was eaten by sea worms. It broke into several pieces during removal. The parts were taken to the restoration workshop of the International Center for Underwater Archaeology in Zadar. The conservation of the beam took a year and the acetone-resin method was used.

As the finds from Trench 2 come from the layers formed by tidal waves, they are not on their primary positions. Trench 1 has not been completed, although the stratigraphy in it seems to be in a better shape. Based on an analysis of the ceramic finds we can conclude that the site

11 Zahvaljujemo dr. Dariju Vujeviću sa Sveučilišta u Zadru na savjetima i pomoći u određivanju litičkih nalaza.

12 Životinjske kosti analizirala je Tajana Trbojević Vukičević s Veterinarskoga fakulteta Sveučilišta u Zagrebu.



čvrsti. Dva ulomka kostiju moguće su prerađeni u alatke, grebalo i šilo.

U prvom sloju sonde 1 pronađeno je 5 drvenih elemenata. Jedan je prikupljen, a ostali su pokriveni geotekstilom i pijeskom za buduća iskopavanja. Čini se da su drveni piloni i greda bili dijelovi nastambe. Moguće je da su neki od pilona zabijeni *in situ*, ali za sigurnu potvrdu trebalo bi se kopati dublje. Manja drvena greda bila je u lošem stanju jer je djelomično bila otkrivena na površini pa su je morski crvi izjeli. Prilikom vađenja raspukla se u nekoliko dijelova. Dijelovi su preneseni u restauratorsku radionicu MCPA Zadar. Nakon procesa koji je trajao više od godinu dana završeno je konzerviranje ove grede metodom Aceton/Kolofonij.

Nalazi iz sonde 2 potječu iz slojeva koje su formirali plimni valovi i stoga se ne nalaze u svojem primarnom položaju. Sonda 1 nije dovršena, mada se čini da je ovdje stratigrafska situacija vjerojatno bolja. Analizom keramičkih nalaza možemo zaključiti da je nalazište bilo naseljeno uglavnom u eneolitičkom razdoblju, ali neki nalazi imaju neolitičke osobine. Kamene alatke tipološki i tehnološki mogu se datirati u oba razdoblja. Radiokarbonska (14C) datacija uzorka drveta ukazuje na neolitik. Životinjski ostatci upućuju da su stanovnici Janica uzgajali stoku, goveda, ovce i koze, ali i da je ribarstvo bilo važan dodatak privredi, što je konzistentno s oba razdoblja. Iz svih dostupnih podataka možemo zaključiti da je nalazište vjerojatno bilo naseljeno i u neolitu i u eneolitu.

**Slika 10. Tablica s tehnologijama zastupljenim u litičkoj građi**  
Figure 10. Table of technologies used for lithic finds

priređio / prepared by: D. Vujević

was populated mostly during Eneolithic. Still, some of the finds exhibit Neolithic characteristics. Typologically and technologically, the stone tools can be dated to both periods. The carbon-dating of a wood sample has placed it to Neolithic. The animal remains indicate that the inhabitants of Janice raised cattle, sheep and goats, but also that fishing was an important additional industry – a fact which is consistent to both periods. All the available data are pointing to the conclusion that the site was probably populated in both Neolithic and Eneolithic.

Prehistoric pile-dwelling settlements are very rare and almost unknown on the East Adriatic coast, although their first traces have been reported.<sup>13</sup> The reason for this most likely lies in the terrain's configuration (a steep, rocky coastline) and strong wave action that can destroy and wash away the remains of a settlement. Given the characteristics of the finds, depth, position of the site and expected sea-level change, we can assume for now that Janice settlement was built on piles above shallow water. Sveta Juština and other neighboring islets protect the





**Slika 11. Drvena greda nakon konzerviranja, a prije restauriranja**  
Figure 11. Wooden beam after conservation and before restoration

foto / photo: M. Mustaćek

Sojonička prapovijesna naselja vrlo su rijetka i gotovo nepoznata na istočnoj obali Jadrana mada se prvi tragovi uočavaju.<sup>13</sup> Vrlo je vjerojatno uzrok tome konfiguracija terena, strma kamenita obala i jako djelovanje valova, koji mogu uništiti i otplaviti ostatke naselja. Što se tiče Janica, s obzirom na karakter nalaza, dubinu i smještaj nalazišta, očekivanu promjenu razine mora, za sada možemo pretpostaviti da je naselje bilo izgrađeno na drvenim stupovima iznad plitkoga mora. Od valova sa zapada i sjeverozapada ovaj je položaj zaštićen otočićem Sv. Juštinom i drugima uz njega. Mada je danas ova obala otvorena prema južnim vjetrovima, neolitičko je naselje od razornoga djelovanja valova vrlo vjerojatno bilo zaštićeno formacijom golemih stijena na jugu, koje su danas pokrivene morem. Na tom se mjestu nalazi uski kameni greben, u vidu niza golemih kamenih blokova, za koji se pretpostavljalo da je rimski valobran. On se prostire od plaže Janice prema otočiću Sv. Juštinu u dužini od oko 200 metara. Nova je teorija da su te stijene zapravo geološka formacija koja je tu postojala barem u neolitičko vrijeme, što potvrđuju dvije analize 14C. One su napravljene iz ostataka školjaka pronađenih u grebenu i oba uzorka datiraju se u doba oko 3700. kal. g. pr. Kr.<sup>14</sup> Vjerojatno postojanje dugoga grebena predstavlja okolnost koja je doprinijela tome da se na dnu ovoga zaštićenog položaja i danas nalaze ostatci nekadašnjega naselja.

Tim sastavljen od sedam hrvatskih i njemačkih ronilaca pretraživao je i sondirao nalazište sveukupno tri tjedna

position from the waves in west and northwest. This section of the coastline is exposed to southern winds today, but the huge rock formation in the south, now covered with water, most likely protected the Neolithical settlement from the devastating action of waves. A narrow reef made of huge stone blocks can be seen in its place today; there were theories that it had been a Roman breakwater. It stretches from Janice beach to Sveta Juština islet, 200 meters in length. According to a new theory, these rocks are actually a geological formation that was here at least in Neolithic. Two radiocarbon analyses have confirmed it. They were made using the remnants of seashells found in the reef. Both samples were dated to around 3700 cal-BC.<sup>14</sup> This long reef has probably contributed to the fact that the remains of a former settlement have been preserved on the seabed of this sheltered position to the present day.

In 2011 and 2012, a team made up of seven Croatian and German divers spent three weeks all together surveying and trenching the site. The divers who took part in the research of the Janice prehistoric site were Luka Bekić and Mladen Pešić from ICUA Zadar, Marko Meštrov from Han-Vrana Agency, Mate Parica from University in Zadar and Roman Scholz, Andreas "Eckbert" Grundmann and Dominic Hosner from RGK / DAI. Two boats equipped with a water pump were used in the research; the netted sediment was examined on them.



**Slika 12. Zajednički rad hrvatske i njemačke ekipe na Janicama organiziran je na dvije brodice**

Figure 12. Two boats were provided for the joint work of Croatian and German teams at Janice beach

foto / photo: MCPA / ICUA

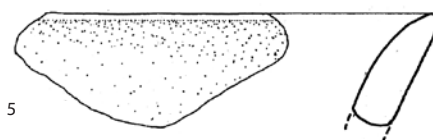
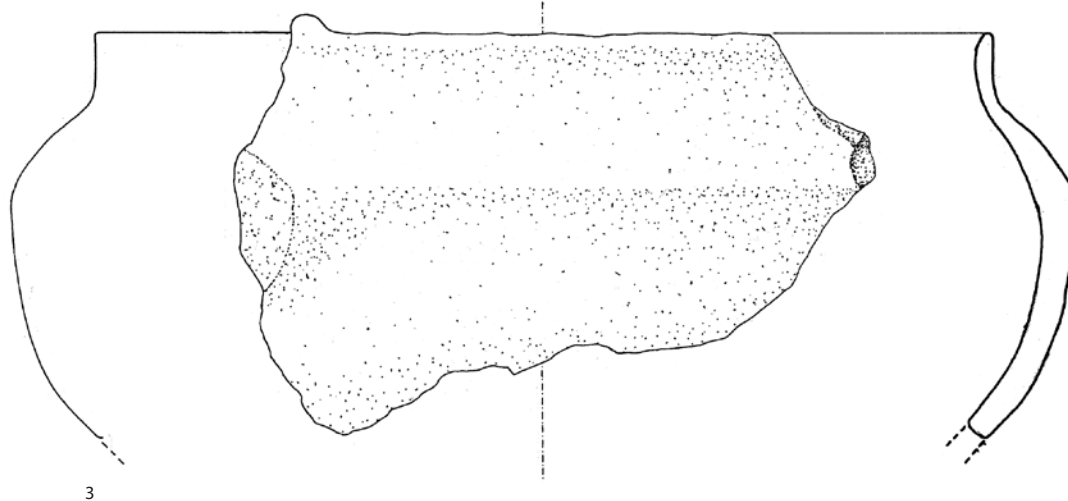
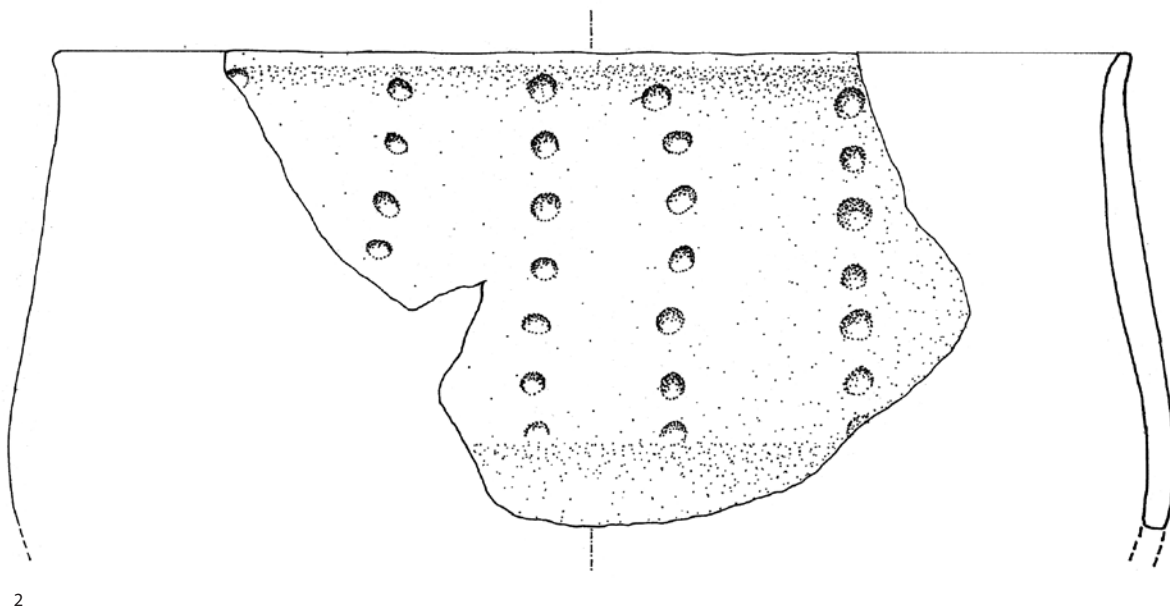
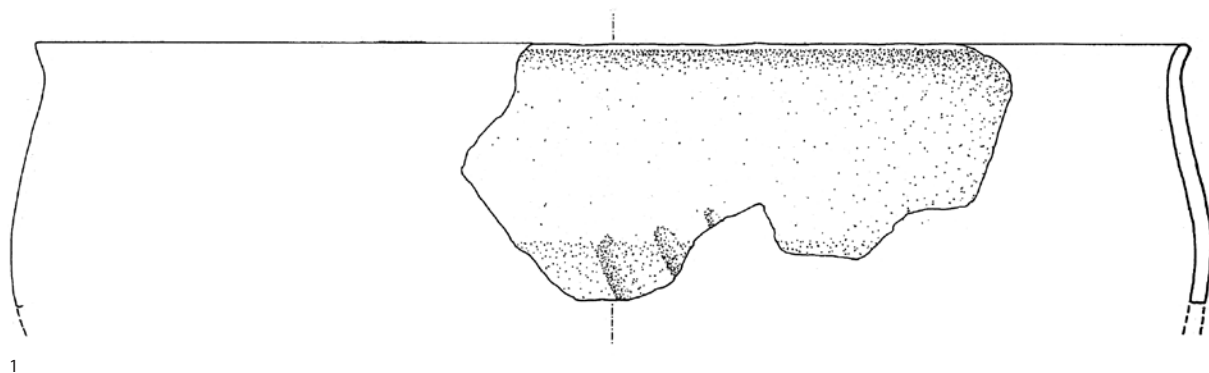
13 J. Benjamin – L. Bekić – D. Komšo – I. Koncani Uhač – C. Bonsall, 2011.

14 Kao i prva, ove dvije analize 14C rezultat su istraživanja Meštrova i Vujevića (u tisku). Analize iz ostataka školjaka jesu: DSH817, koja je izmjerena kao 4994 ± 30BP, te DSH821 kao 4874 ± 24BP. Kalibriranje ovih datuma iznosi 3806 ± 78calAD, odnosno 3670 ± 19calAD prema kalibraciji programa CalPal (Sveučilište u Kölnu, www.calpal-online.de).

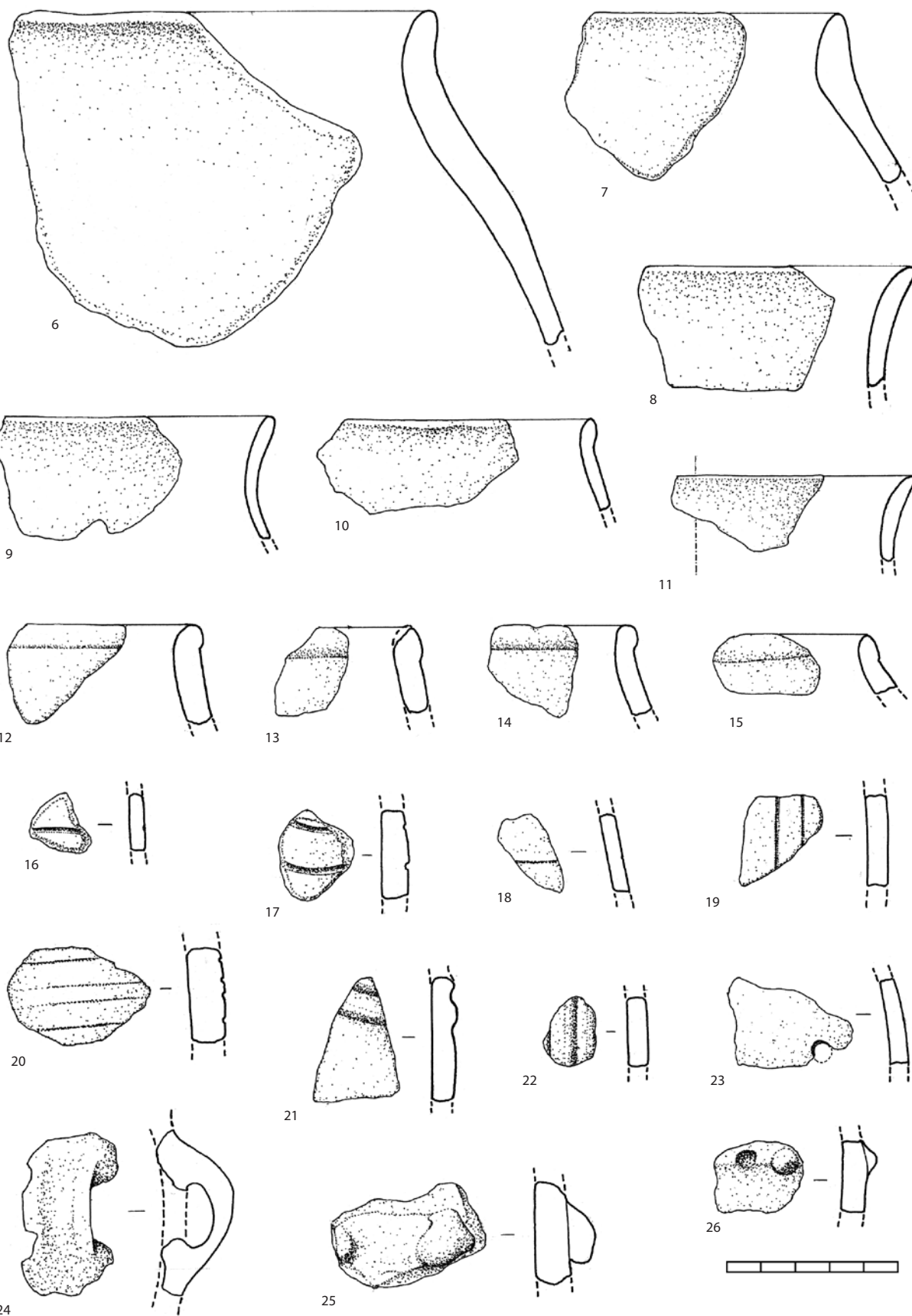
14 Same as the first one, these two radiocarbon analyses are a result of Meštrov and Vujević's research (to be published). Seashell analyses: The result for DSH817 was 4994±30BP and the result for DSH821 was 4874±24BP. After calibration, the dates derived were 3806±78calAD and 3670±19calAD, respectively, as per CalPal program calibration (University of Cologne, www.calpal-online.de).

u 2011. i 2012. g. U istraživanjima prapovijesnoga nalazišta na Janicama sudjelovali su Luka Bekić i Mladen Pešić iz MCPA Zadar, Marko Meštrov iz Agencije Han-Vrana, Mate Parica sa Sveučilišta u Zadru te Roman Scholz, Andreas "Eckbert" Grundmann i Dominic Hosner u ime RGK / DAI. Istraživanje se provodilo s dvije brodice na kojima je bila vodena pumpa te se obavljao pregled prikupljenoga sedimenta u mrežama. Za potvrde ovih sadašnjih zaključaka i pretpostavki potrebno je formirati veću i opremljeniju ekipu s kompletnom logističkom podrškom, koja bi mogla provesti sustavna višegodišnja istraživanja. Ovo nalazište, s obzirom na to da je gotovo jedino takvo na srednjem Jadranu, to i zaslužuje.

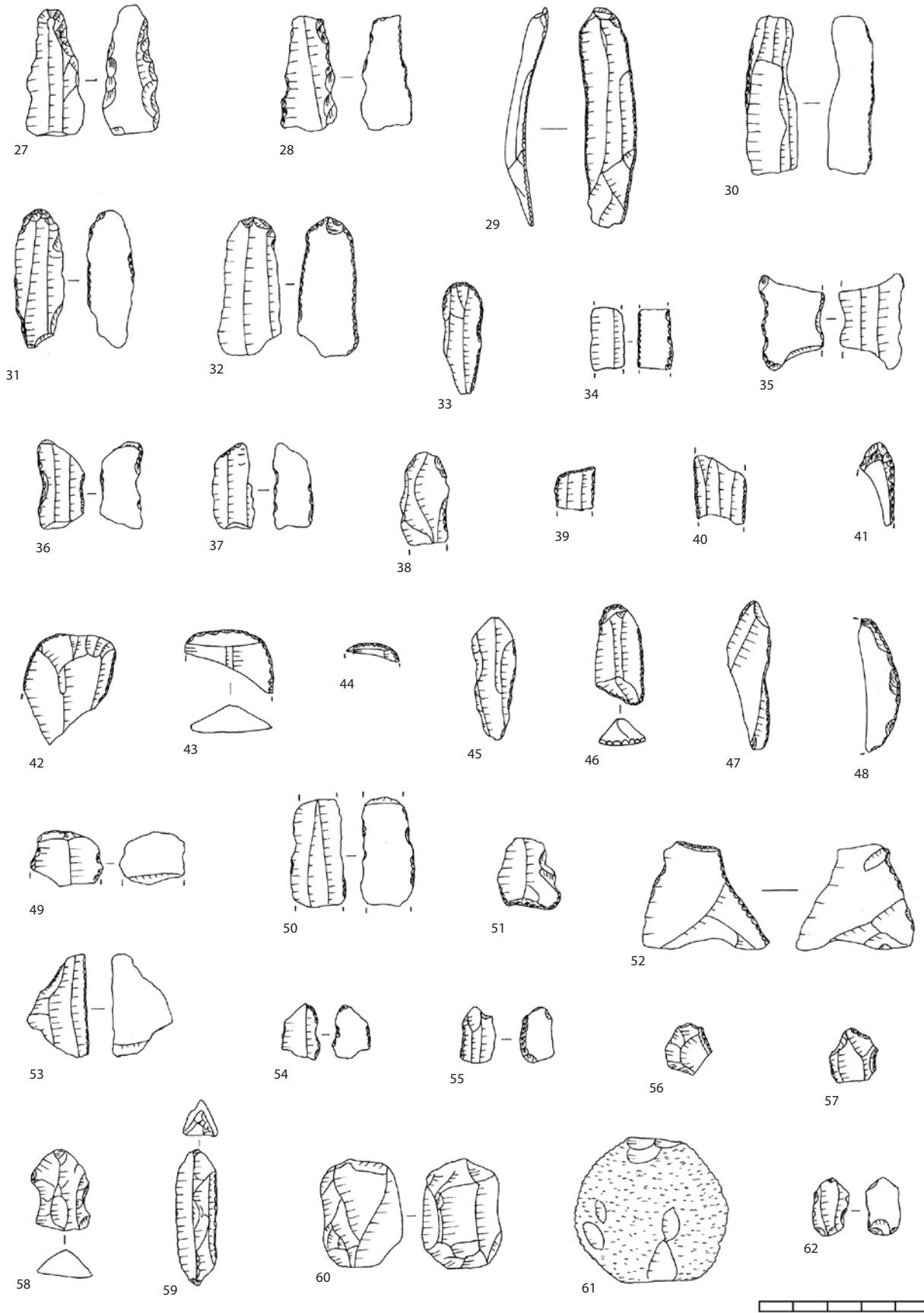
Substantiating all the abovementioned conclusions and assumptions would require forming of a larger, better equipped team with a full logistic support that could be able to carry out systematic multiyear research. Due to its uniqueness in Central Adriatic, this site deserves it.







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