Razvoj poljoprivrede u eneolitiku: arheobotanički ostaci

The development of farming in the Eneolithic: the archaeobotanical remains

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Biljke su potrebne u svim društvima, bilo kao hrana, lijek, zaklon, odjeća, gorivo ili krmna hrana za životinje, a u pretpovijesnim su društvima svakako morale biti značajna komponenta strategije preživljavanja. Način na koji su ova društva iskorištavala i upravljala svojim prirodnim okolišem, koje usjeve su uzgajala i čime su trgovala, mogao se mijenjati s obzirom na vrijeme i različite krajolike, a u skladu sa specifičnim potrebama. Pomoću arheobotanike, koja se bavi proučavanjem biljnih ostataka (prvenstveno makro fosila poput zrna, sjemenki, ljuski orašastih plodova i sjemenki voća) pronađenih u arheološkim iskopavanjima, moguće je rekonstruirati te prošle zemljoradničke sustave, ekonomije, okoliše i ljudske aktivnosti.

Arheobotaničke analize u Hrvatskoj nisu rutinski dio arheoloških istraživanja, djelomično zbog manjka školovanih arheobotaničara te ograničenih spoznaja o toj disciplini i njezinim potencijalnim doprinosima. Tijekom dvadesetog stoljeća objavljeni su pretpovijesni arheobotanički ostaci sa samo devet lokaliteta (Gnirs 1925; Hopf 1964; Karg & Müller 1990; Chapman et al. 1996), ali od tada se povećala količina uzorkovanja, što je po prvi puta pružilo podatke o ljudskom gospodarenju biljem na nizu arheoloških lokaliteta diljem Hrvatske iz različitih razdoblja. U ovom radu bit će predstavljeni trenutno dostupni arheobotanički dokazi iz kontinentalne Hrvatske, uključujući raspon kultiviranih usjeva koji su mogli biti uzgajani tijekom eneolitika, kao i usporedbe s teorijama o razvitku eneolitičkih strategija preživljavanja na proučavanom području.

All societies need plants for food, medicine, shelter, clothing, fuel, and fodder for their domestic animals and would have constituted a major component of subsistence strategies in prehistory societies. How these societies used and managed their natural environment, what crops they grew and what they traded would have differed through time and space depending on their specific requirements. Archaeobotany, which examines plant remains (primarily macro-fossils such as grains, seeds, nutshells, and fruit stones) recovered from archaeological excavations, can be used to reconstruct these past agricultural systems, economies, environments and human activities.

In Croatia archaeobotanical analyses is not routinely undertaken as part of archaeological research, due in part to the lack of trained archaeobotanists and a limited awareness of the discipline and its potential contribution. During the 20th century only nine sites have published evidence of prehistoric archaeobotanical remains (Gnirs 1925; Hopf 1964; Karg & Müller 1990; Chapman et al. 1996), but since then there has been a greater increase in sampling, providing for the first time important information about past human plant economies from a range of archaeological sites and periods across Croatia. This chapter presents current archaeobotanical evidence from continental Croatia exploring the range of domestic crops that may have been cultivated during the Eneolithic and how they compare to prevailing theories on the development of Eneoltihic subsistence strategies in the region.

Arheobotanička istraživanja u Hrvatskoj

Biljni materijal na arheološkim nalazištima u Hrvatskoj najčešće je očuvan zbog procesa karbonizacije i gorenja, iako su zabilježeni i drugi oblici očuvanja, uključujući mineralizaciju i očuvanje zbog velike količine vode. Karbonizacija se događa kada je biljni materijal, namjerno ili slučajno, izložen toplini tijekom aktivnosti poput kuhanja, spaljivanja otpada ili korištenja biljnog goriva (Van der Veen 2007). Neizbježno, većina skupova nalaza stvarana je niz aktivnosti, što ih čini sekundarnim izvorom podataka (Hubbard & Clapham 1992). Dakle, prikupljeni biljni ostaci samo su dio nekoć postojeće cjeline koja je došla u kontakt s vatrom te preživjela spaljivanje, odlaganje i ponovno prikupljanje.

Archaeobotanical research in Croatia

The most common form by which plant material is preserved on archaeological sites in Croatia is through carbonisation or charring, although other forms of preservation can also be found including mineralisation and waterlogging. Carbonisation occurs when the plant material is exposed to heat either accidentally or deliberately, through activities such as cooking, burning rubbish or using plants for fuel (Van der Veen 2007). Inevitably, most assemblages are built up during a series of activities and as such are usually secondary in nature (Hubbard & Clapham 1992). Therefore the plant remains recovered are only a fraction of the once living community that come into contact with fire, survive charring, deposition and recovery.

Rani i srednji eneolitik

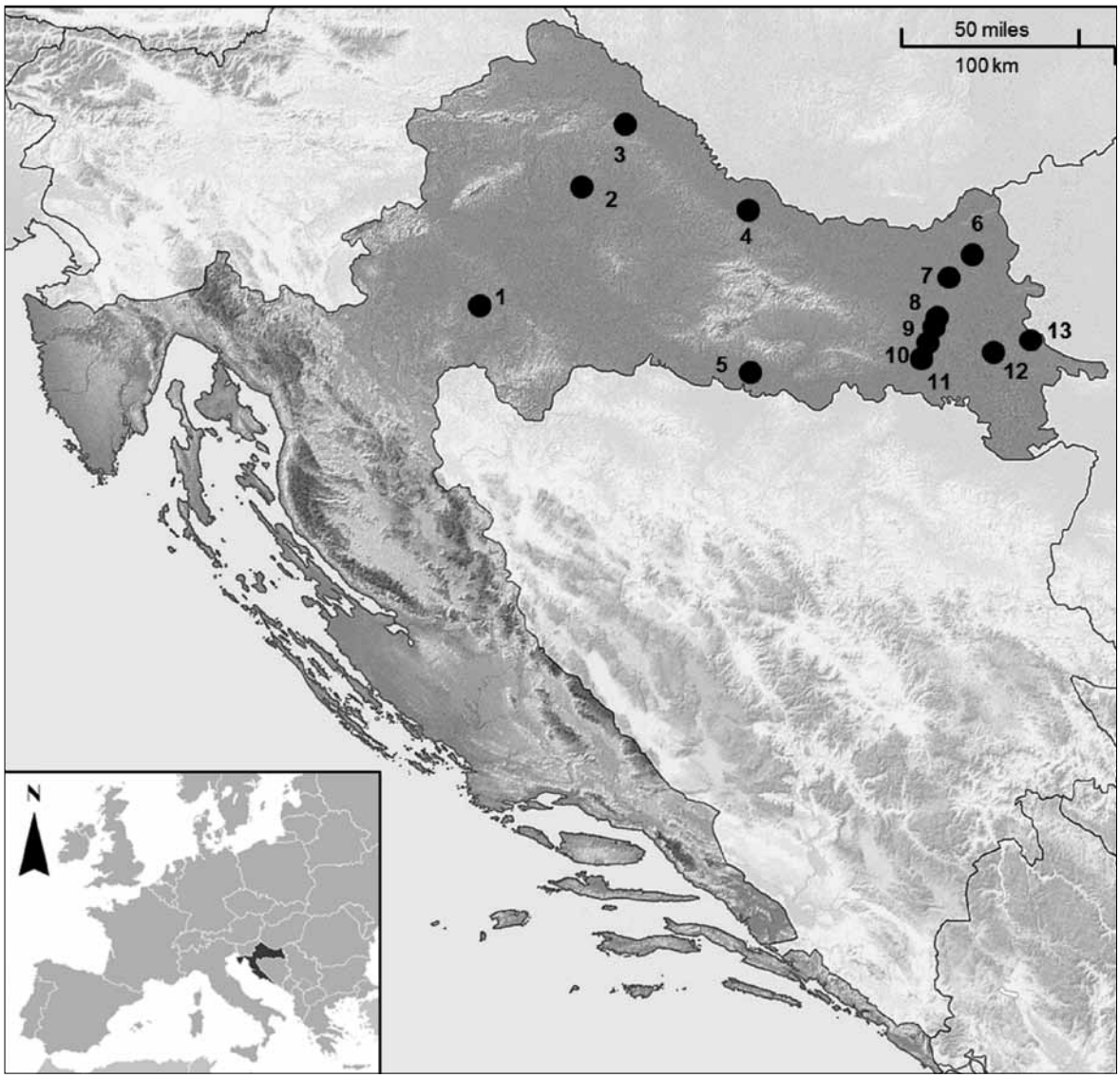
Arheobotanički ostaci pronađeni su na jedanaest rano/srednje eneolitičkih naselja u kontinentalnoj Hrvatskoj, a radi se o sljedećim lokalitetima: sopotsko/lasinjsko naselje Slavča, lasinjska naselja na lokalitetima Čepinski Martinci-Dubrava, Jurjevac-Stara Vodenica, Lasinja, Pajtenica-Velike Livade, Tomašanci-Palača, lasinjsko/retzgajarsko nalazište Barbarsko, retzgajarska naselja na lokalitetima Čeminac-Vakanjac i Tomašanci-Palača, i u retzgajarskim/boleraz slojevima na lokalitetu Virovitica-Batelije (Sl. 1). Ovi lokaliteti obuhvaćaju dva tipa: ravna ili horizontalna naselja s tek nekoliko slojeva naseljavanja, i telove na kojima je zabilježeno više faza ponovne izgradnje na relativno maloj površini. Na naselju tel tipa u Slavči uzorci su uzimani tijekom nekoliko sezona istraživanja, dok su na ostalim ravnim naseljima uzimani tijekom zaštitnih istraživanja financiranih od strane Ministarstva Kulture Republike Hrvatske. Uzorci su, stoga, u najvećoj mjeri uzimani iz ukopanih struktura, osim na lokalitetu tel tipa u Slavči i lokalitetu Čeminac-Vakanjac gdje su uzorci prikupljani iz naseobinskih slojeva, jaraka i jama. Osim u naseljima, uzorci su prikupljeni i iz velike jame lasinjske kulture s lokaliteta Potočani u kojoj su pronađeni posmrtni ostaci 50 individua.

Ukupno su prikupljena 74 uzorka biljnih makro ostataka iz slojeva datiranih u rani/srednji eneolitik. Ukupna gustoća bila je izuzetno mala, s manje od 1 sjemenke po litri zemlje (Reed 2016), zbog čega je izdvojeno tek 191 zrno žitarica, što pak izuzetno otežava identifikaciju preferiranih usjeva

Early and Middle Eneolithic

Eleven early/middle Eneolithic settlements located in continental Croatia have been sampled for archaeobotanical remains. These include the Sopot/Lasinja site of Slavča, the Lasinja settlements discovered at Čepinski Martinci-Dubrava, Jurjevac-Stara Vodenica, Lasinja, Pajtenica-Velike Livade, Tomašanci-Palača, the Lasinja/Retz-gajary site of Barbarsko, the Retz-gajary settlements at Čeminac-Vakanjac and Tomašanci-Palača, and the Retz-gajary/Boleraz levels at Virovitica-Batelije (Fig. 1). These sites represent two types of sites; flat, or horizontal, settlements, which have only a few layers of occupation, and tell sites, which have multiple episodes of rebuilding within a relatively concentrated area. The tell site Slavča was sampled over a number of field seasons while the remaining flat settlements were sampled as part of rescue excavations commissioned by the Croatian Ministry of Culture. Samples were therefore collected predominantly from pit features, except at the tell site of Slavča and the sites of Čeminac-Vakanjac where samples were collected from occupation levels, ditches and pit features. In addition to the settlements, samples were also taken from Potočani a large Lasinja culture burial pit filled with 50 individuals.

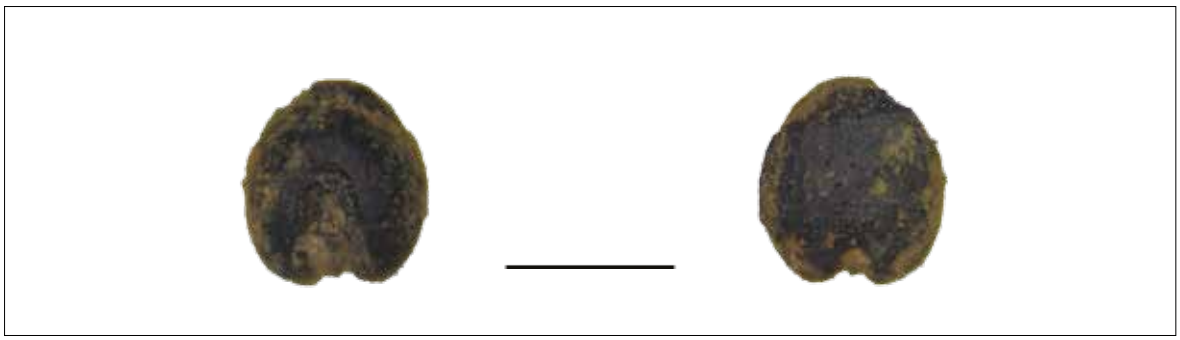
A total of 74 samples contained plant macro-remains from levels dated to the early/middle Eneolithic. Overall density was particularly low at less than 1 seed per litre of soil (Reed 2016). This resulted in only 191 cereal grains being recovered, which makes identification of crop preferences particular-



Slika / Figure 1. Položaj lokaliteta s kojih potječu arheobotanički ostaci obrađeni u tekstu / Location of the sites with archaeobotanical remains referred to in the text: (1) Lasinja; (2) Barbarsko; (3) Potočani; (4) Virovitica-Batelije; (5) Slavča; (6) Čeminac-Vakanjac; (7) Čepinski Martinci-Dubrava; (8) Pajtenica-Velike Livade; (9) Jurjevac-Stara Vodenica; (10) Tomašanci-Palača; (11) Đakovo-Franjevac; (12) Vinkovci, 14 Matije Gupca; (13) Vučedol

(Sl. 3). Među malim brojem ostataka, u uzorcima se najčešće pojavljuje sjeme jednozrne pšenice (*Triticum monococcum*), dvozrne pšenice (*Triticum dicoccum*) i ječma (*Hordeum vulgare*) (Sl. 4). Broj svinutih sjemenki ječma s lokaliteta Čepinski Martinci-Dubrava, Potočani i Barbarsko ukazuje na prisutnost šesteroredne varijante. U Slavči je zabilježeno samo jedno zrno gole pšenice (*Triticum aestivum/durum/turgidum*), dok se ostaci sjemena prosa (*Panicum milliaceum/Setaria italica*) samo sporadično pojavljuju u uzorcima. Uz ostatke zrna žitarica, na mnogim su lokalitetima zabilježeni i ostaci pljeve ili mekinja dvozrne i jednozrne pšenice te jedan ostatak stapke ječma, pronađen na

ly difficult (Fig. 3). From the small number of grains einkorn (*Triticum monococcum*), emmer (*Triticum dicoccum*) and barley grain (*Hordeum vulgare*) are most frequently identified in the samples (Fig. 4). A number of twisted barley grains seen at Čepinski Martinci-Dubrava, Potočani and Barbarsko indicate the presence of the six-row variety. Only one naked wheat grain (*Triticum aestivum/durum/turgidum*) was identified at Slavča, while a number of millet (*Panicum milliaceum/Setaria italica*) grains were recovered sporadically in the samples. In addition to the cereal grains, remains of emmer and einkorn cereal husk or chaff were recovered from many of the sites along with one barley rachis identified



Slika / Figure 2. Karbonizirani klipasti muhar (*Setaria italica*) iz uzorka 11, Lasinja (mjerilo = 1mm) / Carbonised foxtail millet (*Setaria italica*), from sample 11, Lasinja (scale = 1mm).

lokalitetu Slavča. Zbog slabe očuvanosti, pšenična pljeva (*Triticum sp.*) prevladava u uzorcima s lokaliteta Slavča (530 ovojnica zrna), Tomašanci-Palača (60 ovojnica zrna) i Čeminac-Vakanjac (282 ovojnica zrna). Osim toga, slaba očuvanost rezultirala je time da je očuvan samo jedan uzorak velike neidentificirane mahunarke s lokaliteta Potočani i Čepinski Martinci-Dubrava te dvije moguće sjemenke lana (*Linum cf. usitatissimum*) s lokaliteta Čeminac-Vakanjac.

Identificirani su i ostaci divljih plodova, uključujući drijen (*Cornus mas*), pronađen u malim količinama na lokalitetima Jurjevac-Stara Vodenica, Tomašanci-Palača i Čeminac-Vakanjac. Po manje od tri ploda ljoskavca (*Physalis alkekengi*) pronađena su na lokalitetima Tomašanci-Palača i Lasinja, a jedno sjeme iz porodice kupina (*Rubus* sp.) pronađeno je na lokalitetu Lasinja. Osim toga, na lokalitetu Jurjevac-Stara Vodenica pronađen je mogući ostatak koštice trnjine (*Prunus* cf. *spinosa*), a u reztgajarskim slojevima na lokalitetu Tomašanci-Palača i dva ostatka ljuske lješnjaka (*Corylus* sp.). Divlje vrste i korov nisu čest nalaz s ovih lokaliteta. Najveći broj sjemenki divljih vrsta/korova, njih 32, pronađen je na lokalitetu Čeminac-Vakanjac, a radi se o 13 različitih divljih vrsta, uključujući trave (npr. *Bromus* sp.), dvornikovke (*Polygonum aviculare*), ivanjsko cvijeće (*Galium aparine*) i abdovinu (*Sambucus ebulus*).

at Slavča. Due to poor preservation wheat chaff (*Triticum* sp.) dominates the samples at Slavča (530 glume bases), Tomašanci-Palača (60 glume bases) and Čeminac-Vakanjac (282 glume bases). Additionally, poor preservation resulted in only one large unidentified pulse from Potočani and Čepinski Martinci-Dubrava and two possible flax seeds (*Linum* cf. *usitatissimum*) from Čeminac-Vakanjac being identified.

Wild fruits were also identified, including cornelian cherry (*Cornus mas*), which was found in small quantities at Jurjevac-Stara Vodenica, Tomašanci-Palača and Čeminac-Vakanjac. Less than three seeds of chinese lantern (*Physalis alkekengi*) were found at Tomašanci-Palača and Lasinja, and one seed from the blackberry family (*Rubus sp.*) was identified from Lasinja. In addition, one possible sloe stone (*Prunus* cf. *spinosa*) was recovered from Jurjevac-Stara Vodenica and two fragments of hazelnut shell (*Corylus* sp.) were recovered from Retzgajary culture levels at Tomašanci-Palača. Wild plant and weed species were not commonly identified from the sites. Čeminac-Vakanjac had the highest number of wild/weedy plants at 32 seeds, representing 13 different weed species including grasses (e.g. *Bromus* sp.), knotgrass (*Polygonum aviculare*), bedstraw (*Galium aparine*) and dwarf elder (*Sambucus ebulus*).

Kasni eneolitik

Arheobotanički ostaci prikupljeni su sa šest srednje/kasno eneolitičkih lokaliteta u kontinentalnoj Hrvatskoj, uključujući badensko naselje na lokalitetu Čepinski Martinci-Dubrava, badenske i kostolačke slojeve na lokalitetu Tomašanci-Pala-

Late Eneolithic

Six middle/late Eneolithic settlements located in continental Croatia have been sampled for archaeobotanical remains. These include the Baden settlement of Čepinski Martinci-Dubrava, the Baden/Kostolac culture levels at Tomašanci-Palača and at

ča i telu Vučedol, kostolačko naselje na lokalitetu Đakovo-Franjevac, kostolačke i vučedolske slojeve na telu u Slavči te na lokalitetu vučedolske kulture u Vinkovcima, Ulica Matije Gupca 14 (Sl. 1). Uzorci su većinom prikupljani iz jamskih struktura, osim na telovima Slavča i Vučedol gdje u prikupljani iz kuća, jaraka i jama. Uzorci sa Slavče i Vučedola prikupljani su kroz više sezona, dok su oni iz preostalih horizontalnih naselja prikupljeni tijekom zaštitnih istraživanja.

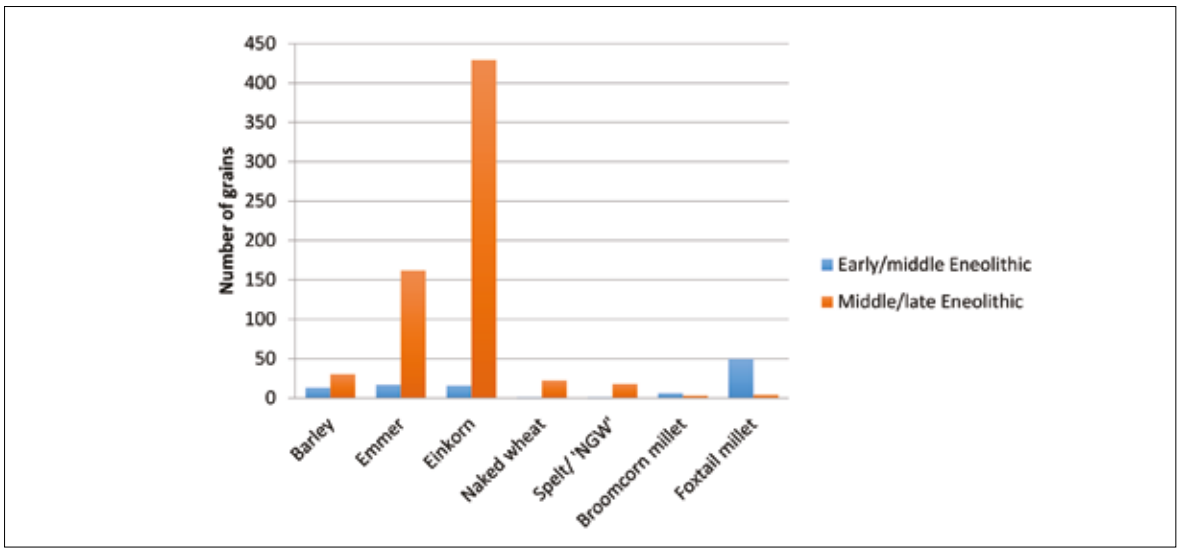
Ostaci zrna i pljeve žitarica prevladavaju u svim uzorcima izuzev onih s lokaliteta Vinkovci/Matije Gupca 14, gdje 77% skupa nalaza sačinjavaju ostaci divljih vrsta i korova. Među žitaricama prevladavaju ostaci jednozrne pšenice (Sl. 3), iako je tomu većinski tako zbog velikog broja nalaza s Vučedola, gdje jednozrna pšenica sačinjava 70% identificiranih ostataka žitarica. Male količine zrna dvorne pšenice zabilježene su na lokalitetima Đakovo-Franjevac i Slavča, dok na položaju Vinkovci/Matije Gupca 14 dvozrna pšenica prevladava sa 125 identificiranih zrna. Ječam se ne pojavljuje u velikim količinama, a najveći broj ostataka, njih 16, pronađen je na položaju Vinkovci/Matije Gupca 14. Na lokalitetima Vinkovci/Matije Gupca 14 i Vučedol definiran je i određen broj mogućih ostataka pira ili „novog tipa" pšenice s ovojnicom koji je identificiran na temelju tupog vrha i izostanka dorzalnog grebena (Jones et al. 2000; Kohler-Schneider 2003). Ipak, s obzirom na morfološke sličnosti, slabo stanje očuvanosti i činjenicu da nisu pronađeni identificirani ostaci pljeve, ovim ostacima nije bilo moguće odrediti vrstu. Mali broj ostataka gole pšenice (*Triticum aestivum/durum/turgidum*) pronađen je na lokalitetima Đakovo-Franjevac, Vinkovci/Matije Gupca 14 i Vučedol, a jedan ostatak stapke gole pšenice definiran je na Vučedolu. Osim zrna žitarica, pronađeni su i ostaci pljeve dvozrne i jednozrne pšenice, kao i velik broj, njih 699, ostataka pljeve pšenice s ovojnicom (*Triticum sp.*), pronađen na lokalitetu Slavča. Ipak, niti na jednom od lokaliteta iz ovog razdoblja nisu pronađeni ostaci stapke ječma.

Mahunarke i uljarice češći su nalaz iz ovog razdoblja. Primjerice, na lokalitetu Đakovo-Franjevac pronađeni su ostaci sjemena sjetvene kukavičice (Lathyrus sativus), leće (*Lens culinaris*) i graška (*Pisum sativum*), a na lokalitetu Vinkovci/Matije Gupca 14, definirano je 47 sjemenki lana. Među ostacima plodova prevladava ljoskavac koji je, u manjim količinama, zabilježen na sva četiri lokaliteta, kao i drijen koji je zabilježen na tri lokaliteta. Osim

the tell site of Vučedol, the Kostolac settlement at Đakovo-Franjevac, the Kostolac/Vučedol levels at the tell site of Slavča and the Vučedol culture site discovered at Vinkovci, 14 Matije Gupca (Fig. 1). Samples were collected predominantly from pit features, except at the tell sites of Slavća and Vučedol where samples were collected from house, ditch and pit features. The tell sites Slavča and Vučedol were sampled over a number of field seasons while the remaining flat settlements were sampled as part of rescue excavations.

Cereal grain and chaff dominate the assemblages of all but Vinkovci/Matije Gupca 14, where 77% of the assemblage is wild plant and weed species. Of the cereals, einkorn grains dominate the assemblage (Fig. 3), although this is largely due to the large number recovered from Vučedol, where 70% of the identified cereal grains were einkorn. Small quantities of emmer grains are recorded at Đakovo-Franjevac and Slavča, while at Vinkovci/Matije Gupca 14 emmer dominates the assemblage with 125 identified grains. Overall, barley is not found in high quantities with the highest number of grains, 16, being found at Vinkovci/Matije Gupca 14. At Vinkovci/Matije Gupca 14 and Vučedol, a number of possible spelt or 'new type' glume wheat grains where identified based on their blunt apex and lack of a dorsal ridge (Jones et al. 2000; Kohler-Schneider 2003). However, due to similarities in morphology, their poor state of preservation and the fact that no identified glume bases were recovered restricted their identification to species. A small number of naked wheat grains (*Triticum aestivum/durum/turgidum*) were also recovered from Đakovo-Franjevac, Vinkovci/Matije Gupca 14 and Vučedol and one naked wheat rachis from Vučedol. In addition to the cereal grains, remains of the emmer and einkorn cereal chaff were recovered, along with a large number of 699 glume wheat glume bases (*Triticum* sp.) being identified at Slavča. However, no barley rachis is seen for this period at any of the sites.

Pulses and oil plants were more commonly found during this period. For example, at Đakovo-Franjevac seeds of grass pea (*Lathyrus sativus*), lentil (*Lens culinaris*) and pea (*Pisum sativum*) were recovered, while at Vinkovci/Matije Gupca 14, 47 flax seeds were identified. The fruit remains were dominated by chinese lantern, which were recovered in small numbers from all four sites, as well as cornelian cherry which was identified at three of the sites. A couple of blackberry (*Rubus fruticosus*) seeds are also found at Đakovo-Franjevac and Slavča. Com-



Slika / Figure 3. Broj zrna svake žitarice po razdoblju / Number of grains recovered for each cereal per period.

toga, na lokalitetima Đakovo-Franjevac i Slavča pronađeno je nekoliko ostataka sjemenki kupine (*Rubus fruticosus*). U usporedbi s ranijim eneolitikom, divlje vrste i korovi prisutni su u većim količinama na svim lokalitetima izuzev Slavče, gdje je samo 4% uzoraka sadržavalo divlje vrste i korove. Osobito visoka frekvencija divljih/invazivnih vrsta zabilježena je na lokalitetu Vinkovci/Matije Gupca 14, zbog toga što je ondje utvrđeno više od 1,000 vrsta trava (*Bromus sp., Phleum sp.*, itd.) i sjeme divlje/bijele lobode (*Chenopodium sp./Chenopodium album*).

pared to the earlier Eneolithic wild plant and weed species are present in higher quantities at all the sites except Slavča, where only 4% of the assemblage contained wild plant and weed species. In particular, Vinkovci/Matije Gupca 14 has a high percentage of wild/weedy species due to the recovery of over 1,000 grass species (*Bromus* sp., *Phleum* sp. etc.) and seeds of goosefoot/fat hen (*Chenopodium* sp./*Chenopodium album*).

Rekonstrukcija praksi uzgajanja usjeva

Teško je pokušati odrediti je li vrsta usjeva identificirana na nekom lokalitetu zaista bila kultivirana. Primjerice, Van der Veen i Fieller (1982) su izračunali da bi uzorak trebao sadržavati najmanje 384 sjemenki, s time da bi jedna vrsta trebala sačinjavati 50% uzorka kako bi se dobila vjerojatnost od 95% za određivanje udjela svake vrste prisutne u uzorku. Osim toga, uzorci s manje od 50 ili 100 sjemenki često se isključuju iz analiza obrade usjeva i ratarstva (Bogaard 2004; Van der Veen 1992). Stoga, male koncentracije žitarica u arheobotaničkim uzorcima interpretirane su kao 'trave' ili kontaminanti, dok su veće koncentracije smatrane dokazima za uzgajanje 'usjeva'. Tek mali broj uzoraka s prostora Hrvatske sadržavao je više od 100 sjemenki, a samo dva uzorka s Vučedola i položaja Vinkovci/Matije Gupca 14 sadržavala su više od 384 sjemenke. Sklonost uzorkovanja jama u skupu nalaza iz

Reconstructing crop husbandry practices

Trying to determine whether a crop species recovered from a site is evidence of that crop being cultivated can be difficult. For example, Van der Veen and Fieller (1982) calculated that one sample needed at least 384 seeds, with one taxon making up 50% of the assemblage, to ensure a 95% chance of estimating the contribution of each taxon to that sample. In addition, samples with fewer than 50 or 100 seeds are often excluded from crop processing and husbandry analyses (Bogaard 2004; Van der Veen 1992). Consequently, low concentrations of cereals in archaeobotanical samples have been interpreted as 'weeds' or contaminants, whereas higher concentrations have been suggested as evidence of a 'crop plant'. For the samples examined within Croatia, only a small number contain over 100 seeds and only two samples from Vučedol and Vinkovci/Matije Gupca 14 have over 384 seeds. The bias to-

Hrvatske, kao i mala gustoća sjemena, također mogu sugerirati da mnogi od uzorka predstavljaju sporu akumulaciju sekundarnog ili tercijarnog odlaganja koje je slabo povezano s izvornim kontekstom. Dakle, kako bi se odredilo je li izgledno da je određena vrsta uzgajana kao usjev tijekom eneolitika kontinentalne Hrvatske, potrebno je općenitije sagledati skupni uzorak svih lokaliteta, kao i širu regiju u istom razdoblju.

wards sampling pits in the Croatian assemblage, as well as the low seed density, may also suggest that many of the remains represent the slow accumulation of secondary or tertiary deposits, which have little association with the context. Therefore, we must look more generally at the patterns of the sites together, as well as in the wider region at the time, to determine whether it is likely that a certain species was grown as a crop during the Eneolithic in continental Croatia.

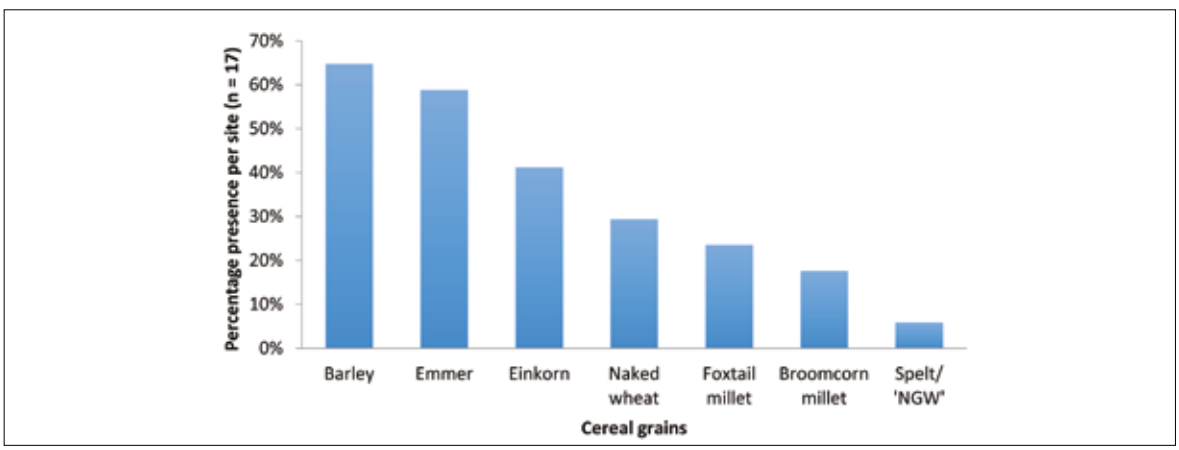
Ječam, dvozrna i jednozrna pšenica

Najčešće identificirane žitarice sa 17 proučavanih lokaliteta su šesteroredni ječam, jednozrna i dvozrna pšenica (Sl. 4). Dvozrna i jednozrna pšenica ujedno sačinjavaju i najveći broj sjemenki izdvojenih iz uzoraka, osobito s lokaliteta datiranih u srednji/kasni eneolitik (Sl. 3). Primjerice, velik broj sjemenki jednozrne pšenice s Vučedola većinom potječe s podova kuća te iz nekoliko uzoraka uzetih iz spaljenog zida, što sugerira da je ovaj usjev namjerno uzgajan na lokalitetu. Ipak, frekvencija ječma na pojedinom lokalitetu visoka je u usporedbi s drugim vrstama žitarica, što sugerira da je to bila jedna od čestih žitarica na lokalitetima (Sl. 4). Ovaj uzorak primijećen je diljem jugoistočne i središnje Europe gdje su dvozrna i jednozrna pšenica te šesteroredni ječam najčešći identificirani usjevi od neolitika do kasnog brončanog doba (Reed 2013). S obzirom na trenutne dokaze, teško je odrediti je li neki od ovih usjeva bio uzgajan učestalije od drugih.

Barley, Emmer and Einkorn

The most commonly recovered cereals from the 17 study sites are 6-row barley, emmer and einkorn (Fig. 4). Emmer and einkorn also have the highest number of grains recovered, especially from the middle/late Eneolithic sites (Fig. 3). For example, the large numbers of einkorn grains recovered from Vučedol are mainly from house floors and a couple of samples from a burnt wall suggesting that this crop was purposefully grown at the site. Nevertheless, the frequency of barley per site is high compared to the other cereal species also suggesting that it was a common cereal at the sites (Fig 4). This pattern is seen throughout southeast and central Europe where emmer, einkorn and 6-row barley are the most common crops found from the Neolithic to the late Bronze Age (Reed 2013). Whether there is a preference of one crop over another at the sites is difficult to determine from the current evidence.

Slika / Figure 4. Postotak udjela zrna žitarica po eneolitičkom lokalitetu / The percentage presence of cereal grains per site for the Eneoltihic.



Novi tip pšenice s ovojnicom, pir i gola pšenica

'Novi tip' pšenice s ovojnicom (eng. 'New type' glume wheat - NGW) prvi put su identificirali Jones et al. (2000) na neolitičkom lokalitetu u Grčkoj, a odonda se taj tip sve češće prepoznaje na lokalitetima diljem jugoistočne Europe. Sve veći broj nalaza sugerira da je ova biljka u tom razdoblju bila uzgajana na širokom prostoru, moguće u kombinaciji s jednozrnom pšenicom, vjerojatno kao zimski usjev, ali da je izgubila na važnosti tijekom brončanog i željeznog doba. U ranoeneolitičkim slojevima sa Slavče identificirano je samo pet ostataka NGW-a, a morfološke sličnosti između ostataka pira i NGW-a te izostanak pljeve na Vučedolu i Vinkovcima/Matije Gupca 14 znatno otežavaju identifikaciju ostataka NGW-a. Posljedično, ograničena količina dokaza moguće ukazuje na to da ovaj usjev nije redovito uzgajan, dok izostanak jasno odredivih ostataka pira sugerira da ta biljka nije uzgajana u proučavanom razdoblju.

Pronađeno je samo jedno ranoeneolitičko zrno gole pšenice *(Triticum durum/aestivum/turgidum*), a ista se tek sporadično javljaju na lokalitetima datiranima u mlađa razdoblja. Gola pšenica se također sporadično pojavljuje diljem jugoistočne i središnje Europe, ali čini se da je do brončanog doba ona u Italiji postala glavni usjev (Mercuri et al. 2006). Ipak, na temelju ostataka s eneolitičkih lokaliteta u Hrvatskoj, čini se neizglednim da je gola pšenica učestalo uzgajana.

New type glume wheat, Spelt and Naked wheat

'New type' glume wheat (NGW) was first identified by Jones et al. (2000) at a Neolithic site in Greece and since then has been identified more regularly at sites across Southeast Europe. The growing body of evidence suggests that it was widely cultivated at this time perhaps in mixed stands with einkorn, probably as a winter crop, but declined in importance during the Bronze and Iron Ages. Only five NGW glume bases were recovered from the early Eneolithic levels at Slavča, while similarities in the morphology of spelt and NGW grains and the lack of chaff remains at Vučedol and Vinkovci/Matije Gupca 14 make the identification of NGW tenuous during the later Eneolithic. Subsequently, the limited evidence may suggest that the crop was not regularly cultivated, while the absence of a clear spelt wheat identification would suggest this crop was not grown during this period.

Naked wheat (*Triticum durum/aestivum/turgidum*) is only found as one grain during the early Eneolithic and only sporadically seen at the later sites. Naked wheat is also found sporadically across southeast and central Europe, but by the Bronze Age in Northern Italy it is suggested to be a primary crop (Mercuri et al. 2006). However, for the Eneolithic sites in Croatia it is unlikely that the remains are representative of naked wheat being commonly grown as a crop.

Proso

Rasprave o tome kada i gdje su proso (*Panicum miliaceum*) i klipasti muhar (*Setaria italica*) prvi puta postali usjevi u Europi i dalje traju (npr. Jones 2004; Zohary et al. 2012: 71). Arheobotanički nalazi općenito pokazuju da se kvantiteta i frekvencija prosa i klipastog muhara znatno povećavaju diljem Europe do željeznog doba. Ista situacija zabilježena je u Hrvatskoj, gdje je u nedavnim iskopavanjima u Sisku pronađen stariježeljeznodobni lonac prepun sjemenki prosa (Reed & Drnić 2016). Čistoća ovih ostataka, i činjenica da su pronađeni u loncu, ukazuju na pohranjivanje hrane za potrebe čovjeka. Analiza stabilnih izotopa ugljika i dušika pronađenih u ljudskim kostima iskopanima na brončano i željeznodobnim lokalitetima u Hrvatskoj također pokazuje da je proso korišteno do željeznog doba (Lightfoot et al. 2015). Proso se u susjednim regijama također rijetko pojavljuje prije kasnog brončanog doba (Kroll 1998; van Zeist 2001/2002;

Millet

When and where broomcorn (*Panicum miliaceum*) and foxtail (*Setaria italica*) millet first became established in Europe as a crop is still debated (e.g. Jones 2004; Zohary *et al*. 2012: 71). Generally, the archaeobotanical evidence indicates that the quantity and frequency of foxtail and broomcorn millet increases significantly across Europe by the Iron Age. This is also supported in Croatia where recent excavations at Sisak revealed an early Iron Age pot filled with foxtail millet grains (Reed and Drnić 2016). The purity of the remains and their recovery within a pot suggest the storage of a crop for human consumption. The examination of carbon and nitrogen stable isotopes of human bones excavated from Bronze and Iron Age sites within Croatia also indicate millet consumption by the Iron Age (Lightfoot et al. 2015). In neighbouring regions millet is also rarely seen until the late Bronze Age (Kroll 1998; van Zeist 2001/2002; Filipović 2011; Medović 2011; 2012).

Filipović 2011; Medović 2011; 2012). U eneolitičkim kontekstima, proso i klipasti muhar pronađeni su u po samo nekoliko primjeraka (Sl. 2), stoga se čini neizglednim da je proso uzgajano u Hrvatskoj tijekom eneolitika.

Mahunarke i uljarice

Mahunarke su važan usjev u većini zemljoradničkih sustava, jer njihovo uzgajanje pomaže održavanju ili povećanju količine dušika u tlu te predstavljaju važan izvor bjelančevina u ljudskoj i životinjskoj prehrani. Za razliku od žitarica, mahunarke nisu čest nalaz na eneolitičkim lokalitetima. Mahunarke su identificirane samo na kasnoeneolitičkim lokalitetima Đakovo-Franjevac i Vučedol, i to u malim količinama. Najčešće identificirana vrsta je grašak (*Pisum sativum*), a slijede dva ostatka leće (*Lens culinaris*) i jedan sjetvene kukavičice (*Lathyrus sativus*). Grašak i leća mogu rasti u hladnijoj klimi i imaju relativno kratko vrijeme rasta. Sjetvenu kukavičicu mogu jesti i ljudi i životinje, a radi se o izdržljivoj mahunarki otpornoj na sušu, veliku vlagu, niske temperature i tlo slabe kvalitete (Gill 1991). Ipak, sjetvena kukavičica sadrži mnogo neurotoksina koji, ako ih se konzumira u velikim količinama, mogu dovesti do neurolatirizma (paraliza donjih ekstremiteta; Spencer & Schaumburg 1983). Ljudi u Etiopiji kratkim namakanjem uklanjaju ovojnicu sjetvene kukavičice jer se u njoj, kao i kod ostalih mahunarki, nalazi najviše toksičnih tvari (Butler et al. 1999). Ljudi u Španjolskoj namaču sjetvenu kukavičicu prije kuhanja variva, ili pak melju sjemenke u brašno od kojeg se potom kuha kaša (Peña-Chocarro & Zapata-Peña 1999). Sudeći prema tome što ih se u jugoistočnoj Europi od neolitika do brončanog doba pronalazi u kontekstima vezanim uz pohranjivanje, ali i ponovno korištenje hrane (npr. Valamoti et al. 2011), vrlo je izgledno da su mahunarke bile svakodnevni sastojak korišten u hrvatskom eneolitiku.

Lan (*Linum usitatissimum*) je uljarica, a ujedno i vlaknasta biljka koja uspijeva na propusnom tlu, ali je posebno osjetljiva na sušu (Casa et al. 1999). Sjemenke lana učestalo su identificirane na kasnoeneolitičkim lokalitetima, osobito na položaju Vinkovci/Matije Gupca 14, gdje je pronađeno 47 sjemenki lana. Očuvanje uljarica kroz proces karbonizacije ipak je osobito problematično, budući da sjemenke često izgore zbog visoke koncentracije ulja u sastavu, stoga neki autori predlažu da se uzgajanje lana na određenom lokalitetu ili regi-

Within the Eneolithic assemblage the recovery of both broomcorn and foxtail millet is limited to only a few grains (Fig. 2), so it is unlikely that millet was cultivated during the Eneolitic in Croatia.

Pulses and Oil plants

Pulses represent an important crop in most agricultural systems as they help maintain or increase nitrogen in the soil as well as provide an important source of protein for both humans and animals. In contrast to the cereals, pulses are not commonly recovered from the Eneolithic sites. Only the late Eneolithic sites of Đakovo-Franjevac and Vučedol have pulses identified and again only in small numbers. The most commonly identified is pea (*Pisum sativum*), followed by two lentils (*Lens culinaris*) and one grass pea (*Lathyrus sativus*). Peas and lentil are both cool-weather crops and have relatively short growing seasons. Grass pea is consumed by both humans and animals and is a hardy pulse that is resistant to drought, waterlogging, low temperatures and poor quality soil (Gill 1991). However, grass pea is high in neurotoxins, which if consumed in high numbers can lead to neurolathyrism (paralysis of the lower limbs) (Spencer & Schaumburg 1983). In Ethiopia, testae of grass pea are removed, as this is where most of the toxic substances of pulses are concentrated, by briefly soaking (Butler et al. 1999). In Spain, grass pea is soaked prior to cooking in stews or the seeds are ground into flour and cooked as gruel (Peña-Chocarro & Zapata-Peña 1999). Judging from their common occurrence both among storage and refuse contexts in southeast Europe from the Neolithic to the Bronze Age (e.g. Valamoti et al. 2011) it is very likely that pulses were regular ingredients of daily meals in Eneolithic Croatia.

Flax (*Linum usitatissimum*) is both an oil and fibre crop that grows best on well drained soils, but is particularly susceptible to droughts (Casa et al. 1999). From the Eneolithic sites flax seeds are commonly identified at the later sites, especially at Vinkovci/Matije Gupca 14, where 47 flax seeds were identified. The preservation of oil plants through carbonisation is, however, particularly problematic as the seeds tend to burn away due to their high oil content. Thus, some have suggested that flax cultivation can be inferred for a site/region even when a few flax seeds are found present in an archaeobotanical assemblage (Kroll 1993). Furthermore, processing of the plant might have taken place outside

ji može dokazati čak i kada se u arheobotaničkom skupu nalaza pronađe tek nekoliko sjemenki (Kroll 1993). Nadalje, obrada biljke mogla se odvijati izvan naselja, osobito ako su stapke korištene za dobivanje vlakana, što bi značilo da su u naselja stizala već obrađena vlakna ili očišćene sjemenke koje su ondje pohranjivane i dodatno obrađivane (Valamoti 2011). Na temelju malog broja pronađenih sjemenki moguće je, dakle, predložiti da je lan tijekom eneolitika u Hrvatskoj uzgajan kao uljarica ili pak kao sirovina za dobivanje vlakana.

Obrada usjeva

Pronalazak dijelova ovojnice zrna pšenice može pomoći pri identifikaciji mogućih strategija preživljavanja u naseljima. Primjerice, istraživači su, od sedamdesetih godina do danas, odredili da se izglednijim čini da su karbonizirani biljni ostaci posljedica proizvodnje hrane ili obrade usjeva, a ne konzumiranja hrane, i da stoga ukazuju na obradu usjeva i pritom korištene metode (Knörzer 1971; Dennell 1972; 1974; Hillman 1984; Jones 1984). Otada su razvijeni prediktivni modeli kojima je moguće identificirati kojem bi stupanju obrade usjeva određeni arheobotanički ostaci mogli pripadati. Model se temelji na pretpostavci da svaki stupanj rezultira uzorkom koji ima različiti karakteristični omjer žitarica, pljeve i korova (Hillman 1984; Jones 1984; Van der Veen 1992; Van der Veen & Jones 2006). Svaki stupanj rezultira dvama skupovima nalaza: usjevni proizvod, koji se dalje obrađuje kroz ostale stupnjeve te usjevni nusproizvod ili otpad, koji se uklanja prije sljedećeg stupnja. Pojednostavljeno, stupnjevi obrade žitarica bez ovojnice (npr. gola pšenica i ječam) su sljedeći (prema Hillman 1984; Van der Veen 1992; (Sl. 5):

• Žetva: sabiranje zrelog usjeva s polja, moguće čupanjem ili rezanjem;

• Vršidba: odvajanje zrna od pljeve, moguće udaranjem štapom ili korištenjem stoke za gaženje;

• Ispuhivanje: odvajanje sitne pljeve i korova od zrna, moguće pomoću vjetra ili košare;

• Grubo prosijavanje: odvajanje većih tvari poput komada korova, neovršenog klasja i sjena;

• Fino prosijavanje: odvajanje malih sjemenki korova od zrna korištenjem sita s gustom mrežicom.

Pšenice s ovojnicom (npr. jednozrna, dvozrna i 'novi tip' pšenice s ovojnicom) pak zahtijevaju daljnje stupnjeve obrade kako bi se zrno odvojilo od uske ovojnice. Primjerice, fazu sušenja zrna ti-

the settlement, especially if stems were processed for fibre extraction, resulting in only processed fibre or processed clean seed being brought to the site, stored and further processed (Valamoti 2011). It may therefore be possible to suggest from the few seeds found that flax was grown either as an oil or fibre crop during the Eneolithic in Croatia.

Crop processing

The recovery of wheat glume bases can help identify possible subsistence activities at the settlements. For example, since the 1970s researchers have determined that carbonised plant remains are more likely to result from food production and crop processing, rather than from food consumption and therefore provide a record of the crop husbandry and processing methods employed (Knörzer 1971; Dennell 1972; 1974; Hillman 1984; Jones 1984). Since then, predictive models have been created to identify which stage of the crop processing sequence an archaeobotanical assemblage may represent. This is based on the assumption that each stage produces a characteristically different ratio of cereal, chaff and weeds within the sample (Hillman 1984; Jones 1984; Van der Veen 1992; Van der Veen & Jones 2006). Each stage produces two assemblages: a crop product, which continues through each stage, and a crop by-product or residue, which is removed from the remaining processes. Simplified, the stages for processing free-threshing cereals (e.g. naked wheat and barley) are as follows (after Hillman 1984; Van der Veen 1992) (Fig. 5):

• Harvesting: to gather the mature crop from the field, possibly by uprooting or cutting;

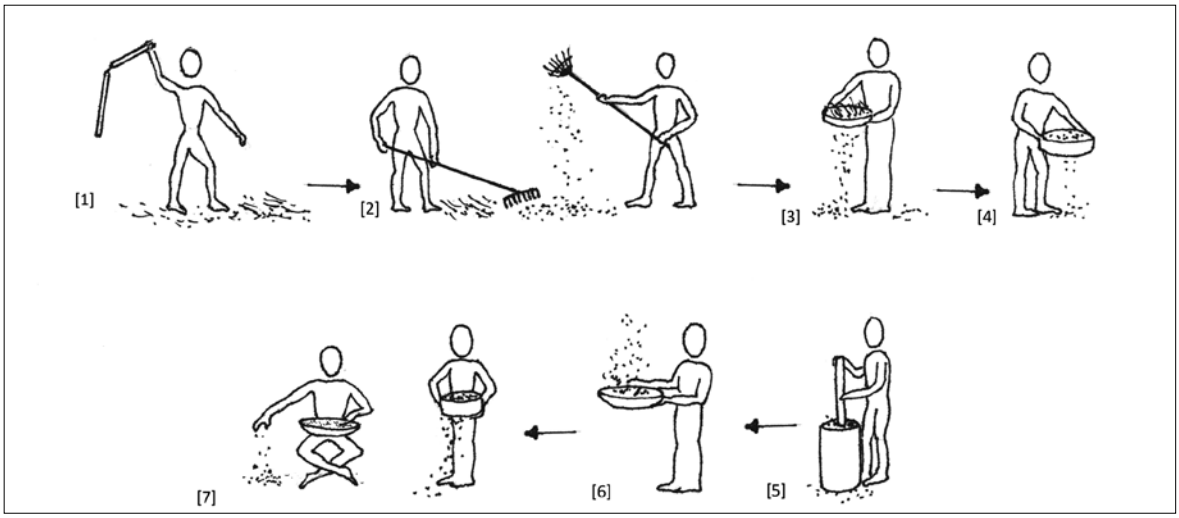
• Threshing: to release the grain from the chaff, possibly by beating with a stick or trampling by cattle;

• Winnowing: to remove the light chaff and weeds from the grain possibly by wind or basket;

• Coarse sieving: to remove larger items such as weed heads, un-threshed ears and straw;

• Fine sieving: to remove the small weed seeds from the grain with narrower meshed sieves.

Glume wheats (e.g. einkorn, emmer and 'new type' glume wheat) on the other hand require further processing stages to release the grain from the tight glumes. For example, a parching stage to dry



Slika / Figure 5. Obrada usjeva: 1. vršidba, 2. pročešljavanje i ispuhivanje, 3. grubo prosijavanje, 4. fino prosijavanje, 5. udaranje (uklanjanje ovojnice s pšenice s ovojnicom), 6. ispuhivanje, 7. grubo i fino prosijavanje i ručno probiranje / Crop processing activities: 1. Threshing, 2. Raking and Winnowing, 3. Coarse sieving, 4. Fine sieving, 5. Pounding (dehusking glume wheats), 6. Winnowing, 7. Coarse and fine sieving and hand-picking (crtež/drawing: M. Galić, prema/after: Stevens 2003).

jekom koje ovojnica postane krhka i spremna za udaranje te drugu fazu prosijavanja (prema Hillman 1984; Van der Veen 1992).

Pojednostavljeno, ovaj model sugerira da uzorak s visokim udjelom zrna žitarica i malo ostalih tvari, koji je posljedica jedne epizode spaljivanja i odlaganja, predstavlja kraj procesa obrade usjeva kada je zrno spremno za upotrebu. Suprotno tomu, uzorak s visokim udjelom ostataka ovojnica, koji je također posljedica jedne epizode spaljivanja i odlaganja, vjerojatno predstavlja otpad od obrade usjeva (stupnja u kojem se pljeva odvaja od zrna).

S eneolitičkih lokaliteta izdvojeno je samo pet vrsta zrna i pljeve žitarica: ječam, jednozrna pšenica, dvozrna pšenica, 'novi tip' pšenice s ovojnicom i gola pšenica. Od ovih pet, u uzorcima kvantitetom i frekvencijom prevladavaju dvozrna i jednozrna pšenica. Pregledom proučavanih lokaliteta, čini se izglednim da su mnogi od uzoraka s malom gustoćom biljnih ostataka deponirani kao posljedica različitih epizoda spaljivanja. Ipak, moguće je da velika gustoća ostataka ovojnica od takvih vrsta pšenica utvrđena na lokalitetu Slavča dokazuje postojanje otpada od obrade usjeva. Neki autori predlažu da se dnevna obrada pohranjene pšenice s ovojnicom odvijala u kućanstvu te da je zatim otpad (pljeva žitarica) odbacivan u vatru gdje je karboniziran (cf. Hillman 1984; Gregg 1989; Meurers-Balke & Lüning 1992; Bogaard 2004: 68; Kreuz 2012). Otpad iz ovih vatrišta naknadno je mogao biti odložen izvan kuća u jamama ili jarcima oko naselja. Pronalazak jednog komada stapke ječ-

the grain and render the glumes brittle ready for pounding, a 2nd winnowing stage, followed by a 2nd sieving stage (after Hillman 1984; Van der Veen 1992).

Simply, this model suggests that a sample with high numbers of cereal grains and not much else, which resulted from one burning and depositional event, would represent the end of the crop processing stages where the grain is ready for consumption. On the other hand, a sample with a high number of glume bases, also resulting from one burning and depositional event, probably represents crop processing waste (i.e. where the chaff is removed from the grain).

Only five types of cereal grain and chaff were identified from the Eneolithic sites: barley, emmer, einkorn, 'new type' glume wheat and naked wheat. Of these five, emmer and einkorn dominate the samples both in the quantity and the frequency. Examining the study sites, it is likely that many of the samples with low densities of plant remains were deposited as a result of different charring events. However, the high density of glume wheat glume bases seen at Slavča may suggest evidence of crop processing waste. Some suggest that the daily processing of stored glume wheats occurred within the household, where the waste (cereal chaff) was then swept into fires and carbonised (cf. Hillman 1984; Gregg 1989; Meurers-Balke & Lüning 1992; Bogaard 2004: 68; Kreuz 2012). The waste from these fires could have then been deposited outside the houses in pits or ditches around the settlement. The recov-

ma u Slavči također bi mogao ukazivati na to da je ječam uglavnom obrađivan izvan naselja, ili da je bio tek sporadično uzgajan na lokalitetu. Ipak, ostaci stapki žitarica krhkiji su od ostataka ovojnica i moguće je da naprosto nisu izdržali proces karbonizacije, što je dovelo do njihove premale zastupljenosti u uzorcima s lokaliteta (cf. Dennell 1976; Hillman 1981; Boardman & Jones 1990).

Prosa poput vrsta *Panicum* i *Setaria* prolaze slične stupnjeve obrade kao i pšenice s ovojnicom, zbog toga što je i njih potrebno vršiti (Harvey & Fuller 2005). Etnografska opažanja iz Španjolske pokazala su da jedna metoda obrade vrste *Panicum* zahtijeva zagrijavanje zrna, bilo na suncu ili u pećnici, a što olakšava uklanjanje ljuske korištenjem mužara (Moreno-Larrazabal et al. 2015). Zabilježeno je da je četirima ženama bilo potrebno 40 minuta da bi očistile 1 kg prosa pomoću mužara. Na eneolitičkim lokalitetima nije pronađena prosena pljeva, što sugerira da tijekom tog razdoblja proso nije obrađivano na prostoru Hrvatske. Međutim, prosena pljeva rijetko izdrži proces karbonizacije, zbog čega njezin izostanak može biti posljedica stupnja očuvanosti uzorka.

Jones (1984) i Butler (1992; Butler et al. 1999) također su proučavali mahunarke s etnološkog aspekta, osobito grahorice, graške, leću i sjetvenu kukavičica. Njihove studije pokazuju da se vrste *Vicia* i *Lathyrus* mogu obrađivati na sličan način kao žitarice bez ovojnice, ali da je proces vršidbe složeniji, budući da mnoge mahune ne puknu tijekom prve vršidbe, već njihova obrada zahtijeva više faza (Butler et al. 1999). Iz razdoblja eneolitika ne postoje dokazi o obradi mahunarki, što može biti posljedica mnogobrojnih razloga, uključujući obrađivanje mahunarki izvan naselja, čime njihovo dospijevanje u vatru i očuvanje u arheološkom kontekstu bilo onemogućeno.

Drugi izvori hrane

Teško je procijeniti ulogu divljih vrsta biljaka u pretpovijesnim zemljoradničkim zajednicama, ali izgledno je da su one imale važnu ulogu u eneolitičkoj prehrani. Povrh toga, divlje biljke mogle doprinositi i drugim aspektima ljudskog života. Primjerice, mogle su biti korištene kao građevinski materijal, lijekovi, boje, gorivo, krmna hrana, ili pak u različitim zanatima ili ritualima. Razlika između jestivih i nejestivih divljih vrsta u arheobotaničkim ostacima daleko je od jednostavne te se

ery of only one barley rachis at Slavča may also suggest that barley was mainly processed away from the settlement, or was only a minor crop at the site. However, cereal rachis is more fragile than glume bases and may simply have not survived the carbonisation process, resulting in its underrepresentation at the sites (cf. Dennell 1976; Hillman 1981; Boardman & Jones 1990).

Millets, such as *Panicum,* and *Setaria,* share similar processing stages with glume wheats, as millets also require dehusking (Harvey & Fuller 2005). Ethnographic observations in Spain have shown that one method of processing *Panicum* involves the warming of grains, either in the sun or in an oven, to help remove the hull when pounded in mortars (Moreno-Larrazabal et al. 2015). They observed that to dehusk 1 kg of broomcorn millet in a mortar it took approximately four women 40 minutes. No millet chaff was recovered from the Eneolithic sites suggesting that they were not processing millet during this period in Croatia. However, millet chaff is less likely to survive the carbonisation process and so its absence could also be a result of preservation.

Pulses, in particular vetches, peas, lentils and grass peas, have also been examined ethnographically by Jones (1984) and Butler (1992; Butler et al. 1999). These studies showed that *Vicia* and *Lathyrus* can be treated similarly to free-threshing cereals, but that there is a spectrum of threshability, as many pods do not shatter during the first threshing requiring further threshing (Butler et al. 1999). Evidence of pulse processing waste is not evident during the Eneolithic, however this may be due to a number of reasons including the processing of the pulses away from the settlements and the lack of opportunity of the remains to come into contact with fire and preserve in the archaeological record.

Other sources of food

It is difficult to assess the role of wild plants in prehistoric farming communities, but it is likely that they played an important role in the Eneolithic diet. Moreover, wild plants would have also contributed to other aspects of human life, being used as building materials, medicines, dyes, fuel, animal fodder, crafts or rituals. The distinction between edible and non-edible wild taxa in archaeobotanical samples is far from straightforward and is often based on those that are 'obviously gathered', due to the high

često temelji na onim vrstama koje su „očito sakupljane“, bilo zbog toga što su mnogobrojne među ostacima (Jacomet 2009), što su pronađene u kontekstima povezanim uz pohranu hrane, ili su naprosto jestive. Nadalje, divlja biljna hrana tipično je nedovoljno zastupljena među nagorenim ostacima zbog slabe očuvanosti. Primjerice, listovi salate neće se sačuvati ako dođu u kontakt s vatrom.

Plodovi

Na proučavanim eneolitičkim lokalitetima pronađen je određen broj drugih jestivih vrsta koji ukazuje na kontinuirano iskorištavanje neposrednog okoliša. Prikupljanje drijena (*Cornus mas*), iako u malim količinama, zabilježeno je na gotovo 50% nalazišta. Drijen se sakuplja u kasno ljeto i ranu jesen te je prepun vitamina C. Ljoskavac (*Physalis alkekengi*) je također definiran među uzorcima, iako češće u onim iz kasnog eneolitika. Slično kao i drijen, ljoskavac je bogati izvor vitamina C i ima dugu povijest upotrebe u ljekovite svrhe. Drugi, iako manje česti, plodovi koji su mogli biti uključeni u prehranu su kupine (*Rubus fruticosus*), lješnjak (*Corylus sp.*) i trnjina (*Prunus cf. spinosa*).

Divlje vrste

Druge moguće jestive vrste uključuju bijelu lobodu (*Chenopodium album*), čiji su listovi, sjeme i cvijet jestivi, zatim listove koprive (*Urtica* sp.) i mentu (*Mentha* sp.). Ipak, mnoge od definiranih vrsta često rastu uz usjeve kao korov. Primjerice, na nalazištima neolitičke kulturne skupine s trakastom keramikom, uz uzgajane se usjeve učestalu i sljedeće divlje vrste: *Bromus secalinus, Chenopodium album, Galium aparine, Galium Spurium*, i *Polygonum convolvulus* (Kruez & Schäfer 2011). Određeni broj ovih vrsta pojavljuje se i na eneolitičkim lokaltetima, zbog čega se izglednijim čini to da su te divlje vrste zapravo korovi koji su sačuvani zbog načina obrade žitarica, a ne da su namjerno prikupljani kao samonikli izvori hrane.

density of remains (Jacomet 2009), are within contexts associated with storage, or are simply edible. Furthermore, wild plant foods will also be typically under-represented in charred samples due to preservation. For example, salad leaves are not likely to preserve if they come into contact with fire.

Fruits

At the Eneolithic sites a number of other edible species were recovered that indicate the continued exploitation of the local environment. The collection of cornelian cherry (*Cornus mas*) is seen at nearly 50% of the sites, although in small numbers. Cornelian cherries are harvested in the late summer and early autumn and are high in vitamin C. Chinese lantern (*Physalis alkekengi*) is also identified from the samples, although more commonly from the later Eneolithic sites. Similarly chinese lantern is a rich source of vitamin C and has a long history of medicinal uses. Other less common fruits which could have been eaten include blackberry (*Rubus fruticosus*) hazelnut (*Corylus* sp.) and sloe (*Prunus* cf. *spinosa*).

Wild species

Other possible edible species could have included fat hen (*Chenopodium album*), whose leaves, seeds and flowers are all edible, as well as the leaves of nettles (*Urtica* sp.) and mint (*Mentha* sp.). However, many of the species recovered are also commonly found as weeds in cultivated crops. For example, at Neolithic Bandkeramik sites weed species found regularly in samples associated with manured crops include, *Bromus secalinus, Chenopodium album, Galium aparine, Galium Spurium*, and *Polygonum convolvulus* (Kruez & Schäfer 2011). A number of these species are also found at the Eneolithic sites making it likely that many of the wild species are in fact weeds from the crop processing waste rather than collected wild foods.

Zaključak

Čini se da se uzgajanje žitarica tijekom eneolitika u kontinentalnoj Hrvatskoj temeljilo na ječmu te dvozrnoj i jednozrnoj pšenici. Sporadični nalazi drugih vrsta žitarica, poput gole pšenice i prosa, mogli bi sugerirati da te biljke nisu često uzgajane u tom razdoblju te da su potencijalno rasle kao korov uz glavne usjeve žitarica. Velik broj ostataka pljeve pronađene na mnogim nalazištima ukazuje na to da se prerada žitarica s ovojnicom – dvozrne i jednozrne pšenice, odvijala u naselju, moguće u više pojedinačnih navrata. Takva praksa utjecala bi na potrebe za radom unutar naselja, s obzirom na to da pohranjivanje relativno nečistih usjeva (npr. djelomično vršenog klasja) zahtijeva manje rada ljeti, ali rutinska „dnevna obrada" zahtijeva više vremena. S obzirom na izneseno, predloženo je da ljudi koji pohranjuju neobrađene ili djelomično obrađene usjeve mogu provesti žetvu i, moguće, preliminarno vršidbu unutar jednog kućanstva (Fuller & Stevens 2009), iako su potrebna nova istraživanja koja bi potvrdila je li tako nešto bilo moguće u eneolitičkim naseljima.

Uz žitarice, izgledno je da su i mahunarke redovito uzgajane kao usjevi na lokalitetima, ali zbog ograničene količine nalaza s područja Hrvatske nije jasno koje su to mahunarke mogle biti. Ipak, one su važne za održavanje kvalitete tla, kao stočna hrana i dodatan izvor bjelančevina i amino kiselina u ljudskoj prehrani te su, vrlo vjerojatno, bile dijelom eneolitičkog sustava poljoprivrede. Još jedan od usjeva koji su vjerojatno bili uzgajani je lan, koji je mogao biti korišten za dobivanje ulja, ali i vlakana. Kao dopuna prehrani temeljenoj na žitaricama i važan izvor vitamina C, također su sakupljani i divlji plodovi poput drijena, ljoskavca i kupine.

Conclusion

During the Eneolithic in continental Croatia cereal production seems to have been based around the growing of barley, emmer and einkorn. The sporadic finds of other cereals, such as naked wheat and millet, would suggest that they are not commonly grown during this period and may even be weeds within the main cereal crops. The large number of chaff remains found at many of the sites indicate that crop processing of the glume wheats emmer and einkorn occurred within the settlement, possibly piecemeal. This would have an impact on the labour requirements within a settlement as the storage of relatively unclean crops (e.g. partially threshed ears) will have a less intensive demand on labour in the summer, but routine 'daily processing' will consume more time. It has therefore been suggested that those storing crops with little to no processing will be able to perform harvesting and perhaps preliminary threshing and raking within just the nuclear household (Fuller & Stevens 2009), although further research is needed to confirm whether this could have been possible at the Eneolithic settlements.

In addition to the cereals, pulses were also likely to have been regularly grown as crops at the sites. The limited evidence within the Croatian assemblage makes it unclear what pulses may have been regularly grown, however, they are important for soil health, for animal feed and also an additional source of protein and amino acids in the human diet and were likely part of the Eneolithic farming regime. Another crop that was likely grown was flax which could have been used as both an oil and fibre crop. To supplement the crop based diet, and provide an important source of vitamin C, wild fruits would have also been collected including cornelian cherry, chinese lantern and blackberries.

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