

Eksploatacija soli u eneolitiku

The exploitation of salt in the eneolithic

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Natrijum hlorid (NaCl) poznatiji kao kuhinjska, morska, kamena, varena, vakumirana ili jednostavno sol, veoma je značajna za život. Odsustvo soli izaziva bitne poremećaje u fiziološkom funkcionisanju ljudskog i životinjskog organizma jer bez neophodnih minimalnih količina naši organizmi ne bi mogli opstati (Buljugić 1990: 6). Teško je reći od kada datira, ali se pretpostavlja da je upotreba soli nastupila još tokom kamenog doba, u periodu promjene ekonomije, prelaska sa lovačko - sakupljačke privrede na poljoprivredu i stočarstvo (domestifikaciju/ uzgoj životinja i žitarica i sedentarni način života) tadašnjeg stanovništva. Korištena je kao dodatak ishrani, kako čovjeka tako i životinja, upotrebljavala se za konzerviranje prehrambenih proizvoda, naročito ribe i mesa, zatim za štavljenje kože, prilikom izvođenja pojedinih rituala, a pogotovo kao lijek (i danas se ljekovitost solnih voda najviše koristi kod liječenja oboljenja reumatizma, išijasa, ženskih bolesti i dr., dok korištenje solnih rastvora u inhalatoru liječi probleme disajnih puteva). Vremenom je počelo i njeno korištenje kao sirovine ili pomoćne materije i u hemijskoj proizvodnji (Imamović 1990: 19; Buljugić 1990: 6). Drevni narodi ulagali su velike napore kako bi dobili sol, tako što su je sami proizvodili ili sticali putem trgovine: sol se smatra jednom od prvih roba kojima se trgovalo i vršila razmjena. Na osnovu količine proizvodnje soli, mogao bi se izvesti zaključak o stepenu razvijenosti stanovništva jednog područja ali i o razvijenosti trgovine te oblasti (Buljugić 1990: 6).

Sodium chloride (NaCl), better known as kitchen, sea, rock, welded, vacuumed, or, simply, salt, is very significant for life. The lack of salt causes serious disturbances in the physiological functioning of human and animal organisms, because our organisms could not survive without the necessary minimal requirements (Buljugić 1990: 6). It is difficult to date it precisely, but it is assumed that the use of salt started during the Stone Age, a period when the economy of the populations changed from hunting and gathering to agriculture and animal husbandry (domestication/growing animals and plants, followed by a sedentary way of life). It was used as a supplement in the diets of both man and animals, it was used to preserve produce, especially fish and meat, in tanning hide, in certain rituals, and especially as a medicine (even today, salt water is used in curing rheumatism, sciatica, female diseases and the like, and salt inhalators are used to cure respiratory problems). With time, it was also used as a raw material or auxiliary material in chemical production (Imamović 1990: 19; Buljugić 1990: 6). Ancient peoples worked very hard to obtain salt, either by producing it themselves or obtaining it through trade: salt is thought to be one of the first goods used in trade and exchange. Based on the level of salt production, it is possible to make conclusions about the degree of development of a population in a given area, but also on the level of trade in the area (Buljugić 1990: 6).

Istraživanja eksploatacije i konzumiranja soli veoma su različite u zavisnosti da li istražujemo prirodno, materijalno i nematerijalno nasljeđe, potragu za solju, tehnike eksploatacije i upotrebe alatki, tehnike dobijanja različitih proizvoda, transport, način ishrane ljudi i životinja, konzervaciju hrane. S druge strane, teme istraživanja uključuju i pokretljivost ljudi i životinja, eksploataciju divljači, simboličku upotrebu soli (mitologija, religija, kultovi i rituali, vjerovanja, sujeverja, magija i zavjeti), narodnu književnost (priče, razgovore i pregovore) i kulturnu literaturu, kontrolu solnih resursa, sukobe, strateške vrijednosti, geografske percepcije, profesije vezane za eksploataciju soli i njezinu upotrebu, ekonomske, pravne i administrativne propise, rječnik, toponimiju, kao i same potrošače (Alexianu 2015: 1). Iako ništa nije ostalo od samih proizvoda, arheološka realnost eksploatacije soli utvrđena je na terenu pomoću različitih vrsta dokaza koji informišu o primijenjenim tehnikama (slivovi, keramika ili akumulacije uglja), ili indirektno o uticaju na životnu sredinu, teritorijalnu organizaciju ili distribuciju robe. Sve informacije koje posjedujemo odnose se na tehnologiju korištenu za sakupljanje/dobijanje soli ili za mjesto na kojem se eksploatacija dešavala (Harding 2013: 111).

Sol se u prirodi javlja u obliku kamene soli ili impregnirana sa okolnim sedimentima ali i rastvorena u vodi (morskoj, slanim jezerima i izvorima), kao stepska sol (izmiješan pijesak sa solju nakon sušenja vode) ili u vulkanskom eruptivnom kamenju (Jovanović 1941: 127). Od praistorije, kamena sol, slana jezera i izvori slane vode bili su veliki izvori soli u unutrašnjosti kopna, dok se u priobalnim područjima sol dobijala iz morske vode. Veoma je bitna činjenica da danas imamo više podataka vezano za eksploataciju kontinentalnih nego morskih izvora soli tokom praistorije (Urem-Kotsou 2016: 128). Pretpostavlja se da je prvobitna sol sakupljena na obalama mora, slanih jezera i/ili slanih izvora tokom perioda maj - septembar (kada su najveće vrućine, a samim tim i najviši stepen isparavanja). Vremenom ljudi su naučili kako se sol može proizvesti, i to na tri načina: rudarenjem kamene soli, prirodnim isparavanjem slane vode u plitkim bazenima ili prisilnim isparavanjem koje se postiže zagrijavanjem slane vode na posebnim pećima, a kasnije i pomoću drvenih instalacija (korita i ograda). Pri tome slana voda koja se koristila mogla je biti morska, iz slanih izvora, a mogla se dobiti i ispiranjem iskopane kamene soli (Forenbaher 2013:

Research into the exploitation and use of salt greatly differs depending on what is studied – natural, material or immaterial heritage, the search for salt, exploitation techniques and tool usage, techniques used to obtain different products, transport, human and animal dietary habits, or food preservation. On the other hand, research topics also include the transit of people and animals, the exploitation of wild game, the symbolic use of salt (mythology, religion, beliefs, superstitions, magic and vows), folk literature (stories, conversations and prefaces) and cultural literature, the control of salt resources, its strategic value, the geographic perception, professions related to the exploitation of salt and its use, the economic, legal and administrative regulations, the vocabulary, toponymy, and the users themselves (Alexianu 2015: 1). Even though there are no remains of the products, the archaeological reality of salt exploitation was confirmed in the field with the help of different kinds of evidence that indicate specific techniques (confluences, pottery or coal accumulation), or indirectly attest to the marks salt left in a living area, on the organization of territory or the transfer of goods. All available information refers to the technology used to collect/obtain salt, or places of exploitation (Harding 2013: 111).

In nature, salt appears either as rock salt, or integrated with surrounding sediments, as well as melted in water (sea, salty lakes and springs), as steppe salt (sand mixed with salt after the water dries out), or in volcanic eruptive rocks (Jovanović 1941: 127). Since prehistory, rock salt, salty lakes and saltwater springs were big sources of salt on inland territories, while, on the coast, salt was obtained from sea water. It is very important to note that there is more available data on inland than coastal salt exploitation during prehistory (Urem-Kotsou 2016: 128). It is assumed that salt was originally collected on the coasts of seas, salty lakes and/or saltwater springs during the period between May and September (the greatest heats and the highest degree of evaporation). In time, people learned to produce salt in three ways: by mining rock salt, through the natural evaporation of salty water in shallow pools, or through forced evaporation that is achieved by heating salty water in special kilns, and, later, with the help of wooden installations (troughs and fences). In these processes, the salty water could have originated from the sea or saltwater springs, but could also be obtained by washing out mined rock salt (Forenbaher 2013: 179-194). In territories that are far from the sea or a saltwater spring, an impor-

179-194) Za područja udaljena od mora i bez izvora slanice, bitnu ulogu igrale su biljke koje sadrže određene količine natrijum klorida. Sol je dobijana spaljivanjem biljaka i rastvaranjem njihovog pepela. Takve biljke se nalaze i u našim krajevima a najpoznatija i najčešća je rusmarin (*Rosmarinus officinalis*). Navedenu metodu koristili su Indijanci, a danas ju koriste pojedina plemena Papuanaca u Novoj Gvineji (Imamović 1990: 22).

Dok u Sredozemlju jaka insolacija i suhi vjetrovi omogućavaju prirodno isparavanje, sjevernije u Evropi proizvodnja soli nije moguća bez prisilnog isparavanja (Forenbaher 2013: 179-194). Pretpostavlja se da je prva „eksploatacija“ soli vršena tokom ljeta kada je sunčevom toplotom dolazilo do isparavanja/evaporacije brojnih solnih izvora i potoka, ostavljajući pri tome koru kristala soli na površini, nakon čega se sol sakupljala i koristila. Kako je sunce samo sredinom ljeta dovoljno toplo da proizvede razumnu količinu soli, bilo je neophodno da se nađu drugi metodi eksploatacije (Harding 2016: 213). Jedan od najranijih načina dobijanja soli, koji je arheološki dokumentovan u centralnoj i sjevernoj Evropi, bilo je isparavanje rastvorene kamene soli tehnikom briketaže, a koja uključuje iskuhavanje rastvora soli ili slanice u keramičkim posudama do tačke ključanja. Najranija briketaža prema dostupnim izvorima evidentirana je u centralnoj Evropi i potiče iz ranog neolita (sredina 5. milenijuma p.n.e.). Na zapadnom Sredozemlju najraniji dokazi proizvodnje soli datiraju iz perioda srednjeg neolita (kraj 5. milenijuma p.n.e.) ali se odnose na rudarstvo kamene soli, dok na istočnom Mediteranu dokazi eksploatacije i korištenja soli nose datum već iz ranog neolita u Anadoliji (7. milenijum p.n.e.) i bronzanog doba u Egeji. Očekuju se i pronalasci jasnih dokaza tehnika rane eksploatacije soli u području jezera Tuz Gölü u centralnoj Anadoliji, gdje se kristalisana sol nastala isparavanjem iz slanog jezera prikupljala sa površine. Prikupljanje morske soli iz prirodnih „solana“ (npr. bazeni kamene soli pored mora) i slanih rastvora isparavanjem u posudama, jedini su konkretni dokazi eksploatacije i upotrebe soli u Egeju do sada. U jugoistočnoj Evropi najranija proizvodnja soli datira još od ranog neolita (kraj 7. milenijuma p.n.e.), a tehnike koje se korištene u ovoj ranoj proizvodnji soli još uvek nisu u potpunosti razjašnjene, ali ne uključuju briketažu (Weller 2002; Kopaka & Chaniotaki 2003; Weller & Dumitroaia 2005; Atalai & Hastorf 2006; Erdoglu & Ozbasaran 2008; navedeno prema Urem-Kotsou 2016: 129).

tant role was played by plants that contain large amounts of sodium chloride. Salt was obtained by burning plants and searching through the ashes. Such plants grew on our territories, and the best known and common one is rosemary - *Rosmarinus officinalis*. The described method was used by Indians, and is still used by Papua tribes in New Guinea (Imamović 1990: 22).

While the insolation and dry winds make natural evaporation possible in the Mediterranean, in more northern parts of Europe it is not possible to produce salt without forced evaporation (Forenbaher 2013: 179-194). It is assumed that the first “exploitation” of salt took place during the summer when the heat of the sun caused vaporization/evaporation of numerous saltwater springs and streams, leaving a crust of salt crystals on the surface that could then be collected and used. As the sun is only warm enough to produce a reasonable amount of salt in the middle of summer, it was necessary to find other methods of exploitation (Harding 2016: 213). One of the earliest archaeologically documented ways of obtaining salt, at least in central and northern Europe, is the evaporation of rock salt solutions by using the briquetage technique, which includes the heating of brine or saline water in ceramic vessels until it reaches boiling point. According to available sources, the earliest briquetage was recorded in the Early Neolithic (middle of the 5th millennium BC) of central Europe. In the western Mediterranean, the earliest evidence of salt production can be dated to the Middle Neolithic (end of the 5th millennium BC), but it refers to mining rock salt. In the eastern Mediterranean, evidence of salt exploitation and use can be dated to the Early Neolithic in Anatolia (7th millennium BC) and to the Bronze Age in the Aegean. It seems likely that clear evidence of early salt exploitation will emerge in the area of the Tuz Gölü Lake in central Anatolia, where crystalized salt, created by evaporation of lake water, was collected from the surface. The collecting of salt from natural “salt works” (e.g. pools of rock salt near the sea), and salty solutions through evaporating in vessels, are, so far, the only clear pieces of evidence of salt exploitation and use in the Aegean. In southeastern Europe, the earliest salt exploitation can be dated to the Early Neolithic (end of the 7th millennium BC), but the applied techniques are still not fully understood. However, it seems they did not involve briquetage (Weller 2002; Kopaka & Chaniotaki 2003; Weller & Dumitroaia 2005; Atalai & Hastorf 2006; Erdoglu & Ozbasaran 2008; navedeno prema Urem-Kotsou 2016: 129).

Što se tiče samog načina procesa dobijanja soli briketom, Forenbaher u svom radu (2013: 185-187) u opisu navodi dvije faze. U prvoj fazi proizvodnje, slana voda iz mora ili iz slanih izvora grijana je u širokim plitkim zemljanim posudama debelih zidova. Za ovaj postupak bila je potrebna velika količina goriva, drveta ili drvenog ugljena, a vatru je trebalo neprestano održavati i nadzirati kako posude ne bi popucale.¹ Dok je voda postepeno isparavala, iz zasićenih otopina obarali su se kristali soli i na dnu posude sakupljala se slana kaša. Za ovu fazu proizvodnje često se koristi izraz «prokuhavanje», iako se voda ne mora nužno zagrijavati do ključanja. Sličan postupak, pod nazivom «vađenje», koristio se u tuzlanskoj solani sve do 1939. godine. Druga faza proizvodnje podrazumijevala je premještanje koncentrisanih otopina soli u glinene kalupe. U njima se slana kaša prosušivala na posebnoj vrsti peći, sve dok se ne bi formirali kompaktni tzv. kolačići soli. Ukoliko je sol bila prljava, dodavala se slatka voda te se postupak ponavljao, sve dok se nečistoće ne uklone. Glineni kalupi obično su ujednačenih oblika i dimenzija, naročito u proizvodnim središtima kasnijih perioda (npr. iz perioda željeznog doba). Napravljeni su za jednokratnu upotrebu jer ih treba razbiti prilikom vađenja tvrdog kolačića. To se može učiniti na mjestu proizvodnje, ali kalup je mogao poslužiti i kao ambalaža za transport. Kalupi su se proizvodili masovno, oblaganjem drvene matrice glinom, čime se osiguravala identičnost proizvedenih kolačića. Standardizovani kolačići soli ujednačene vrijednosti bili su idealni za razmjenu. Konstrukcija i način upotrebe peći za prosušivanje slane kaše dobro su poznati zahvaljujući sada već obilnijoj arheološkoj građi, etnografskim izvorima i eksperimentalnoj arheologiji.

Na ravnu, blago ukopanu površinu tla slažu se u pravilnim razmacima uspravni vretenasti podupirači napravljeni od pečene zemlje. Na svaki podupirač stavlja se po jedan zemljani kalup za prosušivanje slane kaše. Tlocrtne dimenzije etnografskih primjera takvih peći su oko 3 x 5 metara, a sastavljene su od stotinjak potpornih stubića i isto toliko kalupa. Zbog stabilnosti, potpornji i kalupi međusobno se povezuju mekim grudvicama sirove gline. Peć se nakon toga zatvara sa svih strana zidovima od gline i ulomaka polomljenog briketaža, s tim da je ostavljan otvor za loženje i provjetranje. Kako

¹ Prilikom pregleda materijala sa iskapanja iz perioda 2007. – 2009. godine u Muzeju istočne Bosne u Tuzli, uočen je sistem ispućalosti koničnih fragmenata posuda na jednoj strani, po istom sistemu pućanja (IP).

When it comes to the sole process of obtaining salt through briquetage, in his paper, S. Forenbaher (2013: 185-187) describes two phases. During the first phase of production, salty water from the sea or saltwater springs was heated in wide shallow clay vessels with thick walls. This procedure required large amounts of fuel, wood or charcoal, and the fire needed to be continuously maintained and supervised so that the vessels would not break.¹ As the water gradually evaporated, the salt crystals fell to the bottom of the saturated solution, creating a salty mixture. This phase of production is often called “boiling”, although the water does not reach boiling point. A similar process, called “brewing” was used in the salt works at Tuzla until 1939. The second phase of production included the transfer of saturated solutions into clay molds. In them, the salty mixture was dried on a special type of kiln until compact, so called, salt cakes, were formed. If the salt was impure, fresh water was added and the process was repeated until all of the impurities were removed. Clay molds were usually uniform in shape and size, especially in production centers from later periods (e.g. the Iron Age). They were made for single use because they had to be broken to extract the hard cake. This could be done at the place of production, but the mold could also be used as packaging for transport. The molds were mass produced by covering a wooden matrix with clay, thereby ensuring that the produced cakes were identical. Standardized salt cakes of uniform value were ideal for trade. The construction and the ways in which kilns were used to dry out the salty mixture are well known due to the quite abundant archaeological material, archaeological sources and experimental archaeology.

Upright spindly supports made out of fired clay were placed onto flattened and slightly dug out soil. A mold was then placed on each support to dry out the salty mixture. Ethnographic examples of such kilns show that the layout size of such kilns was 3x5 m, and that they were composed of about a hundred supports and the same number of molds. For stability, the supports and the molds were connected by small clumps of raw clay. After this, the kiln was closed off on all sides by walls made of clay and fragments of broken briquetage, with an exhaust hole for feeding the fire and letting in fresh air. As reported further on, the experiments and

¹ During the analysis of material from the excavations conducted between 2007 and 2008 at the Museum of Eastern Bosnia in Tuzla, a system of cracks was registered on one side of conical pedestals, and it followed a uniform pattern (IP).

se dalje navodi, prema provedenim eksperimentima i etnografskim podacima, isušivanje slane kaše na laganoj vatri, pri temperaturi od oko 100°C, moglo je trajati između 12 i 24 sata. Nakon hlađenja, sol se vadila iz kalupa ili se odnosila u kalupima, pri čemu se peć rušila i rastavljala. Neoštećeni dijelovi briketaza (posebno potporni stubići) mogli su se ponovo upotrijebiti. Najprepoznatljiviji dio briketaze i jesu potporni stubići koji su, da bi bili korišteni u istoj peći, morali biti jednakih dimenzija, te su vjerovatno izrađivani unaprijed i serijski. Sastav gline trebalo je prilagoditi tek toliko da se ne raspuca na vatri. Budući da se radi o upotrebним predmetima kratkog vijeka trajanja, nije ih trebalo ukrašavati. Naročito su karakteristični stubići kojima je jedan kraj zaravnjen ili konkavan te blago proširen, a drugi se račva u tri jednaka roščića. Trorogi završetak mogao je biti okrenut prema gore, ali i prema dole, što je vjerojatno zavisilo od podloge na koju su stubići postavljeni. Njihova orijentacija može se odrediti prema tragovima pečenja jer je vrh stubića bio izložen oksidaciji znatno više nego baza (Forenbaher 2013: 179-194).

Za period paleolita nemamo nikakvih dokaza o interesovanju ljudi za sol osim lokacija staništa ili boravka ljudi a koji su u blizini izvora soli, kao i pretpostavku da su dovoljan unos soli ostvarivali prirodnim putem ishrane. Prvi opipljiv dokaz o konzumaciji soli iz rane praistorije datovan je kao mezolitski sa lokaliteta Provanse, gdje su nađeni ostaci drvene ograde koja je, pretpostavlja se, korištena za evaporaciju slanice.

Eksploatacija soli tokom neolita i eneolita u nekim slučajevima čini se posebno dinamičnom zbog značajnih količina keramičkih fragmenata nađenih oko određenih solnih izvora, ponekad povezanih sa strukturama sagorjevanja ili ostataka. Postojeći podaci o eksploataciji soli su oskudni, a najraniji pouzdani dokazi dolaze sa nedavno iskopanog lokaliteta Poiana Slatinei u Lunca u Rumuniji, gdje keramika ranog neolita i radiokarbonski datumi ukazuju na eksploataciju solnih izvora od kraja 7. milenijuma prije nove ere. Ogromne količine pepela, uglja i spaljene zemlje bez dokaza o briketazi ukazuju na eksploataciju soli tehnikom koja obuhvata vatru bez keramike, ili barem bez tipičnih posuda za briketazu. Nakon ovog lokaliteta slijede Gornja Tuzla u Bosni i Hercegovini, Mala Poljska, Varna i Provadia-Solnitsata u Bugarskoj, Kataloniji (Harding 2013: 43-44, 50; Urem 2016: 130-133). Za Karpatski bazen još uvijek nema konkretnih podataka neolitske eksploatacije, dok

ethnographic data suggest that drying out the salty mixture at a temperature of about 100-100°C could have taken between 12 and 24 hours. After cooling, the salt was taken out, in or out of the molds, and the kiln was destroyed and disassembled. The undamaged parts of the briquetage (especially the supports) could have been reused. The most representative parts of briquetage are exactly the supports that had to be of the same size if they were used in the same kiln, and were probably made in advance and through serial production. The composition of the clay paste had to be adjusted only so that it does not fall apart in the fire. Seeing as supports were utilitarian objects, they did not have to be decorated. Supports that have one straight or concave end and another that widens into three horns are especially characteristic. The three-horned ends could have faced up or down, which probably depended on the type of surface that was used as the base. Their orientation can be determined based on burning marks, because the top of the support was far more exposed to oxidation than the base (Forenbaher 2013: 179-194).

There is no evidence that Paleolithic people were interested in salt, other than traces of habitats that were close to sources of salt, as well as the assumption that they could get sufficient amounts of salt naturally through their diet. The first tangible evidence of salt consumption in early prehistory was discovered at the Mesolithic site of Provence, which yielded traces of a wooden fence that was, presumably, used for evaporating brine.

In some cases, dated to the Neolithic and Eneolithic, salt exploitation seems to have been especially dynamic, as indicated by significant amounts of pottery fragments discovered around saltwater springs, and which are sometimes connected with burnt structures or remains. The existing data on the exploitation of salt is sparse, and the earliest reliable evidence was discovered at the recently excavated site of Poiana Slatinei in Lunca, Romania, where early Neolithic pottery and radiocarbon dates suggest that saltwater springs were exploited since the end of the 7th millennium BC. The enormous amounts of ash, charcoal and burnt soil, with no traces of briquetage, suggest that salt was exploited by a technique that included fire and not pottery, or at least not the typical briquetage-related vessels. Other than there, evidence was also discovered at Gornja Tuzla in Bosnia and Herzegovina, Little Poland, Varna and Provadia-Solnitsata in Bulgaria, and Catalonia (Harding 2013: 43-44, 50; Urem

se za Transilvaniju svi neolitski lokaliteti vezuju za solne izvore (Harding 2013: 47). Podaci o prvoj rudarskoj eksploataciji soli vežu se za lokalitet Duzdaği, Azerbajdžan (Harding 2013: 49, 52). Posljednja otkrića koja su vezana za praistorijsku proizvodnju soli u Evropi uključuju lokalitete iz Austrije (Hallstatt, Dürrenberg blizu Halleina), Francuske (Seille vally u Lorraine), Španije (period kulture zvonastih pehara u Vilafáfilu kod Zamore), Bugarske (neolitski i eneolitski lokalitet u Provadiji, Varna) i Rumunije (neolitski lokaliteti Moldavije i bronzanog doba Transilvanije), a istovremeno je obnovljen interes za ovu temu u Njemačkoj, Poljskoj, Italiji i Britaniji, kao i drugim dijelovima Francuske (uglavnom bronzanog i metalnog perioda) (Harding 2013: 11). Jedan od rijetkih nalaza stvarne soli dolazi iz bronzanog doba iz pećine Ourania na istočnom Kritu (Kopaka & Chaniotakis 2003) gdje je tokom iskopavanja otkriveno pola kilograma soli, i velikih i malih komada (uključujući i sol u prahu). Oko izvora soli Halle-a u Njemačkoj pronađeni su ostaci prvih glinenih kalupa lokalnog porijekla, otvorenog oblika sa brojnim primjesama od sirove gline ili od namotaja/kalema, sa otiscima prstiju ili biljaka, sa tragovima pletenog dijela (asure) na bazi, ivice i spoljni zidovi su nedovršeni, ali je unutrašnji dio uredno usaglašen. Fragmentacija je, međutim, značajna, zbog namjernog lomljenja kako bi se izvadili solni kolači/kocke/dijelovi (Weller 2012: 189). Upotreba keramičkih kalupa praktično identičnih oblika i volumena od strane svake kulturne grupe potvrđuje posvećenost proizvodnji i pakovanju soli prema unaprijed definisanom obliku, u kompaktnom obliku i jednostavnom za transport. Proizvodnja nije bila usmjerena samo na proizvodnju soli, nego i na proizvodnju standardizovanog oblika i kvaliteta, veličine i težine. Na osnovu toga solni kolač postaje društveni predmet, identifikacioni marker proizvođača. U tom obliku kretaće se jednostavno, dijeliće se bez gubitka upotrebne vrijednosti i skladištiti dugi niz godina. U centralnoj i istočnoj Evropi, sredinom 5. milenijuma prije nove ere, razvijena je kristalizacija i oblikovanje soli u glinenim posudama (Weller 2012: 189).

Tokom bronzanog doba mogu se identifikovati četiri vrste produkcije soli u Evropi. Dvije od njih uključivale su isparavanje slane vode (slane ili morske vode), koristeći briketažu i primjenu toplate, ili putem insolacije, djelovanjem sunca, na slanu vodu u lagunama; jedna uključuje rudarstvo ili eksploataciju kamene soli; a posljednja uključuje mješavinu rudarstva i koncentrovanog rastvora

2016: 130-133). There is still no tangible evidence of Neolithic salt exploitation in the Carpathian basin, while all Neolithic sites in Transylvania are connected to saltwater springs (Harding 2013: 47). Data about the first mining of salt pertains to the site of Duzdaği, Azerbaijan (Harding 2013: 49, 52). The latest discoveries related to prehistoric salt production in Europe come from sites in Austria (Hallstatt, Dürrenberg near Hallein), France (Seille vally in Lorraine), Spain (the Bell beaker culture in Vilafáfila near Zamora), Bulgaria (Neolithic and Eneolithic site in Provadia, Varna), and Romania (Neolithic sites in Moldavia and Bronze Age sites in Transylvania). At the same time, this topic has again become interesting in Germany, Poland, Italy and Britain, as well as in other parts of France (mostly Bronze Age and metal periods) (Harding 2013: 11). One of the rare finds of real salt, dated to the Bronze Age, comes from the Ourania cave on eastern Crete (Kopaka & Chaniotakis 2003), where half a kilogram of salt was excavated, in large and small chunks (as well as powdered salt). Remains of the first molds were found around the Halle salt source in Germany. The molds were of local origin, had an open shape and numerous inclusions of raw clay or spools, as well as fingerprints or plant imprints, traces of weaving (mats) at the base. The edges and outer walls were not preserved, but the interior was neatly arranged. However, the fragmentation was great due to the intentional breaking of the molds in order to obtain the salt cakes/cubes/parts (Weller 2012: 189). The use of ceramic molds that were practically identical in shape and volume by different cultural groups confirms that salt was produced and packaged according to a predefined mode, in compact shape that is easy to transport. Production did not only focus on the production of salt, but also on standardized shape, quality, size and weight. Consequently, the salt cake became a social object, an identifying marker of the producer. In that way, it could be easily transported, divided without loss of value, and stored for many years. At the beginning of the 5th millennium BC in central and eastern Europe, salt crystallization and shaping it in ceramic vessels was developed (Weller 2012: 189).

It is possible to identify four kinds of salt production in Europe pertaining to the Bronze Age. Two of them included the vaporization of salty water (saltwater or sea water), using briquetage and the use of heat, either through insolation, the effect of the sun on salt water in lagoons; one includes mining or the exploitation of rock salt; and the last includes

soli koristeći „tehniku korita” (Harding 2013: 54). Za solne lagune razumno je pretpostaviti da su postojale u mnogim dijelovima Evrope, posebno oko Mediterana (Harding 2013: 66). Briketaža se obično smatra jednim od glavnih obilježja proizvodnje stare sorte soli još u neolitskim kontekstima, ali posebno tokom perioda od metalnog do rimskog doba. Iako je u nekim područjima poznat značajan niz oblika, i dalje se ne može tačno reći kako je funkcionisao cjelokupni proces isparavanje slaniće i transport dobijenih soli kristala (Harding 2013: 54). U zavisnosti od toga koliko duboko u zemlju zalazi, tamo gdje je sol bila na površini, i nikakvo ili minimalno kopanje nije bilo potrebno, postupak se kategorizovao kao vađenje kamena; za razliku od toga, rudarstvo je obično uključivalo kopanje u zemlju. Što se tiče eksploatacije kamene soli u bronzanom dobu, vršeno je i rudarstvo i vađenje kamena, ali jedina lokacija sa nespornim dokazima o dubokom rudarstvu je Hallstatt na području Salzkammerguta u Austriji. Na drugim mjestima, naročito u Rumuniji, gdje se mnoge izloženosti kamene soli pojavljuju na ili blizu površine zemlje, vjerovatno je došlo do eksploatacije kamena čak i tamo gdje trenutno nemamo niti jedan trag. Gdje se kamena sol pojavljuje blizu površine, kao što je to slučaj sa područjem Becleana (Rumunija), iskopavanje je pokazalo da se kopanjem uklanjao najviši sloj soli eksploatacijom kamena ili rudnika, iako su to dopunjavali dodatni tehnološki procesi (Harding 2013: 61-62). Pretpostavlja se da su rudnici Halštata držali veliki ekonomski uticaj u bronzanom dobu i snabdijevali zapadni dio Karpatskog basena, dok je Vieliczka potencijalno snabdijevala sjeverni, Transilvanija istočni, a Tuzla južni dio (Harding 2013: 62). „Tehnika korita“ poznata je tek posljednjih nekoliko godina, iako su objekti korišteni u ovoj vrsti proizvodnje soli prvi put pronađeni u ranom XIX vijeku. Istorija otkrića opisana je nekoliko puta, nedavno od strane Hardinga i Kavruka u kontekstu objavljivanja njihovog rada u karpatskoj zoni uglavnom u periodu 2005-2010 (Harding & Kavruk 2010; 2013; Harding 2011). Drvena korita (balvani slični kanuima ili drvenim sanducima, sa šupljinama ili rupama) pronađena su u današnjoj Ukrajini i na nekoliko mjesta u Transilvaniji. Korita su vrlo neobična jer su njihove baze perforirane sa redom rupa (Harding 2013: 63, slika 5.5), a na očuvanim primjercima, rupe su ispunjene drvenim klinovima ili štipaljka. Perforacije su bile ispunjene uvijenom trakom ili drvenim iglama. Nijedno od pronađenih korita nije cijelo, tako da nije poznato koliko je otvora prvobitno bilo pri-

a mix of mining and the concentrated solution of salt by using the “trough technique” (Harding 2013: 54). It is reasonable to assume that salt lagoons existed in many parts of Europe, especially around the Mediterranean (Harding 2013: 66). Briquetage is usually considered to be one of the main markers of production of old sorts of salt since the Neolithic, but especially during the metal ages and the Roman period. Although a significant amount of forms was used in some areas, it is still impossible to say how the entire process of vaporizing brine and transporting the obtained salt crystals functioned (Harding 2013: 54). Depending on whether the salt was visible on the surface, it required either none, or only minimal digging, and the process was categorized as collecting rocks. Unlike that, mining usually required digging into the ground. When it comes to Bronze Age exploitation of rock salt, both mining and collecting were used, but the only location with undisputable evidence of deep mining is Hallstatt in the Salzkammergut territory in Austria. In other places, especially Romania, where much rock salt appears on or near the surface, rock exploitation probably took place even in places where there are currently no visible traces. In places where rock salt is visible on the surface, like the Beclean territory (Romania), excavations have shown that the highest layer of salt was removed by rock exploitation or mining, even though other technological processes were also used (Harding 2013: 61-62). It is assumed that the Hallstatt mines were economically very influential during the Bronze Age, and that they supplied the western part of the Carpathian basin, while Vieliczka potentially supplied the northern part, Transylvania the eastern, and Tuzla the southern part (Harding 2013: 62). The “trough technique” has only been known for a few years, even though structures used in this type of production were discovered in the early XIX century. The research history was described several times, recently by Harding and Kavruk in the context of their work in the Carpathian zone that mostly took place between 2005 and 2010 (Harding & Kavruk 2010; 2013; Harding 2011). Wooden troughs (logs similar to canoes or wooden crates, with cavities or holes) were discovered in today’s Ukraine and at several places in Transylvania. Troughs are very unusual because they have a line of holes at the base (Harding 2013: 63, figure 5.5). On preserved examples, the holes were closed by wooden pegs or clamps. The perforations were filled with twisted ribbons or wooden pins. None of the troughs were completely preserved, so the number of holes on

sutno u podlozi, i da li su oba kraja korita zatvorena ili je jedan kraj ostao otvoren (Harding 2013: 63). Najkompletniji dokaz dolazi sa nedavnih iskopavanja u Baile Figi kod Becleana u Rumuniji, gdje su pronađene izuzetno dobro očuvane drvene instalacije koje potiču iz bronzanog doba, mada ni one nisu potpune: pronađena korita nađena su u blatu najvjerovatnije odbačena u stranu, te je nemoguće tačno znati kako su bila postavljena i korištena, ali svakako ukazuju na kompleksan sistem sofisticirane tehnike za ekstrakciju i eksploataciju izvora kamene soli (Cavruc & Harding 2012; Harding 2013: 62-63). Što se tiče funkcionisanja navedenih korita, pretpostavlja se da je tekućina (svježa voda) morala biti uvedene u korito i da je kapala kroz rupe na dnu, na kamenu sol koja se nalazila ispod, te formirala depresije i žlijebove koji su kasnije olakšavali odvajanje kamena. Druga teorija navodi da je slanica uvedena u korito kako bi se koncentrisala, da se kapi sakupljaju u posudi ispod ili da se stvore kristali koji se mogu sakupljati, na primjer na tekstilu koji se nalazi ispod. Praktični eksperimenti pokazali su da prva metoda funkcionise prilično dobro (Buzea 2010, navedeno prema: Harding 2013: 64), barem što se tiče razbijanja kamene soli; drugi takođe funkcionise, mada još uvek nije sprovedena potpuna i obimna rekonstrukcija (Harding, 2009, navedeno prema: Harding 2013: 64).

Na osnovu navedene četiri metode dobijanja soli, Harding je predložio podjelu praistorijske Evrope (2013: 89) na „produksijske solne zone“ tako što je kao „zonu najpoznatiju i najrasprostranjeniju briketaže (ZB)“ definisao istočnu Francusku, Njemačku, zapadnu Britaniju i istočnu Poljsku. Druga zona je „zona solarne evaporacije (ZSE)“ koja obuhvata Mediteran, a treća zona je „zona korita (ZK)“ i obuhvata istočno-centralnu Evropu, Karpatski bazen i Transilvaniju, dok sve tri zone predstavljaju „presudnu primjenu multikulturalne tehnološke konvergencije. Dok je ZSE u velikoj mjeri rezultat uslova okoline, druge zone su kulturno uslovljene.“ (Harding 2013: 90). Prilikom analiza procesa proizvodnje, ista je teorijski podjeljena na tri nivoa, a prema količini dobijene soli na domaću, industrijsku i „ritualnu“ sol. Pri navedenoj podjeli domaća proizvodnja se odvijala u blizini naselja, koristila je sasvim jednostavnu tehnologiju, obrada proizvoda je bila minimalna a proizvođene su relativno male količine soli, dovoljne za potrošnju domaćinstva. Sa druge strane, industrijska proizvodnja odvijala se bez obzira da li su veliki izvori soli bili dostupni ili ne, proizvo-

the original base is unknown, It is also unclear if both edges of the trough were closed off, or if one was left open (Harding 2013: 63). The most complete evidence originates from the recent excavations of Baile Figi near Beclean in Romania, which yielded exceptionally well-preserved, albeit incomplete, wooden installations dated to the Bronze Age: the discovered troughs were found in mud where they were, most likely, discarded, and it is impossible to precisely establish how they were set up and used, but they certainly do point to a complex system of sophisticated equipment used in extracting and exploiting sources of raw salt (Cavruc & Harding 2012; Harding 2013: 62-63). When it comes to the function of said troughs, it is assumed that liquid (fresh water) had to be placed in the trough, and that it dripped through the holes at the bottom onto rock salt that was under it, thereby forming depressions and gauges that made it easier to crush the rock. Another theory suggests that brine was placed into the trough in order to concentrate it, and that the drops were collected in a vessel placed below, or that it created crystals that could be collected on, for example, textile placed underneath. Practical experiments have shown that the first method functions quite well (Buzea 2010, listed according to: Harding 2013: 64), at least when it comes to crushing rock salt; the other one also works, although so far there have been no full and extensive reconstructions (Harding 2009, listed according to: Harding 2013: 64).

Based on the four listed methods of obtaining salt, Harding suggested a division of prehistoric Europe (2013: 89) into “salt production zones”. The best known, and widespread, is the “briquetage zone” (BZ) of eastern France, Germany, western Britain and eastern Poland. The second zone is the “solar evaporation zone” (SEZ) of the Mediterranean, and the third is the “trough zone” (TZ) of eastern and central Europe, the Carpathian Basin and Transylvania. All three zones together make up “a striking instance of cross-cultural technological convergence”. While SEZ is largely the result of the landscape, the other two are culturally conditioned (Harding 2013: 90). In the analysis, the production process was theoretically divided into three levels, depending on the amount of domestic, industrial and “ritualistic” salt. In the said division, local production took place near the settlement, and relied on completely simple technology. The products were minimally processed, and only small amounts of salt were made, sufficient for household use. On

dila je velike količine soli, predviđene uglavnom za razmjenu. Proizvodnja „ritualne“ ili „svete“ soli imala je za cilj proizvodnju soli vrlo visokog kvaliteta, koristeći specijalizovanu tehnologiju i puno prerade; proizvod je bio namijenjen specijalističkoj upotrebi, a proizvedena količina može biti prilično mala (Harding 2013: 92). U odsustvu jasnih indikacija kako je proces funkcionisao, pretpostavke su da je za većinu proizvodnje korištena briketaža do metalnog doba bila domaća po karakteru i mala po veličini. Proizvodnja briketažom od metalnog doba bila je s druge strane velikog obima i vjerovatno industrijske prirode. Rudarstvo u Hallstattu i Dürnbergu, kao i proizvodnja tehnikom korita, takođe su bile industrijske po veličini. Što se tiče „ritualne ili svete“ proizvodnje soli, do sada nije poznato koja bi arheološka manifestacija mogla biti povezana sa njom (Harding 2013: 92).

Prema svemu navedenom, ogromno povećanje aktivnosti proizvodnje soli u Evropi evidentirano je tokom metalnog doba (u poređenju sa prethodnim periodima), aktivnosti su se progresivno povećavale da je na nekim mjestima bila čak na industrijskom nivou. Pojedine lokacije su smatrane centrima trgovine soli (npr. Hallstatt, primorska Francuska, Droitwich i Cheshire u Engleskoj), što nameće pitanja o položaju soli u ekonomiji i stepenu do kojeg je stvarno služila kao „bijelo zlato“, ime koje joj se često dodeljuje (Harding, 2013: 85). I dalje su nepoznati podaci o načinu proizvodnje, ali i transportu iz proizvodnog područja u područje potrošača. Pojedini naučnici (Cavruc & Harding 2012) primijetili su da se najbogatiji materijalni dokazi društvene nejednakosti u tom periodu na Balkanu nalaze u oblastima bogatim solju, (npr. kulturni kompleks Precucuteni i Cucuteni u regionu Karpata kao i Varna kulturi sjeveroistočne Bugarske). Oni se odnose na prosperitet navedenih društava, na sistematsku eksploataciju soli za trgovinu i procjenjuje se da je eksploatacija izvora soli premašila potrebe domaćinstva već tokom početne faze naselja, implicirajući proizvodnju soli za trgovinu. (Urem Kotsou 2016: 132) Pretpostavlja se da se sol proizvodila u različitim oblicima, od blokova u obliku kocke i nepravilnih grudvi do isjeckane soli. Varijabilnost u obliku soli je povezana sa razlikama u dužini razmjene, od razmjene na dalekim lokacijama (kockasti blokovi) do iste na kraćim razdaljinama (isjeckana sol) (Cavruc & Harding 2012; Harding 2013: 62-63). Sol je prevožena morskom vodom, duž reka i (manje obično) preko zemlje; rekonstrukcija koja je predložena za sje-

the other hand, industrial production took place regardless of whether large sources of salt were available or not, it made large amounts of salt, mostly intended for trade. The production of “ritual” or “holy” salt aimed to produce high-quality salt by using specialized technology and a lot of processing; the product was intended for specialist use, and the obtained amount could be quite small (Harding: 2013: 92). In the absence of clear indicators of how the process worked, it is assumed that briquetage was used in most production until the metal ages, and that it was localized and small. Since the metal periods, briquetage salt production was, on the other hand, quite extensive and probably industrial in nature. Mining in Hallstatt and Dürnberg, as well as the trough technique, were also on an industrial level. It is not yet known which archaeological manifestation could be connected to “ritual or holy” salt production (Harding 2013: 92).

Based on everything listed above, a huge increase in the salt production of Europe occurred during the metal periods (in comparison to previous periods). Activities progressively increased and even reached industrial level at some places. Some locations were considered centers of salt trade (e.g. Hallstatt, coastal France, Droitwich and Cheshire in England), something that poses questions about the place salt had in the economy and the degree to which it really was used as “white gold” - a name that it is often given (Harding, 2013: 85). Data about the modes of production, as well as transport from the area of production to the area of use, is still unknown. Some scientists (Cavruc & Harding 2012; Dimitrov 2012) noticed that the best material evidence of social inequality from that period in the Balkans can be found in areas that are rich in salt (e.g. the Pre-Cucuteni and Cucuteni cultural complexes in the Carpathians, as well as the Varna culture in northeastern Bulgaria). These reflect the prosperity of the listed societies, the systematic exploitation of salt for trade, and it is estimated that the exploitation of salt sources surpassed the needs of the household already during the first phase of the settlement, thereby suggesting that salt was produced for trade (Urem Kotsou 2016: 132). It is assumed that salt was produced in different shapes, including cubical blocks, irregular clumps and powdered form. The variability in the shape of salt is connected to the differences in the extent of trade, from long-distance (cubical blocks) to short-distance trade (powdered salt) (Cavruc & Harding 2012; Harding, 2013: 62-63). Salt was transported by sea,

vernu Njemačku od strane Sprockhoff-a, i Cavruka i Hardinga za Rumuniju, sugerišu riječne puteve kao najvjerojatnije u praistoriji. Arheološki primjeri sugerišu da se kretanje soli može zapaziti kroz distribuciju keramičkih posuda za nošenje (Harding 2013: 96). Smatra se da jednom kada je eksploatacija regulisana, a naročito kada je skala proizvodnje porasla sa niskog nivoa, očigledno slučajnog, prerasla na nešto što uključuje značajan broj ljudi i značajnu količinu proizvedene soli, te stekla vrijednost i postala dobro.

Donedavno je bilo izuzetno ograničen broj dokaza o proizvodnji soli tokom praistorije kako u Evropi tako i na Balkanu. Iako postoje direktni dokazi o praistorijskoj proizvodnji soli u jugoistočnoj Evropi samo sa sjevernog Balkana, sol je takođe morala biti proizvedena na Jadranskoj i Egejskoj obali i mogla je biti barem povremeno razmjenjivana među susjedima za druga dobra kao što su morske školjke, ornamenti i kremen (Urem-Kotsou 2016: 130, 133). Pretpostavlja se da su još u ranoj praistoriji ljudi prepoznavali ekonomske potencijale određenih oblasti - kroz lično iskustvo, usmenu tradiciju prenošenu iz generacije u generaciju, od grupe do grupe povodom trgovinskih razmjena, zborova, sajмова, poklona, nevjesta, ceremonijalnih razmjena i sl., te da su se vraćali u oblasti bogate solju da sakupe sol nastalu isparavanjem na suncu u prirodnim uvalama duž obala (Montagnari-Kokelj 2007: 173). Stoga se pretpostavlja da je uloga soli, tj. sol kao element moći u funkcionisanju društava praistorije, vjerovatno mnogo veća nego što na osnovu postojećih materijalnih ostataka možemo danas da zaključimo.

rivers, and (less often) by land. Reconstructions, made for northern Germany by Sprockhoff, and by Cavruk and Harding for Romania, suggest that rivers were most likely used during prehistory. Archaeological examples suggest that the transfer of salt can be traced through the distribution of ceramic vessel used to carry it (Harding, 2013: 96). It is generally considered that salt got its value and became a trading good once exploitation was regulated, and especially when the scale of production rose from a small level, obviously from an unintentional level, to something that included a significant number of people and resulted in large quantities of produced salt.

Until recently, the number of evidence of prehistoric salt production in Europe and in the Balkans was extremely limited. Although there direct evidence of Neolithic salt production in southeastern Europe was only found in the northern Balkans, salt must have been produced on the Adriatic and Mediterranean coasts and could have, at least occasionally, been traded among neighbors for other goods such as sea shells, ornaments or flint (Urem-Kotsou 2016: 130, 133). It is assumed that people recognized the economic potential of certain regions in early prehistory – through personal experience, oral tradition transferred from generation to generation or from group to group during trading exchanges, meetings, fairs, gifts, brides, ceremonial exchanges and the like – and that people went back to salt-rich regions to collect salt made through vaporization in the sun in natural valleys along the coasts (Montagnari-Kokelj 2007: 173). That is why it is assumed that the role of salt, i.e. salt as an element of power in prehistoric societies, was probably a lot bigger than what can be concluded based on the existing material remains.

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