

NOVENSIA 27

# NOVENSIA 27

Studia i materiały  
pod redakcją naukową

Piotra Dyczka

# NOVENSIA 27



Ośrodek Badań nad Antykiem  
Europy Południowo-Wschodniej

Warszawa 2016

Projekt okładki  
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Europy Południowo-Wschodniej  
Uniwersytet Warszawski

Rocznik dofinansowany w ramach programu Ministerstwa Nauki i Szkolnictwa Wyższego na podstawie decyzji DEC: 774/P-DUN/2016.  
The journal has been financed with resources provided by the Ministry of Science and Higher Education, Poland, allotted on the basis of decision DEC: 774/P-DUN/2016.

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Warszawa 2016

ISBN: 978–83–946222–2–0  
ISSN: 0860–5777

Wydanie I  
Druk: Hussar Books

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## A REMEMBRANCE OF SARA SANTORO

Sara Santoro passed away on 22 September 2016. She was professor of Classical Archaeology, an outstanding scholar, member of the Société des Antiquaires de France, founder member of the Associazione Antropologia e Mondo Antico and the Associazione Italiana per lo Studio e la Conservazione del Mosaico. She was on the staff of the Dipartimento di Scienze Psicologiche, della Salute e del Territorio dell' Università degli Studi Gabriele d' Annunzio in Chieti–Pescara in Italy.

Born in Seregno (Milan) in 1950, Sara read archaeology with the famed Prof. Guido Achille Mansuelli in Bologna and completed her degree in 1973. Two years later she began as a researcher at the Dipartimento di Archeologia Università di Bologna. In 1997–2009, she was hired as a full professor of archaeology and Greek and Roman art history at the University of Parma. She was also associated with the Scuola di Specializzazione in Archeologia at the University of Bologna in 1998–1999. She was appointed a professor of the Gabriele d' Annunzio University in Chieti–Pescara in 2009. Lecturing and doing research, she also held important university posts, surrounded by her students and collaborators. She was a dedicated scholar of Greek and Roman urban planning as well as ancient craftsmanship. She also took an interest in archaeometrics, pottery studies and Roman painting. From 1982 to 1994 she headed the Museo Civico Archeologico di Bazzano (Bologna). It was then that she studied the museum oil lamp collection. From 1988 to 2005 she directed the research at Castelraimondo (Forgaria nel Friuli, Udine), a subalpine fortified site inhabited from prehistoric to medieval times. Polish students of archaeology from the University of Warsaw took part in this research. An archaeological park was established on this site within the frame of the European Interreg II and III Italia-Austria project. From 1998 to 2005 Sara Santoro led the “Isola del Centenario” project in Pompeii on behalf of the University in Bologna and was scholarly editor of the project's publications. It was then that she was a frequent visitor in Warsaw, giving lectures at the National Museum in Warsaw and the Institute of Archaeology of the University of Warsaw. She gave a paper at the conference dedicated to a decade of research of the University of Warsaw Institute of Archaeology at Tanais in Russia, held in Stawiska in 2005 (Sara Santoro is seventh from left, arm in arm with Iwona Modrzejewska-Pianetti, in this photograph from Gdańsk from 2005). From 2001 to 2004 she headed the Durrës project for the University of Parma and the National Archaeological Museum in Durrës, this within the frame of the United Nations Office for Project Services concerning the historical monuments of Albania. From 2004 she was research director of the Italian Mission in Durrës on behalf of the University in Parma and then the University in Chieti–Pescara. For the project she excavated the Roman amphitheater, collaborating with the Institute of Archaeology of the Ministry of Culture of Albania. From 2008 she coordinated the excavation of the Gallo-Roman vicus in Bliesbruck in the Bliesbruck Reinheim archaeological park (Moselle, France). She then headed the research at Corfinio-Campus Santa Maria delle Grazie from 2014. She was director and team member of many international archaeological projects. She was author and co-author of more than 160 publications and coordinated many as a scientific editor.



The archaeological community in Europe mourns her premature passing. Prof. Marco Cavalieri was her student in 1992–1996 while Iwona Modrzeszewska-Pianetti collaborated with Sara Santoro within the frame of the Erasmus project, lectured at her invitation at the University of Parma and was close friend for many years. Sara was extremely talented musically — she played the piano well and was gifted with a beautiful voice.

Many colleagues in Poland have been deeply moved by her passing.  
MAGISTRA, SIT TIBI TERRA LEVIS.

Marco Cavalieri, University of Louvain  
Iwona Modrzeszewska-Pianetti, University of Warsaw

Martin Lemke

## DANUBE, LIMES AND LOGISTICS SOME THOUGHTS ON ROMAN ARMY SUPPLY IN MOESIA INFERIOR

*Totius enim legionis ratio ... cotidie adscribitur actis maiore prope diligentia quam res annonaria vel civilis polyptichis adnotatur.*  
Vegetius 2.19

**Abstract:** Understanding army logistics is important for understanding the Roman army and the Roman limes as such, especially the fundamental and dual role of the Danube. Camps and smaller garrisons were located with strategic factors in mind, considering geographical conditions and their influence on logistics, with the Danube being both a border and a transport route. The stepwise annexation of the areas that would become Moesia Inferior is testimony of planning always preceded by terrain reconnaissance. This included a thorough analysis of what was and was not available in the province and whether stable coordination of army supplies by trained personnel was possible. Logistics could have had something of an improvised character, especially in the first century, and they required a specific skillset to be carried out, but overall they were manifest of good organization and planning. A sophisticated and well devised system was in operation.

**Key words:** Roman army, logistics, supply lines, *frumentarii*, Danube limes, Moesia, Moesia Inferior

### Introduction

The wayfaring archaeologist in the Balkans, navigating the scenic but narrow roads of Serbia, Romania or Bulgaria to reach one of the *limes* sites on the Danube perhaps, will inevitably encounter (and get stuck behind) numerous trucks displaying company names with the word “logistics” in them. Studying every millimeter of the back of a trailer for a couple of hours lets the mind roam freely, contemplating the situation in a wider context.

The word “logistics” is derived from the Greek adjective *logistikos* meaning “skilled in calculating”.<sup>1</sup> The first instance of administrative use was a military official with the title *logista* in Roman and Byzantine times.<sup>2</sup> In other words, logistics is a specific variant of administration in its

<sup>1</sup> ROTH 1999, p. 1; on logistics in general see also JOMINI 1837, pp. 485–486 (who proposes a different etymology for the word); for an introduction to military logistics: KRESS 2002.

<sup>2</sup> Byzantine emperor Leo VI was the first to define logistics in his work commonly known as *Taktika* (about AD 900).

Leo’s discernment of λογιστική as a special skill of generals (Epilogue 57, 64) beside tactics and strategy inspired the development of the modern concept of logistics in the works of the late eighteenth- and early nineteenth-century military theorists: “This is what the logistic art is to do. It divides the army into squads ... and the other units, as

broadest sense — dividing the coordination of provisioning into basic units run by specialized personnel.

The importance of searching for remains, whether material or not, of the logistics of the Roman army has been increasingly recognized and studied over the past few years.<sup>3</sup> The present study will summarize the body of evidence for Roman army logistics in the province of Moesia Inferior, which offers, in this case as in others, a convenient training ground for archaeological theories.

## Army logistics

Modern use notwithstanding, logistics is and always has been primarily a military term. It has even been argued that “logistics is the lifeblood of any army”.<sup>4</sup> Accordingly, a whole range of military conflicts in the past and present, from the Battle of Dyrrachium in the Great Roman Civil War (48 BC) through the Burma campaign in World War II and the battle of Pusan in 1950, famously were decided to a large extent by superior supply lines or the lack thereof.

The *NATO Allied Administrative Publication* gives the following contemporary definition of logistics: “The science of planning and carrying out the movement and maintenance of forces. In its most comprehensive sense, the aspects of military operations which deal with: a) design and development, acquisition, storage, movement, distribution, maintenance, evacuation, and disposal of materiel; b) transport of personnel; c) acquisition or construction, maintenance, operation, and disposition of facilities; d) acquisition or furnishing of services; and e) medical and health service support”.<sup>5</sup>

Obviously, the scope of army logistics may vary between the different descriptions and definitions in place, but what they usually have in common is provisioning and transport, and the administration of the two.

## Logistics in the Roman army

The Romans were not the inventors of army logistics, but they certainly perfected this art in the ancient world. Lessons learned in the Punic wars and later military reforms under the Republic led to its rapid development,<sup>6</sup> whereas the decision to keep a permanent border<sup>7</sup> in the early principate<sup>8</sup> led to a significant remodeling in order to provision the units stationed there. Incidentally, the army was by far the biggest organization in the Empire.<sup>9</sup>

The Roman army with its wide range of tasks beyond simple border security<sup>10</sup> still had to find the time and personnel to implement a system of logistics, the success of the army being heavily dependent on a continuous provision of supplies.<sup>11</sup> Consequently, beside providing a rather broad overall training for the soldiers themselves, it fostered the development of a large number of specialized professions that at first glance have little to do with fighting battles. On top of that, these numerous specialists had to be coordinated by a strong administrative apparatus.<sup>12</sup>

well as entire battle lines. It makes a proper division of all these. Which ones and how many will guard fortified towns? Which ones and how many young or old men there are? Which ones are maimed in their limbs or incapacitated by illness? How many have a position in the civil government or one dealing with public affairs? This is what logistics are”. Translation after DENNIS 2010, pp. 635–639.

<sup>3</sup> Especially THOMAS, STALLIBRASS 2008. See also ROTH 1999; PAPI 2007; SIMON 2015; LE BOHEC 2015; POLAK, KOOISTRA 2013.

<sup>4</sup> PIGGEE 2002, p. 1.

<sup>5</sup> *NATO Glossary*, p. 2-L-5.

<sup>6</sup> ROTH 1999, pp. 161–163; ERDKAMP 2002, p. 49.

<sup>7</sup> POLAK, KOOISTRA 2013, p. 359.

<sup>8</sup> For the various purposes and necessities influencing Augustus and his successors in this regard, see EICH 2009, p. 565; cf. DOMASZEWSKI 1908, pp. 192–193; ØRSTED 1985, p. 20.

<sup>9</sup> SPEIDEL 2009, p. 283.

<sup>10</sup> SARNOWSKI 1988, p. 69; DUCH 2015.

<sup>11</sup> THOMAS, STALLIBRASS 2008, p. 1.

<sup>12</sup> SPEIDEL 2009, p. 285.

The logistical difficulties of Roman imperial expansion increased as a rule with the distance from the Mediterranean Sea,<sup>13</sup> hence the prime importance of establishing a frontier on the big rivers, the Rhine and the Danube, not only in terms of “grand strategy” but also communication. Legionary camps and forts were obviously meant to be as self-sufficient as possible, but the garrisons could not exist in a sort of splendid isolation and were heavily interconnected with one another and with other centres near and far to ensure stable supply routes. Provisioning an army locally may have always been the most economic option, but only when the prerequisites of organization, planning and technical knowledge had been fulfilled.

Supply units are depicted on Trajan’s column<sup>14</sup> and Appian noted that provisioning constitutes the hardest task in big armies,<sup>15</sup> but a scientific problem arises from the fact that even though the Roman army did document supply measures thoroughly (as shown by the famous “Hunt papyrus” below), these documents are quite rare,<sup>16</sup> while descriptions by contemporary authors on the topic are even less frequent and dispersed,<sup>17</sup> sometimes even contradictory.<sup>18</sup> Still, from Vegetius we learn that the *praefectus legionis* was responsible for arms, horses, clothes and food, while the duties of the *praefectus castrorum* and his staff included tents, baggage, the sick, vehicles, animals, wood, tools, beds and artillery,<sup>19</sup> and there were many more people engaged in this process.<sup>20</sup> We have the names and job descriptions of some of the specialists dealing with matters one might consider to be logistical in nature, arguably beginning with the work of intelligence units such as the *exploratores* and *speculatores* of a legion as the first step towards a reliable supply system, involving choice of an appropriate spot for the camp, fort or other structure, and going as far as the province administration.<sup>21</sup>

A complex army, garrisoned to protect the border and secure the development and Romanization of the region, could not simply forage.<sup>22</sup> It has been argued that one of the reasons for dividing the legions into *vexillationes* and spreading them over a larger territory was to avoid overloading the supply system in one spot.<sup>23</sup> For this to work, the conditions for the civil population, that is, the autochthonous population and the Roman settlers and veterans, had to be convenient as well. Production had to be stimulated,<sup>24</sup> so that preferably a large part of the food and other supplies,

<sup>13</sup> HANSON 2002, p. 27.

<sup>14</sup> DAVIES 1920, p. 21; POGORZELSKI 2012, pp. 78–79.

<sup>15</sup> App. BC 4.100.

<sup>16</sup> At least compared to the millions of documents that surely existed. Cf. SPEIDEL 2009, p. 283.

<sup>17</sup> SINNIGEN 1962, p. 216: “The routine supply organization was rarely a matter to arrest the attention of observers interested in the more striking aspects of military life”; cf. also GOLDSWORTHY 1998, p. 287; ROTH 1999, pp. 3–5; WHITTAKER 2004, p. 88; JOHNSTONE 2008, pp. 128–129: “Sources of both art and literature in the Roman period were biased towards topics considered suitable for expression and mundane events and situations were seldom represented, described or discussed”; SPEIDEL 2009, p. 286: “Es ergibt sich aber dadurch auch ein Bild vom römischen Heer, das nicht allein durch militärische Übung, Kampfbereitschaft und strenge Disziplin geprägt war, wie es die antiken Autoren so gerne und oft betonten, sondern auch von einem Heer, das eine Verwaltung mit einem umfassenden Anspruch unterhielt”.

<sup>18</sup> See the discussion of terms like *lixae* or *frumentarii*.

<sup>19</sup> Vegetius 2.9, 2.10.

<sup>20</sup> SIMON 2015, p. 246: “Almost any military officer engaged in financial affairs, or anyone from the office of the

*procurator Augusti* or the provincial governor can be associated with the organization of the supply, therefore it is still not possible to determine the exact stages and persons of the army supply”.

<sup>21</sup> SPEIDEL 2009, p. 284: “Die Vermutung einer vielfältigen, detaillierten, intensiven und auch allenorts nach einheitlichen Richtlinien geführten Truppenverwaltung, die sich daraus ergibt, wird zudem durch die reichsweit einheitliche Struktur und Organisation des Heeres gestärkt, in der gerade auch die in der Verwaltung beschäftigten Soldaten überall gleichlautende Grade und Funktionstitel trugen (*librarius*, *actarius*, *beneficiarius*, *commentarius*, *cornicularius*, *exactus*, *optio*, *tesserarius*, usw.)”.

<sup>22</sup> BISHOP 1999, p. 111; cf. HERZ 2002, pp. 19–20.

<sup>23</sup> BISHOP 1999, p. 112; HERZ 2002, p. 26.

<sup>24</sup> WHITTAKER 2004, p. 102; ØRSTED 1985, p. 20; THOMAS, STALLIBRASS 2008, pp. 9–10.

especially when perishable, was directly available near the *limes* sites.<sup>25</sup> At the same time, the development of towns guaranteed the availability of specialized goods, like quality tableware, wine and weapons. Enhancement of a road network and ports facilitated transport and hence also supply lines.

A further precautionary measure to ensure a stable flow of basic supplies was building *horrea* (warehouses, mostly used as granaries), where food could be stored for an extended period of time.<sup>26</sup> Polybius notes that when building a camp ample space was allotted for the *horrea* close to the *praetorium* (*Hist.* 6.27.3–5) and from Tacitus we learn that the camps in Britain had enough food stored for one year (*Agricola* 22.2). The *horrea* also allowed camps to function as tactical bases for military excursions,<sup>27</sup> beyond the Danube for instance in the case of Moesia. The *horrea* were extremely important and guarded by the army when located outside camps.<sup>28</sup>

Accordingly, one may argue that unlike the preferably isolated marching camps of the Republican troops, the Imperial army's permanent garrison sites sought the proximity of existing settlements for reasons both logistic and strategic. First, a settlement indicated the presence of potable water and no threat of flooding, by the Danube for instance in the case of Moesia. The availability of building resources was another important issue.<sup>29</sup> Additionally, local inhabitants could be taxed to supply the garrison with food.<sup>30</sup> In a strategic context, this sought proximity reflected the position of these existing settlements on important communication routes and convenient crossing places on the Danube, which had to be controlled and secured.

Theoretically, the more a given population was advanced in terms of “civilization”, i.e. possessing some sort of administration and urban centres, the easier it could be assimilated into the Empire — although advanced peoples also tended to have advanced armies of their own. In Moesia and later Lower Moesia, the local population was easy to control and apparently not prone to revolt, at least after the somewhat enigmatic “Thracian surge”.<sup>31</sup> On the other hand, it was much harder to assimilate primitive peoples into an orderly Roman province, which would generate “income” for the Empire.<sup>32</sup> In Germania, Rome had experienced painfully how hard it was to build a province without appropriate urban structures, whose value is not reduced to mere economics, but manifests itself also as a motor for Romanization and convenient soldier recruitment.<sup>33</sup>

## Specialists and civilians

Individuals responsible for provisioning a legion tended to be designated as *frumentarii*. As the name suggests, *frumentarii* were initially supposed to collect *frumentum* (grain), and administer the *annona militaris*.<sup>34</sup> In the first and second centuries, they were recruited from among the legionaries.<sup>35</sup> As their tasks diversified, there was a considerable shift in their job description. Their main task was supplying the army with food, but in the historical sources they are mostly known for being messengers and army intelligence specialists, a secondary aspect of their work, but sug-

<sup>25</sup> To make the province as self-sufficient as possible. The *Expositio totius mundi et gentium* from the fourth century AD labels the Late Roman provinces Moesia Prima and Dacia Ripensis, the successors of Moesia Inferior, as *sibi sufficietes*, which should be interpreted as an assertion of their agricultural potential. Cf. MITTAG 2006, pp. 338–351; GROENMAN-VAN WAATERINGE 1997, p. 263; WHITTAKER 2004, p. 98; DAVIES 1997, p. 267; THOMAS 2008, p. 31.

<sup>26</sup> ROTH 1999, p. 185.

<sup>27</sup> ROTH 1999, p. 182.

<sup>28</sup> BISHOP 1999, p. 117; FINK 1971, pp. 115–119.

<sup>29</sup> TOMAS 2016, p. 34.

<sup>30</sup> ROTH 1999, pp. 141–155.

<sup>31</sup> KOLENDÖ 1998.

<sup>32</sup> EICH 2009, p. 568: “Die Motivation für die sorgfältige militärische Durchdringung der attackierten Gebiete war primär fiskalischer Natur, das heißt ihr Sinn war die Gewährleistung der ungestörten, stetigen Abschöpfung von staatlich beanspruchten Ressourcen”.

<sup>33</sup> On the case of Germania, cf. SCHNURBEIN 2003, pp. 93–108.

<sup>34</sup> SINNIGEN 1962, pp. 211 and 213–224.

<sup>35</sup> RANKOV 1990, p. 178.

gestive enough to eclipse the information on their original duties.<sup>36</sup> It has been suggested recently that their alternative tasks included delivering correspondence between the provinces and the emperor rather than espionage.<sup>37</sup> Just like the *exploratores*, recruited often from the local population, specialists in food supply would have had a talent for clandestine operations carried out under the cover-up of their initial duties.<sup>38</sup> At the same time, information from intelligence units could arguably be useful for logistic purposes also.

Nomenclature notwithstanding, the complex food logistics required experts for coordinating operations on a mass scale.<sup>39</sup> Commanders of the army units and their deputies (i.e., *primipilarii*, *centuriones frumentarii*<sup>40</sup> and *beneficiarii*<sup>41</sup>) participated in the process, but all sorts of specialists were needed due to the sheer volume of the different requirements reflecting the size of the army in the province and the demand for quality supplies. Their job was to coordinate movements on the army supply routes and supervise local supply, but the known kinds of supply-related job descriptions in the army should not be treated as carved in stone. Especially in the early Principate it has been noted that campaigns were all exceptional and measures such as task division were calculated *ad hoc*.<sup>42</sup>

At this point, the *lixae* are an interesting subtopic. Apparently, they played some role in supplying the legions, but the exact nature of their work is unclear.<sup>43</sup> A vast baggage train followed each legion, consisting mostly of civilians, both slaves (private or state) and freemen. The latter included the servants of the soldiers as well as the *lixae*.<sup>44</sup> The servants of the legion were responsible for supplying and cooking the food and carrying the equipment.<sup>45</sup> The term *lixae* may have been used for the baggage train employees, but they could have also been craftsmen, engineers and even geodesists or medics according to some theories.<sup>46</sup> They could have also been merchants selling to the army goods of a rather extravagant, luxurious kind, such as spices.<sup>47</sup> They were not, however, either *mercatores* or *negociatores*.<sup>48</sup> They accompanied the army, living apparently outside the camp in the *canabae*.<sup>49</sup> Interestingly, *lixae* are mentioned by Tacitus in a clearly pejorative context, where they are described as unpatriotic capitalists.<sup>50</sup> Some scholars have argued whether *lixae* were freemen or slaves.<sup>51</sup>

More importantly, the example of the *lixae* demonstrates the astonishing extent of civilian participation in army logistics. Auctions were held during the early Principate to allow merchants to purchase the right to transport grain from the provinces to Rome or to the other provinces.<sup>52</sup> Some *negociatores* were specialized in the grain trade<sup>53</sup> and basic products were available on the local markets.<sup>54</sup> Thus private merchants could count on the army for protection not only because of their

<sup>36</sup> KOLB 2000, pp. 290–294; MANN 1988, p. 149; AUSTIN, RANKOV 1995, pp. 136–137.

<sup>37</sup> RANKOV 1990, p. 180.

<sup>38</sup> CUPCEA, MARCU 2006, p. 186.

<sup>39</sup> ROTH 1999, p. 274.

<sup>40</sup> HERZ 2002, pp. 43–44; SIMON 2015, p. 246.

<sup>41</sup> ROTH 1999, p. 274; *beneficiarii* probably acted as intermediaries between the financial administration and the officers of a given unit, cf. MONFORT 2002, pp. 76–79.

<sup>42</sup> EGRI 2008, p. 49.

<sup>43</sup> CONRAD 2004, p. 107.

<sup>44</sup> FEIG VISHNIA 2002, p. 265.

<sup>45</sup> ROTH 1999, p. 111.

<sup>46</sup> CUPCEA, MARCU 2006, p. 182.

<sup>47</sup> ROTH 1999, pp. 93–95.

<sup>48</sup> FEIG VISHNIA 2002, p. 266.

<sup>49</sup> IVANOV 1990, p. 133; WIELOWIEJSKI 1970, p. 191.

<sup>50</sup> Tac. Ann. 2.62: *veteres illic Sueborum praedae et nostris e provinciis lixae ac negotiatores reperti quos ius*

*commercii, dein cupidus augendi pecuniam, postremo oblitio patriae suis quemque ab sedibus hostilium in agrum transtulerat.*

<sup>51</sup> Slaves naturally played a part in army logistics, cf. ROTH 1999, p. 101. Feig Vishnia has suggested that the *lixae* coordinated slaves in their duties (FEIG VISHNIA 2002, p. 272), but this view is somewhat isolated as their mercantile nature is rather beyond doubt. Cf. BOUNEGRU 2006, pp. 71–72: “Les Lixae étaient en fait des accompagnateurs commerciaux (ambulants) des militaires ...”. According to WIELOWIEJSKI 1970, p. 191, they were merchants, small scale traders and peddlers accompanying the bigger army units.

<sup>52</sup> RICKMAN 1980, p. 126.

<sup>53</sup> ERDKAMP 2002, pp. 66–67.

<sup>54</sup> ŻMUDZIŃSKI 2004, p. 120.

part in its supply chain, but also because the main trade routes also happened to be the (potential) main invasion routes for the enemy, which the army was guarding.<sup>55</sup> In his work the Byzantine Emperor Leo VI also pointed out the importance of taking care of civilian traders.<sup>56</sup> The frontier population of the Danube provinces would ideally come to market in the Roman settlements where appropriate trade *fora* could be found.<sup>57</sup> The local indigenous elites, as well as Italic families coming in the wake of the army took part in the exploitation of the province: through agriculture, mining and trade, and also through administrative measures.<sup>58</sup> Over time civilian contractors also played some role in sea transport<sup>59</sup> and the associated long range army supply routes (see *pastus militum*, below).

### Moesia Inferior

After a somewhat slow start during the reign of Augustus, when Rome's strategic interests in Europe were focused on Germania and Illyricum, Moesia became strategically more important in the second half of the first century.<sup>60</sup> It has been suggested that the organizational activity under Trajan after the Dacian Wars should be seen as the beginning of the army supply system, based predominantly on the own resources of Moesia Inferior and partly also Thrace,<sup>61</sup> while others acknowledge Domitian for skillfully combining the supply system with the communication network and the protection forces to provision his campaigns,<sup>62</sup> which is somewhat ironic given his logically (and militarily) disastrous Dacian campaign.<sup>63</sup> He also divided the province of Moesia into two parts, Superior and Inferior, in the year 86. The separate command and supply structure was meant to facilitate defending the area<sup>64</sup> (as was the enlarged manpower). It was certainly true that the war campaigns of both emperors were a special challenge for logistics, the army was on the move and considerably larger than the *limes* garrisons. During his second war in particular Trajan had to cope with a classic military problem: how to protect and not overextend his army's supply lines. He did so by dividing his armies into marching columns,<sup>65</sup> among other things to avoid Dacian guerilla tactics. The emperor had learnt his lesson from the first Dacian campaign when the route eastward was left open for the Dacians to flee and in the second war he had his forces carry out a supplementary attack in a wide arc from the bend of the Danube to cut off this escape possibility. Hence a series of smaller forts were built in the Dobrudja and Wallachia.<sup>66</sup> In the field of military logistics, the extension and over-extension of supply lines is a separate and ever fresh topic.<sup>67</sup> Eventually three legions were stationed in Moesia Inferior during the Principate: the *V Macedonica* at Oescus and later Troesmis, the *I Italica* at Novae and the *XI Claudia* at

<sup>55</sup> ØRSTED 1985, p. 174.

<sup>63</sup> STROBEL 1989, p. 56; FILOW 1906, p. 38.

<sup>56</sup> DENNIS 2010, p. 163: "On the march with your troops in your own country, consider the markets and trade centers on land routes and perhaps also along the coast, so that the <merchants> may be present there without danger and may transport their cargoes for your provisioning without hesitation and without fear".

<sup>64</sup> DVORSKI, ZAHARIADE 1997, p. 61.

<sup>57</sup> WIELOWIEJSKI 1970, p. 271.

<sup>65</sup> Columns make the supply of marching soldiers easier and less prone to guerilla warfare (which preferably targets supply units). Hence Moltke's famous motto: "Grenzt marschieren, vereint schlagen". Trajan was aware of the Roman army's specific vulnerability to guerilla attacks (LUTTWAK 1976, p. 41) not only from the "Varian disaster", but also from the failed campaign of Domitian in AD 86.

<sup>58</sup> EGRI 2007, pp. 109–110; ERDKAMP 2002, p. 61.

<sup>66</sup> SARNOWSKI 1988, pp. 53–59; BENEŠ 1978, p. 67.

<sup>59</sup> ROTH 1999, p. 270.

<sup>67</sup> Cf. studies on recent events, such as: PELTZ *et alii* 2005, esp. chapter 4.

<sup>60</sup> LEMKE 2015a, p. 850; LEMKE 2011; SARNOWSKI 1988.

<sup>61</sup> SARNOWSKI 1988, pp. 66–67.

<sup>62</sup> SINNIGEN 1962, p. 223, regarding the *frumentarii*: "Domitian was apparently the first emperor to organize a 'G-4 Section' for the army" (G-4 being an army slang term for logistics officers).

Durostorum.<sup>68</sup> In their wake, a whole array of smaller units came to garrison on the *limes* as well.<sup>69</sup> All in all, the Lower Moesian army had an estimated strength of 16,400–18,500 soldiers, who needed to be fed.<sup>70</sup>

The supply system had already evolved, becoming considerably reliable in the times of Vespasian when this stretch of the frontier was significantly strengthened as part of the reorganization of the Empire defences.<sup>71</sup> However, the eventual annexation of Scythia (a separate province in late antiquity, modern day Dobrudja) made the dislocation of another legion into the region necessary, including additional *auxilia*, which was difficult considering obligations in other parts of the Empire.<sup>72</sup> Moreover, the unfavourable geographic conditions especially in the southern part of Dobrudja, as well as in the adjacent region of Ludogorie, made provisioning by agriculture particularly difficult.<sup>73</sup> This dilemma was exacerbated by the fact that the territory of Moesia (Inferior) was never densely populated except for the Greek cities on the Black Sea.<sup>74</sup> In a thinly populated area it is harder to feed an army, moreover “the roads and means of water-carriage are much better in rich countries and afford a greater choice, being more numerous, the means of transport are more abundant, the commercial relations easier and more certain”.<sup>75</sup> The impact that the *limes* had on the development of the settlements described above was a major economic factor<sup>76</sup> and the small scale urbanization around army camps was also important for the security of the provisioning.<sup>77</sup> The fords on the Danube and the proximity of the army had a positive influence on the exchange of goods with the Barbaricum. Due to their symbiotic nature, the development of such settlements can be perceived as a natural process.<sup>78</sup> Still, given the particularly small population of the Dobrudja, the Roman administration was forced to implement a “settlement programme” to ensure provisioning of the soldiers, hence the regular distribution of the settlements and their Latin names. As a result, the existence of a rather large number of recorded rural communities in the Dobrudja contrasted with the lack thereof in the remaining parts of Lower Moesia.<sup>79</sup>

Just like in the other provinces, the food supply was generally meant to be based on local resources [Fig. 1], using production centres within the province, and only supplementary exterior supply lines.<sup>80</sup> However, even a central system was always elastic enough for local peculiarities.<sup>81</sup> The unusually large number of cavalry units in the province,<sup>82</sup> for instance, additionally raised the requirements for food and fodder. Thus, when the decision was made to create the province, its development was accelerated with drastic measures: in the early first century 50,000 Dacians (Getae) were moved by order of Aelius Catus to the southern Danube shore.<sup>83</sup> This operation was meant to depopulate the border zone on the northern shore<sup>84</sup> and to increase the population density in the new province. This maneuver was repeated on an even larger scale during Nero’s reign,

<sup>68</sup> MATEI-POPESCU 2010; SARNOWSKI 1988.

<sup>69</sup> MATEI-POPESCU 2013, pp. 207–230; BENEŠ 1978.

<sup>70</sup> DUCH 2015, p. 236.

<sup>71</sup> SCHÖNBERGER 1969, p. 155; GABLER 1999, p. 75; LUTTWAK 1976, p. 57; BENEŠ 1978, p. 65.

<sup>72</sup> POULTER 1986, p. 521.

<sup>73</sup> LEMKE 2015b; POULTER 1980.

<sup>74</sup> MROZEWICZ 1982, p. 6; ZAWADZKI 2009, pp. 55–56.

<sup>75</sup> CLAUSEWITZ 1832, Book 5, Chapter 14–4.

<sup>76</sup> CONRAD, STANČEV 2002, p. 677; THEODOSSIEV 2000, p. 91.

<sup>77</sup> On the local production, see THOMAS, STALLIBRASS 2008, p. 9; KOLENDÖ 1976, pp. 45–67.

<sup>78</sup> For the immigrated population settled for reasons of security and economy close to the camps along the Danube, cf. MROZEWICZ 1984a, p. 116.

<sup>79</sup> POULTER 1980, pp. 734–737. See also MATTHEWS 2015.

<sup>80</sup> SULTOV 1983. Cf. WHITTAKER 2004, p. 98; MONFORT 2002, p. 72.

<sup>81</sup> SPEIDEL 2009, p. 286: “Aus solchen Gründen wurde deshalb der Schluss gezogen, dass die Truppenverwaltungen sehr viel weniger von zentralen Vorgaben und weit mehr von lokaler Initiative bestimmt waren, als dies durch Finks Kategorien nahegelegt wird”; cf. SIMON 2015, p. 242.

<sup>82</sup> BENEŠ 1978, pp. 64–66.

<sup>83</sup> DUCH 2015, p. 238; PREMERSTEIN 1898, p. 158.

<sup>84</sup> ALFÖLDI 1939, p. 30; PREMERSTEIN 1898, p. 158: “Eine wüste Verteidigungszone”.

when Titus Silvanus Elianus, governor of Moesia, ordered 100,000<sup>85</sup> families of *transdanuviani* to be moved to the southern shore, so they would pay tribute in grain and populate the province.<sup>86</sup> At the same time, further depopulation of the left bank was intended, maybe as a countermeasure to the Sarmatian intrusions of the period,<sup>87</sup> even though *annona* (grain) was collected in Wallachia as well, as we know from Hunt's *pridianum* (see below).

Looking at the *limes* sites in Moesia Inferior, one can see that the Danube was their biggest shared attribute. The decision to make the river a frontier line of the Empire included a number of considerations, tactical and logistical ones.<sup>88</sup> More often than not fortresses were built on elevated ground, but never so high as to make the transport of heavier goods from the river level troublesome. Logistic convenience was also the reason for the location of fortress sites right on the Danube, where transport ships arrived. Wherever major tributaries were lacking, the Roman army sought places close to the mouths of smaller streams emptying into the Danube. Springs of fresh water were common in the upper run of these rivers and constructing an aqueduct along a river valley was easier for the engineers. In the case of the large legionary fortresses in the province, the ground selected for their construction had to be sufficiently wide to accommodate the *canabae* and *vici* that invariably emerged. These aspects had preference over the potential defensive characteristics of the terrain.<sup>89</sup>

### ***Canabae and vici***

The *canabae* of the various army camps in Moesia Inferior contributed to the process of supplying the army. Here lived soldier families, veterans, who had a considerable influence on the development of these towns, and people working for the army as well as slaves.<sup>90</sup> By settling near their former garrison<sup>91</sup> they contributed to increased control, consolidation and supply chains for the army, before quicker economic growth and Romanization occurred under Trajan.<sup>92</sup> Most of all, veterans were helpful in the early phases of urban life around the camps as far as organization, economy and security were concerned.<sup>93</sup> From the second century onwards veterans would also settle in the northern Dobrudja,<sup>94</sup> diminishing the considerable infrastructural problems there.

The first *canabae* in the yet undivided province developed in Oescus.<sup>95</sup> Since the area within one *leuga* (2.2 km) was under the direct authority of the army, the inhabitants of the *canabae* despite their status as *veterani et cives Romani consistentes* had no right of ownership there;<sup>96</sup> consequently, they often settled a little farther off. At Durostorum, the *canabae* lay several hundred metres from the camp. They developed when the *XI Claudia* legion arrived and received the honorary title *Aeliae*.<sup>97</sup> In the rural territories south of Novae, Conrad noticed signs of regular land partitioning along the valleys, just like in the other provinces. Veterans lived here probably after completing the *honesta missio*. The *canabae* of Novae stretched approximately 1.5 km towards

<sup>85</sup> Zawadzki's comment should be kept in mind with regard to these numbers (ZAWADZKI 2009, p. 67): "this number rather comes from doubling the 50,000 Getae transferred under Augustus onto the right shore by Aelius Catus. ... The author of the *elogium* likely intended to stress that the feat performed by Plautius Elianus was twice as important. ... Still the number of relocated Danubian settlers must have been substantial, since these people had a positive impact on the grain production".

<sup>86</sup> MROZEWICZ 1987, pp. 107–128; MILLAR 1982, p. 8.

<sup>87</sup> ZAWADZKI 2009, p. 55.

<sup>88</sup> RANKOV 2005; LEMKE 2015a.

<sup>89</sup> LEMKE 2015a.

<sup>90</sup> EGRI 2007, p. 104; ARICESCU 1980, pp. 115–116; MROZEWICZ 1984a, p. 115. MANN 1974, p. 516, labelled the civilians in the wake of a legion an "instant village". At Vindonissa about 2000 slaves belonged to the camp; cf. WHITTAKER 2004, p. 91.

<sup>91</sup> MANN 1983; MANN 1974, p. 515.

<sup>92</sup> SARNOWSKI 1988, p. 51.

<sup>93</sup> TAČEVA 2004, p. 10.

<sup>94</sup> DORUȚIU-BOILĂ 1977, p. 90.

<sup>95</sup> MROZEWICZ 1982, p. 14. On Oescus in general, see BOYANOV 2008; KABAKČIEVA 2000.

<sup>96</sup> CONRAD 2006, p. 322.

<sup>97</sup> GEROV 1977, p. 301.

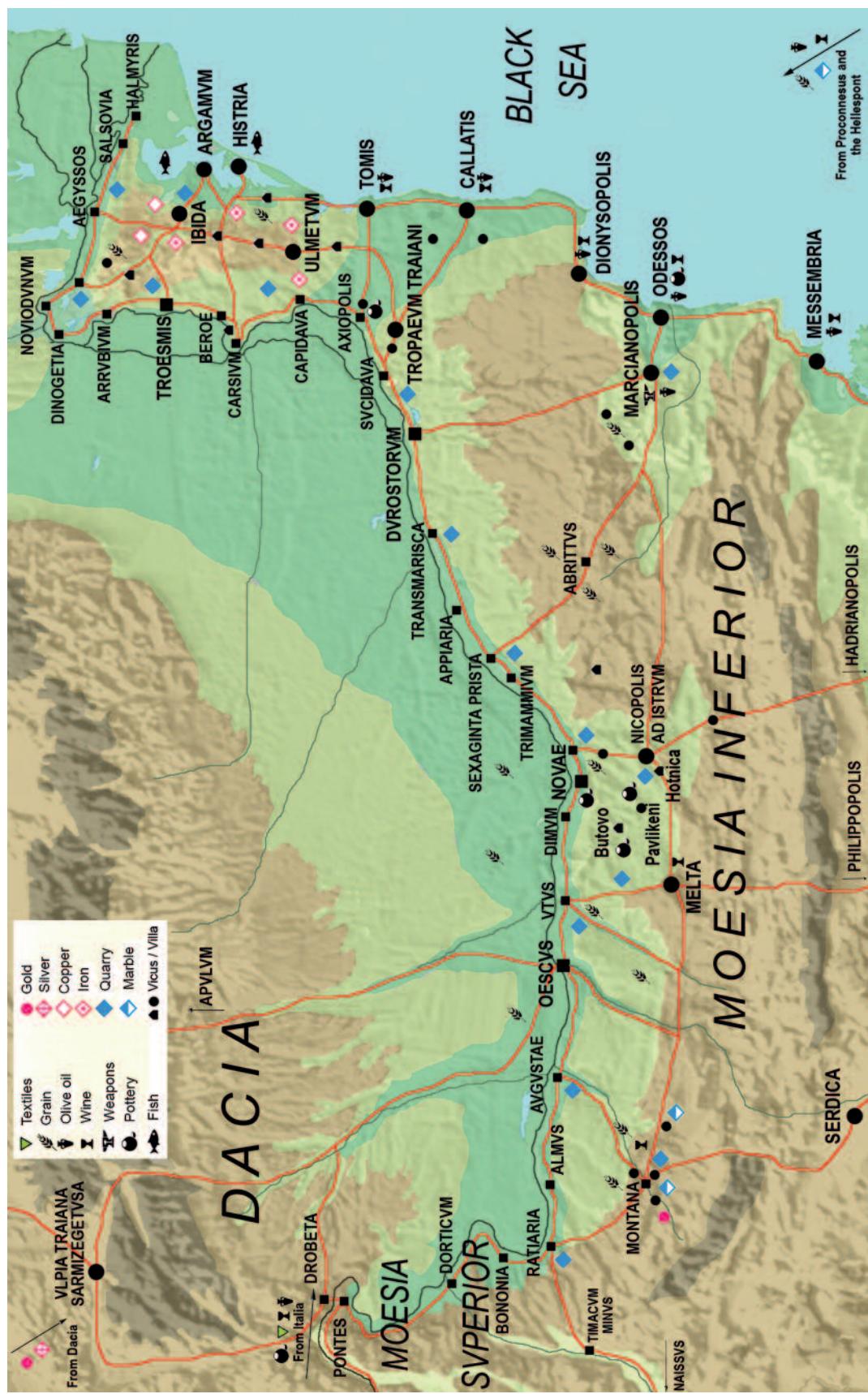


Fig. 1. Natural resources and provincial production centres in Moesia inferior (M. Lemke). The data used the sources stated in the text, as well as A. Tomas, *Archaeologia Bulgarica* 15/2 (2011), Fig. 1

Svišto夫, but also south and east from the camp.<sup>98</sup> On top of that, 32 sites were detected south and southeast of Novae at intervals of about 300–500 m. These farms had a surface of 5 to 50 ha, pointing to small-scale agriculture and the existence of several specialist workshops.<sup>99</sup>

Civil villages, *vici*,<sup>100</sup> were located in a distance of about 1.5–2.5 km from the camps, but they also could be completely independent from the *limes* in the province. They were administered by the inhabitants themselves and not unlike Roman towns,<sup>101</sup> even though they mostly kept their pre-Roman name. As a rule, they were not a continuation of larger pre-Roman settlements under new Imperial rule. *Vici* were likely supported by the given camp commanders, as they facilitated local provisioning and limited the growth of the *canabae*, which could be a hindrance during an attack. On the other hand, it is mostly unknown whether the provincial legates supported the development of these *vici*<sup>102</sup> with the prominent exception of Dobrudja.

The development of the province was accompanied by an expanding road network built by the army, which played a fundamental role in extending and maintaining supply lines.<sup>103</sup> The state of research on these roads is varied. The overall layout of the road network is known from *itineraria*, milestones and other epigraphic evidence, which also provide data on the location of the various towns and settlements. Thus we have the *limes* road along the Danube with roads branching off at right angles and leading into the interior of the province. In modern Bulgaria, these roads ran parallel to the bigger Danube tributaries and towards the mountain passes of the *Haemus mons*, and were connected with a route parallel to the Danube road running through Montana and Nicopolis ad Istrum.

The inhabitants of Roman *vici* were obliged to repair roads, even during the eventful third century.<sup>104</sup> A fragmentary inscription from Ulmetum<sup>105</sup> mentions the duties of maintaining the *via publica* on specified stretches of the road. The responsibility of rural communities for ensuring transport on the *cursus publicus* and technical maintenance is well known in the Imperial administration. There is proof of civilians not being happy with these numerous tasks, such as a “petition” to reduce the labor.<sup>106</sup> The epitaph of a *praefectus vehicularum* is known from modern Comakovci near Montana; he supervised the *cursus publicus* in the second half of the second century.<sup>107</sup> His duties would have included ensuring road maintenance<sup>108</sup> and transport of supplies for the army.<sup>109</sup> The swift development of *vici* in Dobrudja was determined by the army’s reliance on civilians to maintain the road network connecting the *limes* sites with the Pontic towns (Argamum, Histria, the capital Tomis, Callatis, Dionysopolis, Odessos) and to guarantee the supply lines for the garrisons. Creating mixed settlements of veterans and *peregrini* played a major role in *limes* logistics.<sup>110</sup> The *vici* first appeared under Hadrian and were connected with the road network; they certainly did not exist before the consolidation of the Scythian *limes* under Trajan.<sup>111</sup> In late antiquity, after major migrations in the region, these artificial Roman place names disappeared quickly, especially in Dobrudja.<sup>112</sup> The phenomenon is proof of deep changes in the region. Regarding the *vici* belonging to army camps, one should also consider the numerous *villae* loosely concentrated in the vicinity. These also played their part in local production (especially farming) and Romanization,<sup>113</sup> thus enhancing the supply potential. Clusters of villages and *villae* can be seen near

<sup>98</sup> *Canabae* Novae and the question regarding the *municipium* Novae are under investigation: TOMAS 2007, pp. 42–44; TOMAS 2016.

<sup>99</sup> CONRAD 2006, p. 321; TOMAS 2007; TOMAS 2016; ČISTAKOVA 2013.

<sup>100</sup> The overview of the *vici* in Moesia Inferior is still limited. The *vici* in Britannia and Germania have been studied in detail, cf. SOMMER 2006, pp. 95–145; SOMMER 2004, pp. 312–321.

<sup>101</sup> MROZEWICZ 1982, p. 63.

<sup>102</sup> VITTINGHOFF 1968, p. 135.

<sup>103</sup> SIMON 2015, p. 244. For Moesia, see PANAITE 2015.

<sup>104</sup> PETCULESCU 2006, p. 39; POULTER 1980, pp. 734–735.

<sup>105</sup> CIL III 12488.

<sup>106</sup> POULTER 1980, p. 737.

<sup>107</sup> CONRAD 2004, p. 262 (no. 512).

<sup>108</sup> ECK 1979, p. 89.

<sup>109</sup> ERDKAMP 2002, p. 52.

<sup>110</sup> POULTER 1983, p. 86.

<sup>111</sup> POULTER 1980, p. 734.

<sup>112</sup> ZAHARIADE 2006, p. 6.

<sup>113</sup> BÜLOW 1992, pp. 207–211; POULTER 2007, p. 367; MROZEWICZ 1984a, p. 120; ČISTAKOVA 2013.

limes army camps, but also around the towns in the interior: Montana, Nicopolis, Abrittus, Marciapolis, Tropaeum Traiani, Ulmetum. The amount of discovered farming tools also hints at the intensity of agriculture in these areas.<sup>114</sup>

### ***Municipium and colonia***

Municipal status is a formal acknowledgement of urbanization processes taking place at the site.<sup>115</sup> Social differences due to legal status and affiliation (citizenship) were equalized, regardless of whether a given person was a Roman citizen or a *peregrinus*. Inhabitants were equal within the *municipium* and allowed to marry according to Roman law; citizens also could and had to ensure a juridical and religious order within municipal law.<sup>116</sup> It has been suggested that *municipia* developed for reasons of security at a certain distance from army camps;<sup>117</sup> therefore, it was more often the *vicus* than the *canabae* that gained municipal status,<sup>118</sup> but reverse examples are also known, notably at Novae.<sup>119</sup> Municipalization is a characteristic feature of the southern stretch of the European *limes*, including Moesia Inferior, since this type of city was closely connected with the legionary fortresses and constituted a further attempt at anchoring the Roman urban lifestyle on the Danube and beyond, in Dacia. Almost all the towns that were to become a *municipium* or *colonia* on the right bank of the Danube, developed close to army camps.<sup>120</sup> In Moesia Inferior, the army camps Novae, Durostorum and Troesmis received municipal status,<sup>121</sup> as did Tropaeum Traiani,<sup>122</sup> while Noviodunum,<sup>123</sup> Montana and the old Greek trading outpost Axiopolis were possibly also promoted in this fashion.<sup>124</sup> Oescus was the sole *colonia* on the Danube in Moesia Inferior.

### **Trade and resources**

Many imports from Italy and the western provinces have been observed in the first century material from Moesia,<sup>125</sup> illustrating the working of the initial long distance supply lines. The Greek-Thracian market in northeastern Thrace, existing from Republican times,<sup>126</sup> probably could not satisfy yet the new legionary consumers,<sup>127</sup> even though the annexed Pontic cities certainly constituted an economic anchor in the barren region. These cities had become autonomous colonies, *civitates foederatae*, towards the end of Augustus' reign,<sup>128</sup> a fact that was apparently welcomed by both

<sup>114</sup> CHOLAKOV 2012.

<sup>115</sup> ABBOTT, JOHNSON 1968, pp. 3–10; MROZEWICZ 1982, p. 76; ØRSTED 1985, pp. 36–37. Municipalization in Moesia Inferior has been investigated fairly thoroughly: MROZEWICZ 1995, pp. 83–89; MROZEWICZ 2008, pp. 679–686. Cf. also TACHEVA 2005.

<sup>116</sup> VITTINGHOFF 1968, p. 142.

<sup>117</sup> POULTER 1983, p. 81.

<sup>118</sup> MROZEWICZ 1984b, p. 286. Building cities in the *territorium legionis* was likely also avoided to keep jurisdiction and administration simpler (*ibidem*, pp. 288–290), even though places in the direct vicinity of army camps became popular during the crisis of the third century (*ibidem*, pp. 292–293).

<sup>119</sup> Although it should be noted that the *municipium* at Novae is merely attested through a single inscription where the abbreviation MN has been extended to read *municipium Novensium*; cf. GEROV 1989, no. 300.

<sup>120</sup> VITTINGHOFF 1968, p. 132.

<sup>121</sup> PETCULESCU 2006, p. 35.

<sup>122</sup> ARICESCU 1980, p. 47.

<sup>123</sup> MATEI-POPESCU 2016.

<sup>124</sup> BOUNEGRU 2006, p. 30.

<sup>125</sup> PARASCHIV 2002–2003, pp. 177–207; ŻMUDZIŃSKI 1998, p. 47.

<sup>126</sup> BOŽKOVA 2007, p. 91.

<sup>127</sup> On surplus production, see THOMAS, STALLIBRASS 2008, p. 5.

<sup>128</sup> BOUNEGRU 2009c, p. 32.

sides as Rome guaranteed safety and stable development of the entire region.<sup>129</sup> The missing local infrastructure combined with the army's demand resulted in a booming trade in the provinces in the years to come, which in turn accelerated urban development.<sup>130</sup> The products and natural resources discovered at the various *limes* sites hint at the possible supply lines. Since a legionary camp constituted a considerable market,<sup>131</sup> local production could not satisfy all the needs. Soldier's pay was the fiscal basis for the operation with transactions somewhat blurring the division into the army and civilians.<sup>132</sup>

In Moesia Inferior, olive oil and wine were the basic imported products (originating from the Eastern Mediterranean, especially Asia Minor). The prime evidence for this are the relevant amphorae, on one hand mirroring the extent of military control in a given frontier zone<sup>133</sup> and on the other reflecting the long distance nature of these imports.<sup>134</sup> In the first century, the region was supplied with oil from Histria, transported in Dressel 6 amphorae. The Greek Pontic cities were also among the customers, playing their part in turn in supplying the army.<sup>135</sup> The import was supplemented with Spanish olive oil in Dressel 20 amphorae. Zeest 90 amphorae with olive oil from Ionia appeared toward the late second century.<sup>136</sup> Further imports for the camp at Novae included pottery, especially the prized *terra sigillata*,<sup>137</sup> lamps, wine, glass, worked stone (including marble from Proconnesos<sup>138</sup>), lead and jewelry. The lamps came from Italy, the *unguentaria* from Dalmatia and Italy, the wine and olive oil from Italy and Istria, as well as the Pontic cities.<sup>139</sup> In Callatis, both wine and the required amphorae were produced in large quantities,<sup>140</sup> while Histria became a local centre of fishing.<sup>141</sup> In Marcianopolis, a weapons factory was set up in the fourth century.<sup>142</sup> Outside the province, Istria especially seems to have become the main source of olive oil for the entire Danube region.<sup>143</sup> Only a few first-century finds can be connected with Greece or Asia Minor.<sup>144</sup> Over the years, in the second century, the import from Italy diminished as a result of local economic acceleration.

Traded products highlight the importance of civilians in the army supply system. Moesian production centres like Hotnica, Pavlikeni and Butovo developed quickly after the Dacian wars of Trajan.<sup>145</sup> Deliveries of pottery for the army by the local communities may have also been a manoeuvre to offset the burden of a mandatory food supply<sup>146</sup> by allowing the producers to actually sell something. The said production centres developed around the newly founded city of Nicopolis and supplied the *limes* sites to the north, especially Novae. The army and the soldiers' pay was a major factor in the monetization of the province.<sup>147</sup> Limited access to central state coins, for instance during the Marcomanic wars, strengthened local minting. Towards the late second century,

<sup>129</sup> BOUNEGRU 2006, p. 23; PIPPIDI 1958, p. 244. On a lighter note: Among Ovid's many woes after being banished to Tomis was the duty to serve in the defense of the city, before Rome assumed this task; cf. Ov. *Tr.* 4.1.69, *Pont.* 1.8.7. PREMERSTEIN 1898, p. 195, commented on this Roman protection as follows: "Dass dies einigermaßen gelang, zeigt vielleicht am besten der Umstand, dass Ovid ... in dem zwischen 14 und 16 verfassten IV. Buche der *Epistulae ex ponto* von neuerlichen feindlichen Invasionen schweigt, während die Tristien und die vorhergehenden Bücher *ex Ponto* bis zur Ermüdung Klagen über diesen Gegenstand variieren".

<sup>130</sup> EGRI 2007, p. 107; ØRSTED 1985, p. 31.

<sup>131</sup> MANN 1974, p. 516.

<sup>132</sup> WHITTAKER 2004, p. 95; WIELOWIEJSKI 1970, p. 190.

<sup>133</sup> EGRI 2008, p. 51.

<sup>134</sup> EGRI 2008, p. 45; SALKIN 2007, p. 40; SIMON 2015, p. 239; diminished quantities of amphorae in frontier provinces can either result from a reduction of military

personnel or reflect a growing economic independence; cf. THOMAS, STALLIBRASS 2008, p. 8; EGRI 2008, p. 51.

<sup>135</sup> MATEI-POPESCU 2014.

<sup>136</sup> DYCZEK 2002, p. 20.

<sup>137</sup> DIMITROVA-MILČEVA 1987, pp. 108–133.

<sup>138</sup> SKOCZYLAS, GRALA 2003, p. 217.

<sup>139</sup> DUCH 2015, p. 248.

<sup>140</sup> GRAMATOPOL, BORDEA 1969, p. 145.

<sup>141</sup> BOUNEGRU 2009d.

<sup>142</sup> SARNOWSKI 1988, p. 128.

<sup>143</sup> EGRI 2008, p. 50.

<sup>144</sup> ŹMUDZIŃSKI 1998, p. 50.

<sup>145</sup> DUCH 2015, p. 250.

<sup>146</sup> GERRARD 2008, p. 122.

<sup>147</sup> DUCH 2015, pp. 241–244.

provincial minting was dominant among the coins in Moesia and Thrace. This tendency continued when in the third century imports of *terra sigillata* were consequently replaced by corresponding products made in the area of Nicopolis.<sup>148</sup> Additionally, the soldiers produced pottery, “legionary ware”, in the camps themselves.<sup>149</sup>

Short transport routes were crucial when the transported goods were heavy raw materials. Stone used at Oescus came from different quarries than at Novae, Nicopolis, Pavlikeni or Dimum, for instance;<sup>150</sup> this clearly results from efforts to keep the supply route as short as possible. Limestone was the most common rock in use. From Hotnica, which was the quarry for the central Danube plain and the *limes* sites between Dimum and Iatros, stone was transported by the rivers Rosica and Jantra to the Danube.<sup>151</sup> Other quarries from the territory of Nicopolis include Kamenec, Samovodene and Koevei.<sup>152</sup> Some quarries on the lower run of the Danube are also known, for instance near Dervent, where ships could be loaded conveniently at a port;<sup>153</sup> certainly there were many more. Sandstone quarries along the Danube have been found at Novae, Carevec and Oreš, while basalt was available in Dragomirovo, Ovča Mogila, Červena, Slomer, Vărbovka, Pavlikeni and Butovo.<sup>154</sup> The marble used at Novae for statues and architectural elements came from a more distant region (Berkovica, Vraca, Montana), but still within the province. The local acquisition of stone was no problem overall, numerous smaller quarries have also been noted at natural outcrops of limestone in the valleys of the Danube tributaries<sup>155</sup> (like the Jantra). Also in the less hospitable Dobrudja this raw material was relatively abundant.<sup>156</sup> In the Dobrudja, the Altın Tepe (Tur. “Golden Mountain”) and Casimcea mountain ranges held deposits of copper,<sup>157</sup> while traces of antique iron ore mining were discovered in various places.<sup>158</sup> Also, numerous stone quarries were located in the Dobrudja,<sup>159</sup> while the soil was rich in clay in many places, providing good raw material for pottery production.<sup>160</sup>

State<sup>161</sup> and private<sup>162</sup> brick factories were built in the province. The former could be manned by the *vexillationes* deployed for construction works or responsible for pottery production.<sup>163</sup> Clay could be found in numerous places along the Danube and the provincial hinterland, for instance in Ovča Mogila, Dičin, Radanovo and Butovo.<sup>164</sup> The huge amount of wood<sup>165</sup> and metal<sup>166</sup> that were necessary could not always be collected or extracted near the camps. The goods were preferably transported by ship, even though it was possible to move them by wagon or cart.<sup>167</sup> Timber was transported on the Danube.<sup>168</sup> Still, in spite of the currently dominating forest-steppe in the region, it appears probable that wood need not have been imported from far away, the forests in the area being sufficiently large.<sup>169</sup>

<sup>148</sup> ŹMUDZIŃSKI 1998, p. 48.

<sup>149</sup> GASSNER, JILEK 1997, pp. 301–309; DYCZEK 2009, pp.

<sup>150</sup> 153–171; DYCZEK 2016.

<sup>151</sup> SKOCYLAS 1999, p. 129.

<sup>152</sup> SKOCYLAS 1999, p. 130.

<sup>153</sup> TOMAS 2016, p. 37.

<sup>154</sup> BALTRES, AVRAM 2002–2003, p. 199.

<sup>155</sup> TOMAS 2016, pp. 38–39.

<sup>156</sup> BALTRES, AVRAM 2002–2003, p. 203.

<sup>157</sup> RADULESCU 1972, pp. 177–203.

<sup>158</sup> ZAHARIADE 2006, p. 13.

<sup>159</sup> Garvă, Telița, Ighița, Turcoaia, Babadag, Capidava, Pantelimonu de Sus and Istria.

<sup>160</sup> Especially the Kaolin-ware typical of the Dobrudja: DYCZEK 2016, p. 243. Cf. ZAHARIADE 2006, p. 14.

<sup>161</sup> SARNOWSKI 1997, p. 498.

<sup>162</sup> EGRI 2007, p. 105; TOMAS 2016, p. 40.

<sup>163</sup> RADULESCU 1973, pp. 129–135; IVANOV 1994, pp. 7–13; DYCZEK 2009, p. 158. SARNOWSKI 1997, p. 498, suggested that the camp name Tegulicum west of Durostorum reflects the presence of such a detachment.

<sup>164</sup> TOMAS 2016, p. 39.

<sup>165</sup> HANSON 1978, pp. 293–305.

<sup>166</sup> The demand for nails is best illustrated by the cluster of some 875,000–900,000 nails found at Inchtuthill; cf. MAPELLI *et alii* 2009, pp. 51–58.

<sup>167</sup> ROTH 1999, p. 209.

<sup>168</sup> TOMAS 2016, p. 35.

<sup>169</sup> Jordanes, *Getica* 51. Jordanes describes the area around Nicopolis as woodland and pastures, unsuitable for agriculture, which at first glance seems an odd choice of place for founding a city.

A specific mining district existed around Montana, but metal ore, especially iron,<sup>170</sup> was extracted also in Dobrudja, under the command of the *procuratores metallorum*.<sup>171</sup> The people living especially around the Greek cities, in the vicinity of Dionysopolis, Marcianopolis, as well as Anchialus, Deultum and Apollonia just outside the province, provided much of the natural resources, including lime, marble, iron and copper.<sup>172</sup> The mining district around Montana was meticulously secured by military personnel. The town was the most important centre in the western part of the province in terms of mining, local economy, and religion;<sup>173</sup> unsurprisingly, it developed from an earlier Thracian settlement. Due to the strategically important gold mines, it stood out among the cities of Moesia for being a *praesidium*<sup>174</sup> with an army camp, as well as a local administration within its region.<sup>175</sup> The *cohors I Sugambrorum veterana equitata* was stationed there from the early second century, as was a *vexillatio* of the *legio XI Claudia*, which replaced the *cohors* under Hadrian. Additionally, soldiers of the *legio I Italica* may have been stationed there.<sup>176</sup> The area was somewhat special, because its purpose was not solely to provide war material for the needs of the provincial garrisons, but also to organize the “export” of the ores elsewhere.

In Moesia Inferior, warehouses have been identified on military premises and in civil contexts in various places.<sup>177</sup> Especially the huge *horrea* around the farms in the region of Montana give proof of a grain production on a large scale.<sup>178</sup> But also in the eastern part of the province, along the border with Thrace, the conditions allowed for extensive agriculture in the Kamcija and Provadijska Reka river valleys. Here, as well as in some of the few fertile stretches of land in the Dobrudja, huge farms were built.<sup>179</sup>

Two *frumentarii* were mistakenly known from inscriptions in the Montana district.<sup>180</sup> However, the *regionarii* actually mentioned in both of these inscriptions<sup>181</sup> could well have engaged in logistics as Speidel pointed out, given their rather vague job description.<sup>182</sup> A *frumentarius* from the *legio I Italica*, possibly stationed at Novae, is known<sup>183</sup> as being active outside Moesia Inferior in Delphi during Hadrian’s reign.<sup>184</sup> His deeds were far closer to logistics than espionage, as he supervised a construction, a function often fulfilled by *frumentarii*, thus pointing to logistics as their main occupation.<sup>185</sup> A *lixa* is also attested in an inscription from Oescus in Moesia Inferior, dated to the late first century; he was connected with the fifth legion.<sup>186</sup>

The *primipili* could sign food supply contracts with civilian traders,<sup>187</sup> a procedure that from the third century onwards would lead to duties of *pastus militum* and the rise of civilian *primipilarii*, which is described in detail below. The *mensores* probably allotted space for traders, such as Iulius Iero from Novae, a negotiator selling wine,<sup>188</sup> while planning the camp and its surroundings.<sup>189</sup>

<sup>170</sup> ZAH 1971, pp. 191–207.

<sup>171</sup> BAUMANN 1995, p. 439.

<sup>172</sup> PREŠLENOV 2008, p. 300.

<sup>173</sup> SARNOWSKI 1988, p. 85.

<sup>174</sup> Cf. BUCKLER, CALDER, COX 1926, p. 74, inscription no. 201: *qui a Moesiae inferioris Montanensi praesidio numerus.*

<sup>175</sup> Regarding the strategic importance, see RANKOV 1983, pp. 43–47. Cf. also AUSTIN, RANKOV 1995, p. 199.

<sup>176</sup> HIRT 2010, p. 192; RANKOV 1983.

<sup>177</sup> RIZOS 2013; SARNOWSKI 2005, pp. 149–151.

<sup>178</sup> POULTER 1983, p. 89.

<sup>179</sup> SARNOWSKI 1988, p. 66.

<sup>180</sup> CIL III 7420; CIL III 12731; cf. RANKOV 1983, pp. 40–73.

<sup>181</sup> SPEIDEL 1984, pp. 186–187.

<sup>182</sup> RANKOV 1983, pp. 55–56, notes: “Exactly what the regional duties performed by all these officers were we can

only guess ...”, and “... to perform regional administrative duties ...”.

<sup>183</sup> MITCHELL 1987, p. 339. The inscription does not state the place where this officer was stationed, only his affiliation with this legion. Probably Mitchell extrapolated the former from the location of the standing fortress of the *legio I Italica* (with an error): “Novae in Moesia Superior”. There is a camp named Novae in Upper Moesia, but the legion in question was never stationed there.

<sup>184</sup> ILS 9473; BOURGUET 1905, p. 43. Cf. RANKOV 1990, p. 177; SHERK 1957, p. 61.

<sup>185</sup> Cf. DOMASZEWSKI 1908, p. 109.

<sup>186</sup> IVANOV 1990.

<sup>187</sup> WHITTAKER 2004, p. 96; SIMON 2015, p. 243.

<sup>188</sup> IGrLat. Novae 100.

<sup>189</sup> WHITTAKER 2004, p. 96.

It has been noted that the Romans preferably transported most goods on waterways. Maybe this was dictated by the geography of the Empire, or maybe it was the other way round: the waterways dictated the limits of growth for the Empire.<sup>190</sup> In spite of a certain risk connected with water travelling, the Roman army preferred this type of transportation, as it was cheaper and quicker than overland movement and much more convenient for heavy loads.<sup>191</sup> The Romans regularly transported grain, wine, olive oil, wood and stone by ship, as well as bricks.<sup>192</sup> Most legionary camps in the Empire were located on a major river<sup>193</sup> and in Moesia Inferior most of the goods were transported on the Danube and other rivers of the Balkan.<sup>194</sup> While the fleet was supposed to patrol the *limes*<sup>195</sup> and deny enemies the possibility of crossing the river and even capture their vessels, its main task was delivering supplies to the camps.<sup>196</sup> Subunits for guarding convoys were created (for land transport also).<sup>197</sup> Transmarisca and Noviodunum are some of the bases where waterways and major overland roads crossed.<sup>198</sup> From the *pridianum cohortis I Hispanorum* discussed below, we know that some soldiers served on *naves frumentariae*.<sup>199</sup> Stamped legionary tiles, found in cities on the Black Sea, give proof of intensive shipping of building materials not only to, but also from army camps, where the bricks and tiles were produced and from where they were distributed.<sup>200</sup> The army would also send out brick-producing units when necessary.

The Danube was an ideal main route for supply ships (provided it was not frozen), connecting the big ports on the Black Sea and also the Adriatic via the Sava and Drava rivers with the limestone sites and the mouths of the tributaries, which in turn made possible deliveries into the province interior, as well as the transport of raw materials in the other direction, e.g., stone from Hotnica along the Jantra to the Danube. Looking at the miserable width and depth of the Danube tributaries nowadays one is entitled to wonder, if they were navigable at all. However, the rivers carried more water in antiquity<sup>201</sup> and the barges had a minimal draught that required very little depth, so that the main Danube tributaries of the province (Iskăr, Osăm, Vit and Jantra) could have served as waterways for a considerable stretch.

The Moesian fleet, operating since Claudius or Nero,<sup>202</sup> was reorganized by Vespasian after 69/70, receiving the title of *Flavia* at some point.<sup>203</sup> Its soldiers had certain privileges.<sup>204</sup> Noviodunum was the seat of the *praefectus classis*, where in the second and third centuries a *vexillatio* of the *I Italica* was stationed. Even when transporting heavy goods, a quay or other masoned construction was not a precondition for unloading a ship. Small light barges were used for this purpose, connecting with a natural port on a river bank.<sup>205</sup> Still, larger harbour facilities with docks for building and repairing ships were probably located at Dimum.<sup>206</sup> The main base of the fleet was Noviodunum.<sup>207</sup> Moreover remains of solid ports were found at Novae,<sup>208</sup> Halmyris,<sup>209</sup> Capidava and Axiopolis<sup>210</sup> as well as Carsium.<sup>211</sup> At Rasova near the mouth of the river Baciului, a large

<sup>190</sup> ROTH 1999, p. 189. Cf. HERZ 2002, p. 21.

<sup>191</sup> ARICESCU 1980, p. 114; ROTH 1999, pp. 190–191; RICKMAN 1980, p. 120. Cf. Liv. 38.3.11.

<sup>192</sup> CASSON 1965, p. 31; SARNOWSKI 1997, p. 498.

<sup>193</sup> MONFORT 2002, p. 76.

<sup>194</sup> BOUNEGRU 1997, pp. 311–313; BOUNEGRU 2006, pp. 12, 101–104.

<sup>195</sup> LUTTWAK 1976, p. 78.

<sup>196</sup> ŹYROMSKI 1994, pp. 118–119; BOUNEGRU, ZAHARIADE 1996, p. 8.

<sup>197</sup> MONFORT 2002, p. 76.

<sup>198</sup> SARNOWSKI 1988, p. 129.

<sup>199</sup> British Museum Papyrus 2851, col. II, 33.

<sup>200</sup> SARNOWSKI 1988, p. 78.

<sup>201</sup> THEODOSSIEV 2000, p. 94.

<sup>202</sup> SARNOWSKI 2006, p. 89.

<sup>203</sup> It is not quite clear when this title was awarded. Cf. ŹYROMSKI 1994, p. 118; CONDURACHI 1974, p. 84; SARNOWSKI, TRYNKOWSKI 1986, p. 539; ARICESCU 1980, p. 30. The first mention is dated AD 92; cf. BÉRARD 1989, p. 133; GUDEA 2005, pp. 396–404.

<sup>204</sup> ECK, PANGERL 2006, p. 96.

<sup>205</sup> CASSON 1965, p. 32.

<sup>206</sup> SARNOWSKI, TRYNKOWSKI 1986, p. 540. However, one should treat with caution the ideas of MITOVA-DŽONOVA 1986 and 1994 regarding a sophisticated dock at Belene.

<sup>207</sup> ARICESCU 1980, p. 31; BOUNEGRU 2006, p. 109.

<sup>208</sup> SARNOWSKI 1996.

<sup>209</sup> GAJEWSKA 1974, p. 83.

<sup>210</sup> BOUNEGRU, ZAHARIADE 1996, p. 85.

<sup>211</sup> BOUNEGRU 2006, p. 109.

structure with hydraulic mortar from the second century was found and interpreted as the port of camp Flaviana, the late antique base of *militiae nauclarii*.<sup>212</sup> It has been suggested that the port at Novae, together with the unusual location of the army hospital within the camp, was a measure for facilitating the transport of wounded soldiers from the Dacian wars of Trajan.<sup>213</sup>

The talents of the army engineers and architects are attested in the written sources. Ulpian mentions the inspection of a public building programme among the duties of the governor of the province, who would have the *ministeria militaria* at his disposal for helping with the inspection (*Dig.* 50.6.7.1). As governor of Bithynia, Pliny asked Trajan a number of times for competent architects in order to carry out expertises for public building projects in the cities.<sup>214</sup> Trajan encouraged the hesitant Pliny to take action on his own account, given the apparent triviality of the matter,<sup>215</sup> but answering a letter describing the construction of two canals connecting the lake of Nicomedia with the sea via the rivers Melas and Sangarius, the Emperor was curious enough to suggest to Pliny that the latter turn on his behalf to the governor of Moesia Inferior, Calpurnius Macer, with a request for a proper specialist, who should be a *librator* or *architectus*<sup>216</sup> for the project. Moesia Inferior was not far from Nicomedia, but neither were Thrace or Greece, from where the architects working in Rome usually came according to an earlier letter by Trajan.<sup>217</sup> Thus, Trajan's idea of borrowing a specialist from Moesia could have been rooted in the fact that a *limes* province with three legions would have a certain number of excellent architects on hand during the phase of rapid development and building activity after the Dacian wars. We have from Moesia Inferior the grave stele of a *mensor discens*, found at Trimammium<sup>218</sup> as well as an inscription set up by a *miles agrimensor* from Montana.<sup>219</sup> The former belonged to the first Italic legion, the latter to the *XI Claudia*.

## Administration

The proper administration of logistics is the key to supplying an army. Thus, the Roman army command made an effort to be as meticulous as possible in this area.<sup>220</sup> Working on the logistics of the Roman army in Moesia Inferior one has the advantage of having the British Museum Papyrus 2851, also called Hunt's *Pridianum* or somewhat imprecisely, but clearly for the interested — Hunt's papyrus, which is a veritable summary of the topic. The exact provenance of this find is not known.<sup>221</sup> The form of the document is comparable to a common *pridianum* (and it will be referred to as such here<sup>222</sup>): an annual personnel register or roster of an army unit, taking into account that in Egypt, where the document was made, two of these were written annually, as the Roman and Egyptian year did not match.<sup>223</sup> Apart from information on single soldiers and units,

<sup>212</sup> BOUNEGRU, ZAHARIADE 1996, p. 86.

<sup>213</sup> DYCZEK 2004, p. 160.

<sup>214</sup> BOUNEGRU 2009b, pp. 19–29.

<sup>215</sup> AUSTIN, RANKOV 1995, p. 124.

<sup>216</sup> MITCHELL 1987, p. 338; cf. SARNOWSKI 1988, p. 68.

<sup>217</sup> The close contacts of the region with the Pontic cities of Moesia Inferior is well known: BOUNEGRU 2009a, p. 13.

<sup>218</sup> CONRAD 2004, p. 225 (no. 368). For epigraphic sources on other *mensores* in the army, cf. SHERK 1974, pp. 546–549; *Mensor discens*: DOMASZEWSKI 1908, p. 25.

<sup>219</sup> BOYANOV 2014, pp. 63–69.

<sup>220</sup> ROTH 1999, p. 244. Cf. SPEIDEL 2009, p. 285: “Denn die bei Fink gesammelten Dokumente lassen kaum einen anderen Schluss zu, als dass das römische Heer der Hohen Kaiserzeit mit seiner Verwaltung versuchte, alles und jeden

schriftlich in Listen und Verzeichnissen zu erfassen und diese nach verschiedenen Ordnungssystemen anzulegen, um damit die volle Kenntnis über den täglich wechselnden Zustand von Mannschaft und Material zu gewinnen”.

<sup>221</sup> HUNT 1925, pp. 265–272.

<sup>222</sup> FINK 1971, p. 217. Cf. SPEIDEL 2009, p. 288. Marichal has suggested that instead of being an actual *pridianum*, it stated or summarized information from the last *pridianum* (*ChLA XI* 501).

<sup>223</sup> FINK 1958, p. 111. With the deployment of the unit in the European provinces one faces the question of where its headquarters could have been. Why was Stobi in Macedonia the main location for the garrison and what was the nature of the relations of a Moesian *cohors* with Egypt?; cf. SYME 1959, p. 30.

the system of army documentation included also data on current issues like supplies of food, arms, equipment, raw material and other goods, so the commanding officers knew what they had at their disposal and thus could anticipate and properly document the necessary expenses.<sup>224</sup> The unit in question is the *cohors I Hispanorum veterana*, which belonged to the garrison of Egypt before it was moved to Moesia.<sup>225</sup> Its strength was 546 soldiers, 119 of these *equites*.<sup>226</sup> The document dates to the very beginning of the second century.<sup>227</sup> While the year is not entirely certain, there is much to argue in favour of the document being written up during the preparations for one of Trajan's campaigns against Dacia.<sup>228</sup>

The text in column I, lines 11–20, mentions preparations for a big war. A massive concentration of auxiliary forces along the Dacian frontiers took place at this time.<sup>229</sup> Discharging soldiers unable to fight and replacing them with fresh blood, as attested in the *pridianum*, was commonplace and logical,<sup>230</sup> and quite in accord with the duties of the logistics officers as defined by Emperor Leo in his treatise (cited above, n. 2). The data in the document can be divided into geopolitical, intelligence and logistical elements, which all come together in the described mission of the unit's cavalry onto the far side of the Danube. We learn from the text (col. II, 24–37) that both the Haemus mountains as well as the towns of Piroboridava in modern Moldavia and Buridava in Wallachia were *intra provinciam*. Fink deduced that the Romanization of Wallachia had progressed already by the end of the first century,<sup>231</sup> which is somewhat of an overstatement. Still, removing Decebalus from the fertile lowlands on the left bank of the Danube after setting up a Moesian control zone had its strategic significance for the region, because the local harvest would have been at the disposal of the Roman and not the Dacian army.<sup>232</sup> It can be argued based on the *pridianum* that the lands around the Olt and Seret rivers were already somehow part of the province at the time.<sup>233</sup> The stated necessity of defending the *annona*<sup>234</sup> and the manoeuvre of sending a reconnaissance unit beyond the Danube has led some researchers to suggest that Trajan's reason for engaging in Dacia may have been the intrusions of Decebalus into Wallachia towards the end of the first century.<sup>235</sup> The grain from the *annona* was very precious, especially in the winter, when movement on the Danube could have been hindered by the weather.<sup>236</sup> Thus we can observe here a diversification of the supply sources for the Moesian army. The stated expedition beyond the Danube (23 cavalry soldiers; col. II, 29–33) was intended not only as a means of protecting the harvest, but also as a reconnaissance mission. Involved was about 20% of the cohort's cavalry under the command of a *centurio*.<sup>237</sup>

Concerning logistics, the documents allow us to analyse certain aspects of the long distance supply routes. We learn (II, 18–20) that soldiers of this cohort were sent to Gallia for clothes<sup>238</sup> and grain,<sup>239</sup> and also, on horseback, "beyond the river Erar" (which has not been identified). The grain guarded by the soldiers of the cohort was transported in ships.<sup>240</sup> The text is not clear regarding whether the foodstuffs were bought or simply confiscated (foraging).<sup>241</sup> Moreover, the legionaries of the cohort supervised the work in a quarry in Egypt<sup>242</sup> and serve as police in the Dardanian

<sup>224</sup> FINK 1971, p. 241.

<sup>225</sup> FINK 1958, p. 111; CAVENAILE 1975.

<sup>226</sup> HUNT 1925, p. 268.

<sup>227</sup> Fink suggested the year AD 100 (FINK 1971, p. 221). The date accepted nowadays is September 16, AD 105. Cf. SPEIDEL 2009, p. 299.

<sup>228</sup> FINK 1958, p. 102; the main chronological indicator is column I, line 30, with the probable name of a consul (*ibidem*, p. 105).

<sup>229</sup> SYME 1959, p. 29.

<sup>230</sup> FINK 1958, p. 111.

<sup>231</sup> FINK 1958, p. 114.

<sup>232</sup> FINK 1958, p. 115; cf. CANTACUZENE 1928, p. 85.

<sup>233</sup> FINK 1958, p. 115.

<sup>234</sup> CANTACUZENE 1928, p. 90.

<sup>235</sup> FINK 1958, p. 116; SYME 1959, p. 32.

<sup>236</sup> CANTACUZENE 1928, p. 91.

<sup>237</sup> CANTACUZENE 1928, p. 86.

<sup>238</sup> Sending soldiers from Moesia to Gallia is astounding, but not impossible; cf. FINK 1958, p. 106.

<sup>239</sup> Obtaining grain and clothes as far as Gallia seems odd, but as noted by FINK 1958, p. 113, the Rhine and Danube provided a convenient transport route.

<sup>240</sup> CANTACUZENE 1928, p. 71.

<sup>241</sup> WHITTAKER 2004, p. 104.

<sup>242</sup> CANTACUZENE 1928, p. 82.

mines.<sup>243</sup> The papyrus also mentions a soldier killed by bandits plaguing the Danubian provinces,<sup>244</sup> who were the reason why transport convoys had to be guarded by army units.<sup>245</sup> From this and other Roman army administrative documents, like the Vindolanda tablets<sup>246</sup> and further papyri from Egypt and Dura Europos, we also learn that the soldiers of a single unit could be dispersed over a large area when acquiring supplies,<sup>247</sup> so the *cohors I Hispanorum veterana* was no exception in this regard. Added to the many examples of local provisioning, this source highlights the importance of long range supply lines operated both by civilian contractors and the soldiers themselves. We can assume that the administration centered in the capital of Tomis, where many members of the army personnel were stationed at the disposal of the governor and the *beneficiarii consulares* and *speculatores* had their seat,<sup>248</sup> played its part in coordinating the numerous military units within the province in this regard.

More on the logistics of Moesia can be learned from a series of epigraphic monuments found in Novae. Votive statues set up in the headquarters courtyard (*forum militare*) in the second and third centuries were dedicated by the first centurions (*primipili*) of the legion,<sup>249</sup> who among other things were responsible for provisioning logistics within the fortress. Starting around AD 300, the *primipilarii*, civil functionaries responsible for organizing supplies, resumed this tradition.<sup>250</sup> They came from the Cyclades, Hellespont and Phoenicia, at a time when the Roman army relied to a significant extent on a central provisioning system.<sup>251</sup> Nine such bases from the early fourth to the early fifth century were erected by individuals from Novae. One particular Greek inscription<sup>252</sup> records, for the first time, the name of Novae in a context where the *legio I Italica* is also mentioned. It is stated that two dignitaries from Ilion and Alexandria in the province of Hellespont founded a monument for the “glorious town of Noveians”. Similar dedications were found in the colony of Oescus, in the western part of the province.<sup>253</sup> The civil *primipilarii* apparently followed the tradition of their military namesakes, the *primipili* of the Principate, which was to erect a statue or comparable dedication in the headquarters of the legion they were working for after finishing their one-year duty, the *pastus militum*.<sup>254</sup> The context of these annual shifts for civilians is extremely important for understanding the logistics of the Roman army at that time. The *pastus militum* seems to have already existed during the Tetrarchy, although under a different name as part of a reorganization of the supply chains of the Roman army. It has been established, that the *primipilarii* were civilian officials employed by provincial governors, responsible for supplying the troops on the *limes*. As noted above, their task, called *pastus primipili* (in legal sources) or *pastus militum* (in inscriptions),<sup>255</sup> was first attested at the beginning of the third century, as a responsibility of the *primipili* of the army. However, as part of the modifications in the administration, their responsibility was transferred to the *primipilarii*. However, they did not collect the *annona*; this was the duty of the civic magistrates. The duty of the *primipilarii* was to transport supplies from the province in which they were collected (which was also their home province) to the location at which a given legion was stationed, although it is not clear yet who financed the procedure.<sup>256</sup> Supplying the legions of Lower Moesia from rather distant provinces of the Mediterranean seems to have been a consequence of the devastations the Goths brought with them and the subsequent logistic complications.<sup>257</sup> Also, relying on privateers for provisioning the army brought back into

<sup>243</sup> CANTACUZENE 1928, p. 75.

<sup>244</sup> CANTACUZENE 1928, pp. 63–96.

<sup>245</sup> BISHOP 1999, p. 114.

<sup>246</sup> BOWMAN 1998.

<sup>247</sup> FINK 1958, p. 106. Given the overall dynamics of the military personnel, the term *quae hibernatur* is the best indicator for the headquarters of a given unit (*ibidem*, p. 116).

<sup>248</sup> MATEI-POPESCU 2014, pp. 182–186.

<sup>249</sup> SARNOWSKI 2013, p. 138.

<sup>250</sup> SARNOWSKI 1999; SARNOWSKI 2013.

<sup>251</sup> LAJTAR 2013; SARNOWSKI 2013; SARNOWSKI 2005.

<sup>252</sup> LAJTAR 2013; LEMKE 2011, p. 199; DYCZEK 2015.

<sup>253</sup> SARNOWSKI 1999, p. 61.

<sup>254</sup> SARNOWSKI 2013.

<sup>255</sup> LAJTAR 2013, p. 105.

<sup>256</sup> LAJTAR 2013, p. 105; SARNOWSKI 2013; SARNOWSKI 2005.

<sup>257</sup> SARNOWSKI 2013, p. 144; POULTER 2007, pp. 37–38.

the fighting pool forces earlier discharged to engage in the logistic process. At a time of constantly shrinking troops, this could have been a successful measure to have more soldiers available for guarding the frontier, although the process of involving private contractors in the transportation of military supplies had intensified already in the late Republic.<sup>258</sup>

## Conclusion

Summarizing the above, it seems fair to start with the extensive role played by civilians, whether the indigenous population, the traders or the Roman colonists, in the supply system and consequently for the functioning of the army. Military and civil settlements in the frontier zones were closely related,<sup>259</sup> and the urbanization of the province seen as the development of *canabae* and *vici* was conducive to the consolidation of army logistics.

Understanding army logistics is important for understanding the *limes* as such, especially the fundamental and dual role of the Danube. Camps and smaller garrisons were located strategically, taking into account geographical conditions and their influence on logistics, the Danube being both a border and a transport route. The stepwise annexation of the areas that would become Moesia Inferior are testimony to planned actions, always preceded by a reconnaissance on the ground.<sup>260</sup> This included a thorough analysis of what the province could and could not provide as well as a stable coordination of the army supply by specialized personnel.

Indeed, at some point, at least during its zenith, the Roman army gave the impression of having unlimited personnel and resources.<sup>261</sup> The logistics, especially in the first century, showed some improvisation,<sup>262</sup> although requiring a specific set of skills to be carried out, but overall they were manifest to good organization and planning ahead. A sophisticated and well devised system was soon in place. But the sophisticated logistic needs could be cumbersome as well, as Bishop pointed out, leading *ad absurdum*: “It is as if the supply mechanism set up to maintain the standing army had in turn come to require that army to defend it”.<sup>263</sup>

The archaeological record demonstrates that food and other essential products were acquired by all available means: own production on the premises of the *prata*, taxation of the local population, transport on short supply routes within the province and long ones within the Empire as a whole. The various logistic factors, like developing infrastructure, transport and the demography of a province, were not only interconnected, but also influenced by one another on a more abstract, strategic level. Setting the imperial frontier on the Danube was in this part of Europe a well-considered move, implying an interesting symbiotic approach: The army set the stage for Romanizing the province, whereas Romanization played its part in supplying the army, all to the grandeur of Rome.

<sup>258</sup> EGRI 2008, p. 49; SIMON 2015, p. 242.

<sup>259</sup> Contrary to this Agnieszka Tomas suggests: “Military installations came into existence as a result of a public programme, while civil settlements followed them or developed for other complex reasons” (TOMAS 2007, p. 46), and: “The locations for the future military bases were chosen basing on completely different factors than for civilian settlements” (TOMAS 2016, p. 34). To my mind, the reverse is more likely: forts were built in places where civil settlements already existed. Most importantly because provisioning was assured in such places, but also because places of strategic importance in the broader sense, such as intersection of important roads or places characterized by specifically favorable economic conditions, would have naturally fostered the development of such settle-

ments in the first place, prompting the army simply to take control. Thus the same factors were at work when choosing a location. And even though the army would have eventually impacted local economic growth, it must have at first lived off the existing indigenous infrastructure.

<sup>260</sup> SHERK 1974, p. 543: “Topographical information is essential to military success, and, like any effective army, the Roman army saw to it that the various provinces under its control and the people living in or around them were investigated from a military point of view”.

<sup>261</sup> Plb. *Hist.* 3.89.8.

<sup>262</sup> ROTH 1999, p. 331.

<sup>263</sup> BISHOP 1999, p. 112.

## Abbreviations

<i>ChLA</i> XI	<i>Chartae Latinae antiquiores</i> , XI, ed. A. BRUCKNER, R. MARICHAL, Olten – Lausanne 1979.
<i>CIL</i>	<i>Corpus inscriptionum Latinarum</i> .
<i>IGrLat. Novae</i>	<i>Inscriptions grecques et latines de Novae (Mésie inférieure)</i> , ed. J. KOLENDÓ, V. BOŽILOVÁ (= <i>Ausonius Publications. Mémoires</i> 1), Bordeaux 1997.
<i>ILS</i>	<i>Inscriptiones Latinae selectae</i> , ed. H. DESSAU, 2nd ed., Berlin 1954–1955.
<i>NATO Glossary</i>	<i>NATO Glossary of Terms and Definitions</i> , AAP-06, edition 2015.

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## Streszczenie

### Dunaj, limes i logistyka.

### **Kilka refleksji na temat zaopatrzenia rzymskiej armii w Mezji Dolnej**

Sercem logistyki wojskowej jest administracja w szerokim znaczeniu, czyli rozbicie kwestii koordynowania i zaopatrzenia armii na czynniki podstawowe, i idące w ślad za tym istnienie dużej liczby wyspecjalizowanego personelu wojskowego, pełniącego rozmaite zadania związane z utrzymaniem przy życiu ogromnej maszynierii armii. Omówienie przygotowania logistycznego armii rzymskiej w prowincji Mezji Dolnej wymaga osobnego studium, gdyż inaczej można byłoby odnieść wrażenie, że obozy limesowe, w pierwotnym założeniu w dużym stopniu samowystarczalne, stanowią, każdy z osobna, mikrokosmos niewymagający kontaktu z resztą świata lub będący co najwyżej w kontakcie z najbliższymi centrami wojskowymi.

Stopniowa aneksja poszczególnych partiów Mezji Dolnej świadczy o planowym działaniu, które każdorazowo nastąpiło po dokładnym rozpoznaniu terenu. Można też zauważać przemyślaną koordynację zaopatrzenia armii za pomocą odpowiedniego personelu. W kontekście zaopatrzenia dostępne źródła świadczą o tym, że armia zdobywała wyżywienie i konieczne produkty wszystkimi możliwymi sposobami. Były nimi: własna miejscowa produkcja na obszarze *prata legionis*, podatki od lokalnej ludności, transport krótkimi liniami zaopatrzeniowymi wewnątrz prowincji oraz długimi liniami w obrębie całego cesarstwa.

Widzimy ogromne znaczenie populacji cywilnej — ludności autochtonicznej, handlarzy i kolonistów rzymskich — dla zaopatrzenia i, co za tym idzie, funkcjonowania armii. Osadnictwo cywilne i wojskowe było ściśle ze sobą powiązane, a urbanizacja prowincji, zwłaszcza w postaci rozwoju osad przyfortecznych, była zabiegiem służącym konsolidacji zaopatrzenia. Dla intensywności oddziaływań wokół Dunaju miało istotne znaczenie ukształtowanie terenu. Sąsiadujące otwarte przestrzenie nie posiadały naturalnych przeszkód, które mogłyby hamować ekspansję rzymską. Zauważamy też, jak bardzo romanizacja prowincji rzutuje na możliwości zaopatrzenia armii.

W niektórych sprawach widzimy pewną ambiwalencję konieczności i przydatności: rozdrobnienie większych jednostek za sprawą *vexillationes* było konieczne, aby obniżyć punktowe obciążenie zaopatrzeniowe; jednocześnie takie odseparowanie oddziałów służyło zarówno zwiększeniu gęstości kordonu limesowego, jak i wypełnianiu zadań policyjnych wewnątrz prowincji.

Powyższy artykuł pokazuje zarówno mechanizmy szlaków zaopatrzeniowych i innych zjawisk funkcjonujących w skali całej prowincji, kilku prowincji lub nawet całego cesarstwa, jak i aspekty logistyki lokalnej. Pomimo nieraz niezadowalającej liczby źródeł, jakimi dysponujemy, przy pod-

sumowaniu powyższych faktów rysuje się dość wyraźny obraz całokształtu logistycznego armii rzymskiej w Mezji Dolnej. Logistyka mogła też zawierać — zwłaszcza w pierwszej fazie — czynności improwizowane, które i tak wymagały odpowiednich umiejętności. Wkrótce stopniowo powstał system solidnie rozplanowany.

Poszczególne czynniki logistyczne, jak tworzenie infrastruktury, transport i demografia prowincji, nie tylko były ze sobą powiązane, lecz także warunkowały się wzajemnie na szczeblu bardziej abstrakcyjnym, strategicznym. Wiele wskazuje na to, że założenie granicy cesarstwa na Dunaju było efektem przemyślanej strategii, wprowadzonej w życie za pomocą wojska. Wokół tej kwestii toczy się jednak dyskusja, ponieważ trudno jest jednoznacznie zinterpretować intencje polityczne nawet jednego cesarza, a co dopiero całego imperium na przestrzeni kilkuset lat. Z drugiej strony, przydatność procesu urbanizacyjnego wewnętrz prowincji dla zaopatrzenia garnizonów granicznych, a więc dla zabezpieczenia granicy, jest bezsporna.

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## SPINNING IN THE LEGIONARY CAMP AND CITY OF NOVAE\*

**Abstract:** The site of Novae has yielded so far 133 spindle whorls. Five formal types can be distinguished: biconical, conical, hemispherical, oval and discoid. The insignificant mass of the whorls make them suitable for spinning wool yarn. Stone whorls decorated with concentric circle merit special note. A few of the bone whorls also bear interesting decoration. Whorls of clay without any decoration were in the majority.

**Key words:** spindle whorls, Novae, wool, textiles

Archaeological excavation at the site of Novae, conducted between 1960 and 2016 by the Archaeological Expedition of the University of Warsaw and later the University's Center for Research on the Antiquity of Southeastern Europe, yielded 133 artifacts identified as spindle whorls. Part of this collection was lost, probably during the quake that destroyed Svišov in the 1970s. The remaining ones were described again, measured and weighed. Regarding the lost artifacts, data copied from excavation tags and published in a 1993 article by Jacek Okrzesik in *Novensia*<sup>1</sup> were taken into consideration.

### Novae

Novae lies in historic Lower Moesia (*Moesia Inferior*). The fort was established for the VIII Legion of August in the first century AD. In the fourth century, a city replaced the fortress. The largest number of whorls (more than 80%) was discovered in sector IV, in the *valetudinarium* (army hospital) and in later architecture. Singular artifacts came from sectors I, II, V, XI, excavations in the Roman road and the southern defenses. Three whorls were surface finds from the nearby site of Ostrite Mogili.

### Whorl function

The function of a whorl is to keep the spindle spinning and maintain proper yarn tension. Choice of whorl depends on the length of spun yarn and its fineness as well as thickness. How a whole works depends on its moment of inertia. This value may be calculated, multiplying mass of a point

\* The project has been financed with resources provided by the National Science Center, Poland, allotted on the basis of decision DEC-2014/13/B/HS3/04836.

<sup>1</sup> OKRZESIK 1993, pp. 179–196.

by the square of the distance from the spinning axis ( $x = m \times r^2$ ). Calculating the moment of inertia in the case of a whorl, which is a set of points, is much more difficult.<sup>2</sup>

An examination of whorl properties takes into consideration foremost the weight of these artifacts. It is responsible not only for the moment of inertia, but also for proper yarn tension. It cannot be too small because the yarn would be weakly twisted, nor can it be too big because the yarn could break. Diameter and height of a whorl are also important. The bigger the diameter and smaller height, the greater the moment of inertia. Heavy whorls of large diameter are preferred for spinning long yarn that does not need to be strongly twisted. For short yarn, high whorls are better because they ensure faster rotation. This is theory, of course. In practice, the skill and experience of the spinner are of paramount importance.

Ethnographic observation coupled with archaeological experiments and analysis of archaeological finds have led to the establishment of weight divisions for whorls used to spin animal and plant fiber depending on their different properties.<sup>3</sup> To make it simple, whorls for spinning woolen yarn are between 8 g and 60 g. Whorls for spinning flax and hemp must be much heavier.

### **General characteristic of whorls discovered at the site of Novae**

Whorls from the archaeological excavation at Novae are of different shape, size, material and ornament. Clay was the most popular raw materials with 58% of the finds being ceramic whorls. Of these a few were made from pottery vessel walls or bottoms. Stone whorls constituted about 24% of the finds and 11% of the collection were of bone. Glass and metal whorls are the rarest [Fig. 1]. The weight of the whorls ranges from close to 5 g at the lightest to almost 40 g at the heaviest. The predominant weight of the whorls is between 10 g and 25 g.

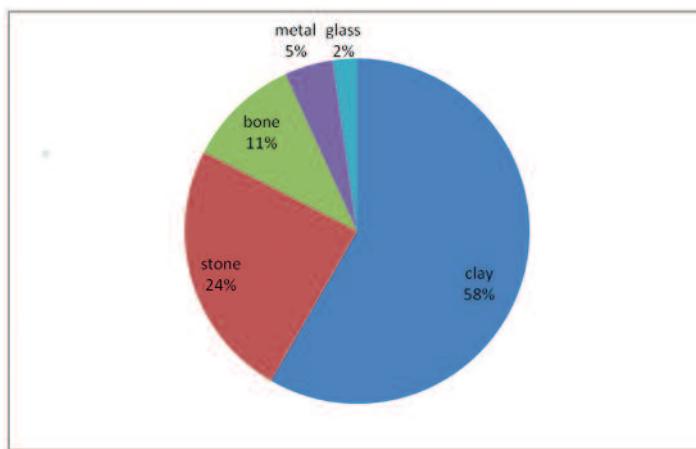


Fig. 1. Percentage share of raw material used for making the spindle whorls found at the site of Novae

### **Typology of whorls from Novae**

The great diversity of shapes of the whorls from Novae makes a typology difficult to establish. Five principal shapes can be distinguished [Fig. 2], further differentiated within these types by clear differences of the diameter to height ratio, as well as inclination of the sides and diameter of the

<sup>2</sup> CHMIELEWSKI, GARDYŃSKI 2010, pp. 870–871; VERCHECKEN 2009, pp. 257–270.

<sup>3</sup> CARRINGTON SMITH 1975, pp. 80–81, after CHMIELEWSKI 2009, pp. 125–126; MARTEENSSON *et alii* 2006.

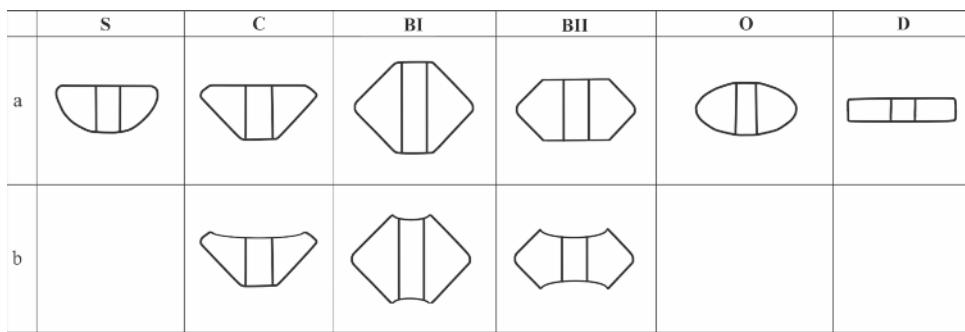


Fig. 2. Typology of spindle whorls discovered in Novae

pierced channel opening. These parameters determine how the whorl works. Thus, artifacts within one type may have had a different function. Biconical whorls are the most common (36%); they are attributed to types BI and BII. BI approaches a double cone in shape with two subtypes: biconical with finely truncated top (BIa) and biconical with slightly depressed top (BIb). The BII type is a double truncated cone, again with two subtypes: a flat top (BIIa) and a depressed top (BIIb). The next type is hemispherical (S) (33%). Discoid-shaped whorls (D) are much less numerous as a group (16%) and the least common were oval whorls (O) (6%) and conical ones (C) (5%). The latter are subdivided into conical whorls with flat base (Ca) and a slightly concave base (Cb). Whorls shaped from vessel walls and bases (so-called sherds), 4% of the collection, are outside this typology [Fig. 3].

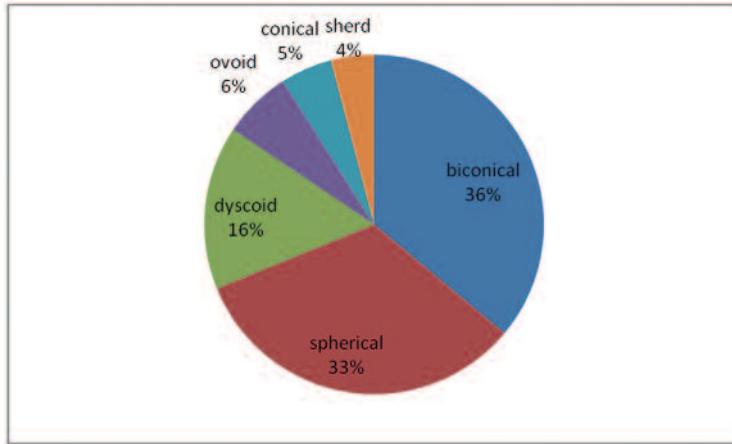


Fig. 3. Distribution of types of spindle whorls known from Novae

### Stone whorls decorated with concentric circles

Stone hemispherical whorls (S) with engraved concentric circles on the top as well as base of the artifact form the most uniform group (21 examples). The stone is of the same kind in all these cases, the decoration is very similar, but there are clear differences in the diameter to height ratio [Fig. 4] and even the diameter of the pierced openings. Some have the top surfaces truncated slightly. A few oscillate on the border of type S (hemispherical) and C (conical). In two cases, the whorls are flattened enough to put them already among the discoid-shaped examples (D).

The weight of whorls from this group oscillated between 5.75 g and 18.35 g [Fig. 5]. The diameter was from 2.15 cm to 3.4 cm, the most frequent measurement being 2.6–2.8 cm. The difference in height is substantial (0.6 to 1.6 cm) [Fig. 4], but the most surprising differences were noted in the shape and size of the pierced opening. The diameter ranged from 0.7 cm to 1.1 cm and it was always larger at the base of the whorl than at the top, usually by 0.1 cm, sometimes 0.05 cm and in three cases even 0.2 cm. The differences in the size of this opening indicates that the spindles on which these whorls were mounted were not the same, unless these tools narrowed toward the ends, thus enabling the whorls to be placed at different heights.

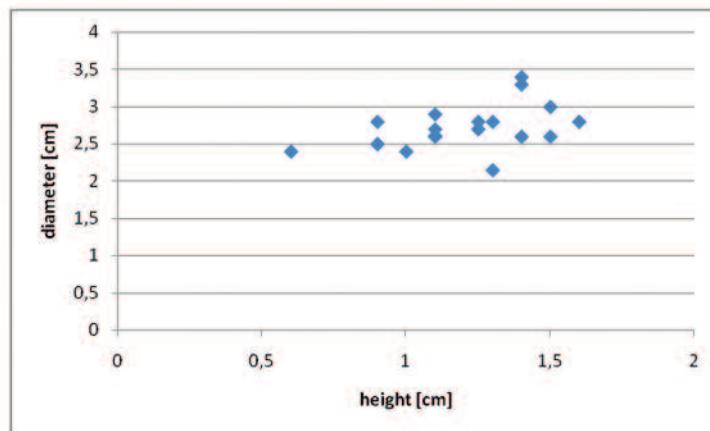


Fig. 4. Height to diameter ratio of stone spindle whorls decorated with concentric circles

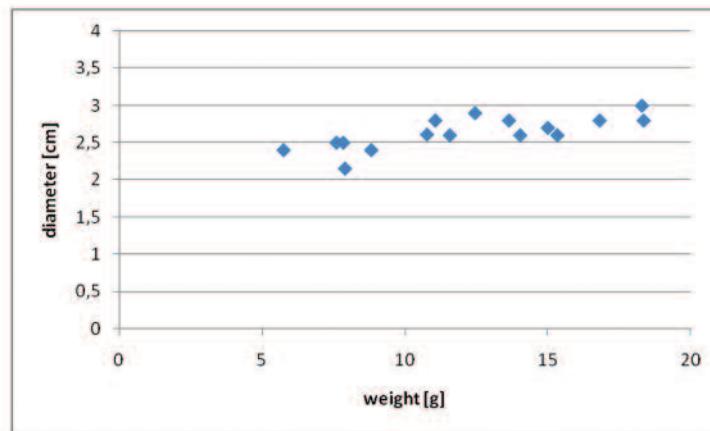


Fig. 5. Mass to diameter ratio of stone spindle whorls decorated with concentric circles

### Whorls of bone

Bone whorls make up the next group and merit attention in their own right. The excavation has yielded 14 examples so far. The weight ranged from 8 g to 33 g. These were mostly hemispherical whorls, more rarely discoid-shaped. A group among the whorls was distinguished by a similar form and decoration (inv. nos 100/96 w; 18/98 w; 452/15 and most probably the lost whorl 55/60). These are hemispherical examples, from 3 cm to 3.7 cm in diameter, 1.4 to 1.5 cm in height. The

base of the whorls is decorated with clusters of small dotted circles forming a unique design in every case despite using the same motif. Two hemispherical whorls (inv. nos 61/99 and 98/77) are decorated with engraved triangles and lines.

### Weaving and spinning in Novae

The whorls discovered at Novae are evidence of a local weaving industry, even if some of the textiles for the army were imported (most probably from Gaul and Italy).<sup>4</sup> However, no ancient textiles survive from the excavation,<sup>5</sup> making it difficult to discuss the role of local weaving. Considering raw material availability, wool may have been processed on site, as well as possibly hemp.

Animal remains identified as ovicaprids were recorded from the *principia* and the Western District. Examination of the bones identified the species of sheep as a short mouflon type.<sup>6</sup> The percentage share of sheep bones was rather low in most deposits,<sup>7</sup> save for a post-consumption deposit from the hypocaust cellar of the headquarters building from the fourth century AD, where the percentage of sheep is predominant.<sup>8</sup> The analysis also showed that the animals had mostly been young. The sporadic presence of sheep bones in post-consumption material from an earlier period indicates that sheep were raised mainly for wool and milk. Metal scissors, a few of which were found on site, are further proof, their shape indicating that they were used as shears for sheep.<sup>9</sup> Hooves impressed in bricks and tiles are also proof of sheep being raised in Novae and its nearest neighborhood.<sup>10</sup>

Hemp may have also been used in the local weaving industry. Its popularity in the Danube region is borne out by a mention in Herodotus (*Histories* IV 74). Nineteenth century travelers also noted the use of hemp in this region.<sup>11</sup> However, there is no evidence for plant fiber use from the excavation in Novae. The discovered whorls are too light to have been used for spinning either hemp or flax, although they would have been suitable for spinning nettles.

The archaeological record in Novae brings no other accessories that could be enlightening for the local weaving industry, the sole exception being a few loom weights.<sup>12</sup> Most of them were net sinkers, although it is quite likely that they were used for weaving, too. These finds show that a warp-weighted loom was in use; this kind of loom was the most common in the Roman Empire (two beam looms were also known).<sup>13</sup>

The local weaving industry may not be reconstructed on the grounds of the finds discovered to date, but the whorls indicate that woolen yarn was chiefly produced on site. Only a few whorls were actually heavier than 30 g. The decorated stone and bone whorls were used presumably for spinning thin and medium-sized yarn. Interestingly, only the stone group of whorls included whorls lighter than 8 g, presumably intended for spinning very fine and delicate yarn.

Further analyses of spindle whorls from other legionary camps and city complexes in this section of the Roman *limes*, as well as new finds from Novae may yet throw light on weaving in former Moesia.

<sup>4</sup> LIU 2013, pp. 131–132.

<sup>5</sup> The sole recorded piece of textile is of medieval date; it is a woolen fragment in canvas weave.

<sup>6</sup> GRĘZAK, PIĄTKOWSKA-MALECKA 2006, p. 42.

<sup>7</sup> SCHRAMM 1975, pp. 215–241; SCHRAMM 1979, pp. 97–130; GRĘZAK, LASOTA-MOSKALEWSKA 1998, pp. 203–209.

<sup>8</sup> GRĘZAK, PIĄTKOWSKA-MALECKA 2000, pp. 100–101.

<sup>9</sup> GACUTA 1987, pp. 89–90; ALFARO GINER 1997, figs. 5–6.

<sup>10</sup> DYCZEK 2011, p. 92.

<sup>11</sup> YATES 1843, pp. 292–293.

<sup>12</sup> KOWAL 2011, pp. 127–147.

<sup>13</sup> ALFARO GINER 1997.

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## Streszczenie

### **Przedzalnictwo na terenie obozu legionowego i miasta Novae**

Na stanowisku Novae podczas badań prowadzonych przez Ekspedycję Archeologiczną Uniwersytetu Warszawskiego, a później przez Ośrodek Badań nad Antykiem Europy Południowo-Wschodniej UW w latach 1960–2016 odkryto dotychczas 133 przesłiki. 58% stanowią przesłiki gliniane, 24% to przesłiki kamienne, a 11% kościane. Ponadto okryto nieliczną grupę przesłników metalowych i szklanych. Ze względu na ich formę można wydzielić pięć typów: bikoniczne, koniczne, semisferyczne, dyskoidalne i owalne. Najczęściej występują przesłiki bikoniczne i semisferyczne, rzadziej dyskoidalne, a pozostałe typy reprezentowane są jedynie przez kilka egzemplarzy. Masa przesłników waha się od 5 do 40 g, co sugeruje, że wykorzystywano je do produkcji przedzy wełnianej. Na szczególną uwagę zasługuje dosyć jednorodna grupa przesłników kamiennych z rytym ornamentem w kształcie koncentrycznych kół. Dekoracja występuje jeszcze na kilku przesłikach kościanych, podczas gdy przesłiki gliniane w zdecydowanej większości są niezdobione.

Analiza przesłników z pozostałych obozów legionowych oraz założeń miejskich na tym odcinku limesu rzymskiego, a także nowych znalezisk ze stanowiska Novae, może rzucić nowe światło na problematykę tkactwa na terenie dawnej Mezji.

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## OSTEOLOGICAL REPORT ON THE HUMAN REMAINS FROM THE MILITARY HOSPITAL AREA AT NOVAE<sup>1</sup>

**Abstract:** During the 2016 mission at Novae, some of the remains from the 97 explored burials from the 2002–2006 missions, led by the University of Warsaw’s Center for Research on the Antiquity of Southeastern Europe, were analyzed and documented. The Late Antiquity town cemetery, created on the grounds of the former military hospital at Sector IV at Novae, was in use until the early medieval period according to relative dating methods and radiocarbon dating. The disarticulated nature and poor preservation of the remains made it difficult for sex determination and age-at-death estimation. Pathologies were also recorded, among them degenerative processes such as osteophyte formation, spondylosis and Schmörl’s nodes were observed on all adult individuals. Spina bifida was also observed on two individuals. The graves followed stereotypical Roman inhumations discovered across the lower Danube region in Bulgaria, however, the small amount of grave goods found in the burials do not provide enough evidence to determine the social class of the individuals. Further research to reconstruct the diet through enamel microwear pattern analysis would be recommended.

**Key words:** bioarchaeology, paleopathology, burial customs, Novae cemetery, Roman fortress

Located just 4 km from the new center of Svishtov, Novae was a key Roman legionary fortress and later settlement on the Lower Danube.<sup>2</sup> A key feature in the *praetentura* of the legionary fortress in Sector IV is the army hospital, excavated by the University of Warsaw’s Center for Research on the Antiquity of Southeastern Europe from 1970 to 2010.<sup>3</sup> Abandoned as a fortress in the fourth century CE, Novae continued as a town with a small cemetery until the early medieval period.<sup>4</sup>

In 2002–2006, the excavation project explored and recorded approximately 97 burials.<sup>5</sup> The graves were close to one another and aligned east–west. Bodies were laid to rest supine, hands on the pelvis.<sup>6</sup> Grave goods were present throughout the cemetery, adult graves typically having only earrings, whereas children’s graves were the richest with earrings and necklaces.<sup>7</sup> Potsherds and coins were discovered throughout the area, facilitating a relative dating of the cemetery. Radiocarbon dates from bone fragments place the cemetery from the seventh to the fourteenth century CE.<sup>8</sup>

<sup>1</sup> The project has been financed with resources provided by the National Science Center, Poland, allotted on the basis of decision DEC-2014/13/B/HS3/04836.

<sup>2</sup> DERDA, DYCZEK, KOLENDO (ed.) 2008; SARNOWSKI *et alii* 2012.

<sup>3</sup> DYCZEK 2008a.

<sup>4</sup> LEMKE 2005; LEMKE 2006, p. 53; DYCZEK 2008b; DYCZEK 2008c.

<sup>5</sup> DYCZEK 2006, p. 138.

<sup>6</sup> *Ibidem*, p. 140.

<sup>7</sup> *Ibidem*, pp. 140–141.

<sup>8</sup> DYCZEK 2006; DYCZEK 2008c.

aDNA analysis of samples from the cemetery assigned the exhumed remains to haplogroup H, which is typical of European populations. The sequences of the results indicate that the samples are characteristic of northern Europe, Germanic tribes, and the Northern Balkan people.<sup>9</sup>

Nine boxes containing some of the remains from the 2004 and 2005 excavation season were subjected to osteological analysis during the 2016 season. Sex determination methods described by Buikstra and Ubelaker were followed.<sup>10</sup> Age-at-death determination drew on additional methods for subadults<sup>11</sup> and adults.<sup>12</sup> Paleopathological changes were observed and documented using supplementary methods.<sup>13</sup> Completeness was determined based on the total percentage of remains: less than 25%, 25–50%, 50–75%, and more than 75% (marked as --, -, +, and ++ respectively). Table 1 summarizes the palaeodemographic data.

Table 1. Age-at-death and sex determination of the studied skeletons

<b>Age-at-death (years)</b>	<b>Male</b>	<b>Female</b>	<b>Unknown</b>	<b>Total</b>
<b>0–2</b>			2	<b>2</b>
<b>2.5–14</b>			2	<b>2</b>
<b>14.5–21</b>	1			<b>1</b>
<b>21.5–30</b>		1		<b>1</b>
<b>30.5–55</b>	1	1		<b>2</b>
<b>Adult</b>	1	1	7	<b>9</b>
<b>Total</b>	<b>3</b>	<b>3</b>	<b>11</b>	<b>17</b>

The table below gives a summary of the data on the completeness of the human skeletons, the sex and age-at-death of the identified individuals, and the most significant morphological and paleopathological characteristics.

Table 2. Sex, age, completeness of the skeleton, and most significant pathologies and morphological changes observed

<b>No.</b>	<b>Object</b>	<b>Completeness</b>	<b>Sex</b>	<b>Age</b>	<b>Comments, most important pathologies</b>
1	1/2005.1	--	?	Adult	–
2	1/2005.2	++	?	~ 6–7 years	Taphonomic changes on parietal lobes (possibly porotic hyperostosis?)
3	2/2005.1	++	M	30–35 years	Caries: LM <sub>3</sub> (6.0 mm), Schmörl's nodes on T12, L4, L5 (4–10.0 mm); well-defined costal ligament impressions on both sternal ends of clavicles; osteophytes present on left ribs

<sup>9</sup> STANKOVIĆ 2003.

<sup>12</sup> LOVEJOY 1985.

<sup>10</sup> BUIKSTRA, UBELAKER 1994.

<sup>13</sup> ORTNER 2003; WALDRON 2009; STECKEL *et alii* 2011.

<sup>11</sup> SMITH 1991; SCHAEFFER *et alii* 2009.

4	3/2005.1	--	?	Adult	-
5	3/2005.2	++	?M	16–18 years	Spina bifida; green staining on ilium and distal scapular end
6	4/2005.1	++	F	35–45 years	Abscess: right M <sub>1</sub> , M <sup>1</sup> , left M <sup>1</sup> ; caries: left M <sup>1</sup> (4.0 mm); inflammatory process on maxilla especially on left M <sup>2</sup> – right M <sup>2</sup> ; slight <i>cribra orbitalia</i> ; slight osteophytical changes on cervical and lumbar vertebral bodies; slight flattening of vertebral bodies; osteophytes on the edges of lumbar vertebral bodies; flattening of vertebral bodies, signs of osteoporosis; spina bifida
7	4/2005.2	-	?	~38–40 weeks	-
8	4/2005.3	--	?	Adult	-
9	5/2005.1	++	F	Adult	Degenerative changes near auricular surfaces of the ilium (right bone slightly coalesced with sacrum)
10	6/2005.1	++	F	25–30 years	Abscess: left M <sup>3</sup> ; asymmetry of right superior articular facet of axis; magnum foramen also shows signs of asymmetry
11	6/2005.2	--	?	Adult	Evidence of spondylosis on lumbar vertebrae
12	6/2005.3	+	?	~32 weeks	-
13	7/2005.1	-	?	Adult	Right femur bowed laterally
14	7/2005.2	-	?	9–14 years	-
15	1/2004.1*	--	?M	Adult	Inflammation of auditory ossicles (both right and left)
16	1/2004.2*	--	?	Adult	Schmörl's nodes of lumbar vertebrae (15 mm); asymmetry in superior articular processes (possibly scoliosis?)
17	1/2004.3*	--	?	Adult	-

\* Skull (1/2004.1) discovered in the trench wall, all other bones from the bulk finds.

Taking measurements and sex determination on this material were difficult due to poor preservation of the bones and the disarticulated nature of the remains. However, degenerative processes such as osteophyte formation, spondylosis and Schmörl's nodes (between 4–15.0 mm) were present on all vertebrae of adult individuals. Caries and abscesses were also observed. Animal remains, from namely pig and cattle, were also present in each box with human remains.

The individual 4/2005.1, a female aged 35–45 years, was the most interesting case and demonstrated severe pathological changes. Three abscesses were present, on the left M<sup>1</sup>, on the right M<sub>1</sub> and on M<sup>1</sup>, which also demonstrated caries [Fig. 1]. Additionally, an inflammatory process near most of the dentition of the maxilla (left M<sup>2</sup> – right M<sup>2</sup>) could suggest initial stages of scurvy [Fig. 2].



Fig. 1. Abscess on the right maxilla of 4/2005.1 (photo M. Srienc)



Fig. 2. Inflammatory process on the maxilla of 4/2005.1 (photo M. Srienc)

Degenerative processes were present in the form of osteoporosis and osteophytes of the edges of the lumbar body and flattening of the vertebral bodies. The female also had *cibra orbitalia*, which likely indicates anemia. In addition, this female presented evidence of spina bifida [Fig. 3].

Evidence of spina bifida was the most interesting pathological change also on skeleton 3/2005.2, a probable male 16–18 years old [Fig. 3].



Fig. 3. Spina bifida observed in 4/2005.1 on the left and 3/2005.2 on the right (photo M. Srienc)

Degenerative processes were observed in all adult individuals. Also, 1/2004.1 had an inflammation of the auditory ossicles (ear infection) on both sides [Fig. 4]. Supplementary research focusing on enamel microwear pattern analysis could provide the data necessary for a reconstruction of dietary habits.

The graves from Novae reflect a stereotype of Roman burial practices recorded throughout the lower Danube region in Bulgaria.<sup>14</sup> Inhumations are generally made in supine position, aligned east–west, accompanied by offerings of domestic animals deposited nearby.<sup>15</sup> The limited number of grave goods in the graves and the nature of the burials do little to establish the social class of the individuals in the cemetery. Enamel microwear pattern analysis and reconstructing the diet could address this issue, helping to determine lifestyle and status of the individuals buried in the cemetery at Novae.

<sup>14</sup> FIEDLER 2008, p. 157.

<sup>15</sup> FIEDLER 2008, pp. 156–157; PARVANOV 2016.



Fig. 4. Inflammation of the auditory ossicles of individual 1/2004.1: left side pictured above, right side below (photo M. Srienc)

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## Streszczenie

### Raport osteologiczny na temat szczątków ludzkich z terenu szpitala wojskowego w Novae

Podczas badań wykopaliskowych prowadzonych w 2016 roku w Novae poddano analizie i zado-kumentowano szczątki ludzkie pozyskane w wyniku eksploracji dziewięćdziesięciu siedmiu pochówków odkrytych w latach 2002–2006 przez zespół Ośrodka Badań nad Antykiem Europy Południowo-Wschodniej Uniwersytetu Warszawskiego. Według ustaleń poczynionych na podsta-wie datowania względnego oraz metodą C14 teren szpitala wojskowego usytuowanego w Sektorze IV w Novae był wykorzystywany jako cmentarz miejski aż do wczesnego średniowiecza. Roz-członkowany charakter oraz słaby stan zachowania szczątków utrudnia określenie płci oraz wieku, jednak ich analiza pozwoliła wyróżnić około siedemnastu osobników. Zaobserwowano również patologie, a wśród nich zwydrodnieniowe zmiany kręgosłupa, takie jak osteofity i guzki Schmörla. U dwóch osobników stwierdzono rozszczep kręgosłupa. Opisywane groby wykazują cechy typowe dla rzymskich pochówków szkieletowych odkrywanych nad dolnym Dunajem, na terytorium dzisiejszej Bułgarii, jednak mała liczba elementów ich wyposażenia jest niewystarczająca do okre-ślenia pozycji społecznej poszczególnych osobników. W celu rekonstrukcji diety zmarłych zaleca się przeprowadzenie badania stopnia starcia szkliwa na zachowanych zębach.

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## **ARCHAEozoological analysis of animal remains from the roman fortress camp in novae**

**Abstract:** The article presents the results of an archaeozoological analysis of animal remains from Novae. Pig remains dominated the second–third century AD horizon. In the fourth and sixth century AD, cattle bones prevailed in the assemblage. Bird, fish, and wild mammal remains were low in number in all periods.

**Key words:** archaeozoology, Novae, meat, consumption

Animal remains from the excavation seasons in 2014, 2015 and 2016, carried out in the Roman legionary fortress in Novae (Bulgaria), were subjected to archaeozoological examination and analysis.<sup>1</sup> The assemblage, coming from different trenches and layers, dates overall from the first century AD to medieval times, but not all the recognized chronological periods yielded a sufficient number of bones to warrant statistical analysis. The present study thus concerns three periods for which such analyses could be carried out: second–third century AD, fourth century AD and sixth century AD.

### **Research methodology**

Species identification was made on the grounds of diagnostic features observed on the bones, considered as characteristic of particular animal species.<sup>2</sup> Goat and sheep remains with no diagnostic features for making the distinction were classed together.

The percentage share of domesticated and wild mammals was calculated and presented in the form of distribution charts.

Anatomical identification of the bone remains was carried out, dividing the bones into seven groups:

- Head — skull, mandible, teeth, horn buds, antlers, hyoid bone;
- Trunk — vertebrae, sternum, ribs, sacrum;
- Anterior (fore-)limb, proximal part — shoulder blade, humeral, radial, ulnar bones;
- Anterior (fore-)limb, distal part — carpal, metacarpal bones;
- Posterior (hind) limb, proximal part — pelvis, femoral, tibial, fibular bones, patella;

<sup>1</sup> The project has been financed with resources provided by the National Science Center, Poland, allotted on the basis of decision DEC-2014/13/B/HS3/04836.

<sup>2</sup> KRYSIAK 1975; HILLSON 1992; COLLINS, HALSTEAD, ISAAKIDOU 2002; LASOTA-MOSKALEWSKA 2008; FRANCE 2009.

- Posterior (hind) limb, distal part — tarsal, metatarsal bones;
- Digits — phalanges I, II and III.

Anatomical distribution percentages were calculated for all cases where more than 30 bones were recorded. The number of bones per group was calculated as a percentage share of the total number of bone remains of a given species.

Carcass parts were identified as either attractive, that is, with a consumptive preference for the most muscled and fatty parts (trunk, proximal parts of forelimbs and hind limbs), and less attractive, that is, the head and the distal parts of limbs, and the phalanges.

Age-at-death of the animals (cattle, pigs, horses, goats and sheep) was determined based on growth and wear of permanent teeth.<sup>3</sup> Long bone epiphysis was estimated according to Jan Kolda.<sup>4</sup>

Sex was determined based on sexual dimorphism characteristics observed on the bones. For cattle bones, proportions were determined for the different metapodial bone dimensions.<sup>5</sup> For pig remains, the shape of the fangs and of the alveoli was of key importance.<sup>6</sup> The shape of horn buds was decisive in the case of goats and sheep.<sup>7</sup>

Height at the withers was calculated based on long bone measurements using coefficients established for cattle;<sup>8</sup> for cattle, pig, sheep, dog and horse;<sup>9</sup> and for goat.<sup>10</sup>

Animal morphology was estimated on a 100-point scale.<sup>11</sup> Bone measurements in centimeters were transposed into a point value between 0 and 100. The position on the scale determined the morphological type.

Pathological characteristics and changes on the bones were evaluated. Also noted were deformations that could be attributed to the use of animals by humans (e.g., harnessing).

All observable marks on the bones were described. This included marks left by processing for consumption (chopping, flaying and filleting), as well as individual craftsmanship (sawing and polishing).

## Results

### Second–third century AD

The number of identified specimens (NISP) reached 202 out of a total of 228 bones, demonstrating the good condition of the remains. The recognized remains included mammals (96%), birds (3%) and fish (1%). No other classes of animals were observed (Table 1, Chart 1). Mammals were divided into domesticated (99%) and wild (1%) species (Table 2, Chart 2). Wild mammals were represented by only two bones, a hare and a boar (Table 3). Most of the assemblage were bones of domesticated animals, including 41.7% pig and 40.6% cattle, followed by 12% goat and sheep, 4.2% horse and 1.6% dog (Table 4, Chart 3).

#### **Pig**

The most numerous group is made up of pig bones, altogether 80 specimens (41.7%). All parts of the carcass were represented (Table 5, Chart 4). Compared to the model skeleton for pigs,<sup>12</sup> there is a definite excess of proximal parts of the anterior limb: 25.6% compared to the model approximate 4%. More head bones and proximal parts of the posterior limbs are also present, while there is a statistically inadequate amount of phalanges (barely 1.3% compared to the model about 20%). There is also not enough distal parts of both anterior and posterior limbs, as well as trunk.

<sup>3</sup> LUTNICKI 1972; GRANT 1982.

<sup>8</sup> FOCK 1966.

<sup>4</sup> KOLDA 1936.

<sup>9</sup> DRIESCH, BOESSNECK 1974.

<sup>5</sup> HOWARD 1963.

<sup>10</sup> SCHRAMM 1967.

<sup>6</sup> HABERMEHL 1975, p. 135.

<sup>11</sup> LASOTA-MOSKALEWSKA 1982–1984.

<sup>7</sup> LASOTA-MOSKALEWSKA 2008, p. 166.

<sup>12</sup> LASOTA-MOSKALEWSKA 2008, p. 238.

Morphologically immature animals (under 3.5 years of age, at which point epiphysis fusion processes are completed) constituted 23.8% pig bones (Table 7). This is less than for most archaeological sites, where the number of young pigs fell in the range of 30–35%.

The sex of six individuals was determined: three males and three females (Table 8).

Marks on bones attesting to meat processing comprised seven traces of chopping and three of filleting (Table 10). Five bones revealed marks interpreted as gnawing by predators (dogs).

### Cattle

Cattle remains were second-ranked in terms of number (40.6%). All parts of the carcass were represented among the remains (Table 6, Chart 5) and, similarly as with the pig remains, there was a surplus of proximal parts of both limbs and distal parts of posterior limbs. Deficiencies were noted with regard to the number of phalanges and trunk bones. Bones of the head and distal parts of the anterior limbs were recorded in model proportions.

Young individuals (under 3.5 years of age) constituted 2.6% of the cattle remains, that is, less than at most archaeological sites, where the percentage share ranged between 5% and 8%.

The sex of seven individuals was determined, two being males and five females (Table 8).

Measurements of cattle bones gave an indication of the morphological type of some of the individuals (Table 9). Bone length transposed onto the 100-point scale fell in the range between 43 and 100 (Chart 7), bone width between 38 and 85 (Chart 8). This puts the animals in the middle-sized (31–70 point range) to large (71–100 point range) cattle range with a slight superiority of middle-sized individuals. Distribution on both charts is close to the regular Gaussian model with the apex near 60 points and the span between about 40 and 85.

Long bone measurements gave a height at the withers between 117 cm (the lowest for a female) and 157 cm (highest for a male). Seven individuals were thus determined (Table 9).

Marks on the bones included all the kinds of marks reflecting meat processing for consumption: 16 marks of chopping, two of filleting, two of flaying and one of part burning (Table 10). Gnawing by predators was observed on two bones.

### Goat/sheep

Bones of goats and sheep occupied third place in terms of the number (12%). Two of the 23 bones from this group were identified as sheep and one as a goat. Not all parts of the carcass were represented. Missing were the distal parts of posterior limbs (Table 6, Chart 6). Anatomical distribution charts could not be prepared because of the insufficient number of bones (22 anatomically recognized bones). Even so, a high frequency of trunk bones and proximal parts of anterior limbs (six each) was recorded in the face of the small number of phalanges (1 bone).

Young individuals (three identified) constituted 13% of all the sheep and goat remains (Table 7). This exceeded the usual percentage of morphologically immature individuals at other archaeological sites, comprised between 5% and 8%.

The length of goat metacarpals placed the height at the withers of the animal at 72 cm.

Marks on the bones included two examples of chopping and one of filleting (Table 10). Two bones also displayed marks of gnawing by predators.

### Horse

Eight horse bones made up for 4.2% of the assemblage. One bone demonstrated gnawing marks.

### Dog

Dog bones, three identified, made up 1.6% of the material. Tibial bone length measurements determined withers height at 56 cm.

### **Wild mammals**

There were two bones of wild mammals, one boar and one hare.

### **Birds**

Six bones of birds made up 3% of the identified bones.

### **Fish**

Two fish bones were determined.

## **Fourth century AD**

The number of identified specimens (NISP) was 79 out of 83 (NISP). Both mammals and birds were represented in the assemblage (Table 11, Chart 9), mammals constituting an absolute majority (98.7%) and among these domesticated mammals. The largest number of bones, 47, belonged to cattle (60.3%) (Table 12, Chart 10). Next in line were pig bones, 18 (23.7%), goat/sheep, 6 bones (7.7%), horse, 6 bones (7.7%) and dog, one bone (1.3%).

### **Cattle**

Cattle remains constituted 60.3% of the material. All parts of the carcass were represented (Table 13, Chart 11). Compared to the model anatomical distribution, there was a surplus of proximal parts of both limbs and of distal parts of the posterior limbs. A deficiency occurred in the case of trunk bones and phalanges. Distal parts of the anterior limbs and head represented model proportions.

The percentage of bones of morphologically immature animals was 6.4% (Table 15), well within the range recorded on most archaeological sites (between 5% and 8%).

Length measurements on the 100-point scale (Table 17) fell between 35 and 100 points (Chart 13). Width measurements were more clustered, between 46 and 67 points (Chart 14), the distribution being closer to the regular distribution with an apex near 53 points.

Measurements of the length of metacarpals of a female specimen gave a withers height of this individual at 111 cm (Table 17).

Nine bones showed chopping marks, three filleting (Table 18). Marks of gnawing by predators were recorded on nine bones.

### **Pig**

Pig remains were in second place (23.1%). Not all the parts of the carcass were represented. Distal parts of the anterior limbs and phalanges were missing (Table 14, Chart 12). The largest number of bones represented the proximal parts of both limbs, while a few bones came from the trunk and distal parts of posterior limbs.

Young individuals made up for 11.1% of the pig remains (Table 15). This is less than on most archaeological sites, where the range recorded was between 30% and 35%.

One individual was determined to be a male (Table 16).

Marks on pig bones included chopping (one case) and gnawing by predators (four cases) (Table 18).

### **Goat/sheep**

Goat/sheep bones constituted 7.7% of the bones of domesticated mammals; two bones were specifically identified as goats and one as sheep. Anatomical distribution charts could not be prepared because of the insufficient number of bones.

One bone belonged to a morphologically immature individual (Table 15). Chopping marks were recorded on one bone (Table 18).

### **Horse**

Horse bones made up for 7.7% of the bones of domesticated animals, but the overall number did not support an analysis of anatomical distribution. Not one of the bones could be used to determine age-at-death.

Gnawing by a predator was noted on one bone (Table 18).

### **Dog**

One dog bone was recorded.

### **Birds**

One bird bone was recorded, making for 1.3% of the assemblage (Table 11, Chart 9).

## **Sixth century AD**

Bones from the sixth century AD counted 752, constituting the largest of the analyzed assemblage; of these 712 were identified to species (NISP). 99.2% of the bones represented mammals (Table 19, Chart 15). The percentage share of bird and fish bones was in both cases 0.4%. Domesticated mammals predominated: 686 bones making for 97.2% (Table 20, Chart 16), while wild mammals accounted for 20 bones (2.8%). Cattle were in first place among domesticated mammals, 59.8% (Table 21, Chart 17). Next in line were pig remains (20.4%), goat/sheep (11%), horse (8.2%) and dog (0.4%).

### **Cattle**

The biggest group was formed by cattle remains. They represented all parts of the carcass (Table 23, Chart 18). A surplus compared to the distribution model concerned proximal parts of anterior limbs. Larger numbers of both parts of the posterior limbs were also present in the assemblage. A deficiency occurred in the number of bones from the trunk, the phalanges and the head. The distal parts of anterior limbs represented model proportions.

Remains of morphologically immature animals made for 6.3% of the cattle bones (Table 26), falling well within the accepted range (5–8%).

Sex determinations resulted in 14 individuals being identified to sex: 12 females, one male and one castrate, meaning an ox (Table 27).

Bone measurements transposed on a 100-point scale determined cattle morphology. Length was distributed from 0 to 100 points (Table 28, Chart 22), but 0 points occurred only once and the chart was skewed with more average results, the apex being around 56 points and span from 38 to 100 points. Superimposing width measurements on the 100 point scale produced a similarly skewed chart with the apex near 50 points and span from 15 to 100 (Chart 23).

Long bone measurements permitted the withers height to be determined for 15 individuals (Table 28). The lowest was a female, 113.4 cm high, the highest a male, 132.5 cm high.

Cattle bones revealed chopping marks in 42 cases, filleting in 10 cases and 1 example of flaying (Table 29). Gnawing by predators was observed on 11 bones.

### **Pig**

The second largest group of bones represented pig remains (20.4%). They did not represent all parts of the carcass, phalanges being notably absent (Table 24, Chart 20), whereas there was

a surplus of proximal parts of both limbs as well as the head bones compared to the model distribution pattern. Trunk and distal parts did not make the mark compared to the model.

The percentage of young animals in the material was 23.6% (Table 26). This is slightly below average for pig remains (30–35%).

Sex determination was successful in the case of 12 individuals: nine males and three females (Table 27).

Talus measurements allowed the withers height of one individual to be calculated at 80 cm (Table 28).

Marks on the bones were interpreted as chopping in seven cases, filleting in four, and part burning in two (Table 29). Gnawing by predators was recorded in four cases.

### **Goat/sheep**

Goat and sheep bones accounted for 11.2% of the domesticated mammals. They represented all parts of the carcass (Table 23, Chart 19). Compared to the distribution model, head bones were in surplus, as were the proximal parts of the limbs. Distal parts of limbs approached the distribution model, while trunk bones and phalanges were below standard.

Bones of young animals constituted 24.7% of all goat/sheep remains (Table 26). This percentage share was much larger than at most other archaeological sites.

Four individuals had the sex determined: three were males and one was a female (Table 27).

Long bone measurements allowed the withers height of two goats and two sheep to be determined. The goats were 62 and 64 cm high, the sheep 68.5 and 61 cm (Table 28).

Cut marks were observed on 13 bones (Table 29). Twelve of these were chopping marks, the last filleting. Gnawing by predators could be seen on three bones.

### **Horse**

The percentage of horse remains accounted for 8.2% of domesticated mammals. An analysis of anatomical distribution demonstrated that all parts of the carcass were present (Table 25, Chart 21) and largely in keeping with the model distribution. Significant differences were noted practically only in the case of the proximal parts of both limbs, where a surplus of bones was noted.

Bones of morphologically immature individuals accounted for 8.9% (Table 26), clearly more than at most archaeological sites where the percentage share rather did not exceed 1%.

Measurement of metacarpals led to a withers height estimate for three individuals: 137 cm, 144 cm and 151 cm (Table 28).

Chopping marks were found on one bone and gnawing marks on another (Table 29).

### **Dog**

Three bones of a dog constituted 0.4% of the domesticated mammals.

### **Wild mammals**

The 20 bones of wild animals that were recorded accounted for 2.8% of mammal remains (Table 20). The set included 10 bones of deer, five of boar, three of fox and one each of roe deer and hare (Table 22).

### **Birds**

Three bones of birds were recorded; they made for 0.4% of the assemblage (Table 19).

### **Fish**

The three fish bones accounted for 0.4% of the assemblage (Table 19).

## Discussion

The bone assemblage from Novae represents three different periods. The first (second–third century AD) corresponds to Novae's functioning as a Roman fort, the seat of the I *Italica* legion. In the fourth century AD, the garrison was reduced and the first civil architecture was raised in place of the old legionary buildings. Novae's era of prosperity ended with the Goth invasion of the Balkans in 376–378. As for the third period, the sixth century AD, Novae was a civil town then, an important river harbor on the Danube and episcopal see. It was even called “Ravenna of the East” in the times of Justinian (527–565 AD).

The meat consumption model in Novae is surprisingly stable despite the 500 years covered by the three periods. Mammals, for the most part domesticated animals, were the principal source of meat. Birds, fish and wild animals were at a premium, very scarce indeed and even absent altogether, as in the second period, in the fourth century AD (although one should admit that it was the smallest assemblage, comprising barely 79 bones, hence consumption cannot be excluded despite the lack of evidence).

The first period (second–third century AD) witnessed a balance between cattle and pig remains. Considering that cattle dominated the assemblage from the first century AD, analyzed by Anna Gręzak and Alicja Lasota-Moskalewska,<sup>13</sup> one should see a change here, possibly due to numerous military conflicts, in which the Empire was embroiled in the second and third century AD. Of all the animals bred for meat, pigs are the only species to have litters more often than once a year; they also have the most piglets in a litter and quickly increase body mass.<sup>14</sup> Thus pig breeding was the most obvious solution, assuming that the objective was to acquire large quantities of meat for soldiers in the shortest possible time. The percentage of bones of young animals was slightly less than the average for both cattle and pig, which is also the rule, as it is not viable economically to slaughter a large number of young animals. Analyzing anatomical distribution, for pigs as much as for cattle, we observe a significant surplus of proximal parts of limbs. This form of distribution of the bones is typical of consumption set on meat. These parts (along with the trunk) are attractive for consumers because of the large amount of muscle tissue (shoulder, haunch, knuckles). The anatomical distribution for pigs as well as cattle revealed all parts of the carcass, including phalanges, indicating that at least some individuals were slaughtered and quartered on site. No phalanges would have been discovered most probably had all the meat been brought to camp in the form of prepared cuts, this because phalanges usually get cut off when flaying the skin. The number of sexed animals is small, so the only conclusion to be made is that adult females predominated in the cattle category, which is the correct structure for livestock breeding at this time. Varro wrote in his *De re rustica* (2.5.18): “As to the number of bulls and cows, the rule is that there be, to every sixty cows, one yearling bull and one two-year-old”.<sup>15</sup> The cattle was of the middle-sized and large variety, a more or less uniform population (between 40 and 80 points on the 100-point scale) with a certain number of very large individuals (100 points on the scale). It was most likely Italian long-horned cattle characterized by a huge skeleton and large body mass as described by Sándor Bökönyi.<sup>16</sup> In the opinion of this researcher, cattle of this variety became common in Pannonia and the other European provinces after the Roman conquest.

Goat meat and mutton was consumed much less often than pork and beef. Young animals were more frequent as well. Eating lamb meat was more of an occasional thing. The morphotype determined for one goat revealed it to be a large individual, 72 cm high at the withers.

<sup>13</sup> GRĘZAK, LASOTA-MOSKALEWSKA 1996.

<sup>14</sup> LASOTA-MOSKALEWSKA 2008, p. 250.

<sup>15</sup> Translation after: Loeb Classical Library, 1934 (<http://->

[penelope.uchicago.edu/Thayer/E/Roman/Texts/Varro/de\\_Re\\_Rustica/2\\*.html](http://penelope.uchicago.edu/Thayer/E/Roman/Texts/Varro/de_Re_Rustica/2*.html)).

<sup>16</sup> BÖKÖNYI 1982.

Marks typical of chopping, filleting, flaying and burning were observed on the bones of all four species. Gnawing marks on some bones attested to the practice of throwing bones to the dogs.

Horse and dog remains were few and bore no marks indicative of processing for the purpose of consumption. Horses were either for riding or as draft animals, whereas dogs may have been used to guard the herds.

The consumption model changed in the fourth century AD. Cattle now predominated the record of faunal remains, although this result cannot be accepted as a certainty in view of the earlier analyzed assemblage from the *principia*, which was also from the fourth century AD.<sup>17</sup> It was found for that assemblage that goat/sheep predominated, followed by pig in second place. Further assemblages from the fourth century are needed for study in order to understand the consumption model for this period in Novae. In the set studied in this paper, cattle bones constituted 60% of all domestic mammals. Pig remains accounted for more than two times less of the bones. The anatomical distribution study pointed to a consumption preference for the best cuts, that is, proximal parts of both limbs. The presence of all parts of the cattle carcass indicated that the animals were slaughtered on the spot. The same cannot be said with certainty for sheep and goats because phalanges were not identified in the record. The number of bones of calves is similar to that from other sites, even while there are less young pigs, sheep and goats than at other sites. The slaughtered cattle represented a fairly uniform morphotype: middle-sized with a fairly frequent occurrence still of large animals belonging to the long-horned variety from Pannonia (only one measurement on the 100-point scale, but there were more bones in the assemblage that belonged to this kind of cattle but were not measurable). Sheep and goat bones were rare. Typical consumption marks were observed on bones of cattle, pigs, goats and sheep. These were not found on the bones of dogs and horses, these being utilitarian animals in this period as in the previous one.

In the sixth century AD, when the camp in Novae ultimately lost its military character, cattle remains continued to predominate in the assemblage, topping pig remains three times over, which leaves no doubt as to the preference for beef as compared to pork. Goat meat and mutton were consumed the least often. The anatomical distribution of cattle remains indicated a huge surplus of the proximal parts of the anterior limbs compared to the model distribution and a reverse proportion in the case of phalanges. Therefore, large quantities of shoulder and shin had to have been brought already after slaughter and skinning. Haunches must have also been brought judging by the disproportion regarding the model pattern for the proximal parts of posterior limbs. A significant low was noted in the case of trunk bones, meaning that the cuts of meat came without the vertebra and ribs, having already been butchered elsewhere. The same went for pigs and goats/sheep (and no phalanges were recorded for pigs). Most of the meat was imported already in the form of a butchered carcass. The anatomical distribution for horse bone was the only one to come close to the model pattern. Since these animals were not consumed, there was no reason for bringing in any additional parts or for butchering the ones present any more than needed. The herd structure for cattle was rather traditional, the number of young individuals not exceeding the norm. A little less young pigs was represented in the assemblage than is the rule. As for goats and sheep, there was much more than usual. It would appear that once goat and sheep meat were consumed, the preference was for lamb meat. This shows that sheep were bred for meat rather than for wool, and this in turn shows a pastoral form of breeding. The male to female proportions in the herds reveals a 6-to-1 ratio for cattle (12 females to 2 males), exactly as suggested by Varro. Males predominated in the pig category, but there is no data for the proportions in pig breeding in antiquity and hence it is difficult to say whether this was a natural one. Cattle morphology remained largely unchanged as compared to the earlier period with middle-sized and large individuals dominating the record. A distribution close to the model one indicates a rather stable breeding situation. Very

<sup>17</sup> GREZAK, PIĄTKOWSKA-MALECKA 2000.

large individuals, which can be identified with Italian longhorned cattle, were still present. The two goats with determined morphology turned out to belong to the small variant. Typical post-consumptional marks were observed on the bones of cattle, pigs, goats and sheep. Dogs and horses were most likely not consumed in this period as well. Horses were rather robust, measuring (three individuals recorded) from 137 cm to 151 cm at the withers. In the sixth century AD, more wild mammal bones were recorded, but still the overall number is very low. This set shows that hunting around Novae was centered on deer, roe deer, boars, foxes and hares.

The overall dietary conclusion from the present study is that meat of domesticated mammals was consumed in Novae, both when it was a Roman fort and when it was a Byzantine town. Birds and fish were not common in the diet. The consumption model changed over time, from a balance between beef and pork to a clear preference for beef. Venison was extremely rare on the table during this entire period.

### Tables and charts

No. bones: number of bones studied

Bd: breadth of distal end

Bp: breadth of proximal end

GL: maximum length

Sd: width of shaft

Table 1. Division into classes, second–third century AD

Class	No. bones	%
Mammals	194	96%
Birds	6	3%
Fish	2	1%

Table 2. Mammals: domesticated and wild, second–third century AD

Class	No. bones	%
Domesticated	192	99%
Wild	2	1%

Table 3. Wild mammals, second–third century AD

Species	No. bones
Boar	1
Hare	1

Table 4. Domesticated mammals, second–third century AD

Species	No. bones	%
Cattle	78	40.6%
Pig	80	41.7%
Goat/sheep	23	12.0%
Horse	8	4.2%
Dog	3	1.6%

Table 5. Pig: anatomical distribution, second–third century AD

<b>Part of carcass</b>	<b>No. bones</b>	<b>%</b>	<b>Model</b>
Head	22	28.2%	20%
Trunk	22	28.2%	34%
Anterior limb, proximal	20	25.6%	4%
Anterior limb, distal	2	2.6%	10%
Posterior limb, proximal	8	10.3%	3%
Posterior limb, distal	3	3.8%	9%
Phalanx	1	1.3%	20%

Table 6. Cattle and goat/sheep: anatomical distribution, second–third century AD

<b>Part of carcass</b>	<b>Cattle</b>		<b>Goat/sheep</b>	<b>Model</b>
	<b>No. bones</b>	<b>%</b>	<b>No. bones</b>	
Head	16	21.1%	3	20%
Trunk	16	21.1%	6	43%
Anterior limb, proximal	17	22.4%	6	5%
Anterior limb, distal	5	6.6%	4	8%
Posterior limb, proximal	11	14.5%	2	3%
Posterior limb, distal	10	13.2%	0	7%
Phalanx	1	1.3%	1	14%

Table 7. Age-at-death, second–third century AD

<b>Age</b>	<b>Cattle</b>		<b>Pig</b>		<b>Goat/sheep</b>	
	<b>No. bones</b>	<b>%</b>	<b>No. bones</b>	<b>%</b>	<b>No. bones</b>	<b>%</b>
Young	2	2.6%	19	23.8%	3	13.0%
Mature and indeterminate	76	97.4%	61	76.3%	20	87.0%

Table 8. Sex, second–third century AD

<b>Species</b>	<b>Male</b>	<b>Female</b>
Pig	3	3
Cattle	2	5

Table 9. Morphology, second–third century AD

<b>Species</b>	<b>Bone</b>	<b>Measurement (cm)</b>	<b>100 point scale</b>	<b>Height at the withers (cm)</b>
Cattle	Phalanx I	GL-5.73	43	
Cattle	Shoulder blade	SLC-5.76	78	
Cattle	Calcaneus	GL-14.05	100	
Cattle	Humerus	Bd-6.95	38	

Cattle	Talus	GLI-7.0	60	
Cattle	Talus	GLI-6.4	45	
Cattle	Talus	GLI-6.97	60	
Cattle	Metacarpals	Bp-5.64, Bd-5.8, Sd-3.24, GL-19.5	46, 40, 52, 56	117
Cattle	Metacarpals	Bp-7.05, Bd-7.33, Sd-3.83, GL-23.0	81, 78, 82, 100	144
Cattle	Metacarpals	Bp-5.86, Bd-6.28, Sd-3.45, GL-20.6	52, 51, 62, 70	124
Cattle	Metacarpals	Bp-5.7, Sd-3.17, GL-20.3	48, 47, 68	122
Cattle	Metacarpals	Bd-6.62, Sd-3.76, GL-21	61, 77, 75	126
Cattle	Metatarsals	Bp-4.82, Bd-5.73, Sd-2.87, GL-22.6	61, 62, 64, 56	136
Cattle	Metatarsals	Bp-5.06, Bd-6.4, Sd-3.25, GL-25.1	69, 83, 85, 81	157
Cattle	Metatarsals	Bd-5.3	47	
Goat	Metacarpals	GL-12.6		72
Dog	Tibia	GL-19.1		56

Table 10. Marks on bones, second–third century AD

Species	Chopping	Filleting	Part burning	Flaying	Gnawing
Cattle	16	2	1	2	2
Pig	7	3	0	0	5
Goat/sheep	2	1	0	0	2
Horse	0	0	0	0	1

Table 11. Division into classes, fourth century AD

Class	No. bones	%
Mammals	78	98.7%
Birds	1	1.3%

Table 12. Domesticated mammals, fourth century AD

Species	No. bones	%
Cattle	47	60.3%
Pig	18	23.1%
Goat/sheep	6	7.7%
Horse	6	7.7%
Dog	1	1.3%

Table 13. Cattle: anatomical distribution, fourth century AD

Part of carcass	No. bones	%	Model
Head	9	19.1%	20%
Trunk	11	23.4%	43%
Anterior limb, proximal	8	17.0%	5%
Anterior limb, distal	3	6.4%	8%
Posterior limb, proximal	8	17.0%	3%
Posterior limb, distal	6	12.8%	7%
Phalanx	2	4.3%	14%

Table 14. Pig: anatomical distribution, fourth century AD

Part of carcass	No. bones	Model
Head	3	20%
Trunk	2	34%
Anterior limb, proximal	6	4%
Anterior limb, distal	0	10%
Posterior limb, proximal	5	3%
Posterior limb, distal	2	9%
Phalanx	0	20%

Table 15. Age-at-death, fourth century AD

Species	Young		Mature and indeterminate	
	No. bones	%	No. bones	%
Cattle	3	6.4%	44	93.6%
Goat/sheep	1	16.7%	5	83.3%
Pig	2	11.1%	16	88.9%

Table 16. Sex, fourth century AD

Species	Male	Female
Pig	1	—

Table 17. Morphology, fourth century AD

Species	Bone	Measurement (cm)	100 point scale	Height at the withers (cm)
Cattle	Phalanx I	GL-6.1	52	
Cattle	Phalanx I	GL-5.43	36	
Cattle	Calcaneus	GL-14.1	100	
Cattle	Tibia	Bd-6.73	55	
Cattle	Talus	GLI-6.96	59	

Cattle	Metacarpals	Bp-5.95	53	
Cattle	Metacarpals	Bp-6.05, Bd-6.06, Sd-3.54, GL-17.8	56, 46, 67, 35	111
Cattle	Metatarsals	Bp-4.8, Sd-2.64	60, 52	

Table 18. Marks on bones, fourth century AD

Species	Chopping	Filleting	Gnawing
Cattle	9	3	9
Pig	1	0	4
Horse	0	0	1
Goat/sheep	1	0	0

Table 19. Division into classes, sixth century AD

Class	No. bones	%
Mammals	706	99.2%
Birds	3	0.4%
Fish	3	0.4%

Table 20. Mammals, sixth century AD

Class	No. bones	%
Domesticated	686	97.2%
Wild	20	2.8%

Table 21. Domesticated mammals, sixth century AD

Species	No. bones	%
Cattle	410	59.8%
Pig	140	20.4%
Goat/sheep	77	11.2%
Horse	56	8.2%
Dog	3	0.4%

Table 22. Wild mammals, sixth century AD

Species	No. bones
Deer	10
Boar	5
Fox	3
Roe deer	1
Hare	1

Table 23. Cattle and goat/sheep: anatomical distribution, sixth century AD

Part of carcass	Cattle		Goat/sheep		Model
	No. bones	%	No. bones	%	
Head	63	15.7%	20	27%	20%
Trunk	59	14.7%	9	12%	43%
Anterior limb, proximal	135	33.6%	17	23%	5%
Anterior limb, distal	29	7.2%	7	9%	8%
Posterior limb, proximal	61	15.2%	12	16%	3%
Posterior limb, distal	50	12.4%	8	11%	7%
Phalanx	5	1.2%	1	1%	14%

Table 24. Pig: anatomical distribution, sixth century AD

Part of carcass	No. bones	%	Model
Head	51	36.4%	20%
Trunk	18	12.9%	34%
Anterior limb, distal	36	25.7%	4%
Anterior limb, distal	8	5.7%	10%
Posterior limb, proximal	18	12.9%	3%
Posterior limb, distal	9	6.4%	9%
Phalanx	0	0.0%	20%

Table 25. Horse: anatomical distribution, sixth century AD

Part of carcass	No. bones	%	Model
Head	10	18.2%	23%
Trunk	21	38.2%	43%
Anterior limb, proximal	7	12.7%	4%
Anterior limb, distal	5	9.1%	11%
Posterior limb, proximal	5	9.1%	3%
Posterior limb, distal	3	5.5%	10%
Phalanx	4	7.3%	6%

Table 26. Age-at-death, sixth century AD

Age	Cattle		Pig		Goat/sheep		Horse	
	No. bones	%	No. bones	%	No. bones	%	No. bones	%
Young	26	6.3%	33	23.6%	19	24.7%	5	8.9%
Mature and indeterminate	384	93.7%	107	76.4%	58	75.3%	51	91.1%

Table 27. Sex, sixth century AD

Species	Male	Castrate	Female
Cattle	1	1	12
Pig	9	0	3
Goat/sheep	3	0	1

Table 28. Morphology, sixth century AD

Species	Bone	Measurement (cm)	100 point scale	Height at the withers (cm)
Cattle	Phalanx I	GL-6.2	55	
Cattle	Phalanx I	GL-5.55	39	
Cattle	Shoulder blade	SLC-5.62	76	
Cattle	Calcaneus	GL-14.25	100	
Cattle	Calcaneus	GL-14.4	100	
Cattle	Calcaneus	Gl-13.8	95	
Cattle	Calcaneus	GL-13.8	95	
Cattle	Calcaneus	GL-13.4	85	
Cattle	Calcaneus	GL-13.2	80	
Cattle	Tibia	Bd-6.5	50	
Cattle	Tibia	Bd-6.5	50	
Cattle	Tibia	Bp-6.72	18	
Cattle	Tibia	Bd-6.71	54	
Cattle	Tibia	Bd-7.5	70	
Cattle	Tibia	Bd-6.0	40	
Cattle	Radius	Bd-6.95	73	
Cattle	Radius	Bp-7.6	15	
Cattle	Radius	Bd-7.45	86	
Cattle	Radius	Bd-8.7	100	
Cattle	Radius	Bd-8.3	100	
Cattle	Radius	Bp-7.74	18	
Cattle	Radius	Bp-9.22	56	
Cattle	Radius	Bp-9.2	55	
Cattle	Radius	Bp-9.1	52	
Cattle	Radius	Bp-7.4, Bd-6.63, GL-26.9	10, 65, 0	116
Cattle	Humerus	Bd-7.9	58	
Cattle	Humerus	Bd-7.26	42	
Cattle	Humerus	Bd-7.91	58	
Cattle	Humerus	Bd-7.5	50	
Cattle	Humerus	Bd-5.82	16	
Cattle	Humerus	Bd-9.46	88	
Cattle	Humerus	Bd-7.8	56	

Cattle	Humerus	Bd-7.15	42	
Cattle	Humerus	Bd-7.26	43	
Cattle	Humerus	Bd-7.06	40	
Cattle	Humerus	Bd-8.2	64	
Cattle	Humerus	Bd-6.86	37	
Cattle	Humerus	Bd-7.4	48	
Cattle	Talus	GLI-6.88	56	
Cattle	Talus	GLI-6.1	38	
Cattle	Talus	GLI-7.1	62	
Cattle	Talus	GLI-6.99	59	
Cattle	Talus	GLI-6.8	55	
Cattle	Talus	GLI-7.52	73	
Cattle	Talus	GLI-6.37	43	
Cattle	Talus	GLI-6.82	56	
Cattle	Metacarpals	Bp-7.21, Bd-7.6, Sd-4.2, GL-21.2	85, 85, 100, 78	132.5
Cattle	Metacarpals	Bp-6.5, Sd-3.89	68, 85	
Cattle	Metacarpals	Bp-4.83, Sd-2.7	26, 25	
Cattle	Metacarpals	Bp-6.11, Sd-3.84	58, 82	
Cattle	Metacarpals	Bp-6.0, Bd-5.82, Sd-3.4, GL-19.5	55, 40, 60, 56	117
Cattle	Metacarpals	Bd-4.42.	6	
Cattle	Metacarpals	Bp-5.9	52	
Cattle	Metacarpals	Bp-5.9, Bd-5.92, Sd-3.26, GL-20.9	52, 43, 53, 72	125.4
Cattle	Metacarpals	Bp-7.02	81	
Cattle	Metacarpals	Bd-5.7	38	
Cattle	Metacarpals	Bp-6.8	75	
Cattle	Metacarpals	Bp-6.34	63	
Cattle	Metacarpals	Bp-5.4	40	
Cattle	Metacarpals	Bp-5.63, Bd-5.8, Sd-3.21, GL-20.4	46, 40, 50, 69	122.4
Cattle	Metacarpals	Bp-5.94, Sd-3.44, GL-20.0	53, 62, 63	120
Cattle	Metacarpals	Bp-5.61, Bd-5.34, Sd-3.04, GL-18.9	45, 28, 42, 49	113.4
Cattle	Metacarpals	Sd-4.34	100	
Cattle	Metacarpals	Sd-3.33	56	
Cattle	Metacarpals	Bp-5.82, Bd-5.83, Sd-3.15, GL-19.9	51, 41, 47, 62	119.4
Cattle	Metacarpals	Bp-5.42, Bd-5.45, Sd-2.88, GL-19.7	41, 31, 34, 59	118
Cattle	Metacarpals	Bp-5.85, Sd-3.2	52, 50	
Cattle	Metacarpals	Bp-6.1, Bd-6.4, Sd-3.36, GL-20.5	58, 55, 58, 69	128
Cattle	Metacarpals	Bp-6.75, Bd-6.9, Sd-3.94, GL-21.2	73, 68, 87, 79	127
Cattle	Metacarpals	Bp-5.8, Sd-3.27, GL-21.6	50, 53, 82	129.6
Cattle	Metacarpals	Bp-5.83	51	
Cattle	Metatarsals	Bp-5.36, Sd-2.84	78, 62	
Cattle	Metatarsals	Bp-5.5, Sd-3.17	82, 78	
Cattle	Metatarsals	Bd-5.8	62	

Cattle	Metatarsals	Bp-4.44, Sd-2.52	48, 46	
Cattle	Metatarsals	Bp-4.5	50	
Cattle	Metatarsals	Bd-5.76	62	
Cattle	Metatarsals	Bd-7.1	100	
Cattle	Metatarsals	Bd-6.16	74	
Cattle	Metatarsals	Bp-4.51, Bd-5.2, Sd-2.57, GL-22.1	50, 43, 48, 51	118
Cattle	Metatarsals	Bp-4.2	40	
Cattle	Metatarsals	Bp-5.34	77	
Cattle	Metatarsals	Bd-5.73	61	
Cattle	Metatarsals	Bp-3.97	33	
Cattle	Metatarsals	Bp-4.16	38	
Cattle	Metatarsals	Bd-6.2	77	
Cattle	Metatarsals	Bd-7.7	100	
Cattle	Metatarsals	Bd-5.95, Sd-2.95	69, 68	
Cattle	Metatarsals	Bd-5.44	51	
Cattle	Metatarsals	Bp-4.66, Sd-2.6	54, 50	
Cattle	Metatarsals	Bp-4.71, Bd-5.2, Sd-2.65, GL-22.9	57, 43, 52, 51	122.5
Cattle	Metatarsals	Bp-4.88	62	
Cattle	Metatarsals	Bp-4.72, Bd-5.38, Sd-2.61, GL-22.1	58, 49, 50, 51	118
Cattle	Metatarsals	Bp-4.32, Sd-2.62	43, 51	
Cattle	Metatarsals	Bp-5.34, Sd-3.1	78, 75	
Cattle	Femoral	Bd-10.33	73	
Cattle	Femoral	Bd-8.6	30	
Cattle	Femoral	Bd-9.3	47	
Horse	Metacarpals	GL-21.4		137
Horse	Metacarpals	GL-22.5		144
Horse	Metacarpals	GL-23.6		151
Goat	Metacarpals	GL-13.8		79
Goat	Metacarpals	GL-11.1		64
Goat	Metacarpals	GL-10.78		62
Sheep	Metacarpals	GL-14.92		68.5
Sheep	Metacarpals	GL-12.41		61
Pig	Talus	GLI-4.52		80

Table 29. Marks on bones, sixth century AD

Species	Chopping	Filleting	Part burning	Flaying	Gnawing
Cattle	42	10	0	1	11
Pig	7	4	2	0	4
Goat/sheep	12	1	0	0	3
Horse	1	0	0	0	1

Chart 1. Division into classes, second–third century AD

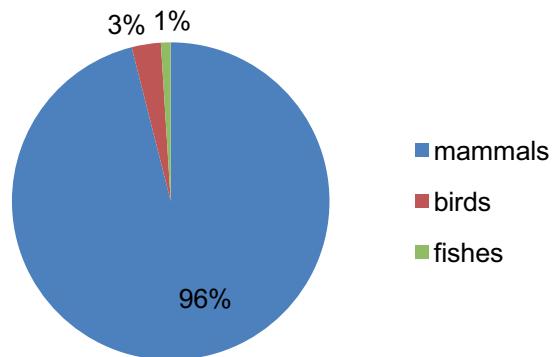


Chart 2. Mammals: domesticated and wild, second–third century AD

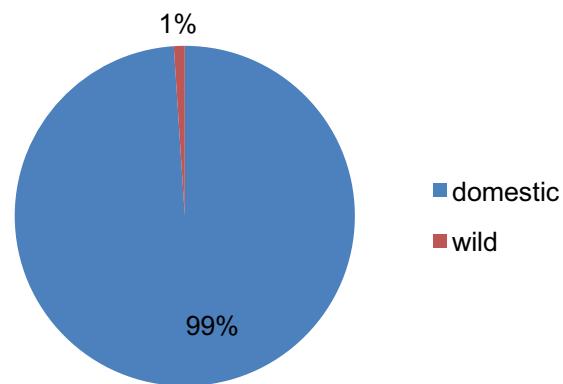


Chart 3. Domesticated mammals, second–third century AD

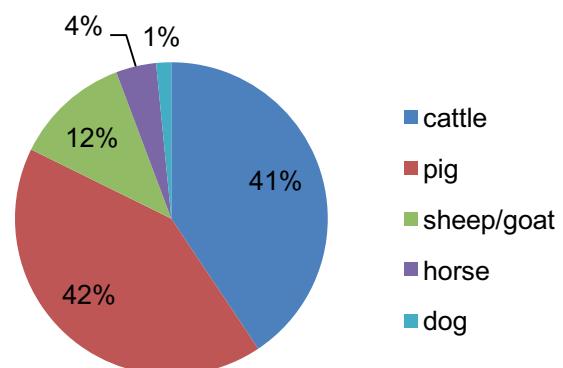


Chart 4. Pig: anatomical distribution, second–third century AD

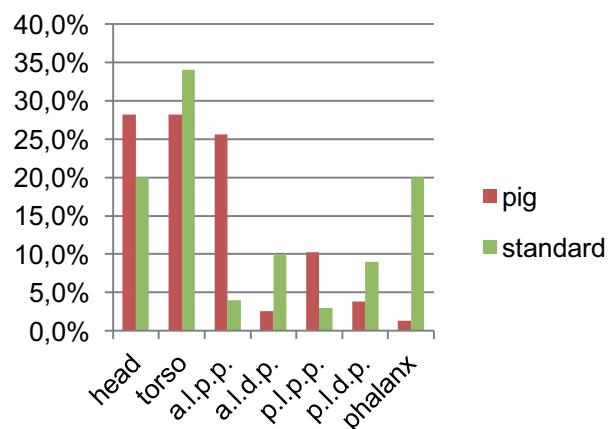


Chart 5. Cattle: anatomical distribution, second–third century AD

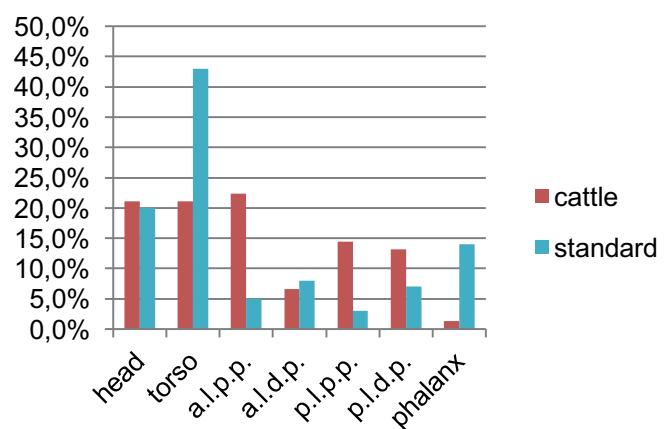


Chart 6. Goat/sheep: anatomical distribution, second–third century AD

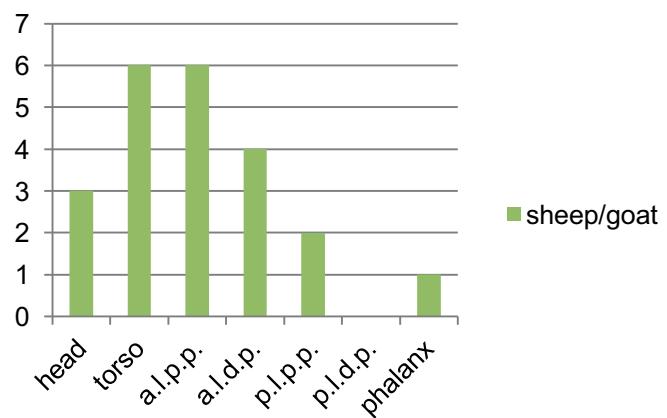


Chart 7. Cattle: 100-point scale. Length measurements, second–third century AD

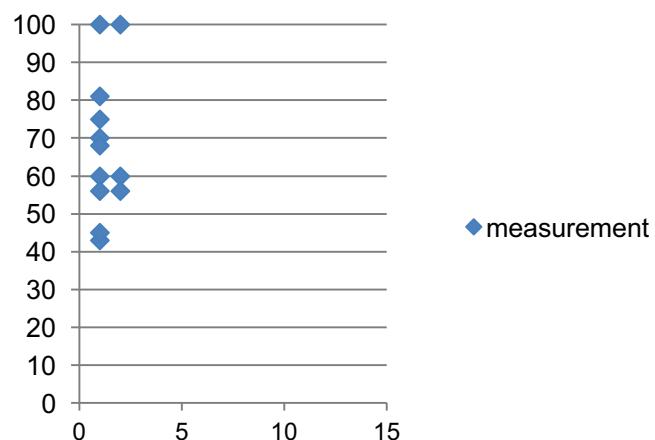


Chart 8. Cattle: 100-point scale. Width measurements, second–third century AD

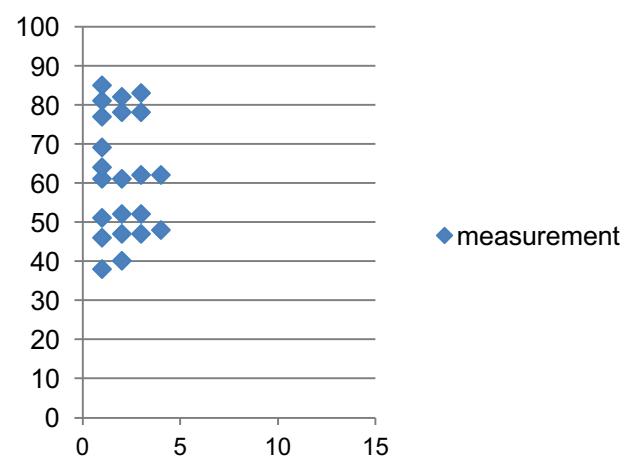


Chart 9. Division into classes, fourth century AD

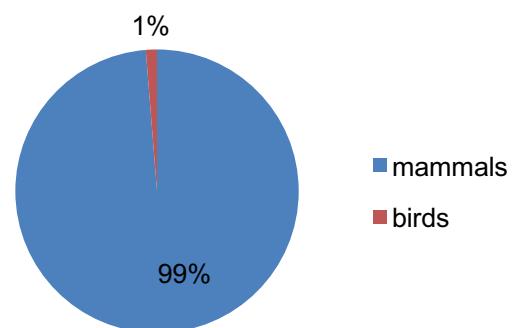


Chart 10. Domesticated mammals, fourth century AD

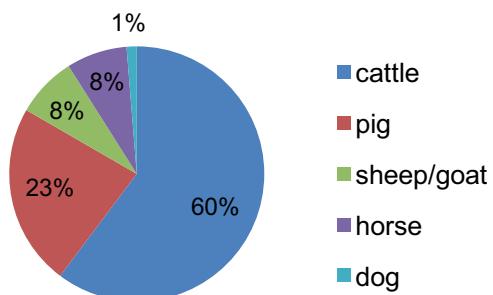


Chart 11. Cattle: anatomical distribution, fourth century AD

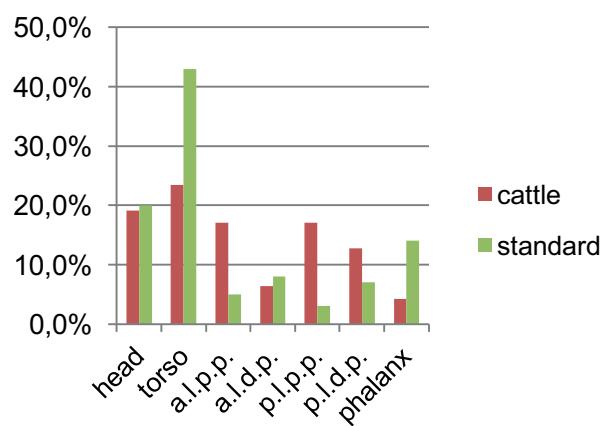


Chart 12. Pig: anatomical distribution, fourth century AD

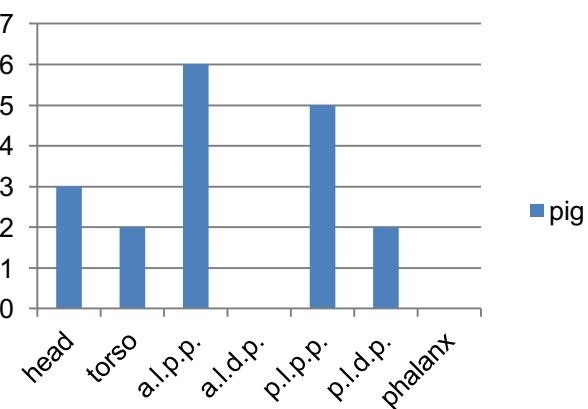


Chart 13. Cattle: 100-point scale. Length measurements, fourth century AD

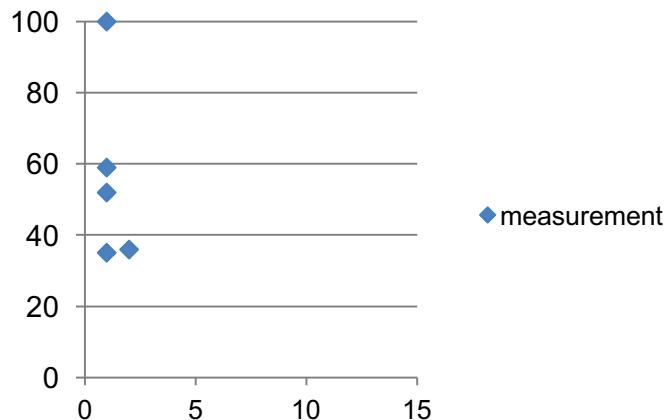


Chart 14. Cattle: 100-point scale. Width measurements, fourth century AD

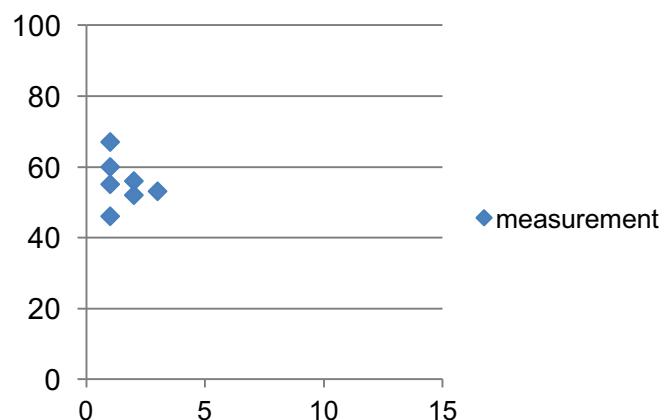


Chart 15. Division into classes, sixth century AD

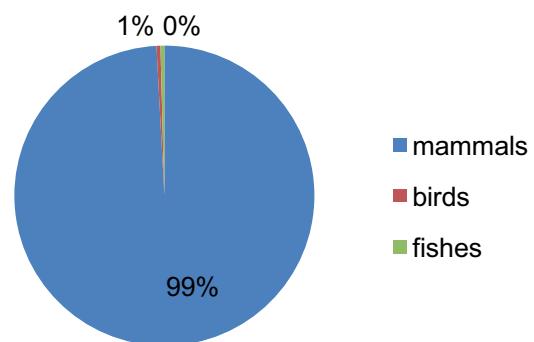


Chart 16. Mammals, sixth century AD

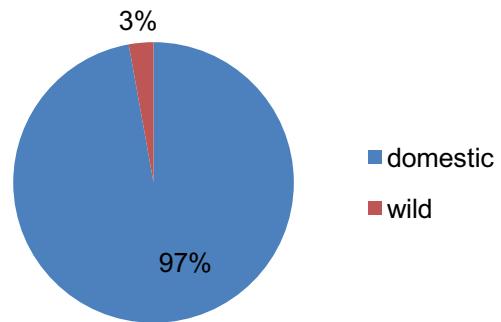


Chart 17. Domesticated mammals, sixth century AD

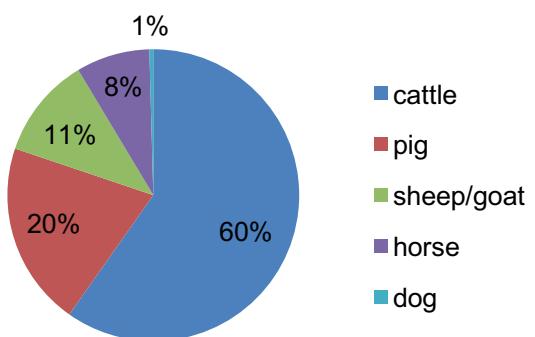


Chart 18. Cattle: anatomical distribution, sixth century AD

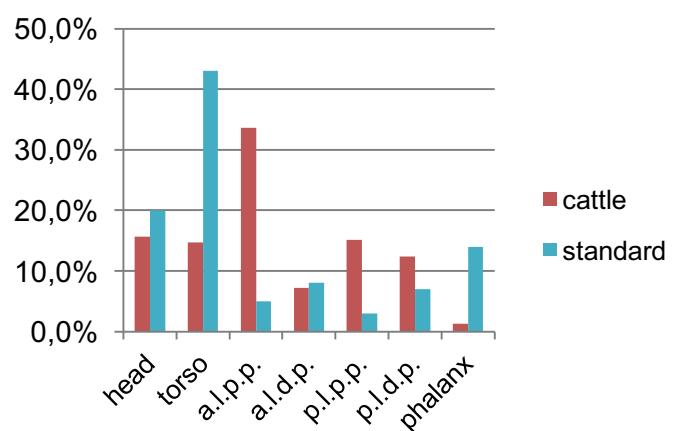


Chart 19. Goat/sheep: anatomical distribution, sixth century AD

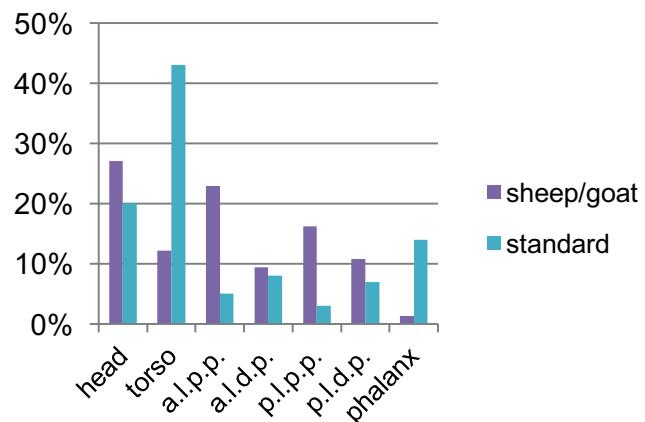


Chart 20. Pig: anatomical distribution, sixth century AD

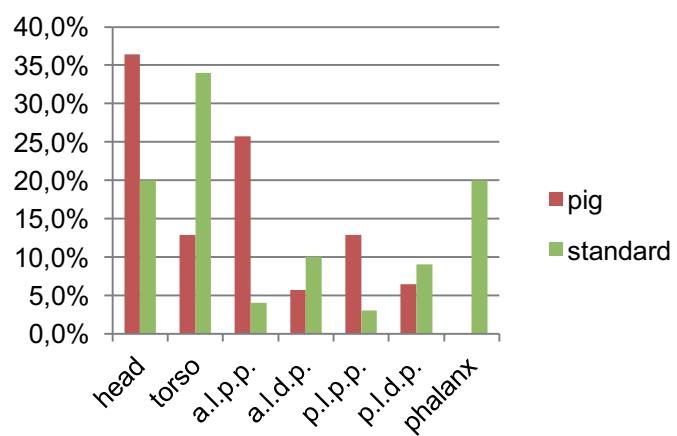


Chart 21. Horse: anatomical distribution, sixth century AD

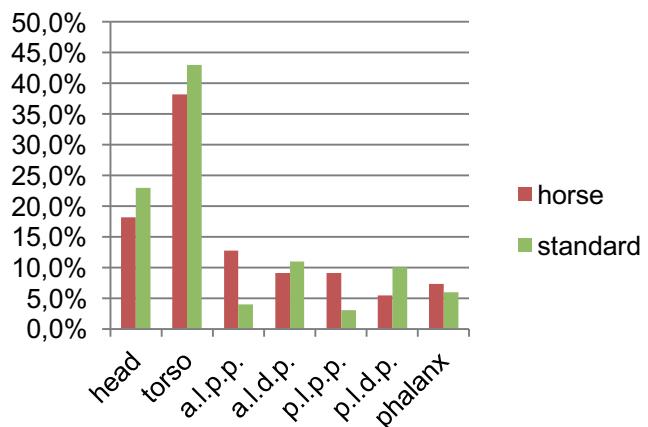


Chart 22. Cattle: 100-point scale. Length measurements, sixth century AD

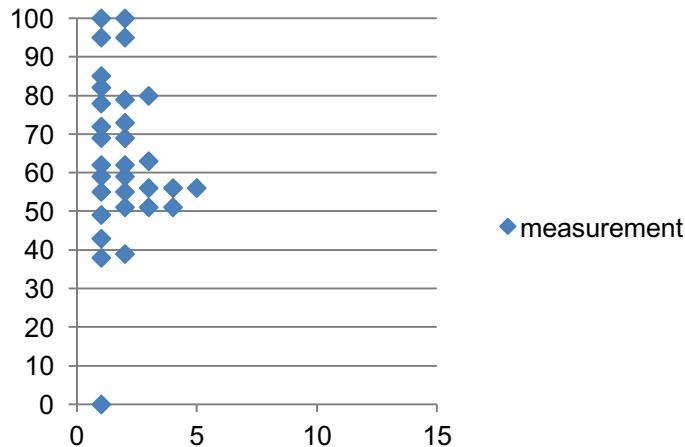
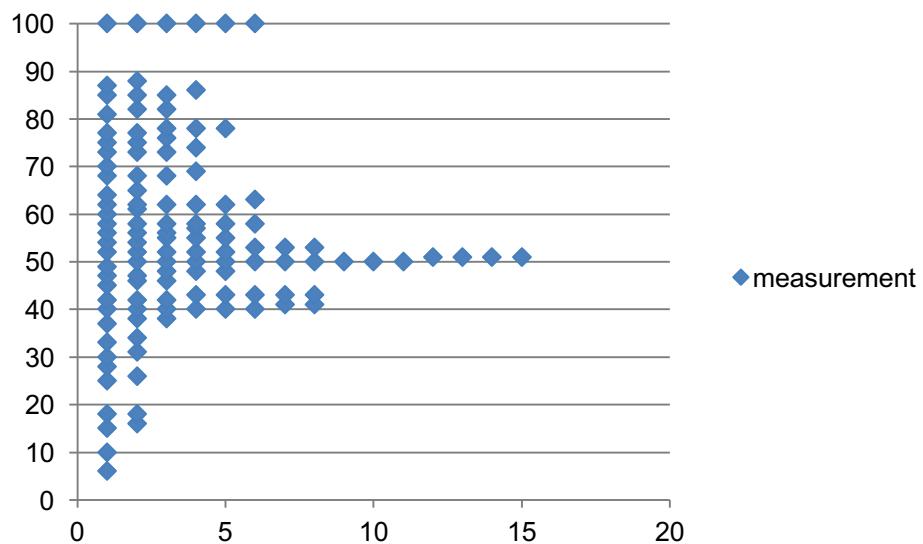


Chart 23. Cattle: 100-point scale. Width measurements, sixth century AD



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## Streszczenie

### Analiza archeozoologiczna szczątków zwierzęcych z obozu rzymskiego w Novae

Artykuł przedstawia wyniki analizy kości zwierzęcych, pochodzących z wykopalisk archeologicznych w rzymskim obozie legionowym w Novae (Bułgaria). Szczątki pochodzą z warstw datowanych na II–III, IV oraz VI stulecie naszej ery. Analiza przeprowadzona została zgodnie z obowiązującymi w archeozoologii standardami obejmującymi określenie wieku, płci, morfologii, wysokości w kłębie itd.

Na podstawie badanego materiału wywnioskowano, że w pierwszym z omawianych okresów — II–III w. n.e., kiedy obóz w Novae był siedzibą I legionu Italiskiego — konsumowano głównie mięso ssaków udomowionych, z lekką przewagą wieprzowiny nad wołowiną. Biorąc pod uwagę także rozkład anatomiczny szczątków świń, w którym dominują części bliższe kończyn, można powiedzieć, że panował wówczas model hodowli nastawiony na szybkie uzyskiwanie mięsa.

Wśród szczątków z IV w. n.e. przeważały kości bydlęce. Ustalenie jednolitego modelu konsumpcji dla tego okresu nie jest jednak możliwe, jako że w innym materiale z tego okresu najczęściej było szczątków kóz i owiec.

W ostatnim z analizowanych materiałów, datowanym na VI w. n.e., także dominowały szczątki bydlęce, ze zdecydowaną przewagą nad kościami świń oraz kóz i owiec. W tym okresie, kiedy Novae przeżywało okres świetności jako miasto cywilne, podstawą konsumpcji mięsa była wołowina.

We wszystkich omawianych okresach model konsumpcji mięsa był jednak podobny — dominowały ssaki udomowione, niewiele zaś jadano dziczych, ptaków oraz ryb.

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## **IDENTYFIKACJA WĘGLI DRZEWNYCH POCHODZĄCYCH Z WYKOPALISK W NOVAE (BULGARIA), SZKODRZE (ALBANIA) I RISAN (CZARNOGÓRA)<sup>1</sup>**

**Abstract:** Wood is naturally susceptible to various destructive factors, especially when oxygen and damp have access (e.g. in contact with soil). Fires burning products of human activities are by paradox a factor in their preservation. Charcoal, which is the effect of such burning, is resistant to fungi and insects, and may last for hundreds of years in shallow-lying layers of soil, constituting invaluable information on the material culture of past ages, especially as they preserve the original structure of the timber used for the production of these artifacts.

**Key words:** charcoal, wood structure, identification, durability

Badaniom poddano dziesięć próbek, pochodzących z wykopalisk Ośrodka Badań nad Antykiem Europy Południowo-Wschodniej UW: w Novae w Bułgarii (3 próbki, o oznaczeniu zaczynającym się od litery „N”), w Risan w Czarnogórze (4 próbki, o oznaczeniu zaczynającym się od litery „R”) i w Szkodrze w Albanii (3 próbki, o oznaczeniu zaczynającym się od liter „SZ”) [Ryc. 1]. Próbki o oznaczeniach N4/2013, N8/2012, R2/2015, R3/2015, R8/2015, SZ13/2013 to kawałki węgli drzewnych, próbka N1/2013 to drobne fragmenty węgli drzewnych zlepione w bryłkach ziemi, próbka SZ11/2011 to fragment elementu drewnianego, a próbka R1/2015 to zdrewniałą fragment jakiegoś owocu-lupiny. Pełen wykaz obiektów wraz z podaną masą zestawiono w Tabeli 1.

Tabela 1. Obiekty poddane identyfikacji

Lp.	Oznaczenie	Postać	Masa całkowita [g]	Wymiary gabarytowe największego elementu [mm]
1	N1/2013	bryłki ziemi z fragmentami węgli drzewnych	45,70	węgle: $8 \times 2 \times 2$
2	N4/2013	2 kawałki węgli drzewnych	4,47	$20 \times 10 \times 10$

<sup>1</sup> Projekt został sfinansowany ze środków Narodowego Centrum Nauki, przyznanych na podstawie decyzji: Novae — DEC-2014/13/B/HS3/04836; Szkodra — DEC-2014/14/M/HS3/00741; Risan — DEC-2015/19/B/HS3/02056.

3	N8/2012	7 kawałków węgli drzewnych	16,27	50 × 30 × 10
4	R1/2015	zdrewniały fragment owocu	4,89	średnica ok. 20 mm
5	R2/2015	7 kawałków węgli drzewnych	16,65	20 × 20 × 20
6	R3/2015	2 kawałki węgli drzewnych	51,65	65 × 45 × 30
7	R8/2015	6 kawałków węgli drzewnych	34,16	70 × 25 × 15
8	SZ5/2014	16 kawałków węgli drzewnych	40,51	50 × 20 × 20
9	SZ13/2013	7 kawałków węgli drzewnych	60,79	35 × 65 × 40
10	SZ11/2011	podłużny fragment drewna	10,94	120 × 20 × 15



Ryc. 1. Postać dostarczonych próbek do identyfikacji:  
 a) próbka N1/2013 w postaci brylek ziemi zawierających niewielkie fragmenty węgli drzewnych;  
 b) próbka N4/2013 w postaci 2 kawałków węgli drzewnych;  
 c) próbka N8/2012 w postaci 7 kawałków węgli drzewnych;  
 d) próbka R1/2015 w postaci zdrewniałego fragmentu owocu;  
 e) próbka R2/2015 w postaci 7 kawałków węgli drzewnych;  
 f) próbka R3/2015 w postaci 2 kawałków węgli drzewnych;  
 g) próbka R8/2015 w postaci 6 kawałków węgli drzewnych;  
 h) próbka SZ5/2014 w postaci 16 kawałków węgli drzewnych;  
 i) próbka SZ13/2013 w postaci 7 kawałków węgli drzewnych;  
 j) próbka SZ11/2011 w postaci podłużnego fragmentu drewna

Wilgotność próbek była zbliżona do stanu powietrzno-suchego — jest to stan odpowiadający temperaturze powietrza ok. 20 °C i wilgotności względnej ok. 70%.

## Metodyka

Obiekty drewniane z wykopalisk archeologicznych, ze względu na postać, można podzielić na dwa rodzaje. Pierwszy rodzaj to niezwęglone naturalne drewno o wysokiej naturalnej trwałości, np. twardziel dębu, jesionu, wiązu, sosny, modrzewia i cisu lub rodzaje drewna mniej trwałe, ale przelegające w warunkach sprzyjających ich zachowaniu, np. w głębiej położonych wilgotnych warstwach gleby, znajdujące się w tzw. wilgotnym stanie ochronnym.<sup>2</sup> Metodyka identyfikacji takich obiektów jest zbliżona do identyfikacji drewna współczesnego, a polega na obserwacjach makroskopowych oraz wykonaniu preparatów mikroskopowych do obserwacji w świetle odbitym. W większości przypadków pozwala to na pewne rozpoznanie rodzajów drewna archeologicznego, co potwierdzają różne prace i eksperytyzy: np. identyfikacja drewna pochodzącego z Pucka,<sup>3</sup> z dna Bałtyku<sup>4</sup> lub ze Szkodry w Albanii.<sup>5</sup>

Drugi rodzaj obiektów to węgle drzewne niepodatne na czynniki biotyczne i mogące przetrwać nawet w płytko położonych warstwach gleby.<sup>6</sup> Węgiel drzewny powstaje w wyniku powolnej pirolizy drewna, przy czym zachowuje w swoim wnętrzu mikrostrukturę drewna. Obserwacji takich obiektów, ze względu na kruchosć struktury (niemożność skrawania cienkich preparatów mikroskopowych), zwykle dokonuje się w świetle odbitym,<sup>7</sup> co pozwala na ich identyfikację, ale zwykle tylko co do rodzaju,<sup>8</sup> czego dowiodły liczne prace: np. rozpoznanie próbek zwęglonego drewna z wykopalisk w Grodziszczu Mazowieckim,<sup>9</sup> z Lovosic w Czechach,<sup>10</sup> kopca Yenibademli w zachodniej Turcji,<sup>11</sup> Oiartzun w kraju Basków<sup>12</sup> oraz Novae w północnej Bułgarii<sup>13</sup> i Risan w Czarnogórze.<sup>14</sup>

Na podstawie wcześniejszych doświadczeń dokonano wstępnych oględzin makroskopowych drewna, używając do tego celu również lupy o cztero- i dziesięciokrotnym powiększeniu. Na podstawie widocznego rysunku oraz przez porównywanie z wzorcami i danymi atlasowymi<sup>15</sup> dokonano wstępnego rozpoznania drewna. Pełen zakres prowadzonych badań obejmował obserwacje makroskopowe i mikroskopowe z użyciem mikroskopu elektronicznego TPL USB 1,3 MPix firmy Bresser. Obrazy drewna utrwalono w postaci fotografii cyfrowych (także powiększonych przy użyciu przystawki do fotografii makro).

W przypadku próbki drewna (SZ11/2011) wykonano również nietrwałe preparaty do obserwacji w świetle przechodzącym. Były to preparaty mikroskopowe reprezentujące trzy podstawowe przekroje anatomiczne drewna (poprzeczny, promieniowy i styczny). Pozyskane na mikrotomie saneczkowym preparaty zabarwiono w jednoprocentowym roztworze safraniny w alkoholu etylowym. Tak przygotowane skrawki drewna obserwowano w świetle przechodzącym za pomocą mikroskopu Olympus z przystawką zaopatrzoną w kamerę cyfrową sprzężoną z komputerowym programem Cell\*B, powalającym na cyfrowe utrwalenie obrazów mikrostruktury.

<sup>2</sup> KOZAKIEWICZ, MATEJAK 2013.

<sup>11</sup> YAMAN 2010.

<sup>3</sup> KOZAKIEWICZ 2008a.

<sup>12</sup> MORENO-LARRAZABAL, URTEAGA, ZAPATA 2011.

<sup>4</sup> KOZAKIEWICZ 2008b.

<sup>13</sup> JANKOWSKA, KOZAKIEWICZ 2011.

<sup>5</sup> JANKOWSKA, KOZAKIEWICZ 2013b.

<sup>14</sup> JANKOWSKA, KOZAKIEWICZ 2013a.

<sup>6</sup> DZBEŃSKI, KOZAKIEWICZ 2002.

<sup>15</sup> Np. WAGENFÜHR 2007.

<sup>7</sup> KOEPPEN 1972.

<sup>8</sup> TENNESSEN, BLANCHETTE, WINDES 2002; HAWES, GRAHAM 2009.

<sup>9</sup> DZBEŃSKI, KOZAKIEWICZ 1997.

<sup>10</sup> PETRLÍKOVÁ, BENEŠ 2008.

Na podstawie danych literatury na temat zasięgu występowania wybranych gatunków drzew w Europie dokonano analizy uzupełniającej, dotyczącej prawdopodobieństwa występowania danego gatunku w rejonach prowadzonych prac archeologicznych. Nazwy rozpoznanego drewna podano zgodnie z nomenklaturą zawartą w normie PN-EN 13556:2005.<sup>16</sup>

## Wyniki badań

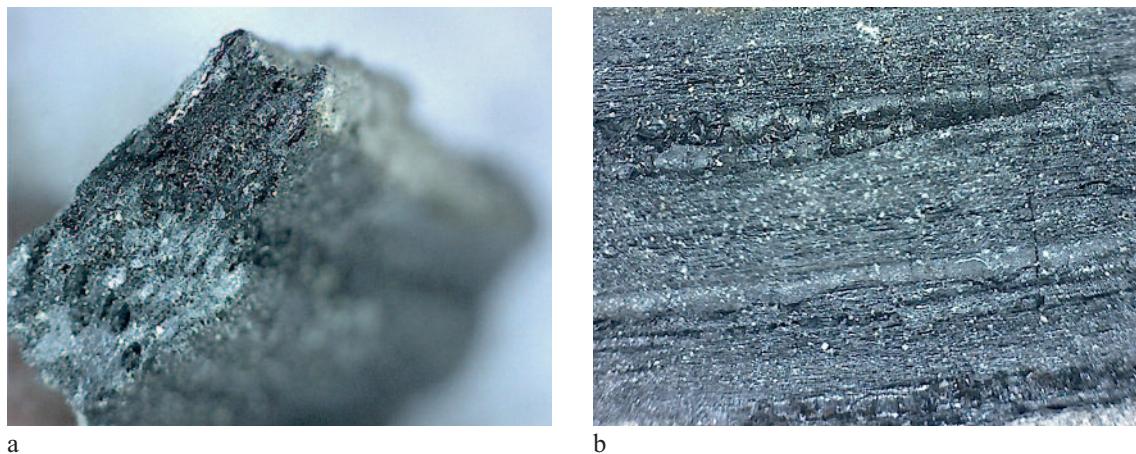
### Identyfikacja próbek ze stanowiska Novae w Bulgarii

**Próbka N1/2013** to bryłki ziemi zawierające drobne fragmenty węgli drzewnych [Ryc. 2]. Obserwacja mikroskopowa tych fragmentów pozwoliła na stwierdzenie obecności następujących cech identyfikacyjnych drewna [Ryc. 3]: zarysowane słoje roczne zaczynające się od pierścienia dużych naczyń, duże promienie drzewne, zgrupowania małych naczyń z towarzyszącymi komórkami miękiszowymi w strefie drewna późnego. Cechy te jednoznacznie wskazują na drewno dębowe (*Quercus sp.*).



Ryc. 2. Powiększony obraz fragmentu powierzchni próbki N1/2013

<sup>16</sup> PN-EN 13556:2005 Drewno okrągłe i tarcica. Terminologia stosowana w handlu drewnem w Europie.



a

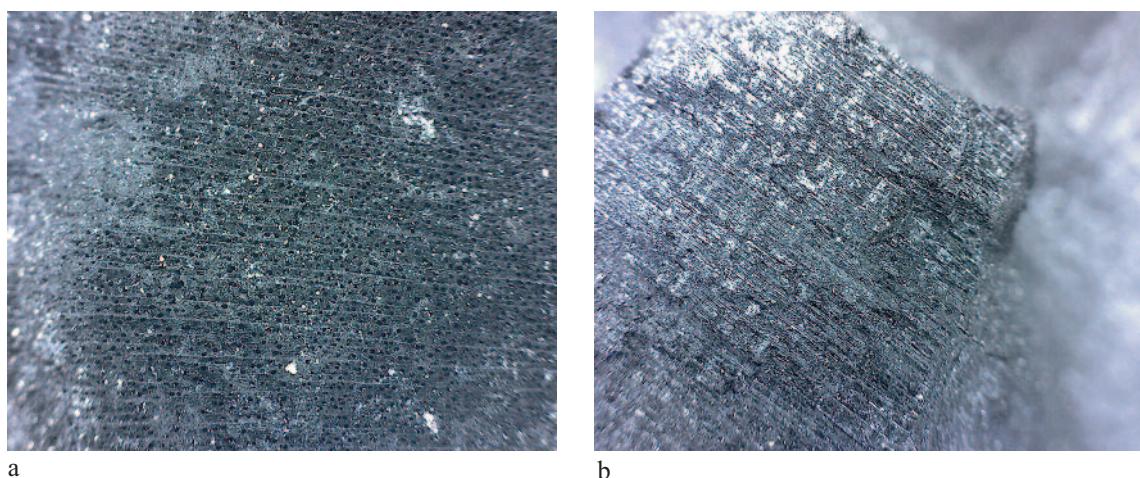
b

Ryc. 3. Obrazy mikroskopowe jednego z fragmentów węgli z próbki N1/2013:  
a) przekrój poprzeczny; b) przekrój promieniowy

**Próbka N4/2013** to zwarte kawałki węgli drzewnych [Ryc. 4 i 5]. Węgle te reprezentują typ struktury drewna liściastego rozpierzchłonaczyniowego. Małe naczynia rozmieszczone są równomiernie na przekroju poprzecznym pojedynczo lub — rzadziej — w zgrupowaniach po 2–3. Brak jest szczególnych układów i zgrupowań komórek miękiszowych. Promienie drzewne są drobne, kilkuszeregowe i nie tworzą zgrupowań. Słoje roczne są słabo zarysowane. Prawdopodobnie jest to drewno brzozy (*Betula sp.*).



Ryc. 4. Powiększony obraz powierzchni próbki N4/2013 — przekrój poprzeczny



Ryc. 5. Obrazy mikroskopowe jednego z fragmentów węgli z próbki N4/2013:  
a) przekrój poprzeczny; b) przekrój promieniowy

*Betula* to rodzaj obejmujący kilkadziesiąt gatunków występujących naturalnie głównie w Azji i Ameryce Północnej. Liczba gatunków brzóz w Europie jest znacznie mniejsza. Do najbardziej rozpowszechnionych należą brzoza brodawkowata (*Betula pendula* Roth.) i brzoza omszona (*Betula pubescens* Ehrh.), a do gatunków o zasięgu lokalnym w wybranych krajach południowej Europy należą także *Betula celtiberica*, *Betula Litvinoviae* i *Betula medwediewii*.<sup>17</sup> Prawdopodobnie węgle drzewne powstały z gatunku najbardziej rozpowszechnionego, czyli z brzozy brodawkowej.

**Próbka N8/2012** to siedem kawałków węgli drzewnych, wśród których da się wyróżnić dwa zbiory o odmiennych cechach identyfikacyjnych.

Cztery kawałki reprezentują drewno liściaste rozpierzchlonaczyniowe o bardzo słabo zarysowanych szerokich przyrostach rocznych [Ryc. 6 i 7] i niewidocznych makroskopowo promieniach drzewnych (jednoszeregowych). Na przekroju poprzecznym naczynia te najczęściej rozmieszczone są w zgrupowaniach po 2–3, a rzadziej pojedynczo lub w większych grupach. Prawdopodobnie jest to drewno topoli (*Populus* sp.).



Ryc. 6. Powiększony obraz powierzchni węgli z próbki N8/2012 — przekroje poprzeczne

<sup>17</sup> AAS, RIEDMILLER 1993; KREMER 1995; PIRC 2006; JOHN-SON, MORE 2009.



Ryc. 7. Obrazy mikroskopowe dwóch rodzajów węgli z próbki N8/2012 — przekroje poprzeczne  
 (po prawej stronie próbka szerokosłoista z niewidocznymi promieniami drzewnymi,  
 po lewej stronie próbka wąskosłoista z widocznymi promieniami drzewnymi)

*Populus* to rodzaj drzew (rzadziej krzewów) najliczniejszej w Europie rodziny roślin drzewiastych — rodziny wierbowatych (*Salicaceae*). Rodzaj ten liczy ok. 35 gatunków i jest szeroko rozpowszechniony w Europie, obejmując swym zasięgiem występowania również Bułgarię.<sup>18</sup> Tylko na zasadzie prawdopodobieństwa (powszechności występowania) można pokusić się o domniemywanie konkretnego gatunku topoli, wskazując np. na topolę białą (*Populus alba* L.) lub topolę czarną (*Populus nigra* L.).

Trzy pozostałe kawałki węgli również reprezentują drewno liściaste rozpierzchłonaczyniowe, ale o dobrze zarysowanych wąskich przyrostach rocznych [Ryc. 6 i 7] i wyraźnie widocznych promieniach drzewnych. Przyrosty roczne są sfalowane, a promienie nierówne o różnej szerokości i długości (zanikające) — są to tzw. pozornie szerokie i wysokie promienie drzewne. Na przekroju poprzecznym grubościennie włókna tworzą dość regularne promieniowe rzędy. Prawdopodobnie jest to drewno grabowe (*Carpinus* sp.).

*Carpinus* to rodzaj nieliczny w Europie i najpewniej można tu wskazać dwa gatunki — grab pospolity (*Carpinus betulus* L.) lub grab wschodni (*Carpinus orientalis* Mill.), występujące w południowej Europie — jako dawców drewna zachowanego w odkrytych kawałkach węgli drzewnych.

<sup>18</sup> Ibidem.

### Identyfikacja próbek ze stanowiska Risan w Czarnogórze

**Próbka R1/2015** to zdrewniały fragment o wyraźnie kulistym zewnętrznym obrysie [Ryc. 8a] i pierwotnej średnicy nieco ponad 20 mm. Na rozłupie (powierzchnia wewnętrzna) widoczne są wyraźnie żeberkowe wgłębienia. Struktura obiektu jest bardzo twarda (zmineralizowana), ale jednocześnie porowata [Ryc. 9]. Opisane wyżej cechy, a także kształt wskazują, że najprawdopodobniej jest to fragment nasienia muszkatołowca wonnego. Wieloletnie przebywanie w środowisku glebowym doprowadziło do częściowego wygładzania zewnętrznej powierzchni nasienia.

Muszkatołowiec korzenny (*Myristica fragrans* Houtt.) to gatunek drzewa z rodziny muszkatołowcowatych, pochodzący z Wysp Banda (z Archipelagu Malajskiego). Jego nasiona znane są jako gałka muszkatołowa — przyprawa, która rozpowszechniła się w Europie w dobie wypraw krzyżowych.



Ryc. 8. Powiększony obraz powierzchni próbki R1/2015:  
a) powierzchnia zewnętrzna; b) wygląd rozłupu z żeberkowatymi wgłębieniami

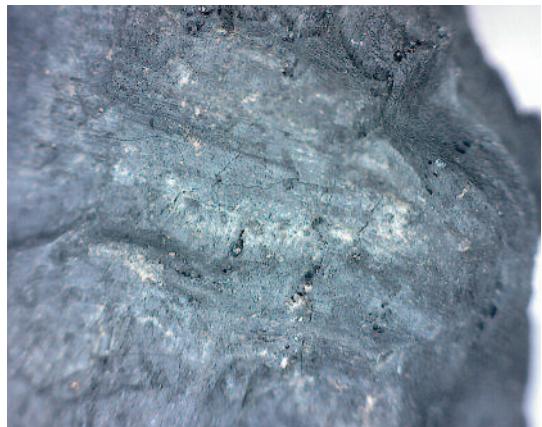


Ryc. 9. Obraz mikroskopowy próbki R1/2015

**Próbka R2/2015** to kawałki węgli drzewnych o zbliżonej strukturze [Ryc. 10]. W strefie drewna wczesnego naczynia mające większe średnice (widoczne makroskopowo) tworzą zwarte pierścienie. Naczynia w strefie drewna późnego są ułożone w zgrupowaniach kształtem przypominającym płomyki ognia. Na wszystkich przekrojach widoczne są bardzo duże (rozbudowane) promienie drzewne. Powyższe cechy budowy anatomicznej jednoznacznie wskazują na drewno dębowe (*Quercus* sp.).



a



b

Ryc.10. Obrazy mikroskopowe jednego z fragmentów węgli z próbki R2/2015:  
a) przekrój poprzeczny; b) przekrój promieniowy

**Próbka R3/2015** to dwa kawałki węgli drzewnych z licznymi spękaniami o identycznych cechach reprezentujących drewno liściaste pierścieniowonaczyniowe [Ryc. 11]. Obecność rozbudowanych promieni drzewnych i układu naczyń w postaci płomysków w strefie drewna późnego na przekroju poprzecznym jednoznacznie wskazują na drewno dębowe (*Quercus* sp.).



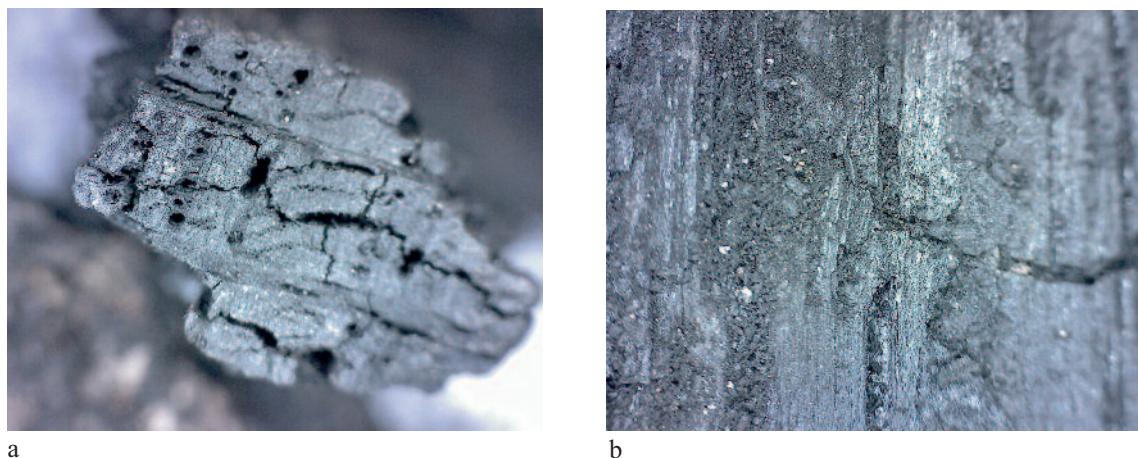
a



b

Ryc. 11. Obrazy mikroskopowe jednego z fragmentów węgli z próbki R3/2015:  
a) przekrój poprzeczny; b) przekrój promieniowy

**Próbka R8/2015** to sześć kawałków węgli drzewnych reprezentujących jeden rodzaj drewna [Ryc. 12]. Charakterystycznymi cechami są pierścienie dużych naczyń rozpoczętające słoje roczne, rozbudowane promienie drzewne widoczne na wszystkich przekrojach oraz zarys płomyków w strefie drewna późnego, tworzonych przez małe naczynia z towarzyszącym miękkim przynaczyniowym. Są to cechy drewna dębowego (*Quercus* sp.).



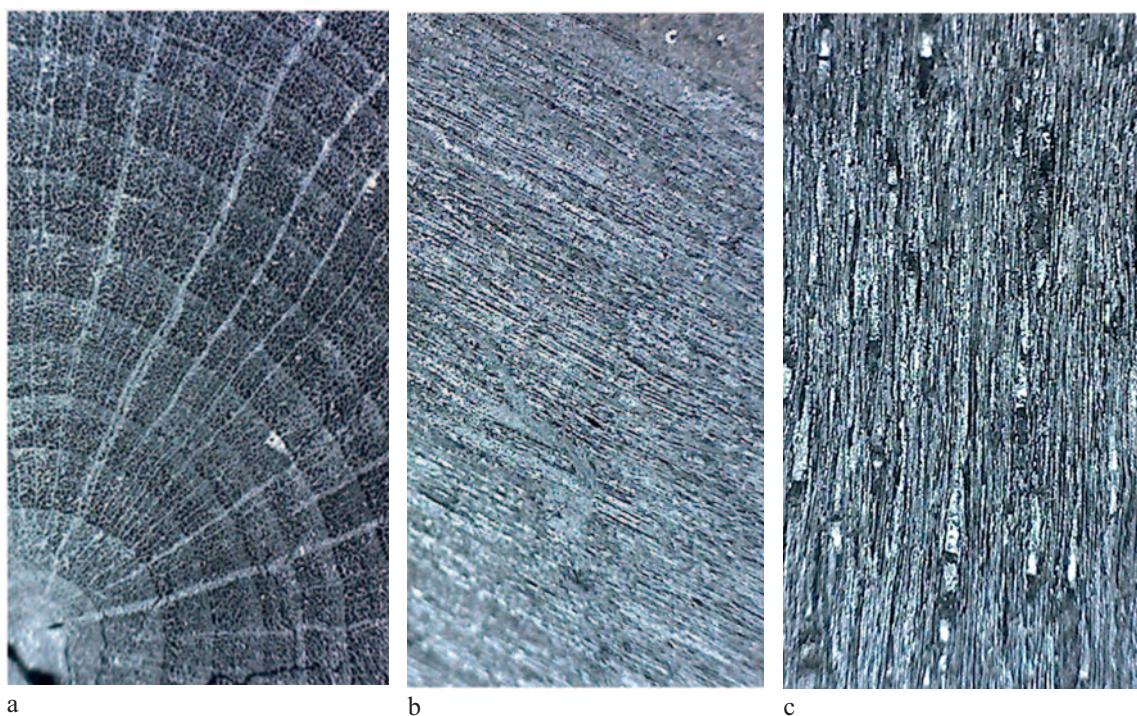
Ryc. 12. Obrazy mikroskopowe jednego z fragmentów węgli z próbki R8/2015:  
a) przekrój poprzeczny; b) przekrój promieniowy

Najliczniejsze w Europie i mające najszerzy rejon występowania są: dąb szypułkowy (*Quercus robur* L.) i dąb bezszypułkowy (*Quercus petraea* Liebl.), a następnie: dąb omszony (*Quercus pubescens* Wild.), dąb burgundzki (*Quercus cerris* L.), dąb węgierski (*Quercus frainetto* Ten.), dąb ostrolistny (*Quercus ilex* L.) oraz dąb korkowy (*Quercus suber* L.). Biorąc pod uwagę wymagania siedliskowe i zasięgi,<sup>19</sup> można stwierdzić, że spośród przedstawionych gatunków najbardziej prawdopodobnymi dawcami drewna zachowanego w postaci węgli drzewnych odnalezionych na terenie Bułgarii i Czarnogóry są dąb szypułkowy (*Quercus robur* L.), dąb bezszypułkowy (*Quercus petraea* Liebl.) lub dąb omszony (*Quercus pubescens* Wild.).

#### Identyfikacja próbek ze stanowiska Szkodra w Albanii

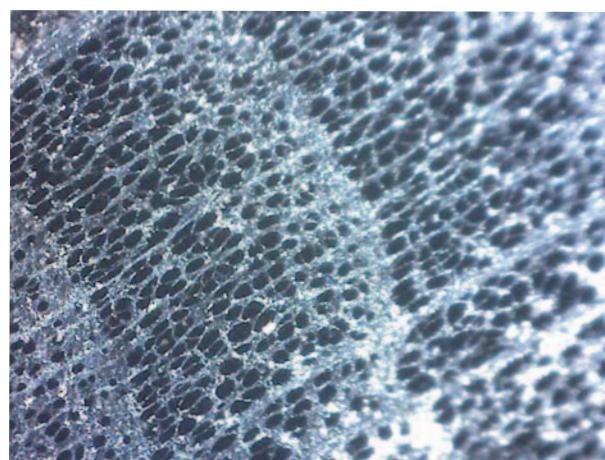
Widoczne cechy makroskopowe **próbki SZ5/2014** pozwalają na stwierdzenie, że wszystkie fragmenty węgli drzewnych pochodzą z drewna liściastego. W materiale obecne są takie elementy struktury jak naczynia, co wskazuje na ten rodzaj drewna. Przyrosty roczne są wyraźnie zarysowane dzięki zwartej warstwie włókien drzewnych na końcu każdego przekroju. Naczynia są równomiernie rozmiieszczane na całym przekroju poprzecznym, co jednoznacznie wskazuje na drewno liściaste o strukturze rozpierzchłonaczyniowej [Ryc. 13].

<sup>19</sup> Ibidem.



Ryc. 13. Obrazy mikroskopowe jednego z fragmentów węgli z próbki SZ5/2014:  
a) przekrój poprzeczny; b) przekrój promieniowy; c) przekrój styczny

Na obrazach przedstawiających analizowane węgle z dwustukrotnym przybliżeniem [Ryc. 14] nie widać żadnych charakterystycznych zgrupowań komórek miękiszowych. Naczynia są bardzo liczne, najczęściej występują pojedynczo. Uzupełniające pionową strukturę włókna drzewne wydają się grubościenne o małym świetle. Promienie drzewne są bardzo szerokie i dobrze widoczne na wszystkich przekrojach. Ich szerokość jest wyraźnie zwiększena na granicy czterech przyrostów rocznych (tzw. kielichowate rozszerzenie). Taki zestaw cech wskazuje na drewno buka (*Fagus*).



Ryc. 14. Obraz przekroju poprzecznego fragmentu próbki SZ5/2014 — powiększenie 200-krotne

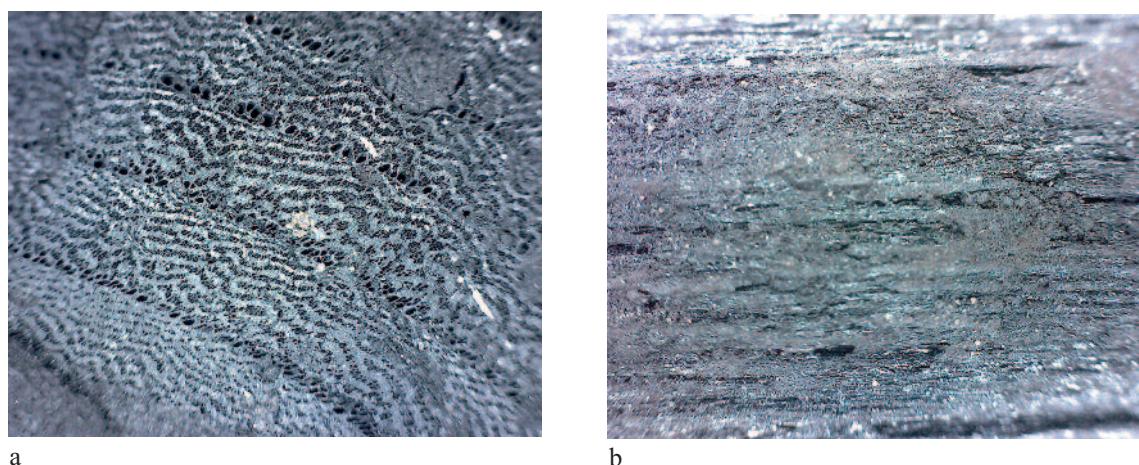
Buk (*Fagus L.*) to rodzaj drzew z rodziny bukowatych obejmujący 9–10 gatunków. Występują one głównie w strefie umiarkowanej na półkuli północnej. W Europie występuje w stanie naturalnym tylko buk zwyczajny (*Fagus sylvatica L.*). Uprawianych jest kilka gatunków obcych i liczne odmiany ozdobne buka zwyczajnego. Gatunkiem typowym jest *Fagus sylvatica L.*<sup>20</sup> Gatunek ten występuje w stanie dzikim w Europie i w zachodniej Azji. W Europie zasięg występowania ciągnie się od północy Półwyspu Iberyjskiego przez Francję, Niemcy, kraje Europy Środkowej i Bałkany. Na Półwyspie Skandynawskim i Wyspach Brytyjskich występuje jedynie na południu. W Azji — wyłącznie na zachodzie, spotykany w Turcji, Iranie oraz na Kaukazie.<sup>21</sup>

Fakt występowania drzew bukowych na terenie współczesnej Bułgarii w I w. n. e. uprawdopodabnia trafność identyfikacji.

**Próbka SZ13/2013** to węgle drzewne wskazujące na pochodzenie z drewna o strukturze pierścieniowonaczyniowej oraz o szczególnym układzie naczyń [Ryc. 15 i 16].



Ryc. 15. Powiększony obraz fragmentu powierzchni próbki SZ13/2013 — przekrój poprzeczny



Ryc. 16. Obrazy mikroskopowe jednego z fragmentów węgli z próbki SZ13/2013:  
a) przekrój poprzeczny; b) przekrój promieniowy

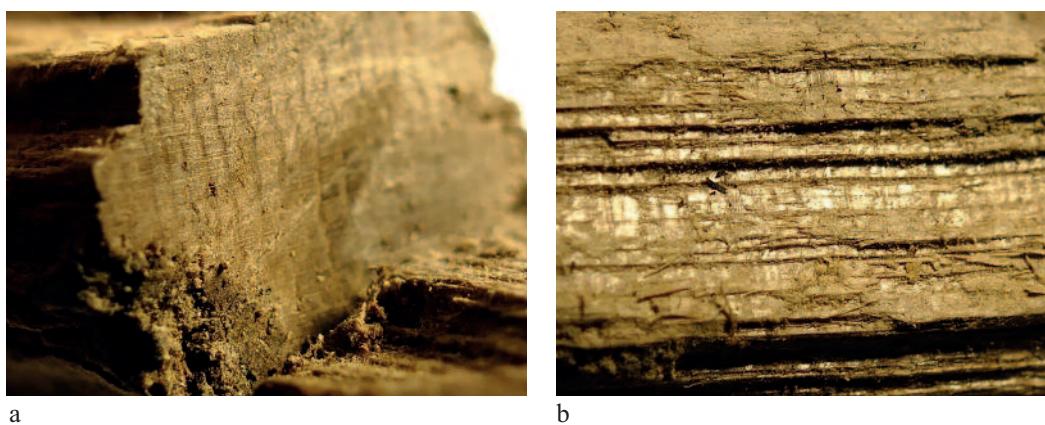
<sup>20</sup> *Index Nominum Genericorum* (<http://botany.si.edu/ing/>).

<sup>21</sup> <http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?16557>.

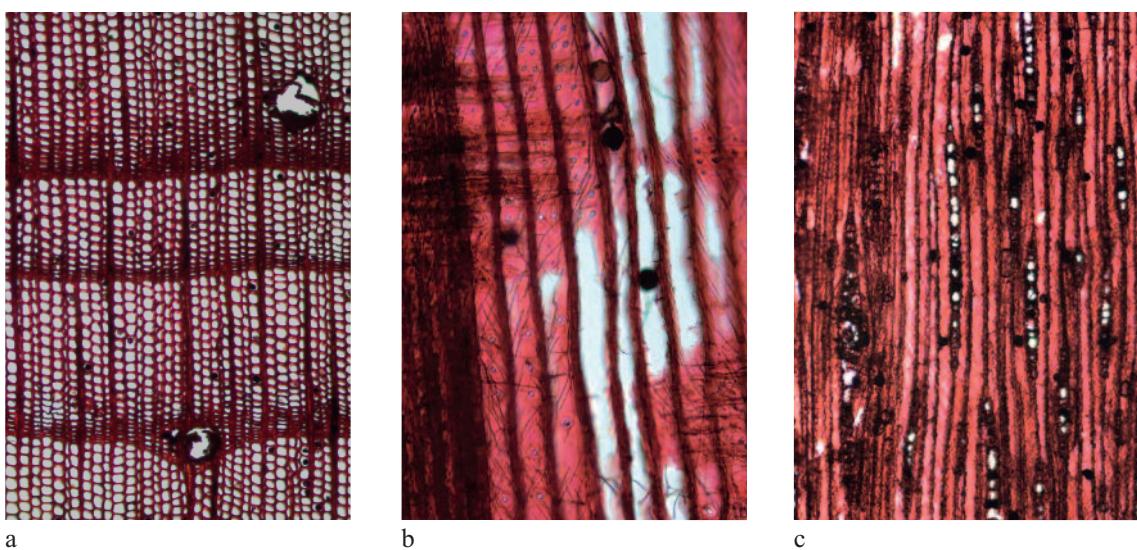
W strefie drewna wczesnego naczynia są większe (widoczne makroskopowo) i tworzą zwarte pierścienie. W strefie drewna późnego naczynia są znacznie drobniejsze, widoczne makroskopowo są jedynie w postaci zgrupowań. Zgrupowania te tworzą stycznie przebiegające pasemka [Ryc. 16a], co jest cechą charakterystyczną dla drewna wiązu (*Ulmus* sp.).

Rodzaj *Ulmus* obejmuje około 20 gatunków drzew. Większość z nich łatwo się ze sobą krzyżuje, tworząc całą grupę zmiennych (wielopostaciowych) i trudnych do odróżnienia mieszańców. Być może jest to taki mieszaniec. Uwzględniając stan zachowania pierwotnej struktury drewna w węglach drzewnych identyfikacja gatunkowa jest praktycznie niemożliwa — o konkretnych gatunkach drewna można jedynie domniemywać na podstawie historycznego zasięgu i częstości występowania poszczególnych gatunków drzew w Europie.

**Próbka SZ11/2011** to fragment drewna powierzchniowo silnie zdegradowany, ale zachowujący „zdrowy rdzeń” [Ryc. 17], co pozwoliło na wykonanie preparatów mikroskopowych do obserwacji w świetle przechodzącym [Ryc. 18].



Ryc. 17. Powiększony obraz powierzchni próbki SZ11/2011:  
a) przekrój poprzeczny; b) przekrój promieniowy



Ryc. 18. Obrazy mikroskopowe drewna próbki SZ11/2011 — obserwacje w świetle przechodzącym:  
a) przekrój poprzeczny; b) przekrój promieniowy; c) przekrój styczny

Odnaleziony fragment drewna to drewno iglaste, na co wskazują wyraźnie widoczne granice przyrostów rocznych oraz brak naczyń. Jest to drewno o bardzo wąskich przyrostach rocznych, zawierające niebyt liczne przewody żywiczne (pionowe biegnące w strefie drewna późnego, a poziome w promieniach o kształcie soczewkowatym). Przejścia ze strefy drewna wczesnego do późnego w obrębie pojedynczych słojów rocznych są dość łagodne (stopniowa zamiana grubości i średnic promieniowych cewek). Same cewki ułożone są w równych promieniowo biegących rzędach. Ich ściany wzmacnione są przez obecność wyraźnych zgrubień spiralnych. Na szerokości ścian promieniowych również w cewkach drewna wczesnego jamki lejkowate otoczkowe występują pojedynczo. W strukturze drewna dominują promienie drzewne jednoszeregowe. Są to promienie o zróżnicowanej wysokości złożone z kilku–kilku nastu warstw komórek. Promienie są promieniami niejednorodnymi tworzącymi przez cewki brzeżne i komórki miękiszowe. Na polach krzyżowych (przecięcie cewek drewna wczesnego z komórkami miękiszowymi) zwykle występują dwie jamki piceoidalne. Przedstawione cechy identyfikacyjne wskazują na drewno świerkowe (*Picea* sp.).

Biorąc pod uwagę obszar występowania różnych gatunków świerków<sup>22</sup> może to być świerk pospolity (*Picea abies* [L.] Karst.) lub świerk serbski (*Picea omorica* [Pancic] Purk.). Obecność licznych zgrubień spiralnych bardziej wskazuje na świerk serbski (w którym element ten jest bardziej typowy), ale nie przesądza o rozpoznaniu gatunku.

## Podsumowanie

Na podstawie analizy makroskopowej i mikroskopowej próbek z wykopalisk archeologicznych zidentyfikowano następujące rodzaje drewna:

A) próbki pochodzące ze stanowiska Novae w Bułgarii:

- próbka N1/2013 (ziemia z fragmentami węgli drzewnych) — drewno dębu (*Quercus* sp.),
- próbka N4/2013 (2 kawałki węgli drzewnych) — drewno brzozy (*Betula* sp.),
- próbka N8/2012 (7 kawałków węgli drzewnych) — 4 kawałki to drewno topoli (*Populus* sp.), a 3 kawałki to drewno grabu (*Carpinus* sp.).

B) próbki pochodzące ze stanowiska Risan w Czarnogórze:

- próbka R1/2015 (zdrewniały fragment owocu) — nasiono gałki muszkatołowej (*Myristica fragrans* Houtt.),
- próbka R2/2015 (7 kawałków węgli drzewnych) — drewno dębu (*Quercus* sp.),
- próbka R3/2015 (2 kawałki węgli drzewnych) — drewno dębu (*Quercus* sp.),
- próbka R8/2015 (6 kawałków węgli drzewnych) — drewno dębu (*Quercus* sp.).

C) próbki pochodzące ze stanowiska Szkodra w Albanii:

- próbka SZ5/2014 (16 kawałków węgli drzewnych) — drewno buka (*Fagus* L.),
- próbka SZ13/2013 (7 kawałków węgli drzewnych) — drewno wiązu (*Ulmus* sp.),
- próbka SZ11/2011 (fragment drewna) — drewno świerkowe (*Picea* sp.).

<sup>22</sup> PIRC 2006; RUSSELL, CUTLER, WALTERS 2008.

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## Summary

### **Identification of charcoal from the excavation at Novae (Bulgaria), Shkodër (Albania) and Risan (Montenegro)**

Macroscopic and microscopic analyses of samples from archaeological excavations identified the following species of wood:

A) samples from the site of Novae in Bulgaria:

- sample N1/2013 (soil with bits of charcoal) — oak wood (*Quercus* sp.),
- sample N4/2013 (two pieces of charcoal) — birch wood (*Betula* sp.),
- sample N8/2012 (seven pieces of charcoal) — four pieces of poplar wood (*Populus* sp.) and three of hornbeam wood (*Carpinus* sp.).

B) samples from the site of Risan in Montenegro:

- sample R1/2015 (woody fragment of fruit) — seed of nutmeg (*Myristica fragrans* Houtt.),
- sample R2/2015 (seven pieces of charcoal) — oak wood (*Quercus* sp.),
- sample R3/2015 (two pieces of charcoal) — oak wood (*Quercus* sp.),
- sample R8/2015 (six pieces of charcoal) — oak wood (*Quercus* sp.).

C) samples from the site of Shkodër in Albania:

- sample SZ5/2014 (16 pieces of charcoal) — beech wood (*Fagus* L.),
- sample SZ13/2013 (seven pieces of charcoal) — elm wood (*Ulmus* sp.),
- sample SZ11/2011 (fragment of wood) — spruce wood (*Picea* sp.).

Apart from nutmeg, the woody objects from archeological features represent arborous plants indigenous to southern Europe.

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Marta Bajtler

## UNDERWATER FINDS FROM RISAN (MONTENEGRO) SEASON 2011<sup>1</sup>

**Abstract:** An underwater archaeological prospection project has been carried out for several seasons, from 2003 to 2011, in Risan Bay around the town of Risan in modern Montenegro. An array of artifacts was raised from the sea bottom, most of them amphorae of different type. These were mainly Greek-Italic MGS V and MGS VI, and Lamboglia 2, dating from the fourth century BC. The article presents objects lifted from areas "R" and "S" in the 2011 season: 13 amphora sherds, 2 black gloss bowls, a lid and an amphora stopper. One of the amphora stamps has a parallel in Croatia.

**Key words:** Risan, amphorae, underwater research, amphora stamps, amphora stoppers

Risan is a small town in Montenegro, located in Risan Bay, which is itself part of Kotor Bay. It was called Rhizon (in Greek) or Risinium (in Latin) and was an important center of exchange (considering the numerous storerooms with amphorae found there<sup>2</sup>) on the trade route running along the eastern coast of the Adriatic. It has been the object of archeological research since 2001, the excavations carried out by archeologists from Poland (Center for Research on the Antiquity of Southeastern Europe, University of Warsaw) and Montenegro.<sup>3</sup>

Stone structures and amphorae were signaled underwater already in the nineteenth century.<sup>4</sup> Amphorae were also brought up repeatedly, entangled in fishermen's nets. All the chance finds suggested that it would be worthwhile to carry out underwater prospection in order to locate the ancient port (if such existed), possible shipwrecks and other objects connected with maritime activity in the area of the bay. The bottom of the bay was first examined with sonar and the more interesting anomalies were verified by divers: the anchorage of ancient Risan, a few clusters of amphorae and scattered stone blocks from ancient walls.<sup>5</sup> The results of the underwater investigations in 2003–2010 were published in 2010 by the head of the underwater prospection project, Rafał Karpiński.<sup>6</sup>

<sup>1</sup> The project has been financed with resources provided by the National Science Center, Poland, allotted on the basis of decision DEC-2015/19/B/HS3/02056. I would like to thank the head of the excavation project, Prof. Piotr Dyczek, for providing material for analysis.

<sup>2</sup> DYCZEK *et alii* 2007, p. 130.

<sup>3</sup> For ground excavation results, see: DYCZEK *et alii* 2004, DYCZEK *et alii* 2007 and DYCZEK *et alii* 2011–2012.

<sup>4</sup> CONS 1881, pp. 249–250; EVANS 1883, p. 40; KARPIŃSKI 2010, p. 138; RICHLÝ 1898, p. 146.

<sup>5</sup> Stone blocks were found next to the Teuta hotel and in the Spila river.

<sup>6</sup> KARPIŃSKI 2010.

## Underwater research

Underwater prospection of the bay, which started in 2003, located ancient pottery lying on the bottom. Research with a Simrad EK 60 echo sounder in 2004 established two clusters of artifacts, in areas "W" and "S". In 2004, the investigations concentrated on the remains of ancient city fortifications submerged in the Spila river. Numerous potsherds were found in 2005 and 2006 in area "R", assumed to be the probable anchorage. The search for the port started in 2006 with surveying alongside Hotel Teuta. A trial trench was opened in 2010 in order to locate the port buildings. In the most recent season of underwater research in 2011, single artifacts were lifted from the bottom in areas "R" and "S".

The diagnostic sherds picked up from the bottom of the bay over the course of four seasons included two ceramic stoppers, three black-gloss bowls, one lid, one roof tile and 98 sherds of amphorae, mostly Greek-Italic forms MGS V and MGS VI, Lamboglia 2 and Dressel 6A.

### Season 2011

Research was reported in area "R", the so-called "anchorage", and in area "S". The "anchorage" is located by the Rtc Cape, about 1050 meters in a straight line to the south of the modern port of Risan. A large cluster of ceramics containing mainly amphorae was scattered over an area of ellipsoid shape, about 140 m by 60 meters on the two axes. Not one artifact was preserved complete, suggesting that the site was the actual anchorage.<sup>7</sup> The material raised from the sea bottom between 2005 and 2010 consisted mainly of different types of amphorae from the Hellenistic period through late antiquity to Turkish times.<sup>8</sup> As for area "S", it is located in the northern part of the bay near the Sopot Cave. This area was first investigated with the echo sounder in 2004; the first diagnostic material was picked up in 2011.

Altogether 17 artifacts were picked up from areas "R" and "S" in 2011. They represented mostly storage vessels or utility ware. Seven fragmentary amphorae and two incomplete black gloss bowls [Fig. 1] were found in the anchorage, and six amphorae sherds, one stopper and one lid from the other area.

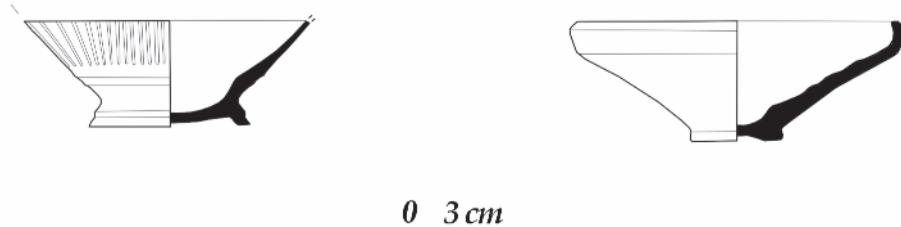


Fig. 1. Black-gloss bowls (graphics M. Różycka)

<sup>7</sup> KARPIŃSKI 2010, p. 146.

<sup>8</sup> KARPIŃSKI 2010, pp. 146, 148.

The state of preservation of amphorae from area “R” is sufficient to determine the types. All seven pieces preserved the rim, neck and handles. One of the amphorae had a stamped rim [Fig. 2]. The following types are represented: Greek-Italic MGS VI (four) [Fig. 3], Lamboglia 2 (two) [Fig. 4] and Dressel 6B (one) [Fig. 5].

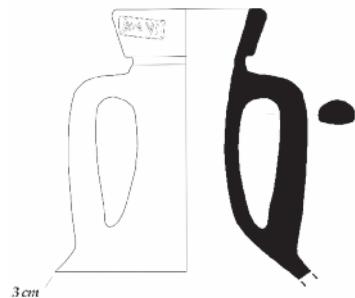


Fig. 2. Amphora Lamboglia 2 with stamp (graphics M. Różycka)



Fig. 3. Greek-Italic amphorae, type MGS VI, from area “R” (photo J. Recław, graphics M. Bajtler)



Fig. 4. Amphorae Lamboglia 2, from area "R" (photo J. Recław, graphics M. Bajtler)



Fig. 5. Amphora Dressel 6B (photo J. Recław, graphics M. Bajtler)

Vessels from area "S" were more difficult to determine. They were represented by two feet, one of which is broken, and three fragments of neck with the rim, two of which were Greek-Italic amphorae MGS VI [Fig. 6]. A ceramic stopper [Fig. 7] has hundreds of parallels from the land-based excavation, found here in context with MGS VI amphorae (that is, 3rd and 2nd century BC).<sup>9</sup> The diagnostic rim fragments were more easily identified than the feet which bear no characteristic features allowing attribution to a specific find.

<sup>9</sup> DYCZEK *et alii* 2007, p. 130; BAJTLER 2013.

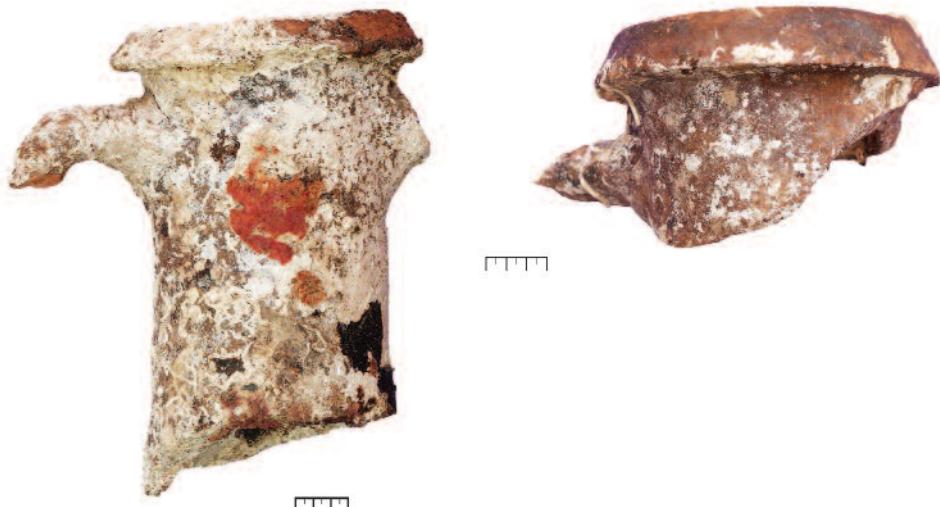


Fig. 6. Greek-Italic amphorae, type MGS VI, from area “S” (photo J. Recław, graphics M. Bajtler)



Fig. 7. Ceramic stopper (photo J. Recław, graphics M. Bajtler)

### **Amphorae**

It is important to note that there was typological continuity between the Greek-Italic amphorae of MGS VI type (3rd–2nd century BC) and the Lamboglia 2 (end of 2nd century BC – 1st century AD) and Dressel 6A (end of 1st century BC – 2nd century AD) types. All of them were produced in the Adriatic region and contained wine. However, there exist transitional types displaying characteristic morphological features that confirm the evolution from one form to another.

Dressel 6B was an amphora intended for olive oil, produced in the Istria peninsula. The fabric of this type was similar to that of the amphorae described above and they were sealed with similar ceramic plugs (with decoration and inscriptions).

## Stamps

One of the Lamboglia 2 amphorae<sup>10</sup> bears two stamps on the rim [Fig. 8]. One of them reads: KANI, the other is illegible. Parallels for the KANI stamp are known from the Stanići-Čelina wreck near Omiš, which was explored in the 1970s.<sup>11</sup> All examples of the stamp on Lamboglia 2 amphorae, including the Risan stamp, display a characteristic form of the letter “K” [Fig. 9]. One of the KANI stamps from Croatia is accompanied by another stamp, ABING, which suggests the content of the other, illegible stamp on the amphora rim from Risan.



Fig. 8. Stamps on a Lamboglia 2 amphora, from Risan (graphics M. Rózycka)

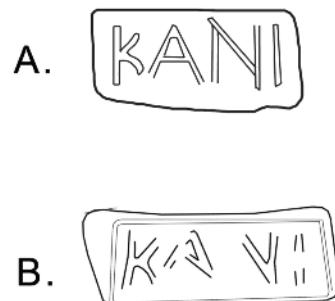


Fig. 9. KANI stamps: A) from the Stanići-Čelina wreck (graphics M. Bajtler after CAMBI 1989);  
B) from Risan (graphics M. Rózycka)

An interesting association can be made with an inscription discovered in Tasovčići near ancient Narona (Croatia), which was an important trade port and Roman colony. The inscription commemorated Octavian’s victory over Sextus Pompeius in Sicilian waters in 36 BC. It mentioned two brothers, Marcus Papius Kanus and Caius Papius Celto, who were both landowners. Moreover, the letter “K” in the cognomen of Kanus in this inscription has a very characteristic form that is similar to that of the letter on the KANI stamp.<sup>12</sup> Could the two brothers mentioned in the inscription have been connected with amphorae production?

<sup>10</sup> It could be a later form of Lamboglia 2 or early of Dresel 6A.

<sup>11</sup> CAMBI 1989, p. 315.

<sup>12</sup> CAMBI 1989, p. 321.

## Conclusion

The types of amphorae making up this underwater assemblage are reflected in artifacts discovered during land excavations in Risan. MGS VI and early Lamboglia 2 forms, as well as the plugs closing them, were found in large quantities in the amphora stores explored in recent work by the archaeological team in Carine.<sup>13</sup>

The underwater finds from the 2011 season exemplify a typological continuity of the containers from the third century BC to the first century AD. They evince an intensive trade in Kotor Bay in this period, which was amplified in the following centuries, justifying the abundance of amphora finds from the area.

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## Streszczenie

### Podwodne znaleziska w Risan (Czarnogóra) w roku 2011

Od 2003 do 2011 roku na obszarze Zalewu Risańskiego, nad którym położone jest miasteczko Risan (gr. Rhizon, łac. Risinium), prowadzona była podwodna prospekcja archeologiczna. Prace badawcze odbywały się w kilku lokalizacjach. Efekty badań podwodnych z lat 2003–2010 opublikowane zostały przez kierownika tych prac, Rafała Karpińskiego (KARPIŃSKI 2010).

W niniejszym opracowaniu omówione zostało 17 zabytków podniesionych z dna Zatoki Risańskiej — z obszaru „R” (tzw. kotwicowisko) oraz obszaru „S” — w sezonie 2011. Z obszaru „R” pochodzą amfory grecko-italskie MGS VI (cztery egzemplarze), Lamboglia 2 (dwa egzemplarze), Dressel 6B (jeden egzemplarz) oraz dwie miseczki czarnopokostowane tzw. *black gloss pottery*, a z obszaru „S” dwie stopy amfor, trzy wylewy amfor (dwa egzemplarze grecko-italskiej MGS VI), pokrywka oraz ceramiczny korek. Jedna z amfor Lamboglia 2 pochodząca z kotwicowiska posiada stempel KANI oraz drugi, nieczytelny. Dla formy KANI znane są analogie z wraku Stanići-Čelina (Chorwacja).

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## **PERIPLUS PSEUDO-SKYLAKSA (24–25) JAKO ŹRÓDŁO WZMIANKUJĄCE RHIZON KILKA UWAG O CHARAKTERZE FILOLOGICZNYM<sup>1</sup>**

**Abstract:** Chapters 24–25 of the *Periplus* of Pseudo-Scylax are believed to be the earliest written source mentioning the ancient Illyrian city of Rhizon. The article presents which part of the text is actually preserved in the one surviving medieval manuscript of the *Periplus*, which has value as a source, and which is the effect of a conjectural emendation of different publishers. The article considers the value and probability of the said conjectures. Also included are some new readings of this text.

**Key words:** Rhizon, Adriatic coast, Pseudo-Scylax, *Periplus*, textual criticism

Ponieważ liczni autorzy piszący o polsko-czarnogórskich wykopaliskach w Risan nad Boką Kotorską często przywołują w swoich pracach tekst *Periplusu Pseudo-Skylaksa* (rozdziały 24 i 25) — w charakterze najstarszego źródła pisanej wzmiankującego to miejsce i wskazującego na istnienie w Rhizon emporium — i ponieważ czynią to bez świadomości licznych komplikacji w tradycji i restytucji tego fragmentu tekstu, celem niniejszego artykułu jest zaznajomienie czytelników-archeologów — zazwyczaj niekorzystających z aparatu krytycznego towarzyszącego wydaniom tekstu — z tym dość skomplikowanym pod względem filologicznym zagadnieniem.

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Anonimowe dzieło geograficzne, zachowane w rękopisach pod tytułem Σκύλακος Καρυανδέως Περίπλους τῆς οἰκουμένης (*Skylaksa z Karyandy Opłynięcie zamieszkałego świata*),<sup>2</sup> powołuje się w tymże tytule na autorytet żyjącego w VI w. p.n.e. greckiego podróżnika i pisarza Skylaksa,

<sup>1</sup> Niniejszy artykuł jest rozbudowaną wersją rozdziału poświęconego *Periplusowi Pseudo-Skylaksa*, stanowiącego część studium pt. „Rhizon/Risinum in Greek and Latin ancient and early medieval sources (until the tenth century)”, które ukaże się wkrótce w tomie *Rhizon / Risinum I*. Projekt został sfinansowany ze środków Narodowego Centrum Nauki, przyznanych na podstawie decyzji DEC-2015/19/B/HS3/02056. Autor dziękuje profesorowi Benedettowi Bravo za lekturę niniejszego tekstu i cenne uwagi.

<sup>2</sup> Rękopis paryski (zob. niżej) zawiera dwa tytuły dzieła: (s. 62) Σκύλακος Καρυανδέως Περίπλους τῆς οἰκουμένης

(*Skylaksa z Karyandy Opłynięcie zamieszkałego świata*) oraz (s. 63) Περίπλους τῆς θαλάσσης τῆς οἰκουμένης Εὐρώπης καὶ Ασίας καὶ Λιβύης καὶ ὅσα καὶ ὄποια εἴθη ἔκαστα, ἐξῆς καὶ χῶραι καὶ λιμένες καὶ ποταμοὶ καὶ ὅσα μήκη τῶν πλῶν, καὶ αἱ νῆσοι αἱ ἐπτὰ αἱ οἰκούμεναι, καθότι ἔκαστη κεῖται τῆς ἡπείρου (*Opłynięcie morza przy zamieszkałych brzegach Europy, Azji i Libii oraz ile jest ludów i jakie są poszczególne z nich, następnie także krainy, porty, rzeki oraz jak długie są odcinki do żeglugi, a także siedem zamieszkałych wysp, wedle tego, jak każda z nich leży przy kontynencie*).

pochodzącego z Karyandy (w Karii, pd.-zach. Anatolia). Wiadomości o Skylaksie, jego podróżach (po Indiach, Oceanie Indyjskim i Morzu Czerwonym) oraz dziełach znajdują się m.in. u Herodota (IV 44), w *Polityce* Arystotelesa (IV 14, 3 [1332 b]), u Strabona (XII 4, 8 [566 C.]; XIII 1, 4 [583 C.]; XIV 2, 20 [658 C.]) oraz w Księdze Suda (s.v. Σκύλαξ). Natomiast omawiany tu anonimowy *Periplus* jest opisem wybrzeży Morza Śródziemnego i Morza Czarnego (prezentowanym zgodnie z ruchem wskazówek zegara, poczynając i kończąc na Słupach Heraklesa), oddającym stan greckiej wiedzy o tych akwenach z IV w. p.n.e. Został on ostatecznie zredagowany — jak się uważa — krótko po roku 338 p.n.e. w Atenach. Dzieło jest zachowane w jednym rękopisie, posiadającym wartość źródłową, lecz prezentującym tekst w bardzo popsucej postaci (*Parisinus Suppl. Gr. 443*, p. 62–106 [XII–XIII w.]), oraz w dwóch jego kopiach z początków XVI wieku, pozbawionych wartości źródłowej dla rekonstrukcji pierwotnego tekstu (*Vaticanus Palatinus Graecus* 142, fol. 216r.–236r., i *Hervortianus = Monacensis Graecus* 566, fol. 34r.–49v.).<sup>3</sup>

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Rhizon (a właściwie Rhizus [gen. τοῦ Ριζοῦντος]) wzmiankowane jest w paryskim rękopisie Pseudo-Skylaksa jedynie w rozdziale 25 (26),<sup>4</sup> poświęconym ludowi Enchelejów oraz partii wschodniego wybrzeża Adriatyku pomiędzy Buthoe (dzis. Budva) a Epidamnos (dzis. Durrës), przy czym dość nieoczekiwane i bez informacji, czy mowa o mieście, czy o rzece (zob. niżej). Jednakże rozdział poprzedni *Periplusu* (24 [25]), poświęcony opisowi tegoż wybrzeża pomiędzy rzeką Naron (Neretwą) a Buthoe, jest — w wersji zachowanej w rękopisie — na tyle nieoczywisty i trudny do interpretacji (pojawia się tam m.in. wielkie jezioro oraz — kilkakrotnie — rzeka Arion, niepoświadczona przez żadne inne antyczne źródła pisane), że wydawcy tekstu oraz jego komentatorzy zaproponowali w rozdziale tym liczne koniektury, w tym takie, które toponim ten (w wersji Ριζούς [Rhizus] lub Ρίζων [Rhizon]) wprowadzają już tam.

W rękopisie paryskim interesujący nas ustęp (rozdziały 24 [25] i 25 [26]) ma postać następującą (w tekście wprowadzono numerację rozdziałów, zaznaczono podział na linie, a także zaznaczono i rozwiązano w nawiasach zwykłych skróty, zaś w aparacie krytycznym poprawiono oczywiste błędy pisarza; akcenty zaznaczono wedle obowiązującej normy, niekiedy wbrew rękopisowi, zastosowano również uwspółcześnioną interpunkcję).

[24. (25.)] Μανιοί. Ἀπὸ (δὲ) νέστων (ἐστὶν) | ó νάρ(ων) ποταμό(ζ)· ὁ δὲ εἰσπλ(ους) ὁ εἰς τ(ὸν) ἄρωνά<sup>a</sup> (ἐστιν) οὐ στενός· εἰσπλεῖ (δὲ) εἰς αὐτ(ὸν) καὶ τριήρης, (καὶ) πλοῖφ<sup>b</sup> εἰς τὸ ἄνω<sup>c</sup> ἐμπόριον, ἀπέ(χον) ἀπ(ὸ) θαλά(σσης) στάδ(ια) π'. οὗτοι (δέ) εἰσιν ἰλλυριοί | ἔθνο(ζ) μανιοί. λίμνη δ' ἐστὶ τὸ εἴσω τοῦ ἐμπορίου μεγ(ά)λη, | (καὶ) ἀνήκει ἡ λίμνη εἰς αὐγαριάτ(ας)<sup>d</sup>, ἔθνο(ζ) ἰλλυρικ(όν). (καὶ) νῆσος ἐν τῇ λίμνῃ ἔνεστι σταδ(ίων) ρκ'· ἡ (δὲ) νῆσος αὕτη (ἐστὶν) εὐλγέωργο(ζ) σφόδρα. ἀπ(ὸ) (δὲ) ταύτης τῆς λίμνης ὁ νάρ(ων) ποταμός | ἀπορρεῖ. καὶ ἀπ(ὸ) τοῦ νάρωνο(ζ) ἐπὶ τ(ὸν) ἀρίωνα ποταμ(ὸν) ἡμέρ(ας) | (ἐστὶ) πλοῦς· ἀπ(ὸ) (δὲ) τοῦ ἀρίωνο(ζ) ποταμοῦ πλ(οῦς) ἡμέρ(ας) ἥμισυ· | (καὶ) κάδμου καὶ

24. (25.) Maniowie. Za Nestami jest rzeka Naron, wejście zaś do Naronu nie jest wąskie: wpływa weń i triera, i statki handlowe, aż do górnego emporium, oddalonego od morza o 80 stadiów. Ci zaś to iliryjski lud Maniów. Jezioro zaś wielkie jest w głąb od emporium i jezioro to rozciąga się do Autariatów, ludu iliryjskiego. I wyspa znajduje się na tym jeziorze, 120-stadiowa. Ta zaś wyspa jest bardzo zdatna do uprawy roli. Z tego zaś jeziora wypływa rzeka Naron. A od Naronu do rzeki Arion jest dzień żeglugi, zaś od rzeki Arion żegluga pół dnia; i są tam kamienie<sup>5</sup> Kadmosa i Harmonii, i świątynia daleko od rzeki Arion. Zaś od rzeki Arion żegluga do Buthoe i emporium. 25. (26.) Enchelejowie. Enchelejowie są ludem

<sup>3</sup> Zob. ALTOMARE 2012, zwłaszcza s. 1 (i przyp. 3–5, tamże dalsza literatura) i 10.

<sup>4</sup> Podwójna numeracja rozdziałów wiąże się z różnym ich numerowaniem przez kolejnych wydawców.

<sup>5</sup> Kadmos i Harmonia zostali zamienieni przez Zeusa w węże, te zaś — według jednej z wersji mitu — uległy przemianie w kamienie (por. Nonnos, *Dionysiaca*, XLIV 115–118).

ἀρμονί(ας)<sup>e</sup> οἱ λίθοι εἰσὶν ἐνταῦθα<sup>f</sup>, (καὶ) ἵερ(ὸν) | ἀποθ(εν) τοῦ ἀρίωνο(ζ) ποτ(α)μ(οῦ). ἀπ(ὸ) (δὲ) τοῦ ἀρίωνο(ζ) ποτ(α)μ(οῦ) εἰς βουθόνην ὁ πλοῦς (καὶ) τὸ ἐμπόρι(ον). [25. (26.)] Ἐγχελεῖς. Ἰλλυρι(ῶν) | ἔθνο(ζ) εἰσὶν οἱ ἐγχελεῖς, ἔχόμ(εν)οι τοῦ ριζοῦντο(ζ). ἐκ βουθό(ης) | (δὲ) εἰς ἐπίδαμν(ον), πόλιν ἐλληνίδα, πλοῦς ἡμέρας (καὶ) νυκ(τός), | ὁδὸς (δὲ) τρι(ῶν) ἡμερ(ῶν).

<sup>a</sup> νάρωνά | <sup>b</sup> πλοῖα | <sup>c</sup> ἄνω | <sup>d</sup> αὐταριάτ(ας) | <sup>e</sup> ἀρμονί(ας) | <sup>f</sup> ἐνταῦθα

Iliryjczyków, sąsiadującym z **Rhizus**. Z Buthoe zaś do Epidamnos, miasta greckiego, żeglugi dzień i noc, drogi zaś trzy dni.<sup>6</sup>

Tekst w takiej postaci przyjęli w swoich wydaniach Rudolf Heinrich Klausen<sup>7</sup> i Patrick Counillon.<sup>8</sup>

Karl Müller,<sup>9</sup> wychodząc od zachowanego w rozdziale 25 (26) toponimu Rhizus (G. sing. τοῦ Ῥιζοῦντος), poprawił w kilku miejscach tekst ostatnich dwóch zdań rozdziału 24 (25) — w celu, aby tekst był bardziej spójny i zrozumiały oraz zgodny z rzeczywistością topograficzną (zob. niżej, komentarz Müllera, s. 110–111). I tak:

- po słowach ἀπὸ δὲ τοῦ Ἀρίωνος ποταμοῦ („zaś od rzeki Arion”) dodał słowa ἐπὶ τὸν Ῥιζοῦντα ποταμόν („do rzeki Rhizus”);
- dwukrotnie zastąpił słowa τοῦ Ἀρίωνος ποταμοῦ („rzeki Arion”) przez τοῦ Ῥιζοῦντος ποταμοῦ („rzeki Rhizus”);
- dodał słowo οὐκ („nie”) pomiędzy słowami ἱερόν („świątynia”) a ἀποθεν („daleko”);
- oznaczył ubytek w tekście pomiędzy słowami ὁ πλοῦς („żegluga”) a καὶ τὸ ἐμπόριον („i emporium”).

Koniekturowane zdania w wydaniu Müllera mają więc postać następującą (koniektury zaznaczono czcionką rozstrzeloną, w nawiasie ostrym umieszczając dodatki wydawcy do tekstu, również w przekładzie):<sup>10</sup>

24. (25.) (...) Καὶ ἀπὸ τοῦ Νάρωνος ἐπὶ τὸν Ἀρίωνα ποταμὸν ἡμέρας ἐστὶ πλοῦς· ἀπὸ δὲ τοῦ Ἀρίωνος ποταμοῦ (ἐπὶ τὸν Ῥιζοῦντα ποταμὸν) πλοῦς ἡμέρας ἡμισυ· καὶ Κάδμου καὶ Ἀρμονίας οἱ λίθοι εἰσὶν ἐνταῦθα, καὶ ἱερὸν <οὐκ> ἀποθεν τοῦ Ῥιζοῦντος ποταμοῦ. Ἀπὸ δὲ τοῦ Ῥιζοῦντος ποταμοῦ εἰς Βουθόνην ὁ πλοῦς (...) καὶ τὸ ἐμπόριον.

24. (25.) (...) A od Naronu do rzeki Arion jest dzień żeglugi, zaś od rzeki Arion <do rzeki Rhizus> żeglugi pół dnia; i są tam kamienie<sup>11</sup> Kadmosa i Harmonii, i świątynia <nie>daleko od rzeki Rhizus. Zaś od rzeki Rhizus żegluga do Buthoe (...) i emporium.

W ostatnim zdaniu rozdziału 24 (25) Müller zaznaczył jedynie ubytek tekstu, nie proponując jego uzupełnienia. Inaczej sytuacja wygląda jednak w towarzyszącym wydaniu przekładzie łacińskim, sporządzonym przez samego wydawcę. Tutaj miejsce to jest uzupełnione, a zdanie to ma postać:

<sup>6</sup> Wszystkie przekłady na język polski sporządził na użytek tego artykułu jego autor. Polski przekład *Periplusu* (na podstawie wydania Müllera), zob. GŁOMBIOWSKI 2005.

<sup>7</sup> KLAUSEN 1831. Komentarz Klausena, zob. niżej, s. 110–111 (cytowany w komentarzu Müllera).

<sup>8</sup> COUNILLON 2006, s. 25–26.

<sup>9</sup> MÜLLER 1855, s. 30–32.

<sup>10</sup> Teksty cytowanych wydań podano (tu i niżej) z użyciem stosowanych współcześnie znaków edytorskich, niekiedy odmiennych od stosowanych przez ich wydawców.

<sup>11</sup> Müller słowo λίθοι tłumaczy *rupes* („skały”), tak też GŁOMBIOWSKI 2005, s. 41.

A Rhizunte autem fluvio usque ad Buthoam navi-gatio est *(diei dimidiati, sicuti etiam ad Rhizuntem)* emporium.

Zaś od rzeki Rhizus do Buthoe żegluga jest *(pół-dniowa, tak jak i do Rhizus)* emporium.

W rozdziale 25 (26) Müller zachował tekst podawany przez rękopis bez zmian. Poniżej pozwalamy sobie przytoczyć w całości jego komentarz na temat przedstawionych wyżej koniektur w rozdziale 24 (25):<sup>12</sup>

ἐπὶ τὸν Πίζοῦντα ποτ. ] Haec supplevi. Deinde bis scripsi Πίζοῦντος pro Ἀρίωνος. Ne praeferrem formam Πίζωνος vel Πίζονος (utramque licebat), quae ad corruptum illud Ἀρίωνος proprius accedit, im-pediri mihi videbar verbis § 25. Verba ἀπωθεν τ. Πίζοῦντος ex seqq. ἀπὸ δὲ τοῦ Πίζ. nata videri possint. Sin genuina sunt, scribendum esse videtur οὐκ ἀπωθεν. In postremis denique lacunam notavi. Fuisse videtur: εἰς Βουθόνην ὁ πλοῦς ἡμέρας ἥμισυ, δοσὶς καὶ εἰς τὸ ἐμπόριον. Nam tale quid situs locorum requirit. Fabricius ita locum adornavit: ἀπὸ δὲ τοῦ Ἀρίωνος ποταμοῦ εἰς Βουθόνην καὶ τὸ ἐμπόριον ὁ πλοῦς ἡμέρας ἥμισυ· καὶ Κάδμου... ιερὸν, ἀπωθεν τοῦ Ἀρίωνος ποταμοῦ. Ἀπὸ δὲ τοῦ Ἀρίωνος ποταμοῦ Ἰλλυριῶν ἔθνος εἰσὶν οἱ Ἐγχελεῖς κτλ. Quae quum nihil lucis afferentes mutationes sint, silentio praeterire licet. Sed de Clausenio dicam, qui totum locum talem, qualem codex exhibit, tueri instituit: „Rupibus Cadmi et Harmoniae, inquit, vicina est Buthoa; itaque quum modo rupes illas ut terminum navigationis posuerit, altero iam loco iis vicino eundem terminum designat. Rupium mentio peregrinatoris, Buthoae mentio mercatoris gratia facta est. Posterior navigationis terminus eodem modo, quo hoc loco (non per μέχρι c. gen., sed per καὶ ἐνταῦθα vel κατὰ δὲ ταῦτα) significatur § 110. Falsum est, quod numerum post Bouθόνην ὁ πλοῦς excidisse contendunt interpres, quum in mentione rupium dictum sit, quantum haec regio distet ab Arione. Eiusdem igitur regionis est emporium, quod post Buthoam commemoratur, neque dubium est, quin hoc sit emporium Rhizon, situm ad amnem Rhizuntem in intimo sinu, cui adiacebat Buthoa. Solet vero Scylax omittere emporiorum nomina (§ 2 et 24). Amnem et oppidum prope Buthoam memorat Stephanus. Quod per amnem Encheleorum regio, per Buthoam terminus navigationis designatur (§ 25), bene se habet, quoniam Encheleorum sedes in media terra, Buthoa ad mare sita fuerit”. Haec Clausenius, haud feliciter. Nam mirum commentum est naviga-

ἐπὶ τὸν Πίζοῦντα ποτ. ] uzupełniłem. Następnie dwa razy napisałem Πίζοῦντος w miejsce Ἀρίωνος. W tym, bym przedkładał tu formę Πίζωνος lub Πίζονος (obie dopuszczalne), która jest bliższa owemu zepsutemu Ἀρίωνος, wydawały się przeszkać słowa § 25. Słowa ἀπωθεν τ. Πίζοῦντος [„daleko od Rhizus”] mogły powstać pod wpływem następujących słów § 25. Słowa ἀπωθεν τ. Πίζοῦντος [„zaś od Rhizus”]. Jeśli jednak są oryginalne, należałyby napisać οὐκ ἀπωθεν [„niedaleko”]. Na końcu wreszcie zanaczyłem ląkunę. Najprawdopodobniej było: εἰς Βουθόνην ὁ πλοῦς ἡμέρας ἥμισυ, δοσὶς καὶ εἰς τὸ ἐμπόριον [„do Buthoe żegluga półdniowa, tak jak i do emporium”]. Czegoś takiego wymaga bowiem sytuacja przestrzenna. Fabricius tak przedstawił to miejsce: ἀπὸ δὲ τοῦ Ἀρίωνος ποταμοῦ εἰς Βουθόνην καὶ τὸ ἐμπόριον ὁ πλοῦς ἡμέρας ἥμισυ· καὶ Κάδμου... ιερὸν, ἀπωθεν τοῦ Ἀρίωνος ποταμοῦ. Ἀπὸ δὲ τοῦ Ἀρίωνος ποταμοῦ Ἰλλυριῶν ἔθνος εἰσὶν οἱ Ἐγχελεῖς κτλ. [„zaś od rzeki Arion do Buthoe i emporium żeglugi pół dnia; i Kadmosa... świątynia, daleko od rzeki Arion. Zaś poczynając od rzeki Arion znajduje się lud Iliryjczyków Enchelejowie itd.”]. Wolno pominąć milczeniem, że zmiany te nie wnoszą tu żadnego światła. Wypowiem się jednak na temat Klausena, który całe to miejsce postanowił zachować w taki postaci, jaką daje kodeks: „Ze skałami Kadmosa i Harmonii — powiada — sąsiaduje Buthoe; a więc skoro dopiero co umieścił te skały jako kres żeglugi, tutaj wyznacza ten sam kres za pomocą innego miejsca, sąsiadującego z nimi. Wzmianka o skałach uczyniona została dla podróżnego, wzmianka o Buthoe — dla kupca. Ten drugi kres żeglugi oznaczony jest w ten sam sposób co tutaj (nie przez μέχρι z genetiwem, lecz przez καὶ ἐνταῦθα lub κατὰ δὲ ταῦτα) w § 110. Niesłusznie komentatorzy twierdzą, że po Bouθόνην ὁ πλοῦς wypadła liczba, ponieważ przy okazji wzmianki o skałach zostało powiedziane, o ile ta okolica odległa jest od Arionu. Emporium, które wymienione jest po Buthoe, przy-

<sup>12</sup> MÜLLER 1855, s. 30–31.

tionem ab Arione ad Rhizuntem fl. semel in peregrinatorum, deinde iterum in mercatorum usum expressam esse; magis miraris Rhizuntem fluv., quum cardo sit horum locorum, ne nominari quidem, adeo ut ex § 25 demum coniectura colligendum sit, fluvio illi ad quem emporium, et infra quem Buthoa urbs sita fuerint, nomen fuisse Rhizunti; maximum vero est quod ad situm locorum non attendens Clausenius falsissima Scylaci affingit. Res ita habet: Ab Arione ad ostium Rhizuntis stadia sunt circiter 300, id est πλοῦς ἡμέρας ἥμισυ. Deinde ab ostio Rhizuntis iuxta oram maritimam usque ad Buthoam (*Butuam* sec. Plin.; hodie *Budua*) stadia sunt ad 200. Totidem vero stadia sunt si per ostium fluminis ad emporium Rhizuntem (nunc *Risano*) naviges. Has distantias item diei dimidiati navigatione Scylax notavit. — Rhizon vel Rhizus non est sane *fluvius*, sed ita vocatur tum a Scylace tum a Polybio II, 11 et Philone (ap. Steph. Byz. v. Βουθόνη) sinus perangustus longeque et multifariam in terram penetrans (hodie *golfe de Cattaro*). Ostium adeo est coarctatum, ut ipse sinus lacus speciem prae se ferat. Saxa quae introitum sic quasi claudebant, Cadmi et Harmoniae dicta esse suspicor. (...)

należy więc do tego regionu, i nie ulega wątpliwości, że jest to emporium Rhizon, położone nad rzeką Rhizus w głębokiej zatoce, przy której leżała Buthoe. Skylaks zaś ma zwyczaj pomijać nazwy emporów (§ 2 i 24). Rzekę i oppidum w pobliżu Buthoe wspomina Stefan [z Bizancjum]. To, że za pomocą rzeki oznaczona jest kraina Enchelejów, a za sprawą Buthoe — kres żeglugi (§ 25), dobrze się tłumaczy, ponieważ siedziby Enchelejów położone były w głębi lądu, Buthoe zaś nad morzem". Tyle Klausen, lecz niesłusznie. Dziwne jest bowiem wyjaśnienie, że żegluga od Arionu do rzeki Rhizus raz została przedstawiona na użytek podróżnych, następnie zaś ponownie na użytek kupców. Jeszcze dziwniejsze, że rzeka Rhizus, która wszak stanowi oś tych okolic, nie jest nawet wymieniona, co więcej, że należy się domyślać na podstawie § 25, iż rzeka, nad którą leży emporium, a poniżej [= na południe od] niej miasto Buthoe, nosi nazwę Rhizus. Najbardziej jednak dziwi, że nie zważając na sytuację geograficzną Klausen przypisuje przekłamania Skylaksowi. Sprawa ma się tak: od Arionu do ujścia Rhizus jest około 300 stadiów, to jest πλοῦς ἡμέρας ἥμισυ [,pół dnia żeglugi"]. Następnie od ujścia Rhizus wzdłuż wybrzeża morskiego aż do Buthoe (*Butua* wg Pliniusza; dziś *Budua*) jest około 200 stadiów. Tyle samo stadiów jest, jeśli popłynie się przez ujście rzeki do emporium Rhizus (dziś *Risano*). Te odległości połowy dnia żeglugi oznaczył Skylaks. — Rhizon lub Rhizus nie jest oczywiście rzeką, lecz w ten sposób nazwana została, zarówno przez Skylaksa, jak i przez Polibiusza (II 11) oraz Filona (u Stefana z Bizancjum, pod hasłem Βουθόνη), niezwykle wąska zatoka, głęboko i w wielu miejscach wcinająca się w ląd (dziś *golfe de Cattaro*). Jej ujście jest do tego stopnia zwięzłe, że sama zatoka sprawia wrażenie jeziora. Przypuszczam, że skały, które w ten sposób niejako zamknęły wejście do niej, nazwane zostały skałami Kadmosa i Harmonii. (...)

W drugim, poprawionym, swoim wydaniu *Periplusu* B. Fabricius<sup>13</sup> (pseudonim Heinricha Theodora Dittricha) przyjął w rozdziale 24 (mającym w jego wydaniu numer 25) większość koniektur Karla Müllera, z następującymi wyjątkami:

- z uzupełnienia Müllera w ostatnim zdaniu (u Müllera w przekładzie łacińskim) *diei dimidiati, sicuti etiam ad Rhizuntem* („półniona, tak jak i do Rhizus”) przyjął do swojego wydania jedynie pierwszą część (ἡμέρας ἥμισυ = *diei dimidiati*, „półniona”), pomijając to, co po niej następuje;

<sup>13</sup> FABRICIUS 1878, s. 12. Nie omawiamy tu pierwszego wydania Fabriciusa (FABRICIUS 1848), jako że wydawca w drugim wydaniu wycofał się z większości swoich

koniektur z pierwszego wydania (zob. wyżej, s. 110, komentarz Müllera), przyjmując liczne propozycje z wydania Müllera.

- wprowadził nową koniekturę, czytając zamiast καὶ τὸ ἐμπόριον („i emporium”) na końcu tego rozdziału εἶτα („następnie”) jako początkowe słowo rozdziału następnego (w jego wydaniu 26);
- usunął nagłówek Ἐγχελεῖς („Enchelejowie”) na początku rozdziału 25 (26).

Jego tekst ma zatem w tym miejscu postać następującą (koniektury Müllera i Fabriciusa zaznaczono jak wyżej).

24. (25.) (...) Καὶ ἀπὸ τοῦ Νάρωνος ἐπὶ τὸν Ἀρίωνα ποταμὸν ἡμέρας ἔστι πλοῦς: ἀπὸ δὲ τοῦ Ἀρίωνος ποταμοῦ (ἐπὶ τὸν Πιζοῦντα ποταμὸν) πλοῦς ἡμέρας ἥμισυ· καὶ Κάδμου καὶ Ἀρμονίας οἱ λίθοι εἰσὶν ἐνταῦθα, καὶ ἵερὸν (οὐκ) ἄποθεν τοῦ Πιζοῦντος ποταμοῦ. Ἀπὸ δὲ τοῦ Πιζοῦντος ποταμοῦ εἰς Βουθόην ὁ πλοῦς (ἡμέρας ἥμισυ).

25. (26.) Εἶτα Ἰλλυριῶν ἔθνος εἰσὶν οἱ Ἐγχελεῖς, ἐχόμενοι τοῦ Πιζοῦντος. (...)

24. (25.) (...) A od Naronu do rzeki Arion jest dzień żeglugi, zaś od rzeki Arion (do rzeki Rhizus) żeglugi pół dnia; i są tam kamienie Kadmosa i Harmonii, i świątynia (nie)daleko rzeki Rhizus. Zaś od rzeki Rhizus żegluga do Buthoe (północna).

25. (26.) Następnie są Enchelejowie, lud Iliryjczyków, siedzący z Rhizus. (...)

Dość odważne koniektury Müllera ośmieniły kolejnych uczonych, by przedstawić coraz to nowe pomysły restytucji i interpretacji rozdziału 24 (25), wychodząc od pewnych założeń o charakterze pozatekstowym, a związanych z topografią adriatyckiego wybrzeża. I tak równo sto lat później Mate Suić<sup>14</sup> — opierając się w swoim wydaniu na kodeksie watykańskim, co zresztą nie ma akurat większego znaczenia w przypadku interesujących nas rozdziałów — uznał, że znaczna część rozdziału 24, z wyjątkiem pierwszego i ostatniego zdania oraz dwóch słów w środku, stanowi późniejsze glosy (noty marginalne), któreomyłkowo zostały wprowadzone przez kolejnych kopistów do tekstu głównego. Do takiego wniosku doprowadziła go interpretacja wzmiarkowanego w *Periplusie* jeziora jako Jeziora Szkoderskiego (położonego znacznie bardziej na południe od opisywanych tu obszarów).

Wychodząc od takiego założenia poczynić musiał następujące koniektury:

- w obrębie drugiej z postulowanych przez siebie glos zastąpił w kilku miejscach formy ὁ Νάρων ποταμός („rzeka Naron”) oraz ἐπὶ τὸν Ἀρίωνα ποταμόν („do rzeki Arion”), ἀπὸ δὲ τοῦ Ἀρίωνος ποταμοῦ („zaś od rzeki Arion”) i ἄποθεν τοῦ Ἀρίωνος ποταμοῦ („daleko od rzeki Arion”) odpowiednimi formami toponimu ὁ Δρίλων ποταμός („rzeka Drilon”) — dzis. Drin, przepływający w pobliżu Jeziora Szkoderskiego);
- w obrębie tejże glosy zastąpił ἡμέρας ἔστι πλοῦς („jest dzień żeglugi”) przez ἡμερῶν (...) ἔστι πλοῦς („jest (...) dni żeglugi”), z zaznaczeniem ubytku tekstu pomiędzy ἡμερῶν a ἔστι πλοῦς;
- w ostatnim zdaniu rozdziału (będącym w swej pierwszej części — wedle jego hipotezy — już nie glosą, lecz tekstem oryginalnym) zastąpił wyrażenie ἀπὸ δὲ τοῦ Ἀρίωνος ποταμοῦ („zaś od rzeki Arion”) przez ἀπὸ δὲ τοῦ Νάρωνος ποταμοῦ („zaś od rzeki Naron”);
- w tymże ostatnim zdaniu pomiędzy słowa ὁ πλοῦς („żegluga”) oraz ἐμπόριον („emporium”) wprowadził określenie ἡμερῶν δύο („dwudniowa”) oraz zmienił istniejące tam w kodeksie καὶ τὸ („i”) na τὸ κάτω („dolne”), traktując jednak te słowa znowu jako glosę, przez analogię do występującego wyżej — w obrębie wcześniejszej glosy — τὸ ἄνω ἐμπόριον („górne emporium”).

<sup>14</sup> SUIĆ 1955, s. 172–175.

Tekst rozdziału 24 z koniekturami Suicia ma więc następującą postać (koniektury zaznaczono pisemmem rozstrzelonym, uzupełnienia wydawcy umieszczając w nawiasach ostrzych, zaś postulowane przezeń glosy — w nawiasach klamrowych, również w przekładzie):

24. (25.) Μανιοί. Ἀπὸ δὲ Νέστων ἐστὶν ὁ Νάρων ποταμός: {ὁ δὲ εἴσπλους ὁ εἰς τὸν Νάρωνά ἐστιν οὐ στενός· εἰσπλεῖ δὲ εἰς αὐτὸν καὶ τριήρης, καὶ πλοῖα εἰς τὸ ἄνω ἐμπόριον, ἀπέχον ἀπὸ θαλάσσης στάδια π'. Οὗτοι δέ εἰσιν Ἰλλυριοί} ἔθνος Μανιοί. {Λίμνη δ' ἐστὶ τὸ εἶσω τοῦ ἐμπορίου μεγάλη, καὶ ἀνήκει ἡ λίμνη εἰς Αὐταριάτας, ἔθνος Ἰλλυρικόν. Καὶ νῆσος ἐν τῇ λίμνῃ ἔνεστι σταδίων ρκ'· ἡ δὲ νῆσος αὕτη ἐστὶν εὐγέωργος σφόδρα. Απὸ δὲ ταύτης τῆς λίμνης ὁ Δρίλων ποταμὸς ἀπορρεῖ. Καὶ ἀπὸ τοῦ Νάρωνος ἐπὶ τὸν Δρίλωνα ποταμὸν ἡμερῶν (...) ἐστὶ πλοῦς· ἀπὸ δὲ τοῦ Δρίλωνος ποταμοῦ πλοῦς ἡμέρας ἥμισυ· καὶ Κάδμους καὶ Αρμονίας οἱ λίθοι εἰσὶν ἐνταῦθα, καὶ ιερὸν ἄπωθεν τοῦ Δρίλωνος ποταμοῦ.} Απὸ δὲ τοῦ Νάρωνος ποταμοῦ εἰς Βουθόνην ὁ πλοῦς {ἡμερῶν δύο} {τὸ κάτω ἐμπόριον}.

24. (25.) Maniowie. Za Nestami jest rzeka Naron, {Wejście zaś do Naronu nie jest wąskie: wpływa weń i triera, i statki handlowe, aż do górnego emporium, oddalonego od morza o 80 stadiów. Ci zaś to Iliowie} lud Maniów. {Jezioro zaś wielkie jest w głąb od emporium i jezioro to rozciąga się do Autariatów, ludu iliryjskiego. I wyspa znajduje się na tym jeziorze, 120-stadiowa. Ta zaś wyspa jest bardzo zdatna do uprawy roli. Z tego zaś jeziora wypływa rzeka Drilon. A od Naronu do rzeki Drilon jest (...) dni żeglugi, zaś od rzeki Drilon żeglugi pół dnia; i są tam kamienie Kadmosa i Harmonii, i świątynia daleko od rzeki Drilon.} Zaś od rzeki Naron żeglugi do Buthoe (dwudniowa) {dolne emporium}.

W rozdziale 25 (26) Suić zachował tekst podawany przez rękopis bez zmian.

Z kolei Jovan Martinović<sup>15</sup> — zestawiając ze sobą i analizując propozycje Müllera i Suicia — zaproponował jeszcze inną lekturę dwóch interesujących nas rozdziałów, tym razem wychodząc od założenia, że opisane w rozdziale 24 (25) jezioro może być tylko Boką Kotorską.<sup>16</sup> Jego liczne propozycje nowej lektury i interpretacji tekstu dają się streścić następująco:

- nagłówek i pierwsze dwa zdania rozdziału 24 (25), od Μανιοί („Maniowie”) do Ἰλλυριοί ἔθνος Μανιοί („iliryjski lud Maniów”), są glosą do rozdziału poprzedniego, który opisuje część adriatyckiego wybrzeża od rzeki Nestos (dzisiejsza lokalizacja niejasna, być może Cetina) do Melite (dzis. wyspa Mljet), wprowadzonąomyłkowo do tekstu tego rozdziału. Za taką hipotezą Martinović podaje argument topograficzny, jako że opisane tu ujście rzeki Naron leży w części wybrzeża znajdującej się na północ od wyspy Mljet;
- kolejne trzy zdania, od Λίμνη δ' ἐστί („Jezioro zaś jest”) do ποταμὸς ἀπορρεῖ („wypływa rzeka”) — traktujące na temat jeziora, czyli, jak zakłada Martinović, Boki Kotorskiej — są również glosą, tym razem już do tego rozdziału, wprowadzoną wtórnie do jego głównego tekstu. W obrębie tej glosy wydawca dodaje słowo κάτω („dolne”) przed ἐμπορίου („emporium”, G. sing.) oraz zmienia nazwę rzeki z Νάρων („Naron”) na Ρίζων („Rhizon”) — zwróćmy uwagę, że nie Ρίζούς [„Rhizus”]);
- dalej, w pierwszej części zdania następnego, należącego już (jak sądzi Martinović) do oryginalnego tekstu rozdziału 24 (25), zmienia on ἀπὸ τοῦ Νάρωνος („od Naronu”) na ἀπὸ τῆς Μελίτης („od Melite”) — czyli od miejsca, gdzie skończył się opis w rozdziale poprzednim) oraz ἐπὶ τὸν Ἀρίωνα ποταμόν („do rzeki Arion”) na ἐπὶ τὸν Ρίζωνα ποταμόν („do rzeki Rhizon”);

<sup>15</sup> MARTINOVIC 1966, s. 114–115.

<sup>16</sup> Z francuskiego streszczenia (MARTINOVIC 1966, s. 116): „(...) le seul endroit qui du point de vue géomorpho-

logique pourrait porter le nom de lac est la baie de Kotor (...”).

- w dalszej części tego rozdziału zmienia ἀπὸ δὲ τοῦ Ἀρίωνος ποταμοῦ („zaś od rzeki Arion”) na ἀπὸ δὲ τοῦ Πίζωνος ποταμοῦ („zaś od rzeki Rhizon”); wyrażenie to ma kontynuację dopiero znacznie dalej, w słowach εἰς Βουθόνην („do Buthoe”), bowiem: 1) zdanie na temat Kadmosa i Harmonii oraz świątyni Martinović uważa za glosę do rozdziału następnego, wprowadzonąomyłkowo do tekstu tego rozdziału, przy czym zmienia w niej ἄπωθεν τοῦ Ἀρίωνος ποταμοῦ („daleko od rzeki Arion”) na ἄπωθεν τοῦ Πίζωνος ποταμοῦ („daleko od rzeki Rhizon”); 2) wydawca wyrzuca z tekstu powtarzające się dalej słowa ἀπὸ δὲ τοῦ Ἀρίωνος ποταμοῦ („zaś od rzeki Arion”);
- po słowach εἰς Βουθόνην („do Buthoe”) wydawca wyrzuca słowa ὁ πλοῦς („żegluga”), zaś przed słowem ἐμπόριον („emporium”) dodaje (ponownie) określenie κάτω („dolne”);
- w rozdziale 25 (26) wydawca zmienia konsekwentnie zachowaną w rękopisach formę τοῦ Πίζοῦντος („od Rhizus”) na τοῦ Πίζωνος („od Rhizon”).

Tekst dwóch interesujących nas rozdziałów w wersji zaproponowanej przez Martinovicia ma postać następującą (glosy i koniektury zaznaczone jw., inne słowa wyrzucone przez wydawcę z tekstu umieszczone również w nawiasach klamrowych, także w przekładzie).

24. (25.) {Μανιοί. Ἄπὸ δὲ Νέστων ἔστιν ὁ Νάρων ποταμός· ὁ δὲ εἰσπλους ὁ εἰς τὸν Νάρωνα ἔστιν οὐ στενός· εἰσπλεῖ δὲ εἰς αὐτὸν καὶ τριήρης, καὶ πλοῖα εἰς τὸ ἄνω ἐμπόριον, ἀπέχον ἀπὸ θαλάσσης στάδια π’. Οὗτοι δέ εἰσιν Ἰλλυριοὶ ἔθνος Μανιοί.} {Λίμνη δ’ ἔστι τὸ εἶσω τοῦ *(κάτω)* ἐμπορίου μεγάλη, καὶ ἀνήκει ἡ λίμνη εἰς Αὐταριάτας, ἔθνος Ιλλυρικόν. Καὶ τῆς λίμνης ἐν τῇ λίμνῃ ἔνεστι σταδίων ρκ’· ἡ δὲ νῆσος αὕτη ἔστιν εὐγέωργος σφόδρα. Ἄπὸ δὲ ταύτης τῆς λίμνης ὁ Πίζων ποταμός ἀπορρεῖ.} Καὶ ἀπὸ τῆς Μελίτης ἐπὶ τὸν Πίζωνα ποταμὸν ἡμέρας ἔστι πλοῦς· ἀπὸ δὲ τοῦ Πίζωνος ποταμοῦ πλοῦς ἡμέρας ἥμισυ {καὶ Κάδμου καὶ Ἀρμονίας οἱ λίθοι εἰσὶν ἐνταῦθα, καὶ ιερὸν ἄπωθεν τοῦ Πίζωνος ποταμοῦ} {Ἄπὸ δὲ τοῦ Ἀρίωνος ποταμοῦ} εἰς Βουθόνην {ὁ πλοῦς} καὶ τὸ *(κάτω)* ἐμπόριον.

25. (26.) Ἐγχελεῖς. Ιλλυριῶν ἔθνος εἰσὶν οἱ Ἐγχελεῖς, ἐχόμενοι τοῦ Πίζωνος. Ἐκ Βουθόνης δὲ εἰς Ἐπίδαμνον, πόλιν Ἐλληνίδα, πλοῦς ἡμέρας καὶ νυκτός, ὁδὸς δὲ τριῶν ἡμερῶν.

24. (25.) {Maniowie. Za Nestami jest rzeka Naron, wejście zaś do Naronu nie jest wąskie: wpływa weń i triera, i statki handlowe, aż do górnego emporium, oddalonego od morza o 80 stadiów. Ci zaś to iliryjski lud Maniów.} {Jezioro zaś wielkie jest w głębi od *(dolnego)* emporium i jezioro to rozciąga się do Autariatów, ludu iliryjskiego. I wyspa znajduje się na tym jeziorze, 120-stadiowa. Ta zaś wyspa jest bardzo zdatna do uprawy roli. Z tego zaś jeziora wypływa rzeka Rhizon.} A od Melite do rzeki Rhizon jest dzień żeglugi, zaś od rzeki Rhizon żeglugi pół dnia {i są tam kamienie Kadmosa i Harmonii, i świątynia daleko od rzeki Rhizon} {Zaś od rzeki Arion} do Buthoe {żegluga} i *(dolnego)* emporium.

25. (26.) Enchelejowie. Enchelejowie są ludem Iliryjczyków, siedzącym z Rhizon. Z Buthoe zaś do Epidamnos, miasta greckiego, żeglugi dzień i noc, drogi zaś trzy dni.

Najnowszy wydawca tekstu Pseudo-Skylaksa, Graham Shipley,<sup>17</sup> nie rezygnując z pewnych koniektur, przedstawia interesujące nas rozdziały w postaci znacznie już bliższej wersji zachowanej w rękopisach. I tak:

- wyrzuca z tekstu nagłówki obydwu rozdziałów, Μανιοί („Maniowie”, w rozdziale 24 [25]) oraz Ἐγχελεῖς („Enchelejowie”, w rozdziale 25 [26]);
- zmienia w drugim zdaniu rozdziału 24 (25) Ἰλλυριοὶ ἔθνος Μανιοί na Ἰλλυρίων ἔθνος Μανιοί (jest to jedynie zmiana przypadka — z N. plur. na G. plur — niepowodująca żadnej zmiany w przekładzie);

<sup>17</sup> SHIPLEY 2011, s. 28 (tekst grecki), 59 (tekst angielski), 108–109 (komentarz).

oraz, ze spraw ważniejszych:

- zachowuje (częściowo) koniekturę Müllera, polegającą na wprowadzeniu po słowach ἀπὸ δὲ τοῦ Ἀρίωνος ποταμοῦ („zaś od rzeki Arion”) słów ἐπὶ τὸν Πίζοῦντα ποταμόν („do rzeki Rhizus”), realizując ją jednak w nieco inny sposób, a mianowicie wprowadzając jedynie ἐπὶ τὸν Πίζοῦντα („do Rhizus”) po słowach ἀπὸ δὲ τοῦ Ἀρίωνος („od Arion”), uznawszy, że zachowane w rękopisie ποταμοῦ (G. sing.) jest zepsutą formą ποταμόν (Acc. sg.);
- zachowuje w następnych zdaniach zaproponowaną przez Müllera dwukrotną zamianę τοῦ Ἀρίωνος („Arion”, G.) na τὸν Πίζοῦντος („Rhizus”, G.);
- rezygnuje z kolejnych koniektur Müllera, zachowując ἄπωθεν („daleko”) oraz nie sugerując braku tekstu pomiędzy ὁ πλοῦς („żegluga”) a καὶ τὸ ἐμπόριον („i emporium”).

Tekst ma więc postać następującą (koniektury zaznaczone jw., słowa wyrzucone przez wydawcę z tekstu umieszczone w nawiasach klamrowych, również w przekładzie).

24. (25.) {Mavioi.} Απὸ δὲ Νέστων ἔστιν ὁ Νάρων ποταμός· ὁ δὲ εἰσπλους ὁ εἰς τὸν Νάρωνα ἔστιν οὐ στενός· εἰσπλεῖ δὲ εἰς αὐτὸν καὶ τριήρης, καὶ πλοῖα εἰς τὸ ἄνω ἐμπόριον, ἀπέχον ἀπὸ θαλάσσης στάδια π'. Οὗτοι δέ εἰσιν Ἰλλυρίων ἔθνος Μανιοί. Λίμνη δ' ἔστι τὸ εἴσω τοῦ ἐμπορίου μεγάλη, καὶ ἀνήκει ἡ λίμνη εἰς Αὐταριάτας, ἔθνος Ἰλλυρικόν. Καὶ νῆσος ἐν τῇ λίμνῃ ἔνεστι σταδίων ρκ'· ἡ δὲ νῆσος αὕτη ἔστιν εὐγέωργος σφόδρα. Απὸ δὲ ταύτης τῆς λίμνης ὁ Νάρων ποταμὸς ἀπορρεῖ. Καὶ ἀπὸ τοῦ Νάρωνος ἐπὶ τὸν Ἀρίωνα ποταμὸν ἡμέρας ἔστι πλοῦς· ἀπὸ δὲ τοῦ Ἀρίωνος ἐπὶ τὸν Πίζοῦντα ποταμὸν πλοῦς ἡμέρας ἡμισυ· καὶ Κάδμου καὶ Ἀρμονίας οἱ λίθοι εἰσὶν ἐνταῦθα, καὶ ιερὸν ἄπωθεν τοῦ Πίζοῦντος ποταμοῦ. Απὸ δὲ τοῦ Πίζοῦντος ποταμοῦ εἰς Βουθόνην ὁ πλοῦς καὶ τὸ ἐμπόριον.

25. (26.) {Eγχελεῖς.} Ἰλλυρίων ἔθνος εἰσὶν οἱ Ἐγχελεῖς, ἔχόμενοι τοῦ Πίζοῦντος. Ἐκ Βουθόνης δὲ εἰς Ἐπίδαμνον, πόλιν Ἐλληνίδα, πλοῦς ἡμέρας καὶ νυκτός, ὅδος δὲ τριῶν ἡμερῶν.

24. (25.) {Maniowie.} Za Nestami jest rzeka Naron, wejście zaś do Naronu nie jest wąskie: wpływa weń i triera, i statki handlowe, aż do górnego emporium, oddalonego od morza o 80 stadiów. Ci zaś to iliryjski lud Maniów. Jezioro zaś wielkie jest w głębi od emporium i jezioro to rozciąga się do Autariatów, ludu iliryjskiego. I wyspa znajduje się na tym jeziorze, 120-stadiowa. Ta zaś wyspa jest bardzo zdatna do uprawy roli. Z tego zaś jeziora wypływa rzeka Naron. A od Naronu do rzeki Arion jest dzień żeglugi, zaś od Arionu (do) rzeki (Rhizus) żeglugi pół dnia; i są tam kamienie Kadmosa i Harmonii, i świątynia daleko<sup>18</sup> od rzeki Rhizus. Zaś od rzeki Rhizus żegluga do Buthoe i emporium.

25. (26.) {Enchelejowie.} Enchelejowie są ludem Iliryjskich, siedzącym z Rhizus. Z Buthoe zaś do Epidamnos, miasta greckiego, żeglugi dzień i noc, drogi zaś trzy dni.

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Reasumując niektóre wątki powyższych propozycji i interpretacji poszczególnych wydawców i odnosząc je do sytuacji topograficznej wybrzeża adriatyckiego, da się stwierdzić, co następuje:  
1. Rzeka Naron — i w tym wydawcy są zgodni — to niewątpliwie dzisiejsza Neretwa, położone zaś nad nią niedaleko jej ujścia „górne emporium” (tò ἄνω ἐμπόριον) to Narona.<sup>19</sup> Określenie „górne” (ἄνω) — jak się wydaje — nie oznacza tutaj ani, dosłownie, położenia na pewnej wysokości (choć określenie takie odpowiadałoby sytuacji topograficznej miasta — podobnie jak znajdująca się dziś na jego miejscu wioska Vid zajmowała ono stoki niewysokiego wzgórza

<sup>18</sup> Chociaż Shipley zachowuje lekcję rekopisu ἄπωθεν („daleko”), w jego przekładzie (SHIPLEY 2011, s. 59) czytamy: „above the Rhizous river”.

<sup>19</sup> Słowo ἐμπόριον dosłownie oznacza plac handlowy przeznaczony dla handlu „zagranicznego”; w szerszym

znaczeniu — osadę/miasto (lub jej/jego część), gdzie taka przestrzeń handlowa się znajduje. Tak więc, dokładniej, należałoby powiedzieć: emporium w Naronie lub Narona jako taka; zob. BRESSON, ROUILLARD (ed.) 1993; Brill's New Pauly, IV, kol. 956–957, s.v. „Emporion” [S. VON REDEN].

wznoszącego się ponad szeroką w tym miejscu doliną Neretwy), ani, przenośnie, lokalizacji północnej (w stosunku do postulowanego przez Suicia i Martinovicia kátω ἐμπόριον, „emporium dolnego”, czyli w takim wypadku południowego), choć oba te znaczenia byłyby dopuszczalne z językowego punktu widzenia. Wydaje się, że określenie ἄνω („górne”) oznacza tu tyle, co „położone w głębi lądu”, „śródlądowe”. Takie znaczenie tego przysłówka znajduje niezliczone potwierdzenia w języku greckim, a sytuacja topograficzna Narony, oddalonej od Adriatyku o ok. 15 km (80 stadów, według *Periplusu*), doskonale do takiej interpretacji pasuje.

2. Wielkie jezioro położone „w głąb” (*τὸ εἴσω*) od emporium interpretowano na różne sposoby:

- Według Müllera jest nim położone kilka kilometrów na wschód od dolnego biegu Neretwy (i około 10 km od Vidu, czyli Narony) niewielkie jezioro Hutovo Blato.<sup>20</sup> Wprawdzie Neretwa nie przepływa przez nie, ale wypływa z niego niewielka rzeka Krupa, będąca jej dopływem.
- Według Suicia chodzi o wielkie Jezioro Szkoderskie, położone w znacznym oddaleniu (ok. 150 km na pd. wsch.) od opisywanych tu obszarów. W związku z tym wydawca ten uznał informację o jeziorze za glosę wpisanąomyłkowo w tym miejscu do tekstu, zaś nazwę rzeki wypływającej z niego poprawił na Drilon (dzis. Drin, rzeka wpadająca do Adriatyku ok. 30 km na południe od Jeziora Szkoderskiego, przyjmująca jako dopływ przepływającą przez to jezioro rzekę Bojanę).
- Według Martinovicia „jeziorem” tym może być tylko Boka Kotorska, głęboko wcięta w ląd wąska zatoka Adriatyku, która w trzech miejscach rozszerza się na kształt jeziora. „Rzeką” wypływającą z tego „jeziora” miałaby być rzeka Rhizon, czyli wąski fragment tej samej zatoki, położony w pobliżu morza. Na poparcie swojej tezy przytacza fakt, że liczni autorzy starożytni zwali Bokę Kotorską „rzeką Rhizon”.<sup>21</sup> Również Martinović uważa informacje o „jeziorze” za glosę wpisaną wtórnie do tekstu, przy czym słowa εἴσω τοῦ ἐμπορίου („w głąb od emporium”) poprawia na εἴσω τοῦ κάτω ἐμπορίου („w głąb od (dolnego) emporium”), zakładając, że nie może tu już chodzić o wzmiakowaną wcześniejszej Naronę (*τὸ ἄνω ἐμπόριον*, „górne emporium”), lecz o inne emporium, o którym jest mowa w dalszej części tekstu.

3. „Kamienie/skały Kadmosa i Harmonii” Müller i Martinović umieszczały nad rzeką Rhizus/Rhizon, upatrując w nich stromych i wyniosłych wzniesień znajdujących się u ujścia Boki Kotorskiej do Adriatyku, Suić zaś — choć nie jest to pewne — być może gdzieś nad rzeką Drilon. Jedna i druga lokalizacja ma za sobą argumenty w literaturze starożytnej.<sup>22</sup>

4. Kolejne opisane odcinki żeglugi przedstawiają się w zależności od interpretacji następująco (zob. tabela poniżej):

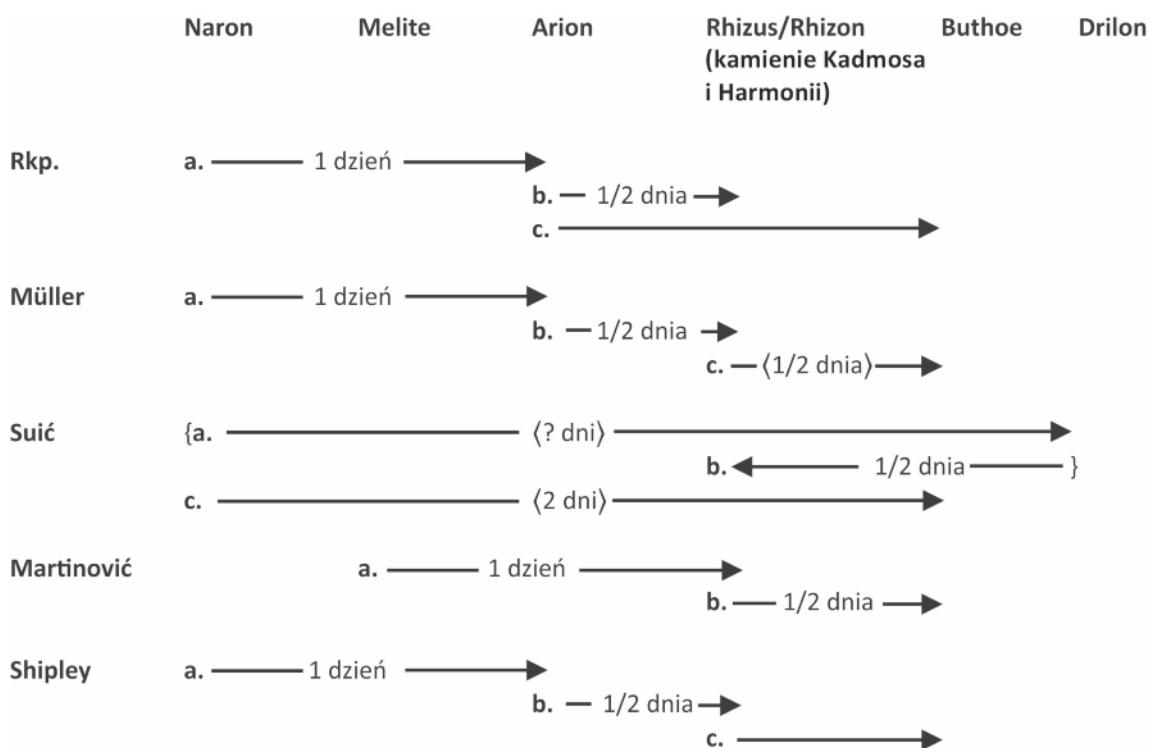
- w rękopisie: **a)** od rzeki Naron do rzeki Arion (jeden dzień); **b)** od rzeki Arion (do kamieni Kadmosa i Harmonii, pół dnia); **c)** od rzeki Arion do Buthoe (długość niepodana);
- według Müllera (i Shipleya): **a)** od rzeki Naron do rzeki Arion (jeden dzień); **b)** od rzeki Arion do rzeki Rhizus (= do kamieni Kadmosa i Harmonii; pół dnia); **c)** od rzeki Rhizus do Buthoe (wg Müllera pół dnia, u Shipleya brak tej informacji);
- według Suicia: **a)** od rzeki Naron do rzeki Drilon (długość niepodana); **b)** od rzeki Drilon (do kamieni Kadmosa i Harmonii, pół dnia); **c)** od rzeki Naron do Buthoe (dwa dni);
- według Martinovicia: **a)** od Melite do rzeki Rhizon (jeden dzień); **b)** od rzeki Rhizon do Buthoe (pół dnia).

<sup>20</sup> MÜLLER 1855, s. 30: *nunc palus d'Utovo vel Popovo* [„obecnie bagno Utovo lub Popovo”].

<sup>21</sup> MARTINOVIC 1966, s. 116: „En faveur de cette possibilité témoigne le fait que tous les auteurs antiques, jusqu'à Strabon, se rapportaient aux bouches de Kotor comme « rivière Rizon ». W rzeczywistości — oprócz Skylaksa

— dotyczy to jedynie Polibiusza (II 11, 16) oraz gramatycznego traktatu Eliusza Herodiana, a z autorów późniejszych — Stefana z Bizancjum. Strabon jednak (VII 5, 3–8) pisał o Zatoce Risańskiej (Πτζονικὸς κόλπος), nie zaś o rzece.

<sup>22</sup> Zob. ŠASEL Kos 1993.



5. W sprawie wzmiankowanego po nazwie Buthoe emporium:

- Müller, proponując koniekturę (w tłumaczeniu łacińskim) *navigatio est <diei dimidiati, sicut etiam ad Rhizuntem> emporium* („żegluga jest (półdniowa, tak jak i do Rhizus) emporium”), uważa, że mowa w tym miejscu o emporium w Rhizus (czy też emporium Rhizus = Rhizon), położonym w takiej samej odległości od ujścia rzeki Rhizus (Boki Kotorskiej) jak Buthoe.
- Fabricius usuwa „emporium” z tekstu, bowiem zamiast kai τὸ ἐμπόριον („i emporium”) czyta εἴτα („następnie”), jako początek następnego rozdziału.
- Suić kai τὸ ἐμπόριον poprawia na τὸ κάτω ἐμπόριον („dolne emporium”), traktując te słowa jako wtórnego umieszczonego w tekście glosę (komentarz do wzmianki o Buthoe), przez analogię do występującego wyżej — w obrębie wcześniejszej glosy — τὸ ἄνω ἐμπόριον („górne emporium”).
- Tekst proponowany tu przez Martinovicia πλοῦς ἡμέρας ἥμισυ εἰς Βουθόνην kai τὸ <κάτω> ἐμπόριον („żeglugi pół dnia do Buthoe i <dolnego> emporium”) również — jak to wynika głównie z komentarza autora<sup>23</sup> — lokalizuje emporium w Budwie lub jej okolicach. „Dolne emporium” pojawiło się już w tekście Martinovicia w (poprawionym przez niego) miejscu, dotyczącym lokalizacji „wielkiego jeziora” εἴσω τοῦ <κάτω> ἐμπορίου („w głębi od <dolnego> emporium”) (zob. wyżej).

<sup>23</sup> MARTINOVIC 1966, s. 117: „L’existence d’un centre commercial puissant dans cette région est démontrée par les riches trouvailles provenant de la nécropole de Budva (phase ancienne: VI<sup>e</sup>–II<sup>e</sup> siècle av. n.è.) et les découvertes récentes faites dans la plaine de Tivat, appartenant à la

même époque. Ceci nous permet de maintenir avec beaucoup de probabilité que l’emporion dit « inférieur » doit être cherché sur le territoire situé entre Budva et la plaine de Tivat”.

Powyższe, tak liczne i różnorodne propozycje lektury i interpretacji rozdziałów 24 (25) i 25 (26), zwłaszcza zaś pierwszego z nich, domagają się krótkiej choćby oceny, którą rozpocząć należy od refleksji nad tekstem zachowanym w rękopisie. W związku z tym można chyba stwierdzić, że:

- Początek rozdziału 24 (25) — aż do pierwszej wzmianki o rzece Arion — jest, w wersji podawanej przez rękopis, spójny z punktu widzenia zarówno struktury samego tekstu, jak i opisywanej rzeczywistości topograficznej.<sup>24</sup> Nie ma zatem powodu, aby dokonywać w nim ingerencji, zwłaszcza tak drastycznych, jak te zaproponowane przez Suicia i Martinovicia.
- Tekst drugiej części rozdziału 24 (25) oraz rozdziału 25 (26) — mimo prób bronienia go, podjętych przez Klausena i Counillona — zawiera przynajmniej trzy niepokojące elementy, który wymagają — jak się wydaje — podjęcia jakichś edytorskich interwencji. Są to:
  1. aż trzykrotne pojawienie się w rozdziale 24 (25) toponimu Arion, przy czym aż dwukrotne w wyrażeniu ἀπὸ δὲ τοῦ Ἀρίωνος ποταμοῦ („zaś od rzeki Arion”), sugerującym początek kolejnego etapu żeglugi.
  2. lokalizowanie świątyni (ἱερὸν) za pomocą przysłówka ἀπόθεν („z dala od”), co wydaje się dziwne — spodziewać można by się raczej wyrażenia typu „blisko czegoś”.
  3. „niespodziewane” pojawienie się toponimu Rhizus (τοῦ Ριζοῦντος) w rozdziale 25 (26), jako punktu odniesienia dla lokalizacji ludu Enchelejów. Taki punkt odniesienia nie spełnia tu swojej roli, skoro nie wiemy, czym jest owo Rhizus (rzeką czy może osadą?) oraz gdzie się znajduje w stosunku do wcześniej opisanych miejsc. Wydaje się więc, że toponim ten winien się pojawić już wcześniej.

Poszukując, gdzie toponim Rhizus mógł znajdować się (po czym zniknąć lub ulec przekształceniu na inny) w rozdziale 24 (25), Müller wskazał trzy takie miejsca, raz dokonując uzupełnienia ἐπὶ τὸν Ριζοῦντα ποταμόν („do rzeki Rhizus”) — po słowach ἀπὸ δὲ τοῦ Ἀρίωνος ποταμοῦ („zaś od rzeki Arion”), oraz dwukrotnie zastępując słowa τοῦ Ἀρίωνος ποταμοῦ („rzeki Arion”) przez τοῦ Ριζοῦντος ποταμοῦ („rzeki Rhizus”) (zob. wyżej).

Wypada zastanowić się nad każdym z nich z osobna, zaczynając tę refleksję od miejsca ostatniego, jako najbliższego zachowanemu w rękopisie τοῦ Ριζοῦντος w rozdziale 25 (26). W miejscu tym zastąpienie ἀπὸ δὲ τοῦ Ἀρίωνος ποταμοῦ („zaś od rzeki Arion”) przez ἀπὸ δὲ τοῦ Ριζοῦντος ποταμοῦ („zaś od rzeki Rhizus”) jest zarówno słuszne ze względów konstrukcyjnych (jako że wyrażenie ἀπὸ δὲ τοῦ Ἀρίωνος ποταμοῦ znajduje się już w tekście nieco wcześniej, a w opisie wybrzeża o charakterze *periplusu* powtórzenie takie nie wydaje się sensowne), jak i możliwe z punktu widzenia krytyki tekstu (z tego samego powodu, z konkluzją, że nastąpiło tu mechaniczne powtórzenie wcześniejszego wyrażenia).

Z pewnością niemożliwe jest też, aby toponim Rhizus pojawił się w miejscu tym po raz pierwszy, ponieważ istnienie wyrażenia „od rzeki Rhizus” sugeruje (podobnie — choć może w nieco słabszym stopniu — jak w rozdziale 25 [26]), że wcześniej rzeka ta winna być już wzmiankowana. Kolejnym więc — idąc wstecz — miejscem, które należy rozważyć, jest ἀπόθεν τοῦ Ἀρίωνος

<sup>24</sup> Nawet wobec faktu, że nazwa rzeki Arion nie pojawia się w innych źródłach starożytnych. Zresztą MÜLLER 1855, s. 30, cytując w komentarzu ustęp z pierwszego tomu dzieła *Voyage dans la Grèce* autorstwa Françoisa Pouqueville (Paris 1820–1822, s. 25): „Dans la province de Breno, l'une de celles qui composent les États de Ra-

guse, est la vallée d'Ombla, traversée par l'Arion, le prince des fleuves souterrains, qu'on voit avec surprise sortir du mont Bergat... Les habitants du pays assurent, sans le prouver, que l'Arion est un écoulement des eaux du lac de Popovo”.

ποταμοῦ („daleko od rzeki Arion”), poprawione przez Müllera na ⟨οὐκ⟩ ἀπωθεν τοῦ Πίζοῦντος ποταμοῦ („nie)daleko od rzeki Rhizus”), a przez Shipleya na ἀπωθεν τοῦ Πίζοῦντος ποταμοῦ („daleko od rzeki Rhizus”). Choć tekst zachowany w rękopisie ma sens z topograficznego punktu widzenia (wzmiankowana świątynia rzeczywiście musiała znajdować się daleko od rzeki Arion, skoro dzieliło ją od niej pół dnia żeglugi), to jednak z punktu widzenia konstrukcji tekstu wydaje się wielce podejrzane, by ktokolwiek, chcąc podać lokalizację obiektu, czynił to za pomocą wyrażenia „daleko od” zamiast oczekiwanej „niedaleko od” lub podobnego mu wyrażenia. Tak więc nie może tu chodzić już o rzekę Arion. Uznając więc sensowność poprawienia τοῦ Ἀρίωνος na τοῦ Πίζοῦντος, wypada się zastanowić, czy należy przyjąć za Müllerem również poprawkę ἀπωθεν („daleko”) na ⟨οὐκ⟩ ἀπωθεν („niedaleko”), czy też pozostawić to słowo, jak Shipley, bez interwencji. Przeciw temu ostatniemu przemawia przywołany już przed chwilą argument, że osobliwe jest lokalizowanie czegokolwiek za pomocą wyrażenia „daleko od”, przeciw propozycji Müllera z kolei — fakt, że jest to uzupełnienie może nieco zbyt odważne. Wydaje się jednak, że można tu zaproponować inną, mniej radykalną koniekturę, i — zmieniając tylko jedną literę ( $\Pi$  na  $N$ ) — czytać, zamiast ἀπωθεν („daleko”), ἀνωθεν („w górze, powyżej, ponad”). Tak więc wzmiankowane tu kamienie i świątynia mogłyby się znajdować ἀνωθεν τοῦ Πίζοῦντος ποταμοῦ („ponad rzeką Rhizus”, w znaczeniu: „na pewnej wysokości nad powierzchnią wody”), co — zważywszy na niezwykle strome brzegi Boki Kotorskiej — byłoby topograficznie uzasadnione.

Kolejna — idąc wstecz — koniektura Müllera, uzupełnienie ἐπὶ τὸν Πίζοῦντα ποταμόν („do rzeki Rhizus”), nie wydaje się jednak już aż tak bardzo konieczna. Wprawdzie byłoby rzeczywiście „porządniej”, gdyby zdanie ἀπὸ δὲ τοῦ Ἀρίωνος ποταμοῦ πλοῦς ἡμέρας ἥμισυ („zaś od rzeki Arion żeglugi pół dnia”) miało taką właśnie kontynuację, to jednak możemy sobie wyobrazić całkiem sensowną narrację bez tej poprawki. Po zdaniu tym wymienione są bowiem kamienie Kadmosa i Harmonii oraz świątynia „ponad rzeką Rhizus” jako logiczny koniec tego odcinka żeglugi. Skoro nazwa rzeki pojawia się przy lokalizacji kamieni i świątyni, nie było chyba potrzeby, aby dodatkowo wprowadzać ją tuż wcześniej. Zdanie to — jak się wydaje — mogłoby mieć zatem postać następującą (koniektury zaznaczono jw.):

ἀπὸ δὲ τοῦ Ἀρίωνος ποταμοῦ πλοῦς ἡμέρας ἥμισυ· καὶ Κάδμου καὶ Ἀρμονίας οἱ λίθοι εἰσὶν ἐνταῦθα, καὶ ἵερὸν ἀνωθεν τοῦ Πίζοῦντος ποταμοῦ.

Zaś od rzeki Arion żeglugi pół dnia: i są tam kamienie Kadmosa i Harmonii i świątynia ponad rzeką Rhizus.

Wydaje się natomiast, że koniekturowane przez Müllera wyrażenie εἰς Βουθόνην ὁ πλοῦς καὶ τὸ ἐμπόριον („żegluga do Buthoe i emporium”) można spokojnie przyjąć w wersji podawanej przez rękopis, tak jak postulują to najnowsi wydawcy tekstu, Counillon i Shipley. Obecność rodzajnika określonego (τὸ) wskazuje na fakt, że chodzi o konkretne emporium, mianowicie to znajdujące się w (lub przy) Buthoe, a zatem tekst ten znaczy „żegluga do Buthoe i (jej) emporium”.<sup>25</sup> Nie wydaje się więc konieczna bardzo skomplikowana i odważna koniektura Müllera, który założył, że chodzi tu o emporium znajdujące się w Rhizon, a zatem że mowa w tym zdaniu zarazem o żegludze od ujścia rzeki Rhizon wzduż morskiego brzegu do Buthoe oraz o żegludze w głąb tejże rzeki do emporium Rhizon (lub emporium w Rhizon).

<sup>25</sup> Por. COUNILLON 2006, s. 25: „C'est à partir du fleuve Arion que l'on se rend à Bouthoë et l'emporion”; SHIPLEY 2011, s. 59: „And from the Rhizous river the voyage is to Bouthoë and the trading-town”.

Wydaje się więc, że można zaproponować nową — w szczegółach — lekturę rozdziałów 24 (25) i 25 (26) w postaci następującej (koniektury w stosunku do tekstu zachowanego w rękopisie zaznaczoną czcionką rozstrzeloną, również w przekładzie):

24. (25.) Μανιοί. Ἀπὸ δὲ Νέστων ἐστὶν ὁ Νάρων ποταμός· ὁ δὲ εἴσπλους ὁ εἰς τὸν Νάρωνα ἐστιν οὐ στενός· εἰσπλεῖ δὲ εἰς αὐτὸν καὶ τριήρης, καὶ πλοῦα εἰς τὸ ἄνω ἐμπόριον, ἀπέχον ἀπὸ θαλάσσης στάδια π'. Οὗτοι δέ εἰσιν Ἰλλυριοὶ ἔθνος Μανιοί. Λίμνη δὲ ἐστὶ τὸ εἶσω τοῦ ἐμπορίου μεγάλη, καὶ ἀνήκει ἡ λίμνη εἰς Αὐταριάτας, ἔθνος Ἰλλυρικόν. Καὶ νῆσος ἐν τῇ λίμνῃ ἔνεστι σταδίων ρκ'. ἡ δὲ νῆσος αὕτη ἐστὶν εὐγέωργος σφόδρα. Απὸ δὲ ταύτης τῆς λίμνης ὁ Νάρων ποταμὸς ἀπορρεῖ. Καὶ ἀπὸ τοῦ Νάρωνος ἐπὶ τὸν Ἀρίωνα ποταμὸν ἡμέρας ἐστὶ πλοῦς· ἀπὸ δὲ τοῦ Αρίωνος ποταμοῦ πλοῦς ἡμέρας ἡμισυ· καὶ Κάδμου καὶ Αρμονίας οἱ λίθοι εἰσιν ἐνταῦθα, καὶ ιερὸν ἄνωθεν τοῦ Πιζοῦντος ποταμοῦ. Ἀπὸ δὲ τοῦ Πιζοῦντος ποταμοῦ εἰς Βουθόην ὁ πλοῦς καὶ τὸ ἐμπόριον.

25. (26.) Ἐγχελεῖς. Ἰλλυριῶν ἔθνος εἰσὶν οἱ Ἐγχελεῖς, ἔχόμενοι τοῦ Πιζοῦντος. Ἐκ Βουθόης δὲ εἰς Ἐπίδαμνον, πόλιν Ἑλληνίδα, πλοῦς ἡμέρας καὶ νυκτός, ὅδὸς δὲ τριῶν ἡμερῶν.

24. (25.) Maniowie. Za Nestami jest rzeka Naron, wejście zaś do Naronu nie jest wąskie: wpływa weń i triera, i statki handlowe, aż do górnego (= śródlądowego) emporium, oddalonego od morza o 80 stadiów. Ci zaś to iliryjski lud Maniów. Jezioro zaś wielkie jest w głąb od emporium i jezioro to rozciąga się do Autariatów, ludu iliryjskiego. I wyspa znajduje się na tym jeziorze, 120-stadiowa. Ta zaś wyspa jest bardzo zdatna do uprawy roli. Z tego zaś jeziora wypływa rzeka Naron. A od Naronu do rzeki Arion jest dzień żeglugi, zaś od rzeki Arion żeglugi pół dnia: i są tam kamienie Kadmosa i Harmonii, i świątynia ponad rzeką Rhizus. Zaś od rzeki Rhizus żegluga do Buthoe i (jej) emporium.

25. (26.) Enchelejowie. Enchelejowie są ludem Iliryjczyków, sąsiadującym z Rhizus. Z Buthoe zaś do Epidamnos, miasta greckiego, żeglugi dzień i noc, drogi zaś trzy dni.

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FABRICIUS 1878

GŁOMBIOWSKI 2005

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MÜLLER 1855	<i>Geographi Graeci minores</i> , e codicibus recognovit, prolegomenis, annotatione, indicibus instruxit, tabulis aeri incisis illustravit C. MÜLLERUS, I, Parisiis [przestrud: Hildesheim 1965], s. 15–96.
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## Summary

### Pseudo-Scylax' *Periplus* (24–25) as a source mentioning Rhizon — some philological remarks

An anonymous geographical work, preserved in manuscript form under the title Σκύλακος Καρυανδέως Περίπλους τῆς οἰκουμένης (*By Scylax of Caryanda. Circumnavigation of the inhabited world*), refers in the title to the authority of a Greek traveller and writer, Scylax of Caryanda (in Caria, southwestern Anatolia) of the sixth century BC. In fact, the *Periplus* of Pseudo-Scylax, which is a description of the Mediterranean and Black Sea coast (clockwise), reflects the state of Greek knowledge of these bodies of water in the second half of the fourth century BC. There is only one surviving manuscript with value as a source but with a very corrupt version of the text (*Parisinus Suppl. Gr. 443*, p. 62–106 [12th–13th c.]), and two copies from the early sixteenth century that are devoid of source value for the reconstruction of the original text.

Rhizon (more properly Rhizus [gen. τοῦ Ριζοῦντος]) is mentioned in these manuscripts of Pseudo-Scylax only in chapter 25 (26), devoted to the description of the Encheleians and sections of the eastern Adriatic coast between Buthoe (today Budva) and Epidamnos (today Durrës). The text of this chapter was presented along with the preceding chapter (24 [25]), of importance for the issue at hand, but presenting certain difficulties as far as understanding is concerned, in a version given by the Paris manuscript (above, pp. 108–109). Since chapter 24 (25) has received several, sometimes very bold conjectural emendations by successive publishers, the following is a presentation with highly detailed commentary of successive editions of Karl Müller (1855; above, pp. 109–111), B. Fabricius (1878; pp. 111–112), Mate Suić (1955; pp. 112–113), Jovan Martinović (1966; pp. 113–114) and Graham Shipley (2011; pp. 114–115), as the one but last publisher of the text, Patrick Counillon (2006), adopted the text from the manuscript unchanged.

The last part of the article presents the author's own opinion on one sentence from chapter 24 (25), along with a proposition of a new (in the details) edition of this passage (above, p. 120).

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## ИССЛЕДОВАНИЯ В ЗАПАДНОМ ГОРОДСКОМ РАЙОНЕ ТАНАИСА В 2012–2014 ГГ. (РАСКОП XXV)

**Abstract:** The article reports on three seasons of archaeological fieldwork conducted by a Russian-Polish team at Tanais in 2012, 2013, and 2014. The team examined the defensive system of western Tanais and some of the Hellenistic architecture.

**Key words:** Southern Russia, Tanais, Classical Antiquity, Hellenism, settlement, Greek defensive architecture

В 2012–2014 гг. продолжались исследования на территории Западного городского района Танаиса. Здесь в рамках совместного российско-польского проекта в 1999 г. был заложен раскоп XXV [Рис. 1–2]. Работы на нем проводились отрядом Института археологии Варшавского университета под руководством Т. Шолля (Центр исследований античности юго-восточной Европы Варшавского университета, Институт археологии Варшавского университета).<sup>1</sup>

К концу сезона 2014 г. общая открытая площадь на раскопе XXV составляла 1125 кв. м.<sup>2</sup> Его восточная половина располагается под западным участком, так называемого, позднего вала, проходящего здесь по линии ССВ–ЮЮЗ. Этот вал тянется вдоль условной северной границы Западного района с запада на восток, а затем поворачивает на ЮЮЗ, недалеко от северной границы раскопа [Рис. 3]. Одно из первых подробных описаний вала было дано

<sup>1</sup> До 2012 г. отряд входил в состав Нижне-Донской археологической экспедиции ИА РАН (руководитель Т. М. Арсеньева). В 2013–2014 гг. работы отряда продолжались в рамках Археологической экспедиции музея-заповедника „Танаис“ (руководитель С. М. Ильяшенко). В работе отряда принимали участие студенты Варшавского, Krakowskiego, Гданьского университетов, волонтеры из Польши и России. Чертежные работы выполнены студентами под руководством С. А. Науменко, электронная обработка чертежей — С. А. Науменко и Н. Е. Беспалая, рисунки находок выполнены студентами и сотрудниками польского отряда. Фотоработы — Г. Выжыковский, С. А. Науменко, Т. Шолль, М. Матера и П. Лех, статистическая и камеральная обработка материалов — М. Матера, реставрация и консервация находок — А. Грачык и И. Нурчик, определение клейм производил М. Матера, опись находок составлена Е. Г. Яценко. Работа выполнена в рамках гранта NCN, DEC-2011/03/B/HS3/00637.

<sup>2</sup> Информации о предыдущих сезонах исследований и полученных результатах: ARSENIEWA, SCHOLL 2000, с. 13–16; ARSENIEWA, SCHOLL 2001, с. 17–19; ARSENIEWA, SCHOLL 2002, с. 13–20; ARSENЬЕВА, ШОЛЛЬ 2003, с. 91–98; SCHOLL 2004, с. 239–245; SCHOLL 2005a, с. 137–145; SCHOLL 2005b, с. 247–259; АРСЕНЬЕВА, ШОЛЛЬ 2004–2005, с. 59–84; АРСЕНЬЕВА, ШОЛЛЬ, МАТЕРА 2004–2005, с. 85–91; АРСЕНЬЕВА, ШОЛЛЬ и др. 2006–2008a, с. 41–44; АРСЕНЬЕВА, ШОЛЛЬ и др. 2006–2008b, с. 45–54; ШОЛЛЬ 2008a, с. 307–338; ШОЛЛЬ 2008b, с. 177–189; SCHOLL 2009, с. 167–173; АРСЕНЬЕВА, ШОЛЛЬ и др. 2009–2010a, с. 69–85; АРСЕНЬЕВА, ШОЛЛЬ и др. 2009–2010b, с. 87–106; SCHOLL 2009–2010, с. 203–204; SCHOLL 2011a, с. 215–218; SCHOLL 2011b, с. 58–60; SCHOLL 2011c, с. 299–303; АРСЕНЬЕВА, ШОЛЛЬ 2012, с. 7–94; ШОЛЛЬ 2012, с. 11–16; ШОЛЛЬ, МАТЕРА 2012, с. 482–488; ШОЛЛЬ, РОВИНЬСКА 2013, с. 48–62; NAUMENKO, SCHOLL 2014, с. 187–201.

М. А. Миллером: „К юго-западному наружному валу городища снаружи примыкает еще какое-то дополнительное небольшое укрепление, которое состояло из вала и рва (...). Вал плохой сохранности, занят и частично разрушен современными постройками, сохранился на протяжении 192 м. Снаружи вала в некоторых местах можно заметить остатки рва”. Он считал, что „укрепление это ни в какой конструктивной связи с укреплениями Танаиса не состоит” и относится к позднейшим сооружениям.<sup>3</sup> Исследования вала Нижне-Донской археологической экспедицией АН СССР на раскопе VII в 1957 г. подтвердили указанное предположение. Тогда было установлено, что он насыпан поверх мусорной свалки первых веков нашей эры. „Грунт для насыпки брался здесь же, из-за чего вдоль северной кромки вала образовалась широкая впадина, составлявшая как бы ров перед валом”.<sup>4</sup> Сейчас его поверхность повреждена позднейшими перекопами и современными мусорными ямами. Здесь же находятся отвалы со старых раскопов VI, VII, IX и XIII, располагавшихся вблизи северной части вала.

В 2012–2014 гг. продолжались работы в восточной половине раскопа, на валу. Здесь, к югу от уже исследованной в предыдущие годы территории, были заложены квадраты 112–114, к северу — квадраты 115–117 [Рис. 1–2].

**В 2012 г.** на новых участках были сняты слои мусора, перекрывавшего остатки древних сооружений: на квадратах 112–114 — до горизонта, связанного с оборонительной стеной к югу от въездных ворот (куртины I); в западной части квадратов 115–117 — до уровня остатков оборонительной стены к северу от ворот (куртины II), в центре этих квадратов — до напластований первых веков нашей эры. В восточную часть квадратов 115–117 попала граница раскопа VII 1957 г.

В последующие 2013–2014 гг. работы велись на тех же квадратах.

**В 2013 г.** в восточной части квадрата 112 открыто продолжение на юг куртины I. В квадратах 113–114 к востоку от куртины I выявлены остатки западной стены 13 и северной стены 17 помещения С. На квадрате 115 открыт новый северный участок улицы «б», проходивший между восточным фасом куртины II и западной стороной стены 11, помещения D. На квадратах 116–117, к востоку от улицы «б» открыта северная часть помещения D I в. до н.э. (северная стена 18, северная половина западной стены 11, а также пол помещения).<sup>5</sup> В полу помещения обнаружены хозяйствственные ямы 4/1/2013, 5/2013 и 6/2013. По составу находок в них найденных ямы относятся ко времени функционирования помещения в I в. до н.э. К северу от стены 18 также расчищен юго-западный угол соседнего помещения, образованный стенами 18 и продолжающейся на север стеной 11. Кроме того, в верхних горизонтах над помещением D выявлены хозяйственные ямы 1/2013, 2/2013, 3/2013 первых веков нашей эры. Все эти ямы были впущены практически с одного уровня. В юго-западной половине раскопа с целью продолжения исследования заполнения оборонительного рва были заложены новые квадраты 26, 27, 28, 29. На них снят дерновый и гумусный слой.

**В 2014 г.** работы в южной части раскопа были сосредоточены на квадратах 113–114. В западной части квадрата 113 выявлено продолжение на юг улицы «б», проходившей между восточным фасом куртины I и западным фасом стены 13 помещения С. Ранее над её верхним горизонтом были зафиксированы остатки каменного завала, как со стороны куртины, так и со стороны стены 13 помещения С. К востоку от улицы «б» исследования сосредоточились на помещении С (квадраты 113–114). В восточной части помещения С (на квадрате 114)

<sup>3</sup> МИЛЛЕР 1958, с. 52

107–108 в 2009 г.: АРСЕНЬЕВА, ШОЛЛЬ и др. 2009–

<sup>4</sup> АРСЕНЬЕВА 1969, с. 98.

2010b, с. 88–89.

<sup>5</sup> Южная часть помещения была открыта на квадратах

выявлена и исследована яма 1/2014. В северо-западном секторе квадрата 113 открыт небольшой отрезок улицы «с». Она проходила, вероятно, по линии В-З вдоль северного фаса северной поздней стены 19 помещения С. В северной части раскопа основные работы велись в квадрате 116 и в западной части квадрата 117. Здесь полностью выявлены границы помещения D: доследована северная стена 18 и открыта его восточная стена 21. В восточной части помещения D исследована яма 4/2/2013.

Наиболее показательная стратиграфическая колонка участка была получена в северном борту квадратов 115–117. Здесь профиль отражал приблизительную картину всего участка на валу. На этих квадратах высота позднего вала от современной поверхности достигала 1,76 м. Верхние, сильно гумированные горизонты, толщиной до 0,60 м были насыщены современным мусором (слой Ia–b). Около 54,4% общего состава находок из слоя составляли обломки лепных сосудов. Фрагменты амфорной тары представлены единичными экземплярами родосских, в том числе — две клеймленые ручки, №№ 7/2012 [Рис. 4], 52/2012 [Рис. 5], и псевдокосских сосудов. Кроме того из этого слоя происходили: фрагменты краснолаковых сосудов, среди которых обломки кубка эллинистического времени с росписью, № 5/2012 [Рис. 6]; две миски IV–V вв. н.э., №№ 6/2012, 8/2012 [Рис. 7–8]; лепной горшок № 1/2012 [Рис. 9], два обработанных астрагала, №№ 9/2012, 26/2012 [Рис. 10–11]; костяная проколка, № 4/2012 [Рис. 12].

Ниже располагались слоевые пласти, горизонтально залегавшие в центре и понижавшиеся наклонно к востоку и западу (IIa–IId). Суммарная толщина этих напластований доходила до 1,70 м. Вероятно, верхние из них были перемещены сюда в ходе сооружения вала, а нижние относились к свалке первых веков нашей эры. Пласти состояли из:

- мусорных слоев серовато-желтого цвета с керамикой и костями животных;
- слоистого светло-серого и светло-коричневого грунта средней плотности с камнями, керамикой и прослойками золы, желтой глины и мергеля;
- плотного серовато-желтого золистого грунта с мелкими камнями, керамикой, костями животных и прослойками золы;
- плотного светло-желтого глинистого слоя с мелкими камнями, щебнем, прослойками золы, горелой глины, углами, керамикой, костями животных и рыб.

Находки в этих слоях достаточно многочисленны и разнообразны. На долю лепной керамики приходится 51,1% из общего их числа. Амфорный материал представлен фрагментами родосских (11%) и псевдокосских сосудов I в. н.э. (11%), а также амфор типа D<sup>6</sup> (15,4%). Среди индивидуальных находок выделяются амфорные ручки с клеймами: шесть родосских, №№ 24/2012, 38/2012, 40/2012, 50/2012, 55/2012, 56/2012 [Рис. 13–18], и одно синопское, № 23/2012 [Рис. 19]. Часть из клейменых ручек (№№ 55/2012, 56/2012) вторично использовалась как тेरочники. Гончарная посуда эллинистического времени представлена обломками мегарских чаш, №№ 33/2012, 37/2012 и 44/2012 [Рис. 20–22], фрагментом расписного краснолакового кубка, № 53/2012 [Рис. 23], дном чернолакового сосуда, № 25/2012 [Рис. 24], дном чернолакового блюда, № 17/2012 [Рис. 25], и ручкой чернолакового канфара II–I вв. до н.э., № 45/2012 [Рис. 26]. Кроме того, найдены две глазчатые бусины, №№ 31–32/2012 [Рис. 27–28], бронзовая монета времени Митридата Евпатора,<sup>7</sup> № 28/2012 [Рис. 29], бронзовый наконечник стрелы, № 59/2012 [Рис. 30] и железный псалий С-овидной формы, № 42/2012 [Рис. 31].

К позднеантичному времени относятся следующие материалы: фрагмент туловы с ручкой амфоры неопределенного центра, № 3/2012 [Рис. 32], краснолаковая миска, № 18/2012 [Рис. 33], и верхняя часть лепного горшка, № 48/2012 [Рис. 34].

<sup>6</sup> Здесь и далее при описании узкогорлых светлоглиняных амфор используется классификация Д. Б. Шелова — типы А, В, С, Д, Е: ШЕЛОВ 1978, с. 17–19, рис. 1–7; смотри также: ŠELOV 1986, с. 395–398, соответству-

ющие типу С IV, вариантам А, В, С, Д по С. Ю. Внукову: Внуков 2006, с. 16, рис. 1, 7–10.

<sup>7</sup> Определение монеты сделано В. В. Яценко.

Лишь нижний из пластов (Пе), выявленных в основании вала, скорее всего, был связан со временем существования архитектурных сооружений Западного района Танаса. Это был слоистый, золистый горизонт с прослойками желтой глины, темной и серой золы, крупными и мелкими камнями.

Далее мы остановимся подробнее на каждом из выявленных объектов, соблюдая хронологию бытования — от самых ранних до наиболее поздних.

**Куртина I** (оборонительная стена, располагавшаяся к югу от въезда по линии С–Ю). Продолжение стены на югкрыто в восточной половине квадрата 112. На этом участке значительная часть камней из неё была выбрана в позднейшее время. Отсутствовали крупные камни западного фасада. Камни восточного фасада оказались смещёнными к востоку. У южного борта раскопа от стены сохранился лишь слой мелких камней забутовки [Рис. 35–36]. Тем не менее, по слою забутовки и остатков фасов ширина её вполне восстанавливается. Она достигала здесь 3,60 м. Сохранившаяся высота — до 0,46 м. Крупные камни фаса были положены на глинистом растворе. Внутренний слой (забутовка) состоял из различных по размеру камней, скального щебня и глины. Общая длина стены с учетом выявленного отрезка — 15,70 м. Время последнего использования куртины I можно отнести к I в. до н.э. К западу от неё находился слой скального щебня (мергеля), залегавшего полосой, шириной до 1 м, параллельно оборонительной стене. При расчистке куртины в глинистом коричневато-желтом слое были обнаружены два терочника из обломков амфор, №№ 74/2013, 89/2013 [Рис. 37–38], каменный якорь, № 62/2013 [Рис. 39], и фрагмент каменного жернова, № 65/2013 [Рис. 40]. В массовом материале, обнаруженному в перекрывавшем стену слое, 90% составляли фрагменты кружальной керамики. Из них 40% датируются первыми веками до нашей эры, а 33% — первыми веками нашей эры.

**Улица «б».** В 2013–2014 г. в южной (квадрат 113) и северной (квадрат 115) части раскопа продолжались исследования улицы «б». Она проходила по линии север–юг через весь раскоп, вдоль восточных фасов оборонительных стен — куртин I и II [Рис. 1]. К настоящему времени общая известная длина улицы составляет 30,00 м, ширина не превышает 1,20–1,40 м. На вновь выявленных участках вдоль её восточной стороны располагались стена 13 помещения С (квадрат 113) и стена 11 помещения D (квадрат 115). Полотно вымостки улицы состояло из мелких окатанных камней, уложенных в глинистом грунте, вперемешку с немногочисленными фрагментами керамики, костями животных и рыб [Рис. 41–42]. Вдоль восточной границы квадрата 115, в северной его части, открыты плоско лежащие бордюрные камни, ограничивавшие мостовую с востока [Рис. 1, 43–45]. К этим камням примыкали остатки стен 11 и 13. В северной части квадрата 113 уличное полотно расчищено до глубины –2,71 м. Здесь его ширина достигала 1,20 м. У южного борта раскопа часть поверхности улицы перекрывали завалившиеся к востоку камни оборонительной стены (куртины I), что позволило исследовать её лишь до уровня –2,50 м, –2,64 м и открыть на ширину до 0,80–0,85 м. В желтоватом суглинке северной части находились разрозненные стенки родосских амфор, хронология которых может быть определена лишь в рамках первых веков до нашей эры. Однако в 2009 г. при исследовании этой же улицы на квадрате 106 были выявлены фрагменты двух ручек родосских амфор с клеймами. Первое клеймо (Е[П] [...] / АРТАМИТИОY) происходило из слоя, перекрывавшего улицу, вероятно, относится к концу III — началу II в. до н.э.<sup>8</sup> Второе клеймо, обнаруженное под слоем каменной мостовой улицы, содержало начальные буквы имени фабриканта APIΣ [...]. По мнению М. Матеры его верхнюю дату можно предполагать в пределах 90–60-х гг. II в. до н.э.<sup>9</sup>

<sup>8</sup> Арсеньева, Шолль и др. 2009–2010b, с. 89, 97, рис. 174. <sup>9</sup> Арсеньева, Шолль и др. 2009–2010b, с. 89, 94, рис. 159.

**Помещение С.** Остатки помещения выявлены в 2013–2014 гг. на квадратах 113–114, на расстоянии 1,00–1,15 м к востоку от куртины I [Рис. 1]. Южная и восточная границы помещения С пока не ясны. Выявленная часть помещения имела прямоугольную в плане форму и была ориентирована по сторонам света. Предполагается, что первоначально помещение было ограничено с запада стеной 13 и стеной 17 — с севера. Стена 17 являлась общей с примыкавшим с севера одновременным помещением В [Рис. 46–48].

**Стена 13** ориентирована по линии С–Ю [Рис. 46]. Участок кладки вблизи северо-западного угла помещения сохранился хуже всего. На остальной части сохранность стены удовлетворительная. Кладка трехслойная, двулицевая, постелистая, состоит из средних камней положенных на глинистом растворе с забутовкой более мелкими камнями. Длина открытого участка стены в пределах помещения С — 5,00 м, ширина — 0,65 м. Ее сохранившаяся высота — от 0,25 до 0,55 м. Южный конец стены уходил в южный борт раскопа. С западной стороны вдоль стены проходит улица «б». На расстоянии 1,85 м к югу от северо-западного угла помещения (стыка со стеной 17) в стене 13 прослежен вход со стороны улицы. В этом месте открыты плоско лежащие камни, служившие, видимо, порогом. Ширина входа составляла примерно 0,80 м. Вероятно, в ходе дальнейшей перестройки (уровень помещения С1) вход был заложен, а перед ним сооружена глинобитная печь 1.

**Стена 17** ориентирована по линии В–З [Рис. 46]. Она была пристроена под прямым углом к стене 13. Кладка трехслойная, сложена на глинистом растворе из средних камней с забутовкой более мелкими. Кладка двулицевая, постелистая. Длина открытого участка стены 3,30 м, ширина 0,65–0,70 м, высота до 0,38 м. Восточная половина стены разрушена поздними перекопами.

Практически на всей исследованной внутренней площади помещения и вдоль стен 13, 17 зафиксирован глиняный пол. Исключение составляет участок в северо-западной части квадрата 114, который вместе с отрезком стены 17 был разрушен большим поздним перекопом. Пол глинистый, плотно утрамбованный. Его толщина достигала в некоторых местах 0,10 м и более. Он, очевидно, все время подмазывался. В северной части помещения, вдоль стены 17 сохранились участки хорошей глиняной обмазки, на которую при последующих перестройках положили вымостку из камешков и керамики. Судя по сохранившемуся полу, помещение С имело ширину с севера на юг не менее 5,00 м и длину с запада на восток — около 5,50 м. Таким образом, его площадь составляла более 27,50 кв. м. В западной части помещения недалеко от стены 13 пол просел вниз почти на 0,71 м, образуя воронку овальной в плане формы. Не исключено, что подобная просадка связана с наличием подвала под помещением С или какой-то иной ранней конструкцией. Возможно, в ходе позднейшей перепланировки, выравнивания поверхности под новые полы и сооружения меньшего по площади помещения С1 это углубление было засыпано мусором.

На уровне пола, у восточного фаса стены 13, в 0,25 м к северу от южного борта, обнаружены остатки глиняно-каменной печи 2, существовавшей одновременно с ранним горизонтом помещения [Рис. 46–47]. Глиняный пол под печью имел мощность до 0,10 м и лежал на слое речного ила толщиной до 0,12 м. С северной и южной стороны печь была ограничена каменными стенками, сложенными из средних камней поставленных на ребро. Сохранилось два ряда кладки этих стенок [Рис. 49–50]. На дне печи находился плоский камень [Рис. 49–50]. Толщина северной стенки печи — 0,20 м, высота — до 0,35 м; толщина южной стенки — 0,20–0,26 м, высота — до 0,40 м. Между стенками лежала мощная глиняная подушка, которую многократно подмазывали [Рис. 51–52]. В составе одной из прослоек был обнаружен сырцовый кирпич размером  $0,30 \times 0,35 \times 0,04$  м. Размеры глиняной части печи: по линии С–Ю между каменными стенками — 0,70 м, по линии В–З глиняная подушка сохранилась на ширину до 0,88 м. Данных о наличии в конструкции печи купола

нет. При расчистке печи был найден фрагмент бортика лощеной миски с верхней частью туловища, № 64/2014 [Рис. 53].

В восточной части помещения С, в 0,5 м к востоку от западного борта квадрата 114, в глиняном полу находилась хозяйственная яма 1/2014 [Рис. 46, 54]. Горловина ямы, вероятно, была обложена камнем и примыкала вплотную к северо-восточному участку (фасу) стены 20, сложенной поверх глиняного пола помещения. Западная стенка ямы на нижнем горизонте располагалась под этой стеной. Первоначально яма, скорее всего, имела колоколовидный профиль. Затем ее горловина и стенки частично обвалились внутрь [Рис. 55]. По этой причине на момент открытия яма в разрезе была почти цилиндрической формы. Лишь у дна стенки резко расширяются. Дно неровное, бугристое. Размеры ямы: по верхнему краю 1,03 м (по линии В–З), 1,12 м (по линии С–Ю). Размеры ямы по дну: 1,72 м (по линии В–З), 1,80 м (по линии С–Ю). Глубина ямы 1,25 м [Рис. 56]. Заполнение ямы неоднородное: рыхлый грунт с горизонтальными прослойками желтой глины, золы с включением мелких камней, костями животных и керамикой [Рис. 57]. Не исключено, что в момент разрушения в верхний слой заполнения ямы попали и предметы I в. н.э.: фрагменты узкогорлых светлоглиняных амфор типа А, № 65/2014 [Рис. 58], фрагменты псевдокосских амфор гераклейского и эгейского производства, обломки амфор Колхиды, № 95/2014 [Рис. 59], а также фрагменты красноглиняных амфор неопределенных центров. В придонной части заполнения обнаружено: несколько обломков родосских амфор; фрагмент верхней части лепного сосуда, № 70/2014 [Рис. 60]; пряслице с графито, изготовленное из дна чернолакового сосуда, № 14/2014 [Рис. 61]; терочки из ручек родосских амфор, №№ 66/2014, 69/2014 [Рис. 62–63]; фрагмент стенки стеклянного сосуда, № 31/2014 [Рис. 64]; железный нож, № 49/2014 [Рис. 65]; оселок, № 81/2014 [Рис. 66]; каменные рыболовные грузила, №№ 68/2014, 71/2014, 76/2014 [Рис. 67–69].

На основании стратиграфических наблюдений и характера находок в слое пола и над ним время функционирования помещения С предварительно определено в рамках I в. до н.э. Не исключено также то, что после некоторых перестроек на этом же месте существовало новое сооружение, получившее наименование „помещение С1”.

**Помещение С1** располагалось на площади квадрата 113, в контурах лежавшего горизонтом ниже помещения С первого века до нашей эры [Рис. 46, 70–71]. Как и в предыдущий период, с запада помещение С1 ограничивала стена 13, описание которой дано выше. На расстоянии 0,95 м к югу от ранней стены 17, параллельно с ней, поверх глиняного пола, была положена новая стена 19. Эта новая стена теперь являлась северной границей помещения С1. В образовавшемся между стенами 17 и 19 пространстве, поверх полосы прежнего глиняного пола была положена вымостка узкой улицы «с». Вдоль западной границы квадрата 114, также поверх пола раннего помещения, располагалась новая стена 20, ограничивавшая помещение С1 с востока. Южная часть помещения уходит под южный борт квадрата 113. Выявленная часть помещения имела прямоугольную в плане форму. Стены ориентированы по сторонам света.

**Стена 19.** Располагалась по линии В–З [Рис. 70] и была приложена западным концом к стене 13 под прямым углом. На востоке она, вероятно, стыковалась со стеной 20. Однако вся восточная половина стены уничтожена позднейшими перекопами. Стена сложена из средних и мелких уплощенных камней. Кладка трехслойная, двулицевая. Длина сохранившейся части стены — 1,40 м, ширина — 0,50–0,60 м. Высота максимально доходила до 0,35 м. Наиболее четко выражен южный фас стены, обращенный внутрь помещения С1.

**Стена 20** открыта на стыке квадратов 113–114. Направление стены С–Ю [Рис. 70]. Её южный конец уходит под борт раскопа, северный уничтожен поздними перекопами также, как и восточный участок стены 19. Кладка трехслойная, двулицевая, состоит из средних

и мелких камней. Кладка максимально сохранилась в южной части (у борта раскопа) и достигает 3 рядов. Длина стены — 3,45 м; ширина — от 1,00 м до 1,16 м; высота южной части — до 0,50 м, высота северной части — до 0,15 м.

Таким образом, выявленная длина помещения С1 по линии С–Ю — 3,35 м; ширина по линии В–З — 2,85 м; площадь по внутреннему контуру — 9,50 кв. м.

Из-за мощных поздних перекопов оригинальный культурный слой внутри помещения сохранился крайне мало (толщина не более 0,20–0,30 м). По этой причине было достаточно сложно выявить границы контактных зон между различными горизонтами напластований. Однако, судя по сохранившимся остаткам, слой внутри помещения С1 просел в центральной части постройки так же как и глиняный пол раннего помещения, о котором говорилось выше. На уровне слоя заполнявшего помещение С1 этот участок с западной стороны был обложен мелкими плоскими камнями [Рис. 72]. Не исключено, что при перепланировке камни были специально положены в это место для выравнивания поверхности под новые полы. Пол в помещении С1 не выявлен.

Слой, заполнявший помещение, серый золистый, различный по плотности с большим количеством мелких и средних камней. В нем также находились многочисленные фрагменты амфор I в. н.э. (псевдокосские амфоры гераклейского производства и неопределенных центров Эгейды, а также амфоры типов А, В и типа Внуков С IIIб) обломки краснолаковой кружальной и лепной посуды. В этом же горизонте найденные и фрагменты керамики первых веков до нашей эры. Однако они составляли лишь 3,5% от общего числа находок.

В северо-западном углу помещения С1, на уровне основания стены 19 и выше обнаружены компактно лежавшие крупные куски обожженной глины (печины?) и крупные камни. Некоторые печины имели бортик. Сохранность конструкции была плохая и ее с трудом можно было идентифицировать. Ширина конструкции — 0,60 м. Толщина печин — 4 см, высота бортиков — до 6 см. Эти фрагменты условно были определены как **печь 1**. Однако, не исключено также то, что это были части переносного очага [Рис. 73–74]. При дальнейшей расчистке между печинами и камнями зафиксирован слой пепла. Под самой глиняной конструкцией тоже находился слой пепла [Рис. 75–76]. Судя по находкам между фрагментами конструкции двух ножек псевдокосской амфоры гераклейского производства, № 84/2014 [Рис. 77], и синопской амфоры, № 80/2014 [Рис. 78], а также венчика краснолаковой миски, № 32/2014 [Рис. 79], и фрагмента горла с плечом лепного горшка, № 39/2014 [Рис. 80], печь 1 может быть отнесена к тому же времени, что и слой, заполнявший контур помещения С1.

**Улица «с»** [Рис. 70–71] обнаружена у северной границы квадрата 113. Она проходила по линии В–З между стенами 17 и 19. На западе улица начиналась от восточного фаса стены 13 помещения С и далее на восток прослеживалась примерно до конца стены 17. Её сохранившаяся длина — 3,40 м, ширина — около 0,90 м. У средней части стены 17 зафиксировано пятно плотного глинистого грунта, поверх которого лежали мелкие камни вперемешку с керамикой первых веков до нашей эры (полотно вымостки). Среди обломков выделяются фрагменты родосских амфор. Мощность мусорного слоя, исследованного над вымосткой улицы «с», составляла не более 0,20 м. Среди находок, в основном, невыразительный материал первых веков нашей эры и множество мелких камней. Вымостка, предположительно, существовала одновременно с помещением С1.

**Помещение D** [Рис. 81–85]. В 2009 г. на квадратах 107–108 была открыта стена 14, ограничивавшая с юга помещение D.<sup>10</sup> В ходе работ следующих сезонов остальная часть

<sup>10</sup> АРСЕНЬЕВА, Шолль и др. 2009–2010b, с. 88–89.

помещения выявлена на площади квадратов 116–117. Помещение D в плане имело прямоугольную форму. Ориентировано длинной осью по линии В–З. Его ширина по внутреннему контуру — 4,00 м, длина по линии В–З — 6,80 м. Площадь помещения — 27,20 кв. м. Своей западной стороной оно примыкало вплотную к улице «б», от которой его отделяла стена 11. Помещение D на юге имело выход на территорию вымощенного каменными плитами дворика, на севере соседствовало с другим комплексом, с которым оно имело две общие стены 11 и 18. Восточной границей помещения служила стена 21.

**Стена 18** [Рис. 86] к настоящему времени открыта почти по всей длине, за исключением небольшого участка в западной части квадрата 116, в месте ее предполагаемого соединения с западной стеной 11. Стена ограничивала помещение с севера и проходила по линии В–З. В большей части она сохранилась на уровне камней основания, ниже горизонта пола помещения. Лишь участок у границы квадратов 116 и 117, длиной 2,20 м, возвышался над уровнем пола на высоту 0,35 м. Длина открытой части стены 6,68 м. Вероятная длина — 6,83 м. Ширина стены — 0,60 м. Она сохранилась в высоту на 0,79 м. Кладка двулицевая, постелистая, состояла из уплощенных камней среднего размера, положенных на глинистом растворе. При расчистке стены обнаружены следующие предметы: два обломка родосской и один косской амфоры, 12 фрагментов псевдокосских амфор гераклейского производства.

**Стена 21** [Рис. 87–89] — восточная, открыта под мусорным слоем засыпи раскопа VII (1957 г.) на квадрате 117 и в северной части квадрата 108 ниже уровня пола. Ориентирована по линии С–Ю. Стена построена впереплёт со стенами 18 и 14 и составляла с ними прямые углы помещения. Стена сооружена из крупных, средних и мелких камней на глинистом растворе. Кладка двулицевая, постелистая, трехслойная. Длина стены по внешнему контуру — 5,40 м, ширина — 0,60–0,65 м. Высота от ее основания по внешнему контуру составляла почти 1,00 м. Следует отметить, что нижние камни кладки восточного панциря стены 21 слегка выступают наружу, примерно на 0,10–0,15 м. Находок при расчистке стены не обнаружено.

**Стена 14** [Рис. 90] ограничивала помещение с юга и ориентирована по линии В–З. Сохранилась восточная половина стены на высоту до 0,16 м. Выявленная длина — 4,10 м, ширина — 0,80 м. Кладка двулицевая, постелистая, трехслойная. Восточный конец стены соединен под прямым углом со стеной 21. На западе, в средней части длины помещения, она заканчивается порогом шириной 0,90 м, от которого уцелели два плоских крупных камня.

**Стена 11** [Рис. 91] — западная. В границах помещения она практически не сохранилась, так как была разобрана до основания еще в древности. От неё осталась лишь неглубокая траншея под фундамент, разделявшая западную границу полов и улицу «б». Однако эта стена продолжалась дальше на юг и ограничивала с запада соседнее помещение А. Эта часть стены была открыта на квадратах 102 (в 2007 году)<sup>11</sup> и 107 (в 2009 году).<sup>12</sup> Ширина стены в границах помещения А — 0,60 м, высота — до 0,47 м. В северной части квадрата 107 её кладка также была сильно разрушена. От неё сохранился лишь один камень лицевой кладки, маркирующий линию стены. По аналогии с известными частями стены можно реконструировать её фрагмент и в помещении D. Кладка двулицевая, постелистая, сложена на глинистом растворе из средних камней. В основание положены более крупные камни. Общая длина стены составляет 13,00 м. Длина стены в границах помещения D могла быть около 4,00 м. При расчистке траншеи под стеной 11 были найдены немногочисленные обломки эллинистической керамики: фрагменты родосских (5 ед.) и косских (4 ед.) амфор, а также фрагмент чернолакового сосуда. Кроме того, здесь же обнаружены три фрагмента амфор первых веков нашей эры и 33 обломка лепных сосудов.

<sup>11</sup> Арсеньева, Шолль и др. 2006–2008b, с. 48.

<sup>12</sup> Арсеньева, Шолль и др. 2009–2010b, с. 88–89.

Почти по всей поверхности внутри контура помещения прослежен хорошо сохранившийся пол, который имел несколько уровней [Рис. 92]. Пол — глинистый, плотно утрамбован. На нем видны следы пожара в виде черной золы и серого пепла. В полу обнаружены также хозяйствственные ямы 4/2/2013, 5/2013 и 6/2013 [Рис. 81–85, 93]. В слое пола и над ним обнаружены следующие находки: девять фрагментов стенок и одна ручка родосской амфоры с клеймом, № 28/2014 [Рис. 94], одна стенка синопской амфоры, девять фрагментов стенок лепных сосудов, тёрочник из ручки родосской амфоры, № 50/2014 [Рис. 95], дно лепного сосуда, № 89/2014 [Рис. 96], глиняное пряслице, № 59/2014 [Рис. 97], железный гвоздь, № 55/2014 [Рис. 98], четыре каменных рыболовных грузила, №№ 35/2014, 54/2014, 57/2014, 58/2014 [Рис. 99–102], один обломок жернова, № 56/2014 [Рис. 103].

В центральной части помещения, на расстоянии 0,60 м к западу от ямы 4/2 находился очаг [Рис. 81, 84–85, 93, 104]. Он имел округлую в плане форму, состоял из плотной, местами сильно обожженной, глины. Диаметр очага — 1,44 м × 1,36 м. По внешнему контуру очага имеется валик высотой до 0,05 м и шириной до 0,10 м. В восточной части его поверхность слегка разрушена. Заполнение очага — зола вперемешку с грунтом.

**Яма 4/2/2013** располагалась в восточной части помещения, точно под уровнем дна ямы 4/1/2013 [Рис. 81, 84–85, 93]. Горловина ямы имела в плане округлую форму. Диаметр по верхнему контуру — 0,58 м, диаметр по дну — 1,38 м, глубина — 1,78 м [Рис. 105]. В разрезе яма 4/2/2013 усеченно-конусовидной формы со слегка выпуклыми в средней части стенками. Заполнение рыхлое, золистое с немногими мелкими камнями, костями животных, рыб и небольшим числом фрагментов керамики. Отметим найденный фрагмент стенки мегарской чаши, № 46/2013 [Рис. 106]. Заполнение в придонной части более плотное. В нем обнаружены: фрагмент колхидской амфоры, фрагмент родосской амфоры, три фрагмента амфор неопределенного центра и шесть стенок лепных сосудов.

**Яма 5/2013** расположена в северо-западной части помещения на расстоянии 2,00 м к западу от ямы 4/2/2013 [Рис. 81, 84–85, 93]. В плане она неправильно-округлой формы. Стенки ямы слегка покаты, дно ровное. Диаметр — 1,04 (СВ–ЮЗ) × 1,28 (СЗ–ЮВ) м, глубина — 0,64 м [Рис. 107]. Заполнение ямы рыхлое, золистое с немногими мелкими камнями, костями животных, рыб и небольшим числом предметов. 60% составляют фрагменты гончарной посуды (из них 45% эллинистического времени, остальные — неопределены). Среди находок выделяется фрагмент верхней части мегарской чаши со следами ремонта, № 81/2013 [Рис. 108], тёрочник из ручки родосской амфоры, № 76/2013 [Рис. 109], а также каменный подпятник, № 66/2013 [Рис. 110].

**Яма 6/2013** располагалась в центре южной части помещения [Рис. 81, 84–85, 93]. В плане она имела неправильно-округлую форму, и усеченно-конусовидную форму — в разрезе. Стенки ее слегка выпуклые, обмазаны глиной. Дно ровное. Диаметр горловины — 0,50 м; максимальный диаметр достигает 1,20 м, глубина — 1,80 м [Рис. 111]. Заполнение ямы рыхлое, золистое с немногими мелкими камнями, костями животных, рыб и небольшим количеством керамических находок. Среди находок 50% фрагментов гончарной посуды, из которых 36% относятся к первым векам до нашей эры, остальные — неопределены. Внутри ямы, в ее заполнении, точно под горловиной, лежал плоский камень, который мог быть крышкой. Судя по размерам ямы, в ней могло храниться около 750 кг зерна.

Время использования помещения отнесено к первым векам до нашей эры. На наш взгляд, это было не жилое помещение, а большой хозяйствственный комплекс, связанный с хранением и переработкой зерна.

## Ямы первых веков нашей эры

**Яма 1/2013** располагалась у южной границы квадрата 116 [Рис. 45, 112]. Яма окружной в плане формы. Верхний контур неровный, диаметр ямы — 0,60 × 0,90 м, глубина — 0,33 м. Стенки сильно покатые. Коническое дно смещено к западной стенке [Рис. 113]. Яма заполнена золистым грунтом с костями и мелкими фрагментами керамики первых веков нашей эры. В верхнем слое заполнения ямы (на глубине 0,06 м) найдено горло оранжевоглиняной амфоры первой половины II в. н.э., № 88/2013 [Рис. 114].

**Яма 2/2013** располагалась на квадрате 116, в 0,20 м к северу от ямы 1/2013 [Рис. 45, 112]. Яма окружной в плане формы. Стенки отвесные, дно неровное, с торчащими камнями, и остатками глины вдоль стенок. Размеры ямы: диаметр по линии С–Ю — 1,30 м, по линии В–З — около 1,20 м, глубина — 0,48 м [Рис. 115]. Заполнение золистое, с рыбьей чешуей, костями животных и рыб, а также кусками обожженной глины. Здесь же найдено несколько невыразительных обломков керамики.

**Яма 3/2013** располагалась на квадрате 116, в 0,5 м к северо-востоку от ямы 2 [Рис. 45, 112]. Яма окружной в плане формы. Стенки отвесные, с уступами. Дно ровное. Диаметр ямы по линии С–Ю — 1,20 м, по линии В–З — 1,40 м, глубина — 0,36 м [Рис. 116]. В верхней части заполнения находилась мощная прослойка рыбьей чешуи, а также и куски обожженной глины толщиной 0,02 м, по-видимому, остатки очага. В остальной части заполнения найдены обгоревшие кости животных и рыб. Фрагменты керамики малочисленны и невыразительны.

Еще одна яма — 4/1/2013 — была впущена уже с уровня разрушения архитектурных сооружений на участке.

**Яма 4/1/2013** располагалась на квадрате 117, в 0,71 м к северо-востоку от его юго-западного угла [Рис. 81]. Верхний контур ямы был перекрыт прослойкой золы. У северной и западной части ямы находились плоские плиты, которыми она, по-видимому, была обложена [Рис. 117]. Яма овальной в плане формы. Её размеры: 1,30 м (С–Ю) и 1,10 м (В–З). Яма заполнена чистой золой, в которой находились кости крупного животного, древесный уголь и мелкие фрагменты керамики [Рис. 118]. Дном ямы служил глинистый пол помещения D (I в. до н.э.), остатки которого залегали ниже. В центральной части дна находилось забитое глиной устье более ранней ямы 4/2/2013.

## Литература

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## Summary

### **Tanais. Archaeological fieldwork 2012–2014**

W latach 2012–2014 ekspedycja archeologiczna Ośrodka Badań nad Antykiem Europy Południowo-Wschodniej i Instytutu Archeologii Uniwersytetu Warszawskiego kontynuowała prace wykopaliskowe w zachodniej części Tanais — wykop XXV.

Prace prowadzone były w głównej mierze we wschodniej części wykopu XXV — kwadraty 112–114 i 115–117. Ich celem było odsłonięcie pozostałości hellenistycznych fortyfikacji i fragmentu zabudowy miasta znajdujących się na północ (kwadraty 115–117) i południe (kwadraty 112–114) od bramy miejskiej.

### **Kwadraty 112–114**

W kwadracie 112 odsłonięty został fragment kuryny muru obronnego I oraz ulicy „b”. W tej części wykopu XXV zachodnie lico muru obronnego zostało niemal całkowicie rozebrane w późniejszym okresie historii miasta. Wschodnie lico muru obronnego zachowane było do wysokości 0,46 m. Na zachód od muru obronnego odkryta została warstwa substrukcji wykonanej z drobnego tłucznia kamiennego i gliny calcowej. Jej szerokość dochodziła do 1 m.

Prace prowadzone w kwadratach 113–114 doprowadziły do odsłonięcia znacznej części datowanego na I w. p.n.e. pomieszczenia C. Znajdowało się ono 1,00–1,15 m na wschód od kuryny

I muru obronnego. Od zachodu pomieszczenie to ograniczone było murem 13, od północy murem 17 stanowiącym jednocześnie południową granicę pomieszczenia B. Podłoga pomieszczenia wykonana została z ubitej gliny. Na poziomie podłogi pomieszczenia przy wschodnim licu muru 13, około 0,25 m na północ od południowego profilu kwadratu 113, odkryte zostały pozostałości gliniano-kamiennego pieca nr 2. We wschodniej części pomieszczenia C w glinianej podłodze znajdowała się cylindryczna jama zasobowa (jama 1/2014) o głębokości 1,25 m.

W późniejszym okresie swego funkcjonowania powierzchnia pomieszczenia C została ograniczona zbudowanym od północy murem 19 oraz murem 20 od wschodu. Pomiędzy murami 17 i 19 powstała wtedy ulica „c” o szerokości około 0,90 m.

### **Kwadraty 115–117**

W kwadracie 115 odsłonięte zostały północna część ulicy „b”, biegąca wzdułż kurtyny muru obronnego II, oraz pomieszczenie D o powierzchni 27,20 m<sup>2</sup>. Było ono ograniczone murami 18 (od północy), 14 (od południa), 21 (od wschodu) i 11 (od zachodu). Podłogę pomieszczenia stanowiła wielokrotnie odnawiana polepa. W jego centralnej części znajdowało się okrągłe, wyłożone gliną palenisko o maksymalnej średnicy 1,44 m. W podłodze pomieszczenia D znajdowały się również trzy jamy zasobowe — jama 4/2/2013, 5/2013 i 6/2013.

W warstwach śmiertnikowych znajdujących się powyżej pomieszczenia D odkryty został horyzont z trzema jamami (jamy 1/2013, 2/2013 i 3/2013) datowanymi na okres rzymski. Czwarta z jam (4/1/2013) datowanych na pierwsze wieki naszej ery odkryta została bezpośrednio nad jamą 4/2/2013. Jej dno stanowiła podłoga pomieszczenia D. Wylot wcześniejszej jamy 4/2/2013 przykryty został warstwą gliny.

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Рис. 1. Генплан раскопа XXX с архитектурными объектами 1999–2015 гг.



Рис. 2. Общий план раскопа XXV в виде ортофото карты

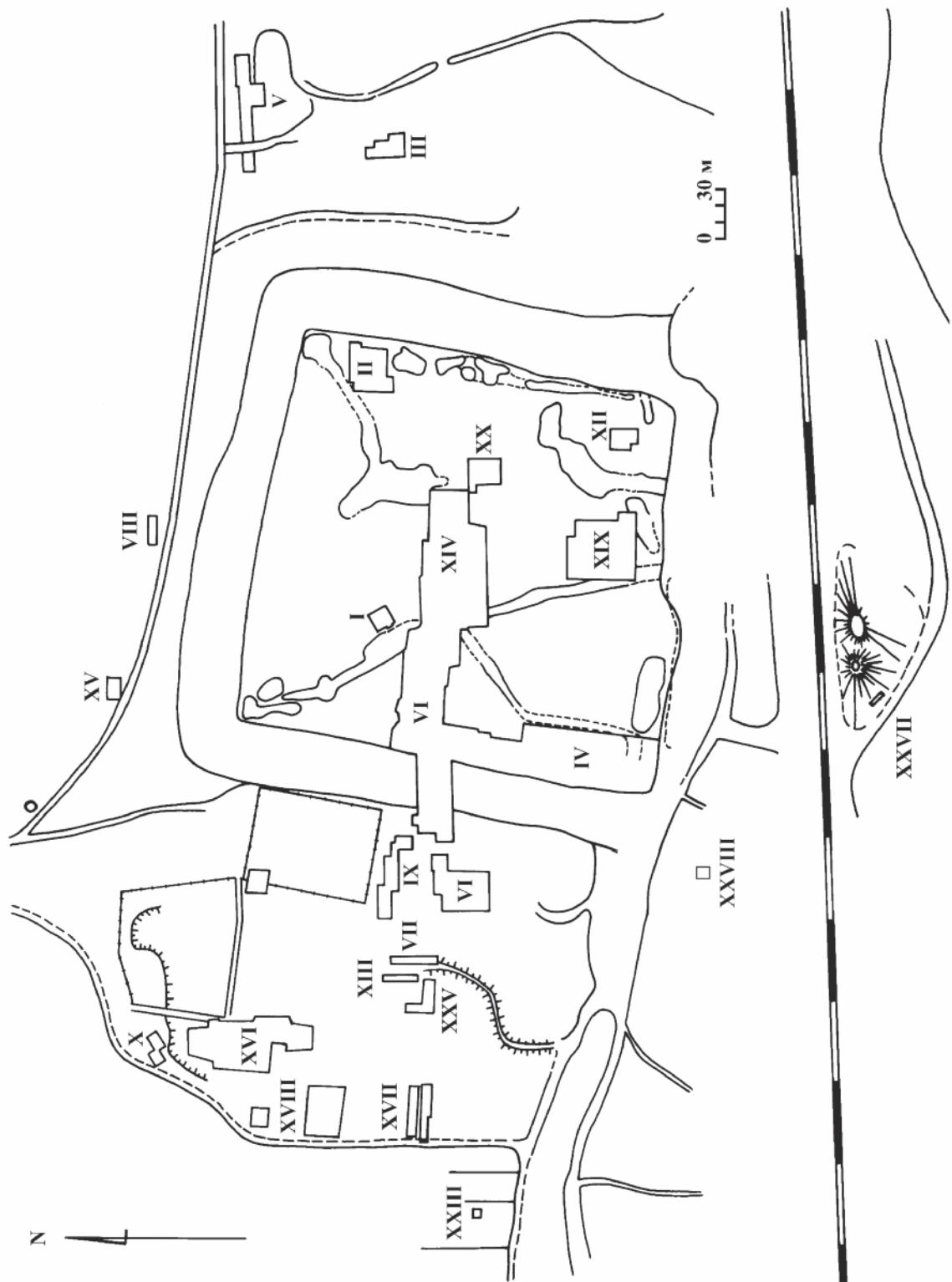


Рис. 3. Генплан городища Танаис с исследованными раскопами



Рис. 4. Фрагмент ручки родосской амфоры с клеймом, № 7/2012



Рис. 5. Фрагмент ручки родосской амфоры с клеймом, № 52/2012



Рис. 6. Фрагмент краснолакового кубка с росписью, № 5/2012

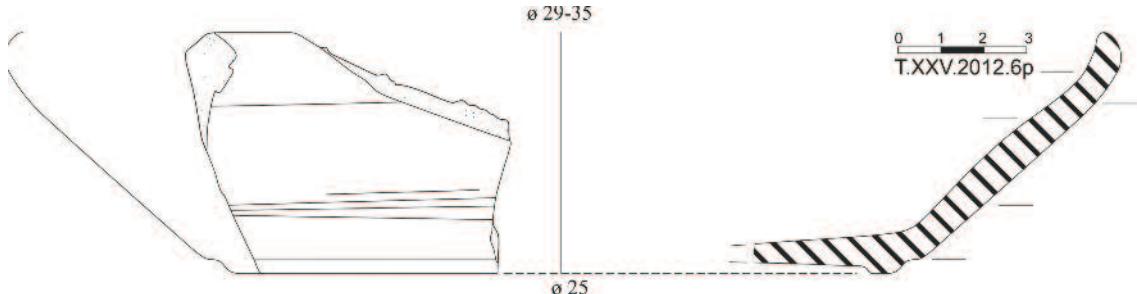
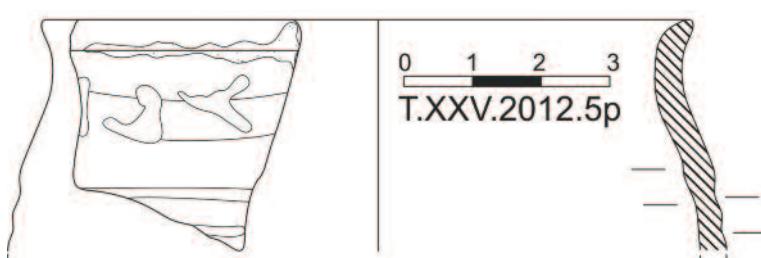


Рис. 7. Фрагмент краснолаковой миски, № 6/2012

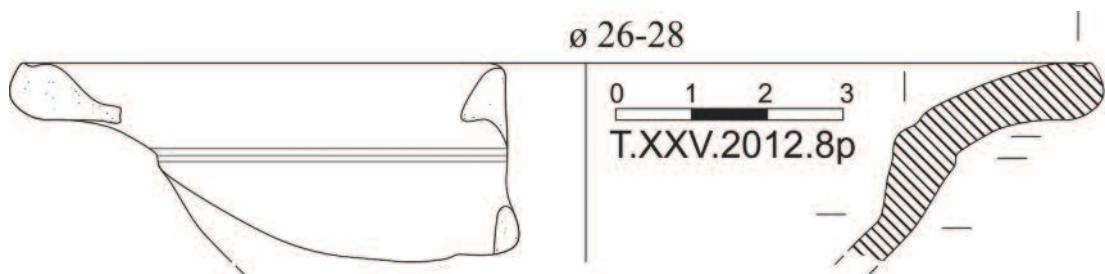


Рис. 8. Фрагмент краснолаковой миски, № 8/2012



Рис. 9. Лепной горшок, № 1/2012

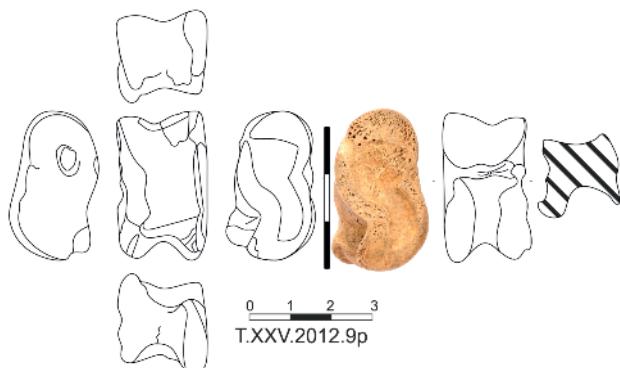


Рис. 10. Обработанный астрагал, № 9/2012

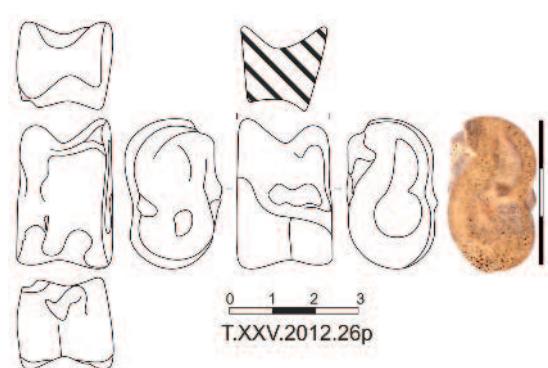


Рис. 11. Обработанный астрагал, № 26/2012



Рис. 12. Костяная проколка, № 4/2012

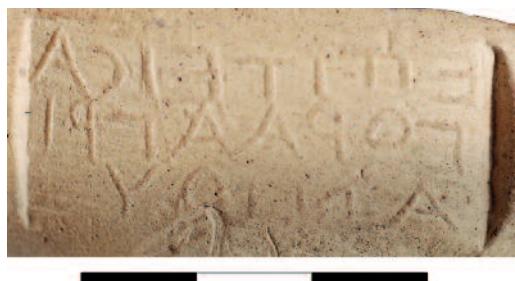


Рис. 13. Фрагмент ручки родосской амфоры с клеймом, № 24/2012

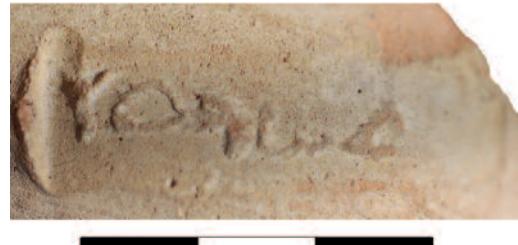


Рис. 14. Фрагмент ручки родосской амфоры с клеймом, № 38/2012



Рис. 15. Фрагмент ручки родосской амфоры с клеймом, № 40/2012



Рис. 16. Фрагмент ручки родосской амфоры с клеймом, № 50/2012

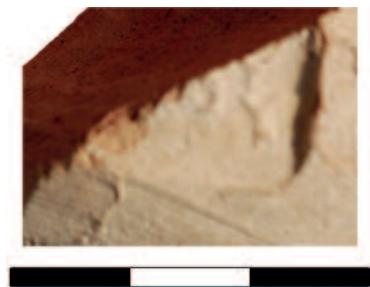


Рис. 17. Фрагмент ручки родосской амфоры с клеймом, № 55/2012



Рис. 18. Фрагмент ручки родосской амфоры с клеймом, № 56/2012

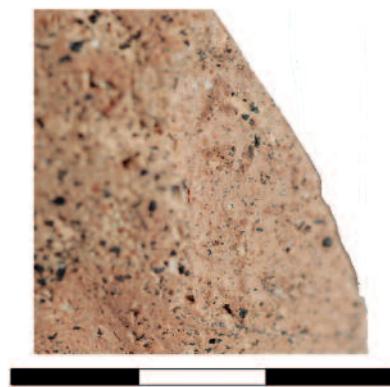


Рис. 19. Фрагмент ручки синопской амфоры с клеймом, № 23/2012

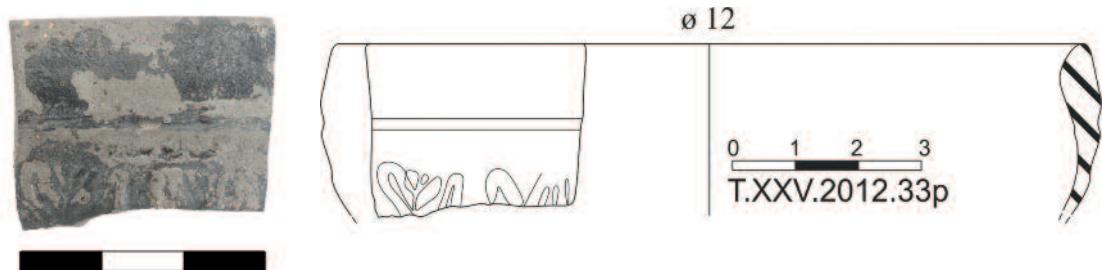


Рис. 20. Фрагмент мегарской чаши, № 33/2012

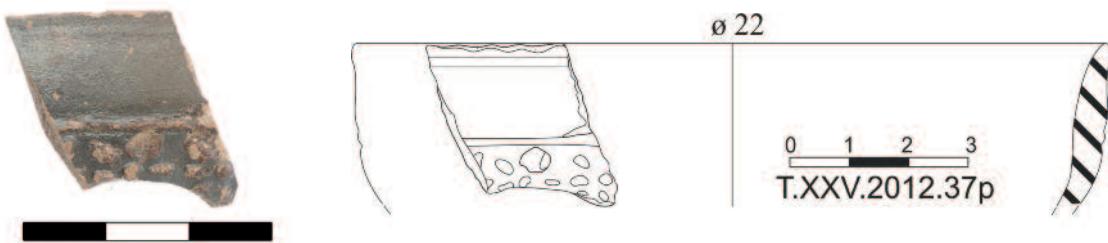


Рис. 21. Фрагмент мегарской чаши, № 37/2012

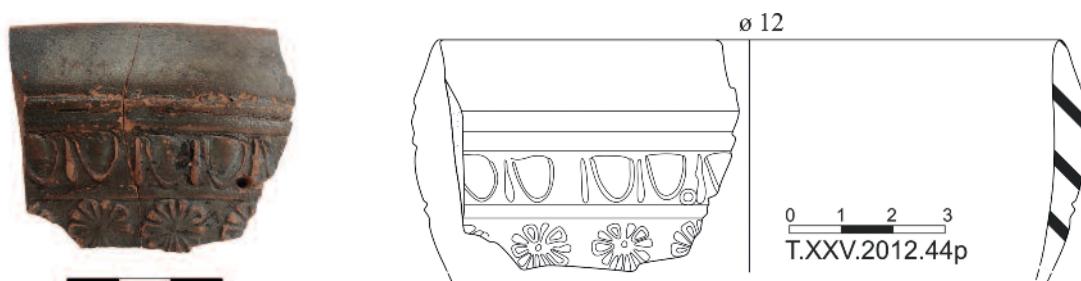


Рис. 22. Фрагмент мегарской чаши, № 44/2012

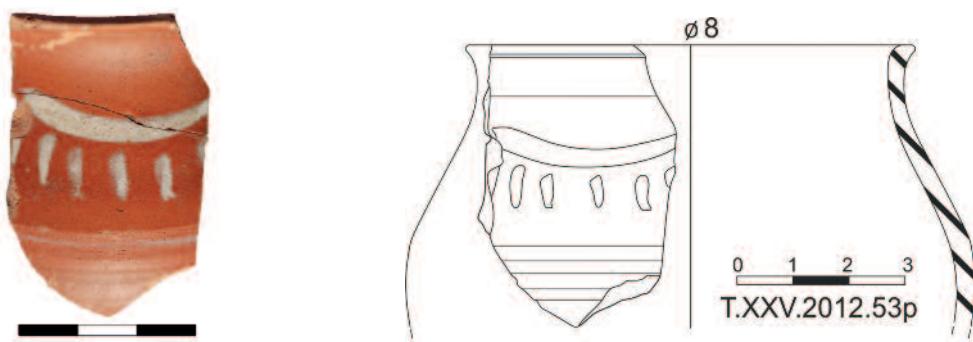


Рис. 23. Фрагмент расписанного краснолакового кубка, № 53/2012

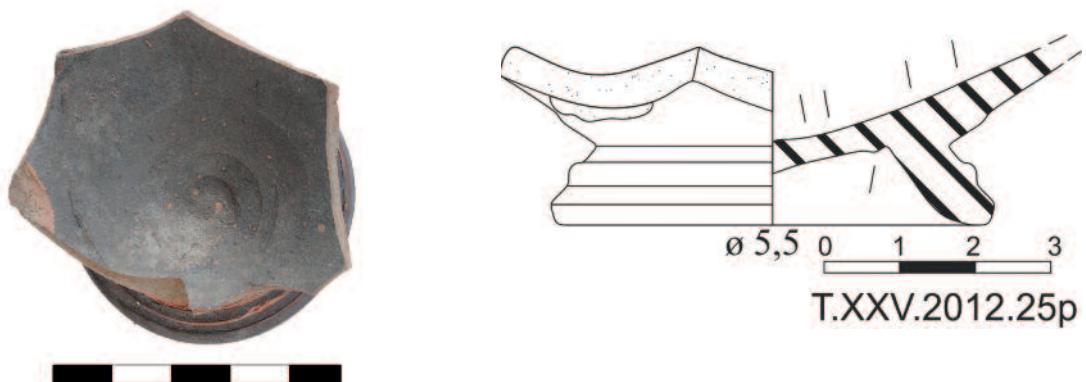


Рис. 24. Дно чернолакового сосуда, № 25/2012

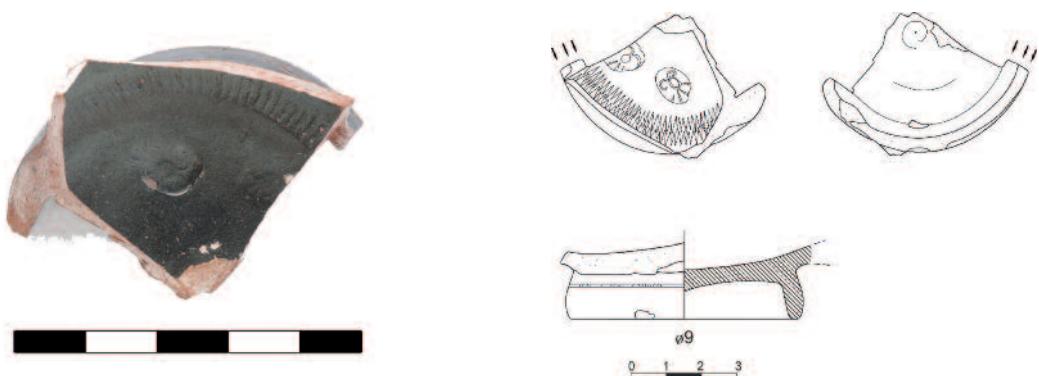


Рис. 25. Дно чернолакового блюда, № 17/2012



Рис. 26. Ручка чернолакового канфара, № 45/2012

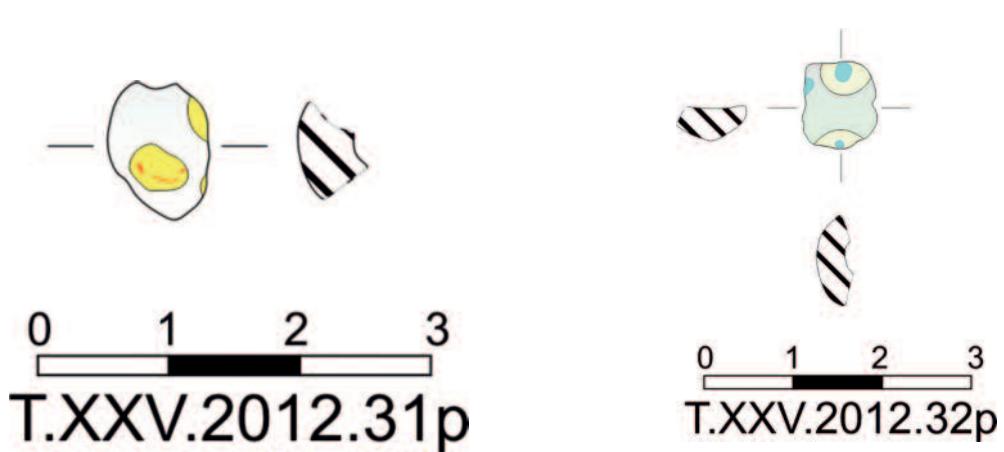


Рис. 27. Фрагмент глазчатой бусины, № 31/2012

Рис. 28. Фрагмент глазчатой бусины, № 32/2012



Рис. 29. Бронзовая монета времени Митридата Евпатора, № 28/2012

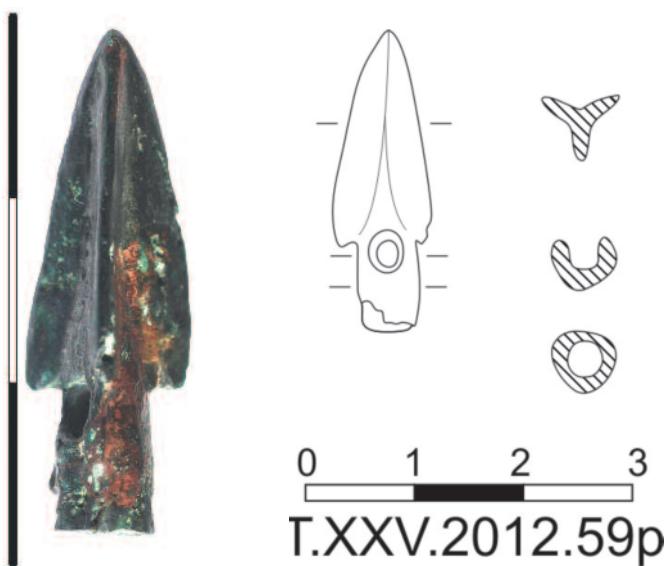


Рис. 30. Бронзовый наконечник стрелы, № 59/2012

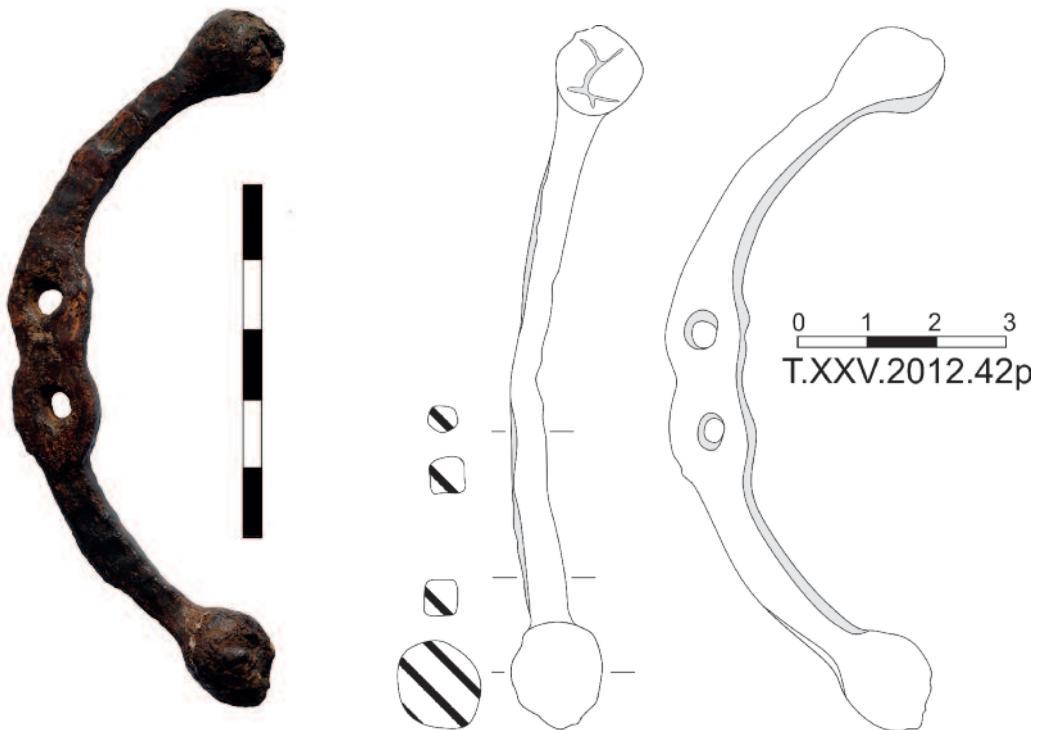


Рис. 31. Железный псалий С-овидной формы, № 42/2012

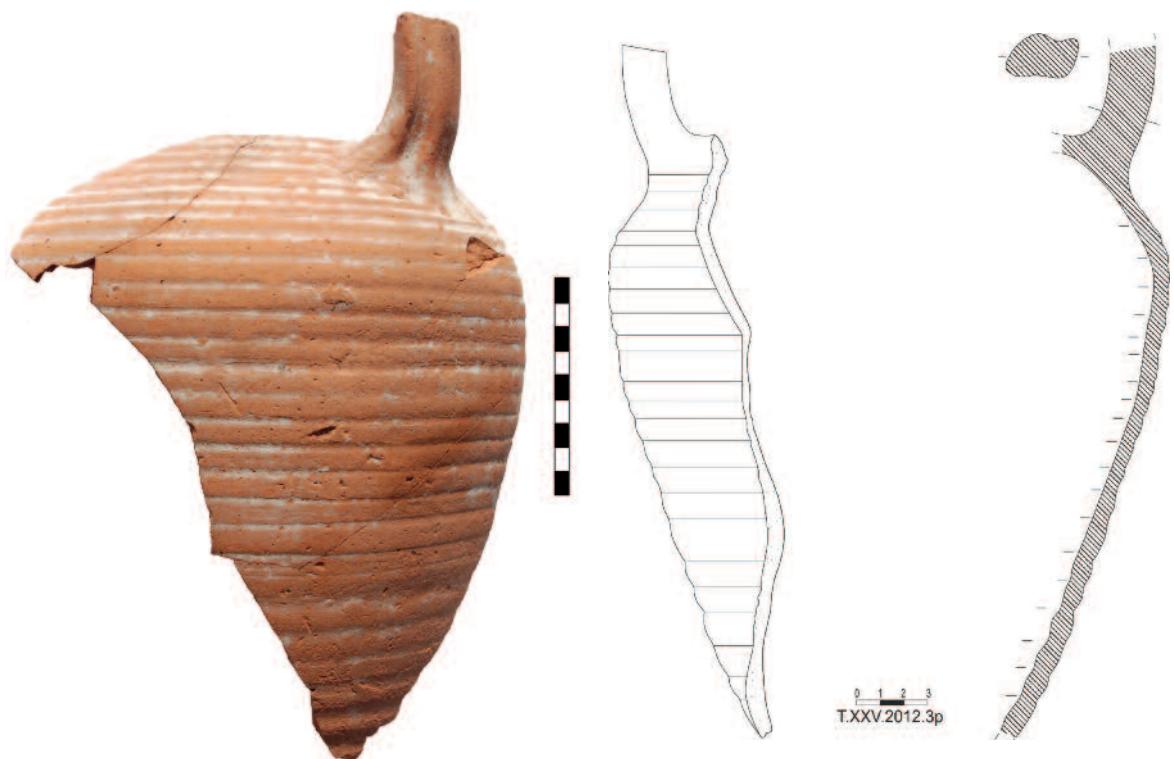


Рис. 32. Фрагмент тулова амфоры неопределенного центра, № 3/2012

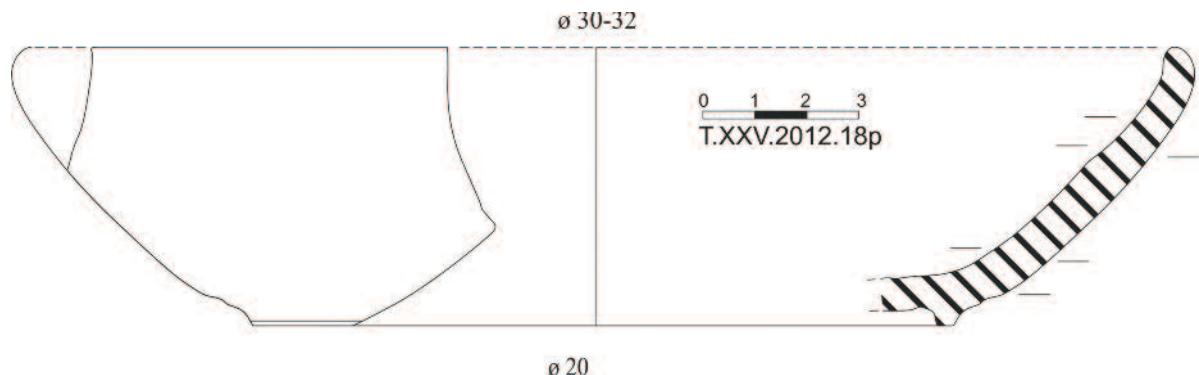


Рис. 33. Фрагмент краснолаковой миски, № 18/2012

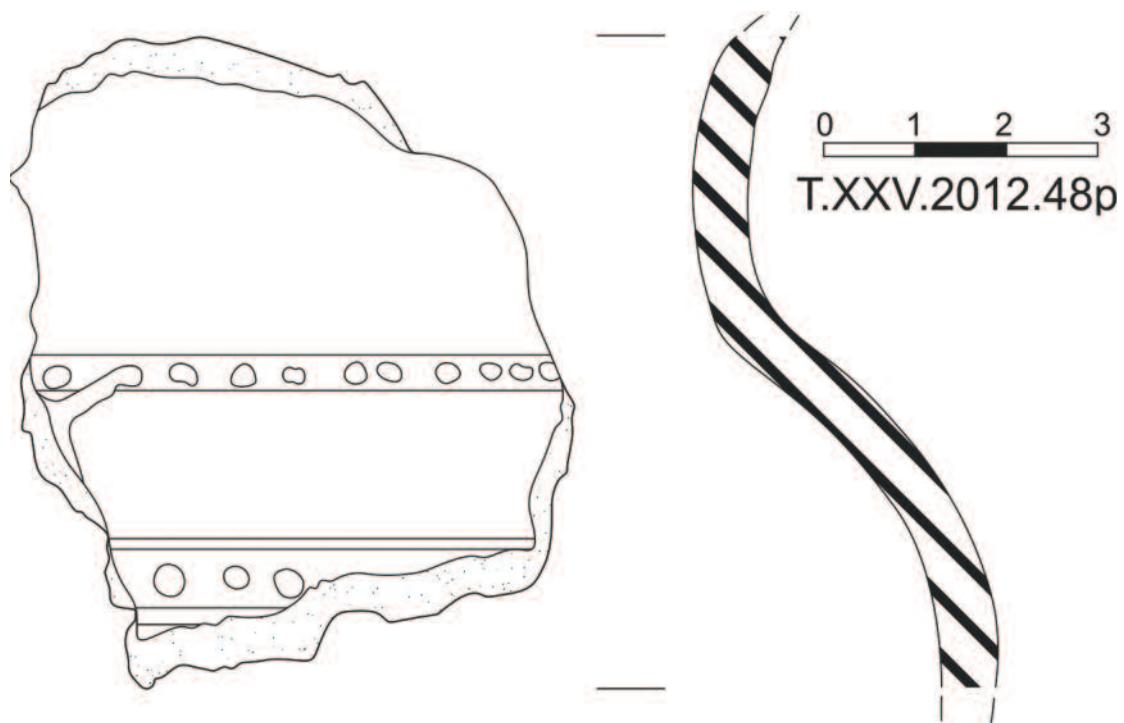


Рис. 34. Верхняя часть лепного горшка, № 48/2012



Рис. 35. Раскоп XXV, кв. 112–113, остатки куртины I, вид с севера



Рис. 36. Раскоп XXV, кв. 112–113, остатки куртины I, вид с юга

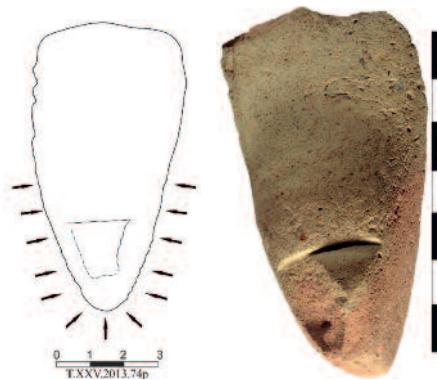


Рис. 37. Терочник из обломка амфоры,  
№ 74/2013

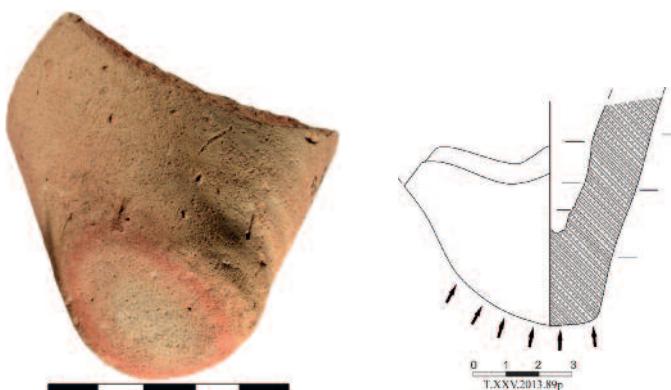


Рис. 38. Терочник из ножки амфоры,  
№ 89/2013

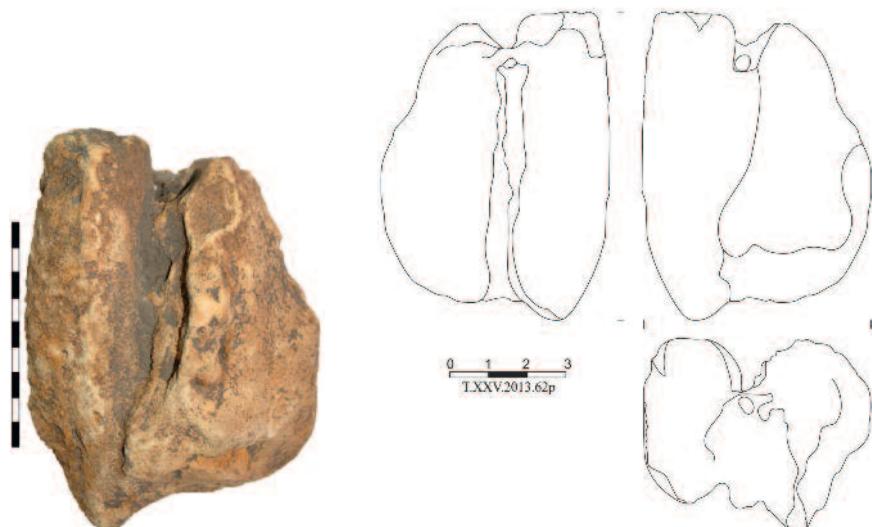


Рис. 39. Каменный якорь, № 62/2013

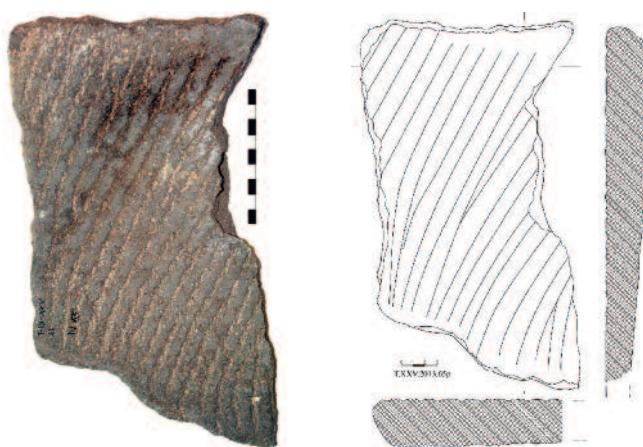


Рис. 40. Фрагмент каменного жернова, № 65/2013



Рис. 41. Раскоп XXV, кв. 113, улица «б», вид с севера



Рис. 42. Раскоп XXV, кв. 113, улица «б», вид с юга



Рис. 43. Мостовая улицы «б» в кв. 115 и стена 11, вид с северо-востока



Рис. 44. Мостовая улицы «б» в кв. 115 и стена 11,  
вид с северо-востока

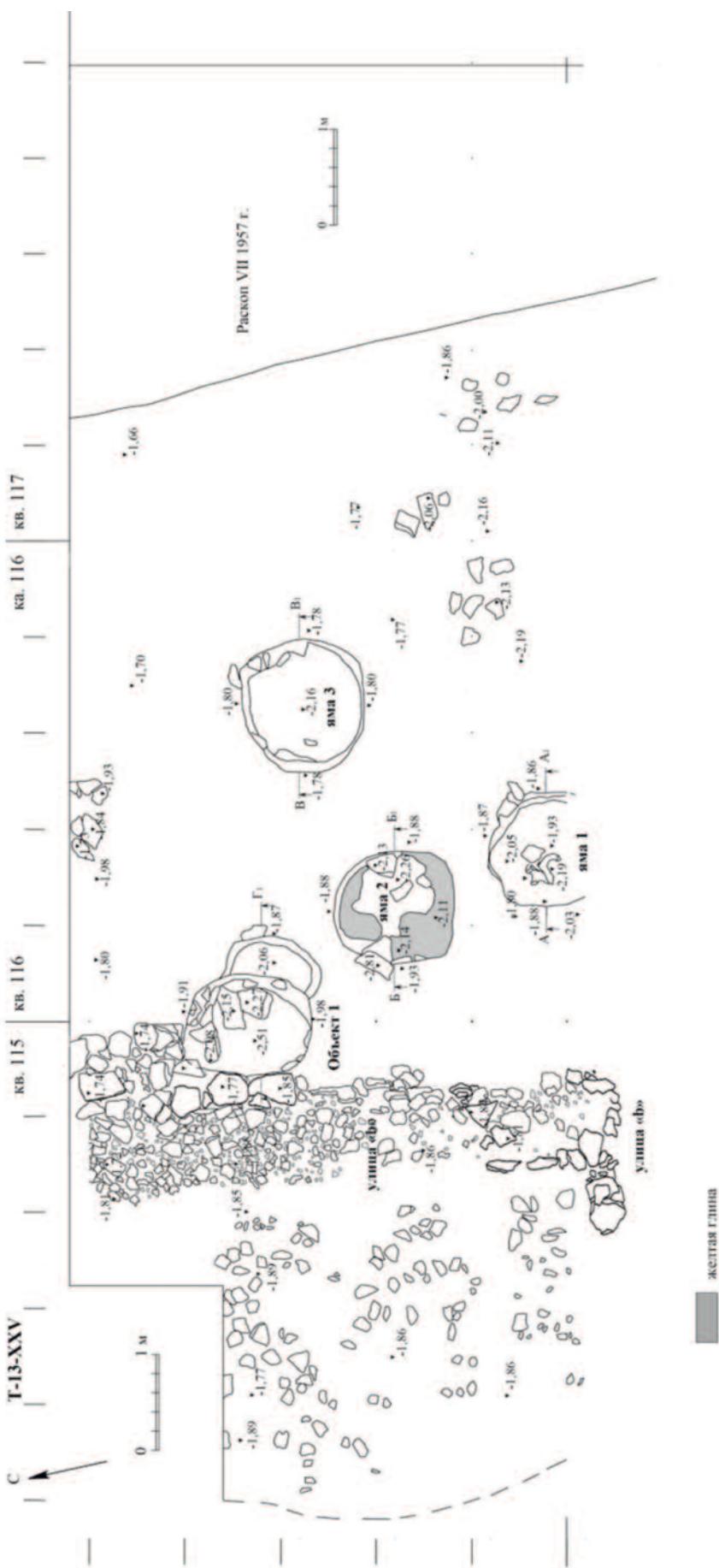


Рис. 45. План расположения архитектурных объектов в квадратах 115–117 (верхний уровень)



Рис. 46. План расположения архитектурных объектов в квадратах 112–114



Рис. 47. Помещение С, вид с севера



Рис. 48. Помещение С, вид с юго-запада



Рис. 49. Помещение С, каменно-глиняная печь 2 после разборки внутренней глинистой части,  
вид с востока



Рис. 50. Помещение С, каменно-глиняная печь 2 после разборки внутренней глинистой части,  
вид с юга



Рис. 51. Помещение С, каменно-глиняная печь 2, вид с востока



Рис. 52. Помещение С, каменно-глиняная печь 2, разрез по линии В–З, вид с севера

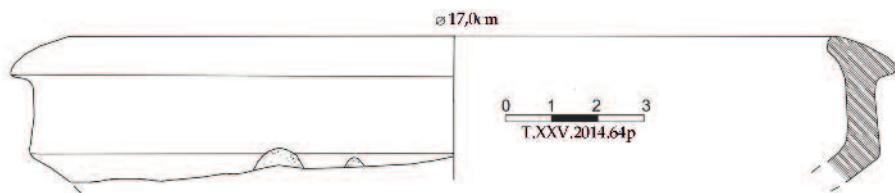


Рис. 53. Фрагмент лощеной миски, № 64/2014



Рис. 54. Яма 1/2014 в полу помещения С, вид с востока



Рис. 55. Яма 1/2014 в полу помещения С, с северной стороны камни, обвалившиеся вместе с горловиной внутрь ямы, вид с юга

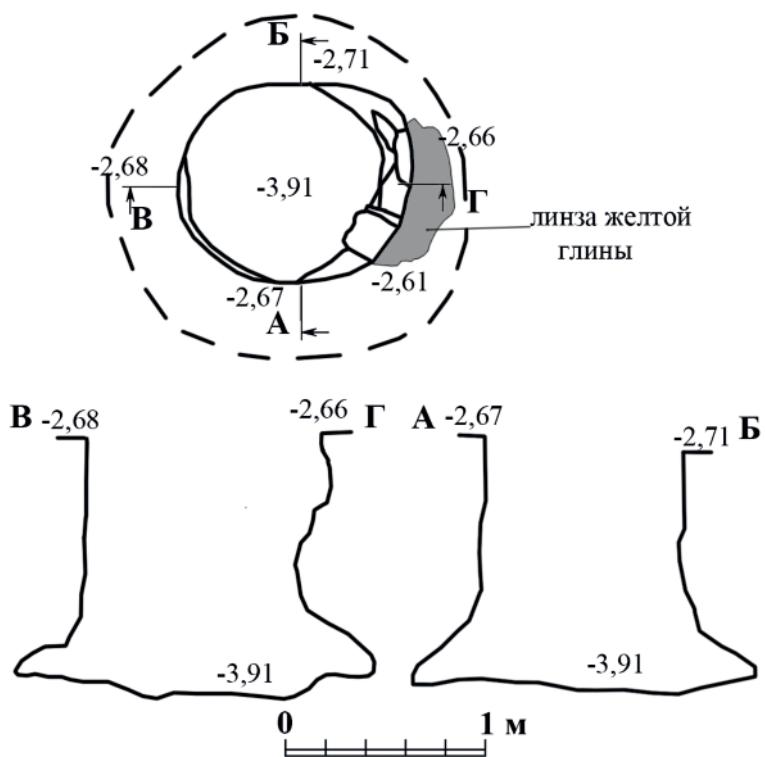


Рис. 56. План и разрез ямы 1/2014 по линии С–Ю и В–З



Рис. 57. Яма 1/2014. Стратиграфический разрез заполнения ямы по линии С–Ю, вид с востока, сверху



Рис. 58. Фрагмент узкогорлой светлоглиняной амфоры типа А, № 65/2014



Рис. 59. Фрагмент колхидской амфоры, № 95/2014

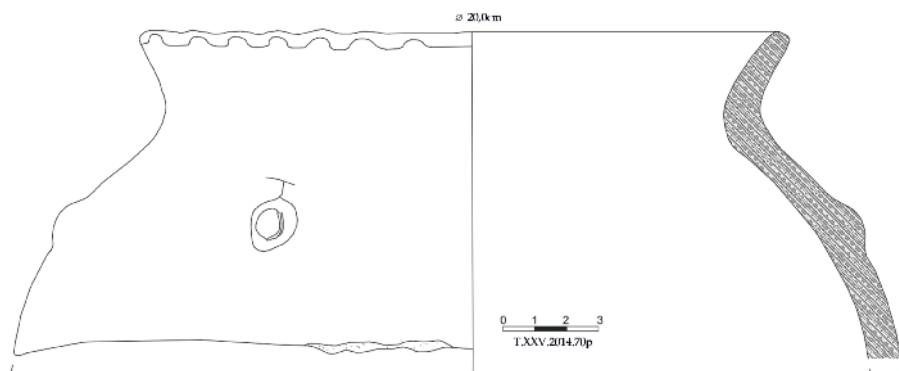


Рис. 60. Фрагмент верхней части лепного сосуда, № 70/2014

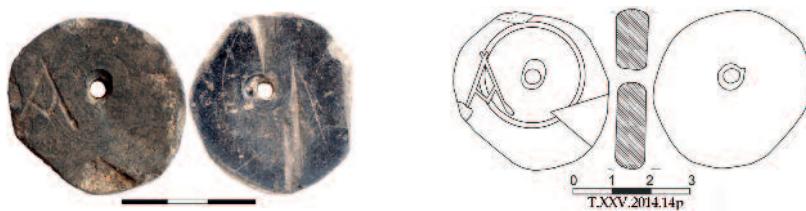


Рис. 61. Пряслице с граффито, № 14/2014

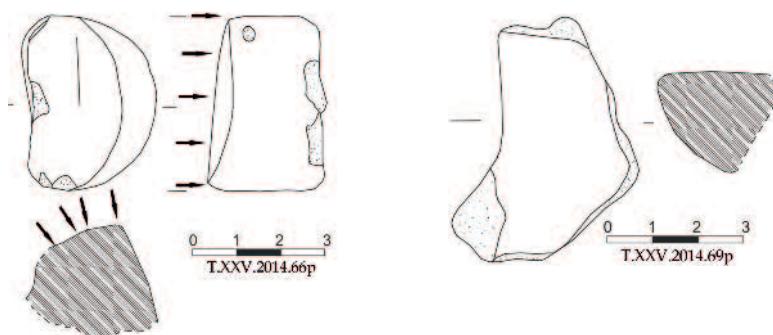


Рис. 62. Терочник из ручки родосской амфоры, № 66/2014

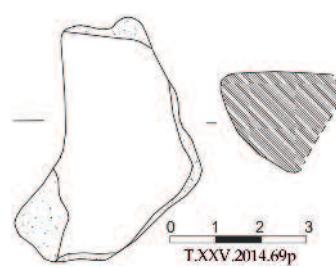


Рис. 63. Терочник из ручки родосской амфоры, № 69/2014

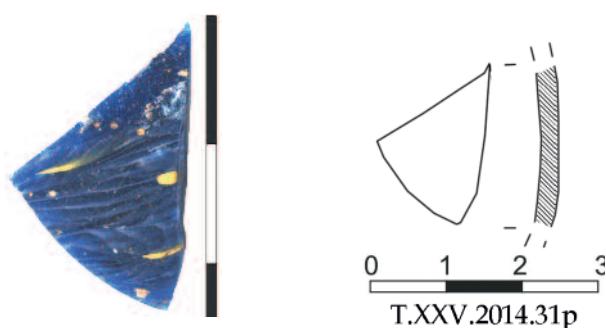


Рис. 64. Фрагмент стенки стеклянного сосуда, № 31/2014



Рис. 65. Железный нож, № 49/2014

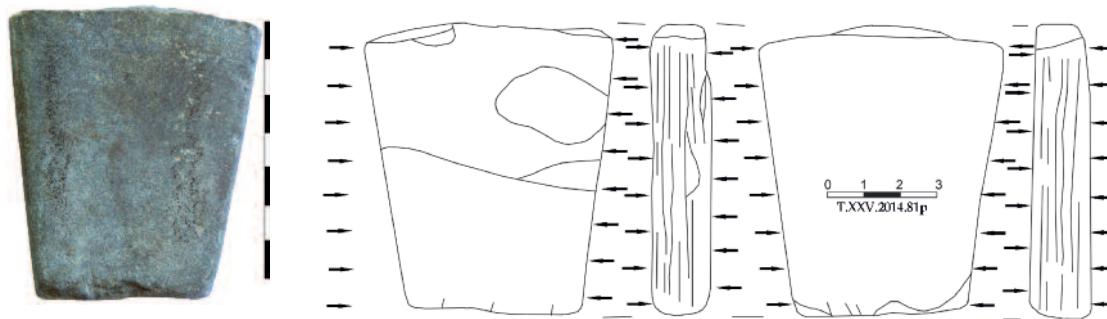


Рис. 66. Фрагмент каменного оселка, № 81/2014

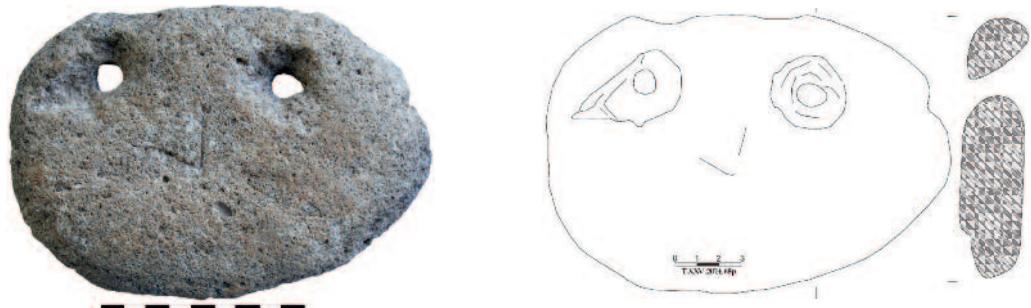


Рис. 67. Каменное рыболовное грузило, № 68/2014

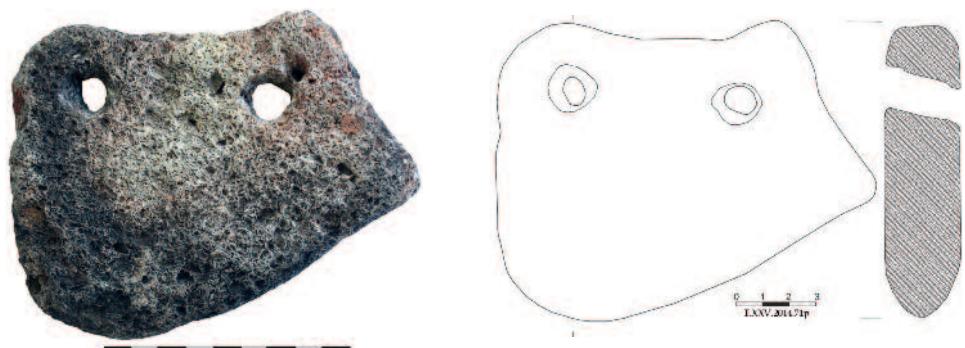


Рис. 68. Каменное рыболовное грузило, № 71/2014



Рис. 69. Каменное рыболовное грузило, № 76/2014



Рис. 70. Помещение С1, вид с юга



Рис. 71. Помещение С1, вид с востока



Рис. 72. Мусорный слой выравнивания над полом помещения С, вид с юго-востока



Рис. 73. Остатки глиняных конструкций печи 1 в помещении С1, вид с юга



Рис. 74. Остатки глиняных конструкций печи 1 в помещении С1, вид с запада сверху



Рис. 75. Разрез через остатки глиняных конструкций печи 1 в помещении С1, вид с севера



Рис. 76. Остатки глиняных конструкций печи 1 в помещении С1 во время расчистки, вид с запада

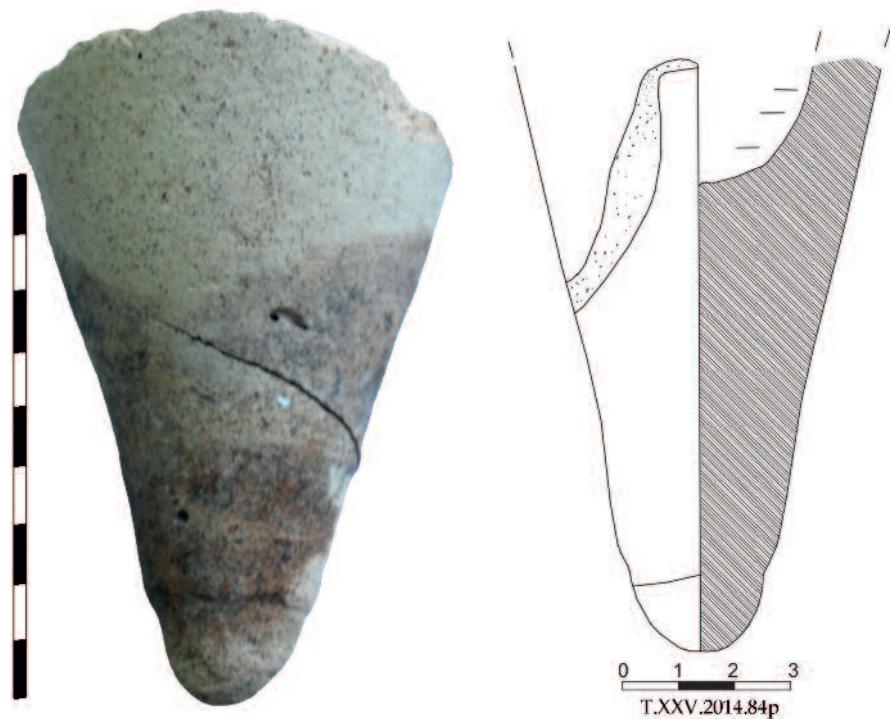


Рис. 77. Ножка псевдокосской амфоры гераклейского производства, № 84/2014

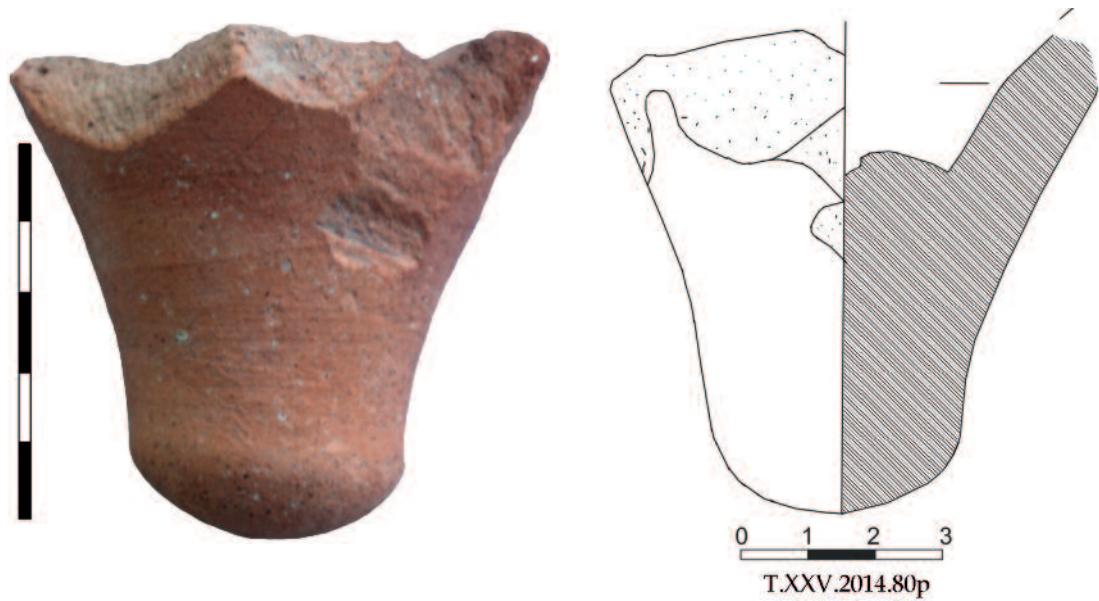


Рис. 78. Ножка синопской амфоры, № 80/2014

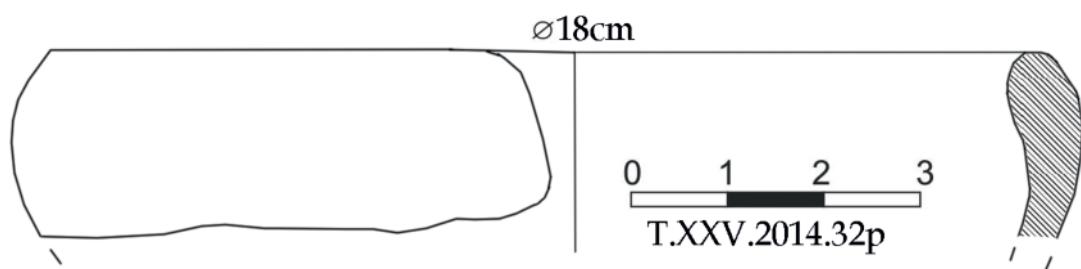


Рис. 79. Фрагмент венчика краснолаковой миски, № 32/2014

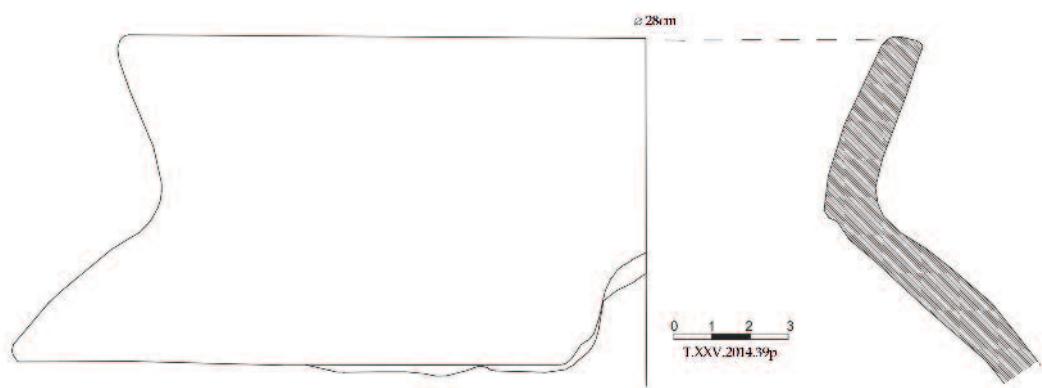


Рис. 80. Фрагмент горла лепного горшка, № 39/2014

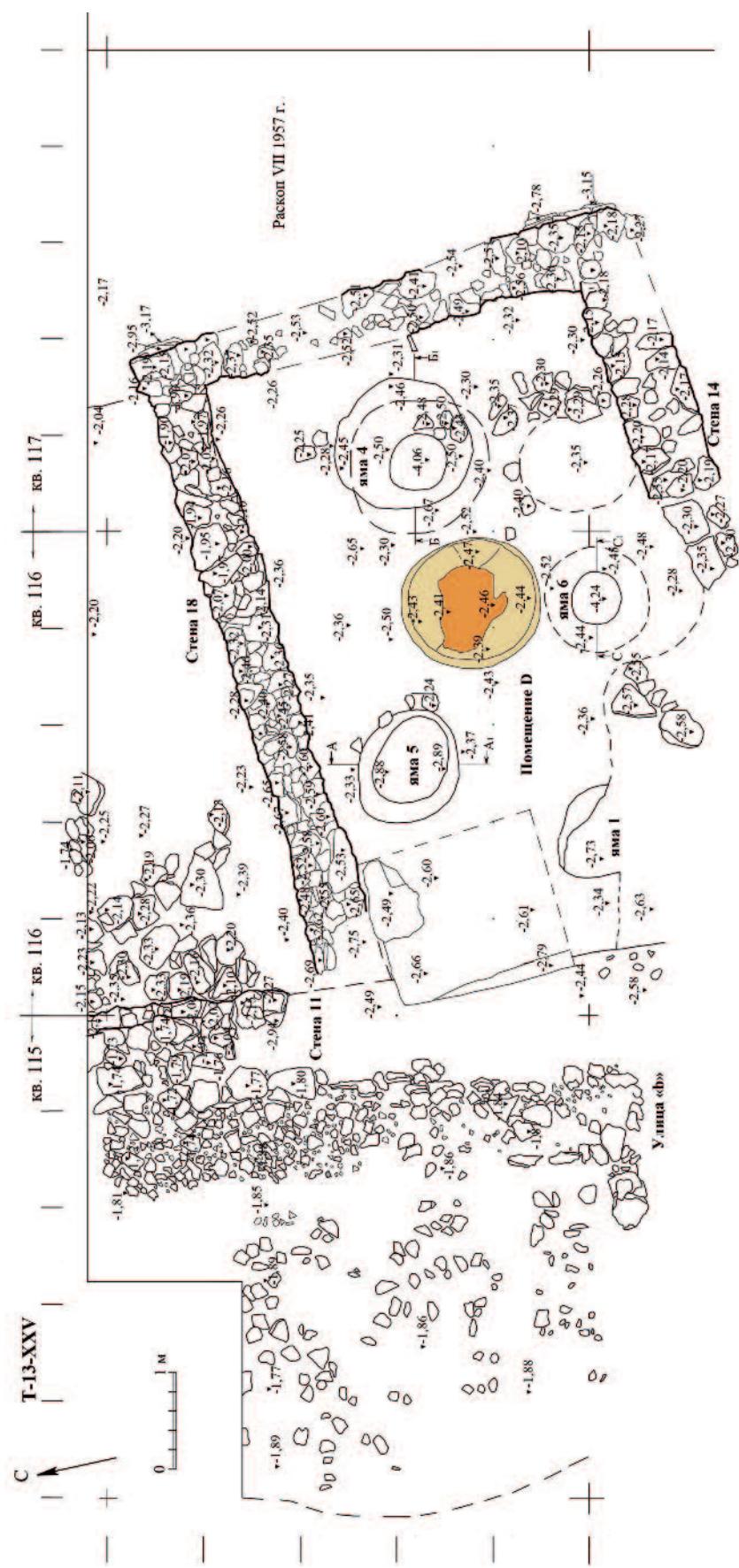


Рис. 81. План расположения архитектурных объектов в квадратах 115–117 (нижний уровень)



Рис. 82. Помещение D в кв. 115–117 в начале работ 2014 года, после зачистки пола, вид с севера



Рис. 83. Помещение D в кв. 115–117 в начале работ 2014 года, после зачистки пола, вид с востока



Рис. 84. Помещение D в кв. 115–117 в процессе работ 2014 года, вид с востока



Рис. 85. Помещение D в кв. 115–117 в процессе работ 2014 года, вид с северо-востока



Рис. 86. Стена 18 помещения D, вид с запада



Рис. 87. Стена 21 помещения D, вид с севера



Рис. 88. Стена 21 помещения D, южный участок, восточный фас, вид с востока



Рис. 89. Стена 21 помещения D, северный участок, восточный фас, вид с востока



Рис. 90. Стена 14 и стена 21, образующие ЮВ угол помещения D,  
вид с востока



Рис. 91. Траншея под фундамент стены 11 помещения D, вид с севера



Рис. 92. Северо западный угол помещения D с участком зачистки разных уровней глиняных полов, вид с юго-запада



Рис. 93. Раскоп XXV, кв. 117–116, помещение D с хозяйственными ямами, вид с севера



Рис. 94. Фрагмент ручки родосской амфоры с клеймом, № 28/2014

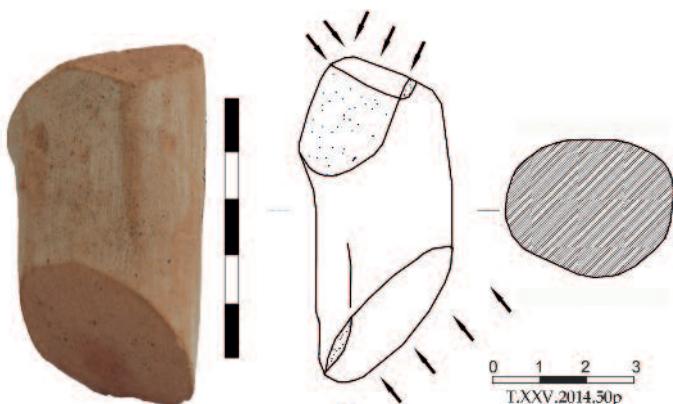


Рис. 95. Терочник из ручки родосской амфоры, № 50/2014

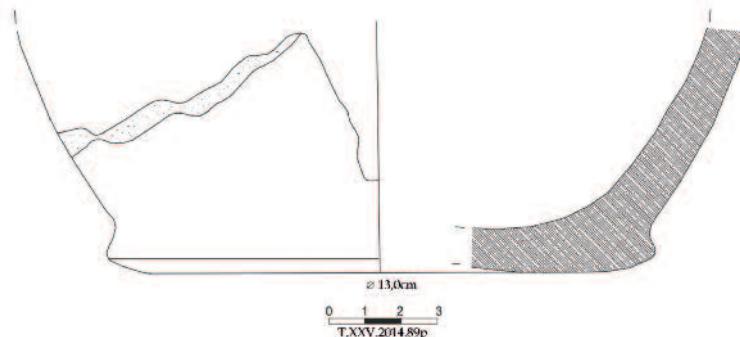


Рис. 96. Дно лепного сосуда, № 89/2014



Рис. 97. Глиняное прядлище, № 59/2014

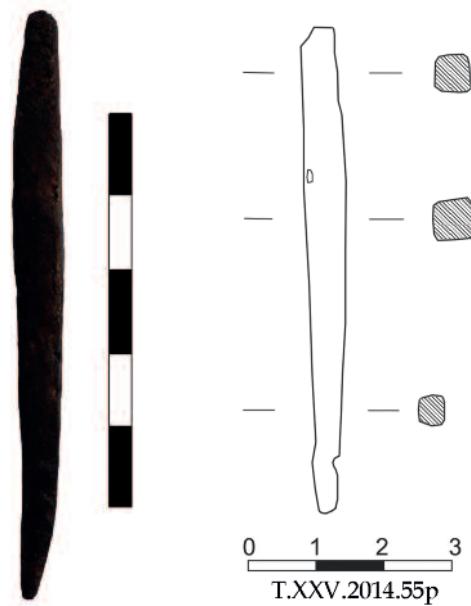


Рис. 98. Железный гвоздь, № 55/2014

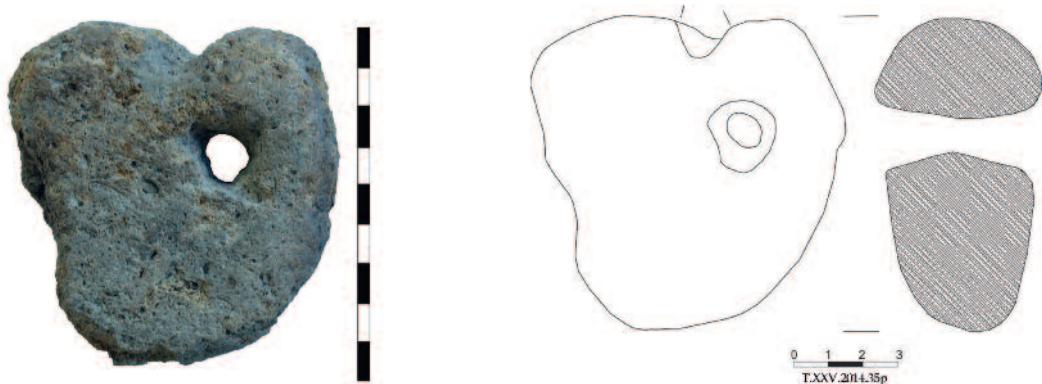


Рис. 99. Каменное рыболовное грузило, № 35/2014



Рис. 100. Каменное рыболовное грузило, № 54/2014



Рис. 101. Каменное рыболовное грузило, № 57/2014

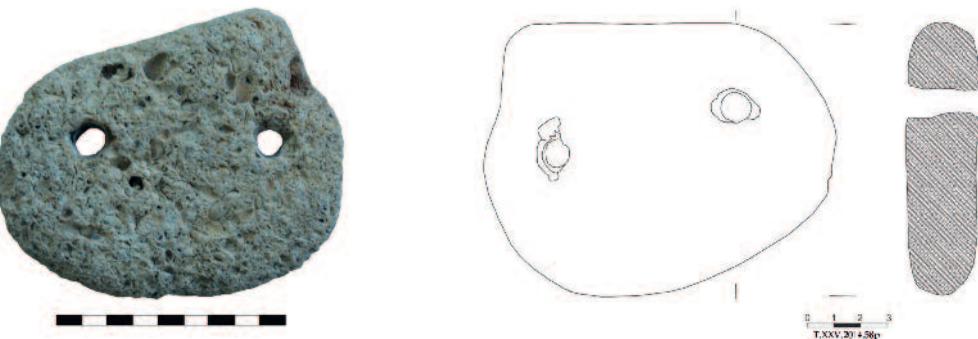


Рис. 102. Каменное рыболовное грузило, № 58/2014

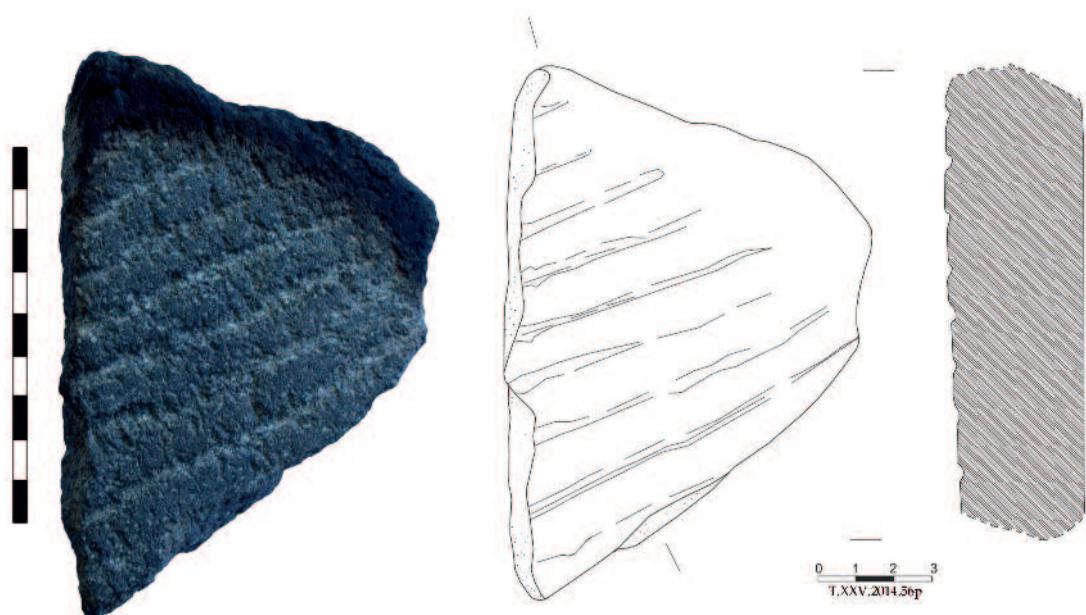


Рис. 103. Фрагмент каменного жернова, № 56/2014



Рис. 104. Глиняный очаг в центре помещения D, вид с севера

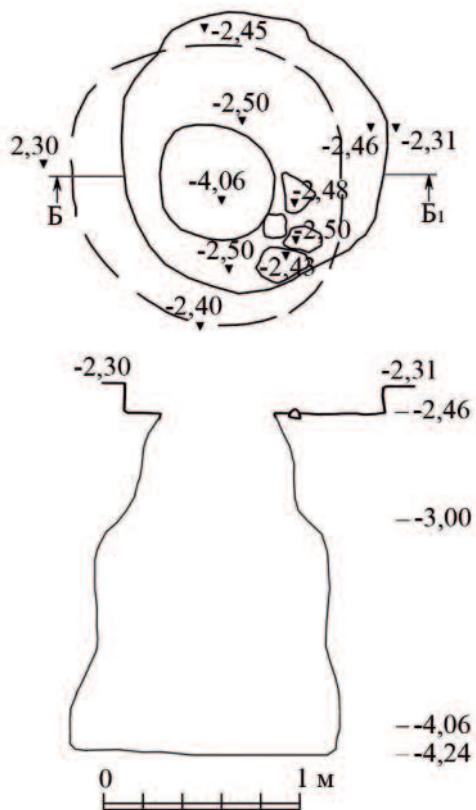


Рис. 105. План и разрез ямы 4/2/2013  
в восточной части помещения D



T.XXV.2013.46p

Рис. 106. Фрагмент стенки мегарской  
чаши, № 46/2013

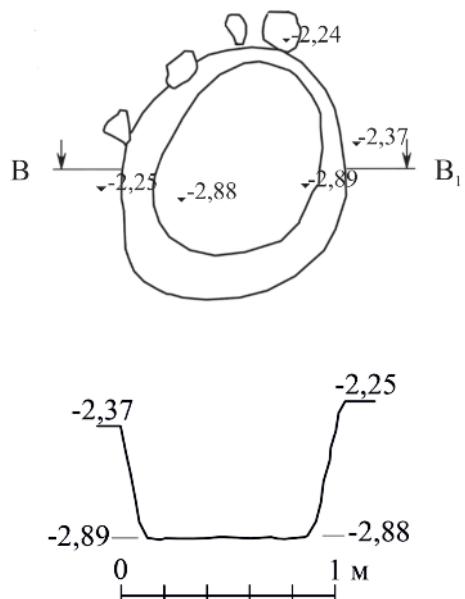


Рис. 107. План и разрез ямы 5/2013  
в помещении D

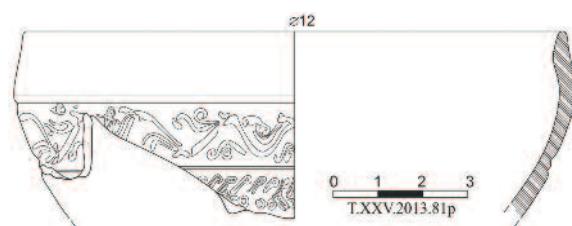


Рис. 108. Фрагмент мегарской чаши  
со следами ремонта, № 81/2013



Рис. 109. Терочник из ручки родосской амфоры, № 76/2013



Рис. 110. Каменный подпятник, № 66/2013

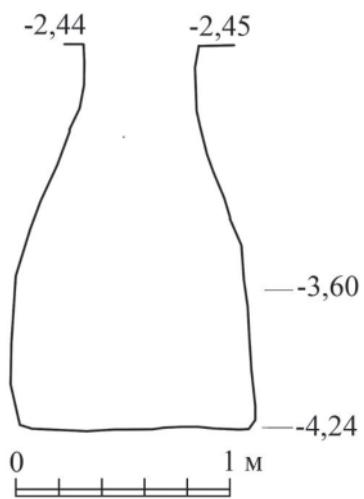
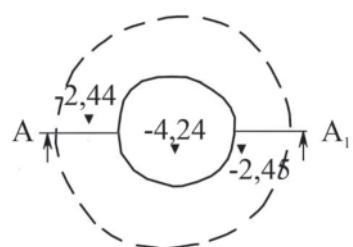


Рис. 111. План и разрез ямы 6/2013 в помещении D



Рис. 112. Раскоп XXV, кв. 115–117, ямы первых веков н.э., вид с востока

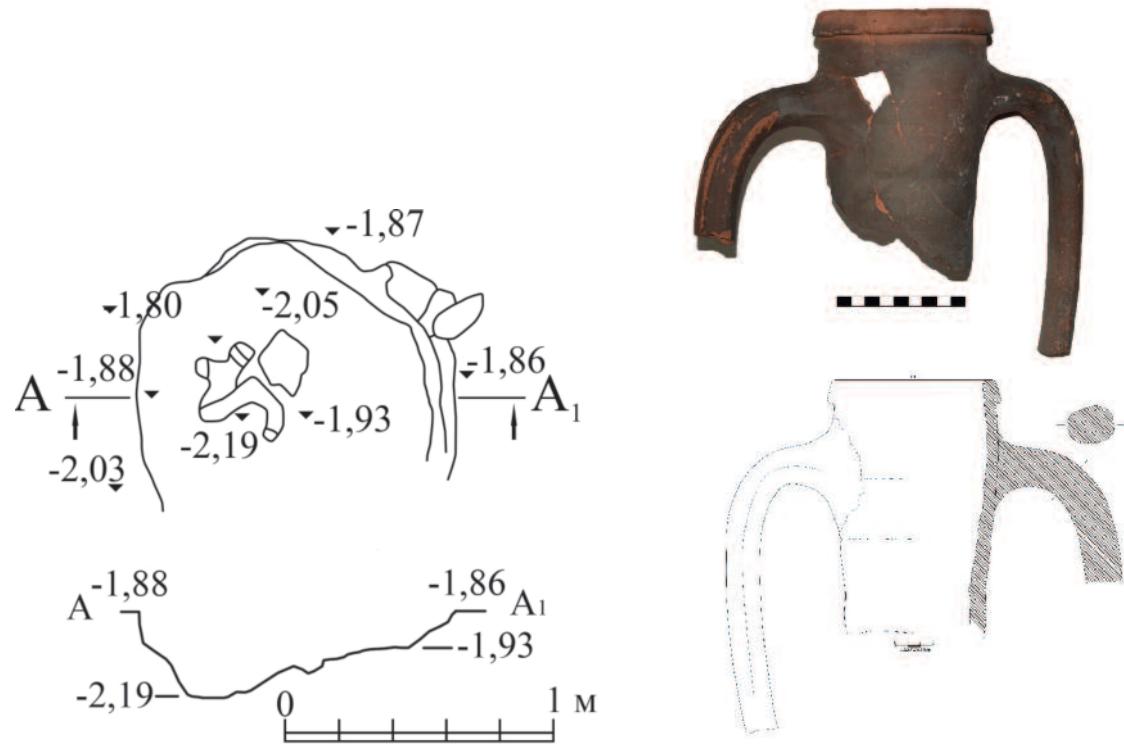


Рис. 113. План и разрез ямы 1/2013  
в квадрате 116

Рис. 114. Горло оранжевоглиняной  
амфоры, № 88/2013

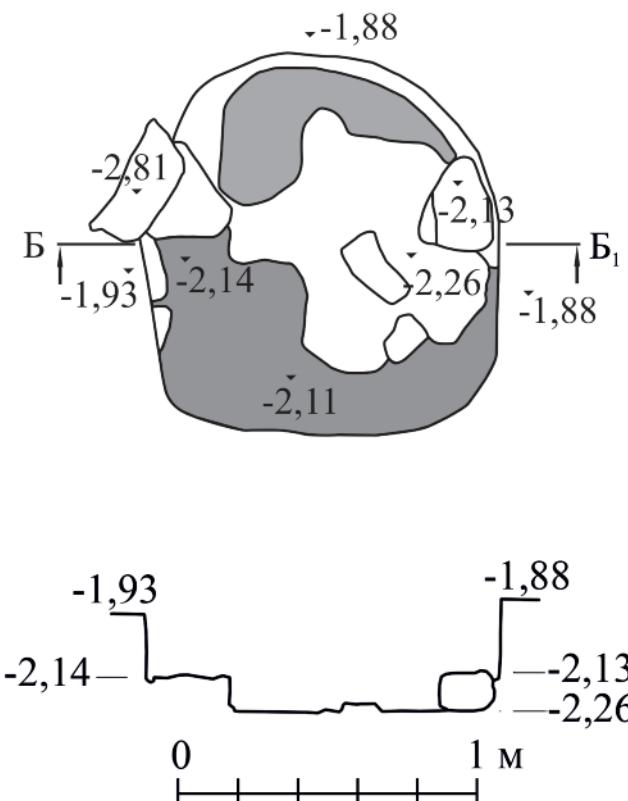


Рис. 115. План и разрез ямы 2/2013 в квадрате 116

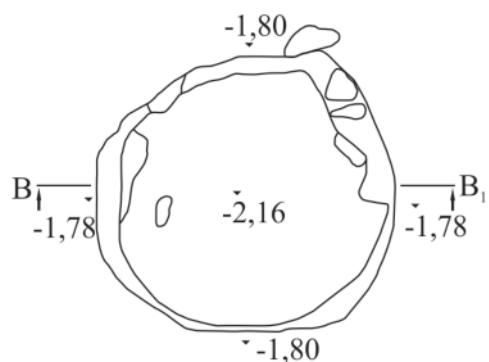


Рис. 116. План и разрез ямы 3/2013 в квадрате 116



Рис. 117. Раскоп XXV, кв. 117–116, верхний уровень ямы 4 (яма 4/1/2013), обложенной камнями, вид с севера



Рис. 118. Раскоп XXV, кв. 117–116, верхний уровень ямы 4, обложенной камнями, с костями животных в золистом заполнении, вид с юга

Małgorzata Daszkiewicz  
Manja Wetendorf  
Ewa Bobryk  
Gerwulf Schneider

## MUSAWWARAT ES-SUFRA — IN SEARCH OF CERAMIC RAW MATERIALS

**Abstract:** Laboratory analysis of pottery discovered at Musawwarat es Sufra revealed the presence of wares made from wadi clays, hafir clays and alluvial clays. Searching for the source of the raw materials was carried out: 1) within the immediate vicinity of Musawwarat es-Sufra, aimed at obtaining samples of raw materials from various wadis (searching for ceramic raw materials used to produce local pottery, i.e. ceramics attributed to reference groups Mus 1–5); 2) within the immediate and wider vicinity of Musawwarat es-Sufra, aimed at finding raw materials from which samples identified as “probably local” could have been made (these are mostly handmade vessels made of various raw materials with lower levels of aluminium and a higher content of fluxes than samples attributed to groups Mus 1–5); 3) within the Nile valley, aimed at sampling alluvial clays from various locations along the river (searching for ceramic raw materials used to produce local pottery attributed to Clay Type A, i.e. ceramics made from Nile alluvial clays). Collected raw material samples have been the subject of: plasticity test, firing test, chemical analysis, X-ray diffraction analysis. Additionally, laboratory model studies were performed to check what impact the chemical composition of organic tempers and so-called kaolinitic temper has on the chemical composition and thermal behaviour of ceramic sherds and the effect that adding various types of temper has on the mechanical and physical ceramic properties of sherds, and whether their use is attributable to a valid technological reason or simply to tradition.

**Key words:** Musawwarat es-Sufra, wadi clay, hafir clay, ceramic raw materials, chemical analysis, X-ray diffraction, firing test, mechanical properties

### Introduction

The first excavations at Musawwarat es-Sufra were carried out under the direction of Fritz Hintze<sup>1</sup> between 1960 and 1968. In seven seasons of fieldwork he excavated several monuments: the Lion Temple (IIC), the Small Enclosure (IB), the Great Hafir (IIG) and the Great Enclosure (IA), as well as other buildings and a post-Meroitic Cemetery (IF). Excavations in Musawwarat were finished for different reasons in 1968, and the Lion Temple was rebuilt during 1969–70. The results of archaeological fieldwork within the valley of Musawwarat were published in several preliminary reports; a classification of pottery from different areas within the Great Enclosure, the Small Enclosure and the Lion Temple was presented by Karl-Heinz Otto.<sup>2</sup> Archaeological work was

<sup>1</sup> Professor of Egyptology at Humboldt University Berlin between 1951 and 1980; founder of the Institute for Egyptology at Humboldt University, 1957, renamed the Institute

for Sudan Archaeology and Egyptology in 1968; see e.g. <http://www.sammlungen.hu-berlin.de/dokumente/212/>.

<sup>2</sup> HINTZE 1962; 1963; 1968; 1971; OTTO 1967.

resumed in Musawwarat es-Sufra thanks to the efforts of Steffen Wenig,<sup>3</sup> who was the head of the project between 1993 and 2004. After a short exploration campaign in 1993 and a building campaign in 1994, excavations in Musawwarat started again in 1995, funded by Deutsche Forschungsgemeinschaft (DFG) for several years, and were mainly focused on investigations within the Great Enclosure and on examining the issue of water management, as well as on exploration of the surrounding area and stratigraphic relationships between different structures within the valley of Musawwarat.<sup>4</sup> Next to archaeological fieldwork special attention was also paid to restoration and protection of the monuments of Musawwarat es-Sufra.<sup>5</sup> The results of archaeological and restoration work were published in several articles, which included details of the pottery recovered from different complexes; other pottery finds were only mentioned in several other reports on archaeological fieldwork within the valley of Musawwarat.<sup>6</sup> Anne Seiler prepared an in-depth study of the pottery from the Small Enclosure and studied the pottery from two small trenches [224.8] and [224.9] from courtyard 224 of the Great Enclosure, where, during an architectural survey in the 1995/96 season, a deposit of ash and pottery was found. The deposit was originally excavated [224.12] by David Edwards and Hans-Ulrich Onasch in 1997 and was interpreted as the dump of a pottery workshop; the pottery was studied in detail by David N. Edwards and partly published in 1999.<sup>7</sup> Some of the fineware specimens were studied by thin-section petrography and chemical analysis by Laurence Smith. A comparison with pottery specimens from other sites (Meroe, Wad Ban Naga, Gabati, Qasr Ibrim) and analysis of clays from Lower Nubia and the Meroe area and Gebel Umm Ali in Upper Nubia led him to think that some of the finewares could probably have been produced at Musawwarat.<sup>8</sup> A second set of laboratory analysis was conducted on samples of coarse ware pottery found in the Small Enclosure and Great Enclosure and was carried out by Małgorzata Daszkiewicz and Gerwulf Schneider.<sup>9</sup> The analysed pottery sherds were made from clays of two geologically different regions and represent different workshops. From 2005 to 2015 Claudia Näser<sup>10</sup> led the project and with the inauguration of the Qatar Sudan Archaeological Project (QSAP) in the 2013/14 season, multi-year funding enabled the extension of archaeological research in Musawwarat es-Sufra.<sup>11</sup> In addition to excavations within the Great Enclosure, the research also includes Site Presentation and Management, Protection Work, Restoration/Conservation, as well as a Community Project and the Graffiti Project. Special attention was given to excavations in “pottery courtyard” 224 in the Great Enclosure, the findings of which became the focus of a project under the auspices of the Berlin

<sup>3</sup> Professor of Egyptology and Sudan Archaeology / Meroitic Studies at Humboldt University Berlin between 1984 and 1999 (later names of the Institute: Institute for Sudan Archaeology and Egyptology, Richard Lepsius Institute, now: Seminar for Archaeology and Northeast African Archaeology); see e.g. LOHWASSER, WOLF 2014, pp. 7–8, with list of publications of Prof. Wenig, pp. 10–20.

<sup>4</sup> The DFG-funding was used for reprocessing the results of Hintze's excavations. Fieldwork, see e.g. WENIG, WOLF 1998a, pp. 24–37; 1998b, pp. 38–49; 1999, pp. 24–43; 2000, pp. 28–48. Water management, see e.g. SCHEIBNER 2004, pp. 39–64.

<sup>5</sup> This work was primarily financed by the Sudan Archaeological Society (SAG), founded in 1993 by Prof. Wenig.

<sup>6</sup> E.g. polychrome painted pottery of “waste-pit” K14, MUCHA 2005, pp. 7–13.

<sup>7</sup> Excavation, see EDWARDS 1999, pp. 8–12; pottery, see EDWARDS 1998, pp. 62–67; EDWARDS 1999, pp. 14–41; SEILER 1998; SEILER 1999.

<sup>8</sup> SMITH 1999, pp. 43–49.

<sup>9</sup> DASZKIEWICZ, SCHNEIDER 2001, pp. 80–91, GERULLAT 2001, pp. 64–79.

<sup>10</sup> Junior-Professor at the Seminar for Archaeology and Northeast African Archaeology (AKNOA) at Humboldt University Berlin between 2004 and 2012, see e.g. <https://www.topoi.org/person/naeser-claudia/>.

<sup>11</sup> Archaeological work in the years between the DFG- and Qatar-funding was primarily financed by the SAG, Auswärtiges Amt (Programm: Kulturerhalt), KAVA (Kommission für Allgemeine und Vergleichende Archäologie des Deutschen Archäologischen Instituts) and Topoi ([www.topoi.org/project/a-1-1](http://www.topoi.org/project/a-1-1), [www.topoi.org/project/a-6-5](http://www.topoi.org/project/a-6-5)); see e.g. WENIG 2004; SCHEIBNER, MUCHA 2009; NÄSER 2013; NÄSER, WETENDORF 2014; NÄSER, WETENDORF 2015.

Cluster of Excellence 264 TOPOI in 2013.<sup>12</sup> To shed further light on pottery production and consumption in Musawwarat, analysis of pottery sherds, raw materials and model analyses<sup>13</sup> were carried out by Małgorzata Daszkiewicz, Gerwulf Schneider and Ewa Bobryk.<sup>14</sup> The analysed fineware and most of the wheel-made coarse ware was made from ceramic bodies of similar chemical and mineralogical composition and could be associated with local production (pottery exhibiting the same chemical composition and thermal behaviour has not been noted at any other sites).<sup>15</sup> Most of the handmade coarse ware samples probably come from other workshops and were not locally produced (in particular, the vessels made from Nile alluvial clays). In order to identify the sources of ceramic raw materials necessary for local ceramic production, clay samples and tempering materials were obtained in 2014 from the immediate vicinity of Musawwarat as well as from the wider surroundings. Analysis of these samples and model analysis using these samples are of utmost importance to identify securely the provenance of ceramic vessels found in Musawwarat.

### **Research planned as part of Excellence Cluster 264 TOPOI project A-6-5**

Taking into consideration all of the published studies mentioned in the introduction, as well as the unpublished results obtained from analysis of pottery and raw materials (carried out by M. Daszkiewicz, E. Bobryk and G. Schneider) recovered from sites located between Khartoum and the Third Nile Cataract, it was concluded that new research should encompass:

- a) fieldwork within the immediate vicinity of Musawwarat es-Sufra, aimed at obtaining samples of raw materials from various wadis (searching for ceramic raw materials used to produce local pottery, i.e. ceramics attributed to reference groups Mus 1–5<sup>16</sup>);
- b) fieldwork within the immediate and wider vicinity of Musawwarat es-Sufra, aimed at finding raw materials from which samples identified as “probably local” could have been made (these are mostly handmade vessels made of various raw materials with lower levels of aluminium and a higher content of fluxes than samples attributed to groups Mus 1–5);
- c) fieldwork within the Nile valley, aimed at sampling alluvial clays from various locations along the river (searching for ceramic raw materials used to produce local pottery attributed to Clay Type A, i.e. ceramics made from Nile alluvial clays).

In addition, the following actions were also planned:

- analysis of materials potentially used as fuel (wood, dung);
- ceramic ethnoarchaeological studies involving sites featuring currently operational pottery workshops within the immediate vicinity of Musawwarat es-Sufra and in the Nile valley, interviews with potters and analysis of the raw materials they use;

<sup>12</sup> Since 2014 the pottery project has been conducted with funding from the Qatar-Sudan Archaeological Project and the Berlin Cluster of Excellence TOPOI. Investigations on pottery from courtyard 224 have been moved to the PhD project of Manja Wetendorf at the Berlin Graduate School of Ancient Studies.

<sup>13</sup> This work was financially supported by the Warsaw University of Technology.

<sup>14</sup> NÄSER, DASZKIEWICZ 2013, pp. 15–22; DASZKIEWICZ, WETENDORF 2014, pp. 99–104; DASZKIEWICZ *et alii* 2015, pp. 89–91.

<sup>15</sup> Analyses of other ceramic sherds were available for comparison from the SDB. SDB = database for Sudanese ancient pottery: this database of analyses compiled by M. Daszkiewicz (analyses carried out by M. Daszkiewicz, G. Schneider and E. Bobryk) currently encompasses 1235 ceramic fragments recovered from various sites dating from the Mesolithic to the Christian period.

<sup>16</sup> Mus 5 = a new, unpublished, reference group.

- analysis of ancient ceramics from Meroitic/post-Meroitic sites within the immediate vicinity of Musawwarat es-Sufra and samples of pottery said to have a Musawwarat fabric,<sup>17</sup> recovered from other sites in northern Sudan;
- laboratory model studies examining what impact the chemical composition of organic tempers and so-called kaolinitic temper has on the chemical composition and thermal behaviour of ceramic sherds;
- laboratory model studies examining the effect that adding various types of temper has on the mechanical and physical ceramic properties of sherds and whether their use is attributable to a valid technological reason or simply to tradition;
- laboratory model studies examining what impact the chemical composition of ashes derived from various fuels has on the chemical composition and thermal behaviour of samples;
- laboratory model studies examining the alteration effect; in this instance, the studies concern the impact of ambient conditions on pottery sherds taken from a ceramic deposit in courtyard 224 of the Great Enclosure at Musawwarat es-Sufra.

The first stage of the fieldwork has been completed, as have some of the planned analyses and model studies. During the course of fieldwork carried out in November 2014 (M. Daszkiewicz, M. Wetendorf, G. Schneider), a total of 64 samples were taken of materials identified in the field as potential ceramic raw materials. Samples were also taken of fuels (wood from local trees and cow dung) and donkey dung, which is still commonly used as a temper today (ethno-ceramological studies revealed that cow dung is used as a fuel and donkey dung as a temper added to ceramic bodies). Preliminary results from studies on the impact of fuels on the chemical and phase composition of ceramic sherds, and of the alteration effect, have already been published,<sup>18</sup> as have the results of model studies concerning measurement of mechanical and physical properties.<sup>19</sup> The present article details the results of analysis carried out on 27 raw material samples [Fig. 1], of which 23 samples were taken from the immediate vicinity of Musawwarat es-Sufra [Fig. 2] and four from locations along the route of a track running parallel to Wadi Awateb and leading from Naga to a tarmac road. The analysis of four samples of Nile alluvial clays is also discussed.

## Raw materials

### Sampling

Bearing in mind the appearance of typical Musawwarat fabrics, where white- or whitish-beige-firing aggregates<sup>20</sup> are visible in a sintered matrix, the search for ceramic raw materials was focused on finding:

- 1) plastic raw materials with the same thermal behaviour as Musawwarat fabrics;
- 2) non-plastic raw materials which yield white- or whitish-beige-firing aggregates;
- 3) ceramic raw materials that could have been used, without any further technological measures (addition of aforementioned tempers), for making local pottery.

<sup>17</sup> DASZKIEWICZ, MALYKH, in preparation.

<sup>18</sup> DASZKIEWICZ *et alii* 2015.

<sup>19</sup> DASZKIEWICZ *et alii* 2016.

<sup>20</sup> In thin-sections they are described as conglomerates of quartz with white coloured matrix (DASZKIEWICZ, SCHNEIDER 2001, pp. 83, 86, fig. 5).

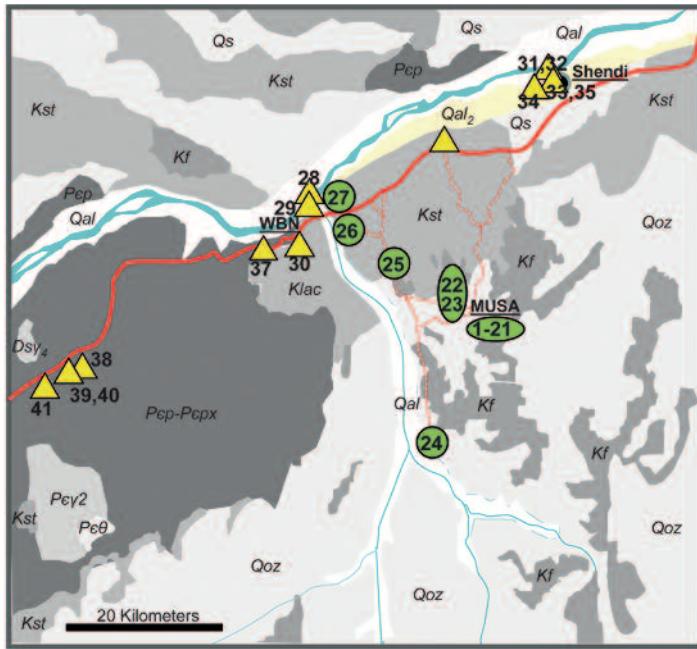


Fig. 1. Locations from which raw material samples were taken in 2014.

Map, amendments made by the authors, showing underlying geology (map created by E. Bobryk).

Samples 1–27 (marked in green) are the focus of this article.

Solid red line = tarmac road; dashed red line = recent main tracks through Butana used by local people.

Kst = undifferentiated fluvial sandstones and siltstones;

Kf = ferruginous horizons in the Kst sequence; Klac = bioturbated lacustrine silts and mudstones;

Pep = differentiated Proterozoic metamorphic rocks (Pcpngs = gneissic area; Pcpmg = migmatites);

Pepx = granulite facies variants of Pepngs;

PeY2 = syntectonic granitic intrusions and anatetic migmatites;

Peθ = undifferentiated Precambrian gabbroic rocks;

Dsy4 = anorogenic syenitic rocks dated to the Devonian period, ring complexes;

Qal = Quaternary recent alluvium;

Qal2 = Quaternary older alluvium, raised terraces;

Qoz = old, often stabilised dunes at or beyond the current limits of true desert conditions

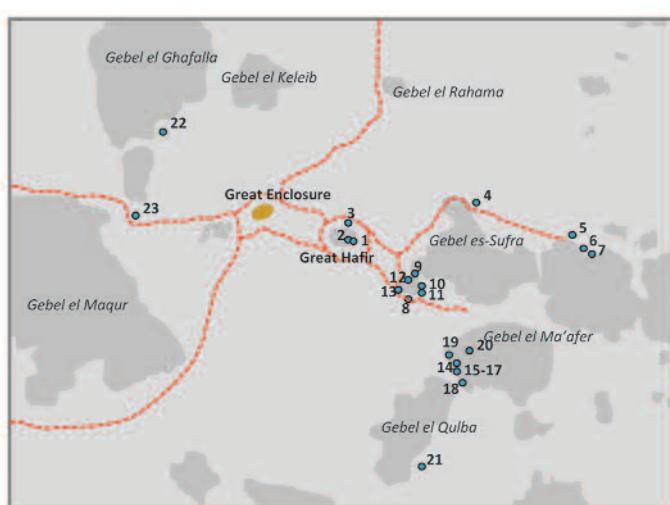


Fig. 2. Location of raw material samples in relation to the Great Enclosure

(map created by E. Bobryk based on Google Maps)

One of the first objectives of this project was to obtain samples of various wadi clays and Nile alluvial clays. Having made an assessment of the terrain surrounding the site at Musawwarat es-Sufra, it was decided to broaden the range of samples to include recent bottom-sediment from local hafirs. These hafirs were either still partly filled with water or completely dry. Three samples were taken from the Great Hafir, located within the site's immediate vicinity [Fig. 2, points 1–3<sup>21</sup>]: two samples of recent bottom-sediment (a less silty upper layer and a more silty lower layer) and one sample from the topmost layer of the hafir wall — a location indicated by a local potter, Amma, as the site from which she takes clay for making ceramics [Fig. 3]. Further samples of recent bottom-sediment were taken from the Hafir Said, north-east of Gebel es-Sufra [Fig. 4]; a sample of whitish silty clay was also collected from the wall of this hafir [Fig. 5]. In the case of dry hafirs, samples exhibiting significant shrinkage on drying were taken from the middle of the hafir, e.g. from the Hafir Hamad behind Gebel Ma'afer [Fig. 6] and from the hafir in front of Gebel el Ghafalla [Fig. 7]. In the case of wadis, raw materials were sampled from the middle of various wadi beds. They included a loam sample taken from the middle of a wadi north of Gebel es-Sufra [Fig. 2, point 4; Fig. 8], used by local villagers as a building material [Fig. 9]. Two samples were taken from Wadi Ma'afer, near a small quarry: one sample was of a silty clay [Fig. 10, point 10] and the other of a fine clay [Fig. 10, point 11].



Fig. 3. Location of samples taken from the Great Hafir in Musawwarat  
(numbers correspond to those used in table 1).

Location no. 3 was indicated by a local potter named Amma  
(photo M. Wetendorf)

<sup>21</sup> The point numbers indicate the location of a given sample on the maps in Figs. 1 and 2.



Fig. 4. Location of a sample of recent bottom-sediment taken from the Hafir Said,  
north-east of Gebel es-Sufra (photo G. Schneider)



Fig. 5. Location of sample of whitish silty clay collected from the wall of the Hafir Said,  
north-east of Gebel es-Sufra (photo G. Schneider)

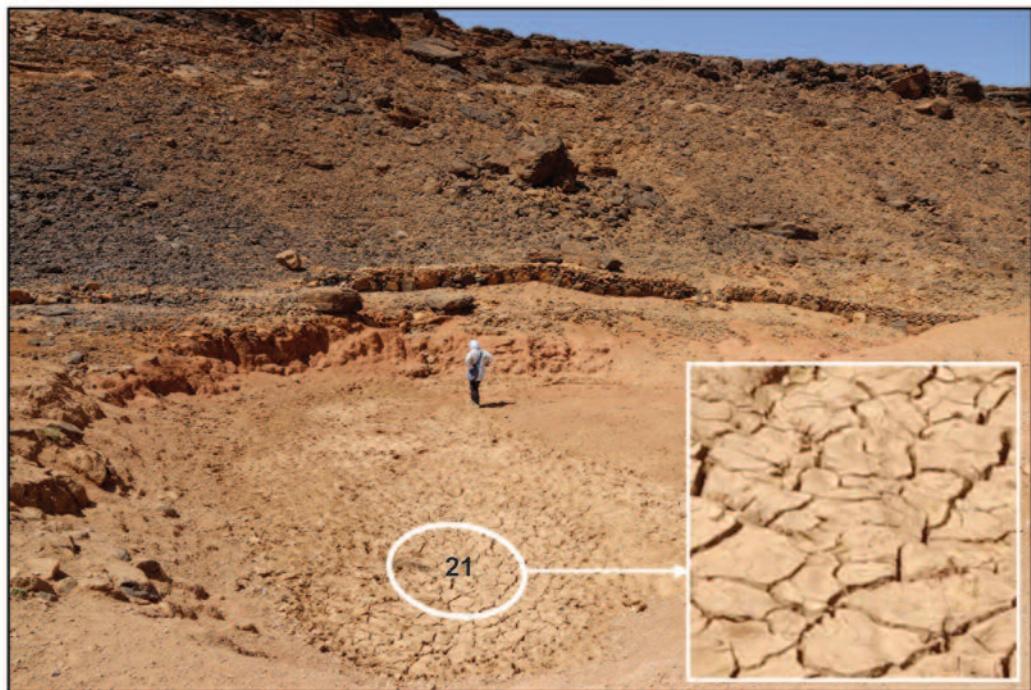


Fig. 6. Hafir Hamad behind Gebel Ma'afer, sample exhibiting significant shrinkage on drying taken from the middle of the dry hafir (photo M. Wetendorf)



Fig. 7. Location of samples taken from a dry hafir in front of Gebel el-Ghafalla (photo M. Wetendorf)



Fig. 8. Loam sample taken from the middle of a wadi north of Gebel es-Sufra  
(photo M. Wetendorf)



Fig. 9. Loam (sample shown in figure 8)  
is currently used by local villagers  
as a building material (photo M. Wetendorf)

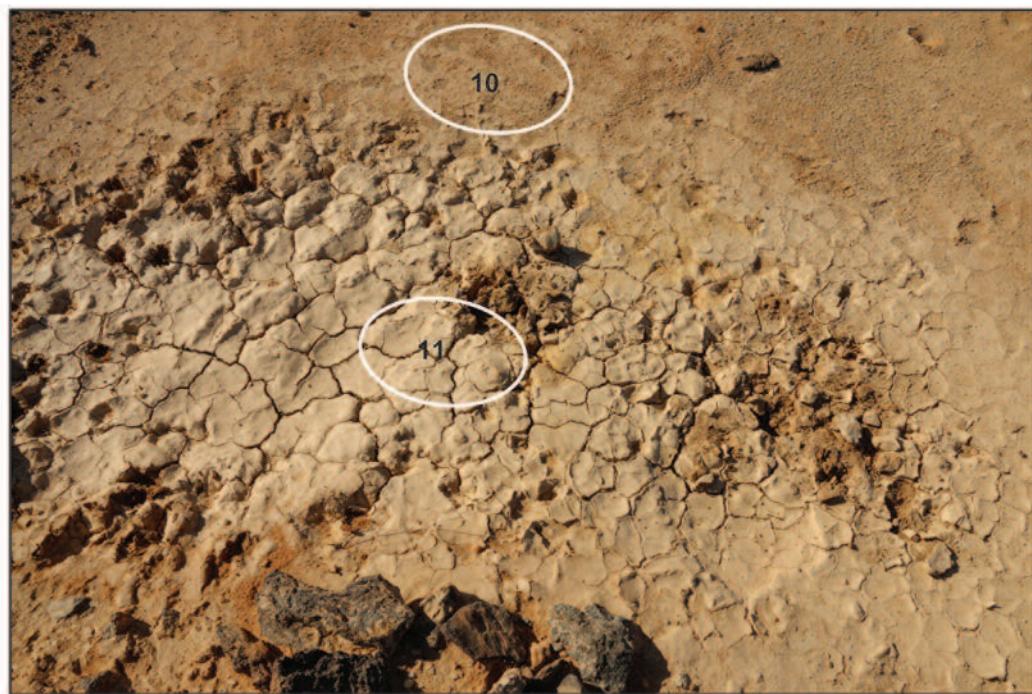


Fig. 10. Location of two samples taken from Wadi Ma'afer, near a small quarry:  
silty clay (point 10), fine clay (point 11) (photo M. Wetendorf)



Fig. 11. White clayey material sampled from the side wall of the Wadi es-Sufra  
(photo M. Wetendorf)

As stated above, a white raw material that may have been used as a plastic temper in the ceramic bodies used for making pottery at Musawwarat es-Sufra was sampled from Hafir Said, and a white clayey material was sampled from the side wall of the Wadi es-Sufra [Fig. 11]. White sandstone, which may have been used as a non-plastic temper, was sampled from various locations used during the Meroitic period and referred to as small quarries at the edge of Wadi Ma'afer [Fig. 2, points 8, 9 and 12].

Nile alluvial clay samples were taken from the river bank [Fig. 1, points 28, 31, 32 and 43]; figure 12 shows the location from which alluvial clay was sampled near El-Geili.

The sampled raw materials that may have been used as plastic raw material differ distinctly in colour and in their content of grains of silt, sand and gravel fraction [Fig. 13]. White temper may have been represented by samples of white sandstone, some of which easily break up into sand-sized fragments because the grains are weakly cemented together; in the case of white wadi clay, no sand-sized grains were observed macroscopically [Fig. 14].



Fig. 12. Sampling of Nile alluvial clay. Location from which alluvial clay was sampled near El-Geili (photo G. Schneider)

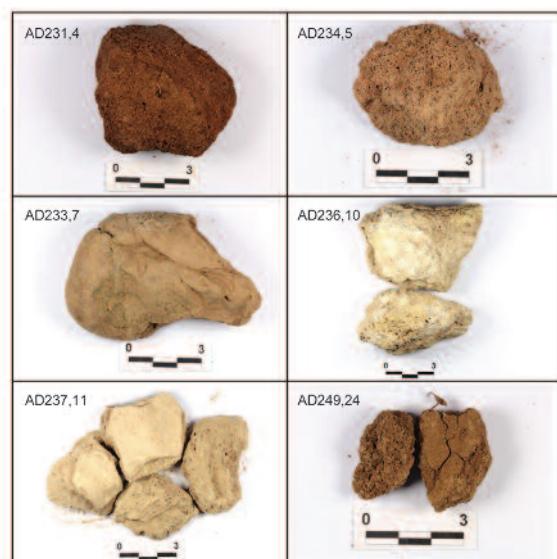


Fig. 13. Raw materials sampled in the area around Musawwarat es-Sufra (photo M. Baranowski)



Fig. 14. Samples of white kaolinitic sandstones (AD230,8; AD235,9; AD239,12) and white kaolinitic wadi clay (AD247,23) (photo M. Baranowski)

## Analysis

The first analysis to be carried out was a plasticity test, which included gauging the water of plasticity (make-up water) content. Water of plasticity content was determined in 25 of the clayey raw material samples presented in this paper. Details of these values are given in table 1 in g H<sub>2</sub>O per 100 g of dry clay. Water of plasticity is the amount of water required to bring 100 grams of clay material to a plastic state (in practical terms this means that the material can be shaped into a ball which will not feature any cracks, and which can, depending on the type of clay, have a certain amount of pressure applied to it such that the ball will only become misshapen but no cracks will appear). The content of water of plasticity ranges from 11 g to 34 g H<sub>2</sub>O per 100 g clay. Three of the raw materials with a content of less than 20 g H<sub>2</sub>O per 100 g clay are not suitable for making a plastic mass that can be satisfactorily formed; this is also the case with silty material (AD259,20),<sup>22</sup> which has a high water of plasticity content of 26%. The most plastic of the raw materials analysed, requiring a greater amount of water, are represented by seven samples. These include three samples of wadi clays (AD249,24; AD250,25; AD269,27), two samples of recent bottom-deposits in hafirs (Great Hafir AD265,1; Hafir Said AD233,7) and a Nile alluvial clay sampled near Shendi (AD292,32).

Conducting plasticity tests revealed which raw materials were suitable for making a plastic mass that can be adequately formed, which, of course, does not mean that all of these raw materials would have been used for making local Meroitic pottery. At the same time, non-pliable raw materials may have been used after they had been levigated.

The next stage of the project was to carry out a firing test. Briquettes for this test were formed using a plastic mass and non-porous porcelain moulds which yielded dome-shaped samples; these samples were then dried and fired in a laboratory furnace<sup>23</sup> at nine temperatures (400, 600, 700, 800, 900, 1100, 1100, 1150 and 1200°C). Two briquettes were fired at each temperature. One of the briquettes was left whole, whilst a thin slice was removed from the middle of the second briquette. Cut-sections were not made from briquettes fired at 400°C and 600°C due to the limited amount of available material and because of the fact that none of the 100 analysed fragments of Meroitic pottery deemed to represent local wares produced at workshops in Musawwarat es-Sufra had originally been fired at a temperature below 700°C.<sup>24</sup> Thus, after firing, thermal behaviour could be observed both in whole samples and in cut-section slides (cut-section slides removed from fired dome-shaped samples are the equivalent of cut-section slides removed from fragments of archaeological pottery for the purposes of MGR-analysis). Based on the firing test it was possible to identify which raw materials exhibit similar thermal behaviour to that of Meroitic pottery from Musawwarat es-Sufra.

The firing test is a routine test carried out by potters, allowing them to ascertain vital properties such as shrinkage on drying, shrinkage on firing, or sintering temperature range. This test is also very important in the reverse situation, when trying to identify the raw materials used in making a known ceramic product — as in the case of an archaeological ceramic analysis. In this situation, the thermal behaviour of the pottery is known (MGR-analysis), as is its chemical composition and its mineralogical and petrographic composition,<sup>25</sup> and the aim is to identify the original raw

<sup>22</sup> Each sample has two numbers. AD... is the sample laboratory number, whilst the number after the comma indicates the given sample's location on a map (maps shown in Figs. 1 and 2).

<sup>23</sup> Firing was done in a Carbolite electric laboratory resistance furnace, in air, static, at a heating rate of 5°C/min,

a soaking time of 1 hour at the peak temperature, a cooling rate of 5°C/min up to 500°C and then cooling with the kiln for 1 hour.

<sup>24</sup> Unpublished analysis results estimating Teq.

<sup>25</sup> Based on the assumption that it is possible to carry out a comprehensive analysis of ancient pottery sherds.

material(s) that, when used with a specific technology, could have yielded this type of ceramic product. It must be emphasized that without conducting a firing test, the results of chemical analysis and/or thin-section studies alone should not be used as the basis for determining whether or not a raw material would have been suitable for making a particular type of pottery. The firing test was carried out on 25 raw material samples. Figure 15 shows an MGR-chart of the firing test for five raw materials, whilst figure 16 shows examples of briquettes made from 18 raw materials, fired at 1200°C. Despite the fact that plasticity tests indicated the suitability of three samples (AD242,15; AD243,16; AD244,17) for making a plastic mass that could be formed satisfactorily [Table 1], the firing test revealed that they did not meet the criteria of raw materials suitable for the manufacture of local Musawwarat es-Sufra pottery. As expected, when fired at 700°C (or a little higher) the briquettes began to crack, which is linked to the expansion of thermally decomposed carbonates (calcite in this case); the cracking process, which results in splinters breaking off from the briquette, occurred in briquettes fired at up to 1200°C. The deterioration of the samples started to become apparent several days after firing (briquettes kept at room temperature). Figure 16 shows samples without any cracks (photographs taken the day after firing), while figure 15 shows the same samples featuring cracks and splinters. It is interesting that when viewed macroscopically in their unfired state these three raw materials look like the typical Musawwarat fabric; one of them (AD242,15) is also similar in appearance, before cracks/splinters occur, after having been fired at 1200°C [Fig. 16].

Briquettes made of Nile alluvial clays differed very distinctly from all other samples in the firing test. Their characteristic feature is an over-melted matrix type [Fig. 17].

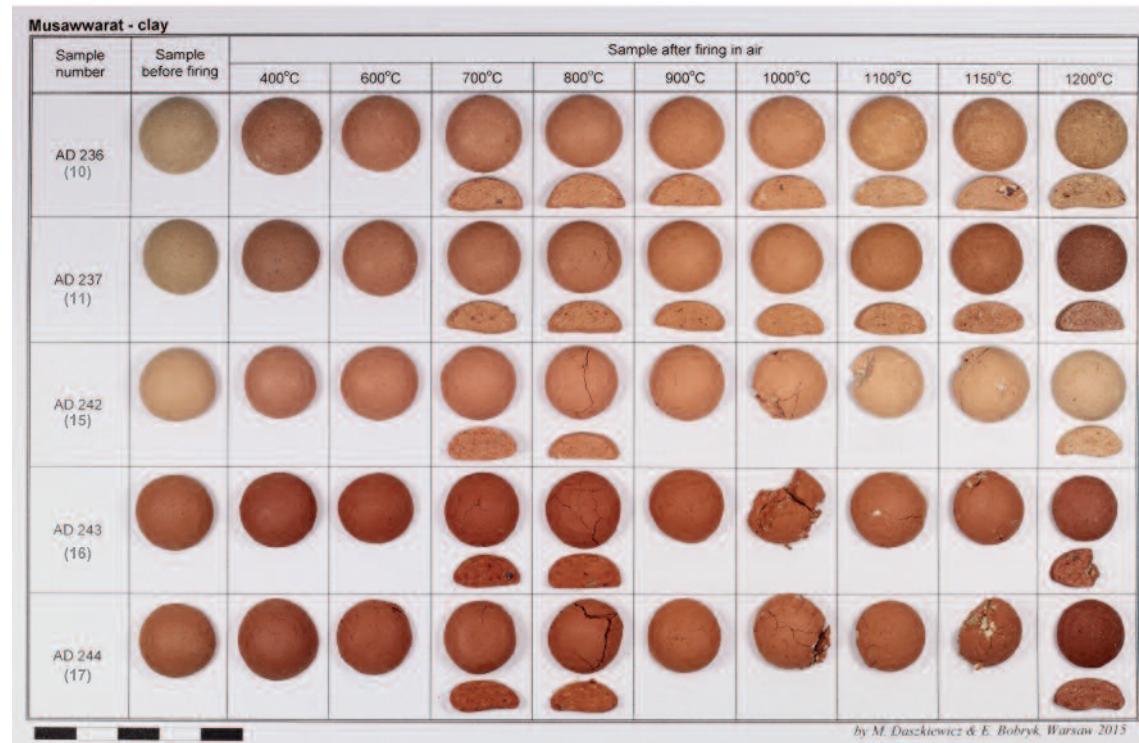


Fig. 15. MGR-chart. Clay specimens before and after firing in air (specimens formed using plastic mass and non-porous porcelain moulds which yielded dome-shaped samples); whole dome-shaped specimens and cut-sections of these specimens (photo M. Baranowski)

Localization	No. on maps	Lab. No.	water of plasticity [g H <sub>2</sub> O/100g clay]	suitable for forming from plastic mass	Type of deposit		X-ray diffraction clay minerals	Thermal behaviour after firing at 1200°C colour		matrix type	Fraction of non-plastic inclusions (macroscopically)	Suitability after firing test
Great Hafir (Musawwarat)	1	AD 265	28	yes	hafir clay (upper part) hafir clay (lower part)	K, Sm, Ch K, Sm, Ch	reddish-brown brownish red-brown	SN	few sand	suitable	suitable	
	2	AD 266	21	yes	material dug out from hafir			SN	silt	suitable	suitable ( a little bit to dark)	
	3	AD 291	25	yes	wadi clay	K, Sm, Ch	brownish-red	SN	silt	suitable	after levigation ?	
North of Gebel es-Sufra	4	AD 231	20	yes	deposit outside wadi	K, Sm, Ch	brownish-beige	SN	silt, sand, few gravels	after levigation ?	after levigation ?	
Hafir Said (north-east of Gebel es-Sufra)	5	AD 234	15	no	middle part of the wall of hafir	K, //	brownish-beige	SN	silt, sand	temper	temper	
small quarry at the edge of Wadi Ma'afer	6	AD 232	29	yes	hafir clay	K, Sm, Ch	brown	SN	vflsol vfn micas	wrong colour (to dark)		
	7	AD 233	8	AD 230	white sandstone	K, //	whitish	SN		temper	temper	
	9	AD 235	12	AD 239	white sandstone	K, //	whitish	SN		temper	temper	
	10	AD 236	10	AD 230	yes	K, Ch	yellow (whitish brownish)	SN	'white incl (silt, sand, grave	suitable	suitable	
	11	AD 237	11	AD 238	yes	K, Ch	brownish-beige	SN	'white incl (silt, sand, grave	suitable	suitable	
	13	AD 238	13	no	sandy deposit	K	beige-brownish	SN	silt, sand, gravels	after levigation ?	after levigation ?	
	14	AD 240			material dug out from hafir (whi)	K				temper		
Hafir Khalifa (in front of Gebel Ma'afer)	15	AD 242	21	yes	upper part of the wall of hafir	K	pinkish white	SN	cc agg (sand,gravel)	not suitable		
	16	AD 243	21	yes	upper part of the wall of hafir	K	pale reddish	SN	cc agg (sand,gravel)	not suitable		
	17	AD 244	20	yes	upper part of the wall of hafir	K, //	reddish	SN	cc agg (sand,gravel)	not suitable		
	18	AD 245	21	yes	hafir clay	K, Sm, Ch	reddish-brown	SN	few sand, isol cc	calcite agg.		
on the foot of Gebel Ma'afer	19	AD 241			silty deposit (whitish/grayish)	K, //				temper		
big quarry (on top of Gebel Ma'afer)	20	AD 259	26	no	silty deposit	K	pale beige	SN	a lot of silt	not suitable		
Hafir Hamad (behind Gebel Ma'afer)	21	AD 248	23	yes	hafir clay	K, Sm, Ch	brownish-red	SN	silt, sand, few gravels	suitable		
Hafir in front of Gebel el Ghafala	22	AD 246	23	yes	hafir clay	Sm, Ch, K	brown	SN	silt	wrong colour (to dark)		
Wadi es-Sufra	23	AD 247	26	yes	wadi clay (whitish)	K	v.pale greenish-white	SN	mnv	temper		
Wadi Awateb, near Naga	24	AD 249	33	yes	wadi clay	K, Sm, Ch	brownish-red	vst BL mat	silt, few sand	not suitable		
wadi N-W from Musawwarat	25	AD 250	26	yes	wadi clay	K, Sm, Ch	brownish-red	SN	few silt, few sand	suitable		
Wadi Awateb	26	AD 251	11	no	wadi clay	beigish-brownish	brown	SN	a lot of silt	not suitable		
	27	AD 269	29	yes	wadi clay	K, Sm, Ch	brown	ovF	isl. silt, isol sand	wrong colour (to dark)		
Wadi Ban Naga	28	AD 253	25	yes	Nile alluvial clay	Sm, Ch, //	slightly reddish-brown	ovM		not suitable		
Shendi	31	AD 261	25	yes	Nile alluvial clay	Sm, Ch, //	reddish-brown	sovM	few silt	not suitable		
Shendi	32	AD 292	34	yes	Nile alluvial clay	Sm, Ch, //	slightly reddish-brown	ovM		not suitable		
El-Geili	43	AD 267	24	yes	Nile alluvial clay	body (clay + donkey dung)	reddish-brown	ovM	few silt	not suitable		
Shendi	33	AD 263	19	yes	clay	Sm, K, //	reddish-brown	sovM	silt	not suitable		
	34	AD 262	21	yes	ashes of donkey dung ceramics			reddish-brown	ovM			
	33	AD 227										

Tab. 1. List of analysed samples. Plasticity water, X-ray diffraction results, firing test results. Suitable = a raw material that may have been used in making Meroitic pottery found at Musawwarat es-Sufra



Fig. 16. Specimens of various raw materials fired at 1200°C  
(macro photos M. Baranowski)

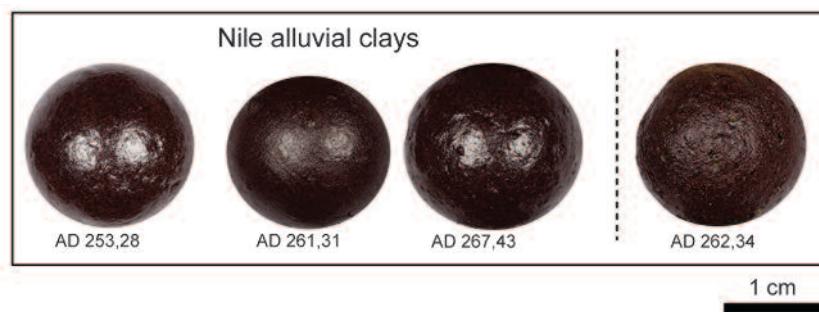


Fig. 17. Specimens of Nile alluvial clays (from left to right: samples taken near Wad Ban Naga, Shendi, El-Geili) and alluvial clay sampled directly from the river bank (AD262,34), fired at 1200°C  
(macro photos M. Baranowski)

The results of the firing test were taken into account in determining whether individual raw materials would have been suitable for making the pottery discovered in Musawwarat es-Sufra. Three raw material samples may have been used following the prior removal (by sifting or levigation) of any excess non-plastic particles in the form of grains in sand and gravel fraction. Seven raw materials could not have been used for producing pottery found at Musawwarat es-Sufra in view of their distinctly different thermal behaviour.<sup>26</sup> For example, wadi clay sampled from Wadi Awateb near Naga, which is a fat, very high-bloating clay [Fig. 16, AD249,24], can be ruled out because of its thermal expansion. Three samples can be excluded because of their colour after firing, which is far too dark (e.g. AD333,7 [Fig. 16]). Their colour is similar to that of pottery sherds made from Nile alluvial clays, but in contrast to such sherds, these four samples have a sintered matrix type (compare figure 16 with figure 17). Six raw material samples represent raw materials that may have been used by ancient potters to make local ceramics. Those most similar to the Mus 1 – Mus 4 reference groups, both in terms of matrix type and colour after the firing test, are samples of wadi clays AD237,10, AD250,25 and AD236,10 — the last of these following prior removal of grains in coarse sand and gravel fraction. These raw materials do not require the addition of the temper visible in Musawwarat fabrics; they contain naturally occurring whitish-firing aggregates or intrusions of a white-firing raw material visible in the form of bands after firing [Fig. 18].

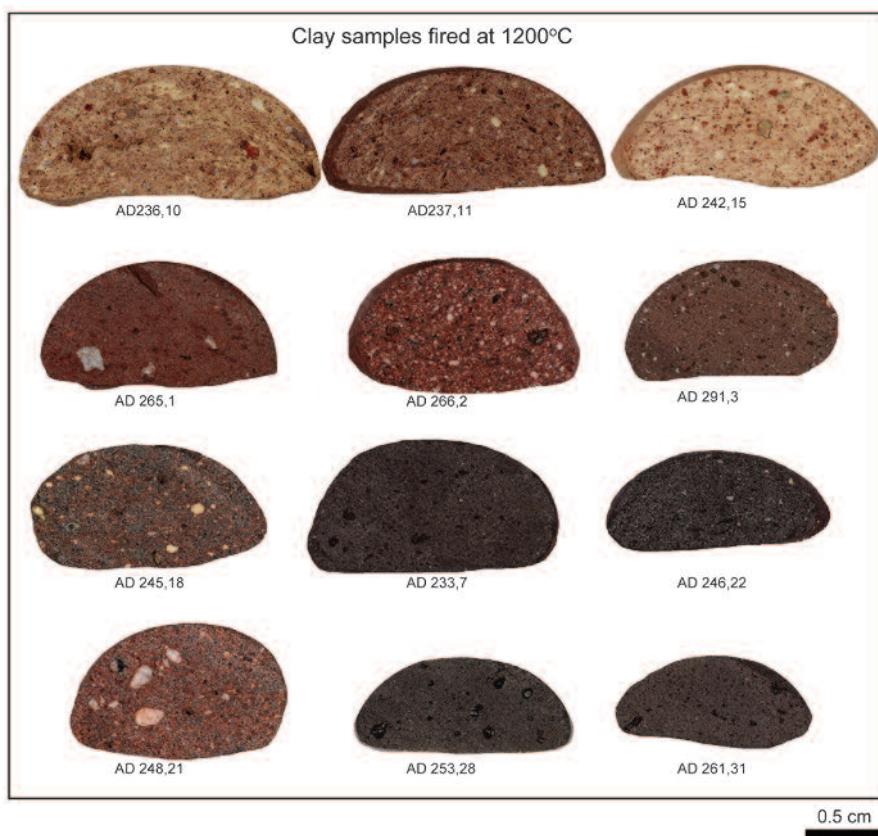


Fig. 18. Cut-sections of specimens of various raw materials fired at 1200°C. Samples of wadi clays AD236,10 and AD237,11 are very similar macroscopically to local Musawwarat fabrics (macro photos M. Baranowski)

<sup>26</sup> In addition, four of these seven samples feature carbonates as non-plastic components, which is not noted in samples of Meroitic pottery found at Musawwarat es-Sufra.

One sample (AD291,3), taken from the upper layer of a hafir wall — very probably material dug out from the Great Hafir at Musawwarat es-Sufra,<sup>27</sup> fires a slightly darker colour than samples Mus 1 – Mus 4, though it is similar to the colour of ceramic sherds referred to as “probably local”.<sup>28</sup> Seven samples may have been used as tempers (whitish aggregates typical of Musawwarat fabrics).

Twenty-eight of the raw material samples were subjected to X-ray powder diffraction analysis,<sup>29</sup> revealing in the case of 25 of these samples from the Musawwarat region [Fig. 1, points 1, 2, 4–25 and 27] that the clay mineral present in every one of them is kaolinite [Fig. 19 and 20]. Kaolinite is not the dominant clay phase in the wadi clay sample taken from Wadi Awateb near Naga (AD249,24). In this instance there is an equally abundant presence of clay minerals of the smectite group, responsible for the earlier mentioned high-swelling of this sample (see firing test). As well as the samples from Wadi Awateb, clay minerals of the smectite and chlorite groups are also present in small quantities in wadi clays AD237,11 and AD231,4 [Fig. 20]. In contrast to wadi clays, all of the samples representing recent bottom-sediments from the centre of the hafir have the same phase composition: smectite, chlorite, kaolinite, muscovite, feldspars, quartz [Fig. 19]. In the other clayey materials, kaolinite was the only clay mineral present [Fig. 19: AD242,15; AD259,20]. Muscovite occurs in most of the samples; plates of muscovite are easily visible macroscopically. Quartz clearly predominates among the non-plastic components. White sandstone sampled from a small quarry at the edge of Wadi Ma’afir is a sandstone in which sand-sized grains of quartz are cemented together with kaolinite. All of the samples of white kaolinitic sandstone and white clayey deposits from Wadi es-Sufra feature weak lines of anatase. Anatase and calcite also occur in three samples taken from the upper layer of the wall of Hafir Khalifa [Fig. 19].

In contrast to the aforementioned raw materials, clay minerals of the smectite group predominate in samples of Nile alluvial clays, with kaolinite occurring as a minor mineral.

In the next step, chemical analysis was carried out on 30 raw material samples to reveal the quantity of major and trace elements<sup>30</sup> [Table 2]. Samples which, after the firing test, were deemed potentially suitable for making Musawwarat fabrics following earlier levigation are characterised by a SiO<sub>2</sub> content of over 80% and by low levels of vanadium (V) and chrome (Cr). Raw materials which had too dark a colour after firing in relation to Musawwarat fabrics are characterised by higher levels of magnesium (Mg) and calcium (Ca) in comparison with the chemical composition of Meroitic pottery local to Musawwarat. The chemical composition of raw materials regarded

<sup>27</sup> This is the clay used by the local potter Amma.

<sup>28</sup> DASZKIEWICZ, WETENDORF 2014.

<sup>29</sup> Analysis done by G. Kaproń at the Faculty of Geology, University of Warsaw. Powdered, pressed samples, start position [°20], 3; end position [°20], 85; step size [°20], 0.026; scan step time [s], 1197.99; scan type continuous; measurement temperature [°C], 25.00; anode material, Co.

<sup>30</sup> In this instance, chemical analysis by WD-XRF (wavelength-dispersive X-ray fluorescence) was used to determine the content of major elements, including phosphorus and a rough estimation of sulphur and chlorine. Total iron was calculated as Fe<sub>2</sub>O<sub>3</sub>. Samples were prepared by pulverising fragments weighing ca. 2g (sample size was dictated by the number and size of the non-plastic components), having first removed their surfaces and cleaned the remaining fragments with distilled water in an ultrasonic device. The resulting powders were ignited at 900C (heating rate 200C/h, soaking time 1 h), melted with

a lithium-borate mixture (Merck Spectromelt A12) and cast into small discs for measurement. This data is, therefore, valid for ignited samples but, with the ignition losses given, may be recalculated to a dry basis. For easier comparison the major elements are normalised to a constant sum of 100%. Major elements are calculated as oxides. The precision for major elements is below 1%; for trace elements this rises to a maximum of 20% depending on the concentrations. Accuracy was tested by analysing international reference samples and by exchange of samples with other laboratories. For major elements and the most important trace elements, it is between 5 and 10%. Preparation of samples for analysis was carried out by M. Daszkiewicz ARCHEA, measurement using a PANalytical AXIOS XRF-spectrometer and the calibration of Arbeitsgruppe Archaeometrie by G. Schneider and A. Schleicher in GFZ Potsdam (GFZ = Helmholtz-Zentrum Potsdam, Deutsches Geo-ForschungsZentrum GFZ, Sektion 4.2, Anorganische und Isotopengeochemie).

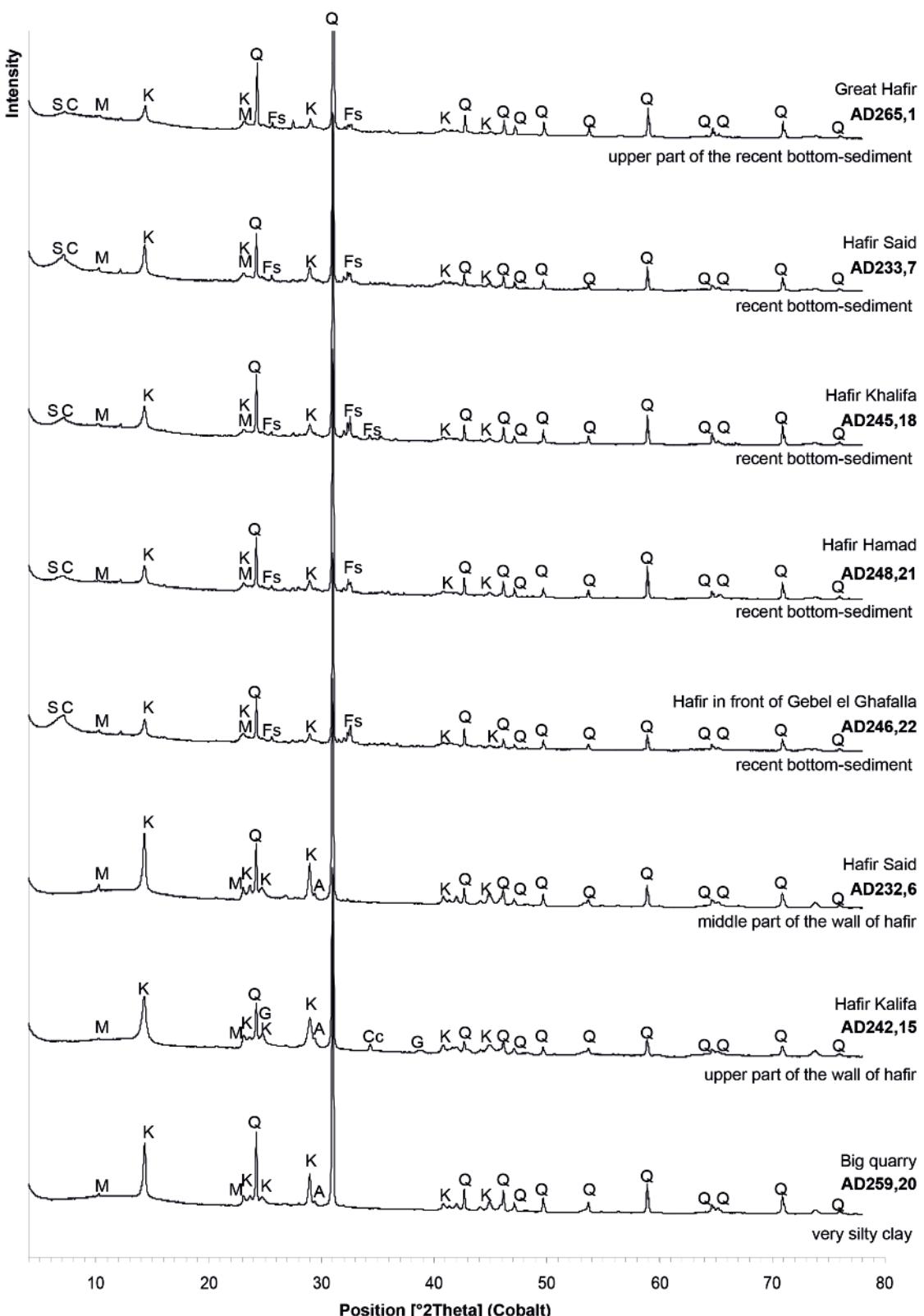


Fig. 19. X-ray powder diffraction analysis of samples taken from various locations:

S = smectite, C = chlorite, K = kaolinite, M = muscovite, Q = quartz,  
 Fs = feldspars, Cc = calcite, G = goethite, A = anatase

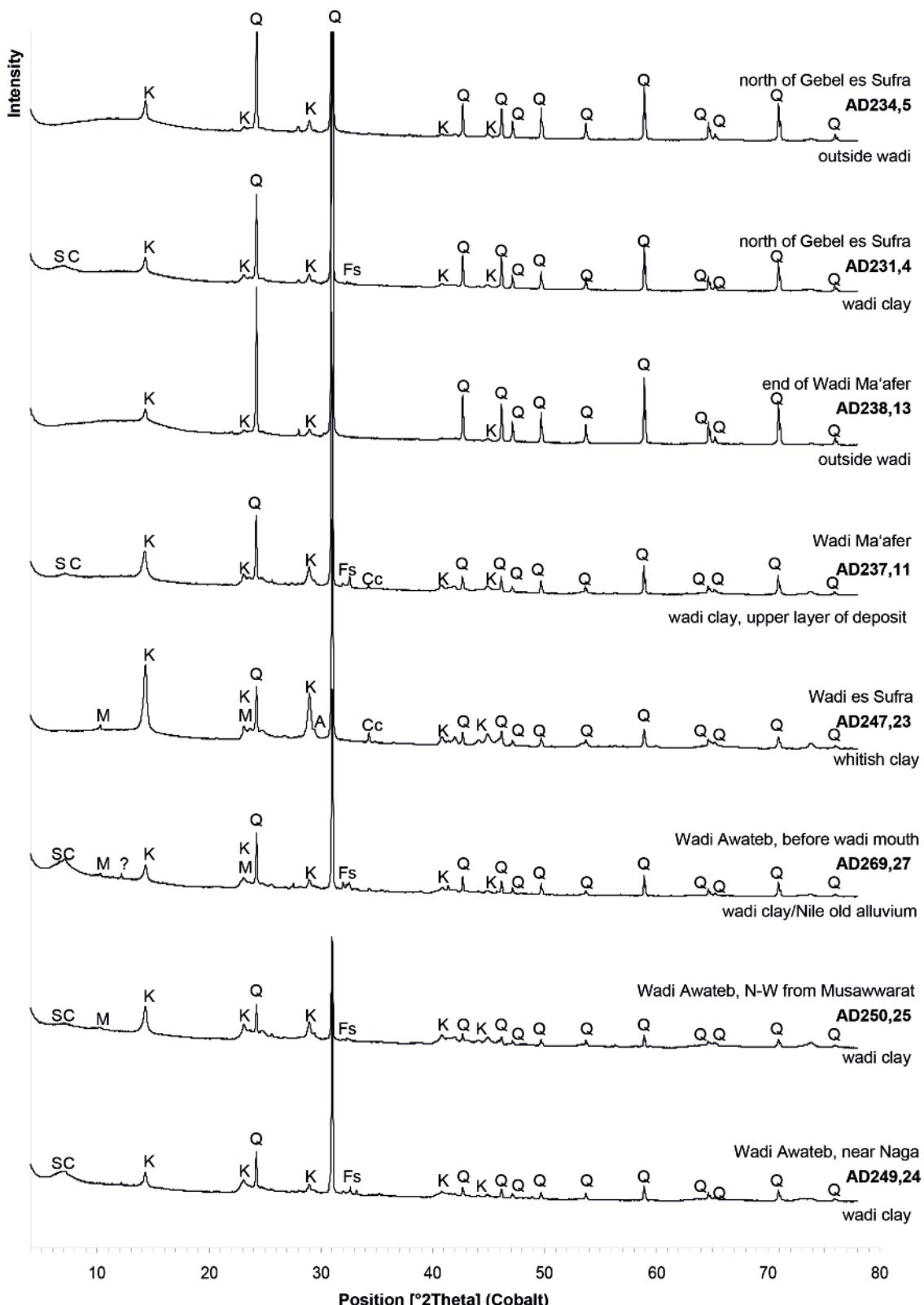


Fig. 20. X-ray powder diffraction analysis of samples taken from various locations:  
 S = smectite, C = chlorite, K = kaolinite, M = muscovite, Q = quartz, Fs = feldspars,  
 Cc = calcite, G = goethite, A = anatase

No. on maps	Lab. No.	SiO <sub>2</sub> per cent by weight	TiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	MnO	MgO	CaO	Na <sub>2</sub> O	K <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	V ppm	Cr	Ni	Cu	Zn	Rb	Sr	Y	Zr	Nb	Ba	(La Ce Pb Th Nd)	I.o.i. %	TOTAL %				
<b>Raw material samples collected within the vicinity of Musawwarat es-Sufra</b>																													
raw materials that may have been used in making Meroitic pottery found at Musawwarat es-Sufra.																													
wadi clays																													
11	<b>AD 237</b>	70.88	1.49	19.36	5.22	0.050	0.88	1.23	0.27	0.52	0.11	122	116	50	32	46	19	87	73	343	18	186	22	60	12	13	53	7.93	100.46
10	<b>AD 236</b>	75.66	1.42	17.02	4.07	0.036	0.51	0.74	0.15	0.33	0.08	98	99	38	22	31	11	60	62	356	14	129	12	42	10	12	40	6.20	99.64
25	<b>AD 250</b>	59.31	1.50	25.15	10.25	0.172	1.28	0.97	0.16	1.08	0.14	190	168	92	60	67	49	91	36	278	20	345	35	92	15	17	48	9.23	99.46
hafir clays																													
1	<b>AD 265</b>	70.52	1.35	16.28	6.97	0.128	1.37	1.38	0.64	1.20	0.17	141	137	58	45	67	41	141	35	276	17	338	30	65	13	8	36	10.81	100.44
2	<b>AD 266</b>	73.76	1.30	14.32	6.37	0.099	1.35	1.19	0.41	1.04	0.16	122	122	51	32	53	36	109	28	341	14	271	21	63	8	15	35	5.62	100.48
21	<b>AD 248</b>	70.49	1.53	16.43	6.25	0.082	1.49	1.86	0.75	1.00	0.13	148	143	46	30	52	37	164	30	411	17	317	30	46	10	8	19	5.45	100.13
a little bit to dark colour after firing																													
3	<b>AD 291</b>	66.81	1.39	19.93	7.70	0.121	1.34	1.05	0.29	1.17	0.21	160	147	65	46	71	48	107	40	252	18	458	46	84	12	17	50	6.89	100.02
wadi clays suitable after levigation																													
4	<b>AD 231</b>	80.25	0.97	11.77	5.13	0.085	0.73	0.62	0.02	0.37	0.05	89	84	38	22	83	13	49	24	257	11	173	28	70	10	7	39	4.21	98.63
5	<b>AD 234</b>	87.43	0.80	8.46	2.30	0.040	0.24	0.42	0.02	0.24	0.04	54	48	14	<5	11	8	26	24	224	7	97	7	40	5	7	5	3.03	101.36
13	<b>AD 238</b>	89.31	0.69	6.68	2.38	0.047	0.30	0.37	0.01	0.19	0.03	53	49	17	<5	14	10	28	15	224	6	121	<5	37	5	5	6	2.54	99.38
raw materials not suitable to be used to produce pottery found at Musawwarat es-Sufra																													
to dark colour after firing, to high Fe, Mg and Ca																													
7	<b>AD 233</b>	65.97	1.60	18.46	7.57	0.130	2.01	2.15	0.80	1.16	0.16	167	155	59	42	72	43	175	41	347	19	360	32	68	10	10	35	6.59	100.20
22	<b>AD 246</b>	71.69	1.66	13.72	6.82	0.100	1.78	2.11	0.86	1.11	0.15	141	153	48	32	63	40	178	34	568	17	354	21	67	10	11	60	4.56	100.27
27	<b>AD 269</b>	66.51	1.39	17.52	8.08	0.128	2.00	2.30	0.66	1.29	0.14	147	147	67	48	70	51	189	31	282	17	377	37	60	11	15	60	6.67	100.20
distinctly different thermal behaviour																													
24	<b>AD 249</b>	66.85	1.28	18.32	8.32	0.114	2.03	1.54	0.27	1.10	0.17	151	140	72	49	73	48	128	29	277	17	314	35	57	11	13	44	8.39	99.69
26	<b>AD 251</b>	90.39	0.56	5.12	2.71	0.045	0.44	0.33	0.02	0.36	0.02	54	50	20	5	15	14	37	12	279	6	142	<5	16	6	<5	13	2.01	100.03
20	<b>AD 259</b>	76.26	1.49	18.42	2.92	0.018	0.17	0.25	0.01	0.41	0.06	141	149	24	6	14	12	49	39	509	15	186	27	84	10	9	45	6.37	100.39
15	<b>AD 242</b>	60.49	1.50	24.18	8.96	0.008	0.22	4.36	0.01	0.21	0.07	190	134	44	43	22	7	76	105	238	19	164	43	55	9	10	54	11.35	99.96
18	<b>AD 245</b>	71.81	1.56	14.76	6.03	0.075	1.44	2.42	0.80	0.99	0.13	137	135	43	27	55	34	168	56	439	15	341	31	62	9	7	56	5.17	100.13
16	<b>AD 243</b>	58.12	1.44	23.89	11.77	0.013	0.23	4.00	0.01	0.37	0.16	199	130	72	45	34	10	78	397	241	15	181	142	264	13	14	252	10.89	100.14
17	<b>AD 244</b>	61.08	1.41	22.28	10.29	0.024	0.40	3.85	0.09	0.44	0.14	170	123	61	42	42	13	81	289	262	16	191	89	181	12	13	174	10.22	100.36
white temper																													
white or whitish-grayish clayey materials																													
6	<b>AD 232</b>	72.96	1.63	23.54	1.09	0.006	0.14	0.07	0.02	0.50	0.04	109	108	13	<5	7	12	45	70	287	17	199	42	95	9	10	71	7.67	99.71
23	<b>AD 247</b>	67.27	1.68	27.29	1.73	0.009	0.09	1.43	0.01	0.44	0.04	122	149	18	7	12	13	60	55	278	20	176	35	70	10	12	77	9.61	100.46
19	<b>AD 241</b>	66.97	1.53	26.04	3.68	0.007	0.06	0.93	0.27	0.45	0.06	192	147	20	<5	16	12	67	84	231	20	200	82	91	20	<5	59	9.24	100.40
kaolinic sandstone, Hafir Khalifa (in front of Gebel Ma'afer)																													
14	<b>AD 240</b>	82.55	1.83	13.71	1.41	0.010	0.00	0.32	0.02	0.08	0.07	80	72	19	<5	11	<5	20	184	472	13	51	114	238	9	<5	196	na	99.31
kaolinic sandstone, small quarry at the edge of Wadi Ma'afer																													
8	<b>AD 230</b>	82.66	1.29	14.29	1.21	0.011	0.10	0.13	0.01	0.17	0.14	53	61	16	<5	8	<5	26	373	271	12	87	218	539	12	<5	521	5.03	99.63
9	<b>AD 235</b>	83.84	1.70	12.29	1.95	0.019	0.01	0.06	0.01	0.09	0.02	100	85	14	<5	7	<5	13	49	498	21	32	15	21	6	<5	15	4.71	100.09
Contemporary pottery workshop in Shendi																													
clay																													
34	<b>AD 262</b>	64.84	1.71	15.54	9.40	0.155	2.42	3.53	0.86																				

(after the firing test) as suitable for pottery making is very diverse in terms of the content of both major and trace elements [Table 2]. The main difference in chemical composition between samples of wadi clays and recent bottom-sediments from hafirs is that wadi clays have a higher aluminium content (19–25%  $\text{Al}_2\text{O}_3$ ). The levels of  $\text{MgO}$ ,  $\text{CaO}$ ,  $\text{Na}_2\text{O}$  and  $\text{K}_2\text{O}$  in wadi clays are also generally lower than those in hafir clays. An interesting case is sample AD250,25 (wadi clay collected from a wadi north-west of Musawwarat), which has 25%  $\text{Al}_2\text{O}_3$  and 10%  $\text{Fe}_2\text{O}_3$ . Such a high level of iron is typical of low-melting, much darker-firing Nile alluvial clays. Despite this very high iron content, the colour of this sample does not differ from that of other wadi clays after firing at 1200°C.

Raw materials which the firing test showed to be unsuitable for manufacturing local Musawwarat fabrics are also highly diverse in their chemical composition. Samples AD242,15, AD243,16 and AD244,17, taken from the top layer of the wall of Hafir Khalifa (in front of Gebel Ma'afer), are distinctive in having a higher content of carbonates (expressed as 3.85–4.36%  $\text{CaO}$ ) than any other raw material samples from the Musawwarat area. These samples also have high levels of iron (8.96–11.77%, X-ray diffraction revealed the presence of goethite and/or hematite), which, as in the case of sample AD250,25, did not result in the sample becoming distinctly darker after firing; the colour is probably neutralised by the sample's kaolinite content (22–24%  $\text{Al}_2\text{O}_3$ ). Two of these samples (those with more than 10%  $\text{Fe}_2\text{O}_3$ ) have very high levels of yttrium (289 and 397 ppm respectively), lanthanum (89 and 142 ppm) and cerium (181 and 264 ppm). The high concentrations of these three trace elements are linked to the presence of monazite. High levels of lanthanum and cerium were noted in one pottery sherd discovered at Musawwarat es-Sufra (AD087),<sup>31</sup> but its yttrium content only amounts to 55 ppm, whilst the high potassium content and low titanium content of this sherd, as well as its different thermal behaviour, preclude its local provenance. In contrast to the aforementioned three samples taken from the top layer of the wall of Hafir Khalifa, the chemical composition of recent bottom-sediments from this hafir only differs appreciably from that of sediments from other hafirs in having a higher  $\text{CaO}$  content (which is higher than the  $\text{CaO}$  content noted in all analysed Meroitic pottery sherds attributed to the Musawwarat reference groups).

Chemical analysis of materials that could have served as temper macroscopically visible in the Musawwarat fabrics as white-firing aggregates [Fig. 21] showed that not all types of white sandstone sampled from local quarries would have been suitable for use by Meroitic potters in Musawwarat es-Sufra. Two samples of white sandstone from a small quarry at the edge of Wadi Ma'afer (AD230,8 and AD235,9) were taken for chemical analysis. The first of these is characterised by very high levels of yttrium ( $\text{Y} = 373$  ppm) as well as lanthanum, cerium and neodymium ( $\text{La} = 218$  ppm;  $\text{Ce} = 539$  ppm,  $\text{Nd} = 521$  ppm). This sandstone was not used as a non-plastic temper in the ceramic bodies from which Meroitic pottery was made in Musawwarat. The second sample was taken from the opposite side of the quarry. There is nothing distinctive in the chemical composition of this sandstone, and it could have been used as a temper [Table 2]. However, it should be noted that adding this sandstone to a ceramic body will result in an increase in its content of silica rather than aluminium (sample AD235,9: 83.9%  $\text{SiO}_2$  and 12.3%  $\text{Al}_2\text{O}_3$ ). A high aluminium content (23–27%  $\text{Al}_2\text{O}_3$ ) occurs in the white-firing silty clayey materials sampled from the wall of Hafir Said (AD232,6), the foot of Gebel Ma'afer (AD241,19) and the bank of the Wadi es-Sufra (AD247,23).

Nile alluvial clays taken from the vicinities of El-Geili, Wad Ban Naga and Shendi differ distinctly from wadi and hafir clays<sup>32</sup> because of their high levels of titanium (2.5–2.85%  $\text{TiO}_2$ ) and iron (12.4–14.4%  $\text{Fe}_2\text{O}_3$ ). Their levels of  $\text{MgO}$  (2.8–3%),  $\text{CaO}$  (3.9–6.0%) and strontium (217–301 ppm),

<sup>31</sup> DASZKIEWICZ, WETENDORF 2014.

<sup>32</sup> Hafir clay = bottom-sediments.

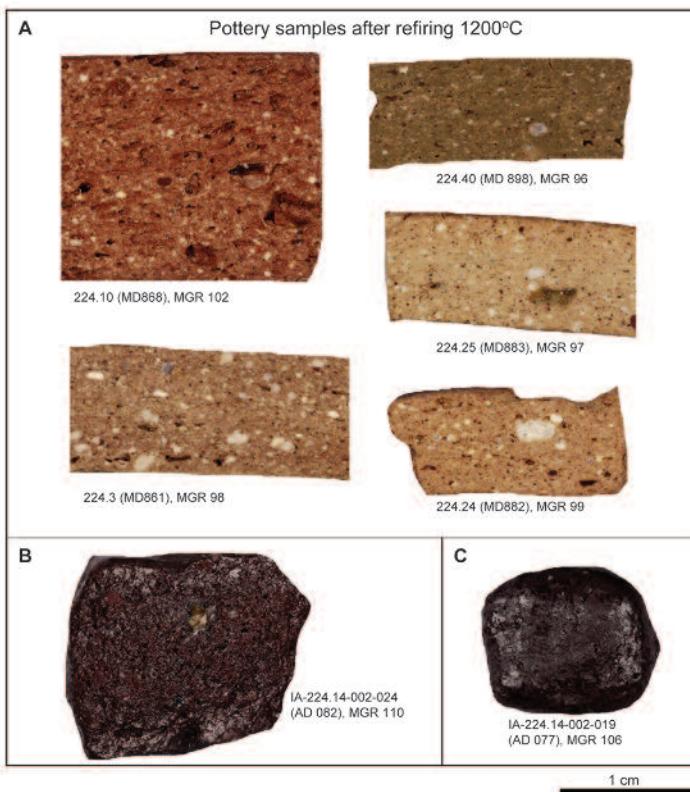


Fig. 21. Pottery fragments after refiring at 1200°C:  
A = local pottery made at Musawwarat, B = imports  
(macro photos M. Baranowski)

which is geochemically correlated with calcium, are also higher than those noted in wadi clays and hafir clays. Carbonates in the Nile alluvial clays are correlated with a higher strontium content than that observed in clays from around Musawwarat (e.g. sample AD243,16 has 4% CaO and 78 ppm Sr, while sample AD292 has 3.92% CaO and 217 ppm Sr), which is attributable to the calcium being of a different origin. Alluvial clays exhibit similar thermal behaviour to that observed in pottery ascribed to the so-called alluvial group discovered at Musawwarat es-Sufra [cf. Figs. 17 and 21]; however, their chemical composition reveals that they were not the raw materials used for making pottery at Musawwarat.

In figure 22, the results of multivariate cluster analysis<sup>33</sup> are presented in the form of a dendrogram. This analysis<sup>34</sup> takes into account the chemical composition of 85 pottery fragments (57 pottery fragments attributed to Mus 1 – Mus 4, five samples attributed to the Mus 5 reference group,<sup>35</sup> 11 fragments identified as “probably local”<sup>36</sup> and 12 fragments made of Nile alluvial clays) and 12 raw materials (samples selected after plasticity and firing tests). Two major clusters were singled out.

<sup>33</sup> All discriminant, principal components and multivariate clusters analyses were done in ARCHEA using the SYSTEM Package ClusCorr 98 on licence from the Weierstrass Institute for Applied Analysis and Stochastics, Leibniz Institute in Forschungsverbund Berlin e.V.

<sup>34</sup> Analysis using Euclidean distance and average linkage

aggregative clustering of a distance, Z-scores transformation of data, elements used: Si, Ti, Al, Fe, Mn, Mg, Ca, Na, K, V, Cr, Ni, Zn, Rb, Sr, Y, Zr, Nb, Ba, La and Ce.

<sup>35</sup> A new reference group; publication in preparation.

<sup>36</sup> DASZKIEWICZ, WETENDORF 2014, samples were classified as “probably local at Musawwarat or regional”.

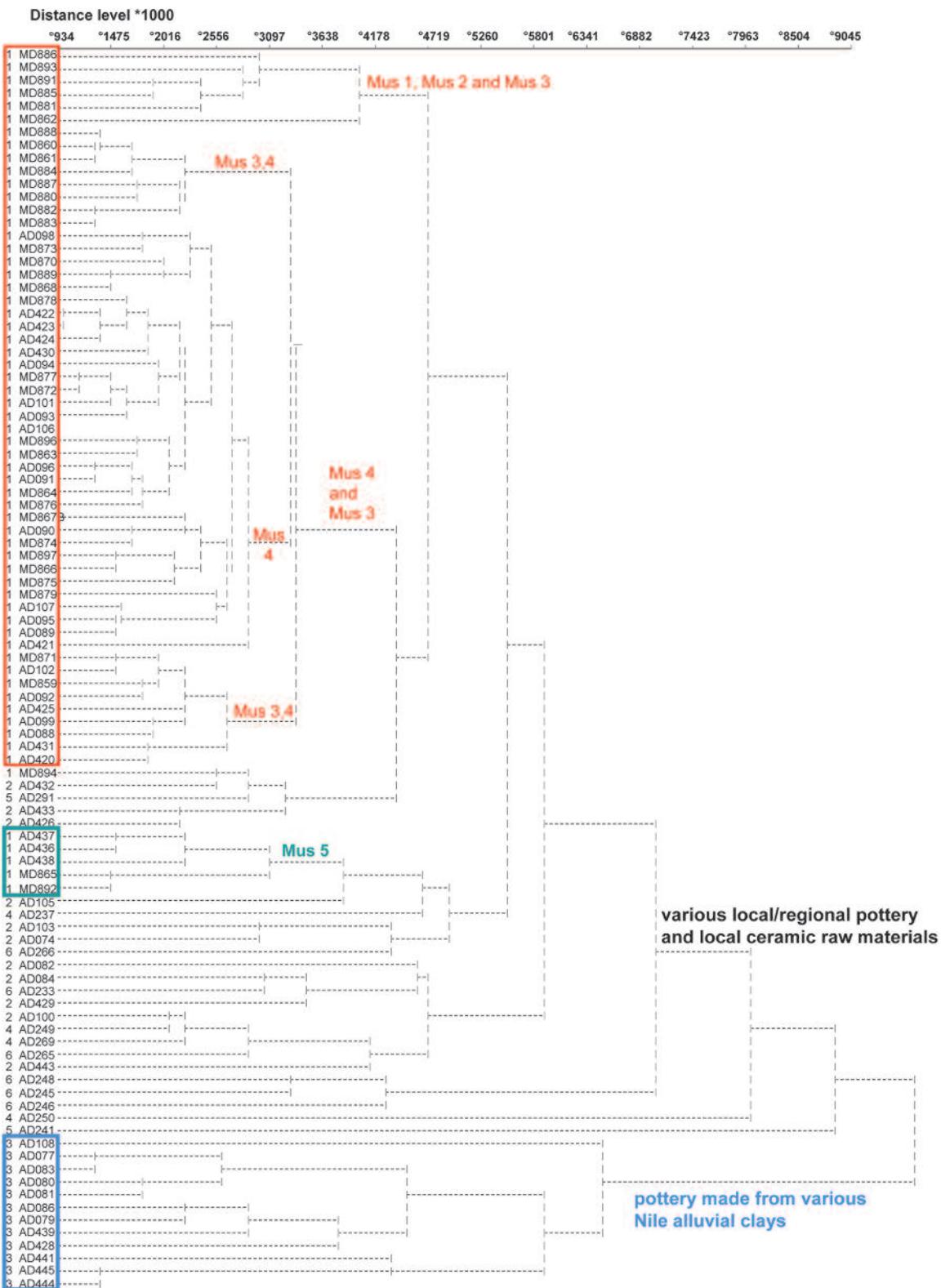


Fig. 22. Dendrogram of cluster analysis. Aggregative clustering of Euclidian distances using average linkage, logged data, elements used: Si, Ti, Al., Fe, Mn, Mg, Ca, Na, K, V, Cr, Ni, Zn, Rb, Y, Sr, Zr, Nb, Ba, La, and Ce. The first column shows cluster numbers used in figures 23–28, see list of abbreviations in figure 23. The second column shows sample numbers

The first of these encompasses all fragments of pottery made from fabrics Mus 1 – Mus 5, “probably local” pottery and all raw materials. The second major cluster is represented solely by pottery fragments made from Nile alluvial clays. This analysis indicates that the greatest similarity with Musawwarat pottery in terms of chemical composition is exhibited by wadi clay AD237,11 and by a raw material used by a local potter<sup>37</sup> (AD291,3). The same picture also emerges when taking into consideration discriminant analysis [Fig. 23],<sup>38</sup> demonstrating the good discrimination of these groups. The same groups are also evident in principal components analysis [Fig. 24]. A loading plot [Fig. 25] attests to the significance of elements such as Ti, Fe, Mg and Ca in grouping the samples.

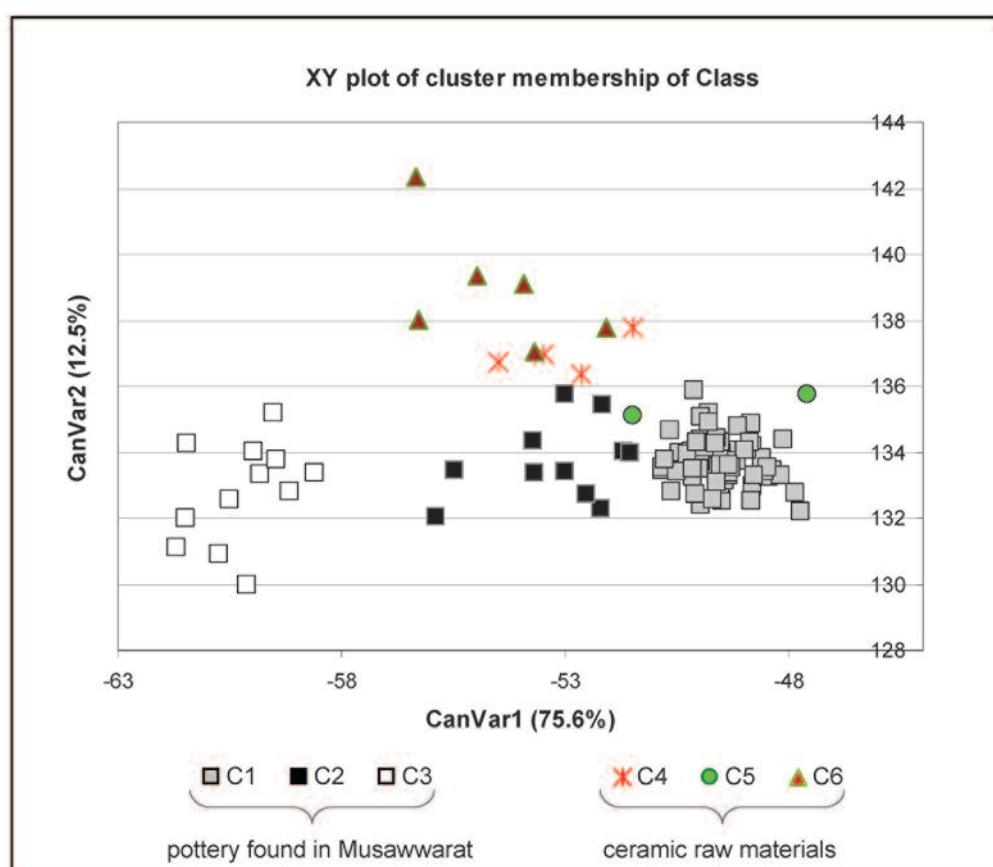


Fig. 23. Discriminant analysis. Plot of the first two canonical variables (CanVar1–CanVar2): C1 = pottery found in Musawwarat es-Sufra belonging to reference groups Mus 1 – Mus 5; C2 = pottery found in Musawwarat es-Sufra made from various clays described as “probably local”; C3 = pottery found in Musawwarat es-Sufra made from various Nile alluvial clays; C4 = wadi clays; C5 = raw materials from hafir walls, including material used by a local potter; C6 = recent bottom-sediments from various hafirs

<sup>37</sup> The earlier mentioned potter named Amma, who lives in a nearby village to the site at Musawwarat es-Sufra.

<sup>38</sup> Uniform coding is used in the dendrogram, discriminant analysis, principal components and biplots: C1 = pottery found in Musawwarat es-Sufra belonging to reference groups Mus 1 – Mus 5; C2 = pottery found in Mu-

sawwarat es-Sufra made from various clays described as “probably local”; C3 = pottery found in Musawwarat es-Sufra made from various Nile alluvial clays; C4 = wadi clays; C5 = material from the walls of hafirs; C6 = hafir clay (recent bottom-sediments).

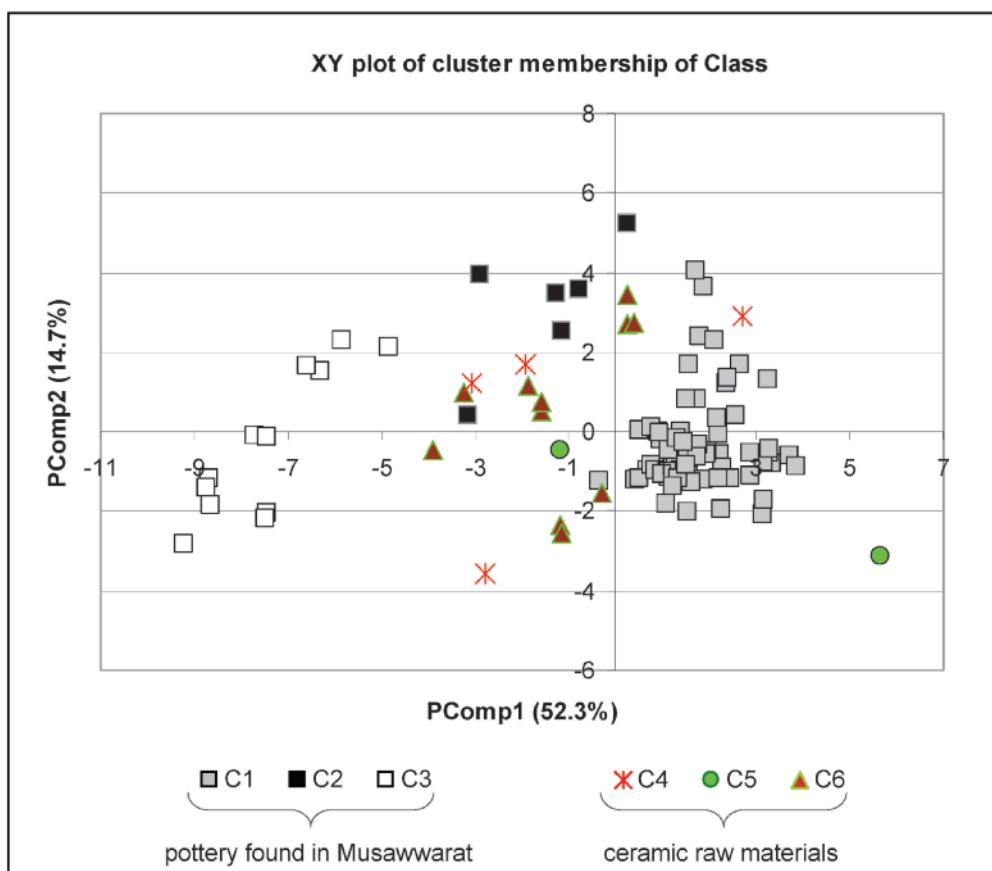


Fig. 24. Principal component analysis. Plot of the first two principal components (PC1–PC2) for potsherds and raw material samples; C1–C6 = see description of figure 23

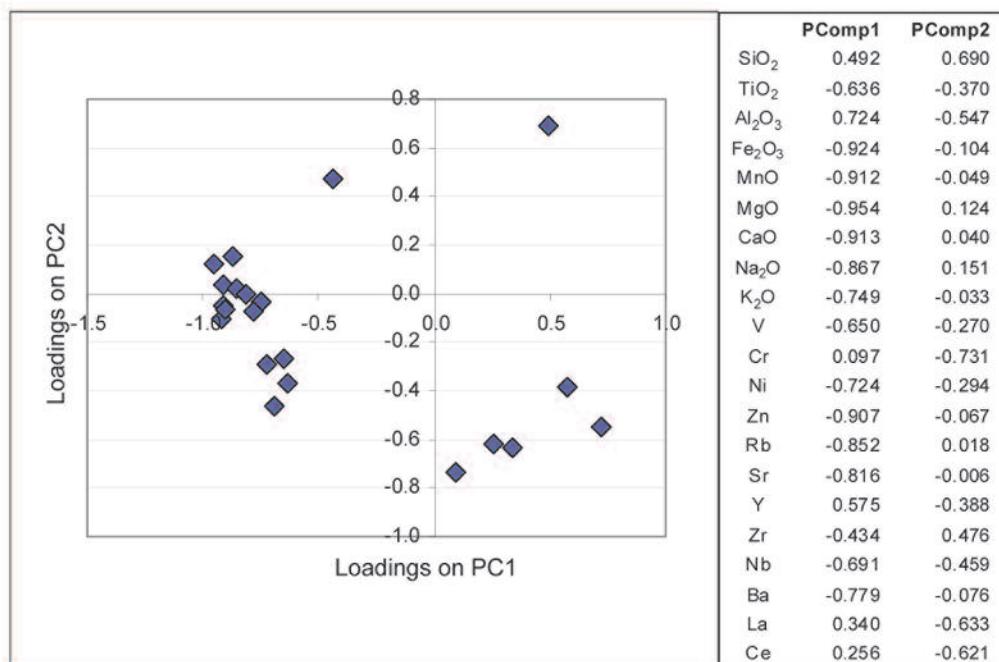


Fig. 25. Loading plot for the plot shown in figure 24

Imported pottery (namely samples of ceramics made from Nile alluvial clays) can be clearly distinguished from all other samples, even without the use of multivariate statistics. Figure 26 shows a biplot of iron content versus sodium content. Pottery sherds grouped under “Nile alluvial clays” are distinctive in having higher levels of iron and lower levels of sodium than those noted in other sherds and local raw materials. All of these samples have an over-melted matrix type after refiring at 1200°C, which is linked to higher levels of fluxes. All pottery sherds made from Nile alluvial clays [Fig. 27, C3] have a flux content of more than 15%. None of the local or probably local sherds, nor any of the samples of wadi and hafir clays and clays from hafir walls, have an equally high level of fluxes. Flux content varies in local pottery (C1 = Mus 1–5) from 6% to 10%. The exception to this is one sample (MD894) with a flux content of 11.87%; this is the only sample representing group MGR 103.<sup>39</sup> One raw material sample was attributed to this ceramic group: wadi clay AD237,11. Samples from cluster C2 are characterised by a flux content of 10–14%; here, there is also one exception — sample AD074, which has fewer fluxes (8.80%). It is the only sample representing group MGR 105. A raw material used by a local potter (AD291,3), one wadi clay (AD249) and one hafir clay (AD233) were also attributed to this group. The remaining hafir clays are characterised by the same sum total of fluxes as C2 pottery, but they have a lower  $\text{Al}_2\text{O}_3/\text{SiO}_2$  ratio, which is linked to an increased quantity of sandy and/or silty grains of quartz.

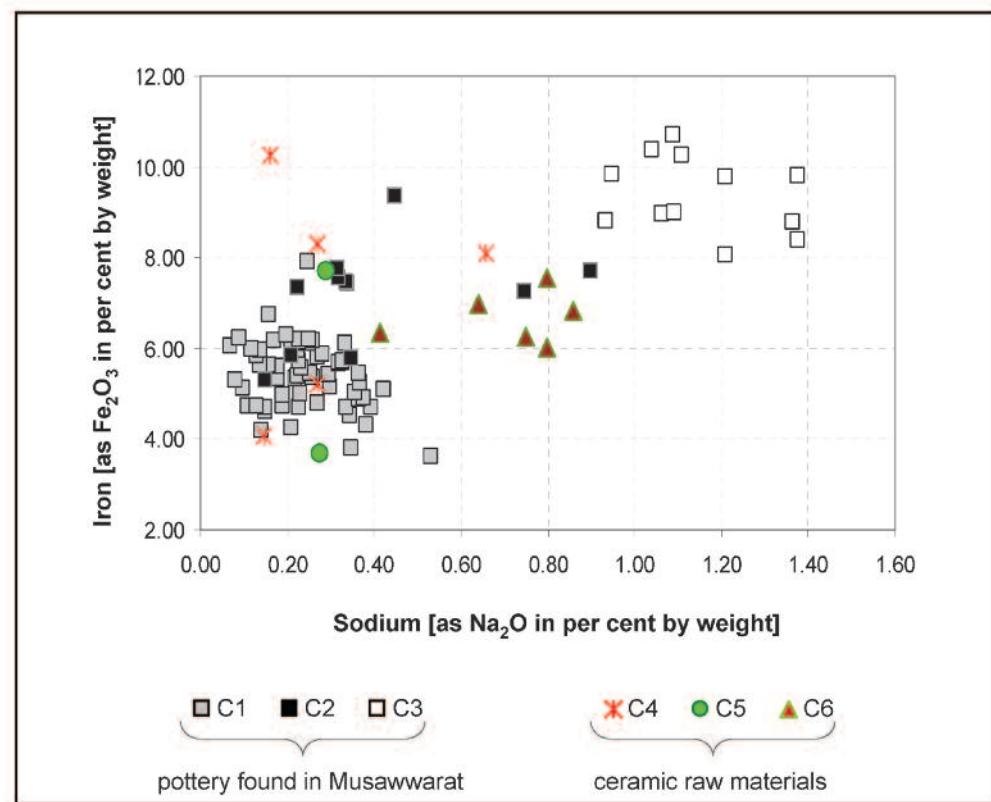


Fig. 26. Biplot showing levels of iron (as  $\text{Fe}_2\text{O}_3$  in per cent by weight) versus levels of sodium (as  $\text{Na}_2\text{O}$  in per cent by weight); C1–C6 = see description of figure 23

<sup>39</sup> NÄSER, DASZKIEWICZ 2013.

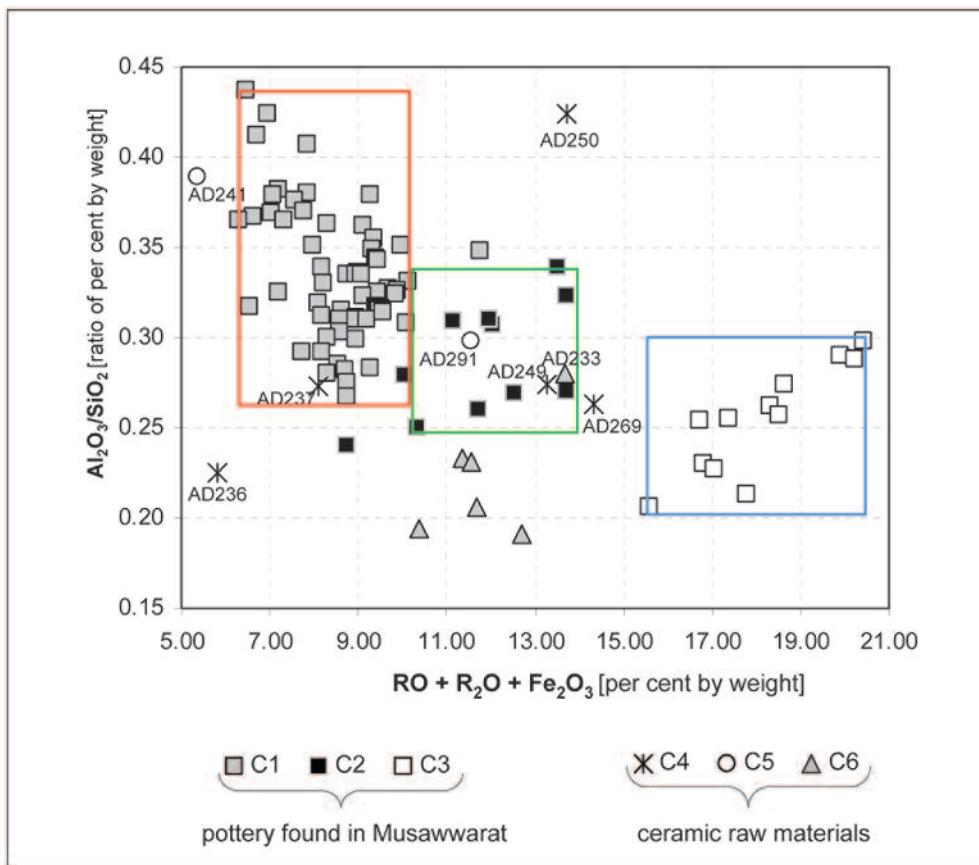


Fig. 27. Biplot showing sum of fluxes (in per cent by weight) versus ratio of  $\text{Al}_2\text{O}_3$  to  $\text{SiO}_2$  (in per cent by weight):  $\text{RO} = \text{MgO} + \text{CaO}$ ;  $\text{R}_2\text{O} = \text{Na}_2\text{O} + \text{K}_2\text{O}$ ; C1–C7 = see description of figure 23

The biplot shown in figure 28 is used in assessing the technical properties of ceramic materials. It shows the total of fluxes in molar sum versus molar ratio  $\text{Al}_2\text{O}_3/\text{SiO}_2$  (this is known as an Avgustinik diagram). Dashed lines indicate various areas where raw materials with differing technical properties occur. Most of the local pottery and wadi clays correspond to “pottery and terracotta clays”, hafir clays correspond to “clinker clays” and “brick clays”, and pottery made of Nile alluvial clays corresponds to “brick clays”. White-firing iron-poor silty clayey materials and kaolinitic sandstones did not fall within any of these categories because of their low level of fluxes, in this case a low iron content.

Analysis results demonstrate conclusively that pottery classified on the basis of its thermal behaviour and chemical composition as having been made from various Nile alluvial clays was indeed made using clays of this type. None of the raw material samples collected from the vicinity of Musawwarat es-Sufra has a similar chemical composition, thermal behaviour or technical properties (according to Avgustinik). Pottery considered to have been produced at workshops local to Musawwarat es-Sufra is fairly homogeneous in terms of both its chemical composition and thermal behaviour. It was made using wadi clays. Pottery that had hitherto been regarded as “probably local” was made using various locally available raw materials, including both wadi and hafir clays, or materials similar to those sampled from hafir walls.

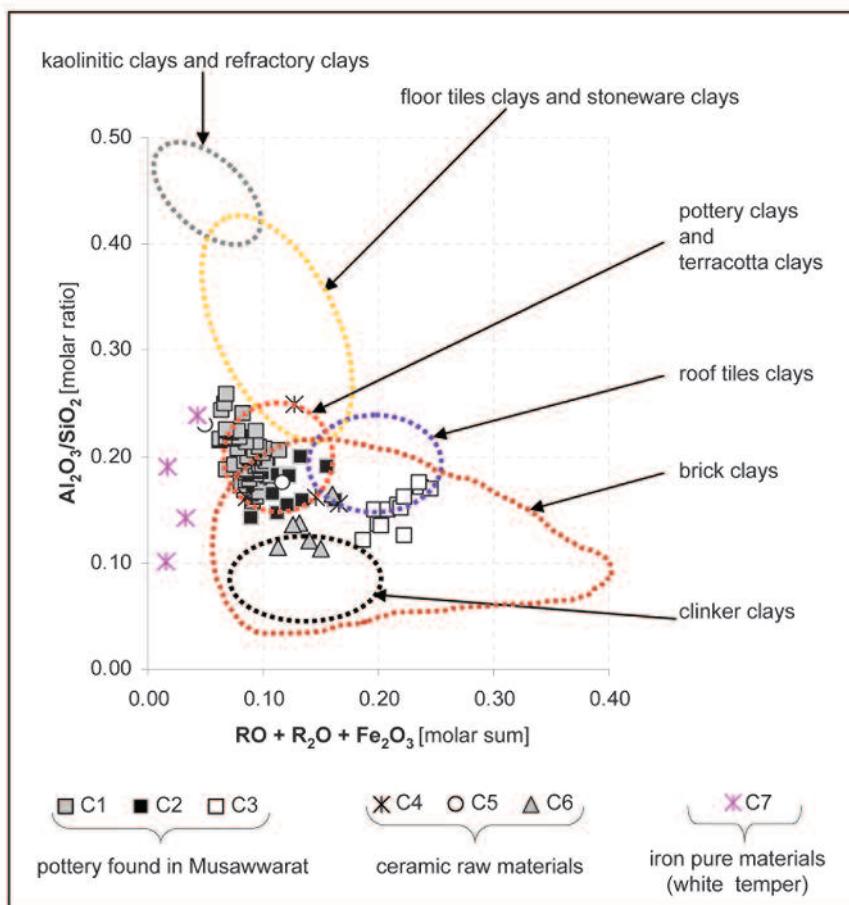


Fig. 28. Biplot showing sum of fluxes (molar sum) versus molar ratio of  $\text{Al}_2\text{O}_3$  to  $\text{SiO}_2$ . All local pottery and wadi clays correspond to “pottery clays”, deposits from hafirs correspond to “clinker clays” and “brick clays”, pottery made from Nile alluvial clays correspond to “brick clays”; C1–C6 = see description of figure 23; C7 = white-firing, iron-poor kaolinitic clayey materials and iron-poor kaolinitic sandstones that may have been used as tempers

### Model analysis

Laboratory analysis of pottery recovered from Musawwarat es-Sufra revealed that some of it was made from wadi clays and hafir clays, predominantly tempered with grains of iron-poor, kaolinitic material (white-firing). Organic temper was chiefly found in vessels made from other types of clays, in particular alluvial clays. However, the wadi and hafir clays local to the Musawwarat region do not exhibit significant linear thermal shrinkage. What then was the purpose of adding the white-firing aggregates (grains of kaolinitic sandstone or aggregates of silty kaolinitic clays) visible in Musawwarat fabrics? And what technological reasons were there for tempering pottery with dung? Model analysis was undertaken in search of answers to these questions. This analysis was carried out on briquettes made of wadi clay (AD236),<sup>40</sup> clay from the upper part of a hafir wall (AD291) and Nile alluvial clay sampled from the vicinity of Shendi (AD261) without any intentional temper and tempered with kaolinitic sandstone taken from the foot of Gebel Ma'afer (AD241), as well as with donkey and cow dung collected around Musawwarat es-Sufra [Fig. 29].

<sup>40</sup> After the removal of several grains in gravel fraction.

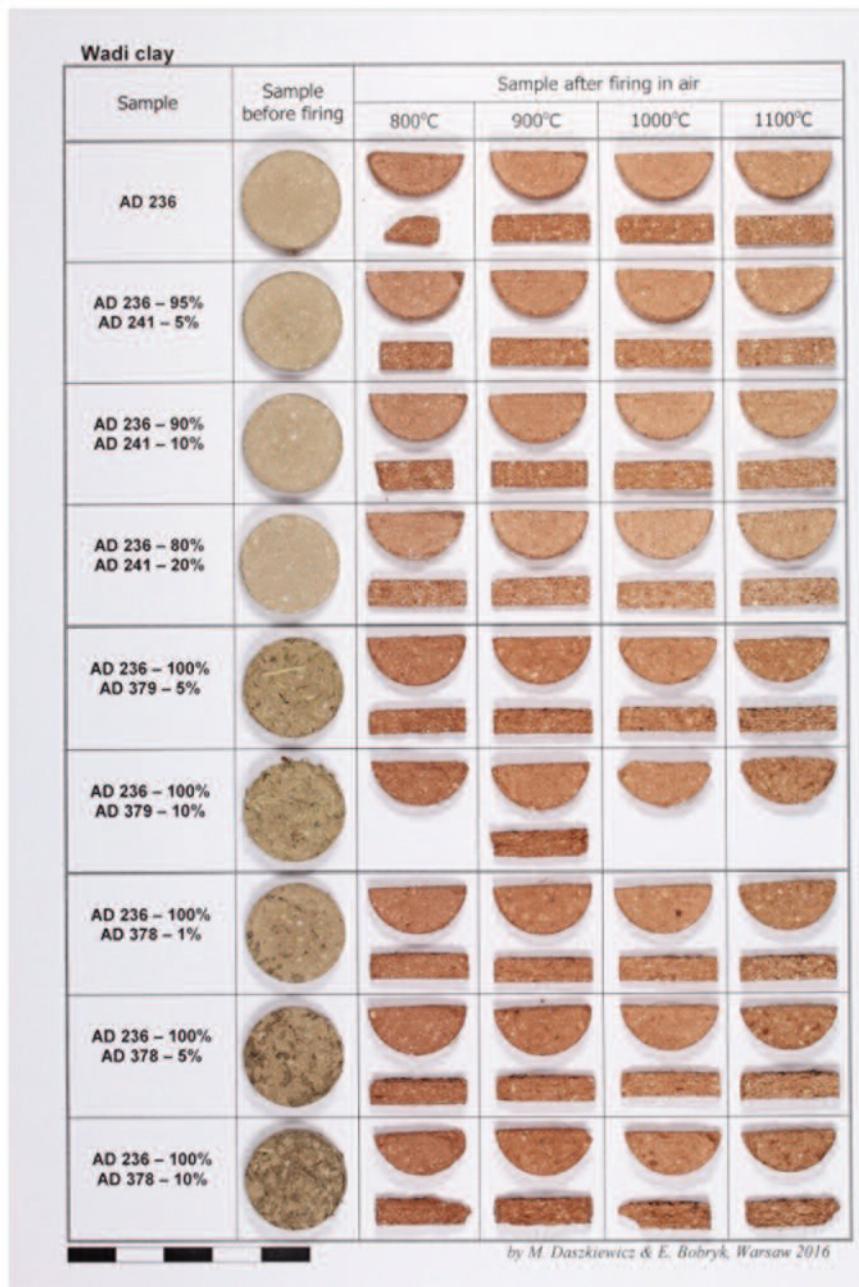


Fig. 29. Briquettes made of wadi clay AD236 tempered with kaolinitic sandstone (AD241), cow dung (AD378) and donkey dung (AD379)

Ethnoceramic studies revealed that all potters using traditional technologies made their pottery from alluvial clays tempered with dried and crushed donkey dung (such temper has no influence on the chemical composition of the sherd, see table 2). When interviewed, these potters confirmed that they only ever used dried donkey dung as a temper, while dried cow dung was only ever used as bonfire fuel. Thus, it was evident that the potters believed that different types of dung have different functional properties. Comparing the fabric of donkey-dung-tempered vessels with sherds of ancient pottery led to some interesting observations. One of them involved a contemporary pot made by a potter in Shendi. The pores of this vessel were identical in appearance to those seen in

Meroitic pottery recovered from the nearby site of Musawwarat es-Sufra. It is usually said that the organic temper used in ancient pottery was either chaff or straw, but perhaps ancient potters also used dung as a tempering material. Its preparation would have been simple, as it only needs to be lightly crushed. This type of organic matter would also have been convenient to use, as it would have already been neatly “chopped up” by the donkey when it chewed its food [Fig. 30]. Whatever the source of the organic temper used in Meroitic pottery found at Musawwarat es-Sufra, what impact this temper had on the properties of the pottery remains an unresolved issue.

Two types of samples were prepared for model analysis:

a) samples with added kaolinite temper

Three selected crumbled clays were used to make ceramic bodies containing 0, 10 and 20% (by weight) kaolinitic sandstone (AD241). Next, a granulated powder for shaping in a uniaxial press was created by adding 7% (by weight) distilled water to each batch, which was then mixed and passed several times through a 0.5 mm gauge nylon sieve. Finally, the samples were formed into disc-shaped briquettes of 20 mm in diameter and ca. 5 mm high in a steel mould at 10 MPa pressure using a hydraulic press.

b) samples with added pore-forming agent

Batches containing a 5% and 10% (by weight) excess addition of dried donkey dung (AD379) and cow dung (AD378), that had earlier been crumbled and fractionated on sieves, were made using three chosen crumbled clays. The 0.5–2 mm fraction selected is the same as that used by a contemporary potter in Shendi. The samples were shaped as described above.

After they had been dried in a laboratory drier, all of the samples were fired in a Carbolite resistance furnace at 800, 900, 1000 and 1100°C, being kept at the peak temperature for 1 hour at a temperature progression of 200°C/h, and then being cooled with the furnace.



Fig. 30. Dried and crushed donkey dung; sample collected from a potter in Shendi (photo M. Baranowski)

Once this process had been completed, the properties of the fired samples were gauged. The apparent density, open porosity and water absorption of the fired samples was determined by hydrostatic weighing. Permeability over time was also assessed (during each measurement the amount of water penetrating the sample was noted after 1, 3, 6, 10, 20, 30, 50, 100, 200, 300, 400 and 1440 minutes), and tensile strength (in [kPa]) was calculated using the Brazilian test as per the following formula:  $\sigma = 2F / \pi D h$  (where: F = destructive force in [N], D = diameter in [m], h = sample height in [m]). A firing test was also carried out.

Measurement of tensile strength (using the Brazilian test) revealed that, as expected, the mechanical properties of samples without any intentional temper steadily improved as the firing temperature increased. The greatest tensile strength at all temperatures was exhibited by samples made of Nile alluvial clay, and the weakest by those made of wadi clay [Fig. 31]. The addition of temper to Nile alluvial clay increased the tensile strength of the briquettes, but only when fired at 800°C was this increase significant. A 10wt% addition of kaolinitic sandstone had the same effect as a 5wt% addition of donkey dung, the best effect being obtained by a 5% addition of cow dung [Fig. 32].

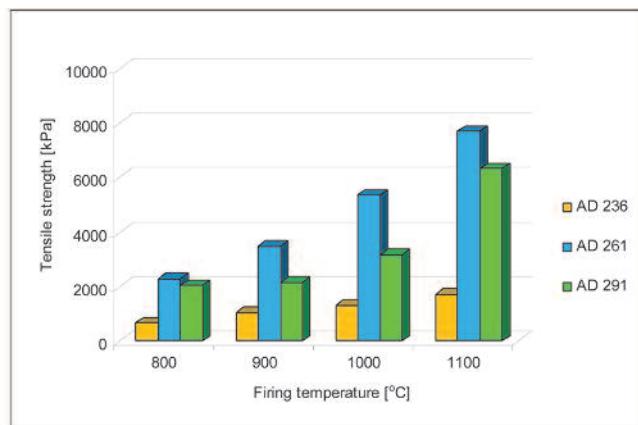


Fig. 31. Tensile strength of briquettes made of wadi clay (AD236), Nile alluvial clay (AD261), clay used by a local potter and clay from the upper layer of the Great Hafir in Musawwarat es-Sufra (AD291) fired at various temperatures (average values of tensile strength, cv<15%)

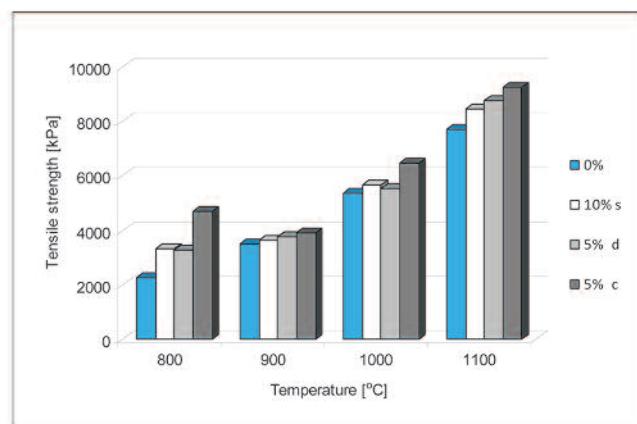


Fig. 32. Tensile strength of briquettes made of Nile alluvial clay (AD261) tempered with either kaolinitic sandstone, donkey dung or cow dung fired at various temperatures (average values of tensile strength, cv<15%)

The same tempers added to the ceramic body made of wadi clay had a slightly different effect on the mechanical properties of the fired briquettes. Depending on the firing temperature, greater tensile strength was achieved by adding kaolinitic sandstone or cow dung. Tempering with donkey dung reduced tensile strength regardless of the firing temperature [Fig. 33]. The amount of temper added was also significant. Figure 34 shows the tensile strength values (in MPa) for briquettes made of wadi clay fired at various temperatures with different percentages of added temper. A 5% addition of kaolinitic sandstone had a better effect than a 10wt% addition, except when samples were fired at 1000°C, when the effect was negligible. In the case of both donkey and cow dung there was a distinct reduction in tensile strength after a 10wt% addition<sup>41</sup> of these tempers as opposed to a 5wt% addition [Fig. 34]. This analysis demonstrates that pottery made of wadi clay has the best mechanical properties when tempered with a 5% addition of kaolinitic sandstone and fired at 1100°C. It is interesting that this ceramic material has the same mechanical properties as pottery made of Nile alluvial clay tempered with donkey dung (or kaolinitic sandstone) fired at 800°C.

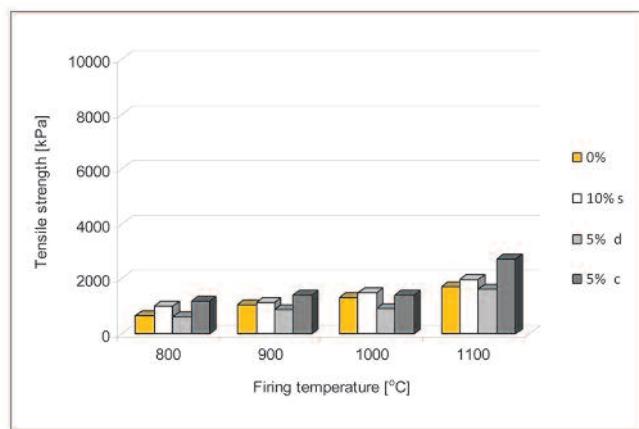


Fig. 33. Tensile strength of briquettes made of wadi clay (AD236) tempered with either kaolinitic sandstone, donkey dung or cow dung fired at various temperatures (average values of tensile strength, cv<15%)

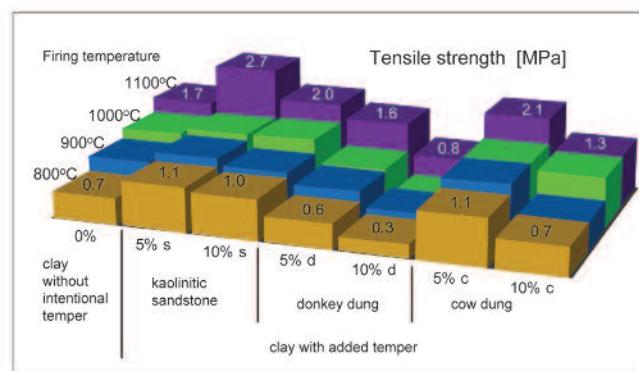


Fig. 34. Tensile strength of briquettes made of wadi clay (AD236) tempered respectively with 5 and 10 weight per cent kaolinitic sandstone, donkey dung or cow dung fired at various temperatures (average values of tensile strength, cv<15%)

<sup>41</sup> Excess addition.

The results of analyses aimed at estimating the original firing temperature of Meroitic pottery found at Musawwarat es-Sufra indicate that it was relatively high-fired. X-ray diffraction analysis revealed the presence of mullite in local wheel-made coarse wares (reference group Mus 4) and both mullite and cristobalite in several samples (e.g. AD093 [Fig. 35]). Fine wares were originally fired at lower temperatures. Inferences about original firing temperatures drawn from the presence of mullite<sup>42</sup> and cristobalite<sup>43</sup> were confirmed by K-H analysis.<sup>44</sup> The curves shown in figure 36a indicate that sample AD093 was originally fired at around 1150°C<sup>45</sup> and sample MD881 at around 950°C [Fig. 36b].

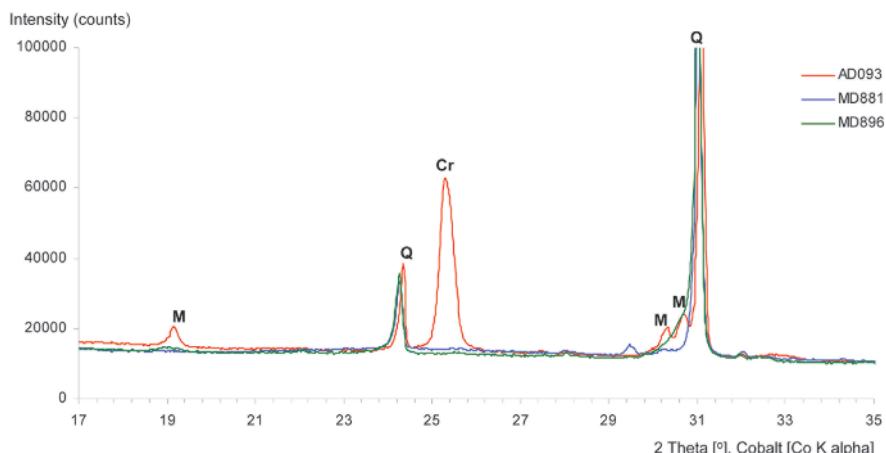


Fig. 35. Diffractograms of X-ray powder diffraction analysis carried out on fragments of local pottery from Musawwarat es-Sufra: M = mullite, Cr = cristobalite, Q = quartz

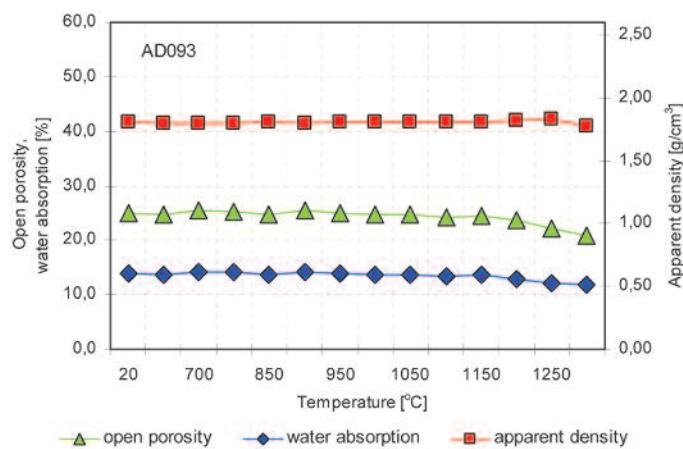


Fig. 36a. Pottery fragment of local Musawwarat wheel-made coarse ware. Open porosity, water absorption and apparent density values were estimated at room temperature and after refiring. Original firing temperature  $T_{eq} = ca. 1150^{\circ}C$

<sup>42</sup> Natural mullite is rare in nature; nevertheless, it is a common compound in high-fired ceramic products as this mineral is part of their final phase composition since they are made from aluminium silicate materials. Mullite forms at ca. 1000°C (or higher) depending on the composition of ceramic bodies.

<sup>43</sup> Polymorph of silica forming at high temperature.

<sup>44</sup> For a description of K-H analysis, see DASZKIEWICZ 2014.

<sup>45</sup> A high firing temperature (1000–1050°C) was detected for Meroitic pottery found in the Fourth Cataract region, among fine wares imported from specialised high-tech workshops (see DASZKIEWICZ *et alii* 2003). An initial study of firing temperatures for pottery found in Musawwarat-es Sufra did not reveal such high values (DASZKIEWICZ, SCHNEIDER 2001).

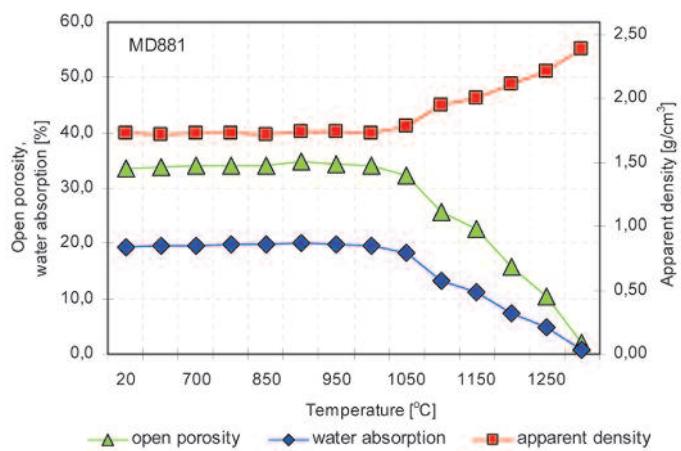


Fig. 36b. Pottery fragment of local Musawwarat wheel-made fine ware. Open porosity, water absorption and apparent density values were estimated at room temperature and after refiring. Original firing temperature  $T_{eq}$  = ca.  $950^{\circ}\text{C}$

Analysis of functional properties, in this instance water permeability, revealed that the briquettes are permeable regardless of the type of clay and temper used and the temperature at which they were fired. To make a vessel impermeable, its surface must be either slipped or polished, as was the case with Meroitic pottery from Musawwarat es-Sufra [Figs. 37 and 38].



Fig. 37. Slip-coated pottery made at Musawwarat es-Sufra (photo M. Wetendorf)



Fig. 38. Pottery made at Musawwarat es-Sufra coated with a thin layer of slip (photo M. Wetendorf)

## Conclusions

1. Ceramic raw materials, the chemical composition and thermal behaviour of which is the same as that of Meroitic pottery found at Musawwarat es-Sufra, are available within the vicinity of this site.
2. Pottery sherds attributable to reference groups Mus 1–4 were made of various local wadi clays (geological horizons Kf and Kst, see Fig. 1).
3. Pottery classified as “probably local” was made of both wadi clays and hafir clays available in the surrounding area (geological horizon Kf, see Fig. 1).
4. In four instances it was possible to verify the provenance of pottery imports found at Musawwarat es-Sufra by comparing them with a database containing samples of ceramics and raw materials collected from various places in Sudan between the Sixth and First Cataracts [Fig. 39]. Two of the Musawwarat samples were made of Nile alluvial clay sourced from the vicinity of es-Zuma; the same clay was also used to make one of the groups of local pottery. One sample belongs to the same reference group (group A2) as local pottery at Hamadab. The fourth sample belongs to the same reference group (group O2) as pottery found at Muweis and Hamadab.
5. The white-firing temper could have been either crushed kaolinitic sandstone or whitish-firing kaolinitic clayey materials from wadis and hafirs. It should be noted, however, that not all locally available kaolinitic sandstone can be taken into consideration as a temper for Meroitic pottery.
6. Model analyses revealed that the mechanical properties of ceramics made from wadi clays improve when tempered with kaolinitic raw materials and when fired at high temperatures (ca. 1100°C). The same is true of pottery made from Nile alluvial clays tempered with dung after firing at lower temperatures (700–800°C). The addition of dung (in particular cow dung) increases the tensile strength of pottery made from hafir clays. This means that pottery made from wadi clay should be fired at higher temperatures than pottery made from alluvial and hafir clays.
7. In order to make vessels impermeable, their surfaces had to be treated (e.g. coated with slip or burnished).
8. The use of cow dung for firing and donkey dung as temper, observed in ethnoceramic studies, is primarily associated with their respective fuel properties.
9. Model analyses demonstrated that the use of tempers represented by whitish-firing aggregates in Musawwarat fabrics made of wadi clays is technologically justified, as it increases the mechanical strength of the pottery.
10. The amount of temper used affects the properties of the pottery. The optimum is to add no more than 5wt% dung or a maximum of 10wt% kaolinitic sandstone.
11. Tempers represented by donkey and cow dung added to a ceramic body have no influence on the chemical composition of a sherd; white kaolinitic sandstone temper results in higher contents of alumina and silica.
12. The results of analysis carried out on Meroitic pottery found at Musawwarat es-Sufra confirm the use of higher temperatures for firing vessels made of wadi clays, with vessels made of alluvial clays being fired at the lowest temperatures. They also confirm the application of surface treatments, such as burnishing and slipping. These analysis results are entirely consistent with the findings of model tests.

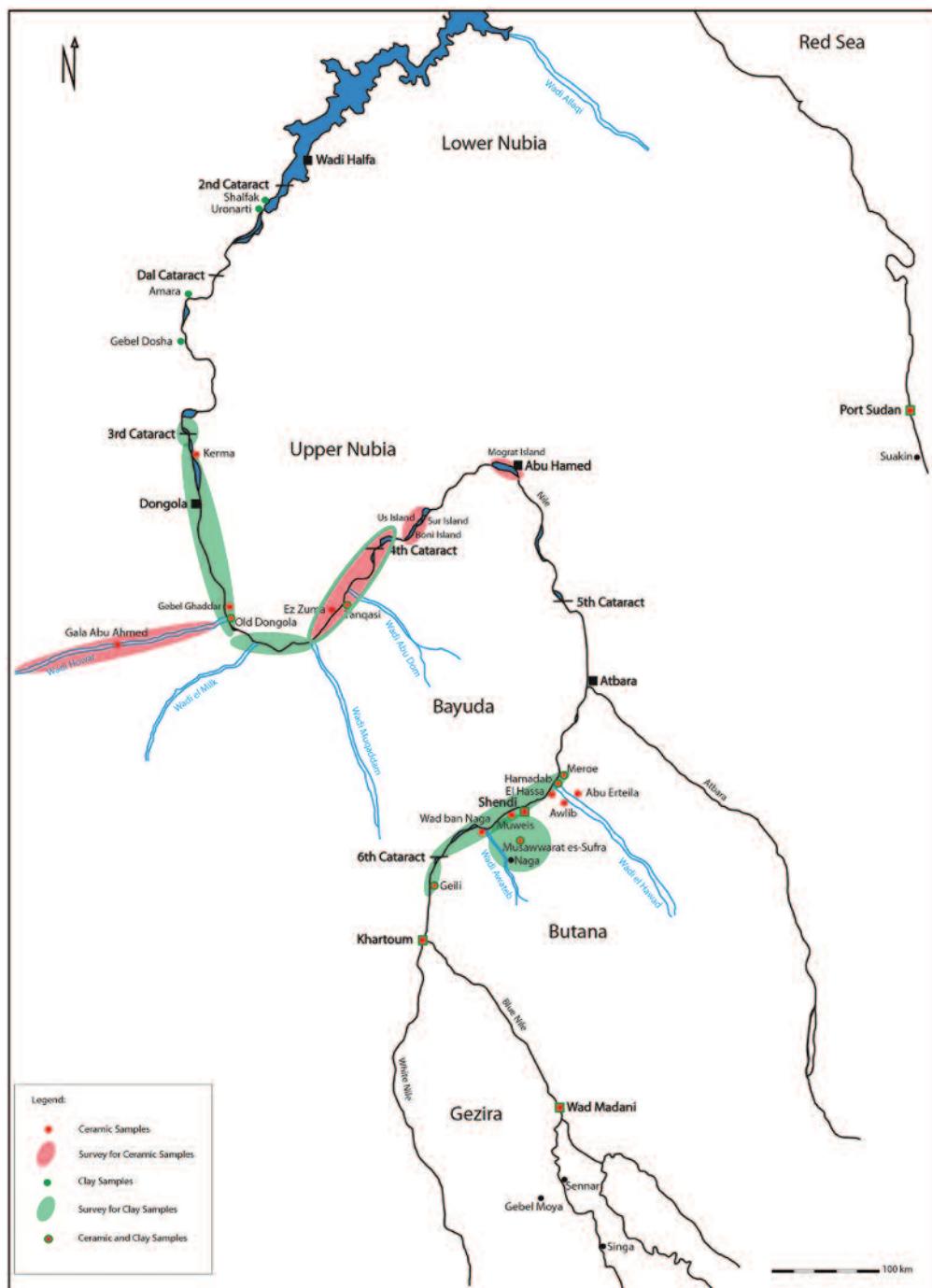


Fig. 39. Locations from which raw material samples were taken in 2008, 2014 and 2017 and sites from where pottery have been analysed in 1997–2017.  
Map, with amendments made by the authors (map created by M. Wetendorf)

## Acknowledgements

The authors are very grateful to the National Corporation for Antiquities and Museums of Sudan for authorising the collection of samples and for permitting the study material to be exported for research purposes.

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## Streszczenie

### **Musawwarat es-Sufra — w poszukiwaniu surowców ceramicznych**

Analizy meroickiej ceramiki znalezionej na terenie Musawwarat es-Sufra wykazały, że została ona wykonana z różnych tzw. *wadi* glin, z glin z hafirów oraz nilowych glin aluwialnych. Gdzie mogły znajdować się źródła surowca do wyrobu tej ceramiki? Biorąc pod uwagę wszystkie dostępne opracowania oraz niepublikowane wyniki analiz ceramiki i analiz surowców (autorzy analiz: M. Daszkiewicz, E. Bobryk, G. Schneider) z terenu pomiędzy Chartumem a III kataraktą nilową, przyjęto, że nowe badania powinny objąć: a) badania terenowe w bezpośrednim otoczeniu Musawwarat es-Sufra, mające na celu pobranie próbek surowców z różnych *wadi* (poszukiwanie surowców ceramicznych użytych do wyrobu ceramiki lokalnej, tzn. ceramiki należącej do grup referencyjnych Mus 1–5); b) badania terenowe w dolinie Nilu, mające na celu pobranie próbek glin aluwialnych w różnych miejscach biegu rzeki (poszukiwanie surowców ceramicznych użytych do wyrobu ceramiki należącej do grupy Clay Type A — czyli ceramiki wykonanej z aluwialnych glin nilowych); c) badania terenowe w bezpośredni i dalszym otoczeniu Musawwarat es-Sufra, mające na celu znalezienie surowców, z których mogłyby być wykonane próbki określone jako „prawdopodobnie lokalne” (w większości są to naczynia robione ręcznie, wykonane z różnych surowców z niższą zawartością tlenku glinu oraz wyższą zawartością topników niż próbki należące do grup Mus 1–5). Ponadto zaplanowane zostały badania materiałów opałowych (drewna, łajna), badania etnoceramologiczne oraz badania modelowe. Pierwszy etap prac terenowych został zakończony, wykonana została również część zaplanowanych analiz oraz badań modelowych. W trakcie prac terenowych przeprowadzonych w listopadzie 2014 roku (M. Daszkiewicz, M. Wetendorf, G. Schneider) pobrano łącznie 64 próbki uznane w terenie za ewentualne surowce ceramiczne. Ponadto pobrano surowce opałowe (drewno z okolicznych drzew i łajno krowie) oraz łajno osła będące po dzień dzisiejszy powszechnie używaną domieszką. W niniejszym artykule przedstawione są wyniki analiz 23 surowców pobranych w bezpośrednim sąsiedztwie Musawwarat es-Sufra oraz wyniki analiz czterech surowców pobranych wzduł drogi biegnącej z Naga do szosy asfaltowej równolegle do Wadi Awateb.

Z przeprowadzonych analiz pobranych surowców oraz z badań modelowych wynikają następujące wnioski:

- W okolicy Musawwarat es-Sufra dostępne są surowce ceramiczne mające skład chemiczny oraz zachowanie termiczne takie jak meroicka ceramika znaleziona na tym stanowisku.
- Fragmenty ceramiki należące do grup referencyjnych Mus 1–4 zostały wykonane z różnych lokalnych glin z *wadi*.

- Wyroby ceramiczne należące do grupy „prawdopodobnie lokalnych” zostały wykonane z dostępnych w okolicy zarówno glin z *wadi*, jak i glin z hafirów.
- Naczynia ceramiczne wykonane z różnych nilowych glin aluwialnych są importami na stanowisku, gliny aluwialne pobrane na wysokości El-Geili, Wad Ban Naga i Shendi nie były surowcami do wyrobu tej ceramiki.
- Rolę biało wypalającej się domieszki mogły pełnić zarówno pokruszony piaskowiec ze spokiem kaolinitowym, jak i biało wypalające się gliny kaolinitowe z *wadi* i z hafirów. Należy jednak podkreślić, że nie wszystkie dostępne w okolicy piaskowce ze spokiem kaolinitowym mogą być brane pod uwagę jako domieszka do meroickiej ceramiki.
- Badania modelowe wykazały, że właściwości mechaniczne ceramiki wykonanej z glin z *wadi* poprawiają się po dodaniu do masy ceramicznej domieszki surowców kaolinitowych i wypaleniu jej w wysokich temperaturach (ok. 1100°C). Takie same parametry mają wyroby ceramiczne wykonane z glin aluwialnych z dodatkiem pokruszonego wysuszonego łajna osła i po wypaleniu w niskich temperaturach (700–800°C). Domieszka łajna (szczególnie łajna krowiego) zwiększa wytrzymałość mechaniczną wyrobów wykonanych z glin z hafirów. Oznacza to, że ceramika wykonana z glin z *wadi* powinna być wypalana w dużo wyższych temperaturach niż ceramika wykonana z glin aluwialnych oraz glin z hafirów.
- Celem otrzymania naczyń nieprzesiąkliwych konieczne jest wykonanie obróbki powierzchni (np. pokrycie slipem czy polerowanie).
- Wyniki analiz meroickiej ceramiki znalezionej w Musawwarat es-Sufra są w pełnej zgodności z wynikami badań modelowych.

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1. Prosimy nadsyłać teksty zapisane standardową czcionką (Times New Roman, Garamond etc.) – 12 pkt. tekst, 10 pkt. przypisy.
2. Teksty prosimy przesyłać jako dokumenty tekstowe (pliki DOC) oraz w formie pliku PDF.
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Przypisy na dole strony winny zawierać, oprócz koniecznych uzupełnień, odsyłacze do literatury podanej w bibliografii, wedle schematu:

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### **2. Książka wydana w serii**

I. NAZWISKO, *Tytuł książki* (= *Nazwa serii* numer w serii), miejsce wydania.

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np. DYCZEK 2005 — P. DYCZEK, „On the genesis of Roman legionary hospitals”, [in:] *Limes XIX, Proceedings of the XIXth International Congress of Roman Frontier Studies, Pécs, Hungary, September 2003*, ed. Z. VISY, Pécs, s. 871–881.

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np. KOLENDO 2008 — J. KOLENDO, „Novae during the Goth raid of AD 250/1 (Iordanes, *Getica* 101–103)”, [in:] *A Companion to the Study of Novae*, ed. T. DERDA, P. DYCZEK, J. KOLENDO (= *Novae. Legionary Fortress and Late Antique Town 1*), Warsaw, s. 117–131.

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I. NAZWISKO, „Tytuł artykułu”, *Tytuł czasopisma* numer rocznika, numery stron.

np. LEMKE 2009 — M. LEMKE, „Stone projectiles from Novae”, *Novensia* 20, s. 209–219.

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I. NAZWISKO, „Tytuł artykułu (hasła)”, *Tytuł encyklopedii* numer tomu (ewentualnie), miejsce wydania, numery stron lub kolumn.

np. CERMANOVIĆ-KUZMANOVIĆ 1976 — A. CERMANOVIĆ-KUZMANOVIĆ, „Risinium”, *The Princeton Encyclopedia of Classical Sites*, Princeton, s. 760.

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cyrylica      transliteracja

а	a
б	b
в	v
г	g
д	d
е	e
ж	ž
з	z
и	i
й	j
к	k
л	l
м	m
н	n
о	o
п	p
р	r
с	s
т	t
у	u
ф	f
х	h
ц	c
ч	č
ш	š
щ	šč (rosyjski); št (bułgarski)
ъ	ă (bułgarski)
ы	y (rosyjski)
ь	,
э	e (rosyjski)
ю	ju
я	ja
ћ	đ (serbski)

Ѓ	g' (macedoński)
Љ	lj (serbski)
Њ	nj (serbski)
Ћ	ć (serbski)
Ќ	k' (macedoński)
Џ	dž (serbski)

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#### **5. Article in periodical**

F. LAST NAME, “Title of article”, *Title of periodical* number of periodical, page range.

e.g. LEMKE 2009 — M. LEMKE, “Stone projectiles from Novae”, *Novenia* 20, pp. 209–219.

#### **6. Article (item) in encyclopedia**

F. LAST NAME, “Title of article (item)”, *Title of encyclopedia* volume number (optional), place of publication, page or column range.

e.g. CERMANOVIĆ-KUZMANOVIĆ 1976 — A. CERMANOVIĆ-KUZMANOVIĆ, “Risinium”, *The Princeton Encyclopedia of Classical Sites*, Princeton, p. 760.

#### **Notes**

1. Items by the same author published in one year need to be identified by successive letters of the alphabet (e.g. 1998a, 1998b, 1998c etc.), listed in alphabetical order of titles.
2. Multiple authors need to be cited in the order on the title page, separated by commas. For more than three authors, list name of first author only and add *et alii*.
3. For book titles in English capitalize all words; in article titles in English capitalize only proper names.
4. For repeated citing of popular series (e.g. *CIL*) and encyclopedias (*RE*) list relevant abbreviations; write out in full if cited only once.
5. In case of titles in other than congress languages include translation into the language of the article, in square brackets [ ].
6. Pages (columns) should be preceded by the relevant abbreviation in the language of the article (PL: s., kol.; ENG: p./pp., col./cols; DE: S., Sp., etc.).
7. Page ranges should be given with ‘en dash’ (see pt. 9 below) without spaces, e.g. 22–35.
8. For multiple publication place names use ‘en dash’ (see pt. 9 below) with spaces, e.g. Warsaw – Cracow – Wrocław.
9. ‘En dash’ — key combination Ctrl + “–” (from the number keyboard).
10. Internet citations should provide full URL in footnotes as well as bibliography. Please provide access dates in each case. If a hard-copy version exists, do not cite electronic version.

## TRANSLITERATION RULES FOR PROPER NAMES IN THE CYRILLIC ALPHABET

Proper names (geographical names, personal names and last names) in the Cyrillic alphabet should be transliterated according to the following rules:

Cyrillic alphabet      transliteration

а	a
б	b
в	v
г	g
д	d
е	e
ж	ž
з	z
и	i
й	j
к	k
л	l
м	m
н	n
о	o
п	p
р	r
с	s
т	t
у	u
ф	f
х	h
ц	c
ч	č
ш	š
щ	šč (Russian); št (Bulgarian)
ъ	ă (Bulgarian)
ы	y (Russian)
ь	,
э	e (Russian)
ю	ju
я	ja
ђ	đ (Serbian)
ѓ	g' (Macedonian)
љ	lj (Serbian)
њ	nj (Serbian)
ћ	ć (Serbian)
ќ	k' (Macedonian)
џ	dž (Serbian)

## ILLUSTRATIONS

1. Illustrations included with an article need to be cited in the text.
2. References to figures are given in the text in square brackets; e.g. [Fig. 1], [Figs. 2–3] (in English), [Ryc. 1], [Ryc. 2–3] (in Polish), [Abb. 1], [Abb. 2–3] (in German) etc.
3. Provide captions for figures describing content. List of figure captions can be appended at the end of the article (after the list of bibliographic references).
4. Include credit information. Authors are responsible for obtaining all relevant copyright permissions required for the legal publication of submitted materials.
5. Submit illustrations as separate files identified by the number of the figure as cited in the text of the article.

### Photographs

Photographs should be submitted as original digital files (TIFF, JPEG, RAW etc.) in maximum available resolution.

### Scans

Scan transparencies in 2400 dpi resolution and submit as TIFF files.

Ink drawings etc. should be scanned in 1200 dpi, as RGB (color) or GREyscale (black/white) in TIFF format.

### Drawings

Digitized figures (plans, maps, drawings of objects etc.) should be submitted as files of the original software in which they were done, that is Corel (not higher than X3) or Illustrator (AI). For Autocad and Archicad software, files should be saved in Corel format, for example.

Submit all illustrations of this kind additionally as PDF or JPG files for inspection.

Avoid submitting JPG or PDF files of figures prepared in one of the graphic software programs.

### Parameters for figures drawn using Corel or Illustrator software

Minimum line thickness: 0.1 mm.

Color: CMYK, for black C=0 M=0 Y=K K=100.

For shades of gray, the difference should be at least 10%.

For legends, Arial font; next to scale: 6 pt, other parts of the legend: 7–9 pt.