Salt in Roman Dacia

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Production, Use, and Strategic Value

Lucrețiu Mihailescu-Bîrliba

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Cover: Salt spring still in use at Livezile (© Lucrețiu Mihailescu-Bîrliba)

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To my wife

Je te promets le sel au baiser de ma bouche
(Jean-Jacques Goldman)

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Iași, December 6th 2024

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Introduction

Salt in Roman times has not enjoyed the same attention as other below ground exploitations, such as metals. The main reasons for this are, on the one hand, the scarcity not only of sources concerning the exploitation itself, but also those that provide indirect information (e.g. aspects of mining, trade or, especially, administration), and, on the other, the lack of archaeological researches on this resource (in any case much less significant than the archaeology of salt in prehistory, or Roman mining). The recent work by Annalisa Marzano, even if it deals with the exploitation of salt from the sea, it does not provide an exhaustive picture of the salt economy in the Roman Empire.[1]

My intention is not to offer an exhaustive bibliographic review of the archaeology and history of salt in the Roman era, but to emphasise the main analytic studies and syntheses that have delivered remarkable results. Most of these works are concerned with the archaeology of salt exploitation in prehistory, and I could not avoid them. As we will see in the following pages, even in the case of Dacia, the pre-Roman salt deposits and resources are important for the study of salt exploitation in the Roman era. It is worth noting that an impressive state of art for salt in Antiquity has been recently achieved by N. Morère Molinero and H. Domínguez del Triunfo.[2] However, the salt in Dacia and especially the epigraphic approaches, even if mentioned, were significantly less studied than the archaeological ones.

1. Researches on salt production and salt industry in the Roman Empire

I shall not insist about the importance of salt in Antiquity, because the information and the analysis provided by modern authors are almost complete. Salt was essential in alimentation (both human and animal);[3] it was also used as a condiment,[4] preservative,[5] technical raw material[6] and a medicine.[7]

Salt exploitation during the Roman Empire was generally not regarded in an holistic way, but it constituted, despite the poor information, subjects of analyses focused on provincial trade, consumption, or exploitation. A start was made by a study on

[1] Marzano 2013: esp. 123-138.
[2] Morère Molinero and Domínguez del Triunfor 2024.
[3] See more recently Moinier, Weller 2015, 153-223, with bibliography.
[4] See more recently Moinier, Weller 2015,155-161, 174-184, 195-199, with bibliography.
[5] See more recently Moinier, Weller 2015, 167-170, with bibliography.
[6] See more recently Moinier, Weller 2015, 223-241, with bibliography.
[7] See more recently Moinier, Weller 2015, 202-219, with bibliography. On medical treatment with salted fish sauces, see more recently Dumitrache 2014, 177-191, with bibliography.

salt in ancient Greece by C. Carusi.[8] Her work represents the results of a huge effort in realising an interdisciplinary approach, putting together literary, epigraphic, and archaeological information. She also studied the taxation of salt products in Greece and Rome,[9] as well the demand for salt in ancient Greece.[10] Her analysis of literary texts, especially a fragment by Livy mentioning a new tax on salt in Republican Rome,[11] shows the importance of salt in the economy of Early Republic. Carusi's main conclusion on the economic policy of Rome in this period is that state intervention regarding salt was early – and firm.[12] For the Roman Empire, even if the state owned the salt resources, except for in and around Rome, it is not certain if it exercised a monopoly on its sale.[13] The conflict between the Autariatae and Ardiaiae, in Illyria, well illustrates the importance of salt resources in the Greek period, as explained by M. Alexianu.[14]

A. Giovannini's 1985 article presents salt from an economic perspective, based mainly on literary sources.[15] He observes correctly that modern historians, even those specialised in ancient economies, were less interested in the mineral.[16] The approach also takes into account modern statistics on salt consumption and resources (including sea salt) in Italy.[17] But the main conclusion is that the city of Rome experienced economic growth on account of its salt resources.[18] According to Giovannini,[19] the construction of main roads and the military strategy of Rome in the 4th century BCE were, in part, linked to the control of salt resources, although he agrees that the 'strategy of salt' was only one element in Rome's prosperity.[20] In my opinion, history cannot be judged in economic terms, and, in any event, our sources for that Republican period are both scarce and poor in terms of the quality of information. Nevertheless, of course, salt remains one of mankind's most important resources – and the Roman world's dependence on it was as great as any.

A more holistic view from a Roman perspective is that offered by Bernard Moinier, who seeks to analyse the question of salt from a more anthropological standpoint.[21] This author (2012) discusses the symbolism of salt in antiquity, looking at its role

[8] Carusi 2008a. See also Carusi 2007a: 221-233.
[9] Carusi 2007b: 325-342.
[10] Carusi 2011: 149-154.
[11] Livy 39, 37.3.
[12] Carusi 2007b: 331-332.
[13] Carusi 2007b: 337.
[14] Alexianu 2007: 281-290.
[15] Giovannini 1985: 373-387.
[16] Giovannini 1985: 373-375.
[17] Giovannini 1985: 376-378.
[18] Giovannini 1985: 381-382. See also (even if it appears less detailed) Moinier 2007a: 354.
[19] Giovannini 1985: 384-385.
[20] Giovannini 1985: 386.
[21] Moinier 2012.

in aspects such as myth, religious belief, ritual, cult practice, magic, etc.[22] Other chapters in his book focus on the use of salt in different situations and within various civilisations: alimentation (men and animals), treatment of materials, medicine, labour (fishing, meat conservation, agriculture, metallurgy), etc.[23] Choosing not to present them chronologically, the author uses both archaeological and literary sources, though epigraphic sources are less well dealt with (modern studies, however, especially those focusing on salt exploitation in the provinces of the Roman Empire, do analyse them in greater depth. Moinier's 2012 work completes one of his previous essays, in which he speaks especially on salt's use by societies, touching also on its symbolism.[24] In a later work with O. Weller (2015), Moinier follows on in the same vein,[25] adding a supplementary chapter to do with 'salt landscapes' and production techniques,[26] otherwise following some particular themes already treated by him, e.g. salt use and specific rituals (although without a precise chronological order of analysis). The maps and sources (literary and archaeological) provided are very useful in terms of our understanding of salt in antiquity. The authors also dedicate a section to salt resources and exploitation in numerous different regions of the Roman world: Italy, Sicily and Sardinia, the Galliae, the Germaniae, Britannia, Noricum, Dalmatia, Thracia, Dacia and the north of the Black Sea, Macedonia, Greece, Asia Minor, Syria, Judaea, Mesopotamia, Arabia, Egypt and the provinces of Northern Africa, and Hispaniae and Lusitania.[27] The information is rich and the sources very widely, if not exhaustively, analysed. A problem remains with the chronological description related to Roman organisation of territory. Pre-Roman exploitations are also looked, i.e. Neolithic (Thrace[28]), Bronze Age (Italy,[29] Narbonensis[30]) Iron Age (Aquitania,[31] Germaniae,[32] Noricum,[33] Illyricum,[34] Dacia,[35]), sometimes the prehistoric settlements having no connection with Roman provinces, i.e. the researches carried out in Moldavia (which did not belong to the Roman Empire) that revealed salt exploitation techniques dating from the Neolithic.[36]

Overall, most research has concerned the archaeology and history of salt in different Roman provinces. Even though some have focused on small communities, these

[22] Moinier 2012: 17-68.
[23] Moinier 2012: 69-139, 166-202.
[24] Moinier 1997.
[25] Moinier and Weller 2015.
[26] Moinier and Weller 2015: 17-151.
[27] Moinier and Weller 2015: 59-143.
[28] Moinier and Weller 2015: 103-104.
[29] Moinier and Weller: 59.
[30] Moinier and Weller 2015: 86.
[31] Moinier and Weller 2015: 90ff.
[32] Moinier and Weller 2015: 99.
[33] Moinier and Weller 2015: 100-101.
[34] Moinier and Weller 2015: 102-103.
[35] Moinier and Weller 2015: 106.
[36] Moinier and Weller 2015: 106; Weller *et al.* 2016: esp. 191-210.

researches contribute greatly to our appreciation of the importance of salt within the Roman world. The study, for example, by P. Lemonnier on salt production along France's western Atlantic shore is illustrative as an ethno-technological approach.[37] This type of research has stimulated archaeological excavations on the former territory of Galliae. Indeed, the excavations in northern France have revealed some of the largest salt-making ovens ever found in France.[38] The work of French archaeologists led to a reconstruction of the oven found at Pont-Rémy, in the Samara archaeological park in the Somme.[39] Investigations by Chr. Hoët-Van Cauwenberghe, A. Masse, and G. Prilaux have helped clarify the role of salt in northern and western provinces of the Empire, connecting the results of their own investigations with written sources.[40] The tutelary goddess Nehalennia can certainly be linked to salt activities,[41] but not exclusively, my impression is that she was worshipped generally by merchants – not only those trading in salt.[42]

For Roman Spain, a synthesis study on salt exploitation was realised by L. Lagóstena Barrios.[43] It is true, as with its North Sea provinces, the producers of sea salt occupied an important place in the salt trade of Hispania, particularly Baetica.[44] Salted fish sauces were specialities of this latter region, particularly as salt substitutes.[45] Lagóstena Barrios investigates written sources, i.e. ancient authors and inscriptions, the latter mainly providing data on merchants.[46] The importance is stressed of trade routes, including long- distance business between Hispania and other provinces.[47] Salt deposits dating from Roman times have also been found in Baetica, close to the river Arroyo Hondo at Prado del Rey (Cadiz region).[48] A channel connected the river to salt sources and an evaporation basin was dug.[49] Near Alicante, at Punta de l'Arenal, an installation for processing salted fish was found in private villa.[50] Not far away, a saltern is attested at El Saladar (the modern toponym is relevant).[51] The Mediterranean area, naturally enough, was generous in terms of sea salt provision. Analysing the use of the term *salinae* by ancient authors, N. Morère Molinero

[37] Lemonnier 1980.
[38] Prilaux *et al.* 2011: 22-31.
[39] Prilaux *et al.* 2014: 208-215.
[40] Hoët-Van Cauwenberghe *et al.* 2017: 20ff.
[41] Hoët-Van Cauwenberghe *et al.* 2017, 22-23. See also De Bernardo Stempel 2004: 181-193.
[42] See also Spickermann 2010: 127-138; Raepsaet-Charlier 2015: 173-226.
[43] Lagóstena Barrios 2007: 301-323.
[44] Lagóstena Barrios 2007: 307-308.
[45] Lagóstena Barrios 2007: 309. For salted fish and salted fish sauces in Baetica, see also Lagóstena Barrios 2001.
[46] See also Étienne and Mayet 1998: 147-164; 2002. For the recent state of research, see Dumitrache 2014: 72-79.
[47] Lagóstena Barrios 2007: 318-319.
[48] Valiente Canovas *et al.* 2014: 7; García Vargas and Martínez Maganto 2017: 202-203.
[49] Valiente Canovas *et al.* 2014: 7; García Vargas and Martínez Maganto 2017: 202-203.
[50] Fumanal and Viñals 1989: 10; Olcina Doménech 2012: 168.
[51] Lowe 2018: 471-472.

highlights the Iberian Peninsula.[52] The signification of this term by Pliny is related to wells and, importantly, it covered the processes of both exploitation and production.[53] In Galicia, salt exploitation remains based on evaporation were excavated near Vigo, including a workshop producing salt products,[54] the production units themselves grouped next to an evaporation and crystallisation basin. A similar saltwork has also been uncovered in Galicia, at Nerga (Carga do Morrazos, Pontevedra).[55] Saltings were also employed in coastal areas.[56] Following especially R.I. Curtis,[57] B. Lowe noticed that saltings often accompanied installations for processing salted fish.[58] In Sicily, such installations, dating to Roman times, have been excavated at Cala Minnola and Levanzo.[59] In Italy, as well the impressive installations for the production of salted fish found at Pompeii,[60] fish factories have also been discovered along the Tyrrhenian coast.[61] Moving north, O. Bounegru, in relation to the Danube provinces, underlines the importance of the salted fish trade in the region of Istros, but he does not expand on this: he only suggested the existence of a tax on salted fish products, without a precise chronology.[62]

For Asia Minor, Pliny's information that salt from Caunos was used for eye treatments[63] seems linked to an inscription dating from the time of Hadrian mentioning a salt office (*haliké oné*).[64] The information was completed by excavations of a saltworks at Iztuzu, near Kaunos, that date from the 1st century BCE.[65] Clear indication of the site's use comes from the placing of the saltwork on a channel connecting the lake (Köyeğiz) to the sea, the unit featuring a circular evaporation design, not rectangular, as usually characterises this type of saltwork.[66] The channels are not linked to the evaporation basins.

A recent volume dedicated to the archaeology of salt has three contributions on salt in ancient Rome. One analyses the production, trade and consumption of salt in the north-western provinces of the Roman Empire.[67] Referring to the importance of the

[52] Morère Molinero 2011: 157ff.
[53] Morère Molinero 2011: 157-158.
[54] Castro Carrera 2008: 381-399. See more recently, Fernández Fernández 2016: 15-27; Lowe 2018: 471.
[55] Currás 2017: 334; Lowe 2018: 471.
[56] Pliny the Elder, *Nat. Hist.* 31, 81. See also Carusi 2008b: 354-355; Morère Molinero 2008: 367-370. For Lusitania, see Moinier 2007b: 243. For a general view, see Marzano 2018: 443ff.
[57] Curtis 1991.
[58] Lowe 2018: 477.
[59] Botte 2018: 380-382.
[60] Curtis 1979: 5-23; 1984: 58-59; 2009: 712-718; Étienne and Mayet 1988: 199-215.
[61] Botte 2018: 382-386.
[62] Bounegru 2007: 348.
[63] Pliny the Elder, *Nat. Hist.* 31, 99.
[64] IKaunos 35.
[65] Atik 2008: 39-45; Atik and Işik 2012: 89-107; Marzano 2013: 127; García Vargas and Martínez Maganto 2017: 200.
[66] Atik 2008: 39-45; Moinier and Weller 2015: 122.
[67] Stockinger 2015: 183-198.

Hallstatt site in terms of Iron Age salt production, U. Stockinger suggests a Roman presence in the area, but there are no traces of salt exploitation.[68] Nevertheless, rock salt extraction at Salzkammergut has been archaeologically attested. The Roman road which connected Ovilava to Virunum made a detour through the site of Michlhallberg, connecting salt exploitation facilities, and the *vicus* next to it, to the two important towns of Noricum.[69] Finds of fibulae indicate the presence of the Roman army in the area.[70] However, a decline in salt extraction in the Hallstatt area had already begun by the end of the La Tène period. The explanation proposed by U. Stockinger, i.e. the gradual integration into Roman trading networks, does not, to the present author, seem very convincing. Other explanations, e.g. ecological factors and the transformation of market areas, seem more plausible.[71]

Another paper by Stockinger discusses saltworks from the 1st centuries CE.[72] Via a graphic of the Mediterranean area, Th. Saile points out that salt lakes were most exploited in the east; rock-salt deposits and brine springs were less important in the south, while in the north salt mines *briquetages* were of greater importance.[73] He noticed that under the Roman Empire, central Europe had to deal with a decrease in salt production.[74] An explanation could be the discontinuity between the exploitation in the late Iron Age by Celtic tribes and gradual Roman occupation.[75] The Romans, however, were always interested in the exploitation of soil resources.[76] Th. Saile underlines also the importance of salt extraction in Roman Britain and of the salted fish trade between Britain and Germaniae.[77] He estimates the levels of salt production in central Europe, presenting the available data for the periods of prehistory and the Iron Age.[78] It is true that the archaeological traces of salt exploitation in Roman Europe do not have a uniform distribution. Saile concludes that while in the Iron Age, salt production in central Europe had reached a very high point, in the Mediterranean area salt was produced in more favourable conditions and consumed in high amounts. After the Roman conquest, the low demand for salt in central Europe resulted in the closing of saltworks and the diminution of local production; at the same time, the Mediterranean zone remained the main region for salt production. Only in the northwestern provinces of the Roman Empire was salt production seen at high

[68] Stockinger 2015: 186. See also Igl 2008: 176-179; Kern 2011: 419.
[69] Grabherr 2001 *passim*; Windholz-Konrad 2008: 44-47; Pollak 2013: 15-19; Stockinger 2015: 186.
[70] Stockinger 2015: 187.
[71] Stockinger 2015: 191.
[72] Saile 2015: 199-209.
[73] Saile 2015: 201.
[74] Saile 2015: 203.
[75] Stöllner 2007: 345.
[76] The doubt appears also in Saile 2015: 203.
[77] Saile 2015: 204.
[78] Saile 2015: 204-205. See also Pauli 1995: 206; Deffner and Dresely 2002: 51.

levels.[79] Saile only refers to Dacia indirectly and does not detail what happens with salt production in this province.

I. Tsigarida analyses salt production and trade in Roman Britain,[80] stressing the army's requirements and its essential in terms of the salt trade and production. The production methods, as previously described by Hocquet,[81] Rippon,[82] and Saile,[83] were based on the of boiling salt water, filtering or leaching salt from peat or sand, evaporation methods, and *briquetage*.[84] Tsigarida illustrates that the pre-Roman periods (including the Bronze Age) are documented for salt production (boiling water, *briquetage*).[85] During Roman times, salt production spread both along the coast and inland.[86] The water springs and saltworks were defended by auxiliary troops, who also received supplies of the product.[87] Archaeological traces of salt exploitation (especially Nantwich, where the water was collected in wood tanks and evaporated by sunlight and wind) have been well recorded in north-western England.[88] Salt production increased in Hadrian's time, associated with the extension of his great wall.[89] Overall, it was the presence of the Romans that shaped landscape use, maximising where possible the available resources, including salt.

Recent archaeological researches in the northern area of Portus, ancient Rome's harbour, have revealed the *Campus Salinarum Romanarum*, situated around the lake of Maccarese.[90] During excavations, hydraulic structures used to hold sea water have been found, dated to the 1st century BCE.[91] The most spectacular of these findings was a pier built in clay on an amphorae core.[92] This alignment is 1 km long on a north-south axis and it is completed by channels made in *opus reticulatum*.[93] The system worked in this way: the lake water was directed through canals in the area of the saltworks, delimited by the amphorae pier just referred to. The salt water was then distributed to large ponds for evaporation and crystallisation (although these have yet to be documented archaeologically), and once the water had evaporated the salt was harvested.[94] An inscription, with a consular date of 135 was set up by L. Virtius

[79] Saile 2015: 205-206.
[80] Tsigarida 2015: 211-220.
[81] Hocquet 1993: 39ff.
[82] Rippon 2000: 42.
[83] Saile 2000: 136-138.
[84] De Brisay 1975: 5; Saile 2000: 144.
[85] Tsigarida 2015: 214.
[86] Arrowsmith and Power 2012: 2.
[87] Tsigarida 2015: 214.
[88] Arrowsmith and Power 2012: 174-182. See also Tsigarida 2015: 215.
[89] Tsigarida 2015: 216.
[90] Morelii *et al.* 2004: 43-75; Morelli and Forte 2014: 9-21; Cébeillac-Gervasoni and Morelli 2014: 23-33.
[91] Morelli *et al.* 2004: 53-75.
[92] Grossi *et al.* 2015: 92-95.
[93] Morelli and Forte 2014: 9-21; Grossi *et al.* 2015: 94-95.
[94] Grossi *et al.* 2015: 97-98. See also García Vargas and Martínez Maganto 2017: 205.

Epaphroditus and L. Cornelius Hesper to Neptune .[95] They were very likely freedmen, after their *cognomina*.[96] The archaeological context and the different occurrences of the term *salinae* led M. Cébeillac-Gervasoni and C. Morelli to think that *salinae* signified not only the place of production but also storage sites and sales taxes.[97] In relation to Dacia, the same authors think that Iulius Omucio from there was not just the freedman of a *conductor*, but also one who represented his interests in the salt trade.[98] It is possible that analysis of the Neptune inscription mentioned above can offer further answers in terms of Dacian salt provision. The inscription referencing Epaphroditus and Hesper shows that the regime of *salinae* was probably the same as that of *portoria*, i.e. in the beginning, the state leased *salinae* to *societates*, and then to individuals. The dedication to Neptune is explained by Cébeillac-Gervasoni and Morelli on the basis fact that the inscription was found in a swamp with thermal waters (there were thermal springs there associated with volcanic phenomena around Lake Albanus).[99] In any event, researches in the area of Lake Maccarese prove that salt was extracted via evaporation. The importance of this installation is shown by the presence of the two *conductores*.

For the western part of the Empire, E. García Vargas and J. Martínez Maganto illustrate that along coastal regions and into the interior, small- and mid-sized saltworks were set up to supply littoral cities and their hinterland population. Moreover, they conclude that, for the Mediterranean area, the salt sources (i.e. both sea salt and salted fish sauces) were sufficient to satisfy local consumption and there was no need for imports of the mineral.[100]

The value of salt is rarely mentioned in ancient sources and, consequently, modern studies have largely avoided the issue. We have some papyri that mention salt costs in Egypt (minimal prices were 2.5 obols per metron at public auctions, and 2 obols for fixed price deals.[101] In general, then, salt relatively inexpensive. Moving to northern Britannia, some tablets from Vindolanda indicate the importance of this product in terms of a soldier's diet,[102] with, perhaps, supplies coming from the brine springs of Cheshire and Worcestershire.[103]

To conclude then, although researches concerning salt production and salt industry in the Roman Empire are relatively restricted, they do highlight several issues. In fact, as one can notice from this brief overview, the literature on salt in Roman times

[95] Cébeillac-Gervasoni and Morelli 2014: 25.
[96] 'Epaphroditus': Solin 1982: 320, 1360; 'Hesper': Solin 1982: 382.
[97] Cébeillac-Gervasoni and Morelli 2014: 26.
[98] Cébeillac-Gervasoni and Morelli 2014: 27.
[99] Cébeillac-Gervasoni and Morelli 2014: 28-30.
[100] García Vargas and Martínez Maganto 2017: 209.
[101] Drexhage *et al.* 2002: 254-255.
[102] *Tab. Vind.* 176, 185, 186, 191, 202, etc.
[103] See Cool 2006: 57.

is fairly extensive. The main obstacles in this respect are the lack of literary and epigraphic information on salt, and the scarcity of archaeological research in this field. In many cases it is impossible to link up the various data we have, however, as we have seen, there are valuable syntheses on salt exploitation and saltings in the Roman world. Hopefully, we will have a more complete view when we put together all our information.

2. Researches on salt archaeology and salt history in Roman Dacia

Even if the researches on salt exploitation and salt administration in Roman Dacia are scarce, and the results far from offering us a coherent image of this economic activity, there are, however, some works which are important for this stage of our approach and which treat the aforementioned issues from historical, ethnographic, and archaeological perspectives, both in synchronic and diachronic ways. I will briefly present now the most important researches and their results, although more details appear in the following chapters – where Dacian salt exploitation and administration will be discussed.

The exploitation of salt in Roman Dacia has become the topic of more detailed studies over the last two decades. The absence of archaeological research, also caused by the fact that traces of old mines have not survived, as well as the sparse epigraphic evidence, have resulted in a small corpus of literature on the economy of salt in this province. Nevertheless, earlier information on several salt exploitation practices first appears in the 17th/18th centuries in works by J. Fridwaldszky,[104] J.E. Fichtel,[105] and M. Ackner.[106] A very interesting study treats the first map of salt exploitations, realised by Fichtel.[107] D. Moscal analyses the correspondence between 18th-toponyms and actual placenames. Fichtel's map includes salt extraction not only in Transylvania, but also in Moldavia and Wallachia, and it remains an important source for documenting evidence of saltworks in the area. From our point of view, the map is of added interest in terms of locating those salt exploitations that provide continuity from ancient to modern times. We note, in particular, that the richest salt resources are coming from Transylvania, which corresponds generally with Roman Dacia.

The first monograph to appear on mining in Roman Dacia was V. Wollmann's,[108] who identifies several salt exploitation centres (many surface ones) during Roman times, on the basis of older evidence, e.g. Ocna Mureș, Turda, Cojocna, Sic, Pata, Ocna Dejului, Ocna Sibiului, Domnești, Rogna, Sânpaul, Mărtiniș, Ocnele Mari, etc.[109]

[104] Fridwaldszky 1767: 159.
[105] Fichtel 1780: 89.
[106] Ackner 1856: 23.
[107] Moscal 2018: 1-11.
[108] Wollmann 1996.
[109] Wollmann 1996: 241-244.

Unfortunately, the author only dedicates ten pages to the exploitation of salt. Only in passing does Wollmann address the administration of saltworks in Roman Dacia, mentioning the *conductores pascui et salinarum* and three employees from this regional administration.[110] Nevertheless, according to the scholar, a great quantity of salt was produced in Roman Dacia (some of which was even exported).[111]

An exhibition catalogue from Sfântu Gheorghe, Romania, mentions several salt exploitations dating to the La Tène era in Dacia, i.e. at Praid–*Sânpaul* and Cârlomănești.[112] The catalogue also lists salt-spring wells in eastern Transylvania.[113]

In 2007, D. Benea dedicated two articles to the administration of Dacian saltworks under the Romans, one more condensed, the other more extensive.[114] Reiterating, to a large extent, the information provided by Wollmann, Benea details, however, several facets to do with the administration of salt mines. She finds that in the proximity of the main salt exploitation centres there were *castra* or fortifications housing military units,[115] however she does not provide details on the sites individually – this would, of course, been most useful in terms of gauging the importance placed by the Roman army and, implicitly, by the administration, on the exploitation of this resource. What should be stressed is the role of these troops in the wider Roman strategy in Dacia, not only from the viewpoint of economic implications, but also military and political ones. In other words, these troops were tasked additionally with protecting mining exploitations (not just those producing salt), but their main role was to defend the province, either along the *limes* or in areas of strategic importance (i.e. military and commercial) – including mountain passes, fords, etc.

Benea presents rather briefly the *conductores salinarum* mentioned in our epigraphic sources from Dacia.[116] The personnel of the administration are likewise presented cursorily.[117] Starting with an inscription from Pannonia Inferior, Benea writes that the three *conductores* attested in Dacia originate, without exception, from the *canabae* of Apulum,[118] despite the fact that two of the dates are from the Severan era, when the urban structures of Apulum had already been established. In Dacia, the leaseholders bear the title of *conductores pascui et salinarum*. The link between the exploitation of salt and the administration of the lands owned by the Roman state is to be expected, with the supplying of salt for cattle (and the army's horses) being an important part of animal husbandry. Benea suggests that these *conductores* from Dacia were here

[110] Wollmann 1996: 248-249.
[111] Wollmann 1996: 249.
[112] Harding *et al.* 2006: 56-74.
[113] Chiricescu 2006: 164-167.
[114] Benea 2007a: 41-46; Benea 2007b: 91-112.
[115] Benea 2007a: 42-43; Benea 2007b: 102.
[116] Benea 2007a: 43-44; Benea 2007b: 102-105.
[117] Benea 2007a: 44; Benea 2007b: 105.
[118] Benea 2007a: 44; Benea 2007b: 105.

responsible, along with others, for sales of salt into the Barbaricum.[119] We will discuss this hypothesis later. In any event, for Benea, rigorous control of salt exploitation was instituted by Septimius Severus, against the backdrop of his incessant wars in the early years of his reign.[120] On this issue, too, we will return later. Alternatively, I. Tsigarida, when analysing salt administration in Roman Dacia concludes that the state was in fact and *de jure* the real owner of the salt exploitation in the province, with *conductores* being subordinate to *procuratores*.[121] In our opinion this conclusion is correct, but we have to pay attention to what *salinae* signify in every instance.

I have attempted (2016) to assess the epigraphic corpus to do with functionaries associated with the administration of salt production (slaves and freedmen), and concluded that their presence exactly on site at salt exploitations (in other words, their direct involvement on the ground) reveals the importance placed by the Roman state on this exploitation.[122] Furthermore, in a another article (2018) I have detailed the role of the army in the area of a salt exploitation (Ocna Mureș-Salinae) within the context of no archaeological remains having yet been found of a *castrum* or military fortification.[123]

As stated, the archaeological information concerning the exploitation of salt in Dacia is rather scant. Investigations carried out by A. Harding and V. Kavruk have confirmed the existence of a salt spring at Mărtiniș (which definitely functioned in the Roman era).[124] Geophysical surveys made by the same authors in the Sânpaul area led them to conclude that there was some Roman mining exploitation on the road to Ocland, although no investigations have been made to confirm this.[125] The dating of timber samples point to the Iron Age, not the Roman era.[126] Even though the same authors do not specify which period of the Iron Age is concerned, I hold to the opinion that it refers to the La Tène phase, preceding the Roman conquest. Likewise, excavations carried out at Băile Figa (Bistrița-Năsăud County) have yielded timber implements used in the extraction of salt from the springs, some, likewise, dating from the Iron Age (4th-3rd centuries BCE).[127]

Recently, the project led by M. Alexianu on the ethnoarchaeolgy of salt[128] provided important field researches, published partially by the project leader, V. Kavruk, D.

[119] Benea 2007b: 107.
[120] Benea 2007b: 108.
[121] Tsigarida 2012: 320-321.
[122] Mihailescu-Bîrliba 2016: 51-58.
[123] Mihailescu-Bîrliba 2018. See also Mihailescu-Bîrliba 2019a.
[124] Harding and Kavruk 2013: 43.
[125] Harding and Kavruk 2013: 43.
[126] Harding and Kavruk 2013: 47. See also Harding 2015: 216; 2016: 377.
[127] Harding and Kavruk 2013: 60-64, 120-121. See also Harding and Kavruk 2010: 139; Harding 2015: 214; 2016: 378.
[128] Kavruk and Curcă 2017.

Ștefan, V. Vasilache,[129] myself and A. Asăndulesei.[130] Some other articles I recently wrote represent the basis on which this book was built.[131]

As well as these investigations, we have the identification of exploitation points previously made by V. Wollmann at sites such as Ocna Mureș, Turda, Cojocna, Sic, Pata, Ocna Dejului, Ocna Sibiului, Domnești, Rogna, and Ocnele Mari.[132]

Although our archaeological investigations are limited, of particular importance seems to be the continuity evidenced at Sânpaul between the La Tène and Roman periods. Sufficient systematic excavations have been carried out at Băile Figa to identify another La Tène exploitation, although we do not know if this exploitation was also used in the Roman period. In any case, not far from this site is Domnești, the site of a salt spring and where the discovery was made of an inscription set up by Atticus, the slave of a *conductor pascui et salinarum*.[133]

Even though from a quantitative point of view the surviving sources (both archaeological and epigraphic) are few, they nevertheless provide very important data with regards to the exploitation of salt in Roman Dacia.

The main objectives of my approach are: to analyse the archaeological researches made on salt exploitation within the territory of Roman Dacia; and to discuss the epigraphic information, so as to have a better understanding of salt exploitation, administration, and the relationships of mining and administrative staff with the military personnel. Finally, I shall combine these areas of information and offer a global image on salt exploitation in Roman Dacia, as well as endeavouring to expand on the particularities of salt production, its industry, and its consumption within this province – all in comparison with what we know of the rest the Roman world.

[129] Kavruk *et al.* 2019. S. also the analysis of ancient texts (Curcă 2018).
[130] Mihailescu-Bîrliba 2019b; Mihailescu-Bîrliba and Asăndulesei 2019. See more recently Mihailescu-Bîrliba and Alexianu 2021; Mihailescu-Bîrliba 2022a.
[131] Mihailescu-Bîrliba 2022b, c; 2023a, b.
[132] Wollmann 1996, 241-244.
[133] ILD 804.