*Studia Antiqua et Archaeologica* 28(2): 454-472
DOI: 10.47743/saa-2022-28-2-13

# Salt Exploitation References in Plinius Maior's Work

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**Abstract.** *This article aims to approach the work of Pliny the Elder,* Naturalis Historia*, from the perspective of salt exploitation, highlighting the forms of manifestation, its geographical distribution and briefly the main uses. The motivation of the present paper materialized after going through Pliny's text, which revealed a subject that lacks fluency to a certain extent. Pliny distinguishes two categories of salt, according to its state, natural and artificial. Thus, a first systematization of the references about salt identified in* Naturalis Historia *is based on these aspects, highlighting, in the case of the natural state of the explored mineral, the salt lakes, springs or salt mountains and sea water; regarding the artificial state of salt, mentions of salt pans have been documented. Along these, a short* excursus *regarding the medicinal uses of salt is added, in order to better portray the image of salt in the era.*

**Rezumat.** *Articolul de față își propune abordarea operei lui Pliniu cel Bătrân,* Naturalis Historia*, din perspectiva exploatării sării, evidențiind formele de manifestare ale acesteia, distribuția geografică și, pe scurt, principalele utilizări ale acesteia. Motivația lucrării de față s-a concretizat în urma parcurgerii textului lui Pliniu, care a scos la iveală un subiect lipsit într-o oarecare măsură de fluență. Pliniu distinge două categorii de sare, după starea ei, naturală și artificială. Astfel, o primă sistematizare a referințelor despre sare identificate în* Naturalis Historia *se bazează pe aceste aspecte, evidențiind, în cazul stării naturale a mineralului exploatat, lacurile sărate, izvoarele sărate sau munții de sare și apa de mare; în ceea ce privește starea artificială, au fost documentate mențiuni de saline. Pe lângă acestea se adaugă un scurt excurs privind utilizările medicale ale sării, pentru a înfățișa mai bine imaginea sării în epocă.*

**Keywords:** *salt exploitation, saltworks, Plinius Maior.*

The ancient authors, both Greek and Roman, managed through their works to travel through time with extremely valuable information, which can be considered useful even today, not only for outlining the historical period they express, but also for the models they create, effective in studying current history. One of these authors is Gaius Plinius Secundus, known as Pliny the Elder or Plinius Maior, not to be confused with his nephew, whose tutor he was. He was born into a fairly influential family in the northern region of Italy, in Como, in 23 AD. He studied in Rome, which he left when he began his military career, being the leader of a cavalry squadron. He returned to Rome, specializing in law, but he goes, towards the end of Nero's principality, in Spain, where he held the position of procurator. He returns to the centre of the

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Roman world when Vespasian won the principality, right in the entourage of the emperor, whom he knew from the front in Germany. He died in 79 AD, near the Vesuvius volcano, after its eruption, because of the poisonous smoke released by it.

Pliny was an active career man, but always passionate about studying and recounting events, elaborating his works based on his own professional experience, but also consulting the works available at that time, many of which are now lost[2]. The most extensive of his works, *Naturalis Historia*, was also the only one which survived. The work represents the last text written by Pliny, being dedicated to the emperor's son, Titus, probably completed two years before his ascension to the throne and the author's death, in 79 AD.

The work can be considered a true encyclopaedia, containing information on astronomy, meteorology, geography, mineralogy, zoology and botany, structured in thirty-seven books. It can be said that the work analysed in the present study also presents information of questionable veracity, but it should not be neglected that a large part of the displayed ideas is extremely valuable, offering a wide range of topics for study.

For the present study, Book XXXI is the one that has a special value, being dedicated to the *Cures obtained from underwater animals*. Pliny's excursus about salt is the only one in ancient Greek and Latin literature that has survived to this day[3], providing an inventory of the production sites and uses of salt in the first century of our era[4]. To elaborate, the few chapters dedicated to the mineral considered indispensable also refer to salt water, how salt is obtained, the categories of salt, but also the remedies that use the saline substance in the treatment of some diseases.

The motivation of the present paper materialized after going through Pliny's text, which revealed a subject that lacks fluency to a certain extent. The main objective is to precisely identify the records related to salt and to structure these into different categories. The author, in Book XXXI, addresses, by sector, saline expressions, emphasizing the forms of manifestation of salt and its categories, but also the geographical distribution of the natural resource, the various methods of exploitation and the main uses, focusing on the medical ones. References related to the presence or exploitation of salt in various known areas found in other books of the encyclopaedia, disparate or fragmentary, will also be included in the present study.

The classification of the information about salt presented by Pliny was precisely inspired by the few directions drawn by the author itself on the analysed work. The information was not ordered in a well-defined system, causing quite often, like also Bernard Moinier points, confusions in the interpretation of the text[5].

[2] CARUSI 2008, 354.

[3] *Eadem*.

[4] MOINIER 2015, 37.

[5] MOINIER 1985, 75.

Before starting the exposition of a structured view regarding salt mentions gathered from *Naturalis Historia*, it must be clarified that Pliny brought under the term *salt* other substances too, obtained and used at that time as a substitute for sodium chloride[6] – *halmyrax*[7], *hammoniacus*[8], *nitrum*[9], etc. – but the most valued of all salts was the natural, white and pure mineral[10]. As I mentioned, since the present study aims to discuss the references about the different types of salt exploitation and uses, with the main role of spice and preservative, the records of the other kind of salts will be only shortly addressed.

Pliny distinguishes two categories of salt, according to its state, natural and artificial[11], being exploited according to the forms it takes and the geographical conditions characteristic of each area. Thus, a first systematization of the references about salt identified in *Naturalis Historia* is based on these aspects, highlighting, in the case of the natural state of the explored mineral, the salt lakes, springs or salt mountains and sea water, with which salt is in a connexion of obvious interdependence[12]. Regarding the artificial state of salt, mentions of salt pans have been recorded.

The vast and varied territory of the Roman Empire, spread around the Mediterranean Sea, an important supplier of salt, which makes the difference between civilized and barbaric peoples, from the interior, without access to the sea or to the product obtained from its waters[13], also reveals other forms of saline manifestations and types of salt.

One of these expressions of nature from which salt was obtained are the salt lakes. The most appreciated was the lake of Tarentum, located in the south of today Italy, from where the "most pleasant and whitest" salt was collected [14], by evaporating the shallow water, which did not exceed "the height of a knee"[15], turning it entirely into fine salt. Also, by drying the liquid from the lake, naturally, under the action of the sun, salt was also collected in Sicily, from two lakes, one near Gela, and the other known as Cocanieus. The salt harnessed from Lake Cocanieus was called *cocanicus* and considered of high quality, for the reason that the ancients used it to forge another type of salt, the so-called ammonia salt (*hammonicus*)[16].

Other lakes that evaporated in great quantity, sometimes right to the centre, exposing the salt, were those of Phrygia, Cappadocia, and that of Aspendum[17], on the banks of the river

[6] CARUSI 2008, 361.
[7] PLINIUS 31.46.
[8] PLINIUS 31.39.
[9] PLINIUS 31.46.
[10] FATÁS CABEZA 2002, 185.
[11] PLINIUS 31.39.
[12] CARUSI 2008, 353.
[13] CARUSI 2008, 353.
[14] PLINIUS 31.41.
[15] PLINIUS 31.39.
[16] PLINIUS 31.39.
[17] PLINIUS 31.39.

Eurimedon[18]. In Phrygia, Pliny mentions that the salt of Tatta is valued[19], coming from the lake with the same name, the actual lake from the territory of modern Turkey, Tuz Gölü, which still locally provides an important amount of salt[20]. Regarding the natural way of producing salt, Pliny highlights the action of the sun, which causes the evaporation of salty water, but also emphasizes the fact that the moon favours the regeneration of the amount of water transformed into salt[21]. The moon also plays an important role in other regions where salt is found, specifically in the "dry lands of Africa as far as the oracle of Ammon", causing, depending on its phases, an important natural production[22].

Returning to the salt that comes spontaneously from the waters, Pliny indicates other lakes where salt was extracted and then left it to dry in the sun[23], such as the one from Citium[24], in Cyprus[25], and the one near Memphis[26], in Egypt[27]. Along with the above references to lakes from which salt is collected, Pliny also in brief mentions salt lakes with turbid waters in the territory of Africa[28], but without specifying any names. He also gives indications that "in Bactria there are two extensive lakes, one towards the Scythians and one towards the Aryans, which evaporate, exhaling salt"[29], but he does not provide any other details, nor does he specify whether or not those natural sources are exploited. In the region of which they belong, probably the Caspian Sea basin, the author also indicates other exploitations of salt[30].

Relative to this region, Pliny also brings into discussion the rivers, relating them to salt, calling those at the Caspian gates "rivers of salt"[31]. The author calls these rivers so because of the extensive surfaces covered by salt, mentioning similar situations attested for the barbarian tribes[32] of the Mardi and Armenian[33], located in the same area. Among the Bactrians, the rivers Oxus and Ochus are recorded as bringing salt flakes from the neighbouring mountains[34]. The Ochus river is the river that flowed in Antiquity in the north of the Bactria region, and in the

[18] MOINIER 1985, 81; PLINIU 5.26.

[19] PLINIUS 31.39, 45.

[20] SMITH 1854.

[21] PLINIUS 31.39.

[22] PLINIUS 31.39.

[23] PLINIUS 31.39.

[24] The influence of salt exploitation in this locality had an effect on the toponymy of the area, the port being called *Salinae*.

[25] PLINIUS 31.39.

[26] PLINIUS 31.39.

[27] MOINIER 1985, 81.

[28] PLINIUS 31.39.

[29] PLINIUS 31.39.

[30] MOINIER 1985, 81.

[31] PLINIUS 31.39.

[32] PLINIUS 6.18.

[33] PLINIUS 31.39.

[34] PLINIUS 31.39.

contemporary world it is known as the Darya-i Pandj[35], being a tributary of the first one, the Oxus. Its modern name is Amu Darya[36], preserved to this day since Pliny, who uses this name when he describes the tribes of the Caspian region: "the territory is crossed by the river Amu Darya, which flows into Lake Oaxus"[37]. The Bactrians were a people who occupied the region opposite the Hindu Kush mountains bounded by the springs of the Indus River and the Ochus River[38].

In addition to lakes and rivers, from which salt comes spontaneously, Pliny also indicates springs, especially those with warm water, as a category that usually contains salt, offering as an example the springs of Pagasa[39], in the region of Thessaly[40], a city known for its salt springs[41]. About these springs he gives no other details, such as those relating to their exploitation or medicinal use, as he records in the case of other saline expressions.

According to the author, the saline manifestations exposed above express the types of salt spontaneously originating from the waters, under the action of the sun. Salt, both in Antiquity and today, is obtained, in a significant proportion, from the seas, but in addition to artificial exploitation, through salt pans, salt is also formed naturally, from the foam left by seawater on the shores and on the rocks[42].

But, before dealing with artificial salt, meaning that obtained in salt pans, we must also mention the salt mountains, as a natural form of presentation. Such a mountain, says Pliny, is found in India, and is known as Oromenus[43], of which we are given no other geographical details, but it is possible that the author may be referring to the present deposit in the Punjab, still exploited[44]. The text of the encyclopaedia adds that this type of exploitation was similar to that of stone quarries, signalling that the mineral was forming again once it was cut[45], a phenomenon also found in other regions[46]. No further details are given about the physical characteristics of the mined product, instead the author mentions shortly its important economic value, as "kings get a greater tax from it than from gold or pearls"[47]. The brief characterization provided by Pliny reveals an aspect of the economic context of ancient India, where the kings obtained a substantial tax from salt, a situation somewhat different from that

[35] Ancient History Encyclopedia
[36] Encyclopaedia Britannica
[37] PLINIUS 6.18.
[38] PLINIUS 6.18.
[39] PLINIUS 31.39.
[40] PLINIUS 4.8.
[41] MOINIER 1985, 83.
[42] PLINIUS 31.39.
[43] PLINIUS 31.39.
[44] MOINIER 1985, 82.
[45] PLINIUS 31.39.
[46] Cardona cf. MANGAS, ROSARIO HERNANDO 2011, 41.
[47] PLINIUS 31.39.

of the Empire, where salt obtained in the Mediterranean Sea basin, widespread and quite easy to obtain, was considered a product, to some extent, trivial, even having a rather low price, at a given time[48].

Pliny additionally records the existence of some walls, houses of salt lumps, or towers of square blocks of salt, built by welding with water, at Gerrae[49], in Arabia[50] or near Pelusius [51], in Egipt[52], discovered by King Ptolemy[53]. The origins of these products, used apparently on a fairly large scale, are not revealed, but considering that the settlements were located in a coastal region, and Pliny records them in the continuation of the mentions of the salt mountains, it is possible that the provenance of the salt blocks to be closely related to these geographical forms. According to the ancient encyclopaedia, salt was cut into almost translucent lumps also at Egelesta, in Hispania Criterion[54], a locality difficult to locate on the current map of Spain[55].

Salt was used in Antiquity, naturally, and in other forms, which Pliny briefly explains. For example, in Cappadocia salt was extracted from the ground, by condensing water, being cut in the manner of mica sheets[56]. It is obvious that the author is referring to rock salt mines, where the harvest of the product must be attributed to the condensation of underground water deposits[57]. By "sand removal" from a weedy place, in between Egypt and Arabia, salt was exposed, like in the arid lands of Africa to the oracle of Amun, where salt was found under the same conditions, considered of being influenced by the phases of the moon[58]. Pliny indicates the etymology of the name Ammon starting from the Greek *ammos*, which means "sand"[59]. On the basis of this observation the author continues the description of the ammoniacal salt (*hammonicus*), from the regions of Cyrene, also discovered under the sands[60]. Although it is obvious that the exposition does not refer to sodium chloride, the continuation of the text confirming this – "it is spurious with Sicilian salt and that of Cyprus"[61] –, I opted for the presentation of the technique for extracting this type of salt, outlined by Pliny, making an analogy with the exploitation of halite in caves. The method used did not benefit from special

[48] CARUSI 2008, 353, 361.

[49] STRABON 16.3.3.

[50] PLINIUS 6.32; 31.39.

[51] PLINIUS 31.39.

[52] PLINIUS 6.33.

[53] It is probably Ptolemy XV or Caesarion (b. June 23, 46 BC - d. August, 30 BC), the last king of the Ptolemaic dynasty in Egypt, whom Octavian's troops executed while he headed towards India.

[54] PLINIUS 31.39.

[55] MANGAS, ROSARIO HERNANDO 2011, 41.

[56] PLINIUS 31.39.

[57] CARUSI 2008, 354.

[58] PLINIUS 31.39.

[59] PLINIUS 12.49.

[60] PLINIUS 31.39.

[61] PLINIUS 31.39.

attention in the encyclopaedia, the author only trying to justify the phenomenon by which the object in question gains weight when it is brought to the day light[62]. The ancient explanation is limited to specifying that the air in the galleries is more humid, causing a decrease in weight[63], but it seems that the air in the grotto is dry, the salt gaining weight in the open air due to its hygroscopic property, which causes the absorption of moisture from the air[64].

Pliny's references to natural salt, formed spontaneously, are limited to the geographical indications expressed above. Regarding artificial salt, it should be noted that it mainly refers to the salt obtained in salt pans, considered the most common and the most often met[65]. The name artificial seems to originate from the anthropic catchment system, through which seawater is led into constructed basins[66].

The operating principle of the salt pans does not benefit from a detailed description in Pliny, who records only a few details about the fresh water courses necessary for this technique, which are either natural or in the form of pipes[67]. By fresh water it is explained that rainwater[68] or dew drops[69] can also be understood, both being of real help in obtaining salt. Along with fresh water, the sun plays a very important role, because otherwise the salt could not dry[70]. It seems that even the wind is not to be neglected in the process of exploiting salt in the salt pans, the *aquilon* producing an abundance of clean salt[71]. The image of an ancient salt pan can be outlined thanks to a poem, *De reditu suo*, by Rutilius Namatianus, from the beginning of the 5th century AD[72]. It describes how seawater entered through channels dug into the ground into tanks with multiple compartments. At the beginning of summer, the inflow of the sea was stopped with the help of locks, and the action of the sun evaporated the water already collected and turned it into a thick crust[73]. Regarding this crust, Pliny mentions that in Africa, near Utica, the salt was collected in piles in the form of hills, which, under the action of the sun and the moon, acquired an extremely hard consistency, being impossible to melt under the action of a liquid and can only be cut with the iron[74].

[62] PLINIUS 31.39.
[63] PLINIUS 31.39.
[64] MOINIER 1985, 76.
[65] PLINIUS 31.39.
[66] CARUSI 2008, 355.
[67] PLINIUS 31.39.
[68] PLINIUS 31.39.
[69] PLINIUS 31.40.
[70] PLINIUS 31.39.
[71] PLINIUS 31.41.
[72] CARUSI 2008, 355.
[73] CARUSI 2008, 356.
[74] PLINIUS 31.39.

The author is reserved in the technical descriptions of the salt pans, but indicates the name of the one who founded them, king Ancus Marcius[75], (also known as the founder of Ostia, at the mouth of the Tiber[76]). In a brief enumeration of other centres where there were salt pans, Pliny mentions that in Crete, for example, salt is obtained without fresh water pipes, just by simply pouring sea water into the salt pans[77], and around Egypt, the seawater entering the wet soil determines a certain amount of salt[78], also obtained by bringing water from wells to the salt pans[79]. Among the points of obtaining salt in salt pans, Salamis, on the coast of Cyprus, yields the most prized sea salt[80]. Other salt pans, only rapidly mentioned by Pliny, are those in Tragasus[81], Acanthus[82] or Agrigent[83], about which we do not receive any other details than that they received their names after the cities to which they belonged, only their physical qualities in relation to water or fire being recorded. In Megara, near Attica or in Eubeea[84] salt is also exploited, but the technique used is not mentioned; it is possible, due to the position of these cities, to talk about sea salt pans.

In areas where it was not possible to obtain salt from sea water, the inhabitants developed a type of salt pans where salt water is extracted from wells and springs[85], as in Cappadocia which provides salt prepared for transport, in the form of bricks[86]. It is possible that this reference to reveal the dissolution of the salt by the injection of fresh water, to be then subjected to evaporation at day, in *briquetages* vessels[87]. Similar situation is attested in the case of the territory of Chaonia, in Epirus[88], where the author records that the water from the well is boiled and cooled, obtaining an insipid and coloured salt[89], without indicating, however, what kind of well is the one from which the water is procured or the exact colour the finished product has.

[75] PLINIUS 31.41.

[76] CABEZA 2002, 185.

[77] PLINIUS 31.39.

[78] PLINIUS 31.39.

[79] PLINIUS 31.40.

[80] PLINIUS 31.41.

[81] PLINIUS 31.41; STRABON 13.1.48.

[82] PLINIUS 31.41; STRABON 7.7.32-36.

[83] PLINIUS 29.4; 31.41.

[84] PLINIUS 31.41.

[85] PLINIUS 31.39.

[86] PLINIUS 31.41.

[87] MOINIER 1985, 83.

[88] PLINIUS 4.1.

[89] PLINIUS 31.39.

In Babylon, bitumen and salt were probably jointly extracted[90], as Pliny reports that the first condensation forms a liquid pitch similar to oil, and after this is removed, the salt is revealed[91].

For the territories far from the sea, the possibility of salt supplies was limited to trade or to alternative techniques for obtaining it[92]. One of these ways of obtaining artificial salt attested in Gaul and Germany consists in pouring salt water on burning wood[93], obtaining a black salt[94]. Experimental research confirmed the indications recorded in the ancient encyclopaedia. Through this process, one obtains not only crystallized salt and residual coal, but also salt ash, with the same characteristics as salt[95], the tree itself turning into salt[96]. Pliny mentions that in a region of Hispania, without being precisely indicated, the substance extracted from the wells to be poured over the wood is called *muria*, that is, brine[97], from well-maintained salt water springs. Pliny has also knowledge of the existence of some salt water springs, which come from the ground in some pits[98], but he does not record any geographical reference for them. Another mention is concerning the brine of superior quality from the cities of Antipolis, Thurii, and Delmatia[99]. Salt was often kept in the form of brine, in ceramic containers[100], and the brine from the salty dishes was subjected to a new boiling process, producing salt again, in its "state"[101], probably in its crystallized form.

Could represent a matter of interpretation the reference of Pliny regarding the practice of Umbers (considered to be the oldest tribe in Italy[102]) from the Theophrastus writings, with respect to the cane or cane-ash boiling in water[103]. B. Moinier believes that this practice may be an allusion to the salt obtained by burning a saliferous peat, a technique also practiced in northern Europe[104]. Given that the author inserts this reference in the context of the exposition about obtaining salt from brine (*muria*), it is possible that the water in which these peoples boiled the respective plant was salty. C. Carusi, on the other hand, provides an ample description of the weight of salt water and its infiltration into the soil, in order to then extend

[90] MOINIER 1985, 83.
[91] PLINIUS 31.40.
[92] CARUSI 2008, 357.
[93] PLINIUS 31.39.
[94] PLINIUS 31.39.
[95] CARUSI 2008, 359.
[96] PLINIUS 31.40.
[97] PLINIUS 31.40.
[98] PLINIUS 35.25.
[99] PLINIUS 31.43.
[100] CABEZA 2002, 186.
[101] PLINIUS 31.40.
[102] PLINIUS 3.14.
[103] PLINIUS 31.40.
[104] MOINIER 1985, 83.

the explanation to the process set forth by Pliny and also Aristotle[105], by which Umbers obtained a substance with which they satisfied their need for salt, as a spice[106]. The product obtained was probably not sodium chloride, but more certainly potassium chloride[107].

Each of the types of salt exposed above has different qualities. For some of them, Pliny highlighted the physical ones, expressed by colour, sometimes being the only mention of a centre where salt was exploited, naturally or artificially. I have already stated that the salt obtained by burning wood soaked in salt water was black. The whitest one, on the other hand, was considered the one from Tarentum, being also the most brittle[108], and the one from Sicily, near Gela, having such a brightness that it could blind[109]. The salt of Cappadocia was saffron-coloured, transparent, and of a pleasant aroma[110], and that obtained from the lake near Memphis was red[111], while near the Oxus it was reddish, and at Centuripe, purple[112]. The last salt-producing locality is not mentioned by Pliny in another context, but the existence of some salt caves today can confirm such exploitation in Antiquity as well.

In addition to these qualities, the salt obtained in the Roman Empire revealed itself in all aspects of life, being much appreciated. I have already mentioned that lumps of salt were used in construction, and the fact that they were used in cooking is self-evident, "any easily melting salt" being preferred, more moist and therefore less bitter, such as that of Attica and Euboea[113]. For the preservation of meat, drier ones were preferred, like the one from Megara[114]. Pliny emphasizes the fact that salt, without specifying a specific type, was also useful in animal nutrition, especially for sheep, cattle and beasts of burden, stimulating milk production and increasing the quality of cheese, giving it a more pleasant taste[115]. Also, in relation to the food sector, salt was also used in the preparation of *garum*, Pliny providing quite a lot of details in this regard[116]. It can be determined that the places for preparing *garum* were in close connection with the salt pans, the marine one, at least[117]. In connection with this, the author mentions the ponds of Carthage, Mauretania, Carteia, Clazimenae, Pompei or Leptis[118]. The importance of salt was also augmented by its use in obtaining pearls, the fished clams being

[105] ARISTOTLE II.3.
[106] CARUSI 2008, 361.
[107] CARUSI 2008, 361.
[108] PLINIUS 31.41.
[109] PLINIUS 31.41.
[110] PLINIUS 31.41.
[111] PLINIUS 31.41.
[112] PLINIUS 31.41.
[113] PLINIUS 31.41.
[114] PLINIUS 31.41.
[115] PLINIUS 31.41.
[116] PLINIUS 31.43-44.
[117] VARGAS, MAGANTO 2006, 257-258.
[118] PLINIUS 31.43.

stored in clay pots under a thin layer of salt, the pearls then falling into the pot as the meat was disappearing[119].

Along with different assets distinctive for different salt categories, Pliny refers in his work also to the effectiveness of medicinal use of salt, either for humans or animals.

For this approach, the author states that in ancient times, the most praised for its use as a medicine was the salt of Tarentum[120] the so-called "salt foam"[121], collected from the shores of the sea or from the rocks that were washed by the sea water, leaving behind salt. Likewise, most of Pliny's contemporary physicians ranked the salt lumps from Egelesta, in Hispania Citerior, first among all kinds of salt[122].

*Naturalis Historia* brings to light numerous medicinal uses of salt, some of which were expressed in treatments of the diseases known in Antiquity. Since the main objective of the present work is not to analyse the uses of salt, but only the types of exploitation, I'll only briefly frame the information about salt-based remedies in two tables. These correspond to human and animal diseases cured with the product obtained from salt mining, so appreciated by Pliny himself, dedicating a larger space than other facets, such as the segments of his market[123].

**Table 1. Human diseases and their salt-based remedies indicated by Pliny the Elder in *Naturalis Historia***

| **No.** | **DISEASES** | **REMEDIES** | | |
|---|---|---|---|---|
| **A.** | **Animal/insect bites** | **Internal** | **External** | **Not specified** |
| 1. | Snake bite | | | Salt + marjoram + honey + hyssop[124] |
| 2. | Horned viper bite | | | Salt + oregano + cedar resin/ pitch/honey[125] |
| 3. | Scolopendra[126] bite | Salt drunk with vinegar[127] | | |

[119] PLINIUS 9.55.

[120] PLINIUS 31.41.

[121] PLINIUS 31.41.

[122] PLINIUS 31.39.

[123] MOINIER 1985, 86.

[124] PLINIUS 31.45.

[125] PLINIUS 31.45.

[126] Insectivorous myriapod, 10-12 cm long, with a body consisting of 21 rings, each with a pair of legs (*Scolopendra cingulata*). Because it is poisonous, the bite, especially of the tropical one, is dangerous and can even be fatal to humans.

[127] PLINIUS 31.45.

| | | | | |
|---|---|---|---|---|
| 4. | Crocodile bite | | Salt with vinegar in linen cloths with which the wounds are struck[128] | |
| 5. | Scorpion sting | | Salt applied with one fourth of linseed and oil or vinegar[129] | |
| 6. | Against bumblebees, wasps or similar insects | | | Salt with vinegar[130] |
| **B.** | **Dermatological conditions** | **Remedies with unspecified use, possibly external** | | |
| 1. | Wounds<br><br><br>Wounds with excrescences or rotting | Chewed salt[131] - **internal remedy**<br>Salt crushed with barley flour, placed on a linen cloth and sprinkled with wine[132]<br>Salt applied to the wound[133] | | |
| 2. | Head injuries | Salt with beef tallow[134] | | |
| 3. | Pustules/ pimples/ warts in early stage | Salt with beef tallow | | |
| 4. | Body growths/dead flesh | No specific treatment is specified, it is only mentioned that salt is used in such conditions. | | |

[128] PLINIUS 31.45.
[129] PLINIUS 31.45.
[130] PLINIUS 31.45.
[131] PLINIUS 31.45.
[132] PLINIUS 31.45.
[133] PLINIUS 31.45.
[134] PLINIUS 31.45.

| | | |
|---|---|---|
| 5. | Leprosy | Salt + wine from dried grapes (after the wood has been removed from it) + ox tallow + marjoram + yeast/ bread[135] |
| 6. | Boil | Salt + wine from dried grapes (after the wood has been removed from it) + ox tallow + marjoram + yeast/ bread[136] |
| 7. | Psoriasis | Salt + wine from dried grapes (after the wood has been removed from it) + ox tallow + marjoram + yeast/ bread |
| 8. | Burns | Salt + oil[137] |
| 9. | Erysipelas [138] | Salt + vinegar + hyssop[139]<br>Salt + oil + vinegar – mixture with which sick people sitting in front of the fire are rubbed, to sweat[140] |
| 10. | Carcinomas | Salt + Tamini grapes |
| 11. | Weft [141] | No cure is specified, only that salt removes calluses and calluses from the feet. |
| 12. | Bruises | Wrap salt in linen cloth and apply often with hot water[142]. |
| 13. | Skin maintenance | Salt in cleansers to stretch the skin[143]<br>Citium salt stretches the skin best[144]<br>Cappadocia salt, in brick form, gives a glow to the skin[145] |
| **C.** | **Ophthalmological conditions** | **Remedies** |
| 1. | Eye disease | No specific treatment is specified, it is only mentioned that salt is used in such conditions.<br>Salt added to collars or patches[146] – Tatta and Caunus salt are recommended[147]. |

[135] PLINIUS 31.45.

[136] The variety from Thebes is recommended, especially against itching cf. PLINIU 31.45.

[137] PLINIUS 31.45.

[138] Infectious dermatitis.

[139] PLINIUS 31.45.

[140] PLINIUS 31.45.

[141] PLINIUS 31.45.

[142] PLINIUS 31.45.

[143] PLINIUS 31.45.

[144] PLINIUS 31.41.

[145] PLINIUS 31.41.

[146] PLINIUS 31.45.

[147] PLINIUS 31.45.

| | | | | |
|---|---|---|---|---|
| 2. | Blows to the eye that cause bleeding; bruises | Myrrh + honey/ hyssop + hot water + *salsugo*[148] (salt water from a source other than the sea, with a higher concentration of salt[149]) – for compresses[150] | | |
| 3. | Cataract | Crushed salt in mills, mixed with milk[151] | | |
| **D.** | **Dental conditions** | **Remedies** | | |
| 1. | Prevention of dental caries | Keep salt under the tongue, every morning on an empty stomach, until it melts[152] | | |
| 2. | Toothache | Salt heated with vinegar and applied with resin[153] | | |
| 3. | Mouth wounds | Put salt in the linen strip[154] | | |
| 4. | Swollen gums | It is rubbed with salt[155] | | |
| 5. | Rough tongue | Fine crushed salt[156] | | |
| **E.** | **Rheumatic diseases** | **Remedies** | | |
| 1. | Tendon pain, especially around the shoulders and kidneys | Sachets of salt heated frequently with hot water[157] | | |
| 2. | Thigh pains | Sachets of heated salt[158] | | |
| 3. | Podagra[159] | Crushed salt + flour + honey + oil[160] | | |
| 4. | Sciatica | Salt used in lavages[161] | | |
| 5. | Sprains | Salt + flour + honey[162] | | |
| **F.** | **Diseases of the internal organs** | **Remedies** | | |
| | | **Internal** | **External** | **Not specified** |
| 1. | Angina | | Salt + oil + vinegar + | |

[148] PLINIUS 31.45.

[149] PLINIUS 31.42.

[150] *Salsugo* from Spain is preferred.

[151] PLINIUS 31.45.

[152] PLINIUS 31.45.

[153] PLINIUS 31.45.

[154] PLINIUS 31.45.

[155] PLINIUS 31.45.

[156] PLINIUS 31.45.

[157] PLINIUS 31.45.

[158] PLINIUS 31.45.

[159] Gout located in the lower limbs, especially affecting the big toe.

[160] PLINIUS 31.45.

[161] PLINIUS 31.45.

[162] PLINIUS 31.45.

| | | | | |
|---|---|---|---|---|
| | | | liquid pitch (applied on the neck)[163] | |
| 2. | Constipation | Salt + wine[164] | | |
| 3. | Tapeworms | Salt + wine (no side effects)[165] | | |
| 4. | Diseases of the colon | Salt is drunk[166] | | |
| 5. | Cramps | Salt is drunk | | |
| 6. | Migraines | | | Salt with beef tallow |
| 7. | Hydropsy[167] | | | No treatment is specified, but it is mentioned that some sick people were cured with salt. |
| **G.** | **Otorhinolaryngological conditions** | **Internal remedies** | | |
| 1. | Tonsillitis | Any type of salt is swallowed[168] | | |
| **H.** | **Other types of conditions** | **Remedies** | | |
| | | **Internal** | **External** | **Not specified** |
| 1. | Convalescence[169] | Salt is held under the tongue[170] | | |
| 2. | Fatigue | | | Salt + oil[171] |
| 3. | Fever chills | | Salt ointments with oil[172] | |

[163] PLINIUS 31.45.

[164] PLINIUS 31.45.

[165] PLINIUS 31.45.

[166] PLINIUS 31.45.

[167] Disease caused by the accumulation of serum in a natural body cavity (abdomen, chest, etc.).

[168] PLINIUS 31.45.

[169] To be able to bear the heat of the thermal baths.

[170] PLINIUS 31.45.

[171] PLINIUS 31.45.

[172] PLINIUS 31.45.

| | | | | |
|---|---|---|---|---|
| 4. | Chronic cough | Salt is drunk[173] | | |
| 5. | Opium poisoning | Salt with vinegar and honey is drunk[174] | | |
| 6. | Tumours | | Salt with flour and honey is applied[175] | |

**Table 2. Animal diseases and their salt-based remedies indicated by Pliny the Elder in *Naturalis Historia***

| No. | Disease | Remedy | |
|---|---|---|---|
| | | **Internal** | **External** |
| 1. | Sheep and cattle scabies | Salt is given to lick[176] | Salt is applied[177] |
| 2. | - | Salt is spat into the eyes of the beasts of burden[178] | |

Although through the present study we did not aim to explore the medical uses of salt in Antiquity, the two tables reveal the great appreciation and circulation and a comprehensive use of salt, obtained either naturally or through the various exploitation methods, exposed above. Pliny states about high-quality salt that "it is harsh, hot, upsets the stomach, causes sweating, has a laxative effect in wine and water, is useful in medicines and cleansing substances"[179]. In addition to the information gathered in the two tables, Pliny reports that salt was used for its astringent effects on bodies, preventing even corpses from decomposing, thus lasting through the ages[180]. Other actions of salt were manifested through chewing, highlighting the purifying and dissolving properties[181] of the vital element. Although praised intensely, salt is also recognized as having a negative capacity, the author indicating that it is

[173] PLINIUS 31.45.

[174] PLINIUS 31.45.

[175] PLINIUS 31.45.

[176] PLINIUS 31.45.

[177] PLINIUS 31.45; It is not specified how the salt is applied to cure scabies, but it can be assumed topically.

[178] PLINIUS 31.45; It is not specified whether this custom is a cure for a specific disease, a practice with symbolic value or, considering the effect that salt has in contact with the organ of vision, a procedure that is difficult to decipher.

[179] PLINIUS 31.42.

[180] PLINIUS 31.45.

[181] PLINIUS 31.45.

harmful to the stomach[182], and consumed in excess, it retains water in the body[183], concluding in this sense that "any place where salt is found is sterile and does not give rise to nothing"[184].

According to the information provided by Pliny, salt can be considered a fifth element, along with water, earth, air and fire, since, at least for the health of bodies, "nothing is more useful than salt and the sun"[185]. This connection between sun and salt has been captured over time by several ancient authors. For example, Pliny states that fresh water is related to the moon, while salt water has a certain relationship with the sun[186], and Pythagoras says that "Salt is born of the purest parents: the sun and the sea". In addition to the physical qualities attributed by human communities, salt has also benefited from a symbolic interpretation, because it is an extremely necessary element for human life, the meaning being transferred to another dimension, to express special spiritual pleasures[187].

Pliny highlights the meaning it has in Latin, the term *sales*; it expresses jokes, spiritual pleasures, "the charm of life, full joviality and the rest after labour"[188]. Pliny emphasizes the value of this substance through the micro toponym *Via Salaria* which denoted the route on which salt was transported to the Sabines[189]. Thus, we can mark an economic importance that salt enjoyed in the Roman Empire from the first century, and even before. This is amplified, according to Pliny, also by a proverb from which it follows that the Romans often ate salt with bread[190]. The importance of salt is also emphasized by the behaviour of the society in the period described by Pliny, especially in certain regions of Egypt, on the seashore, which, despite the risk of some diseases, kneaded the flour with sea water, in order to save salt[191]. This custom can also reveal an economic importance, being under municipal or state monopoly, increasing its price greatly, depending on the season [192].

Of all the symbolic uses attributed to salt, the most important is revealed in sacred ceremonies, when salt is the most powerful element, because nothing is accomplished without ground salt[193]. Pliny sums up all the qualities of salt, of any level, in a single statement: "One cannot imagine a human life without salt!"[194], as he tried to highlight, by mentioning the centres where salt is exploited sustainably, resulting in a commercial product, known,

[182] PLINIUS 31.45.
[183] PLINIUS 31.32.
[184] PLINIUS 31.39.
[185] PLINIUS 31.45.
[186] PLINIUS 2.104.
[187] PLINIUS 31.41.
[188] PLINIUS 31.41.
[189] PLINIUS 31.41.
[190] PLINIUS 31.41.
[191] PLINIUS 18.12.
[192] CABEZA 2002, 187.
[193] PLINIUS 31.41.
[194] PLINIUS 31.41.

appreciated and used in all regions of the known world. The barbarians are different from the Romans, not only through culture and other occupations, but also through the lack of openness to the sea and specific exploitation techniques.

The Mediterranean Sea basin offered favourable conditions for obtaining salt by evaporation: a high salinity, the climate or the position of the shore, which allowed the establishment of artificial salt pans, intended to support a large-scale exploitation[195].

It is noted that most of the cities where salt was exploited were coastal or located in regions with salt deposits, and most of them benefit from continuity, sometimes even in terms of methods used[196].

Summarising the references in Pliny's work regarding the salt exploitations, we must keep certain reservations about the fidelity of the information presented, relative to the places or production techniques[197]. However, they constitute an important body of knowledge about salt from the period, which the author collected and handed back to humanity through his encyclopaedia. The presence of the salt mentions in the *Naturalis Historia* through other ancient Greek and Roman authors, too, makes the value of the work be once more demonstrated.

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[195] CARUSI 2008, 355.

[196] MOINIER 1985, 73.

[197] CARUSI 2008, 354.

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*** PITAGORA

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