

Reappraisal of the number of salt mummies identified in Chehrābād Salt Mine, Zanjan, Iran

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Abstract: *The Chehrābād Salt Mine mummies were first discovered in 1993. So far, six individuals have been identified in the mine. Three (1, 2, and 3) were found accidentally by miners, while another three (4, 5, and 6) were discovered through systematic archaeological excavations. This article shows that there are two more individuals represented in the collection, bringing the total number of mummies to eight. Osteological examination confirms that the extra bones initially placed with Salt Man 1 belong to another individual, possibly a young adult male, of unknown date, called Salt Man 7. In addition, results from AMS dating of an extra piece of mandible, which was originally placed with the skeletal remains of Salt Man 3, indicates that this specimen does not belong to this individual; it was removed from the collection and renamed as Salt Man 8. The osteological analysis of the bone remains of Salt Man 8 suggests that this individual might also be a young male.*

Key words: Salt Men; natural mummies; Achaemenian; Sassanian; osteography

Introduction

A mummy is a body whose skin and organs have been fully or partially preserved by either deliberate human action, incidental exposure to extreme cold or low humidity environments, in anaerobic environment where decay is inhibited (bogs), or being captured in salt mines (Cockburn et al. 1998). Although mummies have been reported from all around the world, certain kinds, such as salt mummies, are among

the rarest. Generally speaking, human mummies can be classified as ritualistic or natural; the former (e.g. Egyptian mummies) are not within the scope of this article. The oldest naturally mummified human bodies are found in the Atacama Desert, dating to about 7000 BCE (see Arriaza 1995). Aside from those presented in this article, the most notable naturally mummified bodies are those from the Tarim Basin (China; Li et al. 2010), the Siberian Ice Maiden (Polosmak 1994), and, perhaps most famously, Ötzi, discovered in the Ötztal Alps and dating back to 3300 BCE (Müller et al. 2003).

Most of the naturally mummified bodies, which have been discovered so far, are from dry or cold conditions, and in some instances from bogs (e.g., Spindler et al. 2013; Painter 1991). The salt mummies from the Chehrābād Salt Mine in Iran, alongside other examples such as those from the Hallstatt (Reschreiter 2007) and Dürnbreg salt mines (Schatteiner & Stöllner 2001; Stöllner et al. 2003), are among the only human mummies whose mummification process took place in salty conditions. The aim of this paper is to present new findings from the Chehrābād Salt Mine.

Based on more than six decades of archaeological investigation, it has been shown that the Iranian plateau has been a dwelling place for humans since at least the Late Pleistocene (Vahdati Nasab 2011). Although our knowledge concerning human remains belonging to the pre-Neolithic period in Iran is limited, a significant number of human remains have been discovered during excavations of sites that chronologically encompass the Chalcolithic to the Islamic period. Tepe Hissar, Gohar Tepe, Tepe Sialk, Tepe Zagheh, Shahr-e Sokhteh, and many other important sites are among those archaeological locations that have provided significant numbers of human skeletons. In spite of the fact that almost all major archaeological sites in Iran have revealed human remains, they have often received limited or little attention from archaeologists (Vahdati Nasab & Nouri 2010).

A quick survey of the physical anthropological data derived from excavations conducted prior to 1980 in Iran reveals that, in a majority of field missions, which led to the discovery of human remains, relatively extensive bioarchaeology reports were provided in the excavation reports or as independent articles by physical anthropologists (e.g. Krogman 1940; Lambert 1979; Muscarella 1965; Rathbun 1966, 1983, 1984a, 1984b; Turnquist 1983). On the contrary, in post-1980s field expeditions, it is noticeable that there are shortened reports or in some instances a complete absence of physical anthropology research. Although investigations concerning the possible causes for this decline in reporting is beyond the scope of this article (for more information see Vahdati Nasab & Nouri 2010), this situation has inhibited the authors from conducting comparative osteological studies of sex, age-at-death, and stature information for the salt mummies with other human skeletal remains from Iran.

Discovery of the Salt Men

The Chehrābād Salt Mine is located 75km north-west of Zanzan city (the capital of Zanzan province, 300km west of Tehran), in the vicinity of Hamzelu village, at an elevation of 1350m above sea level ($36^{\circ}54'20''\text{N}$, $47^{\circ}51'93''\text{E}$) (Figure 1). In December 1993, during the process of salt extraction at the mine, workers came across a human head with hair and a beard, and a lower limb inside a leather boot, associated with artefacts including iron knives, a silver needle, a sling, rope, a grindstone, some pottery shards, and some textile fragments, and most importantly a few extra bones (Aali 2007). The head and its associated materials were called Salt Man 1 and are currently exhibited in the National Museum of Iran in Tehran (Figure 2). Unfortunately, this significant discovery did not convince the authorities to cancel the mining permit. In 2004, after the accidental discovery of another individuals (Salt Men 2 and 3) the Cultural Heritage Office in Zanzan province started archaeological excavations at the site under the supervision of Abolfazl Aali and his colleagues, and as a result Salt Men 4 and 5 were discovered (Aali 2007). Salt Men 4 and 5 were the first mummies to be recovered during systematic archaeological excavations. Salt Men 1 to 3 were all found in scattered pieces, with Salt Man 3 discovered in very fragmentary shape.



Figure 1. Location of Chehrābād Salt Mine (1), and some other archaeological sites in Iran: (2) Tepe Hissar, (3) Gohar Tepe, (4) Tepe Sialk, (5) Tepe Zagheh, (6) Shahr-e Sokhteh.



Figure 2. Salt Man 1, in the National Museum of Iran in Tehran.
Photograph by H. Vahdati Nasab.

In 2010 a joint collaborative team from the Iranian Cultural Heritage Organisation, the Deutsches Bergbau-Museum Bochum, the University of Bochum, the University of Oxford, the Swiss University at Zurich, Tehran and Zanzan Universities, the Austrian Academy of Science and the Natural History Museum of Vienna was formed to conduct field expeditions and analysis on the discovered materials; this is called the Salt Men Project (SMP). The SMP concentrates its work on continuation of excavations at the site and on forming several laboratory groups to conduct DNA analysis, physical anthropology, isotope analysis, textile analysis, paleopathology, paleoparasitology, archaeobotany, radiocarbon dating, and chemistry (Pollard et al. 2008; Aali & Stöllner 2015). So far, the SMP field campaign has managed to discover parts of one more mummy (Salt Man 6) and published several articles.

Isotopic analysis of five individuals has revealed that two of the mummies were local, and two seem to have come from the northeast of Iran; the fifth might have

come from further afield (Ramaroli et al. 2010). Paleoparasitology studies indicate the presence of tapeworm (*Taenia* sp.) among some of the salt mine individuals, which might suggest the consumption of raw or undercooked meat (Nezamabadi et al. 2013). In addition, textile analysis has provided evidence of pre-Islamic Iranian textile technologies (Hadian et al. 2012; Mouri et al. 2014).

The contextualisation of the salt mummies

The salt mine in Chehrābād is a rare example of an ancient salt mine (Aali & Stöllner 2015) that has been exploited in various periods over a long time span from about 600 BCE to modern times (**Figure 3**), particularly during four longer periods: Achaemenian, Sassanian, Seljuk and Safavid to Pahlavi periods in the 20th century. Archaeological excavations of the mine brought to light interesting results concerning the techniques, the supply and the logistics of the old mining processes as well as the involvement of the rural surrounding landscapes (Aali & Stöllner 2015).

Most of the Salt Men were probably miners who died during mining accidents. According to the archaeological and stratigraphical evaluation of the excavation data it turns out that at least three mining catastrophes can be evidenced.

1. The first mining catastrophe took place around 400 BCE. According to the Bayesian modelling of AMS-¹⁴C dates of findings and mummies (Salt Men 3-5) directly related to this event it is possible to limit its likely time-span to between 405 and 380 BCE (Pollard et al. 2008; Aali et al. 2012). It is clear that the miners were caught by surprise when heavy blocks broke down from the mining hall's ceiling and struck them, resulting in their death. This also applies to the dispersed parts of Salt Man 3, and now also including parts of an eighth miner (**Figure 4**). It appears evident that Salt Man 5 was carrying out a bag with rich salt pieces from the mining zone, possibly to the surface as a leather bag with small salt pieces was found nearby, when he was struck by a falling salt block and died.

2. The event that led to the casualty of Salt Man 1 (and possibly also other miners, see below) remains unclear as the findings were made by recent mining activities and there is no detailed recording of the archaeological context. It is even unclear where exactly the mummy parts had been discovered. According to the reports, the find spot should be southeast of the current excavation area (**Figure 4**). The radiocarbon dates indicate that they represent mining activities of the Early Sassanian period, a period that is not evidenced in the north-western parts of the mine that were investigated during the 2004-2005 and 2010-2017 excavations. This suggests that another mining-area further to the east was exploited at the beginning of the Sassanian period.

3. A third event is evidenced only indirectly by dating and the distribution of mummy parts. Salt Men 2 and 6 were found in younger Sassanian mining debris that originally was re-deposited in the course of antique mining activities. Salt Man 2 was

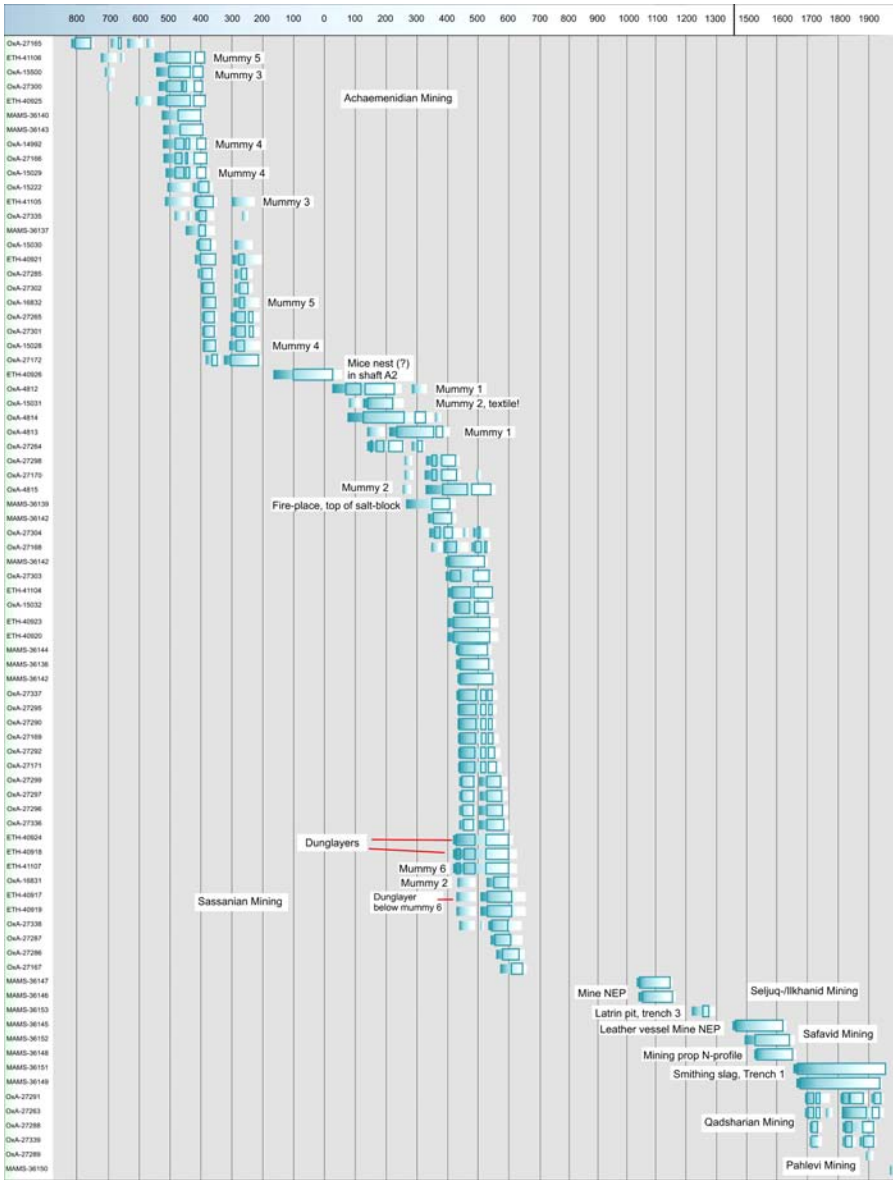


Figure 3. AMS-Radiocarbon dates of Mannheim, Oxford and Zurich laboratories: Achaemenian, Sassanian, Seljuq and Safavid to Modern Times mining phases, after DBM/RUB/ICHTO Zanjan, Th. Stöllner.

discovered when bulldozing the upper parts of the clay and gypsum-covering of the south-west parts of the mine while the mummified parts of Salt Man 6 were found

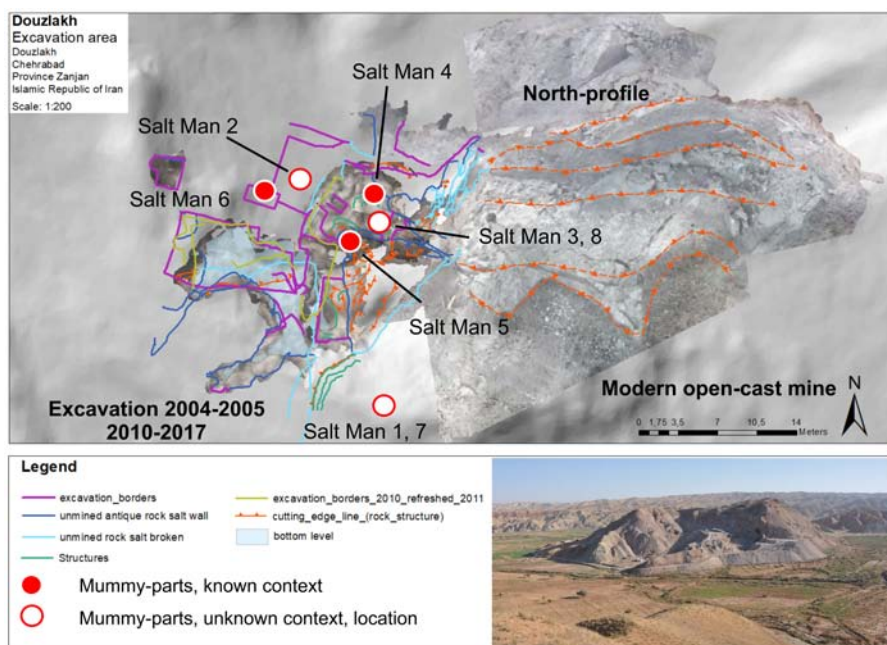


Figure 4. Location of the Salt Men 1 to 8 in the area of the open-cast and the excavation parts of the Chehrābād salt mine, after DBM/RUB/ICCHTO Zanjan, N. Schimerl, Th. Stöllner.

during regular excavations in 2010 (Figure 4). It is obvious that both mummies and their dispersed parts were found in a similar stratigraphic position. This also explains the broader dating spans of findings for Salt Man 2, discovered nearby (AMS-¹⁴C dating: OxA-15301). The dating of Salt Man 2 parts themselves range over a period between the late 4th to the early 6th century CE (OxA-4815; OxA-16831). In particular, dating from an organic dung layer beneath the parts of Salt Man 6 indicates that mummies and mining activities belong more or less to the same mining period (ETH 41107, Aali et al. 2012). It is also clear that especially Salt Man 6 parts were likely re-deposited within those activities while Salt Man 2 might directly belong to a catastrophic event that is also evidenced by larger rock-salt blocks embedded to the layers of this period. It is possible that a tunica found only some meters away in comparable stratigraphic context belonged to one of these bodies (Grömer & Aali 2019).

New osteological discoveries

Re-examination of the human remains of Salt Man 1 confirmed the presence of some duplicated elements; these bone fragments that were formerly associated with Salt

Man 1 have now been renamed Salt Man 7, although it is not clear if they belonged to only one individual.

In addition, osteological re-examination of the heavily fragmented human remains that were previously attributed to Salt Man 3 revealed that the collection contains at least two individuals. The results from AMS dating (using OxCal 4.1.7) conducted at the University of Oxford confirmed this claim (Vahdati Nasab et al. 2011, 2012). Thus, this new individual has been identified as Salt Man 8.

Methods

Two osteological collections kept in the Iranian National Museum (Salt Man 1) and Zolfaghari Archaeological Museum in Zanjan (Salt Man 3) were used to identify new specimens. The criteria for distinguishing between individuals entailed three major approaches: duplicated elements, differences in morphology between bilateral elements, and differences in general bone size and robustness. In terms of dental studies, severity of dental wear was assessed using a chart developed by Smith (1984). Each tooth is scored using a grading system ranging from 1 (no wear) to 8 (severe wear). Carious lesions were identified visually and scored following Hillson (2001). All teeth were visually inspected for enamel hypoplasia defects with the aid of a hand-lens, based on Buikstra and Ubelaker (1994). Sex estimation was established using femoral bicondylar width (BCB), employing the linear distance between the medial border of the medial condyle and the lateral border of the lateral condyle.

Osteography of Salt Men 7, 3, and 8

Salt Man 7

Three thoracic vertebrae (T1, T2, and T3) are in anatomical position covered with some soft tissues. Some plant remains are observable at the vertebrate foramen.

T1. The left superior articular facet is intact, while the right superior articular facet is missing except for a small portion (the damage is post-mortem). The vertebral body and vertebral foramen are intact; however, the laminae are broken. The left and right transverse processes are missing. The pedicles are intact. The very end of the spinous process is broken.

T2. The left and right superior articular facets are articulated to T1. The left transverse process is intact, but the right transverse process is missing. The vertebral body and vertebral foramen are intact. The superior and inferior vertebral bodies are articulated with T1 and T3. The tip of the spinous process is broken.

T3. The left and right anterior facets are intact and articulated with T2. The left and right transverse processes are missing. The vertebral body is intact. The vertebral

foramen is missing; clear signs of erosion are seen on the inferior part of the body. The costal foveas are intact.

Attached to T2 and T3 there are remains of the head and neck of R2 and R3 (Figure 5). In the case of R2 the head and neck are attached to T2; however, the body of the rib is missing due to post-mortem damage. Concerning R3, the head is attached to T3 and the neck and the body are missing (post-mortem damage).

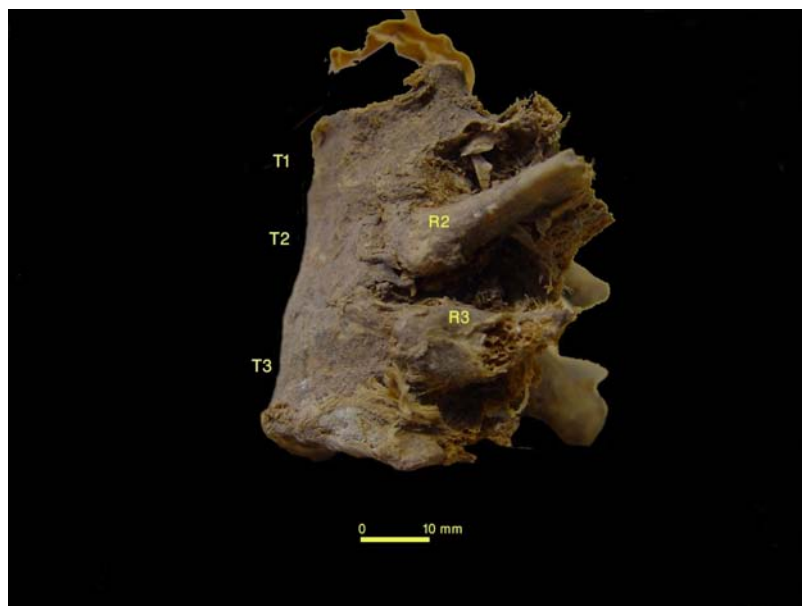


Figure 5. Salt Man 7, three thoracic vertebrae.

Perhaps the most well-preserved parts of Salt Man 7 are the left maxilla and zygomatic bones. No human soft tissues in the form of dry mummified soft tissues or hair was present. The remains of this individual are covered with some dirt, which was not removed during the osteological examination (Figure 6).

Left maxilla. The zygomatic process and infraorbital foramen are intact (Figure 6). The frontal process is broken (this might not be post-mortem damage). The canine fossa is intact. The nasoalveolar clivus is broken. The maxillary sinus is filled with fragments of broken sphenoid (post-mortem damage). The anterior lacrimal crest is missing. The anterior nasal spine and canine jugum are intact. The alveolar process is present. The palatine bone is 90% intact, except for some breakage at the anterior part. The palatine process is missing.

Left zygomatic. The frontal process, zygomaticofacial foramen, and maxillary process are intact. The temporal process is broken at the most posterior part. The



Figure 6. Salt Man 7, zygomatic process and infraorbital foramen.

masseteric origin is eroded. The remains of plant roots can be seen at the maxillary sinus.

Left maxillary dental arcade. Eight teeth are present in the left maxilla. They represent various degrees of post-mortem breakage, alongside signs of wear. Due to post-mortem damage, pathological analysis is possible for the second premolar and molar teeth only. All teeth display moderate wear (grade 3-4). Moderate calculus deposit is also present on the labial surface of the teeth and M¹ has an extensive carious lesion on the distal crown surface. No sign of enamel hypoplasia was observed (**Figures 6 and 7**). The important point concerning the dental arcade is the M³, which could be used to estimate the age-at-death of the specimen (**Figure 7**).

Salt Man 3

Salt Man 3 was the last specimen to be accidentally discovered by the miners in a fragmentary condition (**Figure 8**). Due to the nature of the discovery, most of the bones demonstrate signs of post-mortem damage. As a consequence, Salt Man 3 was not included in the museum exhibition. Re-examination of the bone collection assigned

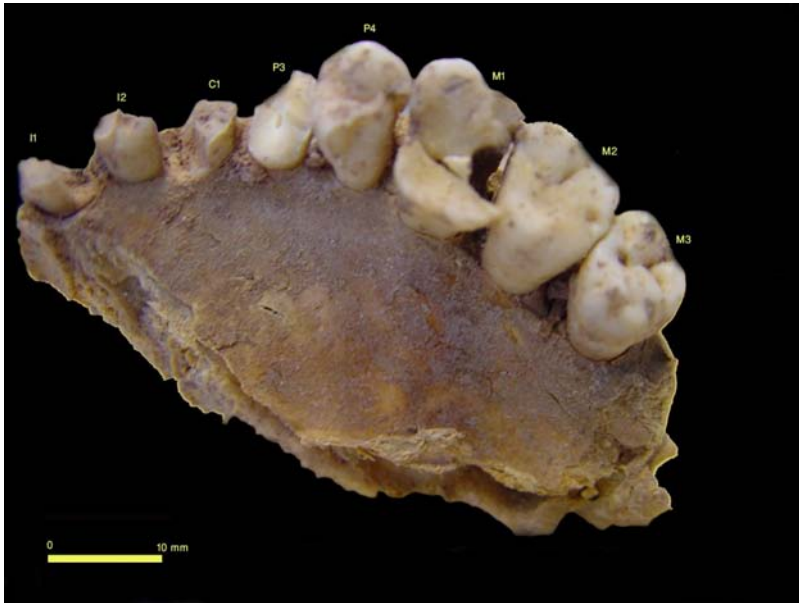


Figure 7. Salt Man 7, left maxillary dental arcade.

to Salt Man 3 was conducted in 2011 and 2012. The most significant point concerning Salt Man 3 is that although the bone collection suffered heavily as a result of the industrial activities at the site, some parts of the skeletons are still intact and remains of dry mummified human soft tissues are present on most of the bones, suggesting that the original body was complete. Several pieces of textile were also discovered alongside the human remains.

While the skeleton of Salt Man 3 is about 40% complete, most of the cranial parts are missing; the postcranial bones are relatively well represented.

Right zygomatic. The frontal process, zygomaticofacial foramen, maxillary process, masseteric origin, and temporal process are intact (Figure 9).

Left temporal bone. The suprasetal crest and external acoustic (auditory) meatus are intact, except for some breakages at the anterior part of the auditory meatus. The postglenoid process is intact but it seems there are some breakages in it. The entoglenoid process cannot be seen as it is completely covered with remains of soft tissues. The middle meningeal groove, internal acoustic (auditory) meatus, and carotid canal are intact. There are some remains of soft tissues on the entoglenoid process (Figure 10).

Maxillae. Most of the left maxillary bones are missing; however, at the right side the nasoalveolar clivus, canine jugum, alveolar process, and alveoli are present (Figure 11). Five teeth are available, however, due to post-mortem damage patho-

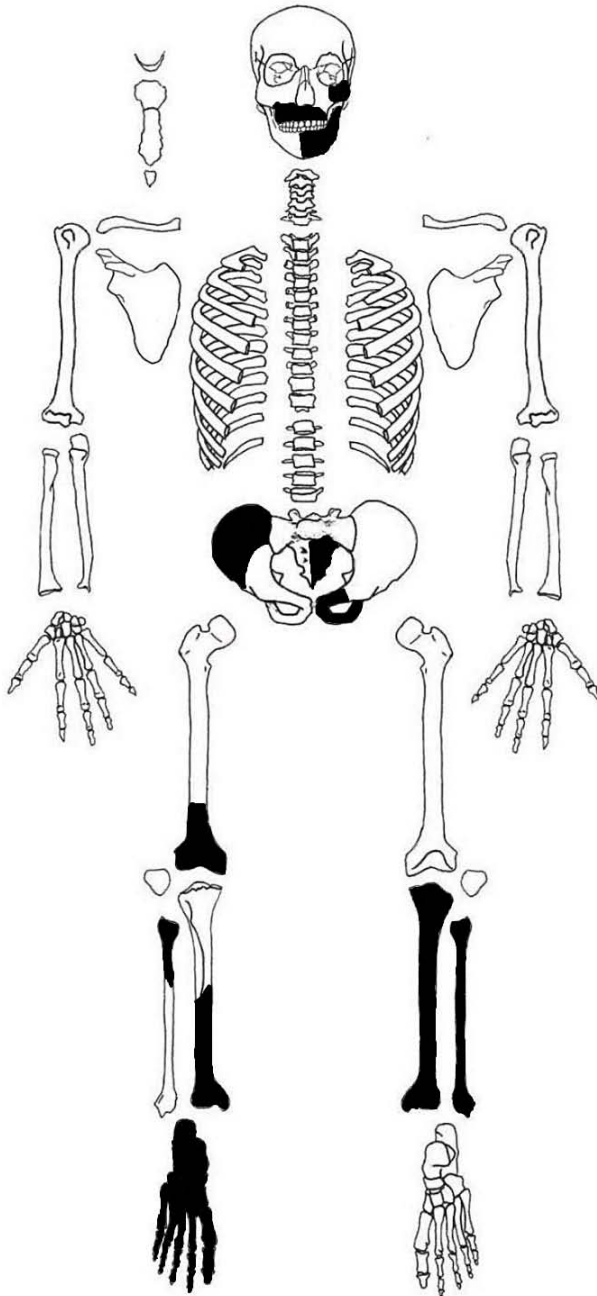


Figure 8. Inventory of Salt Man 3. Black parts represent discovered bones.



Figure 9. Salt Man 3, left zygomatic bone.

logical analysis is possible only for the left upper incisors. All teeth display moderate wear (grade 3-4) and moderate calculus deposit are present on the labial surface of the teeth. A root surface carious lesion was observed on the labial side of the left I¹. No sign of enamel hypoplasia was identified.

Left mandible. Only the left part of the mandible has been recovered; the pattern of breakage indicates post-mortem damage (Figure 12). The extramolar sulcus, endocoronoid ridge, mylohyoid line, submandibular fossa, and coronoid process are intact, except for some breakages in the superior part of the coronoid process. The mandibular notch, ascending ramus, oblique line, and left mental foramen are intact. Six teeth are present in the mandible. All teeth display slight to moderate wear (grade 3-5) and moderate calculus deposit is also present on the labial side of the teeth (except P₂). No sign of carious lesions or enamel hypoplasia were observed.

Right tibia. The proximal end and some parts of the shaft are missing (post-mortem damage). The distal end is intact, except for some breakages at the anterior part (Figure 13). The broken part is not missing, it is joined to the bone by soft tissues remains. The anterior crest and medial surface are intact. The medial malleolus cannot



Figure 10. Salt Man 3, left temporal bone.

be clearly seen as there are some remains of soft tissues on it. The interosseous crest and interosseous surface are intact. There are some soft tissue remains on the anterior part of the bone, especially the broken part.

Right tarsal bones. The talus, calcaneus, cuboid, and navicular are intact. The medial (first) cuneiform is missing, as is the intermediate (second) cuneiform. The lateral (third) cuneiform is not intact.

Right metatarsal bones. All five metatarsal (MT) bones are present, in various degrees of preservation. In the case of MT1, the head, shaft, and base are intact, except for some breakages at the inferior part of the base. The colour of the bone surface is varied. There are some soft tissues remains on the head and the inferior part of the base. In MT2 the head is intact; however, it cannot be clearly seen as there are



Figure 11. Salt Man 3, maxillae.

some soft tissues remains on it. The bone articulated to the tip of the head is probably the second proximal phalanx. The shaft is intact, and it is articulated to MT3 at the base. The base is intact but cannot be clearly seen as there are remains of soft tissues on it. There are some soft tissues remains on the proximal part of the head, and the anterior and posterior parts of the base. Signs of erosion and breakages can be seen on the shaft.

In MT3, the head is intact, but it cannot be clearly seen as there are remains of soft tissues on it. The bone articulated to the tip of the head is probably the third proximal phalanx. The shaft is intact, and it is articulated to MT2 at the base. The base is intact; it also cannot be clearly seen as there are some soft tissue remains on it. There are remains of soft tissues on the proximal part of the head, and the anterior and the posterior parts of the base.

In the case of MT4, the head, shaft, and base are intact, and in the case of MT5 the head is intact, except for some fractures to the lateral part. The shaft and base are intact, except for some fractures to the lateral part of the base. The styloid process is intact. There are some soft tissue remains on the posterior part of the base.



Figure 12. Salt Man 3, left mandible.

The second proximal phalanx. The head is intact, however, it cannot be clearly seen as soft tissue remains are present. It is possibly articulated to the second intermediate phalanx. The shaft is intact. The base is intact and articulated to MT2. There are remains of soft tissues on the head and the base.

The third proximal phalanx. The head is intact but cannot be clearly seen as there are some soft tissue remains on it. The shaft is intact. The base is intact and articulated to MT3. There are some soft tissues remains on the head.

Left tibia. The whole bone is intact. The colour of the bone surface has changed at the anterior part of the proximal end, the tibial tuberosity, and most parts of the shaft. There are also some soft tissue remains on the medial surface, interosseous crest, and the end part of the shaft near to the distal end (Figure 14).

Left fibula. There is a post-mortem breakage to the shaft, separating it into two parts (Figure 15). The other breakage completely separates the distal end from the shaft. There are also some post-mortem breakages at the distal end of the shaft. There are remains of soft tissues on the posterior part of the shaft. The head, styloid process, interosseous crest, and proximal fibular articular surface are intact.

Right femur. The proximal end and most parts of the shaft are missing (post-mortem damage). The distal end is intact, except for some breakages to the lateral part (Figure 16). The medial supracondylar line (ridge), lateral condyle, intercondylar fossa (notch), medial condyle, and patellar surface are intact. There are some soft tissue remains on the anterior and lateral parts of the bone. Some breakages can be seen at



Figure 13. Salt Man 3, right tibia and right foot.

the lateral part and there are two small holes (probably post-mortem) in the posterior part of the distal end.

Right fibula. Most parts of the shaft and the proximal end are missing (post-mortem damage). There is a breakage to the shaft separating it into two parts (also post-mortem damage). The head and styloid process are intact, except for some breakages at the superior part of the styloid process. The interosseous crest is intact. The fibula groove is missing. The distal fibular articular surface is intact, except for some breakages to the superior part. There are remains of soft tissues on the shaft and distal end (Figure 17).



Figure 14. Salt Man 3, left tibia.



Figure 15. Salt Man 3, left fibula.



Figure 16. Salt Man 3, right femur.



Figure 17. Salt Man 3, right fibula.

Pelvic girdle. Only the right illium, left pubis, left ischium, and left sacrum are present (Figure 18). For the right illium, the body, crest, tubercle, pillar, the tuberosity, greater sciatic notch (damaged), and iliac fossa are present. Concerning the left pubis, the body, iliopubic (superior pubic) ramus, ischiopubic (inferior pubic) ramus, and pubic symphysis are intact. In the case of the left ischium, although there are some breakages to the medial part of the bone, the ischial tuberosity is intact, except for some breakages to the posterior part.



Figure 18. Salt Man 3, pelvic girdle.

The sacrum has suffered from some post-mortem damage, especially to the right side. The transverse lines are intact, except for one which is missing. The dorsal wall is

intact; however, the median crest (spine), promontory, and sacroiliac joint (auricular surface) are missing.

Salt Man 8

What has been called Salt Man 8 in this article is a piece of left mandible discovered among the remains of Salt Man 3 (**Figure 19**). Most of the mandible body is missing, probably due to post-mortem damage. Only the medial part of the mandibular body, with the mandibular foramen plus P₂, M₁, and M₂ are present. All teeth display slight wear (grade 2-3) along with mild linear enamel hypoplasia suggesting periods of stress during childhood. No sign of carious lesions or calculus deposits were observed.

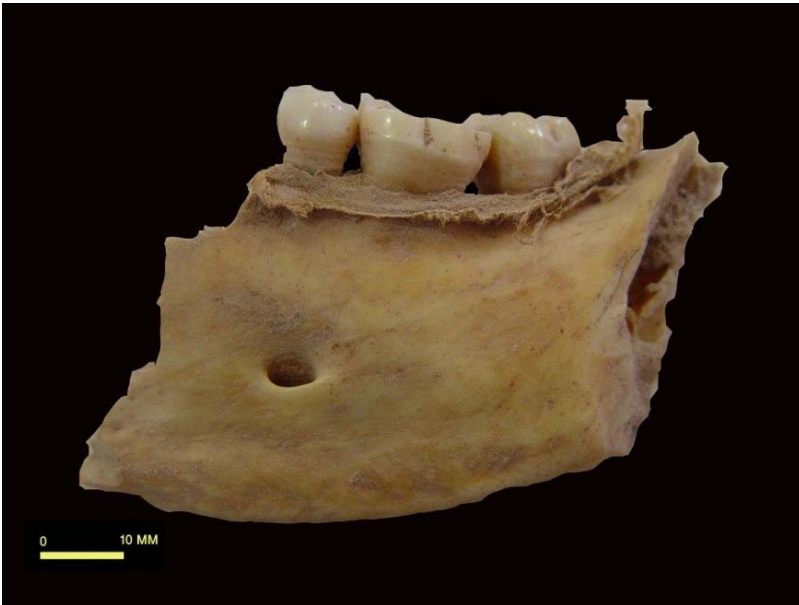


Figure 19. Salt Man 8, left part of the mandible.

Sex assessment

Not much can be said concerning the possible sex of Salt Man 8 since only a small piece of the mandible has been recovered. In the case of Salt Man 7, based on Buikstra and Ubelaker (1994), only the supraorbital margin can be used to estimate that the individual might have been male. Such a claim is by no means conclusive. Concerning Salt Man 3, the medial edge of the ischiopubic ramus from the anterior view is convex, which indicates the individual is a male. In addition to that the distal eph-

ysis of right femur and the mandible were used for sex determination. The femoral bicondylar width (BCB) measures 84.2mm indicating that the individual was a male. In addition to that in case of left tibia, proximal epiphyseal breadth, as the maximum distance between the condyles (77.6mm), and distal epiphyseal breadth, as the distance between the medial malleolus and the center of the fibular notch (44.8mm) were measured. Based on González-Reimers et al. (2000) these measurements indicate the individual was probably a male. The mental eminence fits well with a score 4 in Buikstra and Ubelaker (1994); therefore, Salt Man 3 could have been male as well.

Age at death

Since Salt Man 7 does not have postcranial elements useful for age-at-death determination, the tooth-wear pattern presented in White and Folkens (2005), which was adapted from Lovejoy (1985), was used to estimate the possible age at death of Salt Man 7. As demonstrated in **Figure 7**, the dental arcade has suffered severe post-mortem damage, resulting in several breakages to the incisors, canine, premolars, and M₁. Only M₂ and M₃ are intact. The maxillary attrition of Salt Man 7 could well be associated with group D in figure 19.3 of White and Folkens (2005: 369) and the possible age of the individual would therefore be between 20 and 24.

In Salt Man 3 the pubic symphysis is missing, and the auricular surface is covered with remains of soft tissues, estimation of age using these two very important postcranial parts was not possible. Instead, fusion patterns for various male skeletal remains first proposed by McKern and Stewart (1957) and presented in White and Folkens (2005), plus tooth-wear and tooth eruption patterns, were used in age estimation for this individual. Patterns of fusion in the distal tibia, distal femur, proximal fibula, and iliac crest all indicate that the ossification process was completed and therefore the skeleton belonged to an adult individual (18 and 22 years old). In addition, the mandible of Salt Man 3 shows no signs of eruption for M₃; moreover, the tooth-wear pattern for the mandibular dental arcade fits well with group B1 in figure 19.3 of White and Folkens (2005: 369), indicating the same age. It seems therefore plausible to propose an age of between 18 to 22 years for Salt Man 3.

Salt Man 8 is represented by a small piece of mandible; therefore, only tooth-wear and tooth eruption patterns are applicable in age estimation for this individual. Like Salt Man 3, Salt Man 8 shows no signs of eruption for M₃; in addition, M₂ demonstrates very few signs of wear on its cusps. Adding such data together lead to the conclusion that Salt Man 8 was a young male, possibly below 20 years old. **Table 1** summarizes the specifications of all eight mummies.

Table 1. Summary of eight Salt Men. The dating was conducted in the Research Lab for Archaeology and the History of Art at the University of Oxford.

Salt Man	Elements present	Age	Sex	Radiocarbon date (calibrated)	Discovery	Date of discovery
1	human head, a foot inside a boot, a jaw and some human bones	35-40	Male	Early Sassanian period, 220-390 CE	During modern mining activities	1993
2	a human skeleton with some skin and soft tissue as well as some hair	?	Male	Sassanian period, 430-570 CE	During modern mining activities	2004
3	some bones, soft tissue, pieces of clothing, a shoe and a belt	18-22	Male	Achaemenian period, 410-350 BCE	During modern mining activities	2004
4	complete body, full clothing and some objects	15-16	Male	Achaemenian period, 410-350 BCE	Archaeological excavation	2004
5	a human skeleton with some skin and soft tissue, parts of cloth	?	Male	Achaemenian period, 410-350 BCE	Archaeological excavation	2005
6	human skull and a small part of a human pelvis	?	Male	Sassanian period, 432-611 CE	Archaeological excavation	2010
7	three thoracic vertebrae, left maxilla and part of a left zygomatic bone	20-24 (?)	Male	?	Re-examination of Salt Man 1 container	2010
8	a piece of left mandible	?	Male (?)	Sassanian period, 429 CE	Re-examination of Salt Man 3 collection	2011

Concluding remarks

Various anthropological and archaeological research is in process by different scholars involved in the SMP. The osteography report presented here proposing the identification of two new individuals and their possible age and sex, alongside DNA analysis, paleopathology, paleoparasitology, and isotope data will help scholars to complete the puzzle of the salt mummies discovered in Chehrābād Mine. These data could be incorporated into the reconstruction of a clear picture of the life of ordinary individuals during the Achaemenian and Sassanian dynasties, which ruled Persia for 700 years.

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