A *catillus* fragment with inscription from the surroundings of the Roman mining settlement in the *territorium metallorum* Tresminas / Jales

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1 Introduction

In 1998, Jürgen Wahl found a *catillus* fragment of an ore mill (Fig. 1) during a systematic field survey in the *territorium metallorum* Tresminas / Jales (Freg. Tresminas, Conc. Vila Pouca de Aguiar, Portugal). He recognised an inscription on the original grinding surface of the millstone[1]. Although it is only a short sequence of Roman numerals, which therefore do not have the same significance as the other inscriptions from the Tresminas / Jales mining district, the find will be presented here, as it reveals interesting aspects.[2] Between 1734 and 1986 a total of 22 inscriptions were discovered and published from the entire mining district. These are mainly dedicatory and funerary inscriptions.[3] What is unusual here is that seven of them can be attributed to Roman citizens who came from the Roman city of Colonia Clunia Sulpicia (today Peñalba de Castro, prov. Burgos, Spain). A further three inscriptions are dedications from the soldiers of Legio VII Gemina Felix and Cohors I Gallica equitata Civium Romanorum who were stationed at the site.[4] Due to its brevity, there are two possible interpretations of the new inscription. Both will be discussed below.

2 Location of the inscription stone

The *territorium metallorum* Tresminas / Jales comprises the three polymetallic deposits of Tresminas, Gralheira and Campo de Jales. Gold was mined here particularly intensively during the 1st and 2nd centuries AD. In addition to the numerous mining relics in the form of adits, shafts and tunnels, ore processing facilities such as stamp mills, ore mills and ore washing plants, a complex water supply system and a Roman settlement with two quarries to the south have also been preserved in the Tresminas deposit area. Further quarries are located in the nearby granite zone (Fig. 2).[5]

The fragment of the ore millstone bearing the inscription was found slightly to the south of the Roman mining settlement and all the facilities associated with mining, above the present-day village of Covas (Freg. Tresminas, Vila Pouca de Aguiar, Portugal). This village includes most of the modern fields in the area of the Roman settlement as well as some in the open-cast mining area of the 'Corta de Covas' itself, which explains the abundance of spolia, stamping floors, ore and grain mills, building elements and inscriptions in this municipality. In the discovery area itself, two aqueducts ran alongside each other in Roman times. Due to agricultural and forestry activities, no

[1] For inscriptions on grain mills cf. e.g. SALIDO DOMINGUEZ / VILLA VALDES 2014, 217–229.

[2] We would like to thank Prof. Dr. Markus Scholz for his valuable advice on reading and interpreting the inscription. We would also like to thank Dr. Dr. Stefanie Hoss for proofreading our text.

[3] CONTADOR DE ARGOTE 1734, 473–482; WAHL 1988, 238–239; REDENTOR 2010, 121–162; RODRÍGUEZ COLMENERO et al. 2010 169–171, fig. 1.

[4] REDENTOR 2010, 128 Tab. 1 und 138 Tab. 2.

[5] WAHL-CLERICI 2020b. – WAHL-CLERICI 2022a.

visible traces of the channels remain in this section. Unfortunately, it is also not possible to clearly assign the inscribed stone to one of the two aqueducts.[6]

3 The millstone fragment

The letters of the inscription were carved into the side of the *catillus* that had been prepared as a grinding surface. The maximum dimensions of the inscription field and thus also of the stone are 40 cm x 19.5 cm. The height of the stone measures a maximum of 16.5 cm at the edge and a maximum of 14.0 cm in the area of the central hole. The stone weighs 24.110 kg. It was made from biotite granite found in the valley of Vila Pouca de Aguiar. All the machine parts used for ore processing, such as stamping plates and ore mills, were made from this stone.[7]

This stone was probably also originally designed as an ore mill, but it has never been used, as the grinding surface does not have the typical very fine, almost polished surface generated through use that can be seen on other ore mills that had been in use. This is particularly evident in the 3D model of the stone. The deep concentric grooves around the central hole and the radially arranged re-sharpening marks that are usually found on other millstones are also missing (Fig. 3).[8] It is likely that part of the stone broke off during its final manufacture or shortly afterwards. The resulting break to the left of the inscription is conspicuously straight and shows no traces of work or grinding. This is therefore a natural fissure that only became apparent during finishing and led to the stone being discarded or used differently. It cannot be ruled out that this face of the stone was indeed further worked on, as indicated by a mark on the upper right of the face (Fig. 4). However, a random cut made by a plough is also a possibility.

The upper outer face of the *catillus* is slightly smoothed, which is all the more noticeable as these were usually rather roughly hewn (Fig. 5). This type of smoothing often results from the use of a stone as paving in a walking area or from prolonged storage in running water. The more likely scenario is that the stone was part of a pavement in a building with the inscription facing downwards. The possibility that the smoothing was caused by storage in running water can be ruled out. While there were two aqueducts in the wider area where the find was discovered (as mentioned above), there was hardly any sand or gravel in them that would have been sufficient to wear down the surface to such an extent.

The blackening of the stone, mainly on the area at the edge of the face with the inscription, was probably caused in recent times by one or more forest or scrub fires, although neither the stone nor the inscription were damaged. As the stone was probably moved several times due to agricultural activities, it can only be stated that it was protruding from the ground with the inscription visible at the time of the fire. However, when it was found, the inscription was facing downwards.

[6] These are the so called T3 and T4 aqueducts, both of which carried water from the Rio Tinhela to the mining area of Tresminas. See in detail WAHL-CLERICI 2020b, 246–247.
[7] WAHL-CLERICI et al. 2012a, 109–118; WAHL-CLERICI 2022b, 112–116; WAHL-CLERICI in preparation.; HULEK / WAHL-CLERICI in preparation.
[8] WAHL-CLERICI et al. 2015, 384–388.

4 The inscription

Reading:
LXXIV
Alternative reading:
LXXIIS

Various interpretations and translations are possible:
(pondo) LXXIV - (weight of) 74 (pounds)
(pondo) LXXII semis - (weight of) 72 ½ (pounds)

(pedatura pedum) LXXIV - (construction section of) 74 (feet)
(pedatura pedum) LXXIIS - (construction section of) 72 ½ (feet)
(pedatura passum) LXXIV - (construction section of) 74 (double steps)
(pedatura passum) LXXIV - (construction section of) 72 ½ (double steps)

The lines of the letters have the following dimensions: 'L' measures 13.6 cm and 6.4 cm, 'X_1' measures 10.6 and 9.2 cm, 'X_2' 8.5 cm and 10.5 cm, the 'I_1' 8.2 cm, the 'I_2' 7.3 cm and the S measures 8.7 cm.

The incisions of all letters are 0.5 cm wide, except for the 'S', which is 0.7 cm wide. The position of the individual letters, some of which are connected to each other, and the relatively large free space before the first and after the last letter suggest that the inscription is completely preserved.

5 Interpretation

There are two possible interpretations of the number given namely that it indicates either a weight or a length.

If it is a weight, 74 pounds would correspond to 24.231 kg, assuming that a Roman pound is 327.45 g.[9] The difference to the weight of the stone is -121 g. For 72 ½ pounds, this result is 23.740 kg, which leads to a difference of +370 g. The 24.110 kg of the ore millstone fragment thus lie between the two possible pound specifications, with the difference being smaller in the case of 74 pounds. It should be noted that small pieces may have broken off the inscription stone over the centuries due to relocation, meaning that it no longer has its original weight.

If the inscription is assumed to refer to a length measurement for a section of a route, there are various possible interpretations. If the measurement is in feet (pes) of 29.6 cm, this would result in lengths of 21.904 m (74 feet) or 21.46 m (72 ½ feet). If a double pace (passum) of 1.48 m is assumed, the distances would be 109.52 m (74 double paces) or 107.3 m (72 ½ double paces).[10] Since the stone was found near two aqueducts, it is more likely, in view of the total length of the structures, that the number refers to double paces in the case of a length measurement.

[9] MUTZ 1983, 7.
[10] Four inscriptions on the Antonine Wall show half double paces with s(emis), which corresponds to 1 gradus = 2 ½ pedes, cf. CIL VII 1126; 1130; 1131; 1132. It was therefore quite common not to round the distance up or down to whole double paces, but to specify it as precisely as necessary.

6 Discussion weights

Although many weights made of various materials have been found in the Roman Empire, they are generally much smaller than the piece found in Tresminas.[11] Two weights of 50 pounds (= 16.253 kg) and 10 pounds (= 3.254 kg) were found in Huete in the province of Cuenca (Spain) and published by E. Hübner in 1861.[12]

At least five weights have been found in Augst, which, like the stone from Tresminas, have no fastening device and of which three are made of stone.[13] One bears a finely carved inscription indicating 7 pounds (= 2.292 kg). However, the stone weighs only 2.160 kg. This results in a difference of 132 g.[14] Another stone has the marking IIII (= 4 librae). This stone also weighs less than 4 pounds (= 1309.8 g), only 1250 g, which is a difference of 59.8 g.[15] In both cases, there are no objective reasons to explain the differences. The author therefore does not rule out fraud.[16]

Since the Tresminas stone is relatively heavy at 24.110 kg, has no holes for attaching a rope or chain, and no means of attaching a hook or strap, it can be assumed that it was used as a weight for a balance scale. The stone therefore had to be placed on the bowl or box of the scales to be used. This must have been a large, stable device, as the scales had to support at least 48.22 kg plus the bowls and ropes or chains.[17]

A key question is which objects were weighed with the scales, especially with a weight of 24.110 kg, or 74 or 72 ½ pounds. Since the stone was discovered in a mining settlement, a connection with the measurement of mined ores or metal objects is conceivable.

We can assume that portions weighing 74 (72 ½) pounds were weighed, although the pure numerical data provides no further clues. Materials from the smelting process in the form of bulk goods could include crushed ore chunks and slag or various additives such as lead and salts. From the so-called ‘lex metallis Vipascensis’ (Aljustrel, Distr. Beja, Portugal), we know that slag and (ore-bearing?) rock fragments were weighed in mining:

> [The leasing] of the fee for exploiting slag heaps and rock deposits. Anyone who wishes in the district of the mines of Vipasca to clean, process, break up, sift or wash silver or copper slag or slag dust scooped out by measure or weight, or who undertakes to execute work of any kind in the quarries, shall within the next three days declare what slaves and hired labourers he will send to do this, and shall pay the lessee each month on or before the last day of the month. If he does not do so, he shall have to pay double.
> Anyone who brings into the mining district scoopings of copper or silver from ore dumps in other places shall have to pay one denarius per 100 pounds to the lessee, or to his partner or agent.[18]

[11] Mutz 1983.
[12] Hultsch 1882, 116, note 6 refers to E. Hübner, Monatsblätter der Berliner Akademie, May 1861, 544. The heavier one was made of serpentine with a bronze handle, and the lighter one was made of bronze.
[13] Mutz 1983, fig. 38.
[14] Mutz 1983, Tabel 6 Nr. 10, 55–56 fig. 37 and 38.
[15] Mutz 1983, Tabel 6 Nr. 11, 56 fig. 37 and 38.
[16] Mutz 1983, 56.
[17] Tresminas’s scales may have been similar to those depicted by Mutz in 1983, 10, fig. 2, on a stone relief in the Museo Nazionale in Naples.
[18] Edmondson 1987, 248, Flach 1979, 412 and 436–437.

Although copper and silver mining through the leasing of mines, as in the case of *Vipasca*, is structurally and organisationally comparable only to a limited extent with the state-run gold mining without a lease system at the mining sites in Tresminas, the mining regulations show that even the processing of 'waste products' was clearly regulated and that the size and weight of the material in question played a role.

It is less likely that the 24.110 kg were used to weigh gold bars. Such imprecise weights would certainly not have been used for precious metals, even if an annual yield of between 50 and 67 kg can be assumed for Tresminas.[19] The weights we know from the moulds of gold bars found in the Roman town on the Magdalensberg (5.6 and 14.5 kg), also significantly differ from the weight of the stone in Tresminas.[20]

The weighing of tools within a regulated mining operation should also be considered at this point. A bundle of tools weighing around 24 kg could be easily carried by workers for a certain period. Each mineworker, for example, used several iron picks during a shift, which then had to be sharpened. The high proportion of iron slag found throughout the Roman mining settlement is evidence of the high demand for iron objects of various kinds.[21]

If tools were not privately owned by the mineworkers, but were organised centrally and issued to workers in a controlled manner it can be assumed that their number and perhaps their weight were checked after each shift to prevent loss or fraud.

7 Discussion Pedatura stone

So-called *pedatura* stones are found in linear construction projects such as Hadrian's Wall and Antonine Wall in northern England and Scotland, or in castle and city walls.[22] An inscription from a section of the Roman aqueduct to Carthage (Tunisia) may be interpreted in a similar way.[23] *Pedatura* stones prove that longer structures were divided into individual sections during their construction. Due to the rugged terrain in the southern foothills of the Serra da Padrela, the aqueducts in the Tresminas mining area reached lengths of up to 25 km, with the distance between the point where the water was diverted from the river and the mining area often only 5–6 km as the crow flies.[24]

Further evidence of the division of the pipes is provided by the fact that subsequent measurements repeatedly revealed significant differences in the gradient of the individual sections.[25]

Inscriptions with the term *pedatura* to indicate a section of a route have been found in small numbers throughout the Roman Empire. Stone inscriptions bearing only numbers are likely to be much more common, but these can often not be linked to route information due to a lack of context.

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[19] WAHL-CLERICI 2020b, 233.

[20] DOLENZ 2015, 385. Since the silver and lead content in the gold mined in Tresminas / Campo de Jales is very low, the option of weighing a silver or lead bar is ruled out, even though the remains of two lead bars were found in the Campo de Jales area.

[21] We know of various compositions of work crews from the quarries on Mons Claudianus. One of them consisted of 36 stonemasons, three blacksmiths, six men working the bellows and hardeners, a foreman and a man with a hammer. HIRT 2010, 209–210.

[22] On Hadrian's Wall: CIL VII 864; 970; 897; 948; RIB I 1629. On the Antonine Wall: KEPPIE 1975; idem 1979; ibid. 1998; HANNON et al. 2020; HANSON et al. 2024.

[23] GOCKEL 1982, 156, Fig. 16–17.

[24] WAHL-CLERICI 2020b, 240–273.

[25] WAHL-CLERICI 2020a, 128 Abb. 14. – For differences in slope for Las Médulas, see MATÍAS RODRÍGUEZ 2004, 180; for Lyon, see HODGE 1992, 176 Fig. 126.

Clear *pedatura* inscriptions were found in the Zugmantel fort on the Upper German Limes (Taunusstein / Orlen, Germany). Here, a unit of Treveri under the supervision of centurio Crescentinius Respectus of the Legio VII Gemina Felix built a section with a length of 96 p(edes), or, more likely, 96 p(assus). Another inscription mentions a centuria of Leubaccus, which was also under the command of Crescentinius Respectus and was responsible for a section of 72 p(edes), or, more likely, 72 p(assus). Both inscriptions are dated to the second half of the 2nd century.[26]

The so-called distance slabs from the Antonine Wall (ca. 142–182 AD) also date from the 2nd century AD and can be considered *pedatura* inscriptions, even though the term is not carved on the 20 stones known to date.[27] Recently, the structure was re-measured and mapped using 3D laser scanning. This has yielded important findings regarding the division and respective lengths of the individual sections, which measured between 3,000 feet and 3,666½ double paces.[28]

Further *pedatura* inscriptions have been preserved from the 4th century. In Herforst (Eifelkreis Bitburg-Prüm, Rhineland-Palatinate, Germany), two inscriptions were found that refer to the long wall built in the southern Eifel during the reign of Emperor Valentinian I (364-375 AD).[29] It was approximately 72 km long and probably protected a late antique imperial domain.[30] The inscription mentions the military unit of the *Primani*, which cannot be clearly identified, as having completed a 500 p(…) long section of the wall.[31] It remains unclear whether this refers to *pedes* or *passus*, i.e. a foot or a double pace. 500 feet correspond to 148 m and 500 double paces to 740 m.[32] The distances of the Antonine Wall already mentioned prove that construction phases could measure up to 5.6 km. Considering the total length of the Herfost 'long wall' of around 72 km, the distance given is more likely to be a double pace than a foot measurement.

Dietz's research on 'Cohortes, ripae, pedaturae. Zur Entwicklung der Grenzlegionen in der Spätantike' based on brick stamps and entries in the *Notitia Dignitatum* leads him to conclude that 'divided work sections *(pedaturae / partes)* were a widespread phenomenon in the legions of the Danube provinces'.[33]

The inscription from Tresminas can only be interpreted as a pedatura stone based on its location near two aqueducts. Both a number in Roman feet and in double paces would be possible. However, the shorter distance of around 21 m seems relatively short for a section of an aqueduct. The length of around 109 m, on the other hand, seems an appropriate distance for a construction crew responsible for a section of an aqueduct. If the stone was indeed used to mark and thus document a section of the route, it is possible that further stones could be found in the area, as other construction crews would certainly have done the same. However, due to the enormous modern interventions in the terrain surface through agriculture and reforestation, the chances of discovering such stones during archaeological field surveys are very slim, especially since many areas have already been systematically surveyed by Jürgen Wahl and Regula Wahl-Clerici since the 1980s.

[26] CIL XIII 7613 u. 7613a. See Reuter 2008, 85.
[27] Hannon et al. 2017, 464–466, Appendix 1.
[28] Hannon et al. 2017, 455–457. See also Hannon et al. 2020 and Ferris 2020.
[29] See CIL XIII 4139; 4140.
[30] Cüppers 2002, 436; Fontaine 2007.
[31] Heimerl et al. 2016, 42.
[32] See Heimerl et al. 2016, 42 and Bienert 2009, 34.
[33] Dietz 1993, 298.

8 Significance of the inscription for the *territorium metallorum* Tresminas / Jales

The inscription of a number on a fragment of an ore millstone from the vicinity of the Roman mining settlement is the first of its kind in Tresminas. It could be interpreted as indicating either a weight or a distance. Regardless of which indication was intended, the inscription points to a high degree of organisation in the execution or documentation of work processes in Tresminas.

Since the number *LXXIV*, converted to 24.231 kg, is very close to the current weight of the stone at 24.110 kg, an indication of weight is more likely. As the stone is relatively heavy and has no hanging device, it was probably used to weigh larger objects or bulk goods on an equal-arm beam balance. The extent to which the weight stone was used in conjunction with others, i.e. whether there was a whole set of different weights, remains open. Further insights into the nature and extent of the use of weight stones can only be gained in future through systematic excavations in the settlement and production area of Tresminas.

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10 Figures

Fig. 1a. Tresminas. Ore mill fragment with inscription. The rounding of the centre hole can be seen at the top. (Foto Wahl-Clerici).

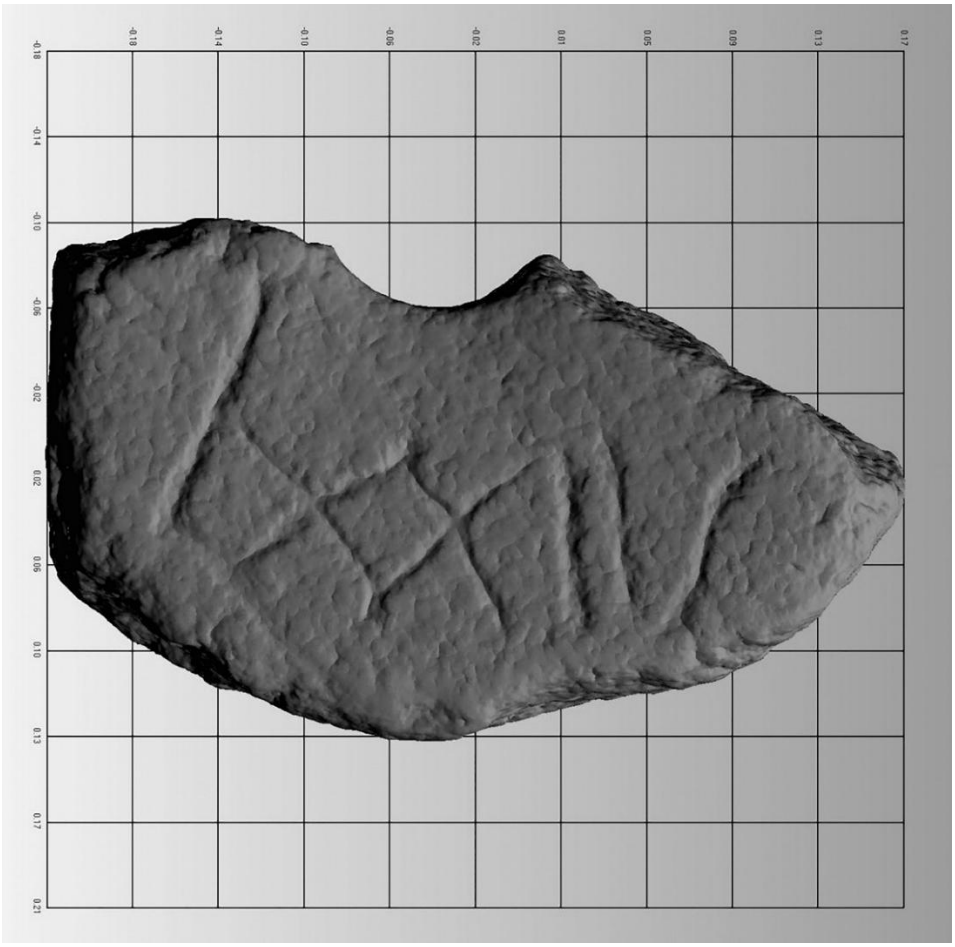

Fig. 1 b. Tresminas. 3D model of the same object. (HafenCity-University Hamburg).

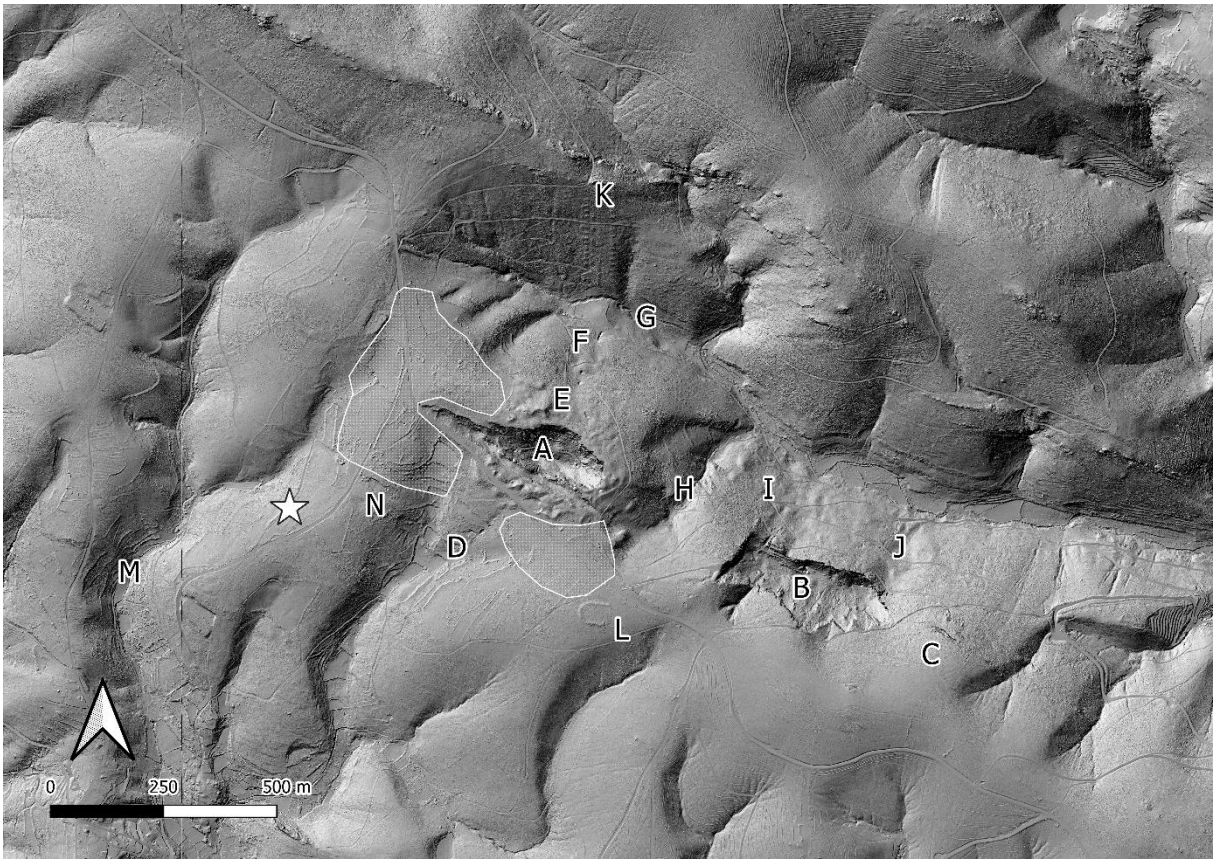

Fig. 2. Tresminas. Terrain model of the mining district showing the main mining areas and the location of the inscription stone.

Star = Finding place of the inscription
A Corta de Covas
B Corta da Ribeirinha
C Lagoinhos
D Galeria Esteves Pinto
E Galeria Jürgen Wahl and Pilar shaft
F Galeria do Pilar
G Galeria do Texugo
H Galeria dos Alargamentos
I Galeria dos Morcegos
J Galeria Buraco Seco
K Washing platforms
L Amphitheatre
M Roman settlement area in Vale de Braceiros
N Schist quarries
White-edged areas = area of the Roman settlement

(Terrain model with data of the Camera Municipal de Vila Pouca de Aguiar by Markus Helfert).

Fig. 3. Tresminas. Fragment of a *catillus* from an ore mill. The re-sharpening and concentric grooves on the grinding surface are clearly recognisable. Typically, the latter only formed towards the centre hole, while the actual grinding surface is smooth. (Foto Wahl-Clerici).

Fig. 4a/b. Tresminas. Lateral break-off point along a natural cleft. It is unclear whether the break at the top right was cut off naturally, deliberately or by a ploughshare. (Foto Wahl-Clerici, 3D model by HafenCity-University Hamburg).

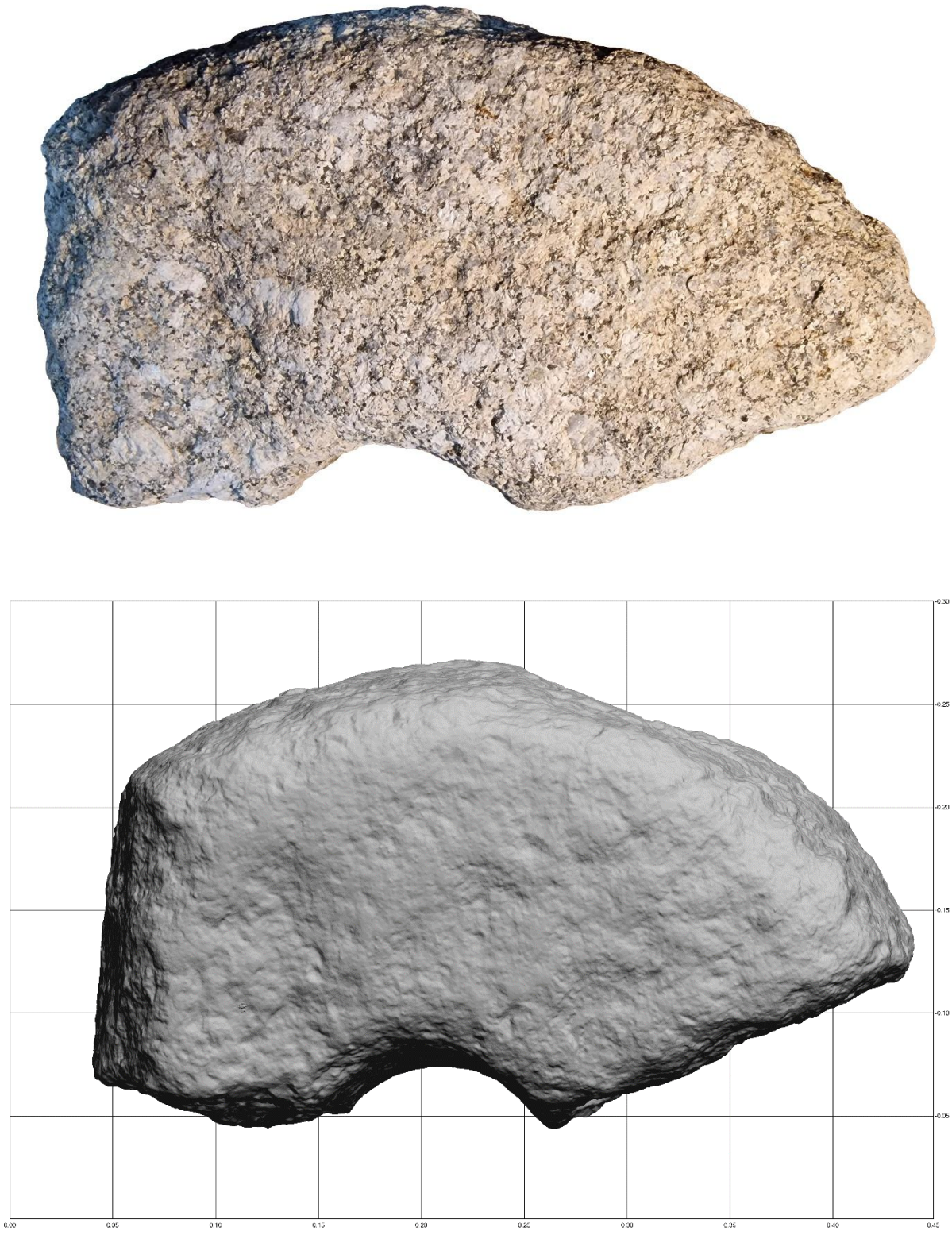

Fig. 5a/b. Tresminas. The surface of the millstone fragment is heavily reground. (Foto Wahl-Clerici, 3D-model by HafenCity-University Hamburg).