ISSN: 2340-3047

Lost in the South: A Roman Copper Ingot from the area of Tarragona in the Baetica

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Recibido: 18/04/2018 Aceptado: 31/05/2018
Revisado: 14/05/2018 Publicado: 29/06/2018

Resumen

Se presenta un lingote de cobre romano recuperado de un pecio ubicado en la región fronteriza de las provincias de Málaga y Cádiz. Con un diámetro de 45 a 53 cm y un peso de 75.4 kg, es uno de los galápagos de cobre más pesados que se conocen. La abreviatura de un nombre y su peso están escritos cerca del borde del fondo. El análisis de los isótopos de plomo y los elementos traza sugieren una procedencia no de minas del sur de Hispania, sino de la región de Cataluña en el noroeste de la península ibérica.

Palabras Clave

lingote de cobre romano; Inscripción; Pecio Baetica; estudio de procedencia; Análisis de los isótopos de plomo; Minas de Cataluña

Abstract

A Roman copper ingot recovered from a wreck located in the border region of the provinces of Málaga and Cádiz is presented in the following contribution. With a diameter of 45 to 53 cm and a weight of 75.4 kg it is one of the heavier specimens. Presumably the abbreviation of a name and the indication of its weight were incised near the rim of the bottom. Lead isotope and trace element analysis suggest a provenance not from mines in southern Hispania, but from the polymetallic ores of the Catalunya region in northeastern Spain.

Key words

Roman copper ingot; Inscription; Provenance studies; Lead isotope analysis; Baetica; Mines of Catalunya

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A Roman copper ingot (figure 1), discovered at the mediterranean south coast of Spain between Cadiz and Málaga and then stored for several years at a private collection, was given recently to the Museo de Huelva. The find spot of the ingot is only vaguely known: it was recovered from a undocumented shipwreck located in the border region of the provinces of Málaga and Cádiz (figure 2; between Gibraltar in the south and Estepona in the north?) at a shallow depth. Traces of sea-encrustations on the greenish surface confirm an origin from an underwater site.

The ingot is of the typical "bun-shaped" form, „that is, round, flat-bottomed, with a convex upper surface".[1] With a diameter between 45 and 53 cm, a height of 8 to 10 cm, and a weight of 75.4 kg, it is one of the larger and heavier specimens. For comparison: The 16 copper ingots periodically discovered in 1992 during dredging works in the sea near the mouth of the Guadalquivir river, not far from Playa de Regla at Chipiona (Cádiz), weigh between 13.7 and 20.6 kg; their dimensions vary between 23-29.5 cm and the heights from 3.5 to 6 cm.[2] Wider variations in weight can be observed within the group of the 28 copper ingots from the 1st century AD wreck "El Pecio del Cobre", which were recovered in 1978-1979 from the seabed west of Islote de Sancti Petri, Chiclana de la Frontera (Cádiz):[3] from 13, 14, and 16 kg to 68 and even 84 kg (the latter one with a diameter of 44.5 cm and a height of 12 cm). The diameters of the 11 copper ingots from the Roman wreck at Albufereta (Alicante) are 45-50 cm at the bottom and 25-30 cm on the top; their height varies between 12-17 cm.[4]

Heavier ingots are known, for instance, from the looted mid-2nd century wreck Planier 2, located off Marseille: the weight of one of them is 97 kg.[5]

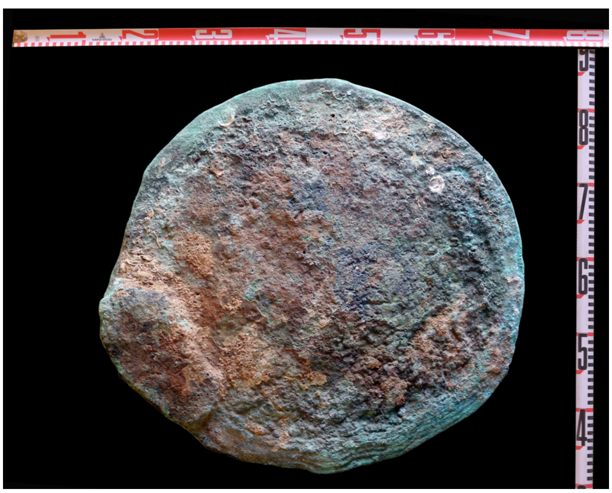

Figure 1. Copper ingot in the Museo de Huelva (D. González Batanero).

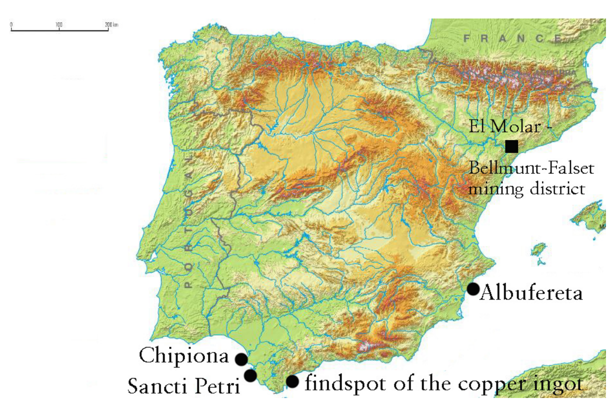

Figure 2. Map of the Iberian Peninsula with the main find spots of copper ingots mentioned in the text (P. Rothenhöfer).

Figure 3. Detail of the copper ingot with incised inscriptions (D. González Batanero).

1 See the introductory remarks to RIB II/1, 2403 (Copper Ingots) and Laubenheimer-Leenhardt 1973, 67-70; cf. e.g. Vallespín Gómez 1986, 310-311.

2 Rico et Domergue 2010, 175 with data of 16 ingots.

3 See Vallespín Gómez 1986, 311 Table 1. – A second wreck with at least 70 copper ingots was recently discovered.

4 Fernández Izquierdo, 2007, 237-238 (without indication of the weight).

5 Laubenheimer-Leenhardt 1973, 36-37 no. 16 (wrongly attributed to the wreck Planier 4).

lab-no. DBM	arch.-inv.	Ag	Sn	Sb	Pb	Bi	P	S	Fe	Co	Ni	Zn	As	Se	Cu [%]
4513/16	Cobre TT	300	10	1000	450	15	10	420	50	2,5	190	15	470	65	99

Figure 4.Trace elements (ppm) and chemical composition (M. Bode).

lab-no. DBM	arch.-inv.	$^{206}Pb/^{204}Pb$	*2SD (abs)*	$^{207}Pb/^{204}Pb$	*2SD (abs)*	$^{208}Pb/^{204}Pb$	*2SD (abs)*	$^{207}Pb/^{206}Pb$	*2SD (abs)*	$^{208}Pb/^{206}Pb$	*2SD (abs)*	Pb [ppm]
4513/16	Cobre TT	18,447	0,009	15,723	0,006	38,670	0,018	0,8524	0,0001	2,0963	0,0002	450

Figure 5. Lead isotope ratios (M. Bode).

The ingot consists of highly pure copper with a concentration of 99 %. Trace elements are *inter alia* antimony, arsenic, lead, sulphur, silver, and nickel (figure 4).

The monetary value of the highly pure copper ingot can be estimated roughly: If we assume 10 gr for an AE-*as*-coin, than 75 kg copper are equivalent to 7.500 *asses*. And 7.500 *asses* can be changed into 18 *aurei* and more than a dozen *denarii*. For comparison: the annual salary of a legionary soldier in the early principate was 225 *denarii* = 9 *aurei*.

Many of the Roman copper ingots bear marks and inscriptions. But in contrast to Roman lead ingots, the epigraphy of copper ingots is poorer:[6] There are no moulded cartouches with names of societates, entrepreneurs, or even of an emperor; usually we only find stamps and/or incised letters – mostly numerals.[7]

Not just numbers, but also letters are found on this ingot (figure 3). They are incised on a lump near the rim. Their height is ca. 2-2.5 cm. Three lines can be distinguished:

Q H G   I?
CCXX ET X
C? V

In the first line we can read the letters *Q H G* and at the end – slipped down – an *I* (or perhaps an E?). Presumably it is the abbreviation of a name (in the genitive): *Q(uinti) H(...) G(...)* [maybe *Gi(...)* or *Ge(...)*].

The second line consists of a number: *CCXX ET X* = 220 and 10 *librae*. The sum of 230 Roman *librae* is equivalent to ca. 75 kg, undoubtedly the indication of the weight. The use of *et* (with lunar E) within a number is, as far as we can see, uncommon for ingots. We would normally expect *CCXXX*.

et is used, for instance, in the funerary inscription AE 1942/43, 78 from Tiaret (Mauretania Caesariensis): *an(no) pro(vinciae) CCCLXX et V* (= AD 324); in a Christian funerary inscription from Mérida, AE 2001, 1167: ... *XXX et VIIII annorum*; or in the funerary inscription ICUR 1, 2251 from Rome: ... *annos XX et VI* ... . Its use in figures of ancient inscriptions seems to be a phenomenon predominantly of late antiquity. As long as we have no other dating criteria, it can be a vague hint for the age of the ingot.

The indication of the weight corresponds well with its actual weight. The same can be observed on other ingots, for instance on an ingot from the Planier 2-wreck: it weighs 97 kg, and it bears the incised number CCXCVII (= 297 librae). Obviously, the weight of copper ingots was exactly noticed.

In the third line only two letters can be read: *C(?)V*. If there were more letters incised, they have vanished completely.

Regarding the findspot of the ingot, it consequently should have been produced in mines of southern Spain, either in the Iberian Pyrite Belt or the Ossa Morena zone. A lead isotope analysis in addition to the chemical analysis should clarify this point (fig. 4-6).

Roman copper ingots and their provenance by lead isotope analysis

For all published Roman copper ingots, for which a lead isotope investigation has been made, an origin can be derived from copper mines of the western Mediterranean.[8] The numerous copper ingots from the shipwrecks Sud Lavezzi 2, Lavezzi 1 and Pecio del Cobre (fig. 6, blue crosses) are most likely from the massive sulfide deposits of the Iberian Pyrite Belt in southern Portugal (e.g.

6 For the epigraphy of Roman lead ingots, see Rothenhoefer, Bode and Hanel, Corpus of Roman Lead Ingots (forthcoming).

7 See e.g. Rico et Domergue 2010, 174-178; longer texts are only known from two ingots (Laubenheimer-Leenhardt 1973, 36-37 no. 16 and 52-55 no. 24).

8 Klein et al. 2007; Klein et al. 2009; Rico et al. 2005.

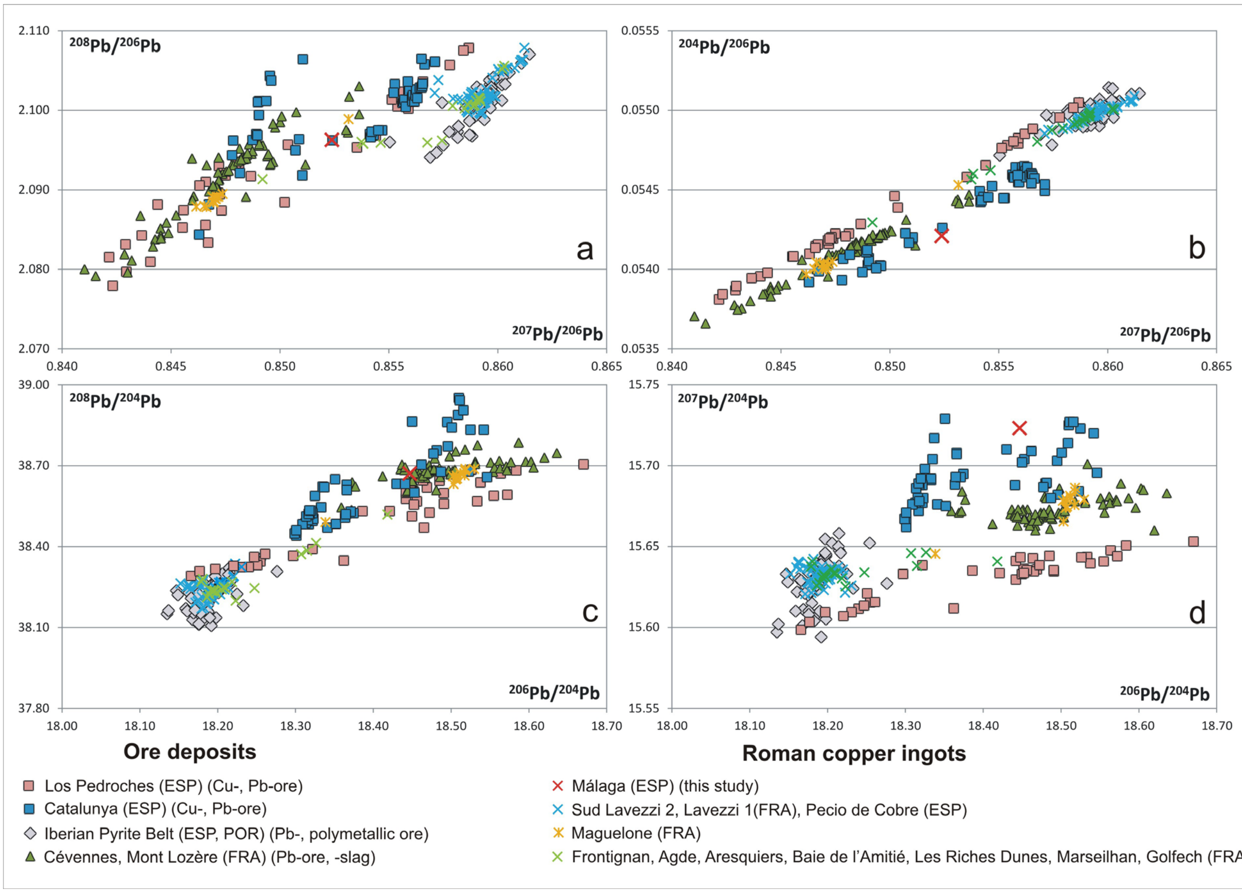

Figure 6. Diagrams with different lead isotope ratios. Ore and copper ingot data: Brévart *et al.*, 1982; Stos-Gale *et al.*, 1995; Canals i Cardellach, 1997; Lescuyer *et al.*, 1998; Marcoux, 1998; Pomiès et al., 1998; Santos-Zalduegui *et al.*, 2004; Rico et al., 2005; Baron et al., 2006; Klein *et al.*, 2007, 2009; Rovira *et al.*, 2013 (M. Bode).

Aljustrel/ancient *Vipasca*) and southern Spain (Riotinto).

Similarly, a whole series of Roman copper ingots found off the French coast or on the French mainland have been shipped from the southern Iberian peninsula (figure 6, green crosses), made also from ore of the Iberian Pyrite Belt or from the central-Iberian Zone (Los Pedroches).[9]

In contrast to previous hypothesis concerning the origin of the copper bars of Maguelone, the lead isotope comparison leads to a different result. With a look at diagrams b and d of figure 6, an origin from the Cévennes ore district in southern France is far more likely, contrary to the assumption of Christian Rico *et al.* that the ingots were produced in mines of Los Pedroches.[10] In addition to numerous archaeological evidence for Roman mining[11], it has recently been shown that for the Cévennes not only a local limited metal production is to be assumed, but also supraregional supply of metals (lead, silver, and brass).[12]

And if calamine for brass production, e.g. in Lyon, has been exploited in southern Gaul[13], then the production of copper is obvious, especially since there is also copper ore.[14]

Sample material of the copper ingot was analyzed at the Deutsches Bergbau-Museum Bochum for the chemical composition (figure 4) and at the Institut für Geowissenschaften in Frankfurt for lead isotope analysis (figures 5). The lead isotope result is surprising: Another old mining area comes into play for the copper

9 Klein et al. 2007 and 2009.
10 Rico et al. 2005, 466-469.
11 See e.g. Davies 1935, 80-83.
12 Hanel and Bode 2016; Parjanadze and Bode (in print).
13 Picon et al. 1995.
14 Cf. e.g. Leblanc 1997.

ingot from Málaga. Again, the diagrams b and d of figure 6 allow a clear differentiation from the aforementioned mining districts and an association with the polymetallic ores of the Catalunya region in northwestern Spain. Not only lead-silver, but also copper ore smelting is attested from the pre-Roman periods.[15] Additionally, the fragment of a copper-lead ingot from the Phoenician period is another hint for pre-Roman copper production in this region.[16]

Up to now discussions about the possible scale of Roman mining activities in that region were focussed on lead-silver production;[17] a significant Roman copper production in this region was not taken into consideration. This should now be changed.

Unfortunately we lack significant information about the wreck. No information is available neither about the number of copper ingots nor about the rest of the cargo, which could help to date the load. Nevertheless, the ingot allows another important conclusion: Our picture of the prevailing trade direction needs to be reconsidered. Important production centers are known from the southern parts of the Iberian Peninsula. Ingots were brought from the mining areas to the sea *inter alia* by using rivers like the Guadalquivir/Baetis. After being transhipped to seaworthy vessels, they were transported eastwards to various destinations in the western Mediterranean. But this ingot shows us, that copper was also shipped into the opposite direction: from the area of Tarragona to the Baetica. That reminds us that trade relations and the ways of metal distribution are much more complex than easy models suggest.

15 See e.g. Montero-Ruiz et al. 2009; Rovira et al. 2013.

16 Montero-Ruiz et al. 2009.

17 See e.g. Rafel and Armada 2010 for the mines of the Baix Priorat region.

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