# Roman Brass Ingots from a Shipwreck near Aléria/Corsica – New Evidence on Brass Production in Gallia Lugdunensis

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Since the 1st century BC the use of brass boomed within the Roman Empire. Numerous objects of daily life were made of this alloy, including vessels (especially the so-called Hemmoorer Eimer), furniture and box fittings, brooches and needles, statuettes and votive offerings, as well as weapons and military equipment parts.[1] With the coin reform of Augustus, brass was needed in larger quantities for the production of both *sestertii* and *dupondii*.[2]

## The Shipwreck of Aléria and its Load

The discovery of a ship's cargo off the eastern coast of Corsica near the Roman provincial capital Aléria around 1980 provided important insights into the transport of metals within the Roman Empire. The load comprised at least 21 brass and 6 lead ingots, the latter were produced most likely in the Mendip Hills of Somerset, England.[3] The provenance of the brass ingots remained unclear. The brass ingots are of a bread-loaf shape (fig. 1). Their total weight is 92.55 kg. Despite their similar shape, their length varies from 17.5 to 24.5 cm. The width is between 8.5 and 13.5 cm and the height ranges between 3 and 5 cm (fig. 2).

Thanks to the *cognomina ex virtute* of L. Septimius Severus on the inscribed lead ingots, their production can be limited to approximately the period between February 197 and February 198 AD.[4] In contrast, there are no epigraphic elements on the brass ingots. The find context suggests a corresponding chronological classification, in the years shortly before 200 AD.

This cargo has considerably increased the number of brass ingots in the Imperium Romanum. Their number was previously at two; both were found in Britain.[5] Recently, the art trade added a more than 1.50 m long ingot (fig. 3) stamped C • PETRON • HERME.[6]

## The Roman Copper and Calamine Industry

Brass is a mixture of copper and zinc, produced in Roman times in sealed vessels/crucibles by the cementation process.[7] The copper sources of this binary alloy are located in the western Mediterranean area, according to the current state of research. Lead isotope analyses on Roman copper ingots mainly point to the Iberian Pyrite Belt (e.g. the mines

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Fig. 1: Brass ingots from the Roman shipwreck of Aléria.


Fig. 2: Brass ingot from the Roman shipwreck of Aléria.

Fig. 3: Brass ingot from the Mediterranean with triple stamp inscriptions.

of Rio Tinto). But Los Pedroches in the Sierra Morena, the Montsant and the Molar-Bellmunt-Falset district near Tarragona, and the French Massif Central with Cévennes and Montagne Noir (e.g. Cabrière) are indeed other – more or less important – possible Roman copper mine districts.[8]

Within the boundaries of the Roman Empire, deposits of calamine and zinc ore have so far been insufficiently explored. In the western part of the Imperium Romanum there are deposits in Campania, Bergamo (Lombardy), in the French Massif Central (Mont-Lozère, Cévennes, Montagne Noir), in the Northern Pennines (North Yorkshire), and in both Germanic provinces in the area of Wiesloch (near Heidelberg) and in the Northern Eifel. Roman traces of exploitation are more or less assured.[9] Moreover, modern zinc deposits in the immediate vicinity of ancient lead-silver deposits such as the Lüderich in Rösrath (Germany), the Iglesiente (Sardinia), Laurion, Thasos (Greece), were certainly not disregarded in Roman times. On the other hand, there is hardly any calamine ore or indications of its exploitation on the ore-rich Iberian Peninsula.[10]

## Geochemical Signatures of the Brass Ingots and the Deduced Provenance of Calamine and Copper

The brass ingots of the Aléria shipwreck have zinc contents of 22 to 29 wt%. Since zinc ore is typically associated with lead minerals and partially intergrown with them, brass has relatively high levels of lead, ranging from 1 to almost 4 wt% in the Aléria ingots. The lead isotope comparison is therefore restricted to investigate the origin of the zinc. After evaluation, possible candidates are two regions in the west of the Roman Empire: either Northern Yorkshire in Britannia or the Cévennes/Montagne Noir (Département Gard) in Gallia Narbonensis/Gallia Lugdunensis.[11]

Interestingly, numerous large cementation crucibles (with heights of about 50 cm) from Lugdunum are proven for the manufacture of brass in the late 1st century AD.[12] They suggest an origin of the brass ingots of Aléria from this region (as an additional cargo to the lead ingots) rather than from Britain, where an equivalent archaeological record so far is missing. It fits also that the area south of Lyon (Pilat, Monts d'Ardèche, Cévennes) is designated as a lead-zinc-rich district.[13]

A look at the brass ingots' chemical patterns leads to the same result. Considering that the partially significant amounts of tin (up to 1.14 wt%) most likely entered into the ingots and not in workshops – as primary (commercial) products and bulk commodities – via the copper or zinc ore, and that there are tin-bearing copper mineralizations at Charrier northwest of Lyon (fig. 4)[14], we might also have a candidate for the copper metal. Whether this suspicion is substantiated must remain open here. According to current knowledge, the ancient exploitation of copper deposits in the Massif Central was of a rather minor importance.[15] In summary, with these local sources nearby, an-

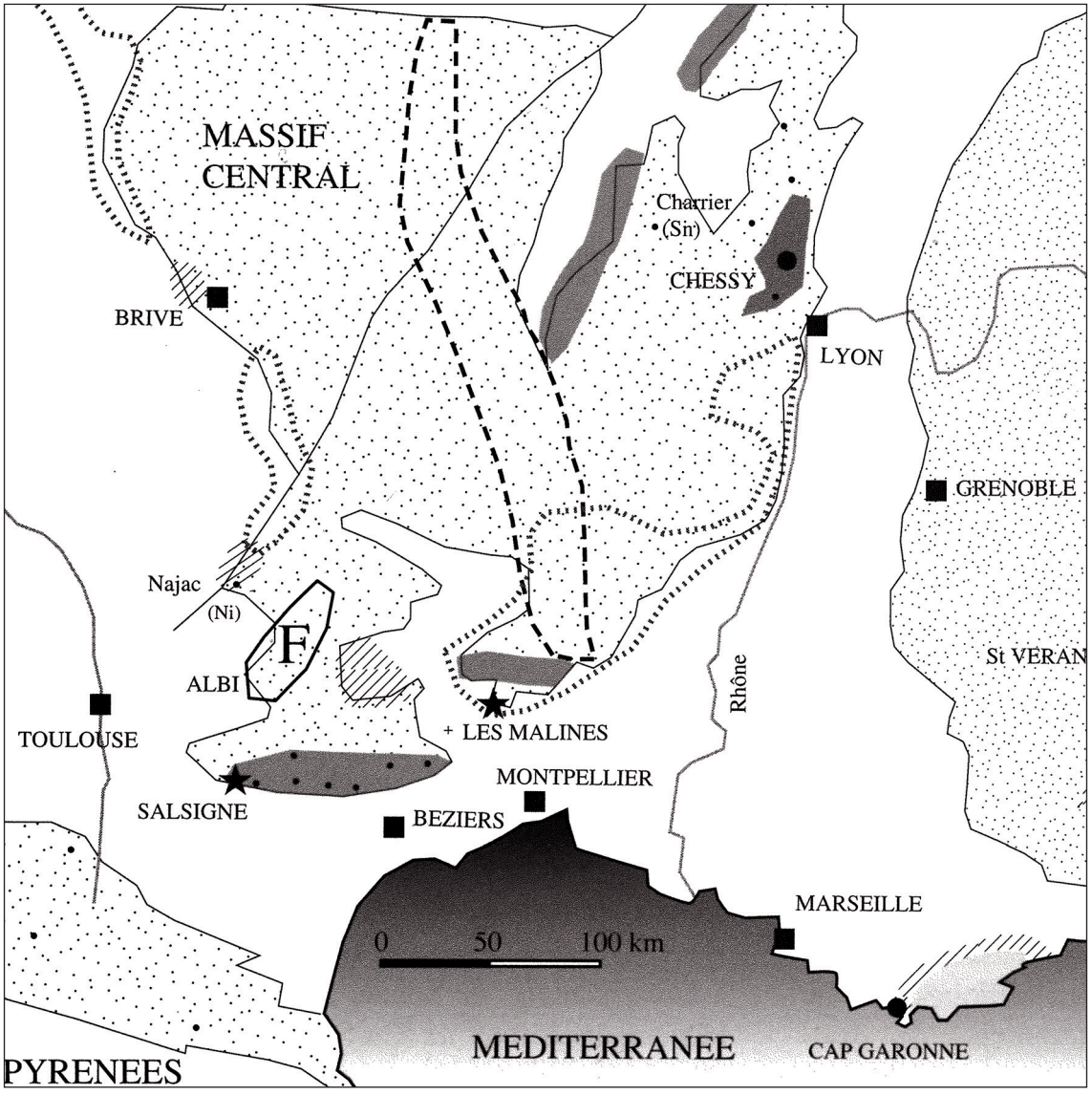


Fig. 4: Map of the copper and zinc deposits in Southern France.

cient Lyon may have been one or possibly the main brass production centre of the Roman Empire towards the end of the 2nd century AD.

Based on the find spots of further lead ingots with inscriptions from the early Severan period on the Gallic mainland, it is possible to reconstruct a transport route (fig. 5) of the shipload from Britain to Rome.[16] Under the premise of an origin of the zinc and copper from the Cévennes and the evidence of brass production by cementation crucibles on the spot (although this is earlier), a load of the brass at Lugdunum would be conceivable.

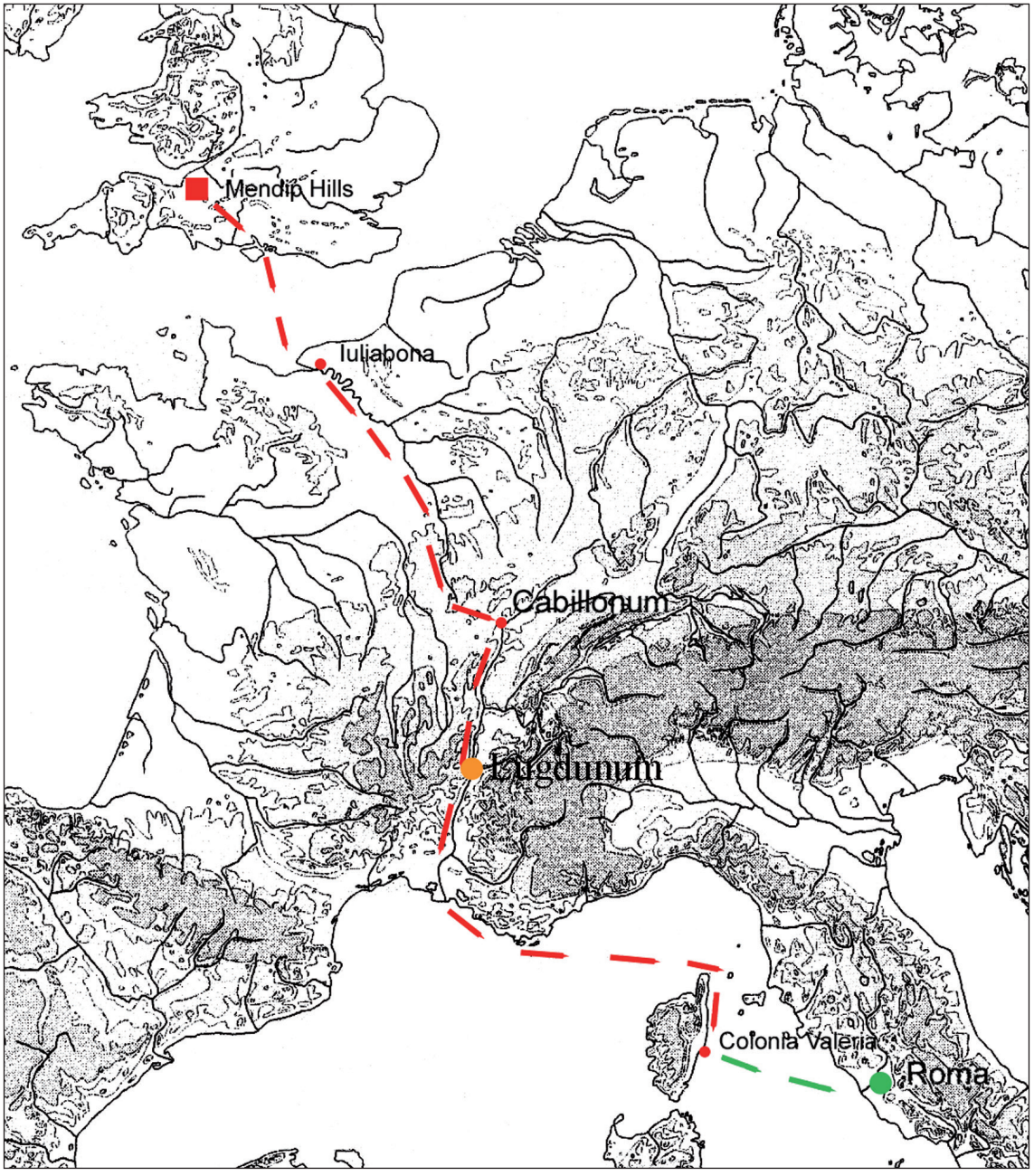


Fig. 5: Possible transport route of the Severan lead ingots made of British lead via Corsica to Rome. Presumed further load of the brass ingots in Lugdunum.

## Notes

[1] Hammer 2001, 614; Hauptmann 2006, 565; Istenič 2009.
[2] R.-Alföldi 1978, 157–160.
[3] Weisgerber 2007; concerning the lead ingots: Hanel et al. 2013.
[4] Hanel et al. 2013.
[5] RIB II 1 no. 2407.1 with stamps V•H•ÊT•B (FO Colchester); Bayley1998, 11, Weisgerber 2007, 149 (FO Claydon Pike, Gloucestershire).
[6] Rothenhöfer 2016 assumes a Mediterranean origin.
[7] Hanel – Bode 2016, 169 with bibliography.
[8] Rico et al. 2006; Klein et al. 2007; 2009; Jézégou et al. 2011; Bode et al. 2018.
[9] See in detail Hanel – Bode 2016, 170–174.
[10] Domergue 1990, 80.
[11] Hanel – Bode 2016, 172–174.
[12] Picon et al. 1995.
[13] Leblanc 1997.
[14] Leblanc 1997, 21 f. figs. 1.2.
[15] Domergue et al. 2006, 138.
[16] Hanel et al. 2013, 316–319. 322 fig. 1.

## Image Credits

Fig. 1–2: Photos N. Hanel. – Fig. 3: Photo P. Rothenhöfer. – Fig. 4: After Leblanc 1997, 22 fig. 2. – Fig. 5: Map N. Hanel.

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