

The identification of lead ingots from the Roman mines of Cartagena: the rôle of lead isotope analysis

P. R. Trincherini, C. Domergue, I. Manteca, A. Nesta & P. Quarati

The metallic deposits of the Iberian peninsula were exploited very early on and drew the attention of many Mediterranean peoples. As early as the Bronze Age, the Sierra Morena copper deposits were exploited. The silver and copper ores of the south-west (Riotinto, Tharsis, and so on) were worked by the Tartessians for the Phoenicians (8th-5th c. B.C.) while the lead and silver mines of the Sierra Morena and those near *Carthago Nova* (Cartagena) were worked by the Iberians for the benefit of the Greeks and Carthaginians (5th-3rd c. B.C.). Thus when, following the Second Punic War (218-210 B.C.), the Romans begin to conquer Spain, the wealth in metals of the peninsula was well known. They took hold of *Carthago Nova* and the nearby lead and silver mines and then extended the conquered territory by stages, waging war against the Lusitanians and the Celtiberians (153-133 B.C.), capturing Numantia (133 B.C.), fighting Sertorius (83-72 B.C.), and finally under Augustus campaigning against the Asturians and Cantabrians (25-19 B.C.), all the time undertaking to exploit the country's resources, especially mineral. In the eyes of Rome, *Hispania* was nothing less than an Eldorado, just as America would be for Spain in the 16th and 17th c.

Of the metal-bearing deposits in Spain, the silver-bearing galena mines of the Sierra Morena in N Andalusia and those in the vicinity of the town of *Carthago Nova* in SE Spain provided the conquerors with large amounts of silver and lead. Ancient authors, especially Polybius (10.2.20; 10.8; 10.38; 34.9.8), Appian (*Iber.* 19 and 23), and Livy (23.45.9; 24.41.7; 26.42-27.18; 28.3.2-3; 32.28.11), spoke of these mines at the time of the conquest, mentioning their extraordinary wealth (Polyb. *op. cit.* Strabo 3.2.10; Livy 34.21.7); two other authors, Diodorus (5.35-38) and Strabo (3.2.3, 3.2.8, 3.2.10-11, 3.4.6), often took their information from Posidonius, who travelled in these regions at the start of the 1st c. B.C. Archaeology shows that the period of greatest exploitation was between the end of the 2nd c. B.C. and the middle of the 1st c. A.D. (Domergue 1990, 179-224). This period happened to be one in which Rome needed both silver, for minting large quantities of *denarii*, its standard currency, and lead, to satisfy growing requirements in its economy, two sectors of which — ship-building and laying out towns — were particularly high consumers of lead. The growth of trade required increasing amounts of lead to fit out ships for the high seas, particularly for lining hulls with lead, as was the norm at the end of the Republic and beginning of the Empire, while at the same time Rome and the major towns of the empire were in expansion mode, building grandiose public edifices (particularly baths) and private mansions for which running water was a necessity. If stone-built aqueducts brought water to the edges of a city, the pipes which distributed the water within the city were made of lead. It was Spain which could meet the comprehensive need for lead by Rome and her empire.¹ Plying along the routes of *Mare Nostrum*, ships loaded with the valuable metal brought it from Spain mainly to Italy. Some of the ships sank, and their wrecks mark out the sea routes. Exploration has brought to light cargoes of lead ingots, some of them amounting to tens of tonnes: the wreck off the island of Mal di Ventre, on the W coast of Sardinia, dating from the middle of the 1st c. B.C.,² contained about 1300 lead ingots from *Nova Carthago*, some 45 tonnes (Salvi 1992).

These ingots bear usually the producers' mould-marks, epigraphic study of which may allow one to discover the origin of the ingots, although many are not amenable to this approach. The analysis of lead isotopes and their relationships is a reliable and fruitful archaeometric procedure to be used in conjunction with study of the epigraphy and the typology of the ingots, macroscopic examination, and consideration of the archaeological context: (in the case of wrecks, the composition of the rest of the cargo and the fittings on board: see, e.g., Bernard and Domergue 1991; Domergue 1994). This yields a more satisfactory approach to the

1 At that time the lead deposits of Britain, Germany and the Balkans were not yet under Rome's control.

2 The dates of the wrecks are given according to Parker 1992.