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The origins of the first ferrous knives on the Iberian Peninsula and in Southern France: a typological viewpoint (9th-7th centuries BC)

Anne-Laure Grevey, Éric Gailledrat

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**Iron Metallurgy and the Formation of Complex
Societies in the Western Mediterranean
(1st Millennium BC)**

Proceedings of the 8th International Archaeological Meeting
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Introduction

The first millennium BC was a period of profound transformation in the central-western Mediterranean. On the one hand, the arrival from the 9th century BC of a large number of migrants from the eastern Mediterranean brought about major changes in the ethnic and linguistic panorama of large areas of this territory. It also led to –or at least facilitated– the introduction and dissemination of new skills and gave rise to intensive interaction with the populations previously established in those territories. This interaction took on diverse forms ranging from the establishment of authentic colonial systems –that entailed the control of the territory by the new arrivals and the marginalization and exploitation of the native population– to relations based on mutual benefit, in which the balance of forces between natives and allochthonous people clearly favoured the former from a political and demographic point of view. In this context, it is logical that there would have been intensive and diverse transformations. One of the most outstanding was the growth in the population, which is perceptible in many different regions, to the point at which it can be considered to have been generalised, albeit with different local and regional dynamics. At the same time, following experiences with a limited trajectory such as the El Argar, Terramare and Nuragic cultures, this demographic increment would have played an important role in the new development of complex societies founded on institutionalised inequality and the existence of political and administrative systems designed to perpetuate it. The hierarchized forms of territorial occupation and the formation of the first cities are one of the most obvious testimonies to this. In summary, this was a period of complex changes that saw the formation and disappearance of political entities of diverse natures and sizes. These ranged from the large Libyan territorial states to the Etruscan and Iberian city-states. Finally, there was the great conflict between Rome and Carthage that opened up the way for the emergence of a large empire covering the whole of the Mediterranean.

In this general context, one of the most important technological innovations to come about in the first millennium BC was the introduction and, more significantly, the generalization of iron metallurgy. This undoubtedly played an important, if not a crucial role in the processes of change we summarised briefly in the previous paragraph. The increase in techno-environmental efficiency that entailed the generalized use of iron tools led to an increase in the production of surpluses and, consequently, the power of the elites, as well as a sustained growth in the population. This in turn was closely linked to the development of social complexity and the expansion of cities. We cannot, therefore, underestimate the importance of the subject of this volume. However, veiled behind this generalization in the use of iron lie diverse local and regional situations that are linked both to the process involved in receiving and accepting the new technology and to the mechanism that, at a particular time, led to its large-scale use in primary production and weapons manufacture. Nobody today defends the functionalist perspectives that saw in the new technologies with the ability to improve productivity an inevitable opportunity to increase social production based on a more efficient control of the environment, reducing the input of work and, in short, favouring the “progress” of the human groups that adopted these innovations. From that excessively simplistic perspective, the adoption of technologies can be simply explained by the adaptive advantages their possession would have represented for the different societies, considered as undifferentiated entities rather than as compound, complex and internally conflicted blocks. In other cases, the introduction of iron has been seen as the chance to improve weaponry, thus endowing a decisive military advantage on the groups that possessed it. This could also have had decisive consequences for the formation of more broad-based, complex political entities.

Obviously, there is some truth to these interpretations, as alongside the internal conflicts proper to any society, there were also common interests that brought them together. However, they err by ignoring the costs involved in the introduction of new technologies and also the risks they presented for social stability. It is perfectly plausible to assume, for example, that a dominant social group would not have favoured the introduction of a technology that could have been used to improve weaponry, even though it would have helped them exercise their power, if they were not certain of being able to control the production and prevent its generalized use. Neither is there any certainty that all or most of the members of a society would have chosen to modify their ways of life by the generalized introduction of a new technology, unless they were forced to do so by circumstances linked to their survival or the imposition by a powerful elite. Such a change could have been imposed through coercion or it may have received consent based on ideology or, more frequently, a combination of the two. In this respect, we have to remind ourselves that an increase in techno-environmental efficiency did not necessarily result in a reduction in the amount of work put in, for example, by the peasants. It could simply have been used to augment the surpluses controlled by the elites, who were able to use them flexibly, both to ensure a supply for the population in the case of need (for example, in years of poor harvests) or, in normal circumstances, to further their own interests.

In other words, the adoption of a new technology and, above all, its generalized use, did not depend solely on its potential advantages from a productivity or military efficiency perspective. It would also have been contingent on the social and economic context in which it occurred and, in particular, on the interests of the dominant groups and their ability to impose them on the society as a whole. In order to fully understand these processes, it is necessary to describe and explain separately, in each region and each society, the conditions in which the process took place. This is, in fact, the objective of this volume, which aims to provide an overall perspective of this question in the central-western Mediterranean based on the particular regional processes, as well as a preface to the same question in the Aegean area.

In the studied territory, the explanation for the adoption of this iron technology by the different societies has traditionally been based on diffusionist approaches. It would have arrived from the Mediterranean Levant (the Hittite world, the Middle East or Cyprus), from where it would have reached the Aegean and the islands of the central Mediterranean and subsequently the rest of the Mediterranean. In the Maghreb and the far western Mediterranean this phenomenon is often linked to Phoenician trade; however, as Ramon and Sanmartí indicate in their contribution, we cannot rule out a dissemination route via sub-Saharan Africa, where iron technology is attested in the second millennium BC. In contrast to the diffusionist hypotheses, Kostoglou proposes as an alternative interpretation that the adoption of iron metallurgy was in fact the result of multiple innovations developed locally that would have taken place in a more or less accidental manner in diverse places and at different times. The possibility of a purely local development is also considered by Ramon and Sanmartí based on the finds made at Althiburos (Tunisia) that attest iron production in the 8th century cal BC, but the knowledge involved could date back to the previous century or even earlier.

At the current state of the research and as we can see from the studies compiled in this volume, the first iron objects are attested in diverse areas of the Mediterranean during the Bronze Age. This evidence is not only found in the Aegean (Kostoglou), but also in Sardinia (Lo Schiavo and Milletti), southern Italy and Sicily (Pacciarelli and Quondam), the Strait of Gibraltar (Suárez and Renzi), the south-east of the Iberian Peninsula (Vives-Ferrándiz and Mata) and even as far as the Atlantic. In northern Italy, apart from two doubtful cases during the Late Bronze Age, iron seems to have appeared suddenly in the 8th century BC (Paltineri *et alii*); however, in the north-western Alpine region (Switzerland and Slovenia) iron objects are documented between the mid-11th and the 9th centuries BC (Paltineri *et alii*). These early cases are undoubtedly prestige objects carried by travellers and traded for their intrinsic properties and rarity, rather than their functional value. According to the typological studies presented by Grevey and Gailledrat, this first period of dissemination of iron objects during the final stages of the Bronze Age continued into the first centuries of the first millennium BC. This would have carried on until the new technology had been adopted, under formulas and procedures that would have varied considerably, depending on the local conditions such as the effective power and interests of the elites and the nature of the relationships with the peoples of the east, such as the Phoenicians, among other possible factors.

In some of the territories studied, the chronology of the appearance of iron objects and the evidence of their manufacture is documented almost contemporaneously and even prior to the first attested colonial contacts. This is the case of Calabria and Sicily at the beginning of the first millennium BC (Pacciarelli and Quondam), as well as of Sardinia, although those first Sardinian productions are made of bronze enriched with iron or copies of bronzes, and appear to have been manufactured in domestic contexts. Significant production of iron objects in artisanal workshops in Sardinia would come in the 8th century BC (Lo Schiavo and Milletti). In general, however, the documentation of this aspect is sparse and very fragmentary in the areas occupied by the indigenous peoples of the western Mediterranean, given that in many regions the existence of workshops is not attested prior to the 6th century BC. This clearly contrasts with what occurred in Phoenician settlements or those with a strong Phoenician presence. Indeed, at various archaeological sites there is a very well documented and probably important production from the last decades of the 9th century, as Ramon and Sanmartí and Suárez *et alii* indicate for the Strait of Gibraltar region (at archaeological sites such as Acinipo and Los Castillejos de Alcorrín) and Vives-Ferrándiz and Mata for the Valencia area (La Fonteta, Baix Segura). Ramon and Sanmartí hypothetically link this production to the demand from Assyria (very well documented elsewhere) to the point of assuming that iron was one of the most important products sought by the Phoenicians in the western Mediterranean.

However, apart from iron production in the Phoenician cultural area, it is plausible to believe that from the 8th century and above all the 7th century BC in the territories dealt with in this volume there would have been a relatively important local production of iron objects, although they would have been mainly confined to prestige items used by a small number of people. These objects were often deposited in the tombs of their owners, which is where they are normally found, whereas they are only retrieved sporadically at other types of archaeological site. According to Beylier, the forging technique would have been mastered in southern Gaul from the second half of the 7th century BC, although there is very little direct evidence to show this. A similar chronology can be proposed for Catalonia, as there is definite evidence from the 6th century BC at La Serra del Calvari and Illa d'en Reixac. However, we also have to bear in mind that some scholars have defended the existence of iron production in this region as early as the 8th century BC in the settlement of Els Vilars d'Arbeca (Belarte *et alii*). In Sardinia, iron metallurgy became important from the 8th and above all the 7th centuries BC. In northern Italy it is well documented at least from the turn of the 7th to the 6th century BC, with evidence of production at Genova (Paltineri *et alii*). In contrast, and as previously mentioned, in Calabria and Sicily an earlier start for the first local productions –between the late 11th and 10th centuries BC– has been proposed (Pacciarelli and Quondam).

In terms of the categories of objects and their evolution, there was very little typological diversity in the early stages of iron production, given, as has already been stated, that they were essentially prestige items. The first were mainly fibulas, needles, razors, rings and spits (the last of these linked to the idea of the banquet), as well as the first weapons, especially in Sicily and Calabria (Pacciarelli and Quondam). An outstanding category is that of knives, which were, moreover, a new item with no precedents in other metals within the repertory of objects used by the autochthonous societies. In some areas the first iron objects were copies of those previously made of bronze, as has been described in Sardinia (Lo Schiavo and Milletti). We should also point out the presence of iron weapons in many of the territories studied, albeit documented in

variable numbers, in funerary contexts and mainly associated with tombs of males/warriors. Iron weapons are often interpreted as prestige symbols (Pacciarelli and Quondam) under the control of the elites (Beylier). However, in some cases and in various territories, weapons are found in the tombs of females, for example in Gaul (Beylier) and Sicily (Pacciarelli and Quondam). We can therefore assume that the presence of arms is not necessarily related to the gender of the deceased and that it symbolizes above all a social position and membership of an elite.

The different articles included in this volume demonstrate how the typological range of iron objects expanded, especially from the 6th century BC, when there was an intensification of the production of weapons and a consolidation of that of work tools. The data available for the 5th-4th centuries BC in the different territories studied –in some cases abundant and of remarkable quality– indicate, with local nuances, a generalized use of iron for the manufacture of objects related to all facets of human existence and activity. These include transportation, building and, above all, work tools (especially farming implements). Iron prestige objects continued to be made, although they became very much a minority item. It is therefore quite normal that, from this period on, it is common to find iron objects in habitation sites. Weapons are also found in contexts of violent destruction, and continue to be especially common in tombs.

The generalization and diversification of the production of iron objects is obviously linked to profound changes in the social and productive structures that are documented in the whole of the study area from the 6th century BC. These can be linked to various causes, above all of a demographic and political nature. These shifts were signalled by the beginning of an imperialist policy on the part of Carthage, the progressive transformation of Rome into a political and military power called to dominate the Italian Peninsula, the beginnings of the formation of the great Libyan monarchies, and the constitution on the Iberian Peninsula of hierarchized societies that evolved towards the formation of city-states and territorial states of a certain magnitude. Iron played an essential role in all these processes, which explains not only the typological diversification of the production, but also its extraordinary growth. The finds of workshops in the indigenous habitats becomes habitual from this time. They are often inside houses, in urban settlements such as Puig de Sant Andreu-Ullastret (Belarte *et alii*), Genova (Paltineri *et alii*), Lattara, Montlaurès (Beylier) and Bastida de les Alcusses (Vives-Ferrándiz and Mata), or in specialised nuclei such as Pontós, among many others. They are also found on the periphery of those towns (e.g. Ullastret), in villages and even in small rural habitats, such as those of Les Guàrdies (Belarte *et alii*) or Christol (Beylier).

Thus, from the 6th century BC, we can speak of a generalized production and use of iron. All this leads us to suspect the existence of sophisticated manufacturing systems, probably with differentiated productions in the various workshops. Above all the elites would have exercised control over this resource, which would have taken on a crucial importance for the economic production, the exercise of violence and the exaltation of power. The transformation and exploitation of iron has been studied in depth on a micro-regional scale in some areas of the Iberian culture, including the territory of Kelin/Los Villares (Valencia), with evidence from the 4th century BC until the Romanization (Quixal), and, on a strictly local scale, at the archaeological site of Les Guàrdies (El Vendrell, Tarragona) (Belarte *et alii*). However, the overall functioning of the production system, and particularly the organization introduced by the elites to prevent iron being used by the subordinated population for purposes other than production (particularly for the manufacture of weapons), is still not known in detail in any of the regions studied in the contributions compiled here (and in some of them, such as the Libyan kingdoms, it is virtually unknown). One of the major challenges facing current research is to undertake a systematic study to re-evaluate the documentation available for many settlements and to obtain new data. The objective of this would be to ascertain where the iron ore was transformed into metal, who controlled the process, how the iron was distributed to the different manufacturing workshops (aristocratic houses, village workshops, etc.) and, a crucial but particularly complicated aspect, to attempt to recognize the types of objects manufactured in each place. We trust the contributions in this volume will act as a starting point for new studies to be carried out with this focus.

Maria Carme Belarte, Maria Carme Rovira and Joan Sanmartí

The origins of the first ferrous knives on the Iberian Peninsula and in Southern France: a typological viewpoint (9th-7th centuries BC)

Anne-Laure Grevey*
Eric Gailledrat**

Summary

The aim of this study is to contribute to our current knowledge of the first occurrence of ferrous objects in the western Mediterranean. We concentrate on the study of knives, as they are the most abundant objects for this period (9th-7th centuries BC). Typological analysis indicates that most of the objects studied appear to come from other regions of the Mediterranean, specifically in the east. Few seem to have originated in the central Mediterranean and links with continental Europe are either very limited or imperceptible.

Keywords: Iron, knives, protohistory, typology

Résumé

Le but de cette étude est de contribuer à la caractérisation de l'apparition des premiers objets en alliage ferreux en Méditerranée occidentale. Nous nous sommes concentrés sur l'étude des couteaux car ils représentent le type d'objet le plus abondant pour cette période (IX^e-VII^e s. av. n. è.). L'analyse typologique montre que la plupart des objets étudiés semblent provenir d'autres régions de Méditerranée, et plus précisément des régions orientales. Peu d'entre eux semblent provenir de Méditerranée centrale, tandis que les rapports avec l'Europe continentale semblent limités.

Mots clé: fer, couteaux, protohistoire, typologie

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1. Issues and questions posed by the first ferrous objects¹

This study² is part of a comprehensive approach to the appearance of the first ferrous objects in the western Mediterranean. Chronologically, it covers the period from the earliest Phoenician presence on the Iberian Peninsula to the first confirmed arrival of Greek seafarers in south-eastern France. The end of the 9th and the 8th centuries BC are marked by the first Phoenician foundations in southern of Spain, which also coincides with the appearance of iron metallurgy in that region. It is clear, therefore, that the Phoenicians and Greeks were there from the beginning of the movement of the goods and people that spread across the Mediterranean Basin at the beginning of the first millennium BC.

Two main questions can be asked about these first objects: What were their origins and what were their distribution routes?

Four theories are generally proposed to explain their appearance. Three are diffusionist and suggest a dissemination of objects and techniques from specific areas by continental, Greek (or Etruscan?) and Phoenician seafarers crossing the Mediterranean and bringing with them objects and skills. The fourth proposes the possibility of a local, spontaneous discovery of ferrous metallurgy.

The main problem concerning the Gulf of Lion area is the lack of real evidence for iron manufacturing centres in the study period. That is why most research has focused on the hypothesis of imports and Mediterranean interactions, especially within the Etruscan sphere (Janin, Chardenon 1998). However, some typological comparisons, such as the knife from Tomb 202, Peyrou necropolis, Agde (Verger 2013, 49) and the falcata-style knives of the Iberian Peninsula (Mancebo Dávalos 2000), have already been made. Therefore, our aim is to provide a summary of these studies in order to contribute to a particular category of object found in the Gulf of Lion region, in this case knives.

Not only are knives the most abundant ferrous artefacts found from this period in the study area, which extends from the mouth of the Rhône river to the Iberian Peninsula (Fig. 1), they also constitute an object of study embodied with intrinsic characteristics (small, easily transportable objects), which leads us to question their precise function within different contexts.

2. Material evidence and methods

Information regarding the 339 knives was compiled in a database. The majority of this documentation is bibliographic, although it also includes some unpublished material and information from direct analyses of the objects. This is particularly the case of knives from the necropolis at La

Rouquette (Puisserguier, France)³ (Mazière 2014).

The typological analysis of these finds was based on the selection of a number of discriminatory morphological components: the type of handle (with or without rivets), the number and position of the rivets, the presence of a ferrule, the presence of a notch, and the shape of the spine and tip (Fig. 2).

This enabled a number of groups to be determined prior to the analysis of their spatial distribution or comparisons with other knives from the eastern Mediterranean, the continental zone, and even within the Italian sphere.

3. Results and discussion

3.1. Knives from the western Mediterranean

The first objects from southern France and the Iberian Peninsula (Fig. 1) are generally dated to the end of the 9th and during the 8th centuries BC, even if some knives from the Iberian Peninsula are dated earlier (Vilaça 2006; Almagro Gorbea 1993, 86). In south-eastern France, and specifically the regions around the Gulf of Lion (Languedoc), they are regularly dated to the second half of the 8th century BC (Taffanel *et alii* 1998). The most important sites are necropolises: Le Peyrou in Agde (Nickels *et alii* 1989), Le Grand Bassin I in Mailhac (Louis *et alii* 1968), Can Bech de Baix in Agullana (de Palol 1958; Toledo i Mur, de Palol 2006), Can Piteu-Can Roqueta in Sabadell (Lopez-Cachero 2005; Lopez-Cachero 2006), El Pla de la Bruguera in Castellar del Vallès (Clop i Garcia *et alii* 1998), Lora del Río in Setefilla (Aubert 1981) and La Joya in Huelva (Garrido 1970; Garrido, Orta 1978).

The knives from our study area predominantly have two rivets (approximately 34%) positioned parallel to the handle. Knives with one rivet are also well represented (approximately 10%), although it is sometimes difficult to determine if this is due to breakage or if there only ever was one rivet. Knives with three rivets are less well represented but are nonetheless present across the entire study area. Knives with four, five or six rivets are much rarer (between 1.5 and 0.6%), and mainly found in the south of the Iberian Peninsula. Three knives without rivets are attested in south-eastern France, while only one is found—in a tomb—in the south of the Iberian Peninsula. Most of the knives have a straight or convex spine.

As a matter of fact, two main groups are observed in the south of the Iberian Peninsula and the Gulf of Lion (Languedoc-Roussillon/Catalonia). Indeed, some types only seem to be present in southern Iberian Peninsula, including the knives with five or six rivets, or those with three rivets, a ferrule, a convex spine and undifferentiated tips. Conversely, knives with two rivets and a straight or angular spine are found exclusively in the Gulf of Lion area. Knives with a straight spine from the south of the Iberian Peninsula include at least three rivets. Nevertheless, although we can

¹ This refers to objects in ferrous alloy, but we have chosen to speak of iron objects in order to lighten the text

² The study constitutes the summary of the master's degree thesis by Anne-Laure Grevey (Grevey 2016).

³ We are grateful to F. Mazière (Inrap, ASM) for access to the data from the necropolis of La Rouquette (France).

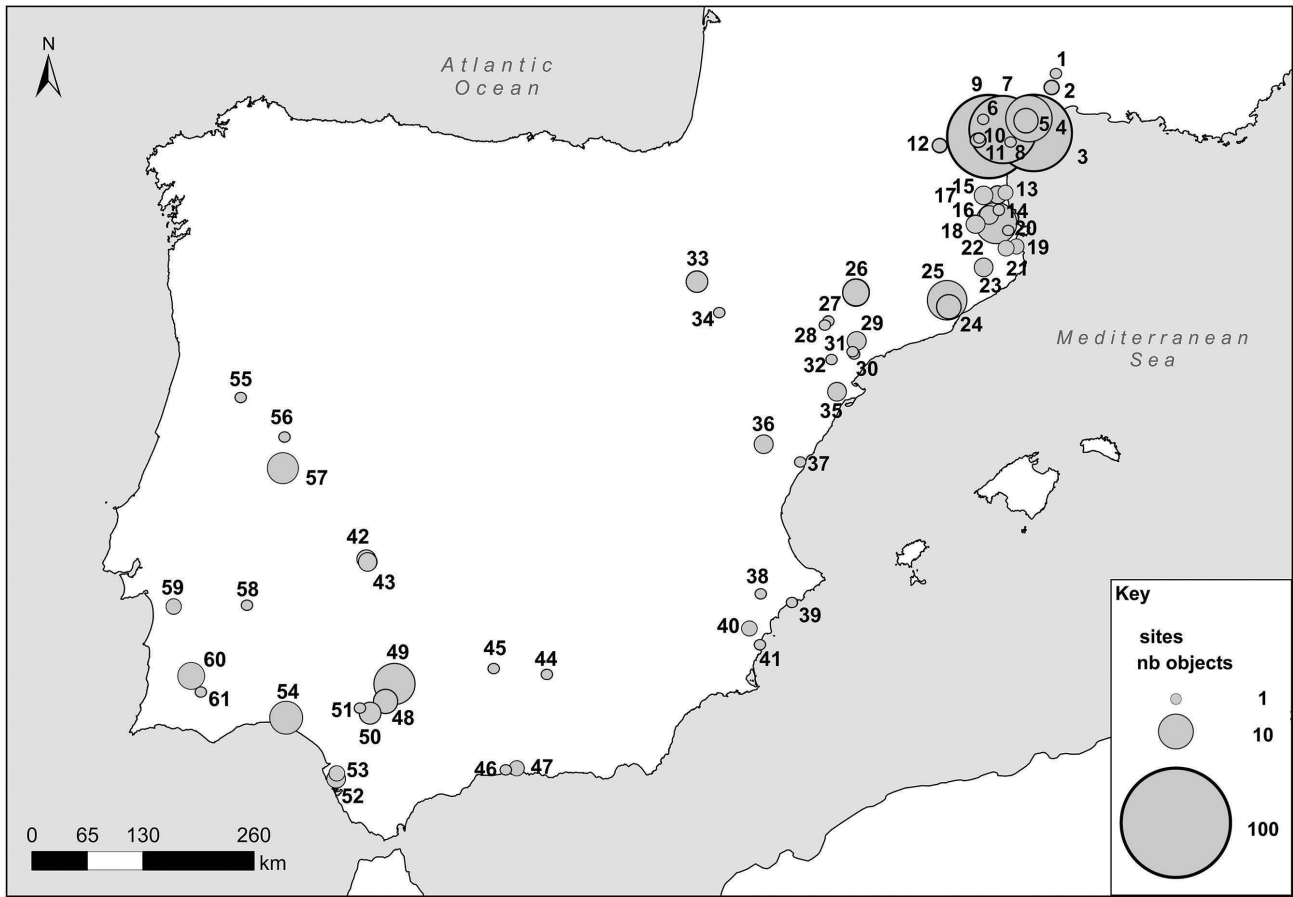


Figure 1. Map with the location of the sites where knives from the analysed period have been found. 1. Pompignan (Sadoulet), 2. Cazevieille (Cazevieille), 3. Agde (Le Peyrou), 4. Pézenas (Saint-Julien), 5. Tourbes (Bonne-Terre), 6. Saint-Pons-de-Thomières (Malvieu), 7. Puisserguier (La Rouquette), 8. Fleury (Les Cayrols), 9. Mailhac (Le Moulin and Le Grand Bassin D), 10. Pépieux (Las Fados), 11. Azille (Le Moulin à Vent), 12. Bram (La Ganache), 13. Cane (Les Hospices and Bellevue), 14. Villelongue-dels-Monts (La Grange), 15. Perpignan (Negators), 16. Cermet (Vilanova), 17. Milles (Las Canals), 18. Serralongue-Vallespir (Camp de les Olles), 19. Empúries (Muralla Nord-Est), 20. Peralada (El Castell), 21. Camallera (Camallera), 22. Agullana (Can Bech de Baix), 23. Anglès (Anglès), 24. Sabadell (Can Piteu-Can Roqueta), 25. Castellar del Vallès (El Pla de la Bruguera), 26. Vallfogona de Balaguer-Térmens (Pedrera), 27. Seròs (Pedrós), 28. Granja d'Escarp (Serra del Calvari), 29. El Priorat (El Molar), 30. Guiamets (Tosseta), 31. El Masroig (El Roig del Roget), 32. Gandesa (Coll del Moro), 33. Cortes de Navarra (Cero de la Cruz), 34. La Muela (Cabezo de la Cruz), 35. Santa Barbara (Mianes), 36. Cortes de Arenoso (Los Morrones 1), 37. Castellón de la Plana (Alcalá de Chivert), 38. L'Alcoià – El Comtat, 39. La Vila Joiosa (Les Casetes), 40. Crevillente (Les Moreres), 41. La Rábita de Guadamar del Segura (La Fonteta), 42. Medellín (Medellín), 43. Mengabril (Mengabril), 44. Torres (Cerro Alcalá), 45. Porcuna (Cerrillo Blanco), 46. Frigiliana (Cortijo de las Sombras), 47. Algarrobo (Morro de Mezquitilla), 48. Carmona (El Acebuchal and Cruz del Negro), 49. Lora del Río (Setefilla), 50. Alcalá de Guadaíra and Mairena del Alcor (Bencarrón), 51. Seville (Puebla del Río), 52. Puerto de Santa María (Las Cumbres), 53. Santa María (Pocito Chico), 54. Huelva (La Joya), 55. Mangualde-Beira Alta (Chans de Tavares), 56. Penamacor (Monte do Frade), 57. Idanha-a-Nova (Moreirinha and Monte do Trigo), 58. Requengos de Monsaraz (Rocha de Vígio 2), 59. Alcaçer do Sal (Olivar do Senhor dos Máctires), 60. Ourique (Monte A-do-Mealha-Nova, Herdades do Pego and Fonte Santa), Almadôvar (Mouricos).

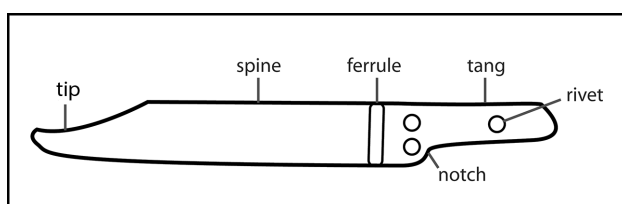


Figure 2. Main morphological elements (typology).

distinguish between the two groups, one type of knife is well-represented in the entire study area: those with two rivets, a convex spine and an undifferentiated tip.

Typological variants abound, even for the earliest periods. Therefore, due to the significant number of types identified (26 complete types from 32% of the identified objects), we initially focused on their spine shape and fitting method in order to compare the sets (Grevey 2016).

3.2. Comparisons

3.2.1. Bronze knives⁴

We are interested in the Late Bronze Age bronze knives because of the possibility that they were not only prototypes for their later ferrous counterparts, but also because they were important within the different regional spectrums, as they originated in an area of local and rapid iron object production.

These bronze knives are certainly similar to their ferrous counterparts: they have been fitted using one or two rivets and have straight or concave spines (for example, the knife from Tomb 355 at the necropolis of Can Bech de Baix; Toledo i Mur, Palol 2006, Fig. 130, 103). However, they also have equivalents in the eastern Mediterranean, more precisely in necropolis of Knossos (Crete) dated to the Minoan Bronze Age and the first sub-Minoan Iron Age (Evans 1906, Fig. 15, 22; *ibid.* Fig. 31, 34; *ibid.* Fig. 71, 66) or in Mycenaean Achaean habitats (Paralimni, Katarraktis, etc.) and necropolises (Kallithea, Klaus, etc.) dated to the Late Helladic III (≈ 1400-1050 BC) (Papadopoulos 1979, 318). They also have parallels in the central Mediterranean (Rivalan 2011, 162), more precisely at Benacci (Italy) dated to the 8th century BC (Bianco Peroni 1976, 79). Therefore, we cannot consider these bronze knives to be local models *stricto sensu*, without doing the same for their equivalents from the eastern/central Mediterranean. These elements are not sufficient to conclude that a local production of iron knives based on earlier bronze local models existed, and other leads need be followed.

3.2.2. Ferrous knives from continental Europe

A typology can be proposed for the first ferrous knives (Hallstatt A and B) from continental Europe: the fittings did not use rivets, but encompassed a tapered tang at the level of the handle, which was inserted into a perishable material. Their spines are convex or, more rarely, straight, and their tips are undifferentiated (Königer 1999, Fig. 27, 60; Pleiner 1981, Fig. 6, 119; see Fig. 5 for the location of the main sites outside the study area). It should be noted, however, that typological particularities are occasionally discernible, as with the presence of a buckle at the end of the knife (Pleiner 1981, Fig. 7, 120).

Comparisons between the knives from our study area and those of continental Europe were therefore relevant in the case of the knives without rivets and with a tapered tang. Here, only four knives corresponded to these criteria (Fig. 3, A). These were mainly distributed in south-eastern France, an area in which other continental European objects have also been found, such as the Gündlingen swords from Cazevieille (Vallon 1984, 27-31; Dedet 1979). The most logical reason for their presence here is that this area lies on the old trade routes between the Mediterranean Basin and continental Europe, which run partially along the Rhône.

⁴ This refers to objects made of copper alloy, although we have chosen to speak of bronze objects in order to lighten the text.

3.2.3. Greek-Etruscan ferrous knives

Three major types can be seen in the Greek-Etruscan knives dated to between 800 and 600 BC (we have only described the most important ones, although there are other types):

1. The first major type, as with those from continental Europe, consists of knives with a tapered tang level with the handle (Coldstream 1977, Fig. 4, 32; Snodgrass 1971, Fig. 84, 235).

2. The second one, attested from the 12th century BC, corresponds to knives with two rivets set parallel to the handle and a notch between the handle and the blade, but in a more ad hoc manner (Varoufakis 1981, Fig. 2, 27). The presence of rivets associated with a notch could not be clearly identified on the two knives discovered in the Gulf of Lion area (Fig. 3, C).

3. The third major type consists of knives with a handle attached by rivets set in orthogonal lines and with a straight or convex spine (Bianco Peroni 1976, pl. 21; Pleiner 1981, Fig. 10, 123). Regarding this last fitting method, S. Verger (2013) proposed a typological comparison between the knife from Tomb 202 at Le Peyrou (Agde, France) and one from Bitelami (Gela, Sicily). The comparison is also relevant to knives from other Italian areas (Rivalan 2011, 164, Note 6). Two more knives from our study area, more precisely the south of the Iberian Peninsula, were also been fitted in this way (Fig. 3, B).

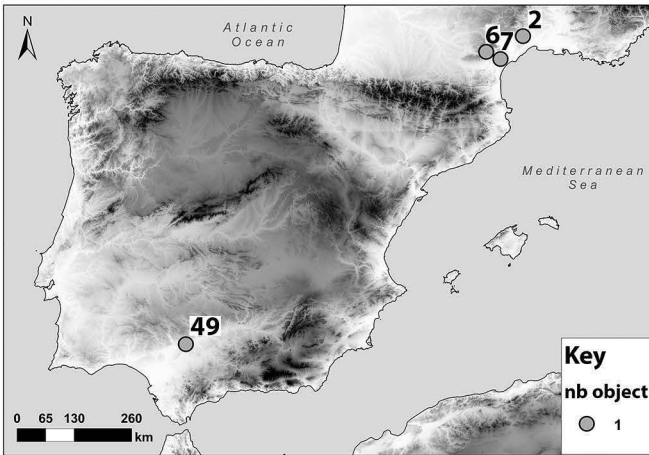
It would seem that comparisons with the Greek-Etruscan knives are only relevant to a limited number of objects in our corpus, most of them from the Gulf of Lion coast. The distribution of these objects (Fig. 3, B and C), which are dated between the end of the second quarter of the 7th century and the second third of the 6th century BC (Nickels *et alii* 1989, 356; Ruiz 2011-2012; Enríquez, Domínguez 1991, Fig. 5, p. 40), is more or less to the same as that of the first Protocorinthian-style pottery identified for the second half of the 7th century BC in south-eastern France (Janin 2003).


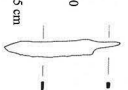
3.2.4. Phoenician, Cypriot and Cretan knives

The Phoenician, Cypriot and Cretan knives have been placed together as they have the same basic characteristics. Two major types are perceivable from the 12th century BC (as with the Greek-Etruscan knives, other types can be found, but only rarely):

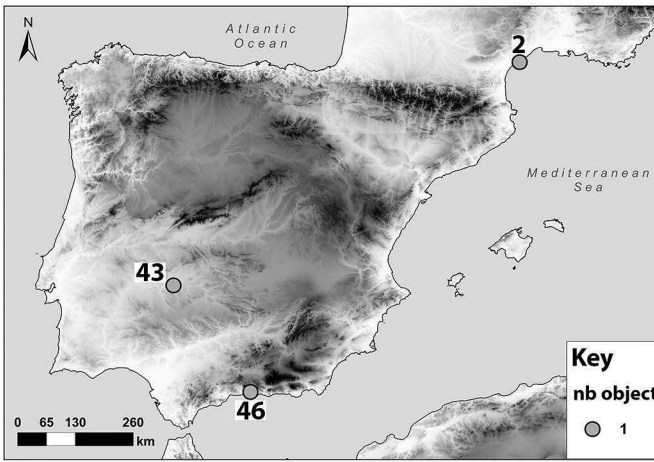
1. The first corresponds to knives with rivets arranged parallel to the handle, and a convex, straight or, in some rare cases, concave spine. The tip is generally undifferentiated, as, for example, at the necropolis of Kaloriziki, 1100-1050 BC, Cyprus (Benson *et alii* 1973, pl. 40), the site of Jatt, 13th-11th century BCE, Israel (Artzy 2006, Fig. 2.8, 39) and the necropolis of Knossos, 11th century BC, Crete (Snodgrass 1971, Fig. 75, 219). Other modes of fitting can be found with either one, three or more rivets inserted parallel to the handle, with examples from the necropolis of Lachish, around 1000 BC, Israel (Tufnell *et alii* 1953) or the necropolis of Kapsalos, archaic period, Cyprus (Karageorghis 1971, 360). Comparisons between the falcata-style knives of the


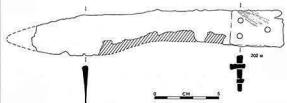
A

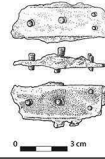



	
Dating	Ha C/D1
Place	Oggelshausen (Germany)
Ref.	Billamboz, Köninger 1995, fig. 57, p. 102
	625-575 BC
	Pompignan (France)
	Gasco 1980, fig. 16, p. 55

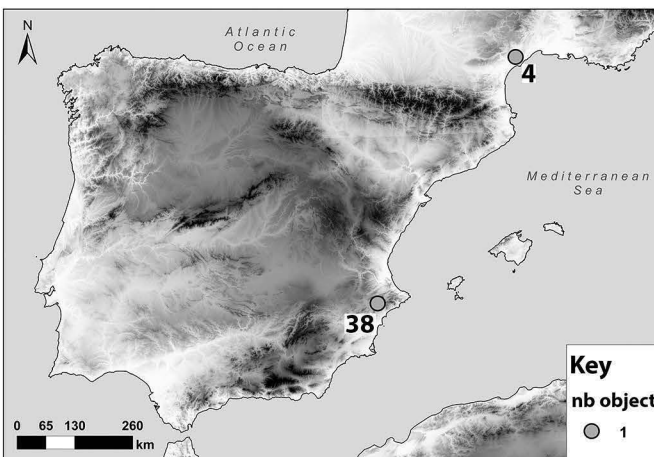
B



	
Dating	650-550 BC
Place	Gela (Sicily)
Ref.	Verger 2013, p. 49
	625-575 BC
	Agde (France)
	Nickels et alii 1989, fig. 246, p. 282

	
Dating	625-525 BC
Place	Frigiliana (Spain)
Ref.	Arribas, Wilkins 1969, fig. 8, p. 205
	800-700 BC
	Monterozzi (Italy)
	Pleiner 1981, fig. 10, p. 123

C



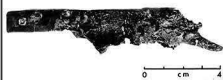

	
Dating	1200-1100 BC
Place	Perati (Greece)
Ref.	Varoufakis 1981, fig. 2, p. 27
	600-550 BC
	Pézenas (France)
	Giry 1968, p. 39

Figure 3. A. Sites where knives without rivets have been found and a comparison. B. Sites where knives with rivets set orthogonally have been found and a comparison. C. Sites where knives with a notch have been found and a comparison.

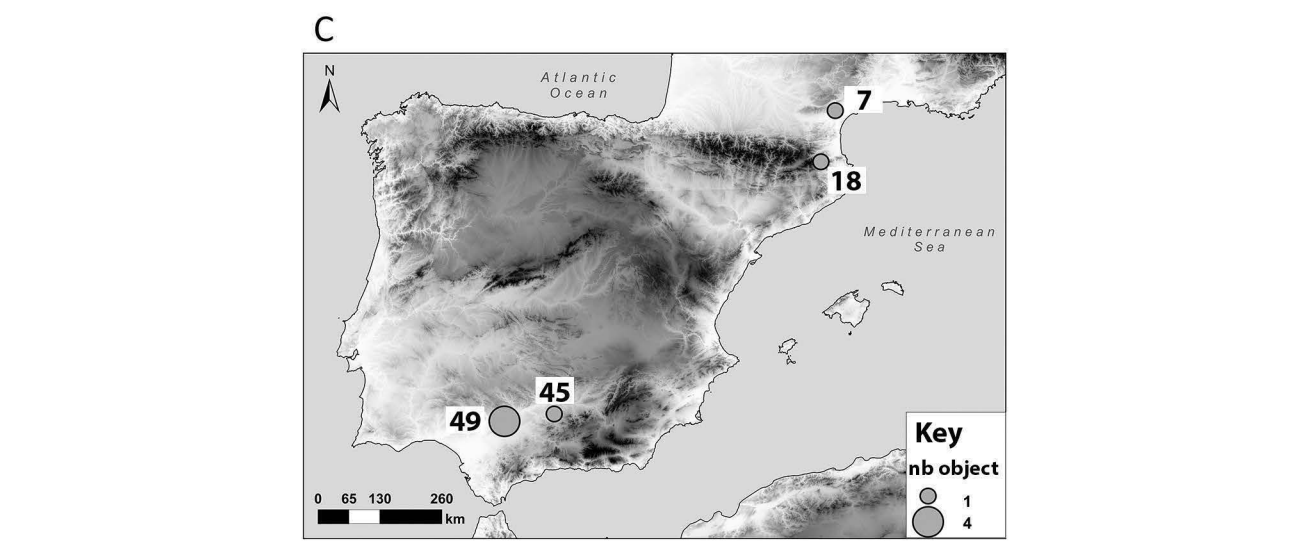
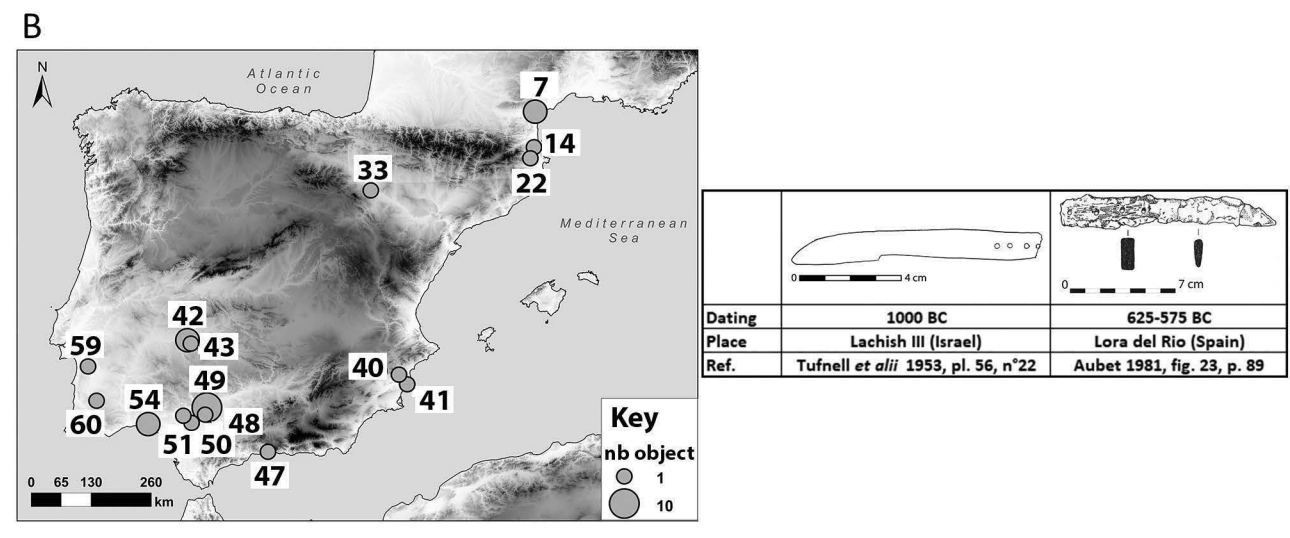
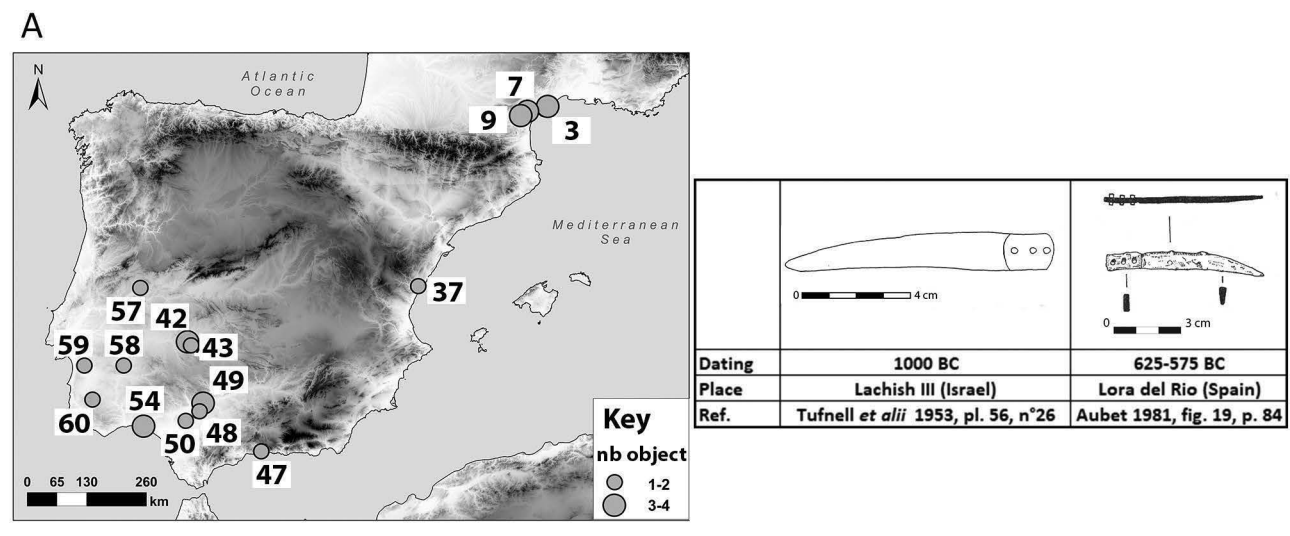


Figure 4. A. Falcata-style knives and a comparison. B. Knives with 3 to 6 rivets and one comparison. C. Knives with copper alloy rivets.

Iberian Peninsula and Cypriot and Phoenician ones have already been made (Mancebo Dávalos 2000). It is clear that the knives of the southern Peninsula are part of an eastern type, generally with three rivets (although in our study area they can have between two and six, Fig. 4, A and B), a convex spine and an undifferentiated tip. This type with two rivets, is also present in the Gulf of Lion. Similarly, the knives with two rivets and a concave spine are found in our study area, as well as in Cyprus.

2. Rarer are knives with a narrow tang at the level of the handle and without rivets and knives with rivets set perpendicularly to the handle (Benson *et alii* 1973, 40; Tufnell *et alii* 1953).

It should be noted that a characteristic that cannot be classified in the typology is found in Cypriot and Phoenician knives and is related to the presence of bronze rivets on some ferrous knives (for example those from the Kaloriziki necropolis in Cyprus; Benson *et alii* 1973, pl. 40; *ibid.* 124). Knives exhibiting this characteristic are found across the entire study area (Fig. 4, C). Furthermore, research carried out on a ferrous knife with bronze rivets found in Egypt showed that the bronze actually came from the Phoenician regions (Yahalom-Mack *et alii* 2017, 68).

The aforementioned Phoenician, Cypriot and Cretan sites in the east have yielded many knives with similar fitting methods to those of the Iberian Peninsula and the Gulf of

Lion coast (knives with two, three or four rivets without notch); they are also from much earlier dates.

3.3. Distribution routes

To sum up, from the second half of the 8th century BC, there were occasional exchanges between the peoples of continental Europe and, probably, the Greeks, most likely as a consequence of the rediscovery of western sea lanes at the beginning of the first millennium BC. These exchanges left traces, partly in the form of ferrous objects, but more notably in the form of knives with a tapered tang level with the handle. Later, in the second half of the 7th century BC, transactions between local populations and the Greek-Italian peoples (Etruria and Sicily) can be perceived through the presence of knives with rivets arranged in orthogonal lines. The diffusion of knives (with parallel rivets in the handle, convex or straight spines and an undifferentiated tip) from east to west is probably the result of cargos transported by Mediterranean seafarers, possibly headed by the Phoenicians.

As multifunctional tools, these knives would have triggered the interest of the western populations and were probably exchanged along with other “exotic” goods, such as fibulas and possibly textiles (Gailledrat 2014, 56). Through this step-by-step spread, the local populations played a certain role in the dissemination of these objects.

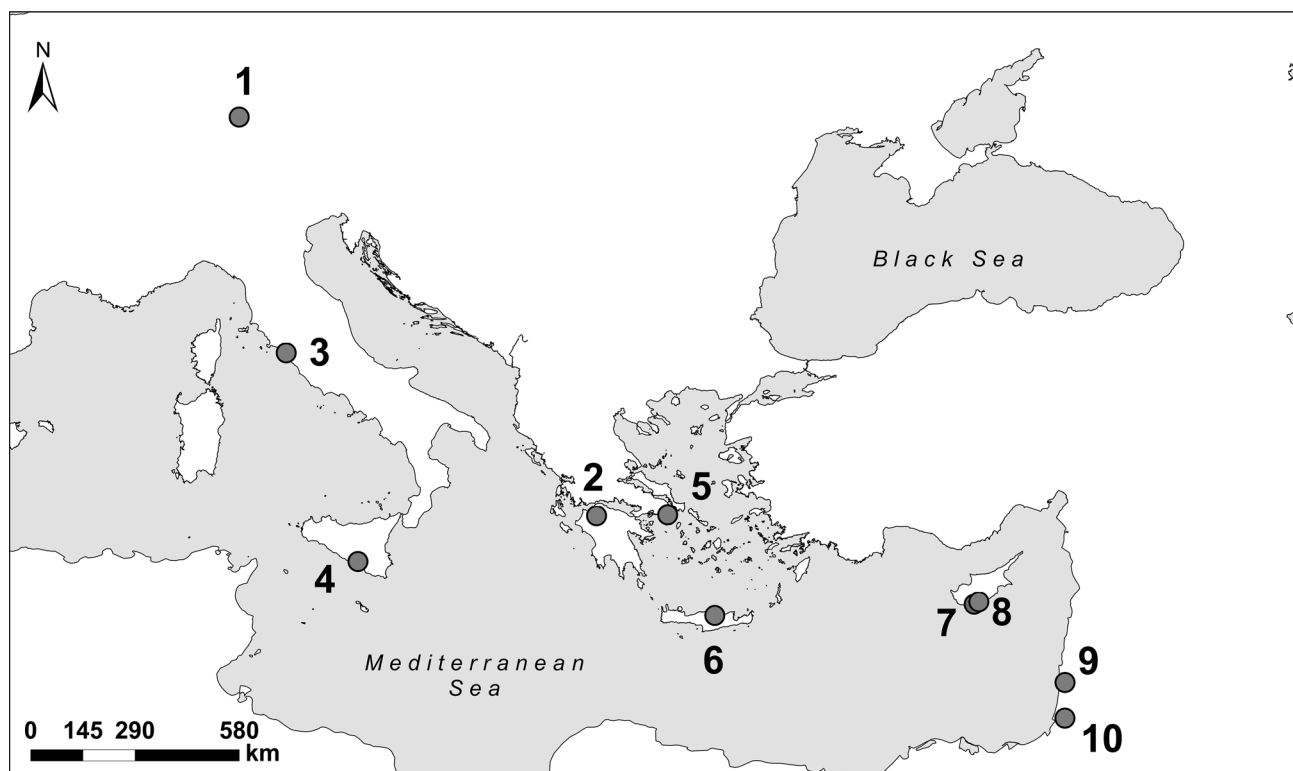


Figure 5. Location of the sites mentioned outside the study area. 1. Oggelhausen (Germany), 2. Achaea sites (Greece), 3. Monterozzi (Italy), 4. Gela (Sicily, Italy), 5. Perati (Greece), 6. Knossos (Crete), 7. Kaloriziki (Cyprus), 8. Kapsalos (Cyprus), 9. Jatt (Israel), 10. Lachish (Israel).

However, the scope of this diffusion must be relativised, in the sense that most of the defined types appear to be limited to a given region.

It is still too early to progress with theories on the local adaptations of these knives, which would have been distributed via the main routes used in the western Mediterranean. However, it is worth noting that some types, more specifically the knives with a ferrule or concave tip, could have been manufactured locally from around 750/700-600 BC; indeed, these typological elements are not attested in other regions of the Mediterranean or in continental Europe.

In summary, maritime, fluvial and terrestrial routes were certainly used to distribute these objects and types. The maritime routes would have been used by people from the eastern and central Mediterranean and from there, fluvial valleys would almost certainly have been used by all the actors in trade, as the vast majority of knives are distributed along these axes.

4. Conclusions

This study of the first ferrous knives dated between the 9th and 7th centuries BC in the south of France and on the Iberian Peninsula is consistent with previous studies into contacts between peoples and cultures in the western Mediterranean for the same period.

All the hypotheses on the introduction of iron seem plausible, but to varying degrees: in fact, most of the knives can be compared to those found in the eastern Mediterranean (knives with two to four rivets, convex spines and an undifferentiated tip; knives with two rivets, concave spines and undifferentiated points; knives with two rivets and straight spines). They were probably distributed by Mediterranean seafarers of eastern origin (Gailledrat 2014), while some can be compared with to central Mediterranean productions (knives with rivets arranged with orthogonal lines between them). Only 1% of them are similar to those found on the continent (knives with a tapered tang level with the handle), but the problem here is that fitting method is similar to knives found in the Mediterranean (Tufnell *et alii* 1953, pl. 56; Snodgrass 1971, 235; Coldstream 1977, 32) and central and eastern Europe (Billamboz, Köninger 1995, 102; Stoia 1989, 55).

It appears that the first iron objects were introduced through the first exchanges with oriental seafarers. However, our view of this phenomenon may be distorted, as only knives have been taken into account, and these were obviously not the only objects introduced to this region between the 9th and 7th centuries BC. In fact, fibulae, bracelets, rings, horse bits, hooks, roasting skewers, razors, pins, weapons, toiletries and many other characteristic objects are also dated to this period. Their origins may of course be different, even local, and various exchange networks should be considered. However, the eastern mediterranean vector is currently the most plausible route to explain the mass arrival of the first ferrous knives. In a more general manner (imported objects, typological or technical influences) this mediterranean vector has to be balanced with the early local working of iron alloy, which probably begins in the 7th

century BC and had a special importance between western Languedoc and Catalonia.

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Bibliography

- ALMAGRO GORBEA, M.:
1993. "La introducción del hierro en la Península Ibérica. Contactos precoloniales en el periodo Orientalizante", *Complutum*, 4, 81- 94.
- ARRIBAS, A., WILKINS, J.:
1969. “La necrópolis fenicia del Cortijo de las Sombras (Frigiliana, Málaga)”, *Pyrenae*, 5, 185-244.
- ARTZY, M.:
2006. *The Jatt hoard in northern Canaanite/Phoenician and Cypriot context*, Cuadernos de Arqueología Mediterránea, 14, Barcelona.
- AUBET, M.E.:
1981. “La necrópolis de Setefilla en Lora del Rio”, J. Maluquer de Motes, M.E. Aubet, *Programa de investigaciones protohistóricas. Andalucía y Extremadura*, Barcelona, 53-223.
- BENSON, J. L., PORADA, E., CATLING, E.A., CATLING, H.W.:
1973. *The necropolis of Kaloriziki excavated by J. F. Daniel and G. H. McFadden for the University Museum of Pennsylvania, Philadelphia*, Göteborg.
- BIANCO PERONI, B.:
1976. *Die Messer in Italien*, Prähistorische Bronzefunde, VII, 2, München.
- BILLANMBOZ, A., KONINGER, J.:
1995. "Hallstattzeitlich Fundstellen im südlich Federseemoor, Kreis Biberach", *Archäologische Ausgrabungen im Baden-Württemberg*, 96-104.
- COLDSTREAM, J.N.:
1977. *Geometric Greece*, London.
- CLOP I GARCIA, X., FAURA I VENDRELL, J.M., GANGONELLS I RIFA, M., MOLIST I MONTANA, M., NAVARRO I BARBERAN, C.:
1998. *El Pla de la Bruguera Centre de distribució Sony. Una necròpoli d'incineració de la Primera Edat del Ferro a Castellar del Vallès (Castellar del Vallès, Vallès Occidental)*, Excavacions Arqueològiques a Catalunya, 15, Generalitat de Catalunya, Barcelona.
- DEDET, B.:
1979. “Les tombes du Languedoc oriental au premier âge du Fer dans leur contexte culturel : acquis et problèmes”, *Revue Archéologique de Narbonnaise*, 12, 9-42.

- EVANS, A. J.:
1906. *The prehistoric tombs of Knossos*, London.
- KONINGER, J.:
1999. "Von Fischen, Fallen und Faschinen. Neues aus den hallstattzeitlichen Fundstellen von Ogelshausen-Bruckgraben, Kreis Biberach", *Archäologische Ausgrabungen in Baden-Württemberg*, 59-64.
- GAILLED RAT, E.:
2014. *Espaces coloniaux et indigènes sur les rivages d'Extrême-Occident méditerranéen (Xe-IIIe s. av. n. è.)*, Montpellier.
- GARRIDO, J.P.:
1970. *Excavaciones en la necrópolis de « La Joya » Huelva (1a y 2a campañas)*, Excavaciones Arqueológicas en España, 71, Ministerio de Educación y Ciencia, Madrid.
- GARRIDO, J.P., ORTA, E.M.:
1978. *Excavaciones en la necrópolis de « La Joya », Huelva, II (3a, 4a y 5a campañas)*, Excavaciones Arqueológicas en España, 96, Ministerio de Educación y Ciencia, Madrid.
- GASCO, Y.:
1980. "Fouille de deux tumulus de la nécropole du Sadoulet à Pompignan (Gard)", *Documents d'Archéologie Méridionale*, 3, 45-64.
- GREVEY, A.-L.:
2016. *Les premiers couteaux en alliage ferreux dans la Péninsule ibérique et le Midi (IX^e-premier quart VI^e siècle av. n. è.)*, master 2 memory, University of Paul-Valéry Montpellier III, Montpellier (France).
- JANIN, T.:
2003. "Importations, modèles méditerranéens et faciès orientalisant dans le sud de la France : l'exemple du Languedoc occidental au VII^e s. av. n. è.", C. LANDES, *Les Etrusques en France. Archéologie et collections*, Lattes, 19-22.
- JANIN, T., CHARDENON, N.:
1998. "Les premiers objets en fer en Languedoc occidental et en Roussillon (VIII^e s. av. n. è.) : types, chronologie et origine", M. FEUGERE, V. SERNEELS, *Recherches sur l'économie du fer en Méditerranée nord-occidentale, Monographies Instrumentum*, 4, 56-64.
- KARAGEORGHIS, V.:
1971. "Chronique des fouilles et découvertes archéologiques à Chypre en 1970", *Bulletin de correspondance hellénique*, 95, 335-432.
- LÓPEZ CACHERO, J.:
2005. *La necrópolis de Can Piteu-Can Roqueta (Sabadell) en el contexto del bronce final y la primera edad del hierro en la Vallès: estudio de los materiales cerámicos*, Universitat de Barcelona, Barcelona (PhD).
2006. *Aproximació a la societat durant el Bronze final i la Primera Edat del Ferro: el cas de la necrópolis de Can Piteu-Can Roqueta (Sabadell, Vallès Occidental, Barcelona)*, Societat Catalana d'Arqueologia, Barcelona.
- LOUIS, M., TAFFANEL, O., TAFFANEL, J.:
1958. *Le premier âge du Fer languedocien, 2. Les nécropoles à incinération*. Monographies préhistoriques et archéologiques, 3, Institut International d'Études Ligures, Bordighera-Montpellier.
- MANCEBO DÁVALOS, J.:
2000. "Análisis de los objetos metálicos en el período orientalizante y su conexión con el mundo fenicio. Los cuchillos afalcatados", M.E. Aubet, M. Barthelemy, *Actas del congreso internacional de estudios fenicios y púnicos*, Cádiz, 1825-1834.
- MAZIÈRE, F.:
2014. *La Rouquette (Puisserguier, Hérault). Une nécropole du premier âge du Fer en Bas Languedoc occidental*. Rapport d'opération, fouille archéologique. Inrap, Nîmes (typed).
- NICKELS, A.:
1989. *Agde, la nécropole du premier âge du Fer*, Paris.
- PALOL P. (de):
1958. *La necrópolis hallstättica de Agullana (Gerona)*. Bibliotheca praehistorica hispana, 1, CSIC-Diputació provincial de Barcelona, Madrid-Barcelona.
- PAPADOPOULOS, T.J.:
1979. *Mycenaean Achaea*, Studies in Mediterranean Archaeology, LV: 1, Göteborg.
- PLEINER, R.:
1981. "Die Wege des Eisen nach Europa", R. Pleiner, *Frühes Eisen in Europa : Acta des 3. Symposiums des Comité pour la sidérurgie ancienne de l'IUSPP*, Schaffhausen/Zürich, 115-128.
- RIVALAN, A.:
2011. *Typologie et chronologie des objets métalliques du Bronze Final IIIB à la fin du premier âge du Fer en France méridionale (900-450 av. n. è.)*, PhD thesis, University of Paul-Valéry Montpellier III, Montpellier (France).
- RUIZ, J.A.M.:
2011-2012. "Las necrópolis tartésicas de la provincia de Málaga", *Mainake*, 33, 327-342.
- SNODGRASS, A.M.:
1971. *The dark age of Greece: an archaeological survey of the eleventh to the eighth century BC*, Edinburgh.
- STOIA, A.:
1989. "The beginning of iron metallurgy in Romania", M.L.S., Sørensen, T, Roger (T.), *The Bronze age-Iron age transition in Europe*, 43-67.
- TOLEDO I MUR, A., PALOL, P. (de):
2006. *La necrópolis d'incineració del Bronze final transició*

a l'edat del Ferro de Can Bech de Baix, Agullana, Alt Empordà, Girona: els resultats de la campanya d'excavació de 1974, Sèrie monogràfica, 24, Museu d'Arqueologia de Catalunya, Girona.

TUFNELL, O., MURRAY, M. A., DIRINGER, D.:

1953. *The Welcome-Marston archaeological research expedition to the Near East. Lachish III (Tell Ed-Duweir). The Iron Age*, London/New-York/Toronto.

VALLON, J. :

1984. *Les tertres protohistoriques des environs du Pic Saint-Loup (Hérault)*, Montpellier.

VAROUFAKIS, G.:

1981. "Investigation of some Minoan and Mycenaean iron objects", R. Pleiner, *Frühes Eisen in Europa: Acta des 3. Symposiums des Comité pour la sidérurgie ancienne de l'IUSPP*, Schaffhausen/Zürich, 25-32.

VERGER, S.:

2013. "Agde, le Peyrou, tombes avec vases et ustensiles grecs (Hérault)", S. Verger, Pernet L., *Une odysée gauloise. Parures de femmes à l'origine des premiers échanges entre la Grèce et la Gaule*, Arles, 47-49.

VILAÇA, R.:

2006. "Artefactos de ferro em contextos do Bronze Final do território português: Novos contributos e reavaliação dos dados", *Complutum*, 17, 81-101.

YAHALOM-MACK N., ELIYAHU-BERAR A., MARTIN M.A.S., KLEIMAN A., SHAHACK-GROSS R., HOMSHER R.S., GADOT Y., FINKELSTEIN I.

2017. "Metalworking at Megiddo during the Late Bronze and Iron Ages", *Journal of Near Eastern Studies*, 76, 53-74.