



Metalle der Macht – Frühes Gold und Silber
Metals of power – Early gold and silver

6. Mitteldeutscher Archäologentag
vom 17. bis 19. Oktober 2013 in Halle (Saale)

Herausgeber Harald Meller, Roberto Risch und Ernst Pernicka



Tagungen des
Landesmuseums für Vorgeschichte Halle
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Landesamt für Denkmalpflege und Archäologie Sachsen-Anhalt
LANDESMUSEUM FÜR VORGESCHICHTE

herausgegeben von
Harald Meller,
Roberto Risch und
Ernst Pernicka

Halle (Saale)
2014

Dieser Tagungsband entstand mit freundlicher Unterstützung von:
The conference proceedings were supported by:



Universitat Autònoma de Barcelona

Die Beiträge dieses Bandes wurden einem Peer-Review-Verfahren unterzogen.
Die Gutachtertätigkeit übernahmen folgende Fachkollegen: PD Dr. Barbara Regine Armbruster, Prof. Dr. François Bertemes, Prof. Dr. Christoph Brumann, Prof. Dr. Robert Chapman, Dr. Andrea Dolfini, Prof. Dr. Gerhard Eggert, Dr. José Lull Gracia, Dr. Maria Filomena Guerra, Prof. Dr. Detlef Günther, Prof. Dr. Andreas Hauptmann, PD Dr. Reinhard Jung, Dr. Laurence Manolakis, Prof. Dr. Gregor Markl, Dr. Regine Maraszek, Prof. Dr. Carola Metzner-Nebelsick, Prof. Dr. Pierre de Miroschedji, Prof. Dr. Louis Daniel Nebelsick, Prof. Dr. Ernst Pernicka, Prof. Dr. Margarita Primas, PD Dr. Sabine Reinhold, Dr. Ralf Schwarz, Dr. Zofia Anna Stos-Gale, Dr. Christian-Heinrich Wunderlich.

Bibliografische Information Der Deutschen Nationalbibliothek
Die Deutsche Nationalbibliothek verzeichnet diese Publikation in der Deutschen Nationalbibliografie; detaillierte bibliografische Daten sind im Internet über <http://portal.dnb.de> abrufbar.

ISBN 978-3-944507-13-2
ISSN 1867-4402

<i>Redaktion</i>	Jennifer Bröcher, Dirk Höhne, Kathrin Legler, Janine Nätke, Sven Roos, Monika Schlenker, Manuela Schwarz, Anna Swieder, Andrea Welk
<i>Redaktion und Übersetzung der englischen Texte</i>	Tanja Romankiewicz, Nicholas Uglov • beide Edinburgh, Bettina Stoll-Tucker
<i>Organisation und Korrespondenz</i>	Konstanze Geppert
<i>Technische Bearbeitung</i>	Thomas Blankenburg, Nora Seeländer, Mario Wiegmann
<i>Vor-/Nachsatz, Sektionstrenner, Umschlag</i>	S. 19, 49, 367 Fotos Juraj Lipták • München, Gestaltung Brigitte Parsche
<i>Rubrikentrenner</i>	S. 51 © G. Borg, Halle (Saale); S. 151 © CEZA, Mannheim; S. 321 © C.-H. Wunderlich, LDA; S. 369 Piotrovski 2013; S. 313 Abb. 20,15–16; S. 449 J. A. Soldevilla, © ASOME-UAB; S. 609 Piotrovski 2013, S. 466 Abb. 157,3 u. Staatl. Museum f. Bildende Künste A. S. Puschkin; S. 883 J. Lipták, München

Für den Inhalt der Arbeiten sind die Autoren eigenverantwortlich.

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<i>Papier</i>	alterungsbeständig nach DIN/ISO 9706
<i>Satzschrift</i>	FF Celeste, News Gothic
<i>Konzept und Gestaltung</i>	Carolyn Steinbeck • Berlin
<i>Layout, Satz und Produktion</i>	Nora Seeländer
<i>Druck und Bindung</i>	Salzland Druck GmbH & Co. KG

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Silver in Neolithic and Eneolithic Sardinia

Maria Grazia Melis

Zusammenfassung

Silber im neolithischen und äneolithischen Sardinien

Kupfer und Silber sind die Metalle, die als erste in Sardinien bearbeitet wurden: Beweise für ihren Gebrauch gibt es aus der ersten Hälfte des 4. Jts. v. Chr. im Zusammenhang mit den Ozieri-Facies des Endneolithikums. Die Verwendung von Gold ist hingegen nur durch ein einziges Artefakt belegt, das in die späte äneolithische (Glockenbecher-)Periode datiert. Blei taucht erst um die Mitte des 3. Jts. v. Chr. auf.

Das Ziel der vorliegenden Studie ist es, zu klären, ob die Einführung von Metallen – und vor allem von Silber – einen Einfluss auf soziale, politische und ökonomische Strukturen im prähistorischen Sardinien ausübte – vor allem hinsichtlich der Veränderungen am Übergang vom Neolithikum zum Äneolithikum –, den Einfluss von Metallobjekten und Metallurgie auf Fertigungsprozesse und Wirtschaft und ob es im 3. Jt. v. Chr. einen Unterschied zwischen den lokalen Gruppen der neolithischen Tradition (Filigosa und Abealzu) und den Gruppen außerhalb dieser Tradition (Monte Claro und Glockenbecher) gab. Der archäologische Fundkontext und die verfügbaren archäometallurgischen Daten werden ausgewertet, zusammen mit einer Analyse von bisher unpubliziertem Material.

Silber repräsentiert ca. 22 % der Artefakte aus dem neolithischen und äneolithischen Sardinien; 4 % davon können der ersten Hälfte des 4. Jts. v. Chr. zugeschrieben werden und weitere 8 % der zweiten Hälfte des 4. Jts. v. Chr.; die verbleibenden Funde datieren in das 3. Jt. v. Chr. Interessanterweise stammt – wie auch bei den Kupferfunden – eine gleichmäßige Anzahl von Silberfunden aus den Frühphasen der Metallverarbeitung (4. Jt. v. Chr.) aus Siedlungskontexten, wohingegen Silberartefakte seit der mittleren Phase des Äneolithikums fast ausschließlich aus Grabkontexten bekannt sind. Ein weiterer zu beachtender Beleg ist ein einzelnes Silberartefakt unter den Metallfunden des mehrschichtigen »Schreins« am Monte d'Accoddi. Hier fand sich unter anderen Objekten aus dem mittleren Äneolithikum eine kleine silberne Scheibe.

Summary

Copper and silver are the earliest worked metals in Sardinia: there is evidence of their use from the first half of the 4th millennium BC, in the sphere of the Ozieri facies of the Final Neolithic. The use of gold is represented by a solitary artefact belonging to the Late Eneolithic (Beaker) period. Lead, however, appears roughly around the mid 3rd millennium BC.

The objective of the present study is to determine whether the introduction of metals – and in particular silver – exerted an influence over social, political and economic structures of prehistoric Sardinia – in particular the changes occurring between the Neolithic and the Eneolithic periods –, the influence of metal articles and metallurgy on manufacturing and economy and whether it was a difference between local human groups of Neolithic tradition (Filigosa and Abealzu) and groups beyond this tradition (Monte Claro and Bell Beaker) in the 3rd millennium BC. The archaeological contexts of the finds and the available archaeo-metallurgical data are analysed, together with new analyses of unpublished material.

Silver represents approximately 22 % of artefacts recovered in Sardinia from the Neolithic and Eneolithic periods; of these 4 % are attributable to the first half of the 4th millennium BC and 8 % to the second half of the 4th millennium BC; the rest belong to the 3rd millennium BC. It is interesting to note that, as for copper, in the early phases of metallurgy (4th millennium BC) a consistent quantity of silver finds come from settlements, whereas from the middle phases of the Eneolithic, silver and copper artefacts are almost exclusively found in funerary contexts. Further proof for consideration is provided by the presence of a solitary silver artefact among the metal finds from the multi-layered shrine site at Monte d'Accoddi: a small disc recovered amongst finds from the Middle Eneolithic.

The archaeological data

The earliest Sardinian silver artefact was found in tomb V of Pranu Mutteddu and dates to the first half of the 4th millennium BC¹ (facies Ozieri I; Fig. 1,9). This small necropolis is of particular importance because it is evidence of individual

burials in monumental tombs during a cultural facies of predominantly collective burials in rock-cut tombs. The presence of a small necropolis of rock-cut tombs close to the individual burials reflects social inequality represented through the different treatment reserved for eminent persons. This is confirmed by the wealth of grave goods of

¹ Radiocarbon dates are not available for this site. The chronology is based on the range

obtained by datings coming from other contexts.

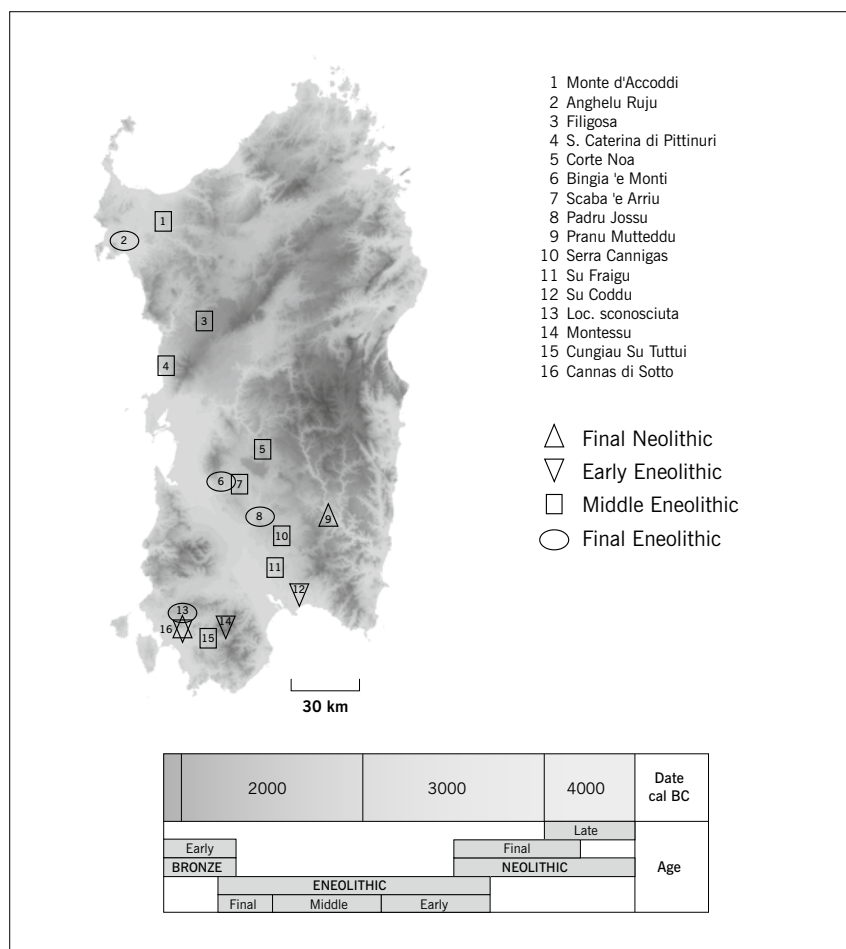


Fig. 1 Map of Sardinia with sites containing silver artefacts and related timeline.

Abb. 1 Karte von Sardinien mit der Lage der Orte mit Silberartefakten und zugehöriger Zeit-
leiste.

tomb V: a ceramic dish, two silver disc rings (Fig. 6,1–2), a flint dagger and blade, and obsidian arrowheads (Atzeni/Cocco 1989). Stone continues to hold an important role which it will maintain in some geographical areas even into the middle Eneolithic during the 3rd millennium BC.

In the second half of the 4th millennium BC (Ozieri II or Sub-Ozieri) the number of sites and silver artefacts doubles. An »allée couverte« placed opposite the rock-cut tombs of the necropolis of Montessu (Fig. 1,14) contained the remains of a burial with grave goods including pottery, a round threaded silver ring and a copper disc ring (Atzeni 1987). Two more rings (Fig. 6,3–4) and a silver lamina were discovered in the Su Codddu/Canelles settlement (Fig. 1,12) (Melis 2005). One was a disc ring similar to that of Pranu Mutteddu. Given its smaller dimensions, it was probably used as part of a necklace. The second ring was an incomplete circle. They were found in the Canelles l. Badas area (Stratigraphic Unit 1058), in a cylindrical storage pit (structure no. 47), reused as a rubbish dump. The lamina was found in an area to the north (Su Codddu) in an irregular-shaped structure (no. 51) that was only partially investigated (Ugas et al. 1985). Slag deposits were discovered in the same area as the lamina, and were interpreted on site as waste from smelting silver. Remains of marine molluscs, pottery, and stone tools were recovered from the same layer. In the tomb 12 of the Cannas di Sotto necropolis (Fig. 1,16) some silver rings with materials of the Final Neolithic and the Early Eneolithic were recently discovered (Salis 2013). Since

in the short note published the number of artifacts found are not specified, these finds are not included in the statistical processing presented in Figures 2 and 3.

During the 3rd millennium BC the presence of silver artefacts grew notably, alongside a more widespread use of copper (Fig. 3–4). The artefacts originating from the facies of local tradition, Filigosa and Abealzu, were intended exclusively for funerary contexts. The only exception is a small silver disc (probably part of a necklace) discovered in the village surrounding the sanctuary of Monte d'Accoddi (Fig. 1,1; 6,5). However, the stratigraphic position of this find is not completely reliable, as the sanctuary was excavated during the 1950's using artificial levels and not stratigraphic units; the artefact was found on the 6th level of an area (X-S) to the east and close to the front of the ramp. Although most of the finds in Level 6, where the silver ring was found, belong to the two phases of the 4th millennium BC (Ozieri I and II), the presence of some material relating to the first half of the 3rd millennium BC throws some doubt on the reliability of the dating. A copper object discovered in the same level, a crescent-shaped lamina which hints at more developed techniques of metallurgy, is likely to originate from a later phase. It features a curved tail which suggests its use as a pendant. The level below contained fragments of a skullcap, possibly the remains of a disturbed burial, to which the ring could also belong.

Many finds from the collective burials in rock-cut tombs date to the first half of the 3rd millennium BC. The most

important of these discoveries is that of Cungiau Su Tuttui (Fig. 1,15). This tomb was divided into two chambers, the outer one completed with large vertical stone slabs. The absence of skeletal remains, apart from a few teeth, means that there is no available data as to the type of burial, although it is likely to have been a multiple burial. The inner chamber contained ceramic vases, mostly miniature vessels, as well as 170 stone necklace beads and extremely rare obsidian splinters. Among the many silver objects were ten simple rings, as well as single, double and multiple spirals, three bracelets and four necklace discs (Fig. 6,9). Inside one stone bead, there was a small rolled up sheet of silver, interpreted as part of the metal wrapping. Five small copper daggers and a hairpin were also found. The outer chamber also contained a rich collection of grave goods. The exact number of objects is not known, but they included miniature vases, copper and silver rings, two hatchets, bracelets, small daggers made of copper, and stone necklace beads (Usai 2000).

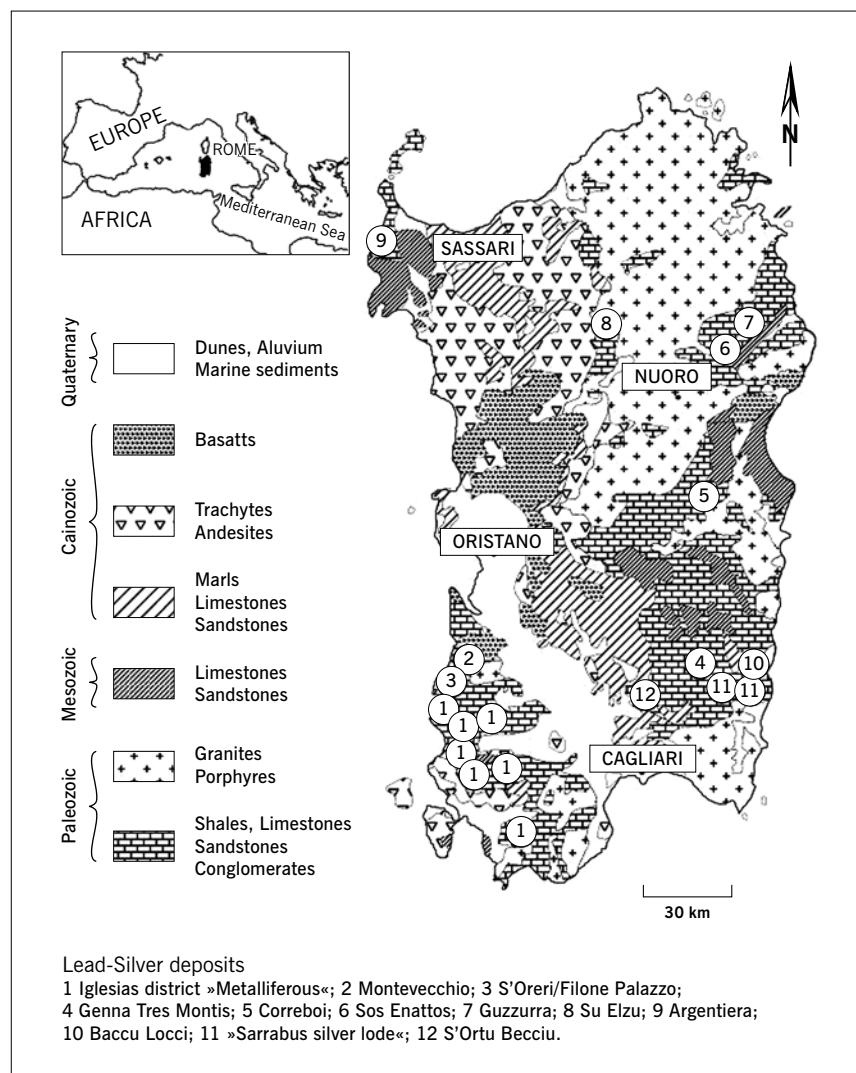
The composition of the grave goods of Tomb I of Filigosa (Fig. 1,3) was very different. It was a secondary deposition of a burial of an uncertain number of individuals of both sexes. The minimum number of individuals was probably quite high, considering the presence of over 500 ceramic vases. A small silver spiral ring was found in Tomb III of the same necropolis (Foschi Nieddu 1986).

The funerary chambers of the S. Caterina di Pittinuri tomb (Fig. 1,4) contained the poorly preserved remains of some 100 individuals, in secondary, re-deposited contexts (Cocco/Usai 1988). The buried were accompanied by few grave goods: Room B contained a few ceramic fragments, three obsidian arrowheads, part of a bone necklace, and a seashell containing ochre; Room C was home to a small carinated ceramic cup, eight obsidian arrowheads, clay and bone necklace pieces, two silver rings, one rectangular and the other circular in section (Fig. 6,7a); Room D contained few pottery fragments, a spiralled silver ring, and a silver necklace ring with circular section (Fig. 6,7b). The entrance hall and the first chamber did not contain skeletal remains; the other two chambers, of ritual importance, contained offerings of numerous miniature vases, pig jawbones, and fragments of deer antler.

The tomb of Scaba'e Arriu (Fig. 1,7) was used in two phases of the Eneolithic period, Filigosa and Monte Claro (Ragucci/Usai 1994–1998). Amongst the skeletal remains of the Filigosa phase at least 99 individuals of both sexes and all age groups, but mostly adults, were identified. Many fragments show evidence of burning and a number of individuals had trepanations. The grave goods consisted of 21 objects made from flint and obsidian, vases, pottery spindle whorls, and loom weights, as well as shell and bone elements for

Fig. 2 Lead-silver deposits in Sardinia.

Abb. 2 Blei-Silber-Lagerstätten in Sardinien.



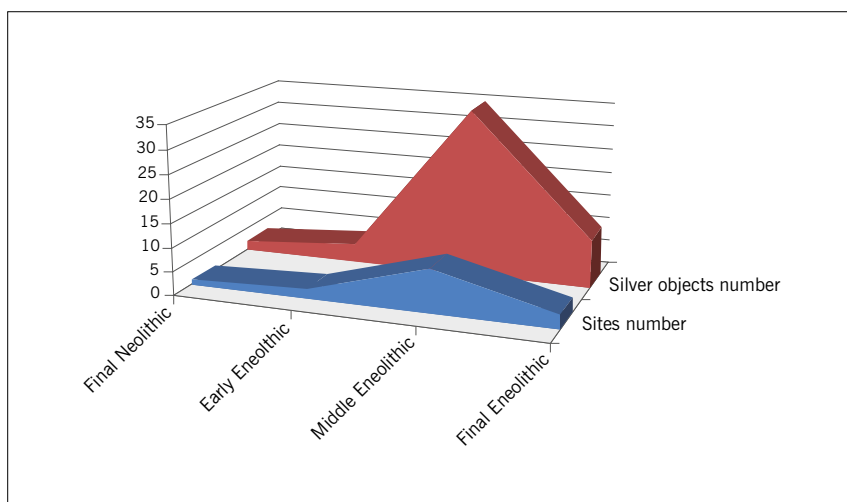


Fig. 3 Distribution of finds of different chronological phases by the number of artefacts and the number of sites.

Abb. 3 Verteilung der Funde verschiedener chronologischer Phasen nach Anzahl von Artefakten und Anzahl von Fundstellen.

necklaces. Also discovered were wooden and silver necklace pieces. The occupation layers of the last phase did not contain any metal objects.

A different architectural type is attested to at Serra Canigas (Fig. 1,10): a single-chambered hypogeum »a forno« (Atzeni 1985). It contained a collective burial, characterised by the ritual of secondary deposition following partial cremation. The tomb was in part destroyed by agricultural work, which led to the dispersion of some of the finds. What is interesting is the composition of the grave goods: miniature pottery, including some unusual forms (ryton), spindle whorls, a loom weight of larger dimensions than typical, ten arrowheads and two obsidian scrapers, and a conically-ended bone point. Amongst the copper objects were an awl, four daggers, a spiral ring found on a finger bone, and a double-spiralled ring (Fig. 6,6). The latter was also discovered attached to a finger bone along with a simple silver spiral ring. The discovery of five other daggers was mentioned, while only photographic documentation remains of another ten rings (some of copper and others of silver; simple and spirals rings).

Our picture of the local facies is completed by the documentation of the finds from the small »allée couverte« at Corte Noa (Fig. 1,5). The scarce skeletal remains were accompanied by 40 obsidian arrowheads and an indeterminate

number of copper and silver objects (Fig. 6,8), including disc rings, circular and spiral threads, and elements for necklaces, including a small cylindrical silver spiral tube. Lead also makes its first appearance, in the shape of an amorphous fragment (Atzeni 1988).

In the cultural sequence of Eneolithic Sardinia the facies of Monte Claro has no affinity to those of local tradition. This is reflected in the distinctive character of the metallurgical data. The only silver objects come from a hypogeum »a forno« (Tomb 14) from a small necropolis close to the Su Fraigu settlement (Fig. 1,11). The grave contained the crouched burial of an individual curled on its left side, two pieces of a silver necklace, one of which was cylindrical, and three pieces of a copper necklace. The remaining tombs did not have grave goods or contained only pottery (Ugas 1993).

The silver objects discovered in the necropolis of rock-cut tombs of Anghelu Ruju (Fig. 1,2) are datable to the Bell Beaker Culture of the Final Eneolithic; two pairs of oval necklace pieces with horizontal holes and a ring, discovered in Tombs XIII, XXbis, and XVIII (Taramelli 1909).

A silver ring from the Doneddu collection from an unknown locality, probably south-west Sardinia, may be attributable to the same period (Pau 2011).

The hypogeum-megalithic tomb of Bingia'e Monti (Fig. 1,6) also contained rich grave goods (Atzeni 1998). The

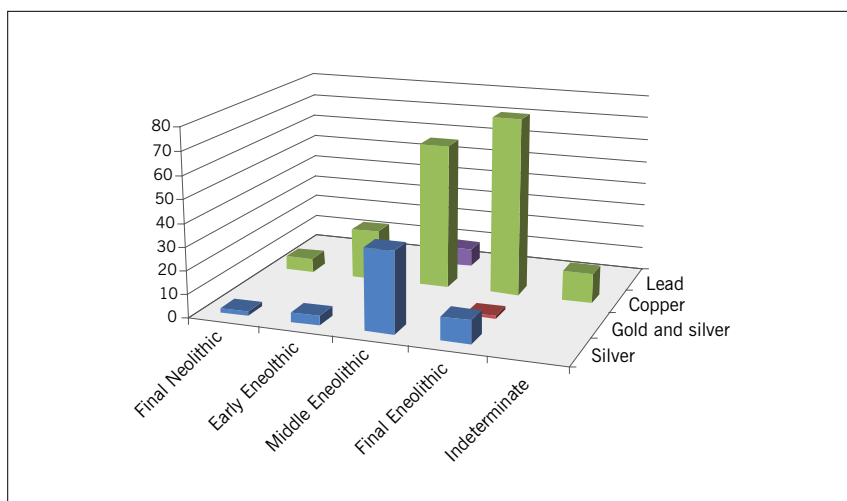


Fig. 4 Distribution of silver, electrum, copper, and lead artefacts.

Abb. 4 Verteilung der Silber-, Elektron-, Kupfer- und Bleiartefakte.

Excavation inventory no.	Chemical elements in %										Object	Excavation data
	Ca	Ti	Fe	Cu	Zn	As	Br	Ag	Sn	Pb		
6213	3.0		0.2				5.0	40			Ring	Structure 47, layer 1058
6214	2		0.1				3.5	20			Necklace ring	

Tab. 1 X-ray fluorescence (XRF) analysis of two silver rings from the Su Coddu/Canelles I. Badas settlement, Structure 47.

Tab. 1 Röntgenfluoreszenzanalyse (RFA) zweier Silberringe der Siedlung Su Coddu/Canelles I. Badas, Struktur 47.

occupation layers of the Bell Beaker period were characterised by the remains of numerous burials, some of which were placed in three stone cists. Three articulated skeletons were buried above the cists, curled on their left sides. The grave goods consisted of pottery, bone and shell necklace pieces, a stone brassard, two daggers and nine copper awls, seven buttons with V perforations, five arrowheads and five lunate microliths, and a electrum torque (Fig. 6,12).

The fourth Bell Beaker site which contained silver objects is the rock-cut tomb of Padru Jossu (Fig. 1,8). On the lower level, the remains of at least 18 skeletons were identified. They were accompanied by 16 ceramic vases, a number of pieces of necklaces including shell, bone and stone and four silver fragments (Fig. 6,10), twelve buttons, and roughly twelve bone pins, six flint lunate microliths and four obsidian lunate microliths, a lithic brassard, a copper dagger, and a silver disc (Fig. 6,11). The disc, thought to be a mirror or pendent, has a diameter of 5.4 cm, is 0.15 cm thin and has three perforations. The upper level of the grave contained the skeletal remains of an unknown number of bodies, seven ceramic vases, more than 2000 pieces of necklaces, eight buttons, three pins and three bone points, three lithic brassards, a blade and about ten obsidian lunate microliths. Copper was present in the form of six awls and a small dagger (Ugas 1998).

The archaeometric data

The Greeks called Sardinia »The island of silver veins« (Αργυρόφλεψ Νήσος; scholiast of Plato's *Timaeus*) because of the abundance of this metal. Such richness must have been noticed by prehistoric Sardinian human groups, and probably, by those who came into contact with them. The Sardinian deposits were subdivided into three families according to lead isotopic ratios: Cambrian deposits, Hercinian vein-type and polymetallic mixed sulphides (Valera et al. 2003). Here, the archaeometric analyses of Nuragic artifact suggest a preference for Cambrian silver deposits, located in Sulcis-Iglesiente (south-west Sardinia).

The beginning of metalworking in Sardinia is linked to the presence of copper and silver artefacts in the context of the first half of the 4th millennium BC. However, the first direct evidence of metalworking belongs to the second half of the 4th millennium BC, with the find of a crucible at Su Coddu/Canelles (Manunza 2005). The slag discovered in the structures of the first half of the 4th millennium BC could be attributed to the reduction of copper and silver, according to

Ugas et al. (1985), but this slag has never been scientifically analysed. The results of the analysis of other slag, later discovered in the Canelles I. Badas sector, rule out the possibility of them being related to metalworking (Melis 2005; Melis et al. 2012).

More than 50 silver artefacts from the Neolithic and Eneolithic have been discovered in Sardinia. Despite this, archaeometric research has been applied only to a limited number of objects. The authorisation of destructive analysis has only very rarely been permitted; the necessity to preserve very ancient and precious objects prevails. Such analyses are nearly always of very small, and in general, much oxidised objects. Despite the absence of data it is reasonable to presume that the silver, considering the availability of raw material from which the artefacts discovered in Sardinia were manufactured, originated on the island (Lo Schiavo 1996): in fact, although we cannot exclude that the oldest artefacts could have been introduced from outside, the presence of argentiferous ore deposits, of native silver, and of a high number of silver artefacts, permits us to formulate this hypothesis. It will need to be confirmed by archaeometric analyses in the future. The rarity of native silver (Atzeni 2005) might suggest an early exploitation of the numerous deposits of silver-rich galena. The absence of an evidence for smelting argentiferous ores or of cupellation may be justified by a lack of discoveries.

The picture is still too incomplete to recreate the »chaînes opératoires« of the earliest Sardinian metallurgy, as there is no data on extraction nor on the instruments used for mining, while there are also no specific studies of crucibles.

Recently, X-ray fluorescence (XRF) analyses were carried out on two objects recovered from Structure 47 of the Su Coddu/Canelles I. Badas settlement (Melis/Brunetti, unpublished research). An underlying level within the same building, that was roughly coeval, contained a bone fragment with a radiocarbon date of 3090–2890 cal. BC $2\sigma^2$. The two artefacts show a high level of oxidation. They consist of almost pure silver with calcium, iron and bromide. It is possible that this is linked to the phenomena of post-depositional interaction with the soil (Tab. 1).

Of the many silver artefacts found in Cungiäu Su Tuttui (first half of the 3rd millennium BC), only two rings and a necklace bead have been analysed (Atzeni et al. 2003; Lo Schiavo et al. 2005). The necklace bead is a stone bead covered with a thin layer of silver: this is interesting as it further highlights the importance attributed to silver.

The oldest Sardinian artefact made of gold and silver dates back to the Late Copper Age; a torque, discovered in a

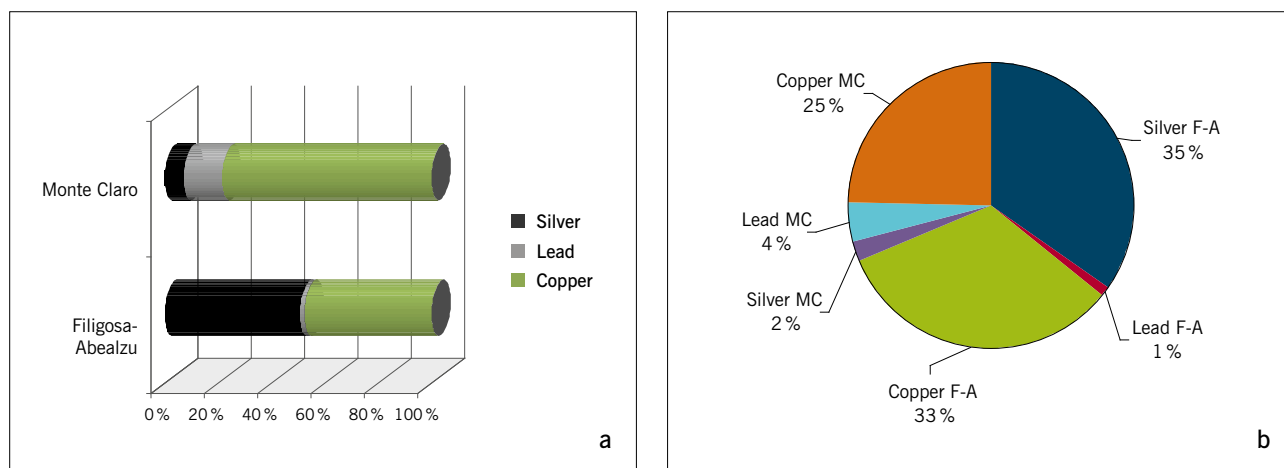


Fig. 5a–b Percentage comparison of silver, lead and copper artefacts between the Filigosa-Abealzu (F-A) and Monte Claro facies (MC).

Abb. 5a–b Prozentualer Vergleich der Silber-, Blei- und Kupferartefakte der Filigosa-Abealzu- (F-A) und Monte Claro-Facies (MC).

Bell Beaker grave at Bingia'e Monti. An analysis by using a scanning electron microscope with energy dispersive X-ray spectroscopy (SEM-EDX) revealed a higher percentage of silver in the outer layer of the necklace than underneath; the surface contained 65 % gold, 32 % silver and 2 % copper, whereas the metal beneath the surface layer contained 51 % gold, 45 % silver and 3 % copper (Atzeni et al. 2003; Lo Schiavo et al. 2005).

Finally, we will touch on a recent acquisition that is still being studied. The XRF analysis carried out on copper objects from the sanctuary of Monte d'Accoddi (Melis/Brunetti, unpublished research) show that some contain a considerable proportion of silver (from 2.5–13 %). This would appear to be an anomaly when compared to the archaeometric data available for Sardinia; the percentage of silver contained in analysed copper objects has always remained below 1 %, with the exception of an artefact of dubious authenticity which contained 6.5 % (Cincotti et al. 1998). While awaiting the completion of the research and subsequent acquisition of new archaeometric data, the possibility should be considered that this higher level of silver was intentional, in particular in two of the objects which contain 8 % and 13 % respectively. According to several authors the deliberate selection of arsenic-rich ores in the production of weapons of the Italian Eneolithic facies was perhaps done with the intention not only of improving mechanical characteristics, but also of transforming »the red colour of copper into silver«³. The silver colour would have given a definite symbolic value to objects which at times had no functionality, such as the overly thin Buccino-type daggers. Similarly, a high percentage of silver in copper artefacts could be due to a precise chromatic choice (C. Giardino, pers. comm.). Confirmation of this hypothesis could come, for example, from the finds of silver daggers in the Gamma tomb of Koumasa in Crete (Branigan 1966) or from the copper alloy dagger with 33.1 % silver from the Rinaldone

grave at Casanuova di S. Biagio della Valle in Italy (De Angelis 1995–1996). In connection with the latter the author, in addition to indicating the percentages of copper and silver contained in the dagger, specifies the presence of silver plate in the patina, while not going into further detail.

Discussion

The silver artefacts discovered in Sardinia dating to the 4th and 3rd millennium BC had generally uniform morphological characteristics, in particular simple band or spiral rings that were also extremely widespread in more recent periods (Bartelheim et al. 2012). The most common categories were rings (44 %), followed by necklace pieces (40 %) and bracelets (8 %). These were all small objects, with the exception of the disc from Padru Jossu and the electrum torques of Bingia'e Monti, from the Final Eneolithic.

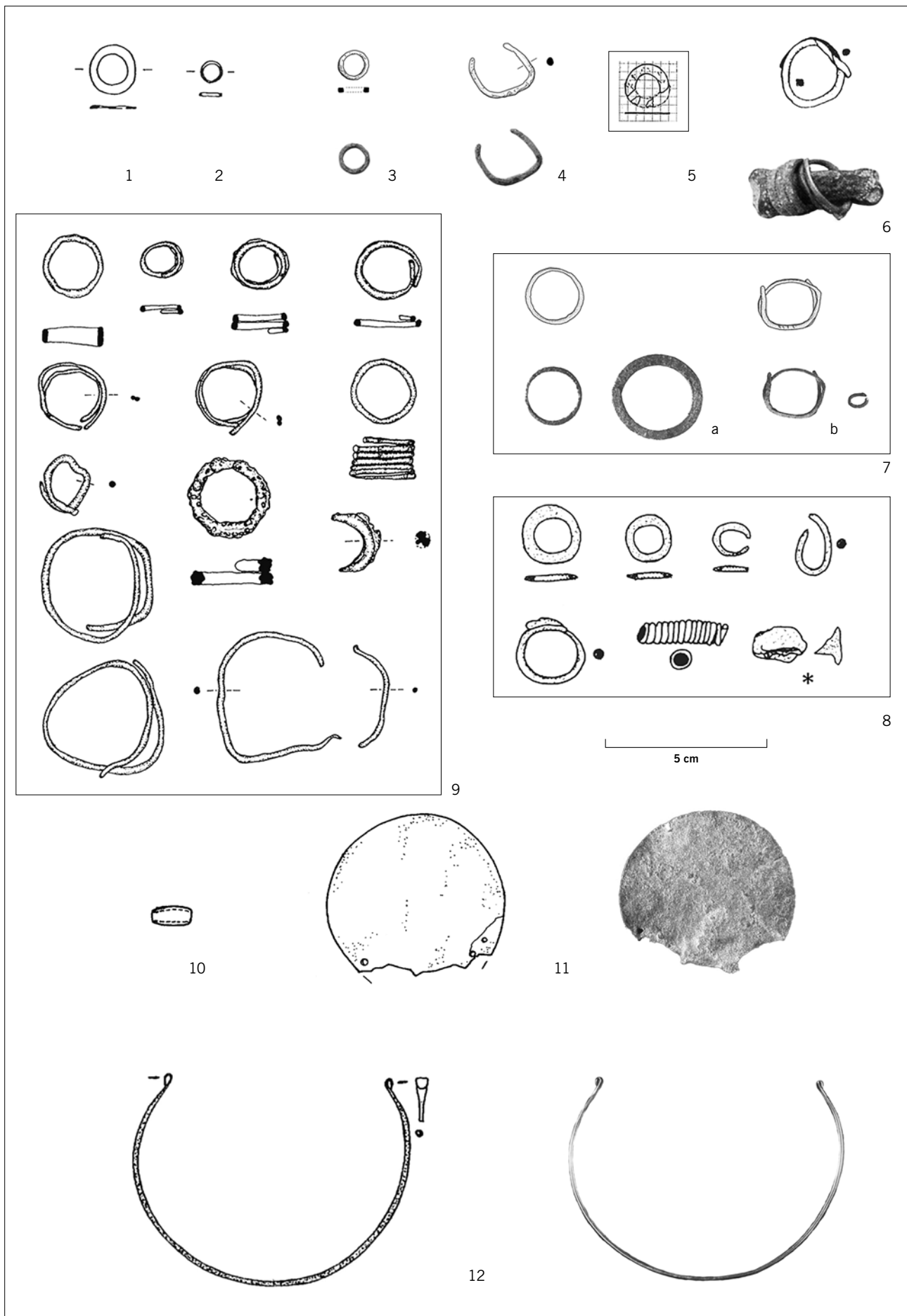
Chronology and cultural contacts

The archaeological data suggests the precocious appearance of silver and copper in Sardinia in comparison with the rest of the Mediterranean. On the origins of metallurgy in the central-western basin of the Mediterranean there exists

Fig. 6 (right page) Silver, lead (8*), and electrum (12) artefacts of the Neolithic and Eneolithic in Sardinia. 1–2 Pranu Muttetdu; 3–4 Su Coddù/Canelles; 5 Monte d'Accoddi, no scale; 6 Serra Cannigas; 7 S. Caterina di Pittinuri; 8 Corte Noa; 9 Cungiau Su Tuttui; 10–11 Padru Jossu; 12 Bingia'e Monti.

Abb. 6 (rechte Seite) Artefakte aus Silber, Blei (8*) und Elektron (12) des neolithischen und äneolithischen Sardiniens. 1–2 Pranu Muttetdu; 3–4 Su Coddù/Canelles; 5 Monte d'Accoddi; 6 Serra Cannigas; 7 S. Caterina di Pittinuri; 8 Corte Noa; 9 Cungiau Su Tuttui; 10–11 Padru Jossu; 12 Bingia'e Monti.

³ Giunilia Mair 2005; Pearce 2007; Ottaway/Roberts 2008; Giardino 2012; Dolfini 2013.



a wealth of literature, recently reprised in Dolfini 2013 and 2014.

A silver artefact was discovered in the Alepotrypa cave in southern Greece and is dated to the mid 5th millennium BC to early 4th millennium BC (Muhly 2002; Roberts 2009); however, in Cyprus the metallurgy of copper, which would be of fundamental importance during the following millennia, developed in an embryonic form in the second half of the 4th millennium BC (Guilaine 2011). Looking towards the central-western Mediterranean, in which Sardinia was part of the obsidian network since the Neolithic, we see that in the south of France silver was almost completely absent in the Eneolithic pre-Beaker and Beaker period. Metallurgy began in France during the second half of the 4th millennium BC and involved copper, lead, and gold⁴.

The number of metal objects found in Sardinia and Italy in the last quarter century has changed the picture considerably when compared with the data examined by Primas (1995): for the 4th and 3rd millennia BC the author had indicated only four finds in silver for Sardinia and two for northern Italy. Recently Bergonzi (2012) has published a paper with eleven such sites for the Italian peninsula and ten for Sardinia (Bergonzi 2012). The number of sites for Sardinia has now reached 16, including Bingia'e Monti where a necklace in electrum has been found.

In the absence of direct radiocarbon dating for Tomb V at Pranu Mutteddu, in which the most ancient silver artefacts were discovered, its date is assumed to fall within the first half of the 4th millennium BC. The radiocarbon dates of the facies, which the context belongs to, are included between the time 4000 cal BC 2σ and 3500 cal BC 2σ .

The entire 4th millennium BC represents an embryonic phase of metallurgy, characterised by a gradual growth in production that was not exclusively reserved for funerary rites. The early 3rd millennium BC signalled the beginning of a new phase, distinguished by important changes. The presence of numerous silver artefacts amongst grave goods emphasises this development.

On the Italian peninsula the metallurgy of silver developed predominantly in the Rinaldone facies, with particular concentration in northern Latium and in the area around Rome (Giardino 2012). Recent radiocarbon dating has made it possible to identify the period 3600–3300 BC as the start of the metallurgical activity of the Rinaldone groups (Dolfini 2010; Dolfini et al. 2011). The relationship of a Guardistallo-type dagger with the male burial of Tomb 21 at Ponte S. Pietro (3750–3537 BC⁵) suggests that as early as the transitional phase between the Final Neolithic and the Eneolithic metallurgic developments were well underway. The introduction of metallurgy should be searched for in the preceding Neolithic phase of central-western Italy (Liguria and Tuscany), and in particular in Chasséen-type contexts. Considering the intense activity of exchange between Sardinia and Tuscany during the Neolithic within the obsidian network, a comparison between the two areas is necessary. The Rinaldone artefacts had a greater morphological variety compared to the Sardinian examples (Anzidei et al. 2007); the

rings (flat disc, simple rings, or spiral band rings) are prevalent in Sardinia, while they are attested to on a single site in northern Latium (Fosso Conicchio), belonging to the Bell Beaker period. Elliptical and biconical beads, common in the Rinaldone area, appear in only one case in Sardinia. These differences, according to Bergonzi (2012), are evidence of a weak relationship between the two areas of production. Nevertheless, the archaeometric data seems to suggest the existence of contacts between Sardinia and the Rinaldone groups: examining the data produced by energy dispersive X-ray spectrometry (EDS) on silver finds from the Rome area, Giardino (2012) speculated about a possible origin of the mineral either from Tuscany or Sardinia. The quantity and the quality of these silver artefacts are evidence of a well developed Rinaldone metallurgical tradition. This information allows us to hypothesise that it played a part in the beginning of the Sardinian metallurgy of silver, through the transmission of knowledge at a time in which the circulation of Sardinian obsidian was still underway in the Tyrrhenian area.

During the final Eneolithic Bell Beaker phase the relationship between Sardinia and the mid-Tyrrhenian Italian coast is confirmed through various discoveries, among them the Grotta del Fontino (Vigliardi 2002); beads with an elliptical section similar to those at Padru Jossu were recovered from this cave. However, the dating of the find's context (3370–3020 cal. BC $2\sigma^6$) was much older than that at Padru Jossu (2463–2155 cal. BC $2\sigma^7$). A similar bead has been dated to the mid 4th millennium BC, discovered in Tomb 3 at Lunghezzina near Rome (Anzidei et al. 2003).

In Corsica, which during the Neolithic had played the role of a stepping stone in contacts between Sardinia and Tuscany, it is possible to find evidence implying contact with Rinaldone groups; for example at Monte Ortu a neck vase was discovered that resembles Tuscan models (Weiss 1996). Nevertheless, the metallurgy of silver does not seem to have reached this island; in the area of the Terrinien, copper metalworking using local ore was developed. The Terrina dates (Camps 1988), arrived at via Bayesian analysis by Pearce (2012) demonstrate the lengthy development of the Terrinien, partially contemporaneous with the Ozieri (4th millennium BC) and the Sardinian facies of the 3rd millennium BC, with which they seemingly share some form of contact. The weak relationship between them during the 4th millennium BC could suggest independent development of metallurgy on the two islands during the initial phases. Nonetheless several analogies in pottery and in the products and tools of metallurgy (such as awls and crucibles) (Melis et al. 2007) indicate that relations between the two islands did continue, in particular, perhaps, in the 3rd millennium BC. Interaction between the islands intensified during the Early Bronze Age, as noted by numerous authors. One gold and one silver ring discovered in the coffre at Palaghju date to this phase (2200–1750 cal BC; Peretti 1966).

Southern Italy and Campania in particular, an area frequented by the Gaudio facies, produced few silver artefacts

4 Ambert 2006; Carozza Mille 2009; Polloni 2008.

5 3750–3537 cal BC 2σ , 4872 \pm 35 BP; sample type: bone; OxA-18217.

6 4500 \pm 50 BP; lab. no. Beta 153574.
7 3843 \pm 41; lab. no. AA72153; Lai 2009.

(Bergonzi 2012; Giardino 2000) but copper artefacts often contain a certain percentage of silver (Giardino 2012). Contact with Sardinia has been hypothesised in relation to the sourcing of copper as well as some analogies in pottery production: the archaeometric data relating to some Gaudo copper artefacts are compatible to a provenance of the ore from Sardinia; some pottery lids found in Campania are very similar to those of the Sardinian Monte Claro facies (Melis 2009; Melis/Talamo 2012).

Elements of funerary ritual – the role of raw materials

In Rinaldone tombs the rituals were codified and practised over long periods. An interesting example is the necropolis at Selvicciola where metal objects seemingly have a deliberate distribution pattern: copper was distributed among the tombs to the north, silver and antimony (grey like silver) among those to the east. The two groups were not chronologically distinct, and neither were they regarding age or sex (Petitti et al. 2012). Making sense of the significance of this data is therefore an arduous task.

In Sardinia the analysis of the composition of grave goods and the understanding of their use in necropoleis is limited by various factors: the loss of metal artefacts due to illegal excavation; incomplete publications in which the minimum numbers of buried individuals and relative numbers of artefacts are not specified; incomplete data on sex, age and the relationship between the deceased and the grave goods; repeated reuse of tombs; the modest number of radiocarbon dates. Furthermore, the almost total absence of settlement sites in relation to the local facies of Neolithic tradition (Filigosa and Abealzu) makes demographic estimates near impossible and there is no understanding of the criteria which ruled access to the necropolis. Therefore, it is unfortunately only possible to make general observations, unsubstantiated by statistical data.

If during the 4th millennium BC copper and silver were equally present in dwellings and burials, during the 3rd millennium they became important components of grave goods, while almost disappearing from settlements. However, this is also true of obsidian, the use of which noticeably declines from the mid 4th millennium BC, but which continues to be included in burials together with objects, whose manufacture would require a significant technical skill. The presence of different raw materials seems to be conditioned by their accessibility: the burials containing the highest quantities of silver objects can be found in the mining district of Sulcis-Iglesiente, while those containing the most obsidian are grouped around Monte Arci. Silver does not, however, substitute other types of rock that were easy to access: 170 stone beads can be added to the numerous silver *parure* elements recovered at Cungiau Su Tuttui in the Suleis-Iglesiente mining district. On the sites relatively close to Monte Arci metal finds are well represented, but obsidian remains more important: at Corte Noa this is demonstrated by the presence of 40 objects. At Scaba'e Arriu obsidian is common, and silver sporadic. At S. Caterina di Pittinuri the quantity of obsidian was double that of silver.

Some sites placed at a distance both from the mining areas and from Monte Arci denote an exception to this trend. At Serra Cannigas metal objects are present in greater numbers than obsidian, although the latter is well represented by twelve objects. It is unlikely that the silver used in the artefacts deposited in the tomb originated in the nearby, but deep, galena deposits at S'Ortu Becciu (Valera et al. 2003). Both obsidian and silver are extremely rare in the Filigosa necropolis.

Another observation can be made concerning the number of artefacts in relation to the number of individual burials, where this is calculable; at S. Caterina di Pittinuri the 100 bodies were accompanied by an extremely low number of stone and silver artefacts; a similar situation can be found at Scaba'e Arriu, where there were 99 individuals, as well as in Tomb I of Filigosa. Here the number of bodies was uncertain but they were accompanied by circa 500 pottery vases. This data leads to a suggestion that silver and obsidian in the graves of the 3rd millennium BC generally accompanied only a few individuals, whereas pottery was used more widely.

Silver sometimes forms part of the grave goods of an individual, and sometimes part of their clothing or jewellery, as demonstrated by a ring found on a finger bone at Serra Cannigas; at S. Caterina the objects seem to be part of the individuals' personal belongings because in the areas dedicated to ritual practises that do not contain burials there were no metal artefacts but pottery and animal bones only. In other cases these objects may be offerings: as at Cungiau su Tuttui artefacts were found both in the funerary chamber and in the outer area, dedicated to ritual practises.

On the criteria of access to the necropoleis the data from Scaba'e Arriu makes an important contribution: the 99 bodies belonged to all age groups and may represent an entire community, without distinction of sex or age, while special treatment may have been reserved for some individuals, who were accompanied by specific objects such as those made of silver.

But the most striking aspect is the diverse role that silver plays among the native facies (Filigosa and Abealzu) and in the intrusive coeval facies of Monte Claro (Fig. 5a–b). In the former two, silver represents 51 % of all (61) metal artefacts, followed by copper (47 %) and lead (2 % of all metal finds). In the latter, copper is preponderant (79 %) compared to lead (14 %) and silver (7 %), the last being found in only one tomb. In the mining basin of Sulcis-Iglesiente there is a widespread presence of Monte Claro sites, while Filigosa sites are only sporadic. Nevertheless, the highest number of silver artefacts was found on a Filigosa site of this area (Cungiau Su Tuttui). On a regional scale it is notable how the arrival of Monte Claro groups influenced the settlement choices of the native facies; in southern Sardinia the numerous settlements of the 4th millennium BC were abandoned and occupied by Monte Claro groups. In the central northern part of the island the phenomena of integration and of impact can be observed: on one side there was sporadic pottery production with mixed styles, while on the other the territory began to feature fortified sites (Melis et al. 2007). It has also been hypothesised that the concentration of statuemihns in central Sardinia may have reflected the territo-

rial struggle between the two groups (Soula 2012). It is perhaps not a coincidence that in the heart of this territory the tomb of Corte Noa, with its wealth of grave goods, is to be found.

Finally, in the Bell Beaker Culture silver played an important role (22 %) when compared to coeval contexts outside from the island; however, it remains subordinate to copper (77 %).

Conclusions

The number of silver finds underlines its growing impact in Sardinian prehistory. The use of gold, present in the electrum necklace of Bingia 'e Monti, remained only marginal. This situation extended to the entire Italian peninsula, where before the Middle Bronze Age gold remained a great rarity (Bergonzi 2009).

The coeval appearance of silver and its importance in Sardinia and in the Rinaldone area, together with the possible Sardinian origin of silver in some peninsular objects, suggests an exchange of knowledge between the two groups. Considering the most striking Eneolithic characteristics of Rinaldone (e.g. most advanced metallurgy, growth of territorial competitiveness, rich grave goods with many arms) compared to the Ozieri we can even suppose that contact between the two groups sparked the »Eneolithisation« of Sardinia. This hypothesis does not conflict with the model

proposed by Dolfini (2013) on the origins of metallurgy: according to this model knowledge of metallurgy would have spread from the Balkans to northern and central Italy and from there to Corsica and Sardinia. While there are presently insufficient elements to confirm or reject the hypothesis of an independent origin of metallurgy in Sardinia, it is, however, plausible to imagine that there would be an exchange of knowledge via the various contacts with central Italy.

The second half of the 4th millennium BC sees the adoption of a more opportunistic approach to the manufacture of stone tools, pottery, and the use of hard animal materials (e.g. bone, horn, shell, ivory, teeth), paired with a reduction in production times, which may be associated to the development of metallurgy, as well as agriculture (Melis et al. 2012).

During the 3rd millennium BC the use of silver increases, and it seems to become an identifying symbol of Neolithic groups, in contrast to the Monte Claro society, that used it only very rarely.

Acknowledgement

I wish to thank all the colleagues who have assisted during the development of this work, A. Brunetti, G. Carboni, A. Dolfini, D. Cocchi, B. Mille, and in particular C. Giardino and J. Guilaïne.

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Bislang erschienene Bände in der Reihe »Tagungsbände des Landesmuseums für Vorgeschichte Halle«

Die Reihe der Tagungsbände des Landesmuseums wurde 2008 ins Leben gerufen. Anlass dazu war die Konferenz »Luthers Lebenswelten«, die im Jahr 2007 in Halle ausgerichtet wurde. Bereits der zweite Tagungsband widmete sich mit dem Thema »Schlachtfeldarchäologie« dem Mitteldeutschen Archäologentag, der seit 2008 jährlich von Landesamt für Denkmalpflege und Archäologie Sachsen-Anhalt veranstaltet und zeitnah publiziert wird. Dem großen Anteil inter-

nationaler Autorinnen und Autoren entsprechend, erscheinen viele Beiträge dieser Reihe in englischer Sprache mit deutscher Zusammenfassung.

Mit dem bislang zuletzt erschienenen Tagungsband konnten die Vorträge und Posterpräsentationen des 5. Mitteldeutschen Archäologentags »Rot – Die Archäologie bekennt Farbe« in zahlreichen Artikeln renommierter Forscher verschiedener Fachdisziplinen vorgelegt werden.

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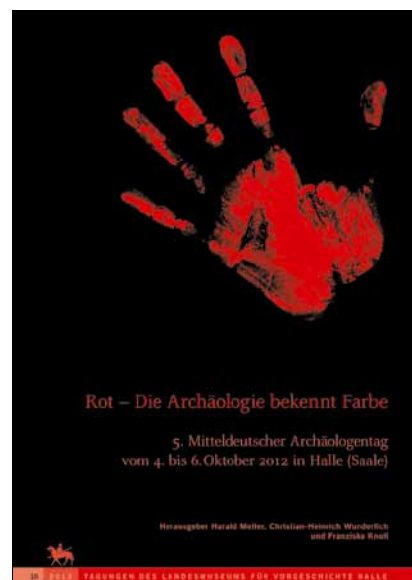
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