

Chapter 12

Caves in Need of Context: Prehistoric Sardinia

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Abstract

This chapter attempts to synthesize the available data relating to the human use of over 100 natural caves in Sardinia during prehistory, and to contextualize these caves and their occupations in relation to wider landscapes, lifeways and beliefs, over space and time. In the Upper Palaeolithic and Mesolithic, a few caves were used by mobile groups as base-camps and shelters within wide socio-economic territories. In the Early Neolithic, large inland caves continued to serve as residential bases for communities practicing a mixed economy, while other caves sheltered living – and now also deceased – members of mobile task groups. Between the Middle Neolithic and the Early Iron Age, the ritual use of the interiors of selected caves was elaborated, whereas large caves were increasingly abandoned as long-term dwelling places as the Sardinian landscape became more extensively settled, although a few caves continued to be used as convenient shelters.

Introduction

Cave archaeology in Sardinia began in 1873. In that year, Giovanni Spano, a Sardinian priest, linguist and archaeologist, excavated some Neolithic deposits in Grotta Sa Rocca 'e Ulari, near Borutta (Spano 1873; see also De Waele 2005). He was soon followed by other Italian scholars interested in geology, palaeontology and archaeology (*e.g.* Francesco Orsoni, Arturo Issel and Filippo Vivanet), who undertook excavations in caves such as Grotta di Sant'Elia and Grotta di San Bartolomeo, Grotta s'Orieri, and Grotta di Genna Luas. After something of a lull in the first half of the twentieth century, with the notable exception of excavations in the Grotta di San Michele ai Cappuccini, Sardinian cave studies revived following the 1955 National Speleological Congress, which was held in Sardinia. New discoveries and excavations have since been made by a variety of groups, including members of Sardinian speleological societies, the staff of the Sardinian Soprintendenze per i Beni Archeologici,

local archaeology enthusiasts, and scholars from universities in Sardinia, northern Italy, the UK and the Netherlands. Their fieldwork has resulted, to date, in the discovery of prehistoric remains in some 114 natural caves in Sardinia (see Appendix), including numerous karst caves (ranging from extensive underground systems to small caves and rockshelters), caves in granites (especially in north-east and central Sardinia), and a few caves resulting from the erosion or alteration of volcanic rocks (such as Sa Grutta de is Caombus, formed by a tectonic fissure in basaltic rock).

With the exception of a few monographs and articles detailing the results of excavations and specialist analyses at particular cave sites (*e.g.* Agosti *et al.* 1980; Carta 1966–7; Ferrarese Ceruti & Pitzalis 1987; Klein Hofmeijer *et al.* 1987–8; Lo Schiavo and Usai 1995; Pitzalis 1988–9; Taramelli 1915; Trump 1983), the majority of this work has only been published superficially, as preliminary reports and notes in conference proceedings and journals, or as inclusions in grand narratives of Sardinian prehistory (*e.g.* Lilliu 2003) – most dominated by a concern with the refinement of relative chronologies based upon artefact typology. This patchwork of incomplete information has consequently undermined previous attempts to synthesize the available data relating to prehistoric caves in Sardinia (*e.g.* Fadda 1991; Usai 2008). It has also led to a decontextualization of the archaeology of the caves, particularly geographically.

The aim of this chapter, then, is not only to produce a synthesis of the human uses of caves (including rockshelters) in prehistoric Sardinia, but also to attempt to contextualize those caves as meaningful ‘lived in’ places, appropriated and abandoned by real people who participated in dynamic cultural practices and social relations. This approach complements my on-going field project in and around a group of prehistoric caves in the territory of Seulo in central Sardinia, which is seeking to evaluate ideas about the ritual transformation of persons, objects and caves using a range of modern scientific techniques (Skeates 2009–10). My chapter focuses on natural caves (as opposed to artificial caves – such as rock-cut tombs), and extends over a 19,000 year period, from the Upper Palaeolithic to the Middle Bronze Age, ordered, as much as possible, by an absolute chronology based upon calibrated radiocarbon dates (Stuiver *et al.* 2005; Tykot 1994). I do, however, exceed these limits for comparative purposes.

Upper Palaeolithic and Mesolithic caves: durable places in a dynamic islandscape

The human use of caves in Sardinia during the Upper Palaeolithic (c. 20,000–11,000 cal BC) is currently represented by just one archaeological site: Grotta Corbeddu (*e.g.* Klein Hofmeijer 1997; Klein Hofmeijer *et al.* 1987–8; 1989; Sondaar *et al.* 1984; 1995; Spoor 1999; Spoor and Sondaar 1986) (Fig. 12.1).

This cave can be interpreted as a significant base-camp and landmark, situated on the edge of the Supramonte uplands in the Valle di Lanaittu, in east-central Sardinia. The valley contains numerous large karstic caves, and may have comprised a key route (for humans and migrating deer) through a more extensive hunting and gathering territory that incorporated a variety of ecological zones, camp-sites and activity areas. Grotta Corbeddu is a large cave system, extending more-or-less horizontally over some 130 m, with a small but accessible main entrance leading to a succession of four relatively commodious ‘halls’, connected by more restricted spaces. Speleotherms are present, particularly in the interior, and a water channel runs between two of the halls. Knowledge and use of this durable structure in the landscape evidently passed between successive human generations, leading to the gradual accumulation of deep, stratified, cultural deposits, which have been radiocarbon dated to a timespan of around 22,000–11,000 years cal BC. The human use of the cave system at this time extended beyond the naturally lit entrance area: since relevant deposits were found not only in Hall 1, adjacent to the entrance, but also in Hall 2, in the interior. Processing activities are indicated by the large proportion of scrapers in the Epigravettian style lithic industry. Such tools were produced mainly on silicified limestone, although the presence of other rock types, such as flint, quartz and goethite, indicates that raw materials were obtained from a variety of sources. The bones of hunted animals, butchered and consumed in the cave, were dominated by two now extinct members of Sardinia’s native Late Pleistocene fauna, the deer (*Megaceros cazioti*) and the Sardinian pika (*Prolagus sardus*). Some of the deer bones, especially the ulnae and mandibles, appear to have been used opportunistically as artefacts. A few disarticulated human bones were also found, although it is unclear precisely how they were deposited in the cave.

A slightly expanded number and variety of caves were used by human groups in Sardinia during the Final Upper Palaeolithic and Mesolithic (c. 11,000–6000 cal BC), including: Grotta Corbeddu; Grotta di Su Coloru (Fenu *et al.* 1999–2000; 2002; Martini *et al.* 2007; Pitzalis *et al.* 2003); and Riparo di Porto Leccio (Aimar *et al.* 1997) (Fig. 12.1).

In Grotta Corbeddu, the relevant stratified cultural deposits (Stratum 2, Hall 2) have been radiocarbon dated to 11,100–6600 cal BC. Charcoal derived from fires lit in the cave was now a characteristic component of these deposits, in addition to the continued presence

of bones of the Sardinian pika (*Prolagus sardus*), and a few disarticulated human bones. Grotta di Su Coloru is comparable in a number of ways. It is a large karstic cave complex, extending for a total of around 640 m. One large and one much smaller entrance lead to a wide and sinuous main gallery, from which depart two long corridors and various other spaces. Speleotherms are present, as well as an active spring. Stratified deposits, the base of which has not yet been reached by on-going excavations, contained a Late Mesolithic stratum (L). This has been radiocarbon dated to 7000–6200 cal BC. It contained charcoal, a lithic industry dominated by scrapers, and the bones of microfauna. The cave is located on the interfluvial Tanna Manca plateau, at an altitude of 340 m, about 12 km inland from the north coast of Sardinia.

By contrast, Riparo di Porto Leccio is a small rock-shelter, situated in a bay on the north coast of Sardinia. Here the Mesolithic style lithic industry was produced on local pebbles. The choice of this site presumably reflects a more maritime orientation for the groups of ‘trapper-fisher-coastal-nomads’ who sheltered here, whose annual territory may have extended overseas as much as inland (Costa *et al.* 2003).

Early Neolithic caves: multi-purpose structures

A significantly larger number and variety of caves were occupied during the Early Neolithic throughout Sardinia, spanning the earlier ‘Cardial Impressed Ware’ phase (5700–5300 cal BC) and the later ‘Filiestru’ ceramic phase (5300–4700 cal BC) (Fig. 12.2). Some 21 Sardinian caves have been reported to contain pottery of this period, ranging from large caves previously occupied during the Palaeolithic and/or Mesolithic, to a small rockshelter used as a shelter and burial place for hunter-herders, to large inland caves inhabited by early farming communities, to coastal caves with more specialized economic and ritual uses (see Appendix). In addition, a few Early Neolithic open-air sites are known in Sardinia, at places such as Sella del Diavolo and Su Stangioni. Their relationship to the cave-sites is unclear, but may have been complementary, particularly in the case of Sella del Diavolo, which is located on the Capo S. Elia promontory on the south coast of Sardinia, close to the Early Neolithic cave-sites of Grotta di Sant’Elia and Grotta di San Bartolomeo (Atzeni 1962; Orsoni 1879; Patroni 1901).

The large Upper Palaeolithic and Mesolithic cave complexes of Grotta Corbeddu and Grotta di Su Coloru continued to be occupied during the Cardial Impressed Ware phase. However, the degree of demographic and cultural continuity indicated by these sites remains

ambiguous. Certainly, at Grotta Corbeddu, the Early Neolithic deposits (in the lower part of Stratum 1a, Hall 2), which contained the remains of hearths and wild animals, are indicative of the maintenance of a mainly hunting and gathering economy focussed on locally available species (Sanges 1987). But they also contained Cardial Impressed Ware, obsidian artefacts, and seashells reflecting new practices and long distance connections.

The Riparo sotto roccia Su Carroppu represents another category of Early Neolithic cave-site (Atzeni 1972; 1977; Lugliè *et al.* 2007). It has been interpreted both as a refuge (possibly for groups of hunter-herders) and as a burial place. The site is located some 10 km inland from the south-west coast of Sardinia, at an altitude of 350 m, in a zone of rocky hills. It overlooks a small valley. It is a small but deep limestone rockshelter. Its lowest deposits contained: fragments of Cardial Impressed Ware; remains of domestic and wild animal species, the latter including deer, boar, Sardinian pika (*Prolagus sardus*), and fish; and chipped stone artefacts, including geometric microliths, of local chert and quartzite and imported jasper and obsidian, the latter divided into blades on Sardinian C type material (from sources on the northeast side of Monte Arci) and flakes on Sardinian A and Sardinian B2 type material (from sources in the southwestern part of Monte Arci and along the lower western slopes of Monte Arci). The contracted skeletons of two buried individuals were also found in the interior of the cave, accompanied by a perforated disk of schist and by perforated seashells of the rustica dove shell (*Columbella rustica*) and of the scallop (*Pectunculus glycymeris*).

Large inland caves, such as Grotta Filiestru and Grotta Sa Korona di Monte Majore, were also used as dwelling places for early farming communities. Grotta Filiestru, for example, is located at 410 m above sea level, on the north side of a small valley, on the edge of the Bonu Ighinu basin, some 20 km inland from the north-west coast of Sardinia (Trump 1983). The site has justifiably been interpreted as the dwelling place of a small group of early farmers, who presumably cultivated their crops and herded their animals in the catchment area of the well-placed cave, which lay just 30 m from a permanent spring. The cave is composed of a large and well-lit main chamber (21 m long, and 6–2 m high), from which depart three restricted passages. Excavations in the large chamber uncovered Cardial Impressed Ware deposits overlying a culturally sterile basal deposit. Radiocarbon determinations provide a date-range of around 5700–5350 cal BC for this first phase of occupation. The deposits contained: ashes; remains of wheat (*Triticum monococcum* and *Triticum dicoccum*) and peas (*Pisum* sp.); domesticated animal bones (sheep/goat, pig and cattle); wild animal bones, including those of the red fox (*Vulpes vulpes*) and Sardinian pika

(*Prolagus sardus*); pottery fragments; chipped stone tools and debitage of Sardinian obsidian, jasper and flint; grindstone fragments; and bone awls. The obsidian was used especially for cutting meat and hides (Hurcombe and Phillips 1998). Overlying these deposits was a stratum containing predominantly plain pottery, assigned to the later 'Filiestru' ceramic phase of the Early Neolithic, and radiocarbon dated to around 5200–4700 cal BC.

Some small coastal caves, such as Tafone di Cala Corsara and Riparo di Santo Stefano, appear to have been used as shelters during the course of primarily economic-related activities focussed on coastal resources. Tafone di Cala Corsara, for example, lies on the Cala Corsara bay on the south coast of the Isola di Spargi, an island in the Maddalena archipelago, situated off the north coast of Sardinia (Ferrarese Ceruti and Pitzalis 1987). Its excavators have interpreted it as a key stepping stone and resting place along an important maritime communication route between Corsica and Sardinia, although its local significance as a base for the exploitation of coastal food resources should also be considered. It is a small cave, roughly 4 m in diameter, and 2–3 m high, and was produced by weathering of a granitic rock face. It contained an intact basal deposit with three sherds of Cardial Impressed Ware, some chipped stone artefacts of flint and obsidian, and mollusc shells.

By contrast, the deep cave of Grotta Verde was probably used during the Early Neolithic primarily for the performance of mortuary rituals (*e.g.* Antonioli *et al.* 1994; Lamberti *et al.* 1986; Lilliu 1978; Lo Schiavo 1987; Tanda 1987). Its entrance is situated 75 m above present-day sea level, on the steep east slope of Capo Caccia, a coastal promontory (containing several karstic caves) flanking the bay of Porto Conte. The entrance leads down to a large chamber containing huge speleotherms, from which depart various branches, including one that descends down a slope of 45 degrees to a terminal chamber. Today, this chamber is filled by a small freshwater lake, but in the Early Neolithic, when the sea level was at least 10 m lower, it would have led down to a small chamber with niches, and then down again to a larger submerged chamber and other spaces. Underwater excavations in the small chamber revealed a series of human burials, placed along a wall of the chamber, in the natural niches and in rock-cut hollows. The human remains were badly preserved and have not been directly dated, but included skull fragments and vertebrae, three of the latter in anatomical connection. Three whole Filiestru style vessels accompanied the burials, the smallest of which had been placed inside the largest one. Other vessels were found in the larger submerged chamber, perhaps having been dropped during the course of collecting drinking water from (what would then have been) an underlying freshwater lens overlying seawater.

Middle and Late Neolithic caves: continuity and ritualization

Selected caves continued to be exploited by human groups in Sardinia for a variety of purposes during the Middle and Late phases of the Neolithic, some now with even more overtly ritual dimensions (Fig. 12.3). The Middle Neolithic (or Bonu Ighinu ceramic phase) dates to around 4700–4000 cal BC, while the poorly defined Late Neolithic (or San Ciriaco phase) can only be placed somewhere around 4000 cal BC. Some 40 caves in Sardinia have been reported to contain pottery of this period (see Appendix), which is almost double the number of caves occupied during the Early Neolithic (21). The caves range from large inland cave dwellings, to small coastal shelters, to more unique ritual caves. In addition, a growing number of open sites in Sardinia can be assigned to the Middle Neolithic, one third located in the Campidano lowlands of the south-west Sardinia. The best-known of these is Cuccuru S'Arriu, a village with a cemetery of rock-cut tombs containing inhumations and secondary burials accompanied by grave goods, including a series of stone figurines.

Large inland caves continued to be occupied, inhabited and abandoned during the Middle Neolithic, many having previously been occupied during the Early Neolithic. For example, at Grotta di Su Coloru, the presence of three strata (E–C) containing Bonu Ighinu pottery is indicative of a long-term series of occupations (one with cobbling) and abandonments. By contrast, at Grotta Filiestru cultural deposits containing Bonu Ighinu pottery continued to accumulate in a single stratum, radiocarbon dated to around 4500–4350 cal BC. It was probably at this time that a pit was dug down into the underlying Early Neolithic deposits and filled with three pottery jars (which remained intact), one containing around 2 kg of red ochre, the other two a black pigment. These pigments, if not also the special deposit itself, might have been associated with the performance of some kind of colourful rituals in (and even around) the cave, although they might also have been used in manufacturing processes. A fragment of a rare 'lithic ring' (perhaps used as a bracelet), made of a polished, dark grey stone, measuring about 10 cm in diameter, was also found in the Middle Neolithic deposits. Animal bones from this phase of the cave's history indicate increasing numbers of cattle at the expense of pig, while plant remains indicate the (presumably local) cultivation of a wider range of crop plants, including emmer wheat (*Triticum dicoccum*), faeroese barley (*Hordeum hexasticum*), lentils (*Lens esculenta*) and broad beans (*Vicia faba*). The nearby Grotta di Sa 'Ucca de Su Tintirriolu (Mara) was also occupied during the Middle Neolithic, probably for the first time (Alessio *et al.* 1978; Contu

1970; Loria and Trump 1978; Trump 1990, 18–19). The site lies on the opposite side of the valley to Grotta Filiestru. It is a 301 m long karst cave. A relatively narrow entrance leads to a 10 m long chamber, which is separated by a low area from a spacious hall (around 60 m long, 6 m wide and 3.5 m high) and a narrow horizontal passage. The deposits in the main chamber contained a large quantity of ash and other cultural material. A sample of charcoal has been radiocarbon dated to around 4700–4350 cal BC. The precise nature of this Middle Neolithic occupation of the cave is unclear. So too is the precise relationship between Grotta di Sa ‘Ucca de Su Tintirriòlu and Grotta Filiestru, which lie just 400 m apart, and which – according to the radiocarbon dates – were occupied at the same time. But they presumably formed part of a more intensively inhabited landscape incorporating the Bonu Ighinu basin, within which caves comprised integral elements of dwelling, ritual and cosmology.

Small caves also continued to be occupied during the Middle Neolithic, probably as shelters used in relation to a narrower range of economic activities linked to the exploitation of local resources. For example, the small caves formed by weathering (known to geologists as ‘tafoni’) eroded into the granite of the Maddalena archipelago continued to be used: in this case, one lying on Cala Serena, a small bay on the north-west coast of the Isola di Caprera, was found to contain two decorated sherds of Bonu Ighinu pottery and some chipped stone artefacts (Difraia 2007).

Some other Sardinian caves appear to have been used exclusively for the performance of rituals during the Middle-Late Neolithic, including burial rites, the production of anthropomorphic cave paintings, and the deposition of figurines, although the dating of the art in particular is problematic.

Grotta Rifugio, for example, was used as a burial cave during the Middle Neolithic (Agosti *et al.* 1980; Biagi and Cremaschi 1978; Carta 1966–7; Germanà 1978). It may also have been perceived by its users as a durable natural monument, strategically situated in a cultural landscape whose use remained characterised by a degree of human mobility and connectivity, despite the adoption of agriculture. It is located in a significant crossing-place in the landscape: on the northern edge of the Sopramonte uplands, at the mouth of the Gonogósula gorge, about 600 m from the point at which the tributaries of the Oliena and Frattale streams join to form the River Cedrino. The limestone cave is of modest dimensions (16 m long), and is composed of three spaces, which lie on three different levels. The entrance chamber, which contains speleotherms, is followed, after a 2 m drop, by a chamber with an adjoining passage, from which one descends to a passage of around 11 m in length, access to which was widened by the breakage of some stalactites (presumably in prehistory).

Disarticulated human remains, belonging to an estimated nine adults and three children, were found in this deepest part of the cave system, possibly having been carried and deposited there during the course of secondary burial rites. They were accompanied by a deposit of dark soil, containing ashes and charcoal, the latter derived from plant species indicative of a local vegetation of both Mediterranean maquis and sub-mountainous brushwood (reflecting the ecotonal nature of the cave's location). This burnt deposit contained a large quantity and wide range of ritual offerings, many made of raw materials obtained (either directly or through exchange) from more distant sources, including the coast of Sardinia, situated about 20 km to the east. The most numerous category of artefact was body ornaments. These included: 1284 small cylindrical necklace beads – 860 of the green silicate mineral chlorite, 424 of the carbonate mineral aragonite; 410 tubular tusk shells (*Dentalium* sp.); 127 perforated rustica dove shells (*Columbella rustica*); 12 bracelets of European thorny oyster (*Spondylus gaederopus*); four perforated dog cockle shells (*Glycymeris glycymeris*); one miniature ring made from a small top shell (*Gibbula divaricata*); seven perforated boar's tusks; and one bone pendant. Other artefacts comprised: fragments from at least 17 pottery vessels, including a deep cup with zoomorphic handles; 24 chipped stone artefacts – of obsidian, flint and basalt; a greenstone axe-head; three bone points and one bone awl; and a pebble with coloured traces of ochre. Faunal remains included: numerous wild species; the bones of at least four sheep or goat and one cow; and mollusc shells.

Grutta I de Longu Fresu is an example of a Neolithic painted cave, recently discovered by M. G. Gradoli, containing a set of material features of symbolic and ritual significance (Gradoli and Meaden in prep; Skeates 2009–10). It lies on the edge of a small stream, the Riu Longu Fresu, at an altitude of around 750 metres, in the uplands of the Barbagia di Seulo. It is a relatively small, 15 m long, karst cave. Its restricted entrance leads to a low tunnel with eight lateral niches, some containing traces of former springs. At the back of this cave, four probably related Neolithic features have been identified, close together in an area just two metres long. The first is the skull of a human adult, cemented to the cave wall by flowstone, and radiocarbon dated to around 4250–4050 cal BC. This date places the skull either towards the end of the Sardinian Middle Neolithic or in the poorly defined Late Neolithic (San Ciriaco phase). The second feature is represented by a few disarticulated human bones, dated to the same period, found scattered in the adjacent floor deposits and in some of the niches. These probably represent the original deposition of at least one whole human body on the floor of this cave, and the secondary placement of some of its bones along the side walls and niches, but also the possible removal of other bones from the cave (J.

Beckett pers. comm. 2009). The third feature is a small, semi-circular, stone structure, formed by a modified group of stalagmites, within whose delimited area was found a small trapezoidal axe-head of smoothed greenstone. The fourth feature is a small group of paintings in an adjacent niche, just to the side of a now extinct spring (Fig. 12.4). The paintings were produced with a dark grey pigment. They are difficult to decipher, being covered by flowstone, but the general consensus is that at least two schematic linear representations of anthropomorphic (or combined human-animal) figures can be seen, with legs, arms and either an elongated head or horns. The style of these paintings ties in well with the corpus of Neolithic cave paintings in the central Mediterranean (e.g. Graziosi 1973). However, samples of the flowstone overlying the paintings are currently being dated using the Uranium-series method, in order to obtain a more precise estimate of the age of the paintings, particularly compared to the radiocarbon dated skull.

Grotta del Papa is another example of a painted prehistoric cave with schematic anthropomorphic ‘stick’ figures, which *might* also date to the Middle Neolithic (D’Arragon 1997). Even more problematic are some corpulent, anthropomorphic figurines, made of stone and bone, imprecisely provenanced to a few Sardinian caves, but comparable in style to the series of stone figurines found in the Middle Neolithic cemetery of Su Cùccuru s’Arriu (e.g. Lilliu 1999, 180–1, 194, 209–12; 2003, 45, 51). Examples come from Riparo sotto roccia di Su Monte, Grotta I di Su Concali de Coróngiu Acca, and Grotta di Monte Meana. Although these objects are clearly of symbolic significance, it is difficult to ascribe ritual significance to the caves in which they were found: particularly given the loss of context caused by their poorly recorded discoveries.

Final Neolithic and Earlier Copper Age caves: continuity

In general, the pattern of cave use established in the Middle-Late Neolithic remained very much the same in the Final Neolithic and Early Copper Age, with the human uses of caves ranging from dwelling to burial and other ritual practices (Fig. 12.5). The Final Neolithic (primarily associated with the Ozieri culture and ceramic style, but also, in north-east Sardinia, with the Arzachena culture) dates to around 4000–3200 cal BC, while the Earlier Copper Age (or Sub-Ozieri/Abealzu-Filigosa ceramic phase) can only be tentatively dated to around 3200–2700 cal BC. Some 46 caves in Sardinia have been reported to contain pottery of this period (see Appendix). Taken at face-value, this again represents an increase in cave use compared to the previous period (from 40 to 46). However, the Final Neolithic and

Earlier Copper Age was almost twice as long as the Middle and Late Neolithic. Certainly, then, any increase in cave use was not on the same scale as the great expansion of open villages, rock-cut tombs (or *domus de janas*) and other monuments (including menhirs, dolmens, cists, megalithic circles, and the unique ceremonial mound and shrine at Monte d'Accoddi) in Sardinia during the Final Neolithic, which outnumbered cave sites by a ratio of about 8 to 1 (Lilliu 2003). Natural caves certainly comprised an integral part of the rich cultural and cosmological landscape of Final Neolithic Sardinia: as indicated, for example, by the various material dimensions of their human uses, including certain symbolic details, which echo features of the artificially constructed structures for the living, the dead and the supernatural. But, given the numerical dominance of other types of site, the significance of caves may now have become primarily local (particularly compared to their apparent regional significance in the Upper Palaeolithic and Early Neolithic).

Large inland dwelling caves, first occupied during the Early or Middle Neolithic, continued to be inhabited during the Final Neolithic. Grotta di Sa 'Ucca de Su Tintirriòlu, for example, appears to have been used more intensively during the Final Neolithic, since the bulk of the prehistoric material excavated at this site can be assigned to the Ozieri culture, radiocarbon dated here to around 3950–3550 cal BC (Trump 1989). The deposits contained outstanding quantities of cultural material, including: much ash, a few human bones, animal bones and mollusc shells, 2,400 classifiable Ozieri style pottery sherds from 11 types of vessel (some engraved with schematic female figures), three ceramic figurines, polished stone axe heads, projectile points of flint and obsidian, flint blades, and a bone handle. The excavators have suggested that the cave may have served as some kind of ritual site and/or as a habitation site (Contu 1970; Trump 1990), although these two dimensions do not need to be regarded as mutually exclusive, particularly in the context of the generally more ritualized Ozieri culture. The nearby cave-site of Grotta Filiestru also continued to be inhabited during the Final Neolithic (Trump 1989), radiocarbon dated here to around 4250–2950 cal BC. Faunal remains were dominated by the bones of sheep/goat, while the artefacts were generally less elaborate than the material found in the Ozieri culture deposits of Grotta di Sa 'Ucca de Su Tintirriòlu. This has led Trump (1983) to suggest that the site may now have served as a pastoralist out-station of a nearby village. Grotta del Guano was also used as a dwelling place during the Final Neolithic, perhaps having first been occupied during the Middle Neolithic, or exclusively in the Ozieri phase, radiocarbon dated here to around 3750–3400 cal BC (Alessio *et al.* 1971; Castaldi 1972; 1980; 1987; Lo Schiavo 1978b). It is situated close to the Middle Neolithic burial cave of Grotta Rifugio, at an altitude of 138 m,

on the River Cedrino. It is a large karst cave, with five entrances leading to a series of chambers and tunnels. In addition to some burnt deposits containing charcoal and carbonized remains of barley, wheat and legumes, and a range of artefacts (including a broken ceramic figurine), fragments of 'plaster' were found which might represent the remains of structures built in the cave. A concreted skull was also found here. Lo Schiavo (1978b) has argued that this was washed into the cave by the river: an interpretation which ties in with her argument that the cave was used exclusively as a dwelling place. However, it could be that the exterior chambers of this cave complex were used primarily for dwelling purposes, given that the majority of the grindstones were found in them, while other spaces in the complex could have served other purposes.

An exception to this pattern is provided some large granitic rock-shelters in north-east Sardinia, which were adopted and adapted by members of the Arzachena culture as a new form of naturally defended settlement (Lilliu 2003, 77–8). At Punta Candela, for example, the basal deposit in one of the natural cavities comprised a 'domestic' deposit of fragments of pottery vessels and artefacts of obsidian and flint.

Other caves were used, perhaps more exclusively, for the performance of rituals; material dimensions of which included the deposition of special assemblages of human remains and artefacts, and the decorating of cave walls with anthropomorphic and abstract symbols.

Ritual deposits were found, for example, in the type-site of the Ozieri culture, Grotta di San Michele ai Cappuccini (Porro 1915; Taramelli 1915; Lilliu 1950). This large cave system, which contains numerous speleotherms, comprises two chambers and an irregular series of more restricted spaces, which extend for about 80 m. Access to the cave would originally have been difficult, being entered by a 6–7 m deep shaft. This, and the nature of the cave deposits, suggests that the cave was not used as a dwelling place, but rather as a place of mortuary and votive deposition. A 40–50 cm deep deposit was excavated in the first chamber, which lies below the entrance shaft. It contained: some human remains, including a skull and long bones (perhaps from just one individual); a large quantity of finely decorated Ozieri style pottery sherds; some red ochre; a spindle whorl; a polished miniature greenstone axe head; a stone polisher; flint arrowheads and blades; an obsidian core; imported pebbles (one incised with anthropomorphic designs); bone points; a bone pin or spatula; and two stone figurines. Some of this material, and in particular the smashed pottery vessels, might have been dropped into the cave from outside.

Possibly votive deposits of pottery vessels were also found in the Grotta Conca Niedda (Melis 1993). This is a large cave system, composed of chambers and corridors which extend over a distance of about 500 m, located at an altitude of 280 m in the tributary valley of Conca Niedda. It contained fragments of large storage vessels and bowls, which have been assigned to the Early Copper Age.

Grutta de is Janas is a large cave complex with two interconnected branches, located on a middle-upper hill slope at 797 metres (Skeates 2009–10). The north branch is about 100 m long, and the west branch about 75 m. The cave contains numerous speleotherms. Later prehistoric ritual deposits have been found throughout the complex. Excavations in a low but wide chamber (between 1 and 1.5 m high, and 11 m long by 5 m wide), situated at the inner end of the entrance corridor leading to the West branch of the cave complex, revealed rich ritual deposits of the Final Neolithic, radiocarbon dated here to around 3800–3650 cal BC (Fig. 12.6). These comprised a homogeneous, 12–24 cm deep, burnt layer, composed of stones and fine dark grey ashey soil. This contained relatively large pottery sherds, animal bones, obsidian artefacts (including arrowheads and flakes, all originally deposited with very sharp – and potentially unused – edges), a perforated seashell pendant, and a polished red bead. Many of the artefacts bore signs of having been intensively burnt, and even the bedrock was burnt in places.

Deposits of human remains have been found in other Ozieri culture caves. For example, the inland cave of Grotta Sa Rocca Ulari also contained human burials, associated with Ozieri style pottery, stone axe heads, flint and obsidian artefacts (Lilliu 1957, 76; Spano 1873). This large cave system, whose main chamber measures 190 m long, is located on the hill slope of Colle di Sorres, just 50 m along from the Ozieri culture *domus de janas* cemetery at San Pietro di Sorres (Soro 2009). Unfortunately, any more precise relationship between these two sites is unclear, since the cave deposits had been disturbed by antiquarian excavations and have only been published superficially.

Further examples of poorly contextualized figurines have been provenanced to a number of caves known to have been occupied during the Final Neolithic. For example, an unusual basalt figurine (14 cm long), known as ‘the Venus of Macomer’, found in Riparo s’Adde could either date to the Ozieri phase or to the Upper Palaeolithic (Lilliu 1999, 175–7; Mussi 2010; Pesce 1949). This small rockshelter was discovered in 1949, but its cultural deposits had been almost completely emptied before the archaeological authorities intervened.

Some examples of parietal cave art – both engraved and painted – have also been assigned to the Final Neolithic. The best (but still questionably) dated are the engravings in the Grotta del Bue Marino (Dorgàli) (Lo Schiavo 1978a; 1980). This is a large limestone karst cave located on the Gulf of Orosei. A group of at least 14 schematic anthropomorphic figures, and two circles with a dot in the middle, were engraved on one of the curved rock surfaces at the entrance to the cave. The figures are around 30 cm long, with arms pointing up and legs down in the form of a double U. They have been compared stylistically to the figures carved in the ‘Domus Branca’ *domus de janas* in the Final Neolithic cemetery of Moseddu. Furthermore, Ozieri culture material was found in this cave, in the remains of a hearth, adjacent to the point at which the art was placed, including fragments of pottery, animal bones, and a greenstone polisher. Riparo di Luzzanas, by contrast, is a small painted rockshelter (Basoli 1992; Dettori Campus 1989). It has narrow tunnel with a sloping roof, on which a group of red ochre painted anthropomorphic stick figures and concentric circles occupy an area of 2 by 1 m. The 10 anthropomorphic figures, which have downward pointing arms, legs and penises, have been compared to others found in a range of archaeological contexts in Sardinia, Corsica, Sicily and south-east Italy, and have consequently been assigned stylistically (and therefore not securely) to the end of the Ozieri phase.

Full Copper Age, Early Bronze Age and Middle Bronze Age caves: expansion and diversification

The Full Copper Age, Early Bronze Age and Middle Bronze Age (or ‘Proto-Nuraghic’ period) are associated in Sardinia with the Monte Claro, Bell Beaker, Bonnànnaro A (or Corona Moltana) and Bonnànnaro B (or Sa Turricula) styles of pottery, and can be loosely dated to between around 2700 and 1300 cal BC, although the absolute and relative dating of this period remains problematic. The number of caves occupied in Sardinia now increased significantly (to some 74 caves, as opposed to some 46 in the Final Neolithic and Earlier Copper Age) (see Appendix) (Fig. 12.7). In the Monte Claro culture, for example, 28 per cent of the 90 known archaeological sites are natural caves (Lilliu 2003, 143–4). And in the process, some caves that had been used and abandoned in previous periods were now reoccupied, to be used both as dwelling places and – increasingly – as places for human burial and for the performance of other underground rituals. Spatially, there was a significant concentration and growth in the human uses of caves in the Carbonia-Iglesias province in south-west Sardinia (a rise from around 20 per cent of all known occupied caves in the Final

Neolithic and Earlier Copper Age to over 40 per cent in this period). Given the agricultural marginality of this area, particularly compared to the adjacent Campidano, which comprised the settlement heartland of the Monte Claro culture (but then a sparsely settled area in the Early Bronze Age), it could be that this increase was related to a territorial expansion into this area by Monte Claro groups who practiced mainly pastoralism and hunting, although their ability to cultivate crops and their connectivity to other socio-economic groups should not be underestimated (c.f. Webster 1996, 53, 69–72).

The indications that large caves continued to be used as dwelling places, but often less intensively and more intermittently, might also offer some support for this economic hypothesis in relation to other parts of Sardinia. For example, Grotta Filiestru continued to be occupied, although less intensively than in earlier periods, as indicated by the presence of Monte Claro, Bell Beaker, Bonnànnaro and Sa Turrìcula style pottery in its upper three stratigraphic levels, radiocarbon dated to around 2300–1700 cal BC (Trump 1983). An increase of sheep/goat and pig, at the expense of cattle, was also noted in the faunal assemblage of this period at this site.

The human use of caves as burial places increased significantly in this period, as did the quantity and range of associated grave goods, at a time in which social display and differentiation, in life and in death, became even more prominent features of the Sardinian cultural landscape. According to Lilliu (2003, 321) 25 per cent of Early Bronze Age Bonnànnaro culture burials were in natural caves, the rest being in artificial rock-cut hypogea, megalithic tombs, cists, and other types of structure. Primary and secondary burials have been identified. For example, Grotta Sisaia, a small cave (about 18 m deep), located on the rocky side of the Valle di Lanaittu, contained a hearth and a mortuary deposit placed within a niche formed by two stalagmitic columns and a cavity in the cave wall (Fadda 1991; Ferrarese Ceruti and Germanà 1978). Charcoal from the hearth was radiocarbon dated to around 2450–2050 cal BC. The mortuary deposit included an articulated human skeleton, accompanied by two Bonnànnaro style pottery vessels and a granite grindstone. The skeleton was of a woman, aged 25–30 years, and had a healed trepanned skull as well as a healed fracture on the left arm. Riparo sotto roccia Su Cannisoni is a wide rockshelter, situated at an altitude of 808 m in a highly visible area of cliffs on the edge of the limestone Pissu is Ilippas hill (Gradoli & Meaden in prep; Skeates 2009–10). Toward the eastern end of the rockshelter, directly below a now-extinct spring, a secondary burial deposit was covered by a pile of stones, which was later cemented by flowstone (Figs 12.8–12.9). The intact secondary mortuary deposit comprised: a pair of adult human skulls (one radiocarbon dated to around

1550–1450 cal BC); and an adjacent semi-circle of stones containing a large group of disarticulated human bones (especially long-bones, but also fragments of a child skull), some animal bones (including sheep/goat), five relatively large fragments of later prehistoric pottery, and some fragments of charcoal. More extensive secondary burial deposits have been identified in Grotta di Tanì (Lilliu 2003, 144–8). This is a 34 m deep, limestone cave of tectonic origin. Groups of human remains, some burnt, others delimited by lines of stones, were found throughout the cave system, together with a range of grave goods. The latter included: mainly Monte Claro style pottery, ranging from large storage vessels to miniature vessels; 10 copper awls; a copper ring; a rectangular bone button; a necklace composed of tubular bones, a stalactite pendant, and animal canines; cockle shells (*Cardium* sp.); olive stones; and pieces of cork.

Some particularly small caves were also used as burial places or ossuaries at this time. They might be loosely compared, in form and contents, to the earlier and contemporary, artificial, *domus de janas* rock-cut tombs of Sardinia. Indeed, when located in suitable positions in the cultural landscape, they might have provided a symbolically valid and technologically convenient – if finite – alternative to either the re-use of existing rock-cut tombs or the construction of new tombs, at least by certain sections of society. One example is the natural cave of Grotta di Baraci, which was used as a burial place during the Full Copper Age and Early Bronze Age (Pitzalis 1988–9). It is located at an altitude of 685 m on the north-east slope of Monte Guzzini, about 5 km from the River Flumendosa. The cave comprises two chambers. The small lower chamber, measuring 5.1 m wide, was repeatedly used as a collective tomb. This was found to contain: numerous human bones; fragments of pottery vessels, including some miniature bowls; and some tools of obsidian and flint, including a flint arrowhead, whose fresh edges, together with the presence of debitage, suggested to the excavator that they had been manufactured then deposited *in situ* as grave goods. Another example is Su Grutta 'e is Bittuleris (Gradoli & Meaden in prep; Maxia and Cossu 1952; Skeates 2009–10). This small, single-chambered, natural cave is just 8 m wide and 6.5 m deep (Fig. 12.10). It lies at an altitude of 826 m, just below the summit of a rocky spur on the edge of the limestone hill of Pissu is Ilippas. The disturbed cultural deposits contained Bronze Age material, radiocarbon dated to around 1750–1600 cal BC), including: the skull of an old adult male that had been trepanned three times; substantial quantities of other human bones; a few animal bones; some small fragments of pottery; obsidian artefacts; a bone pendant; and a bead. Specialist study of the human remains points to successive primary inhumations in this cave, of male and female adults and children, followed by

significant disturbance and fragmentation of the bones. In fact, one of a pair of vertebrae from an arthritic individual appears to have been removed from this cave and incorporated in the secondary burial deposit of Su Cannisoni rockshelter (see above), which lies immediately below Su Grutta 'e is Bittuleris.

Votive deposits of artefacts, especially pottery, were also placed in the inner spaces of selected cave systems, perhaps as offerings to chthonic spirits. For example, a few Full Copper Age artefacts were deposited in Grotta Murroccu (Fadda 1991; Sanges 1985). The cave is located in the river canyon known as Codula di Luna. It comprises a small and poorly accessible curving corridor, a little over 7 m long. In the deepest part of the corridor, a Monte Claro style four-handled jar was found *in situ*, partly cemented to the cave wall by flowstone.

Cave art may also have continued to be produced during this period, although dating remains a serious problem. The eroded granite rockshelter known as Riparo sotto roccia di Frattale (Olivena) contains an anthropomorphic engraving which has been assigned to the Full Copper Age/Early Bronze Age (Moravetti 1980). The schematic figure, of double U form, was engraved on the back wall of the small cavity situated at the base of the rockshelter. It is comparable in form to the figures from the Grotta del Bue Marino (assigned, above, to the Final Neolithic). However, soundings in the entrance to the chamber identified fragments of Bell Beaker style vessels, and so the excavator has also assigned the figure to this period.

Another occasional ritual practice associated with caves might have comprised sealing their entrances. For example, Grotta di San Michele ai Cappuccini, best-known for its Final Neolithic special deposits, might have been ritually sealed during the Bronze Age. Certainly, when the cave was discovered in the early twentieth century, the entrance shaft had been carefully blocked by two tall cylindrical slabs (each around 2 m long and 0.8 m in diameter), made of granite. Given that the Bonnànnaro style pottery fragments found in the cave represents the last use of the cave, it is possible that the cave was sealed during the Bronze Age (rather than the Final Neolithic, as has sometimes been assumed). This practice might be compared to the sealing of at least some of the contemporary rock-cut tombs, such as Tomb VII at Serra Is Aràus, which was sealed with a sandstone statue-stela, and to the restriction of access to the interior of contemporary megalithic 'Giant's Tombs' via portals.

Later Bronze Age and Early Iron Age caves: underground cult places

The late-final phases of Sardinia's Nuragic Bronze Age and the Early Iron Age, which date to around 1300–730 cal BC, lie outside the focus of this paper, and will therefore only be

considered briefly here, in order to close the discussion of the human uses of caves in prehistory. Although as many as 90 per cent of caves previously occupied during the Full Copper Age, Early Bronze Age and Middle Bronze Age appear to have been abandoned at this time, caves certainly continued to be used, but primarily for the ritual purposes of human burial and votive deposition.

Continuing a trend begun in the previous period, numerous small caves were adapted into tombs, often in the vicinity of Nuragic villages (Lilliu 2003, 452–4). In north-east Sardinia, they took the form of small natural fissures in the granite, measuring 2–4 m long, which were now often subdivided and closed by stone walls. They contained primary and secondary burials, and some grave goods (especially pottery vessels), although these were much less rich than those found in contemporary megalithic tombs. Lilliu (2003, 453) has consequently suggested these funerary caves were established by relatively weak and impoverished groups.

Better known but less numerous are the Nuragic ‘cave-shrines’, whose roots can be traced back (at least in part) to the growing use of caves as places of votive deposition in the Full Copper Age. In addition to nuraghi, sanctuaries, Giants’ Tombs, and sacred wells and springs, these caves comprised significant places of ritual performance and votive deposition in the Sardinian cultural landscape. For example, Grotta Pirosu is best known as an Early Iron Age Nuragic cave sanctuary or votive place, although it was previously occupied between the Final Neolithic and Middle Bronze Age (Alessio *et al.* 1970; Lo Schiavo and Usai 1995). It is a karst cave, whose main branch extends for about 180 m. 120 m in from, and 95 m below, the entrance, a wide chamber, containing speleotherms and water pools, leads to a round recess, delimited by speleotherm columns. Within this was found: a stalagmite ‘altar’; a small water pool; a hearth containing charcoal radiocarbon dated to around 900–800 cal BC; and an extraordinary accumulation of votive objects, including around 1500 pottery vessels and 109 metal objects of copper, bronze and gold. By contrast, Sa Grutta de is Caombus was modified architecturally, probably in the Final Bronze Age/Early Iron Age, into what has been described as a Nuragic hypogean temple linked to a chthonic cult (Lilliu 2003, 626). The cave, now partly collapsed, was originally a fissure in basaltic rock. It would have been entered via a 1 m wide stairway of 46 steps, comparable to those constructed at sacred well sites.

Conclusion

This chapter has attempted to present – in context – the archaeological evidence for the human uses of natural caves across prehistoric Sardinia. On reflection, I have to admit that the task of contextualizing remains incomplete, primarily due to the limitations of the available published data. Nevertheless, I hope that this chapter represents a step in the right direction. When seen in context, these caves and the archaeological remains found within them can be understood from two major perspectives. When seen from the outside, especially on a regional scale, they can be understood as diverse places variably connected to wider lifeways, landscapes and beliefs. And when considered from the inside, on a much more local scale, they can be understood as selected, malleable, and multi-sensory architectural spaces, whose occupation involved the conscious installation of assemblages of (inter-related) practical and symbolic resources (c.f. Skeates 1997; in press).

In the Upper Palaeolithic and Mesolithic, at least two large, inland caves and one small, coastal rockshelter were repeatedly occupied and abandoned by mobile groups of hunter-gatherers as base-camps and shelters within wider socio-economic territories. This pattern of cave use continued into the Early Neolithic, albeit with some significant cultural modifications: with large inland caves continuing to serve as residential bases for the exploitation of local resources, both wild and domesticated; while an expanded variety of other kinds of caves (ranging from small rockshelters to a deep coastal cave) continued to shelter living – and now also deceased – members of mobile task groups who practiced a combination of hunting, herding, foraging and farming, in conjunction with occasional burial rites. Continuity is again evident in the Middle and Final phases of the Neolithic, although the secret-sacred use of the deep, dark and wet interiors of selected caves was elaborated, particularly through the accumulation of richer mortuary and votive deposits and of colourful cave paintings within them, whose symbolism was both distanced from and connected to the rich cultural and cosmological landscape of Neolithic Sardinia and the wider Central Mediterranean region (c.f. Whitehouse 1992). This trend towards the sacralization and control of the underworld, at the same time as the elaboration of above-ground monuments, developed further between the Full Copper Age and Middle Bronze Age, and indeed on into the Early Iron Age. Now, ritual performances in a larger number and wider range of caves, including some particularly small burial caves, led to the deposition of even richer mortuary and votive deposits at selected natural places, and, in some cases, to their architectural modification. This trend, and a wider settling of formerly marginal parts of the Sardinian landscape (including the widespread establishment of nuraghic villages and towers), led to a decrease in the use of large caves as long-term dwelling places by residential communities,

although a few of them continued to be intermittently occupied and abandoned as convenient shelters by mobile herders and hunters.

What this synthesis offers, at least, is a challenge to future research on the human use of caves in prehistoric Sardinia: to either fill in, or re-stitch, the contextual web of relations outlined here.

Appendix: prehistoric caves in Sardinia

Note: the data presented here should be treated with some caution, since they are derived from a wide variety of sources, most of which cannot be critically evaluated. They do, however, provide a general indication of the human use of caves in different periods of Sardinian prehistory.

Site #	Site name	Locality	Major period(s) of occupation *	Selected bibliographic references
1	Grande Riparo sotto roccia di Sa Conca Fravilhà	Ollolai	MN-LN	Fadda 1991, 1993
2	Grotta A. di S. Pantaleo	Santadi	FCu-MBA	Melis n.d.
3	Grotta A.C.A.I.	Carbonia	FN-ECu, FCu-MBA	Lilliu 2003
4	Grotta Antico	Carbonia	FCu-MBA	Bettini 2000
5	Grotta B di S. Pantaleo	Santadi	FCu-MBA	Melis n.d.
6	Grotta Barbusi	Carbonia	FN-ECu, FCu-MBA	Lilliu 2003
7	Grotta Bariles	Ozieri	EN, MN-LN	Tanda 1982
8	Grotta Conca Niedda	Sedini	FN-ECu	Melis 1993
9	Grotta Corbeddu	Oliena	Pal, Meso, EN, MN-LN,	Eisenhauer and Kalis 1999; Klein Hofmeijer 1997; Klein

			FN-ECu, FCu-MBA	Hofmeijer <i>et al.</i> 1987, 1987–8, 1989; Sanges 1985–6; 1987; Sondaar and Sanges 1993; Sondaar <i>et al.</i> 1984, 1986, 1995; Spoor 1999; Spoor and Sondaar 1986
10	Grotta de Su Guanu	Pozzomaggiore	FN-ECu	Lilliu 2003
11	Grotta degli Scheletri	Iglesias	MN-LN, FCu- MBA	Floris 2007
12	Grotta dei Colombi	Cagliari	FN-ECu	Lilliu 2003
13	Grotta dei Fiori	Carbonia	FN-ECu, FCu-MBA	Lilliu 2003
14	Grotta dei Pipistrelli	Villamassàrgia	FCu-MBA	Lilliu 2003
15	Grotta del Bandito	Iglesias	FCu-MBA	Lilliu 2003
16	Grotta del Bue Marino	Dorgàli	FN-ECu	Fadda 1991; Lilliu 1957; Lo Schiavo 1978a, 1980
17	Grotta del Carmelo	Ozieri	FN-ECu	Lilliu 2003
18	Grotta del Guano	Oliena	FN-ECu	Alessio <i>et al.</i> 1971; Castaldi 1972, 1980, 1987; Lo Schiavo 1978b
19	Grotta del Papa	Isola di Tavolara	MN-LN	D'Arragon 1997
20	Grotta del Sorcio	Iglesias	MN-LN	Floris 2007
21	Grotta dell'Acqua Calda	Acquacadda	MN-LN, FCu- MBA	Alessio <i>et al.</i> 1970
22	Grotta dell'Anfora	Sassari	FCu-MBA	Usai 2006

23	Grotta dell'Inferno	Muros	EN, MN-LN, FN-ECu, FCu-MBA	Contu 1970a
24	Grotta della Campana	Carbonia	MN-LN	Deidda 2008
25	Grotta della Medusa	Alghero	EN, MN-LN, FCu-MBA	Usai 2006
26	Grotta della Scala di Giocca	Sassari	FCu-MBA	Lilliu 2003
27	Grotta della Volpe	Iglesias	MN-LN, FCu-MBA	Atzeni 2005
28	Grotta delle Scalette	Iglesias	MN-LN	Floris 2007
29	Grotta di Baraci	Nurri	FCu-MBA	Pitzalis 1988-9
30	Grotta di Capo Pecora	Arbus	FN-ECu	Lilliu 2003
31	Grotta di Coa 'e Serra	Baunei	FCu-MBA	Sanges 1985
32	Grotta di Crabilis	Isili	FCu-MBA	Lilliu 2003
33	Grotta di Forresu	Santadi	FN-ECu, FCu-MBA	Melis n.d.
34	Grotta di Frommosa I	Villanova Tulo	FN-ECu, FCu-MBA	Lilliu 2003
35	Grotta di Genna Luas	Iglesias	FCu-MBA	Lilliu 2003
36	Grotta di Is Aruttas	Cabras	FN-ECu	Lilliu 2003
37	Grotta di Is Ollargius	Narcào	FCu-MBA	Bettini 2000
38	Grotta di Is Piras	Nuxis	MN-LN	Deidda 2008
39	Grotta di Monte	Domusnovas	FN-ECu,	Lilliu 2003

	Acqua		FCu-MBA	
40	Grotta di Monte Casula	Monteponi	EN, MN-LN, FCu-MBA	Tanda 1982
41	Grotta di Monte Meana	Santadi	MN-LN, FN-ECu	Lilliu 2003
42	Grotta di Narcào	Narcào	FCu-MBA	Lilliu 2003
43	Grotta di Nicolai 'e Nébida	Iglesias	FCu-MBA	Lilliu 2003
44	Grotta di Nuxis	Nuxis	FCu-MBA	Lilliu 2003
45	Grotta di Orbai	Villamassàrgia	FCu-MBA	Bettini 2000
46	Grotta di Padre Nocco	Buggerru	FN-ECu, FCu-MBA	Lilliu 2003
47	Grotta di Palmaera	Sassari	FCu-MBA	Lilliu 2003
48	Grotta di Perapala	Siniscola	FN-ECu, FCu-MBA	Lilliu 2003
49	Grotta di Pitzu Asimus	Villamassàrgia	FCu-MBA	Lilliu 2003
50	Grotta di Punta Niedda	Portoscuso	FCu-MBA	Lilliu 2003
51	Grotta di Rureu	Alghero	EN, MN-LN, FN-ECu, FCu-MBA	Lilliu 1978
52	Grotta di S'Acqua Gelara	Buggerru	EN	Tanda 1982
53	Grotta di S'Orreri	Fluminimaggiore	FCu-MBA	Floris 2007
54	Grotta di Sa Oche	Oliena	FCu-MBA	Museo Nazionale Archeologico di Nuoro 2006
55	Grotta di Sa Ucca 'e Su	Mara	MN-LN, FN-ECu, FCu-	Alessio <i>et al.</i> 1978; Contu 1970b; Loria and Trump 1978;

	Tintirriòlu		MBA	Trump 1989, 1990
56	Grotta di San Bartolomeo	Cagliari	EN, MN-LN, FN-ECu, FCu-MBA	Atzeni 1962; Orsoni 1879 Patroni 1901
57	Grotta di San Lorenzo	Iglesias	MN-LN, FCu-MBA	Atzeni 2005
58	Grotta di San Michele ai Cappuccini	Ozieri	FN-ECu, FCu-MBA	Lilliu 1950; Porro 1915; Taramelli 1915
59	Grotta di San Paolo	Santadi	FN-ECu, FCu-MBA	Lilliu 2003
60	Grotta di Sant'Elia	Cagliari	EN, FCu-MBA	Orsoni 1879
61	Grotta di Sant'Isidoro	Sinnai	FCu-MBA	Lilliu 2003
62	Grotta di Santa Lucia	Iglesias	FCu-MBA	Lilliu 2003
63	Grotta di Santa Vita	Iglesias	FCu-MBA	Bettini 2000
64	Grotta di Sas Formicas	Dorgàli	FCu-MBA	Lilliu 2003
65	Grotta di Serbariu	Carbonia	FCu-MBA	Lilliu 2003
66	Grotta di Serra di Lioni	Sassari	FCu-MBA	Gruppo Speleo Ambientale Sassari n.d.
67	Grotta di Sos Dorroles	Cala Gonone	FN-ECu	Lilliu 2003
68	Grotta di Sos Sirios	Dorgàli	FN-ECu	Moravetti 1998
69	Grotta di Su Coloru	Laerru	Meso, EN, MN-LN	Fenu <i>et al.</i> 1999–2000, 2002, 2003, 2007; Martini <i>et al.</i> 2007; Pitzalis <i>et al.</i> 2001, 2003
70	Grotta di Su	Pozzomaggiore	FCu-MBA	Lilliu 2003

	Guanu			
71	Grotta di Su Idighinzu	Thiesi	FN-ECu	Lilliu 1957
72	Grotta di Su Marináiu	Cala Gonone	EN, FN-ECu	Lilliu 1957
73	Grotta di Su Moiu	Narcào	FN-ECu, FCu-MBA	Lilliu 2003
74	Grotta di Tamara	Nuxis	FCu-MBA	Lilliu 2003
75	Grotta di Tanì	Iglesias	FCu-MBA	Lilliu 2003
76	Grotta di Villahermosa	Laconi	FN-ECu, FCu-MBA	Lilliu 2003
77	Grotta Domus de is Janas	Sadali	FCu-MBA	Fadda 1991
78	Grotta Filiestru	Mara	EN, MN-LN, FN-ECu, FCu-MBA	Hurcombe and Phillips 1998; Trump 1982, 1983, 1989, 1990
79	Grotta I di Su Concali de Còrongiu Acca	Villamassàrgia	MN-LN, FN-ECu, FCu-MBA	Lilliu 2003
80	Grotta II di Su Concali de Còrongiu Acca	Villamassàrgia	EN, FCu-MBA	Lilliu 2003
81	Grotta Maimòne	Laconi	EN	Lilliu 2003
82	Grotta Montega	Narcào	FCu-MBA	Lilliu 2003
83	Grotta Murroccu	Urzulèi	FCu-MBA	Fadda 1991; Sanges 1985
84	Grotta Pirosu	Su Benatzu	MN-LN, FN-ECu, FCu-MBA	Alessio <i>et al.</i> 1970; Lo Schiavo and Usai 1995
85	Grotta Pitzu 'e Pranu	Belvi	MN-LN	Lilliu 2003

86	Grotta Pitzu 'e Toni	Tonara	FN-ECu, FCu-MBA	Lilliu 2003
87	Grotta Rifugio	Oliena	EN, MN-LN, FCu-MBA	Agosti <i>et al.</i> 1980; Biagi and Cremaschi 1980; Carta 1966–7; Germanà 1978
88	Grotta Sa Korona di Monte Majore	Thièsi	EN, MN-LN, FN-ECu	Foschi 1982; Foschi Nieddu 1987; 1989; Lilliu 1957
89	Grotta Sa Rocca 'e Ulari	San Pietro di Sorres	MN-LN, FN- ECu	Lilliu 1957; Soro 2009
90	Grotta Sisaia	Dorgàli	FCu-MBA	Fadda 1991; Ferrarese Ceruti and Germanà 1978
91	Grotta Su Anzu	Siniscola	MN-LN, FN- ECu	Lilliu 2003
92	Grotta Verde	Alghero	EN, MN-LN, FN-ECu	Antonioli <i>et al.</i> 1994; Lamberti <i>et al.</i> 1986; Lilliu 1978; Lo Schiavo 1987; Tanda 1987; Usai 2006
93	Grutta de is Janas	Seulo	FN-ECu	Skeates 2009–10
94	Grutta di lu Sorigu Antigu	Sassari	MN-LN	Sanna and Sanna 2002
95	Grutta I de Longu Fresu	Seulo	MN-LN	Skeates 2009–10
96	Riparo di Cala di Vela Marina	Isola di Santo Stefano	EN, MN-LN	Difraia 2007; Lilliu 1957
97	Riparo di Luzzanas	Ozieri	FN-ECu	Basoli 1992; Dettori Campus 1989
98	Riparo di Porto Leccio	Trinità d'Agultu	Meso, FN- ECu	Aimar <i>et al.</i> 1997
99	Riparo di Su Monte	Muros	MN-LN	Lilliu 2003
100	Riparo di	Santadi	EN, MN-LN	Tanda 1982

	Tatinu			
101	Riparo s'Adde	Macomer	MN-LN, FN-ECu, FCu-MBA	Mussi 2010; Pesce 1949
102	Riparo sotto roccia di Frattale	Oliena	FCu-MBA	Moravetti 1980
103	Riparo sotto roccia di Monte Incappidatu	Arzachena	FCu-MBA	Lo Schiavo 1991
104	Riparo sotto roccia di Sa Conca Fraviahà	Ollolai	FCu-MBA	Fadda 1991, 1993
105	Riparo sotto roccia Monte di Deu	Tempio	FN-ECu	Lilliu 2003
106	Riparo sotto roccia Punta Candela	Arzachena	FN-ECu	Lilliu 2003
107	Riparo sotto roccia Santa Chiara	Tempio	FN-ECu	Lilliu 2003
108	Riparo sotto roccia Su Cannisoni	Seulo	FCu-MBA	Skeates 2009–10
109	Riparo sotto roccia Su Carròppu	Sirri	EN, MN-LN, FCu-MBA	Atzeni 1972, 1977; Lugliè <i>et al.</i> 2007
110	Sa Forada de Gastea	Seulo	FCu-MBA	Lilliu 2003
111	Su Grutta' e is Bittuleris	Seulo	FCu-MBA	Maxia and Cossu 1952; Skeates 2009–10
112	Su Stampu Erdi	Seulo	FCu-MBA	Unpublished data from Seulo

				caves project
113	Tafone di Cala Corsara	Isola di Spargi	EN, FN-ECu, FCu-MBA	Ferrarese Ceruti and Pitzalis 1987
114	Tafone di Cala Serena	Isola di Caprera	MN-LN	Difraia 2007

* Key to major periods of occupation: Pal – Palaeolithic; Meso – Mesolithic; EN – Early Neolithic; MN-LN – Middle to Late Neolithic; FN-ECu – Final Neolithic and Earlier Copper Age; FCU-MBA – Full Copper Age, Early Bronze Age and Middle Bronze Age.

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Captions for illustrations

Figure 12.1. Map of Upper Palaeolithic and Mesolithic cave sites in Sardinia.

Figure 12.2. Map of Early Neolithic cave sites in Sardinia.

Figure 12.3. Map of Middle and Late Neolithic cave sites in Sardinia.

Figure 12.4. Neolithic paintings in Grutta I de Longu Fresu (Seulo). Photo: G. Farci.

Figure 12.5. Map of Final Neolithic and Earlier Copper Age cave sites in Sardinia.

Figure 12.6. Excavation in Grutta de is Janas (Seulo). Photo: R. Skeates.

Figure 12.7. Map of Full Copper Age, Early Bronze Age and Middle Bronze Age cave sites in Sardinia.

Figure 12.8. Excavation of a secondary burial deposit at Riparo sotto roccia Su Cannisoni (Seulo). Photo: R. Skeates.

Figure 12.9. Secondary burial deposit of skulls and long bones at Riparo sotto Roccia Su Cannisoni (Seulo). Photo: P. van Carsteren.

Figure 12.10. Excavation of Su Grutta 'e is Bittuleris (Seulo). Photo: R. Skeates.