MAPPING PROCUREMENT AREAS OF LITHIC RESOURCES AND MOBILITY PATTERNS: A GIS-BASED APPROACH TO THE EARLY COLONIZATION OF WESTERN MEDITERRANEAN ISLANDS

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Mapping procurement areas of lithic resources and mobility patterns: a GIS-based approach to the early colonization of Western Mediterranean islands

1. INTRODUCTION

This Master Thesis deals with the procurement of lithic raw materials among the first human groups to settle on the islands of Corsica and Sardinia, during the Pre-Neolithic and Early Neolithic, both from a synchronic and a diachronic point of view. Specifically, the aim of this research is to develop a hypothesis for the **procurement strategies** of **chert** and **obsidian** and for the **patterns of mobility** across the territory associated with the pursuit of this activity.

Studies as such have been developed in recent decades in different parts of the world and have proved effective in defining human mobility based on the geographical distribution of raw materials; but have never been conducted in western Mediterranean islands, except for mostly large-scale surveys related to the circulation of obsidian (Tykot and Ammerman 1997, Vaquer 2007, Tykot 2011, De Francesco, Bocci *et al.* 2012, Freund and Batist 2014).

This research has been focused on the tracing of **Least Cost routes** from the settlements towards the raw material sources based on provenance analysis and orography of the territory. To achieve this, the data were first collected through a **bibliographic review** and were then georeferenced in QGIS 3.20, thus translating all available information to a spatial dimension through the construction of **maps** for both islands.

Chert and obsidian have been chosen as material proxies to track movement patterns across the territory for several reasons:

Obsidian can be understood as a privileged marker for chrono-cultural adscription (since its use starts in the Neolithic) but specially as a mobility marker, since its origin is restricted to very few well known and localized sources, only one of which is located in Sardinia; while chert is more ubiquitous and more common, available in the form of pebbles and surface outcrops in various localities. Chert can thus only be a marker of mobility if further systematic studies on its petrological and geochemical composition are carried out: in which case, it may provide important information on preferential selection and management – for example, in terms of quality rather than proximity, when good quality chert procured from distant sources is preferred to poor quality local chert.

The parallel study of the exploitation of these lithotypes thus helps to make visible the complexity of variables that had determined the procurement of lithic raw materials in Pre-Neolithic and Early Neolithic Corsica and Sardinia.

This Thesis has been structured as follows: In chapter 2, *Theoretical Framework*, the first section (2.1.) has been dedicated to outlining the main information known to date about the geography and palaeoenvironment of the two islands, from a diachronic perspective ranging from the Late Pleistocene to the Mid-Holocene. This is followed by a description of the data and current debates concerning the earliest human presence on the islands and the dynamics of peopling, combined with subsistence strategies in relation to available resources, up to the onset of the Neolithic (section 2.2.). The Early Neolithic is addressed in detail in relation to the division into phases based on the material culture (section 2.2.2.).

Subsequently, the presence of geological outcrops of obsidian and chert in the islands is discussed in detail, with a brief history of research and the known data concerning the management of raw materials in the periods examined from a strictly technological point of view (sections 2.3.2. and 2.3.3.). In the same chapter, an overview of the models proposed in the literature on the strategies for obtaining raw materials in nomadic or semi-nomadic societies is given, in order to define the reference framework for a subsequent analysis of the data available for the study area (section 2.3.1.).

In chapter 3, *Objectives*, the research questions and objectives are presented in detail. Chapters 4 and 5, *Materials* and *Methods*, are devoted to the extensive description of the materials and the steps of the research process, from data collection to the construction of the least cost paths, through the structuring of the database and the construction of the specific cartography.

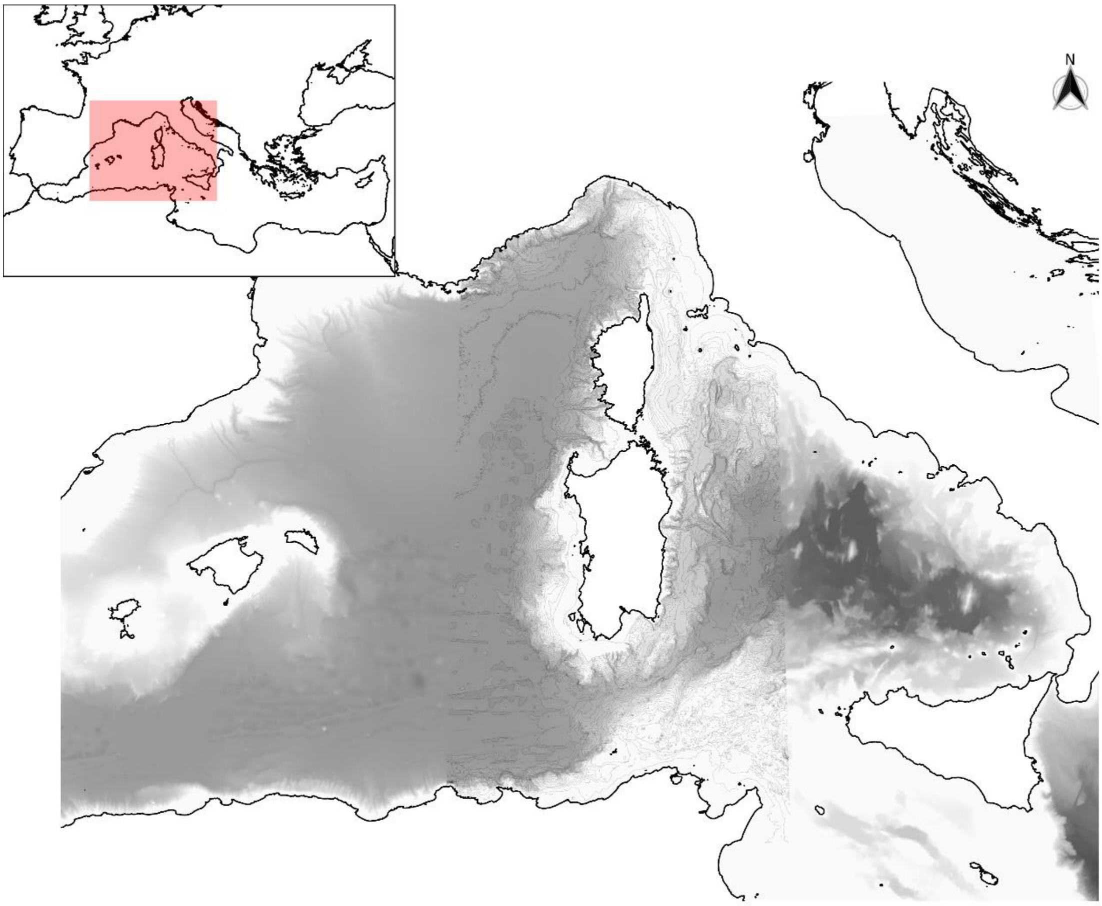
Chapter 6, *Results*, presents the information resulting from the various steps of the research process, from the description of the database to the detail of the maps and the least cost paths, focusing on the quantitative aspects of the obtained data.

In the *Discussion* chapter (7), a section (7.1.) is entirely devoted to explore the numerous problems encountered during the research, which mainly concern the lack of data available in the literature. The next section (7.2.) deals with Least Cost Modelling as a tool increasingly used in archaeology to study the relationships between humans and the environment, explaining its assumptions, detailing some of the strategies adopted in this research and finally exposing its criticalities and advantages. Finally, in section 7.3. (*Pleistocene-Holocene lithic procurement and mobility patterns in Sardinia and Corsica*) interpretations are extensively developed for all collected data, proposing a hypothesis in relation to raw material procurement strategies and mobility patterns of human groups relative to the regions and the period under study. These interpretations are then summarised in the *Conclusion* chapter (8), while chapter 9 is dedicated to expose the research perspectives for the upcoming future.

2. THEORETICAL FRAMEWORK

2.1. Sardinia and Corsica: Geography and Palaeoenvironment

During the Oligocene-Miocene, around 21 million years ago, the process of drift and insularisation of the Corsican-Sardinian block took place (Bonifay, Bassiakos *et al.* 1998, Sartori 2001). What now appear as two islands (Overview 1) have at different times been united into a single landmass, but have maintained a condition of permanent insularity ever since, always being detached from mainland (Lugliè 2018).



Overview 1. Location of Corsica and Sardinia islands within the western Mediterranean. Constructed with QGIS 3.20.

Very few palaeogeographical and palaeoenvironmental data about the Late Pleistocene and Early Holocene of this region are currently available.

2.1.1. Upper Pleistocene

According to the deep-sea cores from the Tyrrhenian Sea, during Corsican-Sardinian Upper Pleistocene fully glacial conditions were reached for the last time at about 30.000 BP (Last Glacial Maximum) (Paterne *et al.* 1986).

At about 17-18 ka BP, the sea dropped to a maximum of -120 m below its current level (Fairbanks 1989). Sardinia and Corsica were thus merged into a single landmass during the Last Glacial

Maximum , separated from peninsular Italy by a stretch of sea over 7 km wide (Shackleton *et al.* 1984, Orombelli *et al.* 2005, Antonioli *et al.* 2004) although at least 300 m deep (Tykot 1995). This circumstance occurred various times during the maximum sea regressions throughout the Pleistocene (Martini 2017).

During the Upper Pleistocene, the Sardinian-Corsican block was thus populated by the same fauna, with a massive presence of specimens of *Prolagus sardus* (a lagomorph about the size of a rabbit), herds of *Megaloceros cazioti* as the only large mammal, and a complete absence of potentially dangerous or competitive carnivores for humans – since the only attested predators were the *Cynotherium Sardous*, the *Vulpes Inchnusae* and indeterminate mustelids, all rather small in size (Bonifay 1998, Mussi and Melis 1999). The presence of elephants of the mammoth line has also been detected, but from earlier chronologies (Mussi and Melis 1999).

2.1.2. Early Holocene

With the end of the glaciation, the sea level gradually began to rise. At around the middle of the 9th millennium BCE it was at -45 m below present-day levels (Pasquet and Demouche 2012); the rising of the sea began to slow after 9 ka BP (approx 7 ka BCE), when it reached -35 m (Shackleton *et al.* 1984), and it was still around -10/-5 m about 5 ka BCE (Allegrini-Simonetti 2000).

This means that during the Mesolithic and Early Neolithic the distance between the sites and the coastline was significantly higher than at present – and, also, that several sites that were then on the shoreline are now probably underwater. This regards Sardinia in particular, whereas it is different for Corsica: due to its very abrupt continental shelves, the present-day coastlines do not differ significantly from Mesolithic ones, except for the Bonifacio area where, however, the sea bottom is not very deep (Costa *et al.* 2003).

At ca. 9 ka BP the Corsican-Sardinian block became separated by a seaway of 10 km wide and the two islands were formed. Similar conditions had likely been reached in previous interglacial periods (Shackleton *et al.* 1984).

From 8 ka BP onwards, the Mediterranean basin began to be populated by drought-tolerant faunal taxa, associated with a reorganization of regional climate (Pittau *et al.* 2012). The vegetation was composed by species pertaining to the thermomediterranean maquis (*Phyllirea, Pistacia lentiscus*, *Juniperus*, *Erica* sp…), mesomediterranean bush (*Arbutus unedo*, *Sambucus nigra*…), *Celtis* species and *Pinus laricio* from mountain forests (Costa *et al.* 2003).

A direct relationship between the first arrival of Mesolithic people to the islands and the disappearance of the megafauna has been proposed by some authors, who have suggested that *Megaloceros cazioti* together with *Cynotherium* were hunted by these population until their extinction (Klein Hofmeijer and Sondaar 1993, Pasquet and Demouche 2012). Other authors state that large mammals had disappeared prior to the arrival of Mesolithic groups; *Megaloceros* in particular seems to have lived in both Corsica and Sardinia until the end of the Late Glacial, disappearing short before the beginning of the Holocene (Magdeleine and Ottaviani 2000); extinction due to natural causes, such as climate change, seems thus possible. Nevertheless, although no osteological traces of *Praemegaceros* hunting have been found, some authors prefer not to dismiss the hypothesis of extinction because of occasional hunting activities that may have remained invisible in the archaeological record (Vigne 2000).

A major deterioration in climate occurred at around 8200 years BP affecting the entire northern hemisphere, with cold, dry, and perhaps windy conditions, especially in wintertime. These temperature anomalies in the order of several degrees contributed to a major displacement of vegetative patterns and triggered hydrologic changes, such as the draining of lakes (Alley and Ágústsdóttir 2004, Berger and Guilane 2009).

The climate of continental Europe was marked by a general major cooling. Water availability increased at latitudes between 42° and 50°N and decreased to the north and south, leading to drier conditions (Berger and Guilane 2009). The majority of Corsican territory would thus have been included in a «transition zone» marked by high seasonal contrasts (namely, a dry season with frequent fires favouring landscape and vegetation opening, and a season with strong rainfall); while Sardinia would have been affected by arid conditions (*Ibid.*, p.40 Fig.6). According to central Greenland ice cores, the 8k event lasted strongly for a few years, then faded over decades within a century or two (Alley and Ágústsdóttir 2004).

2.1.3. Middle Holocene

According to anthracological data, during the VI millennium BCE the landscape of Sardinia and Corsica was characterised by a dense vegetation cover with Mediterranean maquis, alongside forests of xerophilous species (*Juniperus* sp., *Arbutus unedo*) on mountain ranges (Costa 2004, Lugliè, Congia *et al.* 2009).

In Corsica, the environment of the eastern and southern coasts was mainly composed of freshwater ponds located close to the shoreline. They eventually disappeared from the Middle Holocene onwards, when salt intrusion resulting from the progressive sea level rise transformed the area into marshlands; although in Piantarella lagoon on the southern tip of the island this transition is already visible as early as 7.4 ka BP (Revelles, Ghilardi *et al.* 2019).

Between 9 and 6 ka cal BP the landscape of the island was dominated in western areas by *Pinus laricio* forests at high elevations and by *Erica sp.* (mostly *arborea*) at low and intermediate altitudes; in humid eastern plains by *E. arborea* and deciduous oak forest; in the north by a dense vegetation cover dominated by sclerophyllous forests (evergreen oak) and riparian forests, with *Erica* scrublands at lower elevations; in the south by a dense maquis vegetation consisting mainly of *Erica*, affected by frequent fire episodes. Although it is still not clear whether endemic *Erica sp.* formed forests or scrublands, it is demonstrated that open vegetation, thermo-Mediterranean maquis, was dominant in the landscape of south Corsica prior to human occupation, then progressively disappearing due to anthropogenic impact which lead to the expansion of grasslands and Cerealia-type plants from the Early Neolithic onwards (Revelles, Ghilardi *et al.* 2019).

Less data are available for Sardinian landscape and environment. During the Middle Holocene the island vegetation was widely dominated by evergreen Mediterranean shrubland taxa - mostly *Erica*, but also *Cistus* - and evergreen *Quercus*, *Pistacia*, *Olea* and *Arbutus*. Although paleoclimate data are scarce, the prolonged dominance of *Erica* especially in eastern Sardinia attests for warmer/drier summers and cooler/moister winters than today, accompanied by high natural fire activity to which this species is extremely well-adapted (Melis, Di Rita *et al.* 2018). Recent data on north-western Lake Baratz (the only large natural lake on the island) have provided evidence of a coastal landscape dominated by *Erica arborea* and *E. scoparia* woodland about 8,100-7,500 cal BP; then partially replaced with *Pistacia* and *Quercus ilex* after 7,500 cal BP with a decrease in seasonality (Pedrotta, Gobet *et al.* 2021).

The arrival in Corsica and Sardinia of Neolithic people came along with the deliberate introduction of domesticated species of both plants and animals (sheep, goat, pig and later cattle), as the local fauna in particular was lacking species that could be selected for domestication. From the point of view of farming, very few evidence of domesticated plants was found in the Early Neolithic sites of both Corsica and Sardinia. It thus seems likely that the dense vegetation cover led to a delay in the spread of agricultural village economy (Luglié 2017, Revelles, Ghilardi *et al.* 2019), and to the development of pastoralism along with the persistence of hunting (Atzeni 1987, Depalmas, Melis *et al.* 1998), fishing and the collection of shellfish (Luglié 2009b); although a few grindstones have been found at some sites (Foschi-Nieddu 1982, Skeates 2012) and few palynological evidence suggest a modest use of land for arable crops (Melis, Di Rita *et al.* 2018).

Such a nomadic breeding activity in a predominantly wooded area may also have led to the frequent loss of livestock, which consequently became wild: and thus, to the emergence of wild evolutionary lines of the corresponding domestic species within the space of several generations, as was the case with wild boar and mouflon (Poplin 1979, Vigne 1999, Luglié 2009b, Luglié 2017). Apart from domesticated species, some sites have also returned remains of non-endemic wild species such as *Cervus elaphus L.* and *Vulpes vulpes L.* (Luglié 2009b).

2.2. Late Pleistocene-Holocene Boundary: A Chrono-Cultural Overview

The prehistory of the islands of Corsica and Sardinia is a rather recent history of research and discoveries. Up to the 1980s no pre-Iron Age site had yet been discovered in Corsica, although some out-of-context or undated evidence - menhirs, cave paintings and polished axes – suggested settlement prior to this period (Magdeleine and Ottaviani 2012). In Sardinia, up until the 1990s pre-Neolithic evidence was limited to some hypothetical limestone implements, an isolated human phalanx from Grotta Corbeddu (Hofmeijer 1987-1988, Sondaar, Rengert *et al.* 1995), and a female figurine from Macomer (Pesce 1949, Melis and Mussi 2002).

2.2.1. Sardinian-Corsican Palaeolithic

The timing of the first human settling on the islands of Corsica and Sardinia is currently debated and a consensus is yet to be reached among researchers. The first systematic peopling is to be dated in the Neolithic, but occasional settling has occurred before, during the Late Pleistocene and Early Holocene – Mesolithic; while other authors state it could even be dated to the Middle Pleistocene – Palaeolithic (Bini, Martini *et al.* 1993, Bini 1999, Mussi and Melis 1999, Melis and Mussi 2002, Martini 2017). The hiatus between these two interpretations is substantial since tens of thousands of years separate the dates of the different proposals.

The oldest absolute dates on an archaeological site in the Sardinian-Corsican block have been obtained in Corsica, in Grotte de La Coscia, where the levels dated to the Upper Pleistocene (dated ca. 60 ka BP (U-Th) and about 50-44 ka BP (ESR), both inside and outside the cave, have yielded indirect evidence of human presence, such as a "tumulus" composed of an accumulation of antlers, crania and cervid bones, some fireplaces and a small lithic series – which were therefore correlated with the continental Middle Palaeolithic. In 1998, when the data were published, this was the first such discovery in Corsica; it also was the first time that a Neanderthal settlement could be associated to a Mediterranean island with strict and permanent insularity. The preliminary study cautiously concluded that the archaeological evidence confirmed the probable presence of «Hominids» («*Hominidés*») in Northern Corsica «at the beginning of the ancient Würm» (Bonifay, Bassiakos *et al.* 1998).

Since no reliable absolute dates are available in Sardinia before the Holocene, the hypothesis of a Pleistocene settlement on the island is solely based on relative chronologies, namely on tecno-typological attributions of the lithic complexes and, for the evidence recovered in-context, on the pedological study of the stratigraphic profile. Most of the artefacts ascribed to the Palaeolithic have been found out-of-context, as surface finds during surveys; such is the case of Riu Altana, Codrovulos-Pantallinu, Predeiru and other minor collections located in Anglona (North Sardinia) and the geographical exception characterised by Ottana-A (Central Sardinia), which have all been attributed to the Lower Palaeolithic. The only lithic assemblages found in situ are those of Sa Coa de Sa Multa and Sa Pedrosa-Pantallinu, both in Anglona (Martini 2017).

The pedological study of Sa Coa de Sa Multa's stratigraphic profile (Bini, Martini *et al.* 1993, Bini 1999) has returned an attribution to the early Middle Pleistocene (OIS 9) for the paleosurfaces α and β, which form part of the layer B where the alleged Palaeolithic industry has been found. For the overlying layer A an ascription to the Mesolithic has been proposed. 2280 tools coming from the uncovered layer B's industry have been analysed technologically: the artefacts were characterized by a low degree of predetermination and simple operational chains whose aim was to obtain cutting edges (Romagnoli and Martini 2012). On the basis of knapping techniques, they have been ascribed to an SSDA system, i.e. with alternating debitage surfaces; a definition coined by Forestier in order to describe the Clactonian lithic industry of High Lodge (Forestier 1993). The chronotypological attribution of the Sa Coa lithic complex to the Lower Palaeolithic, is consistent with the pedological analysis of the profile (Martini 2017).

Sa Pedrosa-Pantallinu's archaeological layer B has been ascribed to the OIS 6 (Bini, Martini *et al.* 1993), based again on the relative chronology suggested by geological analysis; it would thus be more recent than Sa Coa. The lithic industry would be consistent with this interpretation, since the technology (though still simple) seems to be more advanced (Martini 2017). Nevertheless, using the classification of laminar industries developed by E. Boëda (Boëda 2010), Aureli has proposed a radically different chrono-typological attribution for the 1459 tools coming from Sa Pedrosa complex: that is, from about 35 ka BP onwards (Aureli 2012).

Other evidence in support of the existence of a Sardinian Palaeolithic is based on indirect dating, on dubious stratigraphic correlations, or on findings whose significance is debated (as in the case of the alleged anthropic accumulation of *Megaloceros* remains in Corbeddu Cave) (Sondaar, Sanges *et al.* 1986, Hofmeijer and Sondaar 1992). Several authors have pointed out that, in the absence of reliable evidence, claimings on settlement of the Corsican-Sardinian block prior to the Holocene should be cautious (Cherry 1992, Luglié 2009a, Romagnoli and Martini 2012).

2.2.2. Mesolithic and Neolithic on the Islands

The chronology obtained by absolute dating for the Mesolithic in the islands of Corsica and Sardinia covers a timespan of about two millennia, from the **9th millennium** to the **third quarter of the 7th millennium BCE** included, during which evidence of occasional and discontinuous passages of mobile groups is attested (Lugliè 2017).

Only about 30 sites in total are currently known for the Mesolithic period, scattered across the 8.722 km^2 territory of Corsica and the 24.090 km^2 of Sardinia. These sites generally follow the coeval settlement pattern of central-southern Italian peninsula, since they are mostly distributed close to the sea (Lo Vetro and Martini 2016) or in sub-coastal areas, at altitudes between 200 and 400 metres, in caves and rock shelters (Lugliè 2009a) or, less frequently, in open air stations (Melis and Mussi 2002, Pasquet and Demouche 2012, Martini 2017). But if some peninsular sites are also located inland, in hilly and mountainous regions or at a low-medium altitude close to rivers streams or lakes, in Corsica-Sardinian Mesolithic only the site of Curacchiaghju is situated at a considerable distance from the coast as the crow flies, at an altitude of about 700-800 metres above sea level (De Lanfranchi 2000).

Given the availability of only small terrestrial fauna and the coastal distribution of the settlements, subsistence strategies had to be focused on the hunting of small game (avifauna, *Prolagus*…) and marine resources as well as on the gathering of fruit, vegetables, tubers, berries and roots (Magdeleine and Ottaviani 2000). Isotopic analyses on human bones from both Araguina-Sennola and Monte Leone in Corsica confirm this pattern, indicating that the diet was composed of about 70-80% land mammals and only 20-25% marine resources. It should thus be better said that these early settlers were not actually hunters, but rather trappers, as well as fishers (Costa, Vigne *et al.* 2003, Costa 2004).

Mesolithic sites must have been inhabited occasionally and for short periods by mobile groups, probably travelling from the peninsular coast (Lugliè 2009a). Their mobility, however, had to be quite low (Lo Vetro and Martini 2016) since we have no evidence of obtention of resources from the inner area or of its systematic exploration and colonisation: their movements thus appear to be relatively restricted around the settlement (Costa, Vigne *et al.* 2003, Lugliè 2009a).

The dating of the L1 horizon of Su Coloru Mesolithic level is the latest term for the Corsican-Sardinian Undifferentiated Epipalaeolithic: 7400 ± 40 BP (2σ cal. BCE: 6380-6210) (Fenu, Martini *et al.* 2002). After a void of about 500 years since the last Mesolithic evidence, from the 5700 cal. BCE onwards in both Corsica and Sardinia evidence of Neolithic settlements start to appear.

The gap is chronological as well as behavioral and genetic. According to Lugliè, both the absence of overlapping among Mesolithic and Neolithic sites and the differences in the gene pool of the respective populations (Lugliè 2014) provides proof not only of the lack of contacts between these groups but also of a marked genetic discontinuity (Lugliè 2017). It can thus be stated that the Neolithization of Corsica and Sardinia, such as many other regions of the Western Mediterranean, took the form of an actual process of colonization rather than of acculturation (Lugliè 2009b).

There is a temporal coincidence between the above-mentioned 8k event and the hiatus in terms of archaeological evidence separating the last Mesolithic settlements from the first Neolithic colonisation, since all available records of Mesolithic humans are dated prior to this climatic episode. However, in the absence of data it cannot be said if such a deterioration in climate played a crucial role in preventing for several centuries late Mesolithic coastal navigation in the Tyrrhenian Sea (Lugliè 2018) or whether the gap is to be attributed to taphonomic processes. This under-representation of archaeological sites during the 8500-8000 cal BP episode seems to be shared throughout the whole Mediterranean area (Berger and Guilane 2009).

From a behavioral point of view, human settling dating back to the Neolithic was sharply different from Pre-Neolithic's: the colonisation was systematic and eventually led to the settlement in all the most favourable habitats; it even included an exploration phase to get to know the territory prior to starting the actual peopling project. It was also characterised by open-air settlements with actual constructions (which coexisted with the older housing form of cave dwellings and shelters) and by a new economy based on production, the use of pottery and a different selection and managing of lithic raw materials (Lugliè 2017).

The Pre-Neolithic economy was partly maintained during the Early Neolithic, when several evidence show the persistence of a mainly hunting and gathering economy focused on locally available species, but also the emergence of new technologies and long distance connections. This is particularly visible in the archaeological sites with an occupational sequence ranging from Pre-Neolithic to Neolithic, such as Grotta Corbeddu (Skeates 2012). There is little and doubtful evidence for the development of agricultural activities in the Early Neolithic (Luglié 2009b); it seems more likely that it was introduced later, while the productive economy of the early settlers was essentially based on the breeding of sheep, goats, pigs and cattle. In some cases, some authors have instead deemed the settlements where pastoralism was practiced being dependent on nearby sites of agricultural use that have not yet been found (Trump 1982).

The Early Neolithic in Corsica and Sardinia covers a timespan of about a thousand years, roughly corresponding to the **VI millennium BCE** (Luglié 2009b, Luglié 2017). The conclusion of the neolithization process – with a fully achieved productive economy and an incipiently articulated society based in permanent settlements – is to be dated only to the Middle Neolithic, from the Vth millennium onwards.

This chronology is, of course, conventional and mostly based on diagnostic changes in pottery technology. A further partitioning of the Early Neolithic period has been proposed by various authors, who agree in identifying three phases corresponding to three different ceramic facies. Even though these phases are variously denominated in the literature, they essentially coincide but their chronological boundaries are not yet clear. Based on the synthesis proposed by Luglié (Luglié 2009b; 2017), a general overview will be given here, to clarify both the general partitioning and the correspondences between different terminologies.

a) Pioneer Phase

A form of «Impressed Ware» similar to the archaic Impressed facies of Southern Italy is the marker of this first migration wave from the coasts of western Sicily towards northern latitudes (Luglié 2017), such as the region of Liguria in Italy and south-western France, whose oldest absolute chronologies (such as the ones of Arene Candide cave, Pollera cave, Peiro Signado or Pont-de-Roque-Haute) date back to the beginning of the VII millennium BCE (Manen and Sabatier 2003).

According to Luglié, the Corsican sites of Basi-Serra di Ferro and Campu Stefanu bear evidence of this archaic ceramic production in their Early Neolithic levels. Even in the absence of absolute dates, this would suggest that Corsica, together with the Tuscan archipelago, had been targeted by the early exploration activities undertaken by Neolithic groups from Southern Italy (Luglié 2017). The date obtained for Basi layer 7 is the earliest for the Early Neolithic in Corsica and also one of the earliest for a Neolithic site with ceramics in Europe: 7700 ± 150 (De Lanfranchi and Weiss 1997, Manen and Sabatier 2003), namely 7030-6250 cal BCE (Bailloud 1969, Cesari 2011) or 7002-6187 cal BCE (De Lanfranchi 2000). Given its inconsistency with the range of dates ascribable to the Corsican Early Neolithic, its reliability is debated (Fenu, Martini *et al.* 2002).

The presence or absence of archaeological sites from this pioneer phase in Sardinia is discussed. While some authors state that some archaeological sites bearing Archaic Impressed Ware have also been found in the island, namely in Early Neolithic Cala Corsara (Spargi island, La Maddalena archipelago) (Ferrarese Ceruti and Pitzalis 1987) and in the oldest levels of Su Coloru cave (Cesari 2011), Luglié cautiously suggests that the island could have been left out of the first Neolithic migration wave since evidence of this early phase are still lacking (Luglié 2017). One of the three absolute dates obtained from charcoals in Su Coloru's Cardial levels is the oldest available for the

Early Neolithic of Sardinia: 6830 ± 80 BP, namely 5850-5620 2σ cal BCE (Fenu, Martini *et al.* 2002); but the standard deviation is wide (Lugliè, 2017, p.39, fig.4).

b) *Phase I*

Also defined as *Impressed Cardial Ware* from Su Carroppu (Lugliè 2009b); *Basi – Pienza*; *Basi – Aleria – Pienza* (Calvi Rezia 1980); *Cardial géométrique* (Binder 1995); or *cardial I* (Fugazzola Delpino 2002).

This cultural period corresponds to the phase of arrival and actual beginning of the colonisation of Corsica and Sardinia islands by early Neolithic settlers, directly following the prior pioneering phase. It is characterised by visible changes in lithic production, both in the selection of raw materials (marked by the start of a systematic exploitation of chert and obsidian) and in the technology and typology of artefacts. Lithic and ceramic production are consistent with other Tyrrhenian Cardial groups throughout the Western Mediterranean.

c) *Phase II*

Also defined as *Filiestru – Grotta Verde*; *epicardial* (Atzeni 1987); or *cardial II* (Fugazzola Delpino 2002).

Some authors have proposed a chronology for these two Cardial facies: 5700-5400 cal. BCE for Corsican Cardial phase I (Le Bourdonnec, D'Anna *et al.* 2014); or 5700-5500 cal. BCE for phase I and 5500-5250 cal. BCE for phase II in Sardinia (Fugazzola Delpino 2002).

Nevertheless, Lugliè has observed that it is not yet possible to distinguish between Cardial I and Cardial II in terms of absolute chronology and has proposed an approximate chronology that includes them both as *Tyrrhenian Cardial Ware* facies, namely 5700-5300 cal. BCE (Lugliè 2009b). Other authors have suggested to name it *Middle Thyrrhenian Impressed Ware* (Grifoni, Tozzi *et al.* 2000).

d) *Phase III*

Also defined as *epicardial*; or *Filiestru* (Trump 1983).

In this final phase of the Early Neolithic, the common cultural traits which had probably been maintained through regular trans-Mediterranean contacts began to break down. From the point of view of ceramics, different facies are visible: *Poinçonnée* in Corsica, Epicardial and "*a linee incise*" in Sardinia; while the lithic production is characterised by a widening and intensification of obsidian circulation patterns in the Italian peninsula (Lugliè 2017). To this late phase belong the archaeological sites of Rio Saboccu (Guspini) and Sa Punta – Marceddì (Terralba), dated to 5476-4999 BCE with a 2σ from the norm (namely, approx. 95% of possibility that the date fits in the value)(Lugliè 2009b). The lowest absolute date has been obtained from Filiestru layer 9 (2σ 4911-4682 cal. BC), even though it is not yet clear whether it belongs to the Early Neolithic phase IV or to the beginning of the Middle Neolithic (Lugliè 2009b).

The chronology of this phase can thus be summarised either in agreement with Fugazzola Delpino, who proposes a date between 5250-4750 cal. BCE (5250-5000 cal. BCE in Sardinia, where it is to be understood as Middle Neolithic after 5000 cal. BCE) (Fugazzola Delpino 2002); or according to Lugliè, who proposes a slightly higher date based on the new acquisitions at Rio Saboccu and Sa Punta, namely 5300-4850 cal. BCE (Lugliè 2009b).

In any case, most interpretations agree in dating the end of the Early Neolithic and the beginning of the Middle during the centuries between the sixth and fifth millennia BCE, with the emergence of a material culture with a distinct regional character: the culture of Bonu Ighinu (Lugliè 2017).

In Corsica the chronological gap between the latest Mesolithic and the earliest Neolithic evidence is wider: the most recent date for the Corsican Mesolithic is that of Petracorbara, 7840 years BP but with a very wide interval/margin (± 310); while the highest date for the Early Neolithic, namely the oldest evidence of Cardial Impressed Ware, is dated at 6670 ± 130 BP in the site of Casabianda I (calibrated date 5784-5283 BCE) (Fenu, Martini *et al.* 2002).

2.3. Raw materials Procurement and Management

2.3.1. Lithic Raw Materials Procurement Strategies. An overview

The mobility of hunter-gatherers in relation to resource provision has been addressed by several authors, often based on ethnographic observations. Different possibilities have been described depending on the degree and pattern of mobility of the group, from fully nomadic to sedentary(Beardsley, Holder *et al.* 1955 (1956), Murdock 1967).

Binford in particular has described mobility as strongly related to the environment and has distinguished two main types of organization relative to food-getting activities: a *residential mobility* (when foragers range out into the environment everyday searching for resources, and return to the residential camp each night) and a *logistical mobility* (where small task-specific groups of collectors set out from residential locations for temporary camps, aiming to the procurement of a target resource) (Binford 1979). These strategies are not mutually exclusive and are not necessarily linked to a given degree of mobility: although it generally appears that residential mobility is reduced among sedentary communities, while logistical mobility increases, not all «foragers» are highly mobile and not all «collectors» are nearly sedentary (Kelly 1995).

Various models of raw material procurement have been portrayed in the literature, differing in several aspects. The **down-the-line model** is described as a common pattern of exchange during the Neolithic period, since it is usual in societies without marked social hierarchies, and it is characterised by differential access to the source depending on the geographical distance of the settlement from which the group originates. The raw material supply is direct and abundant for the communities living close to the source, while it is mediated for all others through a stepped model: the community of origin exchanges the raw material with neighbouring villages, and these villages do the same with others further away (Tykot 2002).

Thereby, the frequency of the raw material in the material culture of different groups is higher at the source and decreases with distance (Tykot 2002). This type of frequency is typically described by the so-called **fall-off curve**, plotted on a logarithmic scale where the value is exponential with distance from the edge of the supply zone (Renfrew 1969).

As an alternative to the down-the-line model, a pattern of **direct procurement** of the raw material at its source could also be considered. This term is used to describe both a situation in which the access to the source is unhindered and one in which the raw material is procured as a result of displacement for that express and exclusive purpose (Binford 1979). In the latter, the journey can thus be assessed in terms of efficiency based on the proportion between the energy expenditure and the benefit (Optimal Foraging Theory) (Emlen 1966, Macarthur and Pianka 1966). It is understood that strategies involving high acquisition costs (for example, a long-distance displacement) are effective when the benefit is high but still expose individuals to a serious risk of failing to meet their basic needs (Arroyo 2009). It is thus assumed that the greater the distance traveled to obtain the commodity, the greater its value to the seekers (Gould 1978).

Since food is assumed to be the primary purpose of logistical forays, Kelly and Binford agree in stating that such a pattern is unlikely for the supply of lithic raw materials in hunter-gatherers' societies organized through logistical strategies (Kelly 1995). In this case raw materials or tools are rarely obtained through direct supply but are normally procured incidentally to the execution of the basic subsistence tasks, exploiting what is termed «transport potential»; the material is thus simply researched in the surrounding environment when the opportunity arises. Such a strategy is defined as «**embedded**» in basic subsistence schedules (Binford 1979).

In this type of procurement the **quality** has an incidental influence on the choice of the raw material, except in few specific cases. According to Binford, a material of good quality is required only if the instrument is designed for long-term use and is intended for incorporation into a portable tool kit of future usage («curated» technology). Instead, in case of a situational contingency, the material is selected on the basis of its *presence* in the immediate vicinity and the only factor conditioning relative investment in maintenance, reuse, and recycling is its **quantity** - as the investment is higher if there is little, in order to make the most of it (Binford 1979).

Displacement aimed at obtaining raw material as the target resource is instead considered possible within the framework of residential movements (Kelly 1995) but clearly requires short journeys so that return to base camp within a day is assured and there is no need to set up a temporary camp. This type of strategy is therefore only possible if the distance to be covered is relatively short and in the vicinity of the site.

Kelly has also pointed out that we actually do not know whether the energy intake was regarded by early hunter-gatherers when choosing a resource, or whether a number of other factors came into play in the procurement of raw materials that went beyond the energy efficiency of the strategy. The route of a displacement might also be socially or politically motivated, and a resource might be chosen even if uncertain, for example if it occasionally provides very high returns (Kelly 1995).

Finally, a last model of procurement that could be taken into account is that of **recycling** raw material from older settlements, rather than procuring it at the source. This model is for obvious reasons to be discarded for the Pre-Neolithic of Corsica and Sardinia and is unlikely for the Early Neolithic (at least as the sole source of procurement), given the paucity of evidence from earlier periods.

2.3.2. Raw Material Sources in Sardinia and Corsica

According to several authors, Corsica lacks good quality lithotypes for knapping and has no sources of obsidian or chert (Bonifay, Bassiakos *et al.* 1998, Magdeleine and Ottaviani 2000, Costa, Vigne *et al.* 2003, Leandri and Fernandes 2020). Nevertheless, recent studies have actually highlighted that Corsica *has* some good quality lithotypes, which indeed have been widely exploited: in particular rhyolite, a rock of volcanic origin whose outcrops are located in the north-west of the island (Ameziane-Federzoni 2007).

However, it is indeed certain on the basis of current data that the only sources of both obsidian and chert among the two islands are located in the bigger island of Sardinia.

a) Obsidian

Obsidian is a volcanic glass which possesses several physical properties that make it particularly suitable for knapping: for this reason, it has been widely used in prehistory and often transported over great distances (Tykot 2011). In the entire Western Mediterranean only four obsidian sources have been located, all belonging to island environments within the Italian State: Lipari, Palmarola, Pantelleria and Sardinia (Tykot 1995).

The first comprehensive survey of Sardinian obsidian sources and archaeological sites in their proximity was undertaken in 1958 (Puxeddu 1958); the first complete characterisation of obsidian sources in the Western Mediterranean dates back to only twenty-thirty years ago. Robert H. Tykot was the first to fully describe and chemically characterise obsidian outcrops in Monte Arci (see Tykot 1992, 1995, 1996, 1997, 2002), with major/minor element composition analysis – carried out using the electron microprobe with wavelength dispersive X-ray spectrometers – combined with simple visual examination.

Nine chemically different sources of obsidian can be located in Sardinia, all pertaining to the Monte Arci volcanic complex, of which only five are of archaeological interest, since they were used in prehistory for manufacturing stone tools: **SA**, **SB1**, **SB2**, **SC1** and **SC2**. The last two are usually indicated as **SC** in the literature since their chemical differences are not of archaeological significance (Tykot 1995, De Francesco and Crisci 2003, De Francesco, Bocci *et al.* 2012).

Observations from the first study carried out by Tykot and published in his doctoral dissertation (Tykot 1995) have been used as the main reference in this research to locate the raw material supply areas on the Monte Arci and are reported below (**Figure 1.** Monte Arci obsidian source zones, from Tykot, R. H., 1995. *Prehistoric Trade in the Western Mediterranean: The Sources and Distribution of Sardinian Obsidian.* Cambridge, Massachusetts: Harvard University, fig. 29 p.191.Figure 1).

SA obsidian is concentrated at the easily accessible **Conca Cannas** locality (elevation **382 m a.s.l.**), at the southwestern foot of Monte Arci, where it is localized in primary geological deposit as large nodules within a soft perlitic matrix. In this area obsidian is even frequently found in the form of small specks within the same matrix along the **Riu Cannas**. Nodules can be found in a broad area to the south and east of the quarry, but they are unworkable. Other workable obsidian nodules near Conca Cannas are fist-sized, namely of an average 10-15 cm in diameter; but can reach nearly 40 cm in length and 7 kg in mass. Other authors have reported loose decimetric obsidian blocks along the Canale Perdera and the Riu Solacera surrounding **Su Paris de Monte Bingias** (Francaviglia 1984), and some 10-20 cm blocks in the north of **Monte Sparau** (Herold 1986); the latter have been identified as SB1 type (Tykot 2002).

Towards the north, obsidian is localised in multiple localities on the west side of Monte Arci. Here SB2 type is found in small quantities in the form of large blocks in Bruncu Perda Crobina, Conca s'Ollastu, Seddai and Cucru Is Abis. On the slope of **Bruncu Perda Crobina** (beginning at an elevation under **100 m a.s.l.** in the west, and up to about **400 m a.s.l.** to the northeast) obsidian is available as 15-17 cm long nodules. In the low plain to the west of Cucru is Abis and **Conca s'Ollastu**, scatters of unworked material can also be found. In **Cucru Is Abis**, obsidian outcrops are located at an elevation of **230 m** and flow down to the west near **Funtana Figu**, where blocks up to 1 m in length occur in a modern gravel quarry (Bigazzi, Bonadonna *et al.* 1976, Tykot 1992, Tykot 1995).

SB1 is located in higher elevations towards the interior of the mountain, in the area east of the church of **Santa Maria Zuarbara**, available as small nodules within a harder volcanic layer. It is found *in situ* on the slope of **Cuccuru Porcufurau** (at an elevation of **250-300 m a.s.l.**) as pyroclastic bombs up to 30 cm in length; at **Punta Su Zippiri** (at an elevation of **500 m a.s.l.**) as abundant 3-5 cm nodules; and less frequently at **Punta Nigola Pani** (at an elevation of **350 m a.s.l.**). In the north it also occurs along the **Riu Murus** near Monte Sparau, in the form of blocks; and by **Campo dei Forestieri** as surface scatters (Tykot 1995, Tykot 2002).

Finally, SC is found at very high elevations on the eastern side of Monte Arci (**Perdas Urias** zone, which is actually a major ridge), in the form of large nodules in soft perlitic matrices. A single primary deposit, consisting of specimens up to 17 cm in length, is located at very high elevations (about **600 m** a.s.l.) near **Punta Pizzighinu**, with easy access only from the south or further east. At lower elevations, secondary deposits are abundant, such as natural blocks up to 30 cm near **Santa Pinta**, near **Mitza Troncheddu** to the north and in the low hills of **Cazzighera** to the east (Tykot 1995).

Monte Arci obsidians are all black in colour but differ in other aspects distinguishable by visual characterisation: SA obsidian is glassy and translucent with few microlite crystals; type SB1 is less glassy and usually opaque; type SB2 ranges from virtually transparent to nearly opaque, and from glassy to including many phenocrysts up to 2mm in size; SC is totally opaque, less glassy than the others and frequently has well-defined gray external bands. SC is also the only type that can rarely be found with red streaks or tinted brown, although partially transparent (Tykot 2002).

During the Early Neolithic, obsidian was already traded up to hundreds of kilometres of distance from its source. In that period, multiple systems of production and exchange were operative in the Mediterranean, concerning different categories of material goods – mainly raw materials and utilitarian products. The basic exchange system existed primarily in a local scale but was also combined with some direct long-distance contacts, mostly led through cabotage via maritime routes. The circulation of obsidian is to be understood within this framework, being linked to the trading of other goods.

Exchange circuits helped to compensate for the side-effect linked to the ongoing development of a new lifestyle based on sedentism: that is, the decrease in contacts between people who inhabited the new settlements and their communities of origin. In such framework, material culture worked both as a marker of group or kin identity and as a reproducer of behaviours associated with it (for example, the preservation of eating or drinking habits related to specific types of ceramics), maintaining bonds among communities dispersed by migrations (Tykot 1996).

Therefore, during the Early Neolithic there was no real trade in commodities outside Corsica and Sardinia, but rather a network of informal exchanges between related communities, which also included the large-scale circulation of obsidian.

a) Chert

Few and unsystematic geochemical provenance analyses have been conducted on chert found in lithic assemblages in Sardinian-Corsican archaeological sites. Unlike obsidian, several potential sources are known for chert or silicified lithotypes, scattered throughout the territory of the sole Sardinia, whereas no chert outcrops are localised in Corsica.

The most frequently mentioned in the literature is the **Perfugas basin** in the north of the island, in Anglona (Sassari province); in the same area, outcrops are known in the region of **Laerru** and **Usini**; or at the **Montiferru** massif near the west coast of the island and in the **Campidano** plain south-west, not far from Monte Arci (Bressy-Leandri 2012) (Figure 2).

In the Central Campidano, chert deposits alternate with marine sediments in a small alluvial terrace of the Riu Serri along the slope of the **Sedda Su Cardu** hillock in Santa Maria Is Acquas locality; pebbles transported by floods can also be found in this area (Mussi and Melis 1999).

Other chert-bearing formations have also been located but without considerable knappable qualities (Leandri and Fernandes 2020).

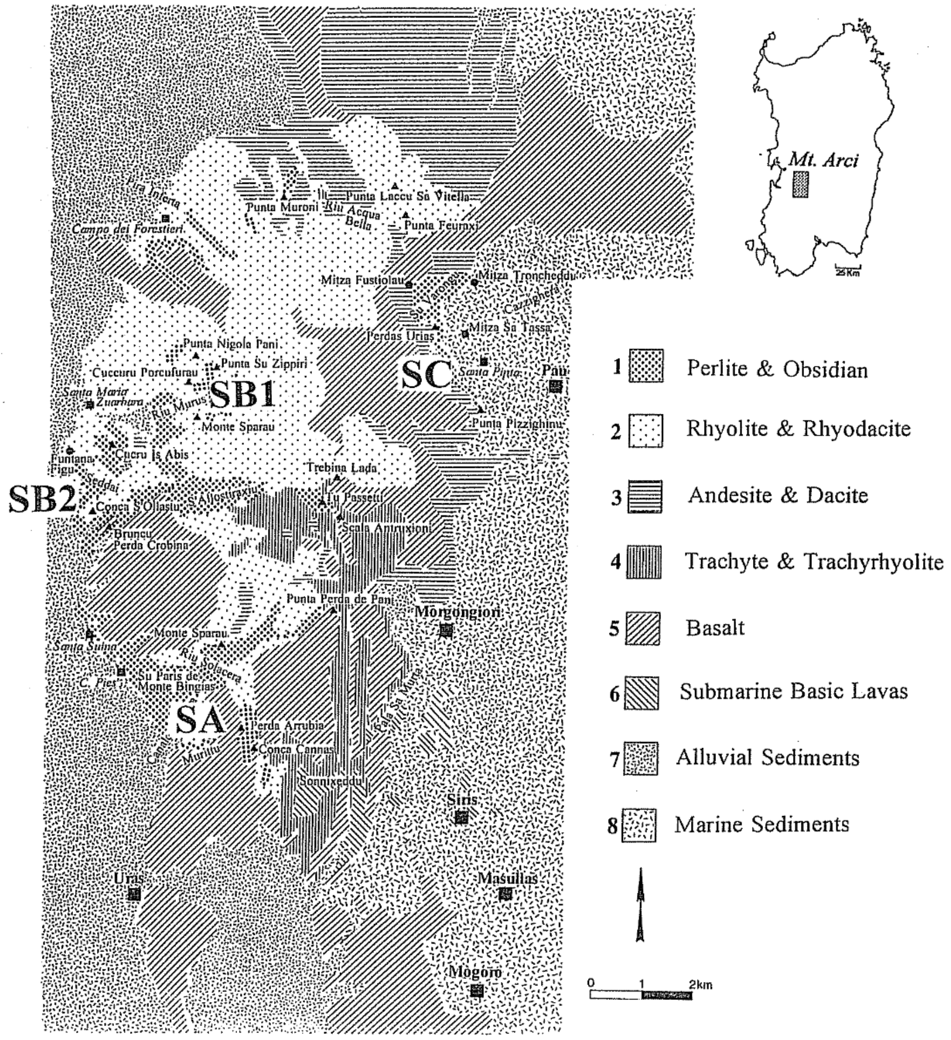


Figure 1. Monte Arci obsidian source zones, from Tykot, R. H., 1995. *Prehistoric Trade in the Western Mediterranean: The Sources and Distribution of Sardinian Obsidian.* Cambridge, Massachusetts: Harvard University, fig. 29 p.191.

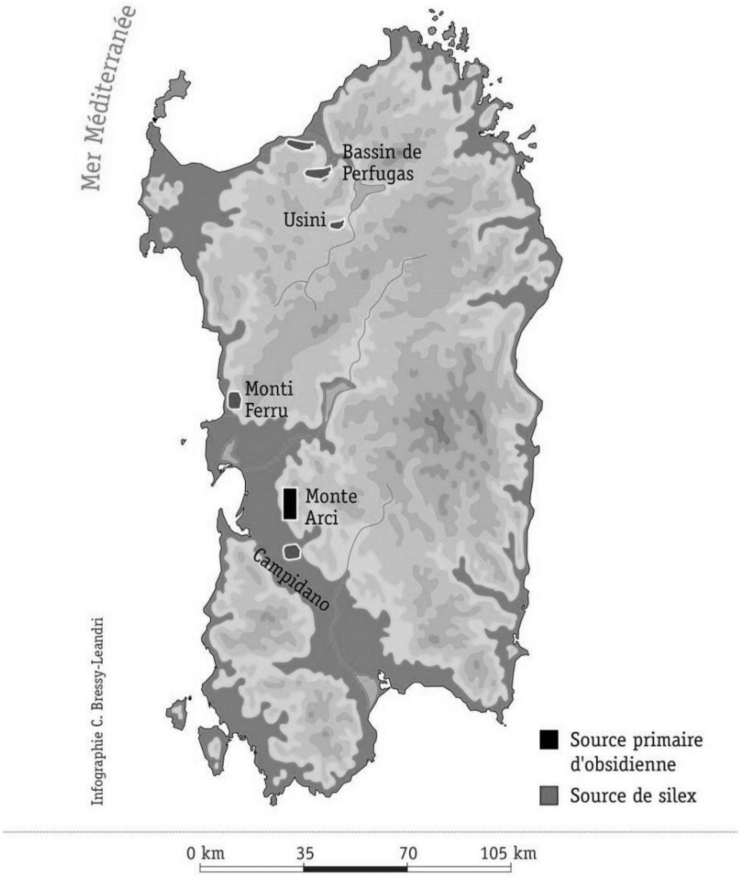


Figure 2. Chert source zones in Sardinia, from Bressy-Leandri, C., 2012. Le silex, un témoin des échanges préhistoriques. *Stantari. Histoire naturelle et culturelle de la Corse, 29(20 années de recherches sur la préhistoire récente),* infographie p. 41.

2.3.3. Management

The few lithic assemblages known for the Mesolithic of Corsica and Sardinia have been obtained from an opportunistic debitage and are characterised by a general lack of typological uniformity and a total absence of bifaces (Luglié 2009a). The knapping techniques vary from indirect percussion and pressure flaking (Salotti, Bellot-Gourlet *et al.* 2000) to direct percussion and knap on anvil (bipolar technique). In some cases, retouches and resharpening have been attested (Mussi and Melis 1999, Fenu, Martini *et al.* 1999-2000, Melis and Mussi 2002), and in one case also evidence of thermal alteration (Cesari 2011).

The typology is mostly unspecialised: the types that have been recognised pertain to the undifferentiated substrate that is common to all palaeolithic industries (Luglié 2009a). Laminar (blades and bladelets) and occasionally microlithic products are attested (Cesari 2011), while retouched elements mostly consist in points, scrapers, side-scrapers, denticulates and geometric tools (Magdeleine 1995, Aureli 2012, Romagnoli and Martini 2012).

A number of assemblages have been described as belonging to the so-called «undifferentiated Epipaleolithic» facies, characterised by a low technical investment, a very simplified operational chain and the use of hard percussion technique to produce unstandardized macrolithic tools (wide flakes, few laminar products and virtually no microlites) (Lo Vetro and Martini 2016). In addition, some Corsican sites have also been ascribed to the so-called «*Mésolithique insulaire*» (De Lanfranchi 1998).

As previously mentioned (see section 2.2.1.), several other Pre-Neolithic assemblages believed to be older have been described (although with reservations) as «Clactonian», thus pertaining to the homonymous Italian out-of-context facies (Martini 2017). Instead, there is no consensus on the attribution to the Epigravettian of the lithic assemblage from hall 1 levels C-D-E of Corbeddu cave (Skeates 2012), questioned by several authors (Cherry 1992, Martini 1992).

During the first phase of colonisation of the islands by Neolithic people, the production system was essentially local: the lithotypes were transported to the settlements in the form of raw nodules, generally small, and thus reduced on site, while no permanent workshops existed at the outcrops. The technology was intensive, aimed at exploiting all the available material, by direct percussion or on anvil; and expedient, namely characterised by a low technical investment. From the point of view of typology, there is little to absent standardisation of the few specialised tools – such as geometric microlites (trapezoidal arrow armatures, obtained from the truncation of flakes or blades) – and a preferential production of simple flakes. The rest of the toolkit is highly variable in both morphology and dimension, as a consequence of the minor production of blades and bladelets and to the rare or absent use of pressure technique (Lugliè 2017).

At a more advanced stage of the Early Neolithic, from the point of view of obsidian knapping technology, the second phase of colonisation was characterised by the introduction of operational chains enabling the production of standardised bladelets and by the regular use of indirect percussion techniques. Bladelets were preferentially obtained from SA and SB2 obsidian types and used as a base for geometric truncations. An example of site belonging to this period is Su Stangioni of Portoscuso, in Sardinia (Lugliè 2017).

3. OBJECTIVES

This Master Thesis aims at investigating the mobility patterns and procurement strategies of the first human groups to settle on the islands of Corsica and Sardinia from the Pre-Neolithic to the Early Neolithic, based on the circulation of lithic raw materials.

The research has focused on the revision of existing publications on chert and obsidian as raw materials employed for manufacturing stone tools in Sardinian-Corsican sites. Considering data on the location of settlements, the quantity of items at the findspots, along with the results of sourcing analyses when available, the following questions have been addressed in this work:

- Is it possible to define based on the **circulation** of raw materials the **mobility patterns** of Pre-Neolithic and Early Neolithic humans in Corsica-Sardinia while performing a specific task such as **lithic procurement**?
- Is it possible to derive from the available data on palaeoenvironment, subsistence strategies, type and location of settlements, circulation of chert and obsidian and patterns of mobility to and from the source of supply, the **procurement strategies** of raw materials in the above-mentioned chronologies?

In order to answer these questions, particular attention has been devoted to the interplay among humans and landscape by proposing patterns of mobility across the territory of the two islands based on the principle of the **minimum energetic cost**, rather than as the crow flies.

This Thesis will also investigate how these dynamics – both mobility patterns and raw material procurement strategies – have been shaped by the boundary from occasional Pre-Neolithic settlements to the beginning of a stable Neolithic colonisation and the changes in terms of economy, technology and lifestyle associated to.

With the aim of addressing these questions, the objectives of this research have been stated as follows:

O1: To build, through bibliographic research, a systematic **database** including all published data concerning the presence of chert and obsidian artefacts in Sardinian-Corsican sites dated prior to the Middle Neolithic. The database will be built in Microsoft Access and will distinguish between archaeological sites dated to the Early Neolithic and those dated to the Pre-Neolithic, and between archaeological deposits with and without evidence of chert or obsidian.

O2: To create specific cartography on the geographical distribution of these raw materials across the territory of the two islands. The database (O1) will be geo-referenced with a Geographic Information System **(GIS)** software, which will allow to digitalize the information onto the map, both making it visible and introducing the fundamental variable of **space/territory** in the research.

O3: To define mobility patterns for the supply of chert and obsidian based on the available results of provenance analyses, using a GIS software to draw the movement lines from the findspot to the source with the principle of the **least cost** (minimum effort). This is to say that the tracing of the probable routes followed by humans will be based on the calculation of the shortest distances from the raw material sources to their findspots based on orography.

By investigating the possible movements of the early human groups inhabiting Corsica and Sardinia, as they traversed the landscape to perform an specific task, as lithic procurement, the results from this study will contribute to the debate on resource management and landscape knowledge of these pioneering populations.

4. MATERIALS

Published data on **26** Pre-Neolithic (PN) and **109** Early Neolithic (EN) archaeological sites have been considered for this research, of which 12 PN + 27 EN in Corsica and 14 PN + 82 EN in Sardinia. These archaeological sites correspond to the totality of the sites currently known in the islands of Corsica and Sardinia for the periods examined, according to the reviewed literature. The data collected and used in the research concern the chronology of the sites, their geographic location (**Errore. L'origine riferimento non è stata trovata.**) and the lithic complexes (**Errore. L'origine ri ferimento non è stata trovata.**), with a special focus on chert and obsidian artefacts when present.

A chronological range of several millennia has been considered for Pre-Neolithic archaeological sites, including either sites dated by absolute methods and those dated by chrono-typological comparisons; the range extends from the Early Middle Pleistocene to the second half of the 7th millennium BCE. For the Early Neolithic the time span is much more circumscribed and includes all sites dated to the 6th millennium BCE, although some very controversial sites stray from this model anticipating the advent of the Neolithic to the second half of the 7th millennium BCE and overlapping the last Mesolithic evidence.

The geographic area in which the archaeological sites have been located includes the entire territory of the two islands, with islets and archipelagos, forming part of the Corsican-Sardinian block; it therefore excludes the islands of the Tuscan archipelago. The chosen Coordinate Reference System is WGS84/UTM projection, zone 32N (EPSG: 32632). For the geo-referencing of archaeological sites, geographic coordinates were used when available or the sites were approximately located using maps found in the literature. Land that emerged on the coastline during the periods under consideration (now submerged by sea level rise) was also included in the map.

The presence and amount of obsidian or chert in the archaeological deposits was recorded, along with their techno-typological characteristics and provenance analysis when available (Tables 3 and 4). Source areas of raw materials have also been georeferenced, especially obsidian outcrops, scattered across Mount Arci in known location; whereas chert, due to the few available data and its ubiquitous distribution, has only been approximately located.

5. METHODS

A bibliographic review has been carried out on papers published as conference proceedings, books and communications related to Pre-Neolithic and Early Neolithic archaeological sites in Corsica-Sardinia and, when present, on the description of lithic complexes. The recovered publications dated from the second half of the 20th century to the present year.

Google Scholar and **Scopus** were used as databases and search engines to collect the reference bibliography. In the first phase of the search, keywords such as «Early Neolithic Sardinia» or «obsidian Corsica pre-Neolithic» were used; then, in a second stage, the bibliography of the papers was used to guide the search or the mentioned archaeological sites were used as keywords, thus proceeding by cross-referencing. Information regarding the palaeoenvironment and palaeoclimate of the relevant periods was collected using the same method. Publications concerning the location of raw material sources were also considered.

In parallel to the bibliographic review, a specific database was constructed compiling all the relevant information. The software used was **Microsoft Access**, a Database Management System (DBMS) which facilitates the organisation of complex data by constructing relational tables and allows to answer specific questions through the formulation of queries.

Four relational tables were built, tied in pairs by a simple 1-to-many relationship (see section 11. Supplementary Data). The entry «N/A» (not available) was used in all cases in which the information was not found in the literature, while the «?» character was used when the available information was uncertain. Asterisks («*») are meant to indicate archaeological sites with both Pre-Neolithic and Early Neolithic occupational levels.

Two tables were built to record all archaeological sites excavated or solely listed in the bibliography, regardless of the evidence they have yielded: one for the Pre-Neolithic and the other for the Early Neolithic. For each site, 14 field values were recorded containing information on: the type of site (cave, open air, shelter or small shelter), whether it featured burials and few additional specifications when useful (mountain shelter; in a pass; on a hill; now on seashore); the region; the area in relation to the cardinal points, with the distance from the seashore in km if available; the age provided by absolute dating, both in years BP and BCE calibrated if available; the culture as given in the literature (Late Mesolithic; Middle Pleistocene, Final Early Neolithic etc.); the dating method, including chrono-typological attributions; the facies, of the ceramics for the Early Neolithic and of the lithics for the Pre-Neolithic; the archaeological level; the coordinates expressed in decimal degrees (DD) and the reference used (Google Maps, reference paper, photo); the altitude above sea level; the main references and additional notes if needed (Table 1).

Each of the two tables has been linked to another table using the archaeological site as primary key. These two dependent tables have been filled with a detailed description of the lithic assemblages of the sites which yielded obsidian, chert, or artefacts on both raw materials. The fields were recorded with information regarding: the total amount of items in the lithic assemblage and the lithotypes; the percentage of obsidian and that of chert out of the total; the number of items in obsidian and in chert; the number of items on which lithotype provenance analyses had been carried out and which analyses; the results of the sourcing, also mentioning the outcrop in the case of obsidian; general information on technology and typology; additional notes regarding specifically the lithic artefacts when present (Tables 2, 3 and 4).

<table>
<tr><th>SITE</th><th>TYPE OF SITE</th><th>REGION</th><th>AREA</th><th>AGE</th><th>CULTURE</th><th>DATING METHODS</th><th>FACIES (ceramic)</th><th>ARCH LEVEL</th><th>COORDINATES REF</th><th>X</th><th>Y</th><th>H_ASL</th><th>REFERENCE</th><th>NOTES</th></tr>
<tr><td>Strette XIV and XX (A Petra - Barbaggio) *</td><td>small shelter</td><td>Corsica</td><td>NE</td><td>range 5600-5000 cal BCE | layer XXb: 6480 ± 480 BP | 6420 ± 300 BP (very high standard deviation)</td><td>Early Neolithic</td><td>C14 on wood charcoal and chrono typology of ceramics</td><td>Cardial Ware (and poinçonnée?)</td><td>layer XIV</td><td>map + Google Maps. APPROX</td><td>42,693167</td><td>9,330972</td><td>20 / 44 QGIS</td><td>Costa et al.2000 | Tykot2002 | Costa et al.2002</td><td>The distance from the coast was the same in the EN as it is now. From autumn to spring the nearby River Strette swells and regularly floods the site. However, it is likely that the position of the river has changed over time and that the site was not as prone to flooding in the Early Neolithic period.</td></tr>
</table>

Table 1. Example of an entry included in the database regarding the Early Neolithic archaeological sites in Corsica and Sardinia (Appendix-Table 5).

SITE	TOTAL ITEMS IN ASSEMBLAGE
Strette XIV and XX (A Petra - Barbaggio) *	1036 (local rocks 75/83%: quartz, rhyolite, granitoids, serpentinites; high quantity of obsidian; chert)

Table 2. Example of an entry included in the database of the EN sites with obsidian and chert in Corsica and Sardinia. (Appendix-Table 6; Part 1/3)

SITE	OBSIDIAN	% IN ASSEMBLAGE	N° IN ASSEMBLAGE	N° ITEMS ANALYSED	ANALYSES	SOURCE	OUTCROP/SUBSOURCE	TECHNOLOGY	TYPOLOGY
Strette XIV and XX (A Petra - Barbaggio) *	Yes	11%	117	10	EMP (Electron Microprobe)	Monte Arci	9 SB2; 1 SC. No SA, no SB1.	Introduced as finished products. No evidence of knapping on site.	Poor typological variability. Mostly simple flakes. Few blades and retouched (sharp armatures).

Table 3. Example of an entry included in the database of the EN sites with obsidian and chert in Corsica and Sardinia. (Appendix- Table 7, Part 2/3)

SITE	CHERT	% IN ASSEMBLAGE	N° IN ASSEMBLAGE	N° ITEMS ANALYSED	ANALYSES	SOURCE	TECHNOLOGY	TYPOLOGY	NOTES
Strette XIV and XX (A Petra - Barbaggio) *	Yes	5%	50	N/A	visual characterisation?	Sardinia (probably)	Few evidence of knapping aimed at obtaining flakes with direct percussion (hard hammer) or knap on anvil. Most of the artefacts have been introduced as finished products	Poor typological variability. Mostly simple flakes. Few blades and retouched (sharp armatures).	Analyses have been led on level XIV. The dichotomy between the introduced pieces characterised by high technical investment and the local pieces characterised by low investment suggests that the occupants of the site were by no means specialists in lithic technology. This site was probably a subsidiary 'satellite' settlement, repeatedly inhabited by small groups originating from a stable site.

Table 4. Example of an entry included in the database of the EN sites with obsidian and chert in Corsica and Sardinia. (Appendix-Table 8, Part 3/3)

The next step has been the construction of a map prior to the georeferencing of both the archaeological sites and the sources of chert and obsidian. The software that has been used is **QGIS 3.20**, the latest released version of the Geospatial Foundation's (OSGeo) Open Source Geographic Information System.

A new and specific project was opened for this Master Thesis. As Project Coordinate Reference System (CRS), the datum WGS84 was chosen and it was associated to UTM projection, zone 32N (EPSG: 32632). The map was thus created using current Digital Terrain Models for the two islands, combined with a vector layer of natural watercourses, a bathymetric chart of the Western Mediterranean and the vectorization of palaeo coastlines for the relevant periods based on isobaths.

60 raster layers representing the morphology of the terrain – obtained from level curves and elevation points of the 10K Geo-topographic Database – were downloaded from the geo-portal of the Sardinian Region, having ROMA40/ Monte Mario Italy 1 (EPSG:3003) as CRS[1]. The gridded digital terrain model which describes the relief of the French territory at medium scale (BD Alti) was downloaded from the geoservices website of France in the form of 35 raster layers divided among Haute-Corse and Corse-du-Sud, having a geodetic system RGF93, associated ellipsoid and projection IAG GRS 1980 Lambert 93, and IGN 1978 as altimetric system (EPSG 2154)[2].

The polygon vector layer for Europe coastlines was downloaded from the European Environment Agency (CRS EPSG3035 – ETRS89-extended/LAEA Europe)[3]. Corsica and Sardinia were isolated as two separate polygons using the «Clip» geoprocessing tools. The previously downloaded DTMs were thus merged and the two resulting rasters (one for each island) where clipped using the «Clip raster by Mask Layer» tool and the polygons as masks. Two DTMs for the landmasses of Corsica and Sardinia were thus produced and modified to obtain a realistic mapping from the point of view of colour; contour lines were also shown every 25 m and 100 m with the respective labels indicating the exact elevation above sea level.

The GEBCO_2020 Grid (General Bathymetric Chart of the Oceans) was downloaded[4] both for an area roughly corresponding to the whole Western Mediterranean and for the sole vicinities of the

[1] Retrieved from https://www.sardegnageoportale.it/areetematiche/modellidigitalidielevazione/, visited on 02/07/21
[2] Retrieved from https://geoservices.ign.fr/bdalti, visited on 02/07/21.
[3] Retrieved from https://www.eea.europa.eu/data-and-maps/data/eea-coastline-for-analysis-1/gis-data/europe-coastline-shapefile, visited on 02/07/21.
[4] Retrieved from https://download.gebco.net, visited on 02/07/21.

Sardinian-Corsican coasts. The latter was modified showing the isobaths every 25 and 100 m under the sea level.

Two vector layers of natural Sardinian waterstreams were downloaded, one pertaining to the geo-topographic database at scale 1:10.000 (DBGT10K)[5] depicting surface and flowing water (wet surface, ASTA_F_BSU) and the other from the ISPRA (Superior Institute for Environmental Protection and Research) depicting the entire national hydrographic network[6]. The first represents in detail the basin of the main rivers, while the latter provides an approximate depiction of the watercourse route; it was also filtered according to the fluvial order classification, limited to «1-2» (Horton 1945, Strahler 1954).

The toponyms of the hydrographic network were shown as labels and the layer was filtered by excluding all elements that did not have a toponymic indication. The indication of navigability was filtered and the navigable rivers were saved as a separate vector layer and indicated with different color and thickness on the map.

The vector layer for Corsica waterstreams was downloaded from the geo-catalogue[7] and was then filtered to depict the sole watercourses of natural origin. All resulting streams were thus filtered again to show only those with permanent flow and toponymic specification. Different thickness of the lines in the map was set after splitting the rivers in two vector layers according to their width, namely between 15-50 wide or less than 15 meters. According to the attribute table, none of these waterstreams is navigable.

Even though there are several natural surface water bodies in the Corsican territories, particularly lakes in the mountains and ponds on the coast, it has been chosen not to represent them in the map due to their small size (<0,50 km^2) (Donta, Lange *et al.* 2005). The same applies to Sardinia but, as there is a natural lake of significant size (Lake Baratz, about 800 m size) (measured with the Google Maps distance measuring tool), it has been chosen to show it in the map through filtering of the polygon vector layer of the bodies of water (SP_ACQ) downloaded from the DBGT10K[4]. Ponds, marshes and lagoons were excluded, since given their nature (shallow standing water for ponds and marshes; shallow water stretch partially enclosed by a stretch or the delta of a river for lagoons) (2015)the presence of these bodies of water is unstable.

The toponyms of the reliefs were downloaded from Sardinian geoportal[8] and from the topographic vector layer of Corsica (Haute Corse and Corse-du-Sud)[9], filtered to include the sole features related to hills, ridges, peaks, summits and mountains in general. The layers related to the location and name of both Corsican and Sardinian caves were downloaded to determine a precise geographical reference for the numerous archaeological sites referable to these contexts[8,10]. The maps of municipalities (for Sardinia) and of municipal lands (for Corsica) were also loaded to be eventually used in the geo-referencing of archaeological sites.

Subsequently, the lines of the palaeocoasts were drawn for the relevant periods. In order to do so, only the depth and morphology of the seabed were considered as the sea level dropped, thus

[5] Retrieved from https://www.sardegnageoportale.it/index.php?xsl=2425&s=330839&v=2&c=14414&t=1&tb=14401, visited on 02/07/21.
[6] Retrieved from http://geoportale.isprambiente.it/tematiche_pt/idrografia/, visited on 02/07/21.
[7] Retrieved from https://data.geocatalogue.fr/id/dataset/1570d8de-f662-4a9f-8e70-dc83ef985c6c, visited on 02/07/21.
[8] Retrieved from http://webgis2.regione.sardegna.it/catalogodati/card.jsp?uuid=R_SARDEG:HMEIM, visited on 02/07/21.
[9] Retrieved from https://geoservices.ign.fr/telechargement, visited on 02/07/21.
[10] Retrieved from http://webgis2.regione.sardegna.it/catalogodati/card.jsp?uuid=R_SARDEG:LFJIM, visited on 02/07/21.

without considering possible vertical tectonic movements, such as uplift or subsidence. The lines of four possible approximate palaeo-coasts were thus drawn by isolating the isobaths of interest on the bathymetric DEM, following the chronology of sea-level rise as described in the literature: one at **-35 m at 7 ka BCE** (Shackleton, Van Andel *et al.* 1984) plus two for **5 ka BCE**, at **-10 or -5 m** (Allegrini-Simonetti 2000), which frame the Early Neolithic; and one at **-45 m at 9 ka BCE** (Pasquet and Demouche 2012), maximum threshold of the Pre-Neolithic according to absolute dates. In the absence of reliable dates, it has been chosen not to represent the palaeocoastline for periods prior to this threshold, despite the presence of sites attributed to the Palaeolithic.

The next and final step in the construction of the map was the geo-referencing of archaeological sites and raw material sources. A first attempt was made to locate the sites via Google Maps, using the simple search tool or a combination of satellite images, photos and maps found in the literature plus manual searching. Coordinates that were found were exported and saved as **.csv UTF-8 comma-delimited** text-files in simple databases composed by the name of the site and the longitude-latitude in decimal degrees. They were then loaded in QGIS as point vector layers, choosing EPSG:4326-WGS84 as Coordinate Reference System.

A different procedure was followed for sites not located on Google Maps. They were drawn directly on QGIS as **point vector features** using maps found in the literature as reference (Figure 3) – which were georeferenced and then added to the project as raster layers; or using the regional caves layer, in case it was a cave or shelter site. The map of municipalities and the map of mountains were used as a reference to approximately confirm the correct location of sites when this information was available in the literature. The attribute table was again built with the name of the sites and the value of x and y in decimal degrees: coordinates were then extracted from the map using the appropriate function of the field calculator.

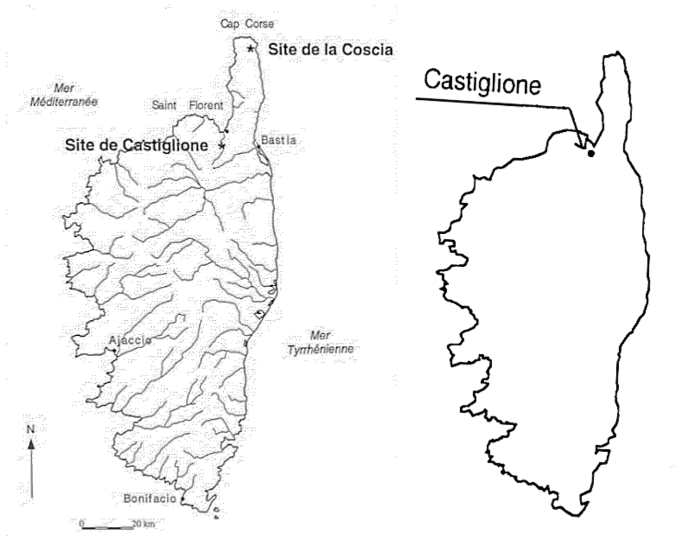


Figure 3. Example of maps found in the literature and georeferenced on QGIS to be used as a reference for the location of sites. From left: Bonifay et al.1998, p.19; Salotti et al.2000, p.220.

The complete tables of the Access database – both the one concerning the sites and the one detailing the raw materials – were uploaded to QGIS as a non-georeferenced .csv file. Vector layers with coordinates were combined into a single layer of points with the **Merge** tool. Finally, the .csv database was uploaded to the points layer using the **Join** tool, thus constructing a sole attribute table containing all sites represented in the map with their respective attribute data. The «Sample raster values» tool was then used to extract the **elevation** of each site expressed in metres above sea level and approximated to the integer. This procedure was repeated for six vector layers, containing respectively the alleged Palaeolithic archaeological sites, the Mesolithic and the Early Neolithic ones for Sardinia and Corsica.

In the map of Pre-Neolithic sites two different symbologies have been used for the alleged Paleolithic sites and for the Mesolithic ones (Figure 4). Instead, with regards to those Early Neolithic sites which present more than one occupation episode, pertaining to different levels, it has been chosen to depict only one of the levels in the map to make clear the location of the site (Figure 8); one should then refer to the database for the complete list of the relative occupational stages (see section 10. Supplementary data).

Raw material sources were instead located through the sole georeferencing of maps found in the literature: for the sources of obsidian the maps provided by Tykot (Tykot 1995) (Figure 1) and Lugliè (Lugliè, Le Bourdonnec *et al.* 2006) were used, while for the sources of chert the sole map of Bressy-Leandri (Bressy-Leandri 2012) (Figure 2) was used.

Subsequently, thematic maps were constructed representing by means of diagrams some of the values given in the attribute tables with the aim of making them easily comprehensible in the geographical context. In particular, the following were represented by pie charts or text diagrams: the **relative percentages of obsidian and chert** in the total lithic assemblages and the **sourcing of raw materials**, when the data was available. Where the presence of the raw material was specified but not its quantity, it was depicted with an indicative percentage number on the pie chart. Also, when the sites without data where so numerous as to make it difficult to read the graphs, the thematic maps were simplified by excluding them and leaving only the pie charts.

It was not possible to create diagrams of relative percentages among Sardinian-Corsican Palaeolithic sites, since the data was missing. For <u>Mesolithic</u> sites, instead, it was chosen to use **text diagrams** rather than pie charts, to represent the absolute number of obsidian and chert items present at the site – since data on the total amount of items in each assemblage was lacking and relative percentages were unknown (Figures 11 and 12).

Regarding the <u>Early Neolithic</u> sites, two thematic maps were produced, one for Corsica and one for Sardinia, to represent the percentages of obsidian and chert in the total lithic items of each settlement. In this case, since absolute quantities of the totals and percentages of obsidian and chert – or the number of items, from which percentages could be calculated – were available, it was decided to make **pie charts** rather than text diagrams (Figures 17 and 18).

Sites were subsequently filtered based on the **sourcing of raw material**, including assemblages that were not sourced and excluding all sites bearing neither obsidian nor chert. Diagrams were created to show the number (or percentage, when possible) of items sourced to the different outcrops, both of obsidian and chert (Figures 13, 14, 15, 16, 19, 20, 21 and 22). This step was essential to identify the sites for which it was possible to produce Least Cost Paths.

5.1. Least Cost Path Analysis (LCPA)

For the archaeological sites for which sources of obsidian or chert were known, analyses were applied to reconstruct the lowest energy cost routes for procuring the raw material. To do this, the "**Least Cost Path**" command of QGIS was used, taking the land **slope** as the only variable for the construction of the cost surface on the basis of the Digital Terrain Model.

Since orography was taken as the only relevant factor, both streams and bodies of water and the sea were excluded from the calculation of movements. For the routes in which the crossing of the sea was necessary - i.e. for all movements from Corsica to Sardinia - it was decided to consider as the most probable path the shortest route as the crow flies from the Corsican palaeo-coast to Sardinian palaeo-coast, drawing a simple straight line (Figure 27).

For all movements from Corsica to Sardinia, the Least Cost Path was therefore constructed in two stages: one, from the relevant settlement to the spot on the coast located at the shortest distance as the crow flies from Sardinia; two, from the corresponding nearest spot on Sardinian coast to the raw material source. With regard to the submerged stretch of land between the current coastline and the paleo-coasts, as this is a virtually unknown part of territory from the point of view of slope, no routes have been drawn there either as the crow flies or on the basis of least cost.

First of all, two maps of land gradient were constructed on the basis of Corsican and Sardinian DTMs using the simple QGIS "**Slope**" tool. The resolution of the Digital Terrain Model of Sardinia was high and it would have needed very long computing time to produce the LCPA: it was thus lowered by increasing the pixel size to 25. The slope map was then used as the **cost surface** or «**friction surface**» layer (Gustas and Supernant 2017) for the calculation of the LCPA.

Archaeological sites were considered as start-points and raw material sources as end-points. As regards chert, the precise coordinates of the outcrops were not available, only the areas in the form of polygon layers; since the LCPA constructs paths using points, the centroids of the polygons were calculated using the appropriate QGIS command and were then used as end-points for the analysis. On the other hand, in the case of obsidian, the outcrop areas were known and vectorized as polygons but also as precise point coordinates, which were several for each geochemical type; all known coordinates were thus used as end-points for the software to trace the route to the nearest one.

Eventually, the polyline layers obtained through LCPA were loaded onto the Mesolithic and Early Neolithic maps, after filtering the point layers of the archaeological sites in order to depict only the settlements involved in the analysis. Four maps were thus produced, one for the provisioning of chert from Mesolithic sites (Figure 23); one for the procuring of obsidian from Corsica during the Early Neolithic (Figures 24 and 25); a third for the supply of obsidian within EN Sardinia (Figure 28); and the last for the procurement of chert in both islands during the EN (Figure 30). **No maps were produced for obsidian supply during the Mesolithic since no data were available for either Corsica or Sardinia.**

6. RESULTS

6.1. Database

According to published data, only a total of **11** Pre-Neolithic and **38** Early Neolithic archaeological sites have yielded obsidian or chert in their lithic assemblages, with absence of information regarding the rest of the sites. Of the Pre-Neolithic sites, only 4 are Corsican (Punta di Caniscione, Campu Stefanu, Cave of Castiglione and Torre d'Aquila) and the other 7 are Sardinian (Sa Pedrosa-Pantallinu, Sa Coa de sa Multa, Su Coloru, Corbeddu Cave, Porto Leccio, Santa Maria Is Acquas and S'Omu 'e s'Orku) (Table 5) (see section 11. Supplementary data).

Among the Early Neolithic sites, 17 Corsican sites have yielded chert or obsidian (A Guaita, A Petra, A Revellata I, Araguina-Sennola, Basi, Bufua III, Campu Stefanu, Curacchiaghju, Filitosa-Sollacaro, Grotta Southwell, Longone I, Lumaca, Renaghju, Riparo Albertini, Strette, Torre d'Aquila, U Grecu) and 21 Sardinian (Acqua Sa Canna, Cala Corsara, Cala di Trana, Cala di Villamarina, Coddu Is Abionis, Corbeddu, Filiestru, Grotta Rifugio, Iglesias, Pauli Annuas, Punta Campu 'e Sali, Rio Saboccu, S. Chiara, Sa Korona di Monte Majore, Sa Punta, Santa Caterina di Pittinuri, Santa Maria Is Acquas, Su Carroppu, Su Coloru, Su Paris de Sa Turre, Torre Foghe) (Table 6)

The Early Middle Pleistocene is the oldest extent for Pre-Neolithic sites, attributed to the Sardinian Sa Coa de Sa Multa layer B, paleosurfaces α, β, γ (Romagnoli and Martini 2012, Martini 2017), although the dating has been questioned along with other alleged Paleolithic attributions made by indirect dating methods (Sa Pedrosa Pantallinu and Santa Maria Is Acquas) (see section 2.2.1.). The oldest PN date obtained with absolute methods is from the Upper Pleistocene, about 60 ka BP or 50-44 ka BP for the Corsican site of Grotte de La Coscia, bearing a lithic series whose intentional processing by humans is actually not certain and which does not present either chert or obsidian (Bonifay 1998).

The most recent Pre-Neolithic absolute dating is **6380-6210 2σ cal. BCE** for the horizon L1 of Sardinian Su Coloru cave site (Fenu, Martini *et al.* 1999-2000, Fenu, Martini *et al.* 2002). The most recent one for a Corsican site is that of Campu Stefanu's US109, about **6595-6470 2σ cal BCE** (Cesari 2011).

In Sardinia, the oldest appearance of chert in the archaeological record dates back to 13.620 ± 180 BP, i.e. the disputed attribution of Corbeddu Cave's layer 3 in hall 2 and levels C-D-E in hall 1 (Sondaar, Sanges *et al.* 1986, Hofmeijer and Sondaar 1992, Sondaar, Rengert *et al.* 1995) (Table 5. *Query* formulated on the Pre-Neolithic database (Appendix 1, 2, 3, 4) to show the sole sites with chert and obsidian, the lithotypes that compose the lithic assemblage and the chronological location of the deposit.

). The lithic complex (found in H1 LC-D-E) has been considered associated with an accumulation of *Megaloceros Cazioti* bones (found in H2 L3) and absolute dating has been performed on the latter; but the correlation is doubtful and so is the anthropogenic origin of the deposition of faunal remains (Cherry 1992).

Obsidian appears for the very first time in Sardinia along with chert in S'Omu e S'Orku coastal shelter at about **8500 cal BP** – which is also the oldest date for the presence of chert in an archaeological record, although the stratigraphy is unclear. The older attribution to 10.000-7700 uncal BP of Porto Leccio is too inaccurate and no specifics were found on the dating method implemented (Tozzi 2012), while the chronology of Santa Maria is Acquas (Late Upper Pleistocene, Final OIS 3 and/or early OIS 2) is imprecise as it is based on relative dating (Mussi and Melis 1999, Melis and Mussi 2002). Furthermore, no Sardinian Pre-Neolithic sites are known in which obsidian and not chert is present (Table 5).

In Corsica, the first absolute date for the archaeological presence of chert is older than that of Sardinia, namely about 8400 BCE at Punta di Caniscione (Pasquet and Demouche 2012). The oldest presence of both obsidian and chert is dated to 7840 ± 310 BP in Torre d'Aquila level 9 (Fenu, Martini et al. 2002), although questioned due to the high standard deviation. The only Pre-Neolithic Corsican archaeological site in which obsidian and not chert is present is that of Cave of Castiglione 3, dated to about the first quarter of the 7th millennium BCE (Salotti, Bellot-Gourlet et al. 2000), which is also the only Pre-Neolithic site where the sole obsidian is present as lithotype (Table 5).

Since only *one* artefact composes the lithic complex of this site and as it consists of a cave-fill, both the dating and the reliability of the stratigraphy should be treated with caution (Le Bourdonnec, Poupeau *et al.* 2014b).

REGION	SITE	AGE	DATING METHODS	TOTAL ITEMS IN ASSEMBLAGE	OBSIDIAN	CHERT
Corsica	Campu Stefanu (Sollacaro-Lévie) *	7028-6658 BCE (Courtaud et al.2016. unclear level) | 7700 ± 30 BP (2σ 6595-6470 cal BCE) (US109)	radiometric dating on human mineral carbon (Courtaud2016) | ? dating on faunal remains (Cesari et al.2011)	N/A (6 obsidians; 3 chert, 1 indet and 2 from Perfugas)	Yes	Yes
Corsica	Cave of Castiglione 3 (Oletta)	End of 7th millennium | 6985-6725 BCE (Dating questioned)	C14 on charcoal	1 (obsidian)	Yes	No
Corsica	Punta di Caniscione (Monacia - d'Aullène)	approx 8400 BCE	AMS on wood charcoal	6905 (local -within a 6km radius- rhyolitic pebbles, hyaline quartz, few chert tools)	No	Yes
Corsica	Torre d'Aquila (Pietracorbara) *	level 8: 7840 ± 310 BP (Fenu et al.2002) | level 9: 6920 ± 300 BP (Weiss 2000). Small sample, too high standard deviation.	C14 on charcoal	N/A (mainly local quartz 30,8%, gabbro, serpentinite, rhyolite, grès + 2 small flakes of white chert + 2 small flakes of obsidian)	Yes	Yes
Sardinia	Corbeddu (Oliena) * UP	13.620 ± 180 BP - 11.980 ± 140 BP	AMS on bone collagen and charcoal (Robert J. Van de Graaff Laboratory of the Rijks-universiteit Utrecht)	N/A (silicified limestone, chert, quartz, goethite)	No	Yes
Sardinia	Porto Leccio (Trinità d'Agultu)	10.000-7700 BP (uncal)	N/A	N/A (quartz, rock crystal, slate, rhyolite, 27%/38% chert, obsidian)	Yes	Yes
Sardinia	Sa Coa de sa Multa (Laerru, SS) 1	no absolute date. Early Middle Pleistocene/Interglacial Mindel-Riss	Pedological study of the profile + Chronotypological attributions	N/A (well silicified local breccias, brecciolas, limestones, dolomites)	No	Yes
Sardinia	Sa Pedrosa-Pantallinu (Perfugas, SS)	no absolute date. (Late) Middle Pleistocene/Riss (OIS 6)	Pedological study of the profile + Chronotypological attributions	N/A (siliceous material)	No	Yes
Sardinia	Santa Maria Is Acquas (Sardara)	no absolute date. Final OIS 3 and/or early OIS 2 (Late Upper Pleistocene)	Micromorphological and pedological analysis, chronotypological attributions	>70 (almost solely chert, also chalcedony and rarely obsidian pebbles, scattered across the paleo landscape)	Yes	Yes
Sardinia	S'Omu e s'Orku (Arbus)	8500 cal BP	C14 dates on human bones and charcoal + sedimentological analysis	N/A (some chert and obsidian implements + ochre fragments, pencils and ochre-stained marine shells)	Yes	Yes
Sardinia	Su Coloru (Laerru, SS) * L	L1 horizon: 7400 ± 40 BP (2σ cal. BCE: 6380-6210; cal. BP: 8330-8160) - L2 horizon: 7740 ± 50 BP (2σ cal. BC: 6660-6420; cal. BP: 8610-8410) - L3 horizon: 7920 ± 50 BP (2σ cal BC: 7040-6660; cal BP: 8990-8610)	AMS on carbon (performed by Beta Analytic Inc. Lab of Miami)	71 (mostly local chert, occasionally quartz)	No	Yes

Table 5. *Query* formulated on the Pre-Neolithic database (Appendix 1, 2, 3, 4) to show the sole sites with chert and obsidian, the lithotypes that compose the lithic assemblage and the chronological location of the deposit.

The oldest date for the Sardinian Neolithic is that of Su Coloru layers H (**5870-5320 2σ cal BC**; 7820-7270 2σ cal BP:) and I (**5850-5620 2σ cal BCE**; 7800-7570 2σ cal BP) (Fenu, Martini *et al.* 2002, Sarti, Fenu *et al.* 2012). The most recent date for the Early Neolithic is that of Filiestru level B9 (**4911-4682 2σ cal BCE**) (Lugliè 2009b).

The oldest date for the Corsican Neolithic is that of Basi level 7, namely **7030-6250 cal BCE** (Bailloud 1969; Cesari *et al.* 2011) or **7002-6187 cal BCE** (De Lanfranchi 2000). Nevertheless, several authors believe the date is too high to be Early Neolithic since it is inconsistent with others from the same cultural period, and some have suggested a quite later attribution at 7700 ± 150 BP (De Lanfranchi et Weiss 1997, Manen et Sabatier 2003). Directly following the chronology of Basi there's Curacchiaghju layer 6c at 7600 ± 150 BP (cal BCE 6994-6038) (De Lanfranchi 2000), but this date is also discussed for the same reasons. The most recent Early Neolithic date is that of Araguina-Sennola layer XVII at about **4700 ± 140 BCE** (De Lanfranchi, Weiss *et al.* 1971).

REGION	SITE	AGE	DATING METHODS	TOTAL ITEMS IN ASSEMBLAGE	OBSIDIAN	CHERT
Corsica	A Guaita (Morsiglia)	2nd half of 6th - 1st half of 5th millennium BC	Chronocultural stratigraphy based on techno-typological attributions. C14 was not possible due to post-depositional disturbance caused by roots.	*27* [11] (majority of obsidians; rhyolite, chert, jasper, local green rocks, quartz, rock crystal)	Yes	Yes
Corsica	A Petra (Barbaggio)	6430 ± 80 cal BP (2nd half VI millennium)	N/A	140 (97,86% local rocks, mostly rhyolite; very few obsidian and yellow chert)	Yes	Yes
Corsica	A Revellata I	6280 ± 75 BP	N/A	821 (obsidian and?)	Yes	N/A
Corsica	Araguina-Sennola (Bonifacio) *	4700 ± 140 BCE	N/A	325 (mostly chert; obsidian)	Yes	Yes
Corsica	Basi 6 (Serra di Ferro)	VI-IV millennia BCE (Tykot 1996)	N/A	N/A (obsidian and?)	Yes	N/A
Corsica	Basi 7 (Serra di Ferro)	7700 ± 150 BP (De Lanfranchi et Weiss 1997; Manen et Sabatier 2003), cal BCE 7030-6250 (Bailloud 1971; Cesari et al. 2011) or cal BCE 7002-6187 (De Lanfranchi 2000). Dating questioned (see Fenu et al.2002)	N/A	615 (mostly chert; quartz; few obsidian and rhyolite implements)	Yes	Yes
Corsica	Bufua III	N/A	N/A	159 (27,7% local rocks; obsidian and chert)	Yes	Yes
Corsica	Campu Stefanu (Sollacaro-Lévie) * (1)	N/A	Chronocultural stratigraphy based on techno-typological attributions. Stratigraphic evidence US 105: subsequent to US 108(a).	N/A (13 chert, part allochthonous part indet.; 16 obsidians; ?local quartz and rhyolites)	Yes	Yes
Corsica	Campu Stefanu (Sollacaro-Lévie) * (2)	N/A	Chronocultural stratigraphy based on techno-typological attributions. Stratigraphic evidence US 108(a): subsequent to US 108(b) which is subsequent to US 114 (Late Mesolithic)	700 (14 chert, part allochthonous part indet.; 35 obsidians; 74 local rhyolites; 423 local quartz)	Yes	Yes
Corsica	Curacchiaghju (Lévie) *	layer 6c: 7600 ± 150 BP (cal BCE 6994-6038)| layer 6a: 7310 ± 170 BP (cal BCE 6456-5779) | layer 6: 7300 ± 160 BP (cal BCE 6426-5805) (Weiss 2000) (De	N/A	359 (obsidian, chert and?)	Yes	Yes

[11] Numbers indicated in italics are obtained from the author's calculations.

REGION	SITE	AGE	DATING METHODS	TOTAL ITEMS IN ASSEMBLAGE	OBSIDIAN	CHERT
		Lanfranchi 2000). Dating questioned				
Corsica	Filitosa-Sollacaro	N/A	N/A	2 (obsidian)	Yes	No
Corsica	Grotta Southwell	N/A	N/A	116 (76,7% local rocks, obsidian, chert)	Yes	Yes
Corsica	Longone I (Bonifacio) *	6320 ± 140 BP (5546-4944 cal BCE)	N/A	40 (15,5% local rocks; obsidian and chert)	Yes	Yes
Corsica	Lumaca (Centuri)	N/A	N/A	N/A (rhyolite and obsidian)	Yes	No
Corsica	Renaghju (Sartène)	2nd half of 6th millennium BC (5700-5400 BP cal)	C14 on charcoal	4303 (39% local rhyolites, quartz et al. + 46% flint and 15% obsidian, non-local resources)	Yes	Yes
Corsica	Riparo Albertini	N/A	N/A	917 (77% local rocks, high presence of local silicified tuff and trachytic lava, 22,5% chert, very few quartz and obsidian)	Yes	Yes
Corsica	Strette XIV and XX (A Petra - Barbaggio) *	range 5600-5000 cal BCE | layer XXb: 6480 ± 480 BP | 6420 ± 300 BP (very high standard deviation)	C14 on wood charcoal and chrono typology of ceramics	1036 (local rocks 75/83%: quartz, rhyolite, granitoids, serpentinites; high quantity of obsidian; chert)	Yes	Yes
Corsica	Torre d'Aquila (Pietracorbara) *	N/A	Chronocultural stratigraphy based on techno-typological attributions (pottery).	401 (mostly local quartz; local rhyolites and gabbro; 9,2% allochthonous chert and obsidian - mostly obsidian)	Yes	Yes
Corsica	U Grecu	N/A	N/A	320 (76,3% local rocks; obsidian and chert)	Yes	Yes
Sardinia	Acqua Sa Canna (Gonnesa)	N/A	N/A	N/A (obsidian, jasper, grey chert and a few other microcrystalline rocks)	Yes	Yes
Sardinia	Cala Corsara (Spargi, La Maddalena)	N/A	N/A	39 (prevalence of chert; obsidian, quartz, quartzite) + unprocessed raw material and debris	Yes	Yes
Sardinia	Cala di Trana (Palau)	N/A	N/A	N/A (obsidian, chert and?)	Yes	Yes
Sardinia	Cala di Villamarina (Santo Stefano, La Maddalena)	N/A	N/A	N/A (obsidian, granite, quartz, porphyry)	Yes	No
Sardinia	Coddu Is Abionis (Terralba)	N/A	N/A	10.000, of which 764 retouched (obsidian, siliceous material and very few quartz, manna, rhyolite)	Yes	Yes
Sardinia	Corbeddu (Oliena) *	6690 ± 80 BP uncal (5730-5429 cal BCE) (Fenu et al.2002 from Hofmeijer & Sondaar1992) - 6.490 ± 90 BP (base level 1)	N/A	N/A (obsidian and?)	Yes	N/A
Sardinia	Filiestru (Mara) B10, B11, D	N/A	N/A	400 (obsidian and?)	Yes	N/A
Sardinia	Filiestru (Mara) B8, B9, D6	level D6: 5200-4700 cal BCE (Skeates2012)	N/A	N/A (obsidian, chert and?)	Yes	Yes
Sardinia	Filiestru (Mara) B9	2σ 5216-4859 cal BCE || 2σ 4911-4682 cal BCE	N/A	N/A (obsidian and?)	Yes	N/A
Sardinia	Filiestru (Mara) D6? (Filiestru)	5200-4700 cal BCE (Skeates2012)	N/A	N/A (obsidian and?)	Yes	N/A
Sardinia	Filiestru (Mara) D7? (Cardial)	5700-5350 cal BCE (Skeates2012) || 6710 ±75 BP (cal BCE: 5740-5480) - 6470 ±65 BP (cal BCE: 5530-5242) (Fenu et al.2002)	N/A	1240 (obsidian, jasper and chert)	Yes	Yes
Sardinia	Grotta Rifugio (Oliena)	N/A	N/A	N/A (obsidian, chert, green stone)	Yes	Yes

REGION	SITE	AGE	DATING METHODS	TOTAL ITEMS IN ASSEMBLAGE	OBSIDIAN	CHERT
Sardinia	Iglesias (?)	N/A	N/A	N/A (obsidian and?)	Yes	No
Sardinia	Pauli Annuas (Terralba)	N/A	N/A	N/A (obsidian and?)	Yes	N/A
Sardinia	Punta Campu 'e Sali (Arbus)	N/A	N/A	39 (obsidian, schist, basalt)	Yes	No
Sardinia	Rio Saboccu (Guspini)	2σ 5476-4999 BCE	C14 on two charcoals taken at the base of S2 structure	1058 (local obsidian, flint and chalcedony)	Yes	Yes
Sardinia	S. Chiara (Terralba)	N/A	N/A	N/A (obsidian and?)	Yes	N/A
Sardinia	Sa Korona di Monte Majore (Thiesi)	2nd half of V millennium - threshold IV millennium BCE?	N/A	N/A (grey and black stone, obsidian and chert)	Yes	N/A
Sardinia	Sa Punta-Marceddì (Terralba, OR)	5313-5028 2σ cal BCE (S.U.13) / 5476-5067 2σ cal BCE (S.U.11)	C14	2819 (98,9% obsidian; flint/chert; rhyolite; silicified limestone)	Yes	Yes
Sardinia	Santa Caterina di Pittinuri (Cuglieri)	N/A	N/A	3090 (obsidian and chert)	Yes	Yes
Sardinia	Santa Maria Is Acquas (Sardara)	No absolute dates. Early Holocene?	Micromorphological and pedological analysis, chronotypological attributions	N/A (only obsidian)	Yes	No
Sardinia	Su Carroppu (Sirri, Carbonia)	5854-4609 BCE	Obsidian hydration	123 (obsidian, flint, quartzite and jasper + 3 indet. elements)	Yes	Yes
Sardinia	Su Coloru (Laerru, SS) * F	6400 ± 40 BP (2σ cal BC: 5470-5310; 2σ cal BP: 7420-7260)	AMS on carbon (performed by Beta Analytic Inc. Lab of Miami)	308 (silicified lithotypes and obsidian)	Yes	Yes
Sardinia	Su Coloru (Laerru, SS) * G	N/A	N/A	28 (local chert and obsidian)	Yes	Yes
Sardinia	Su Coloru (Laerru, SS) * H	6680 ± 160 BP (2σ cal BC: 5870-5320; 2σ cal BP: 7820-7270)	AMS on carbon (performed by Beta Analytic Inc. Lab of Miami)	229 (chert and obsidian)	Yes	Yes
Sardinia	Su Coloru (Laerru, SS) * I	6830 ± 80 BP (2σ cal BCE: 5850-5620; 2σ cal BP: 7800-7570 BP)	N/A	31 (only chert)	No	Yes
Sardinia	Su Paris de Sa Turre (Cuglieri)	N/A	N/A	N/A (obsidian and?)	Yes	N/A
Sardinia	Torre Foghe (Tresnuraghes)	N/A	N/A	1045 (phonolite, chert, obsidian)	Yes	Yes

Table 6. *Query* formulated on the Early Neolithic database (Appendix 5, 6, 7, 8) to show the sole sites with chert and obsidian, the lithotypes that compose the lithic assemblage and the chronological location of the deposit.

The presence of chert and obsidian artifacts is rather scarce in Pre-Neolithic contexts of both islands. It is always a matter of very few items, although it is hardly ever possible to verify the percentage out of the total as for most sites there is no data on the quantity and composition of lithic artifacts found in the deposit. In Corsica, 2 obsidian and 2 chert artifacts have been found in Torre d'Aquila levels 8 and 9, mostly composed of local quartz; 1 obsidian item in Cave of Castiglione where no other artifacts were present; very few chert elements over a total of 6905 local lithotypes in Punta di Caniscione; 6 obsidian and 3 chert artifacts in the very recent site of Campu Stefanu (Table 7).

In Sardinia, the alleged Palaeolithic deposits have yielded an unspecified amount of chert out of an also unknown total of artifacts. At least in three out of four cases (Corbeddu Cave; Sa Coa de Sa Multa; Sa Pedrosa-Pantallinu) the lithotype should be better defined as silicified material rather than as chert (see section 7.1.4.) and only for Santa Maria is Acquas it is known that the total lithic complex was composed of minimum 70 items. In turn, Mesolithic deposits are composed as follows: 4 obsidian and 2 chert items in S'Omu 'e S'Orku; a total of 71 lithic artifacts from Su Coloru of which the majority in chert, without further specification on the quantity; and 1 obsidian artefact along with 39 in chert in Porto Leccio. The latter is the largest amount of chert found in a Pre-Neolithic deposit on the two islands, but the literature reports contradictory percentages in relation to quantity over total, ranging from 7.4 to 27 and 38% (Lugliè 2009a, Skeates 2012, Tozzi 2012, Martini 2017) (Table 7).

REGION	SITE	TOTAL ITEMS IN ASSEMBLAGE	% OBSIDIAN IN ASSEMBLAGE	N° O IN ASSEMBLAGE	% CHERT IN ASSEMBLAGE	N° C IN ASSEMBLAGE
Corsica	Campu Stefanu (Sollacaro-Lévie) *	N/A (6 obsidian; 3 chert, 1 indet and 2 from Perfugas)	N/A	6	N/A	3
Corsica	Cave of Castiglion e 3 (Oletta)	1 (obsidian)	100%	1	0	0
Corsica	Punta di Caniscione (Monacia - d'Aullène)	6905 (local -within a 6km radius- rhyolitic pebbles, hyaline quartz, few chert tools)	0	0	N/A	N/A («a few») (Le Bourdonnec et al.2014))
Corsica	Torre d'Aquila (Pietracor bara) *	N/A (mainly local quartz 30,8%, gabbro, serpentinite, rhyolite, sandstone + 2 small flakes of white chert + 2 small flakes of obsidian)	N/A	2	N/A	2
Sardinia	Corbeddu (Oliena) * UP	N/A (silicified limestone, chert, quartz, goethite)	0	0	N/A	N/A
Sardinia	Porto Leccio (Trinità d'Agultu)	N/A (quartz, rock crystal, slate, rhyolite, 27%/38% chert, obsidian)	N/A	1 (perforating tool)	7,4 / 27	39
Sardinia	Sa Coa de sa Multa (Laerru, SS) 1	N/A (well silicified local breccias, brecciolas, limestones, dolomites)	0	0	N/A	N/A
Sardinia	Sa Pedrosa-Pantallinu (Perfugas, SS)	N/A (siliceous material)	0	0	N/A	N/A
Sardinia	Santa Maria Is Acquas (Sardara)	>70 (almost solely chert, also chalcedony and rarely obsidian pebbles, scattered across the paleo landscape)	N/A	N/A	N/A	N/A
Sardinia	S'Omu e s'Orku (Arbus)	N/A (some chert and obsidian implements + ochre fragments, pencils and ochre-stained marine shells)	N/A	4	N/A	2
Sardinia	Su Coloru (Laerru, SS) * L	71 (mostly local chert, occasionally quartz)	0	0	N/A	N/A

Table 7. Query formulated on the Pre-Neolithic database (Appendix 1, 2, 3, 4) to show the quantity of chert and obsidian at sites in which they are present.

A marked increase in the presence of obsidian and chert in archaeological deposits occurs with the onset of the Early Neolithic. In each of the 38 sites where these raw materials are present, the ratio of chert to obsidian is quite variable, and there appears to be no marked preference for one over the other at an intersite scale. In Corsica, 7 over 19 occupational levels have more obsidian than chert in their lithic assemblage; 2 have the sole obsidian and no chert; 7 have more chert than obsidian. In Sardinia, only one site has chert and not obsidian, while 4 have more chert than obsidian; 4 have more obsidian than chert; 4 have obsidian but no chert (Table 8).

A minimum total (excluding data not provided) of 2516 chert items have been found in Corsican Early Neolithic archaeological sites, of which 1984 in the sole Renaghju layer 1. The available data on the percentages out of total make it possible to add that at least other 462 items to the count. A minimum total of 1255 is instead known for obsidian items, to which are added at least 118 calculated from the percentages of the total (Table 8).

On an intrasite scale, a predilection for chert as a raw material for lithic technology in Corsica during the EN is therefore visible, with a total amount of **2978 chert** items collected in archaeological deposits belonging to this period, compared to **1373 obsidian** artifacts.

In Sardinia instead there is a striking absence of data regarding the quantity of chert and obsidian in Early Neolithic archaeological deposits, both in percentage and number. 10 over 28 chert and obsidian-bearing deposits have no specifications on either lithotype other than the recording of their presence/absence in the deposit. For a further 5 sites the ratio of chert to obsidian is unknown since no data are given on the amount of chert (Table 8).

According to available data, a minimum total of 6098 obsidian items have been found in Sardinian Early Neolithic archaeological sites, plus 1214 calculated from percentages. Including dubious data, a total of 1918 chert items have been collected, to which 138 items must be added (Table 8).

Even in the case of Sardinia, in an intrasite context it is thus possible to see a preference for one lithotype over the other, but in this case it is **obsidian** that is preferred, with **7312** of total items found in archaeological deposits compared to **2056** in **chert**.

REGION	SITE	TOTAL ITEMS IN ASSEMBLAGE	% OBSIDIAN IN ASSEMBLAGE	N° O IN ASSEMBLAGE	% CHERT IN ASSEMBLAGE	N° C IN ASSEMBLAGE
Corsica	A Guaita (Morsiglia)	*27* (majority of obsidians; rhyolite, chert, jasper, local green rocks, quartz, rock crystal)	44%	12	*14,8%*	4
Corsica	A Petra (Barbaggio)	140 (97,86% local rocks, mostly rhyolite; very few obsidian and yellow chert)	1,45%	2	0,7%	1
Corsica	A Revellata I	821 (obsidian and?)	*2,9%*	24	N/A	N/A
Corsica	Araguina-Sennola (Bonifacio) *	325 (mostly chert; obsidian)	41%	132	>obsidian	N/A
Corsica	Basi 6 (Serra di Ferro)	N/A (obsidian and?)	4%?	N/A	N/A	N/A
Corsica	Basi 7 (Serra di Ferro)	615 (mostly chert; quartz; few obsidian and rhyolite implements)	4%	26	*72.35%*	445
Corsica	Bufua III	159 (27,7% local rocks; obsidian and chert)	50,9%	*81*[12]	21,4%	*34*
Corsica	Campu Stefanu (Sollacaro-Lévie) * (1)	N/A (13 chert, part allochthonous part indet; 16 obsidians; ?local quartz and rhyolites)	N/A	16	N/A	13
Corsica	Campu Stefanu (Sollacaro-Lévie) * (2)	700 (14 chert, part allochthonous part indet; 35 obsidians; 74 local rhyolites; 423 local quartz)	*5,14%*	36	*2%*	14

[12] Numbers indicated in italics are obtained from the author's calculations.

REGION	SITE	TOTAL ITEMS IN ASSEMBLAGE	% OBSIDIAN IN ASSEMBLAGE	N° O IN ASSEMBLAGE	% CHERT IN ASSEMBLAGE	N° C IN ASSEMBLAGE
Corsica	Curacchiaghju (Lévie) *	359 (obsidian, chert and?)	39% (layer 6)	141	N/A	N/A
Corsica	Filitosa-Sollacaro	2 (obsidian)	100%	2	0	0
Corsica	Grotta Southwell	116 (76,7% local rocks, obsidian, chert)	10,3%	*12*	12,9%	*15*
Corsica	Longone I (Bonifacio) *	40 (15,5% local rocks; obsidian and chert)	20%	*8*	65%	*26*
Corsica	Lumaca (Centuri)	N/A (rhyolite and obsidian)	60%	67	0	0
Corsica	Renaghju (Sartène)	4303 (39% local rhyolites, quartz et al. + 46% flint and 15% obsidian, non-local resources)	15%	653	46%	1984
Corsica	Riparo Albertini	917 (77% local rocks, high presence of local silicified tuff and trachytic lava, 22,5% chert, very few quartz and obsidian)	1,2%	3	22,5%	*206*
Corsica	Strette XIV and XX (A Petra - Barbaggio) *	1036 (local rocks 75/83%: quartz, rhyolite, granitoids, serpentinites; high quantity of obsidian; chert)	11%	117	5%	50
Corsica	Torre d'Aquila (Pietracorbara) *	401 (mostly local quartz; local rhyolites and gabbro; 9,2% allochthonous chert and obsidian - mostly obsidian)	6%	24	*1,2%*	5
Corsica	U Grecu	320 (76,3% local rocks; obsidian and chert)	5,3%	*17*	15,3%	*49*
Sardinia	Acqua Sa Canna (Gonnesa)	N/A (obsidian, jasper, grey chert and a few other microcrystalline rocks)	N/A	N/A	N/A	N/A
Sardinia	Cala Corsara (Spargi, La Maddalena)	39 (prevalence of chert; obsidian, quartz, quartzite) + unprocessed raw material and debris	N/A	N/A	88%	*34*
Sardinia	Cala di Trana (Palau)	N/A (obsidian, chert and?)	N/A	N/A	N/A	N/A
Sardinia	Cala di Villamarina (Santo Stefano, La Maddalena)	N/A (obsidian, granite, quartz, porphyry)	N/A	N/A	0	0
Sardinia	Coddu Is Abionis (Terralba)	10.000, of which 764 retouched (obsidian, siliceous material and very few quartz, manna, rhyolite)	93,1%	711	6,3%	48
Sardinia	Corbeddu (Oliena) *	N/A (obsidian and?)	N/A	N/A	N/A	N/A
Sardinia	Filiestru (Mara) B10, B11, D	400 (obsidian and?)	17%	*68*	N/A	N/A
Sardinia	Filiestru (Mara) B8, B9, D6	N/A (obsidian, chert and?)	30%	N/A	70%	N/A
Sardinia	Filiestru (Mara) B9	N/A (obsidian and?)	N/A	N/A	N/A	N/A
Sardinia	Filiestru (Mara) D6? (Filiestru)	N/A (obsidian and?)	N/A	N/A	N/A	N/A
Sardinia	Filiestru (Mara) D7? (Cardial)	1240 (obsidian, jasper and chert)	25%	*310*	N/A	N/A
Sardinia	Grotta Rifugio (Oliena)	N/A (obsidian, chert, green stone)	N/A	21	N/A	2
Sardinia	Iglesias (?)	N/A (obsidian and?)	100%	N/A	0	0

REGION	SITE	TOTAL ITEMS IN ASSEMBLAGE	% OBSIDIAN IN ASSEMBLAGE	N° O IN ASSEMBLAGE	% CHERT IN ASSEMBLAGE	N° C IN ASSEMBLAGE
Sardinia	Pauli Annuas (Terralba)	N/A (obsidian and?)	N/A	N/A	N/A	N/A
Sardinia	Punta Campu 'e Sali (Arbus)	39 (obsidian, schist, basalt)	95%	37	0	0
Sardinia	Rio Saboccu (Guspini)	1058 (local obsidian, flint and chalcedony)	98,97%	1047	N/A	N/A
Sardinia	S. Chiara (Terralba)	N/A (obsidian and?)	N/A	N/A	N/A	N/A
Sardinia	Sa Korona di Monte Majore (Thiesi)	N/A (grey and black stone, obsidian and chert)	N/A	N/A	N/A	87?
Sardinia	Santa Caterina di Pittinuri (Cuglieri)	3090 (obsidian and chert)	45%	1390	55%	1700
Sardinia	Sa Punta-Marceddì (Terralba, OR)	2819 (98,9% obsidian; flint/chert; rhyolite; silicified limestone)	98,9%	2789	0,77%	22
Sardinia	Santa Maria Is Acquas (Sardara)	N/A (only obsidian)	N/A	N/A	0	0
Sardinia	Su Carroppu (Sirri, Carbonia)	123 (obsidian, flint, quartzite and jasper + 3 indet. elements)	82%	101	N/A	N/A
Sardinia	Su Coloru (Laerru, SS) * F	308 (silicified lithotypes and obsidian)	N/A (very few)	N/A	N/A	N/A
Sardinia	Su Coloru (Laerru, SS) * G	28 (local chert and obsidian)	*7.14%*	2	*92.85%*	26
Sardinia	Su Coloru (Laerru, SS) * H	229 (chert and obsidian)	N/A	N/A	N/A	N/A
Sardinia	Su Coloru (Laerru, SS) * I	31 (only chert)	0	0	100%?	31?
Sardinia	Su Paris de Sa Turre (Cuglieri)	N/A (obsidian and?)	N/A	N/A	N/A	N/A
Sardinia	Torre Foghe (Tresnuraghes)	1045 (fonolitic rocks, chert, obsidian)	80%	*836*	10%	*104*

Table 8. *Query* formulated on the Early Neolithic database (Appendix 5, 6, 7, 8) to show the quantity of chert and obsidian at sites in which they are present.

6.1.1. Provenance analyses

In relation to provenance analyses of lithotypes, whether geochemical or simple visual characterization, few have been conducted. With regard to chert, **all provenance analyses of Pre-Neolithic assemblages have been led through the sole visual characterizations, i.e. without the geochemical analysis of the lithotypes.** In Corsican Pre-Neolithic only two chert artefacts from Campu Stefanu and those from Punta di Caniscione have been sourced to the Perfugas basin in Sardinia, while the rest has remained indeterminate. In Sardinia, only 6 items from Porto Leccio have been sourced to Perfugas, while most have been traced to a local origin: such is the case of 2280 artefacts from Sa Coa de sa Multa, 1459 from Sa Pedrosa-Pantallinu, less than 70 for Santa Maria Is Acquas, an unknown amount for Su Coloru and the remaining 30 items of hydrothermal origin from Porto Leccio (Table 9). Nevertheless, it must be underlined that the stratigraphy of

Porto Leccio is likely disturbed, as suggested by the presence of pottery fragments, and that the items sourced to Perfugas could actually belong to more recent periods (Luglié 2009a, Tozzi 2012).

In relation to obsidian artefacts, of the whole Pre-Neolithic evidence the sole single fragment from Cave of Castiglione has been sourced. The result has been quite outstanding, since visual characterisation combined with non-invasive particle-induced X-ray emission spectroscopy (PIXE) have shown that the fragment came from the island of Palmarola (Salotti, Bellot-Gourlet *et al.* 2000). Nevertheless, apart from this particular evidence, **there are no other data that attest to where the obsidian found in Pre-Neolithic Corsican-Sardinian deposits was obtained**.

REGION	SITE	N° OBSIDIAN ITEMS ANALYSED	OBSIDIAN ANALYSES	OBSIDIAN SOURCE	N° CHERT ITEMS ANALYSED	CHERT ANALYSES	CHERT SOURCE
Corsica	Campu Stefanu (Sollacaro-Lévie) *	N/A	N/A	N/A	N/A	Visual characterisation?	1 indet. and 2 from Perfugas basin (Sardinia)
Corsica	Cave of Castiglione 3 (Oletta)	1	visual characterisation; PIXE	Palmarola	0	0	0
Corsica	Punta di Caniscione (Monacia - d'Aullène)	0	0	0	N/A	Visual characterisation?	Allochthonous: Perfugas basin (Sardinia)
Corsica	Torre d'Aquila (Pietracorbara) *	N/A	N/A	N/A	N/A	N/A	N/A
Sardinia	Corbeddu (Oliena) * UP	0	0	0	N/A	N/A	N/A
Sardinia	Porto Leccio (Trinità d'Agultu)	N/A	N/A	N/A	N/A	Visual characterisation?	30 hydrothermal origin (Local?) + 6 from Perfugas + 3 indet
Sardinia	Sa Coa de sa Multa (Laerru, SS) 1	0	0	0	2280	Visual characterisation?	Local?
Sardinia	Sa Pedrosa-Pantallinu (Perfugas, SS)	0	0	0	1459	Visual characterisation?	Local?
Sardinia	Santa Maria Is Acquas (Sardara)	70 obsidian + chert	N/A	N/A	70 obsidian + chert	Visual characterisation?	Local: Sedda su Cardu?
Sardinia	S'Omu e s'Orku (Arbus)	N/A	N/A	N/A	N/A	N/A	N/A
Sardinia	Su Coloru (Laerru, SS) * L	0	0	0	N/A	Visual characterisation?	Local

Table 9. *Query* formulated on the Pre-Neolithic database (Appendix 1, 2, 3, 4) to show the available data regarding provenance analyses conducted on obsidian or chert artefacts.

Proportionally fewer provenance analyses have been conducted on chert during the Early Neolithic than during the Pre-Neolithic, while there is instead a marked proportional increase in these analyses on obsidian artefacts. However, less than half of the EN lithic complexes containing obsidian and chert have been addressed by provenance studies, and in the case of chert these are always visual characterizations (alleged, when unspecified), apart from the single case of

Renaghju where optical observation of sedimentary microfacies with stereomicroscope has been performed (Bressy, D'Anna *et al.* 2008).

In Corsica, five sites have yielded chert which has been sourced to Sardinia, but for the sole sites of Campu Stefanu (US105 and US108a in shelter 1) and of Renaghju layer 1 the number of items that have been sourced is reported: the source is the Perfugas Basin, for a total of 1343/2 items sourced to Perfugas, of which 1331 at the sole Renaghju. For the remaining Corsican sites the chert is mostly non-sourced and for only Longone I and A Petra it is reported that it may be generally allochthonous to the site where it was found. No Corsican EN chert evidence was recorded as being of local origin (Table 10).

In contrast, in Sardinia, the few provenance analyses have mostly traced chert artifacts back to a local origin, namely in the vicinities of the site; but specifications on the exact outcrop are rare. Chert is of local origin at the sites of Su Carroppu and Su Coloru, apart from some items on high-quality raw material in Su Coloru layers H and I, which have been traced back to the Perfugas basin; and in Coddu is Abionis, where it is believed to have come from the alluvial deposits of the near Mogoro and Mannu rivers. In Filiestru level D7 it is thought to have been collected outside the cave somewhere in the valley, where it occurs naturally. Instead, in Cala Corsara it has been sourced to the Perfugas basin or to the Anglona region, both in the north of the island – but not on the islet (La Maddalena) where the site is located (Table 10).

With regard to provenance analysis on obsidian, the use of different methods has been reported in the literature in addition to simple visual characterization: Energy Dispersive X-Ray Spectroscopy with scanning electron microscopy (SEM-EDS), elemental composition analysis with non-invasive Particle-Induced X-ray Emission spectroscopy (PIXE), microprobe and Electron Microprobe (EMP), non-destructive X-Ray Fluorescence (XRF) and Instrumental Neutron Activation Analysis (INAA).

Of the 8 Early Neolithic **Corsican** assemblages that were analysed, **all obsidians came from Mount Arci in SW Sardinia, apart from one single artefact from A Guaita** layer 3 (out of a total twelve obsidian items analysed) **and one from Renaghju** layer 1 (out of a total 622 items analysed) which were **sourced to the island of Palmarola.** In **Sardinia**, on the other hand, **all fourteen of the obsidian assemblages analyzed have been traced back to Mount Arci** (Table 10).

REGION	SITE	N° OBSIDIAN ITEMS ANALYSED	OBSIDIAN ANALYSES	OBSIDIAN SOURCE	OBSIDIAN OUTCROP	N° CHERT ITEMS ANALYSED	CHERT ANALYSES	CHERT SOURCE
Corsica	A Guaita (Morsiglia)	12	visual characterisation; SEM-EDS; PIXE	11/12 Monte Arci; 1/12 Palmarola	4 SB2; 7 SC. No representation of SA. + 1 Palmarola.	N/A	visual characterisation?	Sardinia
Corsica	A Petra (Barbaggio)	N/A	N/A	N/A	N/A	N/A	N/A	Allochthonous
Corsica	A Revellata I	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Corsica	Araguina-Sennola (Bonifacio) *	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Corsica	Basi 6 (Serra di Ferro)	70 ca. (30 in level 6.3, 29 in level 6.2, 11 in level 6.1)	microprobe (see Tylot1995)	Monte Arci	In level 6.3: approx. 40% SC; 10% SB2; 50% SA | In level 6.2: approx. 60% SC; 10% SB2; 30% SA | In level 6.1: approx. 70% SC; 30% SA. / No SB1	N/A	N/A	N/A

REGION	SITE	N° OBSIDIAN ITEMS ANALYSED	OBSIDIAN ANALYSES	OBSIDIAN SOURCE	OBSIDIAN OUTCROP	N° CHERT ITEMS ANALYSED	CHERT ANALYSES	CHERT SOURCE
Corsica	Basi 7 (Serra di Ferro)	2	N/A	Monte Arci	50% SC; 50% SA. No SB.	N/A	N/A	N/A
Corsica	Bufua III	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Corsica	Campu Stefanu (Sollacaro -Lévie) * (1)	N/A	N/A	N/A	N/A	half (6-7)	visual characterisati on?	Perfugas basin, Sardinia
Corsica	Campu Stefanu (Sollacaro -Lévie) * (2)	N/A	N/A	N/A	N/A	N/A	visual characterisati on?	5 Perfugas basin (brecciated and bedded), the rest indet (*calcédonie ux ou gris à floculations*)
Corsica	Curacchia ghju (Lévie) *	9 (Tykot1996) | 4 (Radi & Bovenzi2007)	N/A	Monte Arci	8/9 SB (Tykot1996) | 4 SB (Radi & Bovenzi2007)	N/A	N/A	N/A
Corsica	Filitosa-Sollacaro	N/A	N/A	N/A	N/A	0	0	0
Corsica	Grotta Southwell	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Corsica	Longone I (Bonifaci o) *	N/A	N/A	N/A	N/A	N/A	N/A	Imported
Corsica	Lumaca (Centuri)	21	XRF (non-destructive X-Ray Fluorescence method)	Monte Arci	N/A	0	0	0
Corsica	Renaghju (Sartène)	622 (84% of the total obsidian assemblage)	visual characterization; non-invasive particle-induced X-ray emission spectroscopy (PIXE); energy dispersion spectrometer of a scanning electron microscope (SEM-EDS) on mm-sized polished fragments	621/622 Monte Arci; 1/622 Palmarola	45,3% SA; 35,4% SB2; 19,1% SC types Monte Arci + >1% Palmarola	N/A	optical observations of sedimentary microfacies with stereomicrosc ope at magnification s 10×-60×	1331 Perfugas basin, Sardinia + 217 unknown and 436 indet
Corsica	Riparo Albertini	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Corsica	Strette XIV and XX (A Petra - Barbaggi o) *	10	EMP (Electron Microprobe)	Monte Arci	9 SB2; 1 SC. No SA, no SB1.	N/A	visual characterisati on?	Sardinia (probably)
Corsica	Torre d'Aquila (Pietracor bara) *	10	EMP (Electron Microprobe)	Monte Arci	5 SA; 1 SB1; 3 SB2; 1 SC	N/A	N/A	N/A
Corsica	U Grecu	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sardinia	Acqua Sa Canna (Gonnesa)	N/A	visual characterisation?	Monte Arci	Pebbles in local floodplain (transported and levigated by watercourses) or in situ outcrops	N/A	N/A	N/A
Sardinia	Cala Corsara (Spargi, La Maddale na)	26	EMP (Electron Microprobe)	Monte Arci	1 SA; 15 SB2; 10 SC. No SB1.	N/A	visual characterisati on	Perfugas or Anglona?

REGION	SITE	N° OBSIDIAN ITEMS ANALYSED	OBSIDIAN ANALYSES	OBSIDIAN SOURCE	OBSIDIAN OUTCROP	N° CHERT ITEMS ANALYSED	CHERT ANALYSES	CHERT SOURCE
Sardinia	Cala di Trana (Palau)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sardinia	Cala di Villamarina (Santo Stefano, La Maddalena)	N/A	N/A	N/A	N/A	0	0	0
Sardinia	Coddu Is Abionis (Terralba)	4	INAA (Instrumental Neutron Activation Analysis) and visual characterisation	Monte Arci	1 SA; 2 SB1; ? SB2; 1? SC | Conca Cannas and Santa Maria Zuarbara | Or locally in the form of pebbles/fragments transported by watercourses (Riu Mogoro and Riu Mannu)	N/A	visual characterisation?	Local: chert and silicified marls in the alluvial deposits of the Mogoro and Mannu rivers
Sardinia	Corbeddu (Oliena) *	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sardinia	Filiestru (Mara) B10, B11, D	27 + 45	27 with Electron Microprobe + 45 with visual characterization	Monte Arci	15% SA; 70% SB; 15 % SC	N/A	N/A	N/A
Sardinia	Filiestru (Mara) B8, B9, D6	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sardinia	Filiestru (Mara) B9	20	visual characterization and EMP (Electron Microprobe)	Monte Arci	4 SA; 10 SB2, 6 SC. No SB1 (20% SA; 50% SB; 30% SC)	N/A	N/A	N/A
Sardinia	Filiestru (Mara) D6? (Filiestru)	20+155	20 with Electron Microprobe + 155 with visual characterization	Monte Arci	30% SC; 50% SB2; 20% SA	N/A	N/A	N/A
Sardinia	Filiestru (Mara) D7? (Cardial)	N/A	N/A	Monte Arci	2/3 SA; 1/3 SB. No SC	N/A	N/A	Local? (several varieties of flint, most occurring naturally within the valley, though none in the cave)
Sardinia	Grotta Rifugio (Oliena)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sardinia	Iglesias (?)	N/A	N/A	N/A	N/A	0	0	0
Sardinia	Pauli Annuas (Terralba)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sardinia	Punta Campu 'e Sali (Arbus)	N/A	N/A	N/A	N/A	0	0	0
Sardinia	Rio Saboccu (Guspini)	100% with visual characterisation; of which 38+16 other analyses	visual characterization; elemental composition analyses with PIXE at AGLAE extracted-beam facility	Monte Arci	very rare SB1 (collected at primary and sub primary deposits at a min. 17km distance NE); most abundant SA (primary deposit Conca 'e Cannas, 16km distance E); SB2 (primary deposit 9 km NE, sub primary deposit 14 km NE); SC (the only secondary deposits exploited, immediate vicinity of the site).	N/A	N/A	N/A

REGION	SITE	N° OBSIDIAN ITEMS ANALYSED	OBSIDIAN ANALYSES	OBSIDIAN SOURCE	OBSIDIAN OUTCROP	N° CHERT ITEMS ANALYSED	CHERT ANALYSES	CHERT SOURCE
Sardinia	S. Chiara (Terralba)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sardinia	Sa Korona di Monte Majore (Thiesi)	26	N/A	Monte Arci	58% SB2	N/A	N/A	N/A
Sardinia	Sa Punta-Marceddì (Terralba, OR)	626	visual characterization + elemental composition (PIXE)	Monte Arci	52,5% SA; 24,8% SB2; 22,7% SC. No SB1	N/A	N/A	N/A
Sardinia	Santa Caterina di Pittinuri (Cuglieri)	35	visual characterization; XRF spectrometer	Monte Arci	74,3% SB (of which 68,6% SB2 and 5,7% SB1); 17,1% SA; 8,6% SC	N/A	N/A	Hydrothermal origin
Sardinia	Santa Maria Is Acquas (Sardara)	N/A	N/A	N/A	N/A	0	0	0
Sardinia	Su Carroppu (Sirri, Carbonia)	63 determined by PIXE; 38 with visual characterisation	visual characterization; Particle-Induced X-Ray Emission (PIXE)	Monte Arci	43%SA, 28%SB and 28%SC Monte Arci. No representation of SB1.	N/A	N/A	Local
Sardinia	Su Coloru (Laerru, SS) * F	N/A	N/A	N/A	N/A	N/A	visual characterisation?	Local silicified lithotypes. NO Perfugas chert
Sardinia	Su Coloru (Laerru, SS) * G	N/A	N/A	N/A	N/A	N/A	visual characterisation?	Local chert
Sardinia	Su Coloru (Laerru, SS) * H	N/A	N/A	N/A	N/A	N/A	visual characterisation?	Mostly local chert + few from Perfugas
Sardinia	Su Coloru (Laerru, SS) * I	0	0	0	0	N/A	visual characterisation?	Local chert + allochthonous chert from Perfugas (high quality)
Sardinia	Su Paris de Sa Turre (Cuglieri)	2	INAA (Instrumental Neutron Activation Analysis)	Monte Arci	? SA; 2 SB1; ? SB2; ? SC	N/A	N/A	N/A
Sardinia	Torre Foghe (Tresnuraghes)	49	XRF (non-destructive X-Ray Fluorescence method)	Monte Arci	N/A	N/A	N/A	N/A

Table 10. *Query* formulated on the Early Neolithic database (Appendix 5, 6, 7, 8) in order to show the available data regarding provenance analyses conducted on obsidian or chert artefacts.

6.2. Cartography

The maps specifically constructed on QGIS for this research show a quite different pattern between the Pre-Neolithic and Early Neolithic in terms of quantity and location of settlements in the islands of Corsica and Sardinia. While there is only little evidence of human presence during the Pre-Neolithic (Figure 4), with the Early Neolithic (Figure 8) the number of settlements multiplies, especially in Sardinia.

In the territory of Pre-Neolithic Corsica two clusters of settlements are visible, one in the north on the Cap Corse, of which Cave of Castiglione is the maximum southern limit, and one in the southern tip; but there are also two decidedly isolated sites, namely Curacchiaghju (about 19 km as the crow flies from nearest site, Punta di Caniscione) and Campu Stefanu (about 26 km as the crow flies from Curacchiaghju) (calculated with the «Measure Line» QGIS tool).The other sites are generally distributed at a distance of no more than about 10 km one from the other, apart from Punta di Caniscione which reaches about 15 km (Figure 4).

Even if the distance of Punta di Caniscione and Curacchiaghju from other sites as the crow flies does not differ much, in reality, it is greater because Curacchiaghju is located at about 700-800 meters above sea level (990 in QGIS). The case of Curacchiaghju is an exception among the settlement pattern of Pre-Neolithic Corsican sites because, apart from Grotta Scritta's 360 m and Gritulu 150 m (177 on QGIS) of elevation, all other sites remain below 100 m above sea level. The only Paleolithic site, Grotte de la Coscia, is close to 100 m with an elevation of 94 m asl. Most sites are in caves or in shelters, with only two open-air settlements, of which one is uncertain (Longone). The only open-air Pre-Neolithic archaeological site in Corsica is thus Punta di Caniscione, about 8 metres above sea level (Figure 5).

All Corsican Pre-Neolithic sites could be considered «coastal» according to current sea level, since they are located in a range with a maximum distance from current coastline of 2 km. The only exceptions are again Campu Stefanu, at a distance of ca. 4 km, and Curacchiaghju – which is to all effects an inland site, at a distance of ca. 12 km as the crow flies from the coastline.

Nevertheless, if drops in sea level are considered, the picture changes. When measurements up to the 9ka BCE palaeocoastline are considered, most of the sites reach a distance of at least 3 km from the coastline and some (Gritulu and Cave of Castiglione) have a peak of up to 6.7 km. Strette, today about 800 meters away from the shore, at 9ka BCE was located at almost 4 km distance. Also the distance of Curacchiaghju from the sea was significantly higher, up to 21 km. Finally, the only known **Palaeolithic site** (Grotte de la Coscia), which is now less than 2 km far from coastline, was during the Mesolithic at **5.3 km** inland: it is therefore assumed that it was even more distant at the time of its occupation.

Proportionally to the greater extent of territory, Pre-Neolithic Sardinia is decidedly less anthropized. With regards to the alleged Palaeolithic sites, half of them are concentrated in the Anglona area in the north of the island, i.e. in the current territories of Perfugas and Laerru – although for most of them it has not been possible to identify the exact location. Two others (Interiscias and Giuanne Malteddu) have been approximately located at a distance of ca. twenty km, in the current territory of Sassari. Only three sites are situated elsewhere, isolated from each other: Santa Maria is Acquas in the Campidano plain, the only settlement in the southern quadrant of the island, at a distance of at least 70 km as the crow flies from the nearest; Grotta Corbeddu on the east coast; and the site of Ottana A inland, at a distance of about 50 km from the sea both from the east and west (not considering the obstacle posed by the mountains) (Figure 4).

Palaeolithic Sardinian sites are located at a distance of at least 8 km as the crow flies from current seashore, up to a maximum of 18 km for Santa Maria Is Acquas, except for the Ottana site. However, they are all in relative proximity to watercourses (Figure 4). As most of them have not been dated by absolute methods, it is not possible to establish what the actual distance to the sea was at the time of their occupation. Their elevation lies within a maximum of 200 meters above sea level, reached by the site of Grotta Corbeddu and presumably also by that of Ottana (approximately located). Apart from Grotta Corbeddu, all settlements are open-air or of unknown type (Figure 6).

Mesolithic settlements in Sardinia are very few and scattered over the territory in isolated positions (Figure 4). Apart from Sa Coa de Sa Multa and Su Coloru, both in the Perfugas basin at a distance of a few km from each other, the other four sites are located respectively: in the northern coast of the island (Porto Leccio), in the western coast (S'Omu 'e S'Orku), in the south-west region at about 12 km from the sea (Su Carroppu) and in the east at about 11 km from coastline (Grotta Corbeddu) (Figure 4).

Among Sardinian Mesolithic sites, only S'Omu 'e S'Orku and Porto Leccio can be defined as properly coastal settlements, while the others are all located within a range of 8-12 km from current coastline as the crow flies and have a minimum altitude of 200 meters above sea level. Given that 9 ka BCE the sea level was -45 m under the present, distance from the coastline was significantly higher than today, especially in some regions. According to isobaths, even Porto Leccio was probably more than one km far from coastline and S’Omu ‘e S’Orku at least 3 km far (Figure 4).

Nearly all of the scarce Sardinian Mesolithic settlements are cave or shelter sites (Figure 7).

A significant increase in settlements is recorded in both Corsica and Sardinia with the onset of the Early Neolithic (Figure 8).

The Corsican map shows a geographical distribution of settlements rather similar to the Pre-Neolithic, i.e. a cluster in the Cap Corse and one in the south. The west and east coasts remain largely uninhabited, apart for some new sites in the north-west and east, some sites in the interior and two new settlements around the mouth of the Taravo river, near Campu Stefanu. Only one site is completely isolated from the others, namely the mountain shelter Riparo Albertini, at an elevation of 950 asl and at a distance of ca. 28 km from the nearest coastline. The other two mountain sites (together with Curacchiaghju) are Grotta Southwell and Grotta di Vizzavona, less than one km apart and more than thirty km from the coastline, at an elevation of respectively 879 and about 910 m asl. All other sites do not exceed 400 metres a.s.l. and are within a maximum range of 5.6 km from the seashore (Figure 8).

About the typology of sites, in Corsica there is a significant increase in open-air settlements compared to the Pre-Neolithic, slightly outnumbering cave or shelter sites (Figure 9).

With the advent of the Early Neolithic the sites in Sardinia increase dramatically in number. These are mostly open-air sites (which were almost absent in the Pre-Neolithic), while settlements in caves or shelters are mainly concentrated in mountainous areas or at higher elevations, and only in a few cases are found strictly near the coast (Figure 10).

The south-western region is quite densely populated compared to the previous period, with settlements less than 20 km apart and clusters of sites only a few hundred metres away from each other. Instead, the east coast of the island is completely uninhabited and so is the hinterland, except for a small cluster of three sites in the current Orosei Gulf, several kilometres from the sea. Various settlements are found at the northern tip of the island, which projects towards Corsica, and in the north-west, particularly around the present-day municipality of Sassari; while no sites have been found towards the current Asinara, which formed a single uninterrupted strip of land between 5 and 7 ka BC (Figure 8).

Several sites are clustered in proximity to the western slopes of Monti Ferru; on the Sulcis/Iglesiente mountains slopes in the Riu Cixerri plain; and near Monte Arci along the course of the Riu Mannu, today close to the mouth but at the time (and in the absence of the lagoon) several km away from the coastline (Figure 8).

Among Sardinian EN sites the highest altitudes are reached by three cave sites in the current municipality of Laconi: Grotta Maimone, at 539 m a.s.l., Grotta Leori, at 604 m asl and Grotta Sa Spilunca Manna, at 617 m a.s.l., which is also the highest distance from the coastline (approximately 55 km as the crow flies in the 7th millennium BC and between 47 and 43 in the 5th millennium) together with Grotta Bariles in the municipality of Ozieri (i.e. 57 km from the 7th millennium BC paleo coast) (Figure 8).

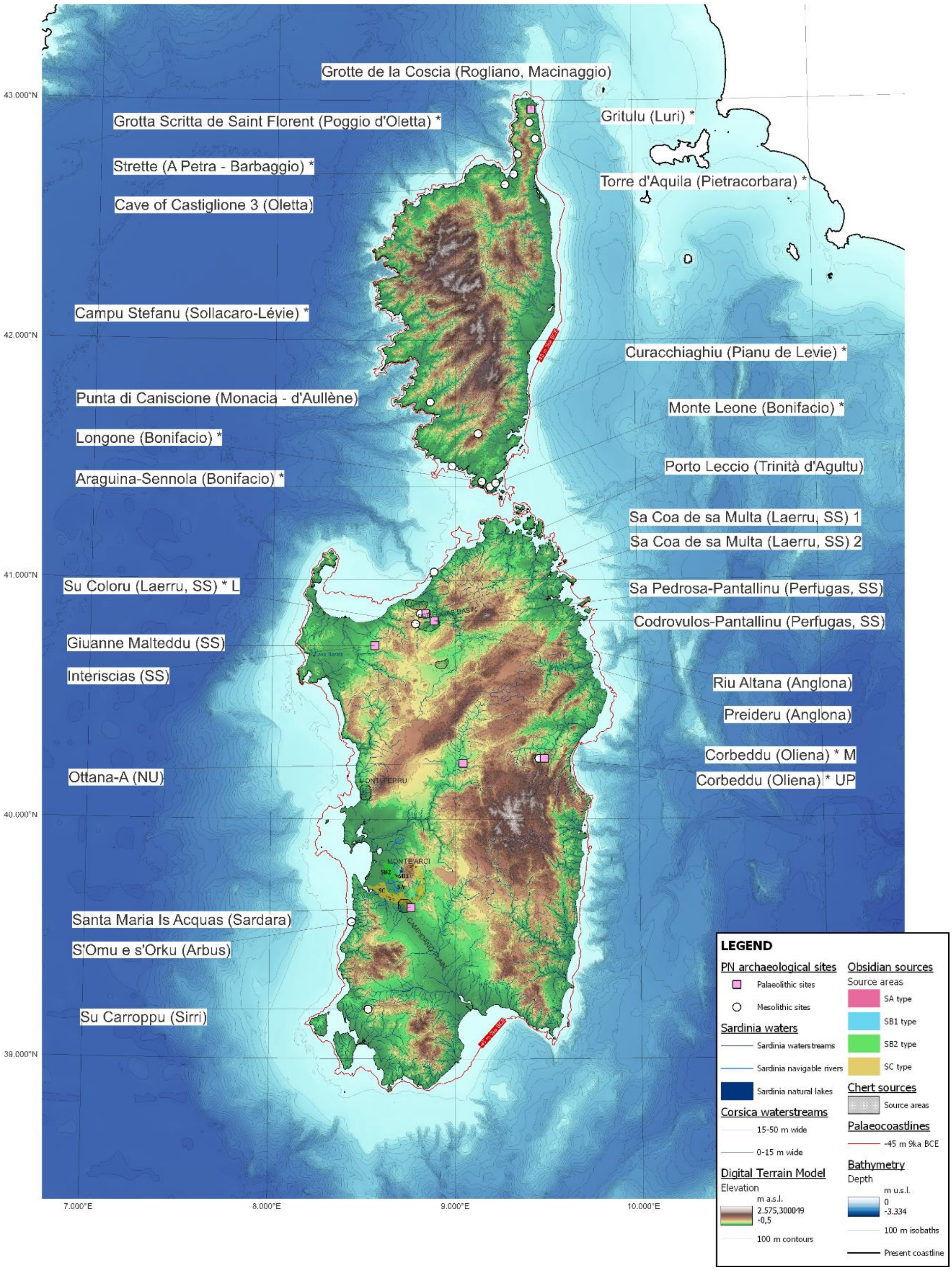


Figure 4. Map of Sardinian-Corsican Pre-Neolithic archaeological sites constructed using QGIS 3.20.

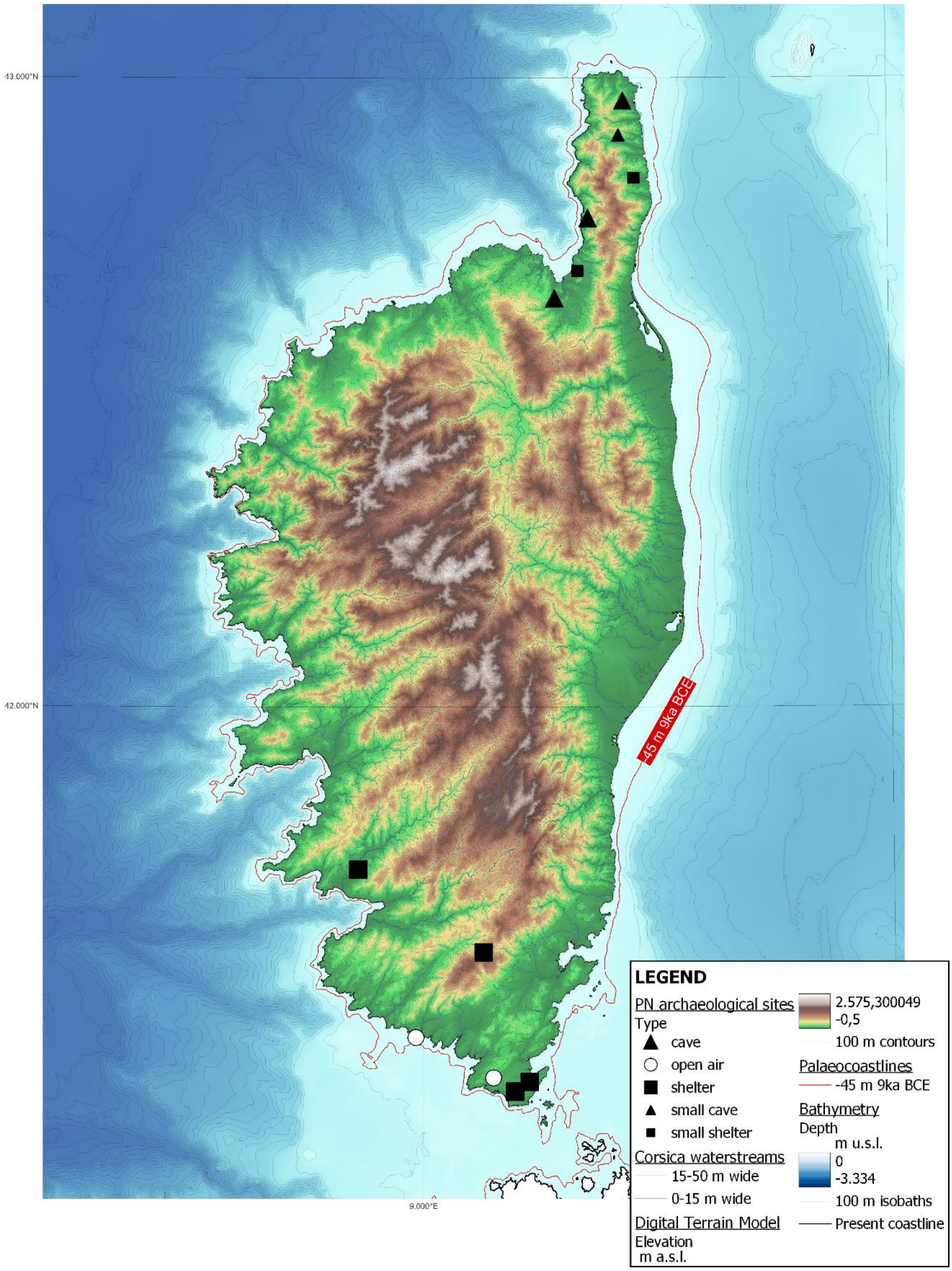


Figure 5. Thematic map depicting the typology of settlements (cave, shelter, open-air site) of Corsican Pre-Neolithic archaeological sites, constructed using QGIS 3.20.

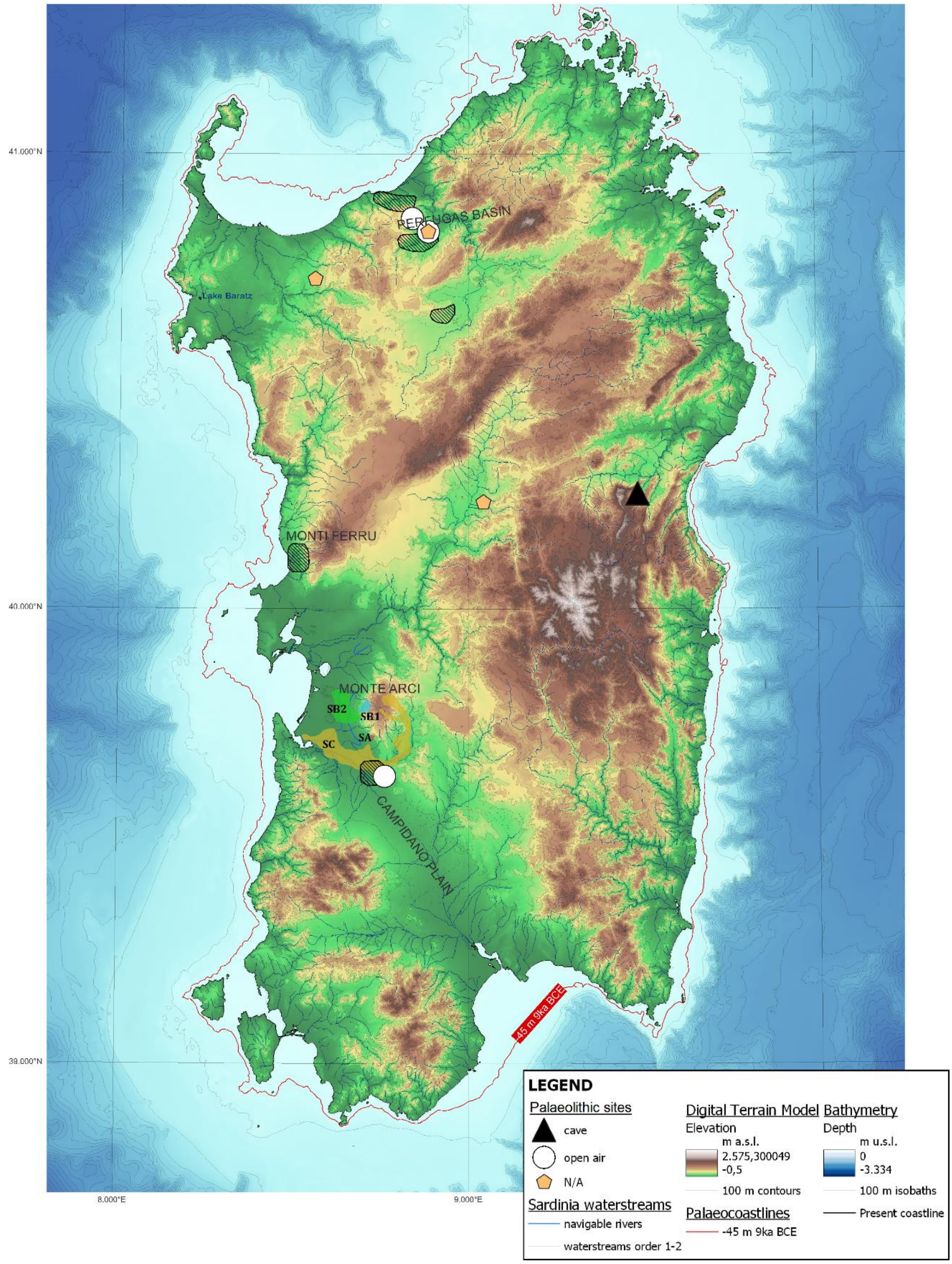


Figure 6. Thematic map depicting the typology of settlements (cave, shelter, open-air site) of Sardinian Palaeolithic archaeological sites, constructed using QGIS 3.20.

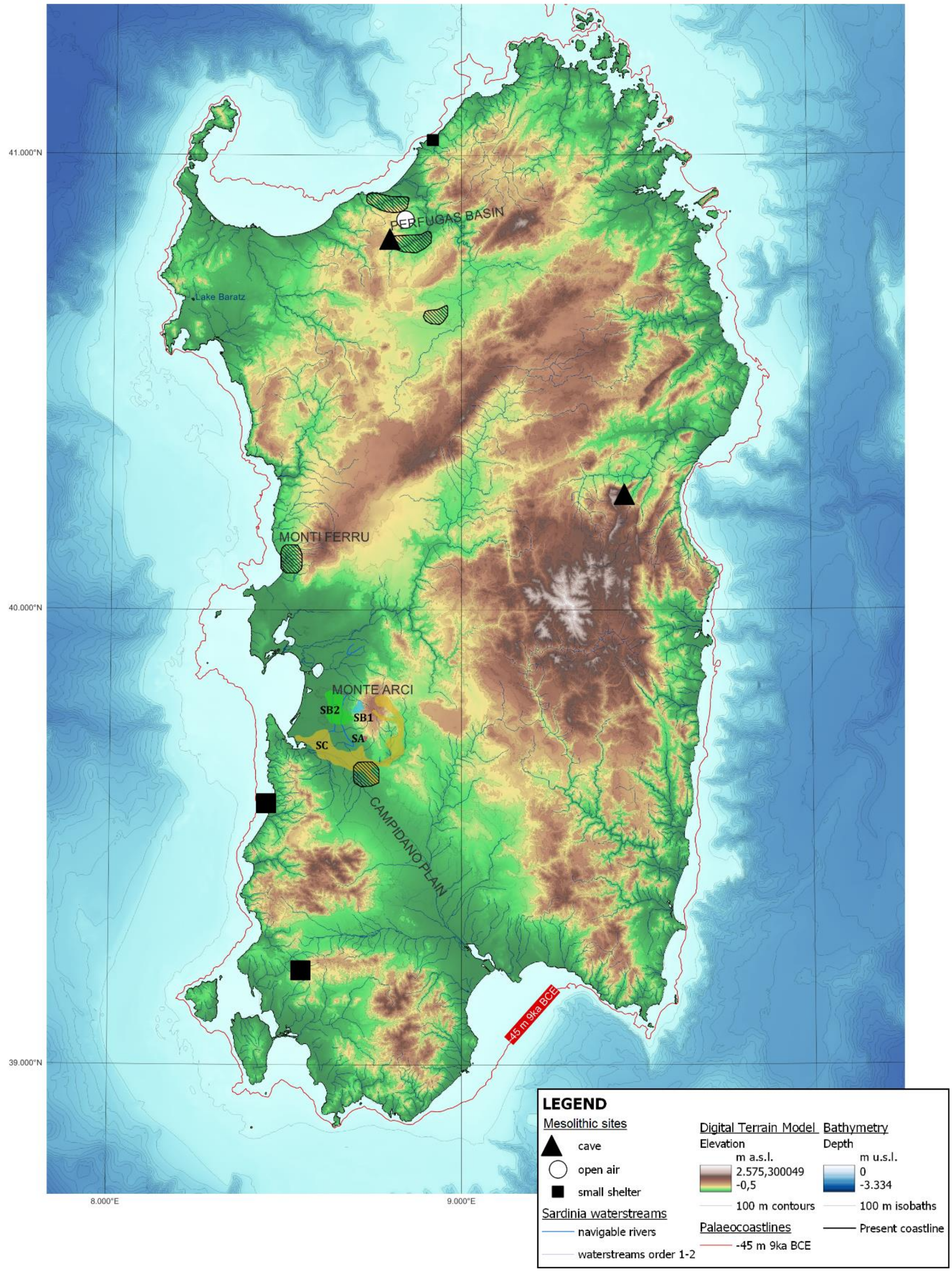


Figure 7. Thematic map depicting the typology of settlements (cave, shelter, open-air site) of Sardinian Mesolithic archaeological sites, constructed using QGIS 3.20.

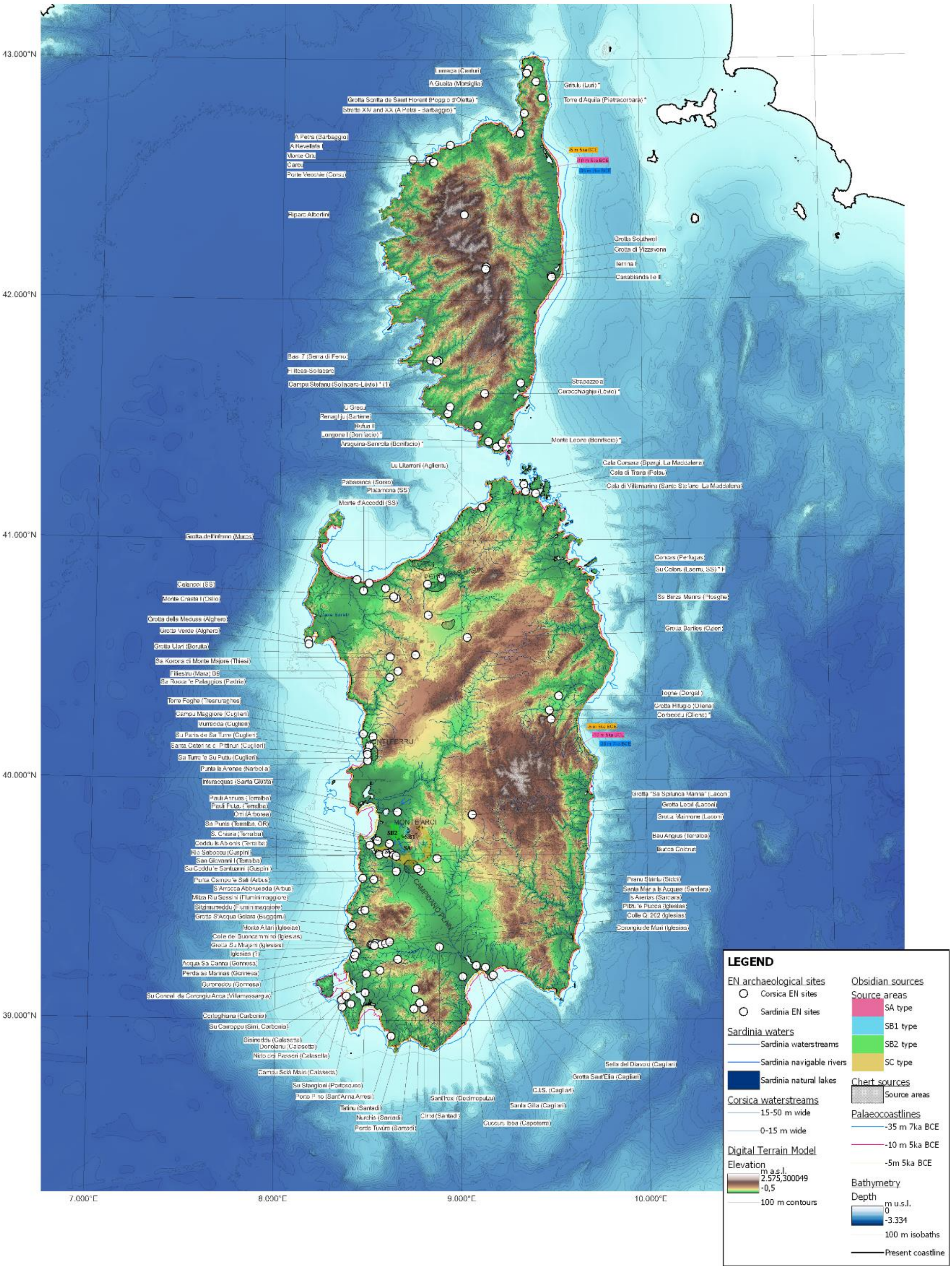


Figure 8. Map of Sardinian-Corsican Early Neolithic archaeological sites constructed using QGIS 3.20.

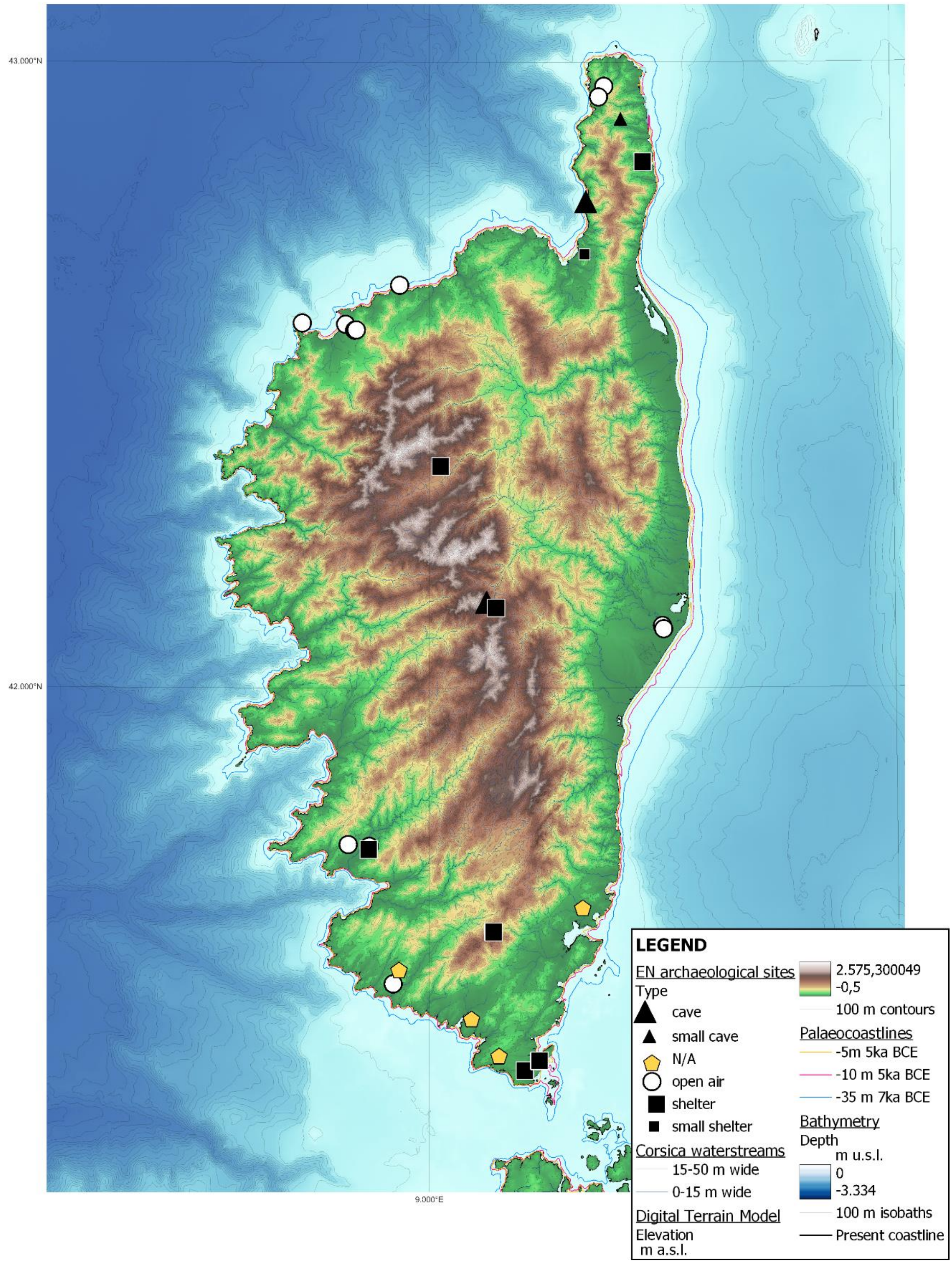


Figure 9. Thematic map depicting the typology of settlements (cave, shelter, open-air site) of Corsican Early Neolithic archaeological sites, constructed using QGIS 3.20.

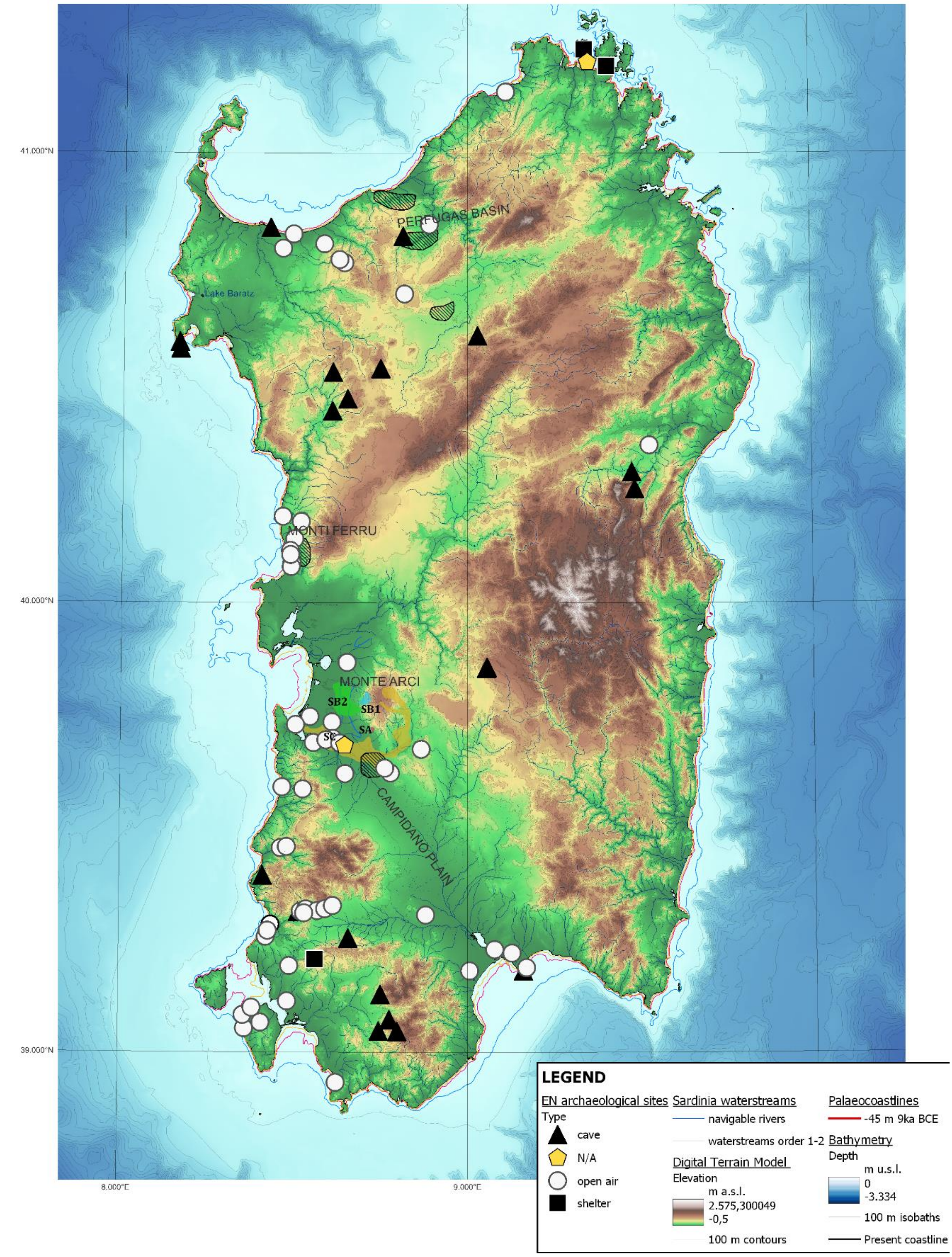


Figure 10. Thematic map depicting the typology of settlements (cave, shelter, open-air site) of Sardinian Early Neolithic archaeological sites, constructed using QGIS 3.20.

6.2.1. Raw Materials Thematic Cartography

One thematic map of the absolute quantities of chert and obsidian items in Pre-Neolithic sites was obtained for Corsica (Figure 11) and one for Sardinia (Figure 12), for the sole Mesolithic period – due to the absence of data on Palaeolithic sites. These maps make it possible to appreciate the extreme lack of information related to raw materials in these chronologies.

In relation to Corsica, two thematic maps were also obtained, representing through pie charts the results of the sourcing of obsidian and chert items found in Mesolithic archaeological sites (Figures 13 and 14).

The same thematic map was obtained for Sardinian Mesolithic archaeological sites (Figures 15 and 16), although, as regards obsidian, there is no data in relation to sourcing (Figure 15).

Instead, thematic maps constructed for the Early Neolithic are richer in information because far more data is available, as explained above (see section 6.1. Database). Two thematic maps (one for Corsica and one for Sardinia) have been obtained, representing by pie charts the percentage of obsidian and chert artefacts out of the total lithic remains in Early Neolithic archaeological deposits (Figures 17 and 18).

Graphs allow the refinement of generic observations previously made on an **inter-site** scale (see 6.1. Database). As one can easily appreciate through the observation of the map, **in Corsican Early Neolithic**, **lithotypes other than chert and obsidian** – predominantly described as being **of local origin** in the literature – **are generally preferred over the latter for knapping**, constituting in 7 out of 8 cases over the 75% of the exploited lithic materials (Figure 17).

In the remaining cases, as previously mentioned, obsidian and chert are equivalent, since in three deposits obsidian outnumbers chert in percentage and in three others vice versa; in addition to one site (Filitosa) where two obsidian fragments are the only lithic remains found. **The use of chert is most frequently attested at sites in southern Corsica and is almost absent at sites in the north**. **Obsidian**, on the other hand, **is found in sites whose location varies widely**, from the north to the south of the island via the centre, although it is present in higher percentages in the south (Figure 17).

In Early Neolithic Sardinia, the situation is completely different: the thematic map shows a **sharp preference for obsidian**, particularly in the area **around Mount Arci and in the settlements south of it**; while **in the area of Perfugas and in the northern tip there is a clear preference for chert**. Obsidian and chert are both present at two sites in Montiferru; in one chert is slightly prevalent, in the other obsidian is predominant. Lithic materials other than chert and obsidian are prevalent only in one deposit in Filiestru cave (Figure 18).

With the depiction through diagrams of the results of raw material sourcing in Early Neolithic archaeological sites, two maps were also obtained for Corsica and two for Sardinia, respectively for obsidian and chert sourcing (Figures 19, 20, 21 and 22).

The map of obsidian sourcing **in Corsica** shows a **marked prevalence of Sardinian obsidian** compared to Palmarola's, for which there is very little evidence (two, one item at A Guaita and another at Renaghju). **All geochemical groups from Monte Arci are generally used, apart from SB1**, for which only one item is attested, at Torre d'Aquila (Figure 19). **Chert sources can also be traced back to Sardinia** and, in the few cases where the outcrop is specified, **it is always chert**

from the Perfugas basin; in some cases the source is unknown but it is always allochthonous (Figure 20).

No obsidian other than from Monte Arci has been found in Sardinian Early Neolithic. The thematic map of obsidian sourcing shows that all the different geochemical groups are used, but SB1 type rather rarely compared to the other three. There is also a general clear preference for SA and SB2 types over SC, which never reaches half the percentage of obsidian in the assemblage (Figure 21). Regarding **chert**, virtually **all items are traced back to a strictly local context**, and this also applies to the only two assemblages that have been sourced to Perfugas, because they are in fact close to the basin. **The only exception is the site of Cala Corsara** at the northern tip of the island, whose chert has been **sourced to Perfugas or generally to the Anglona region**, which is several tens of kilometres away as the crow flies (Figure 22).

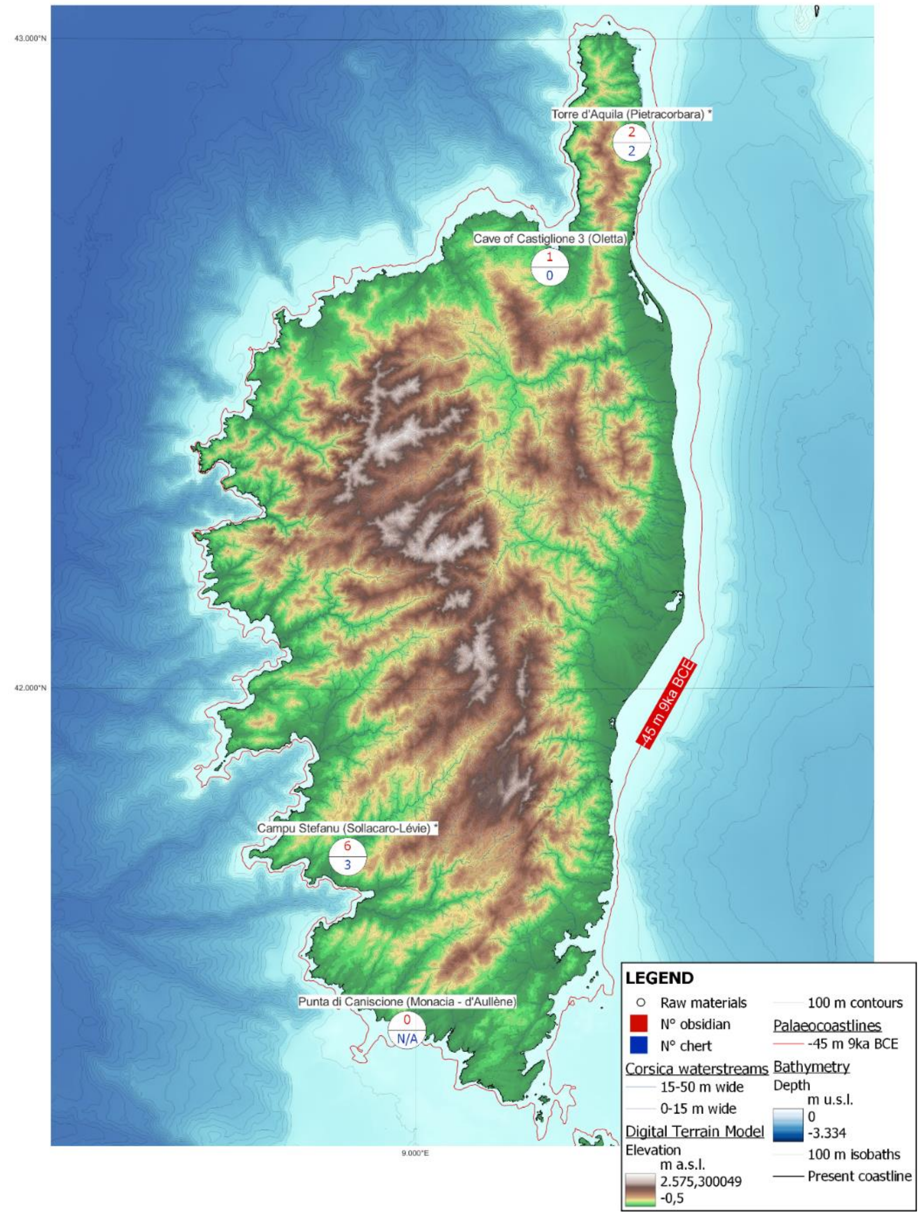


Figure 11. Thematic map of absolute quantities of chert and obsidian items in Corsican Mesolithic sites, constructed with QGIS 3.20.

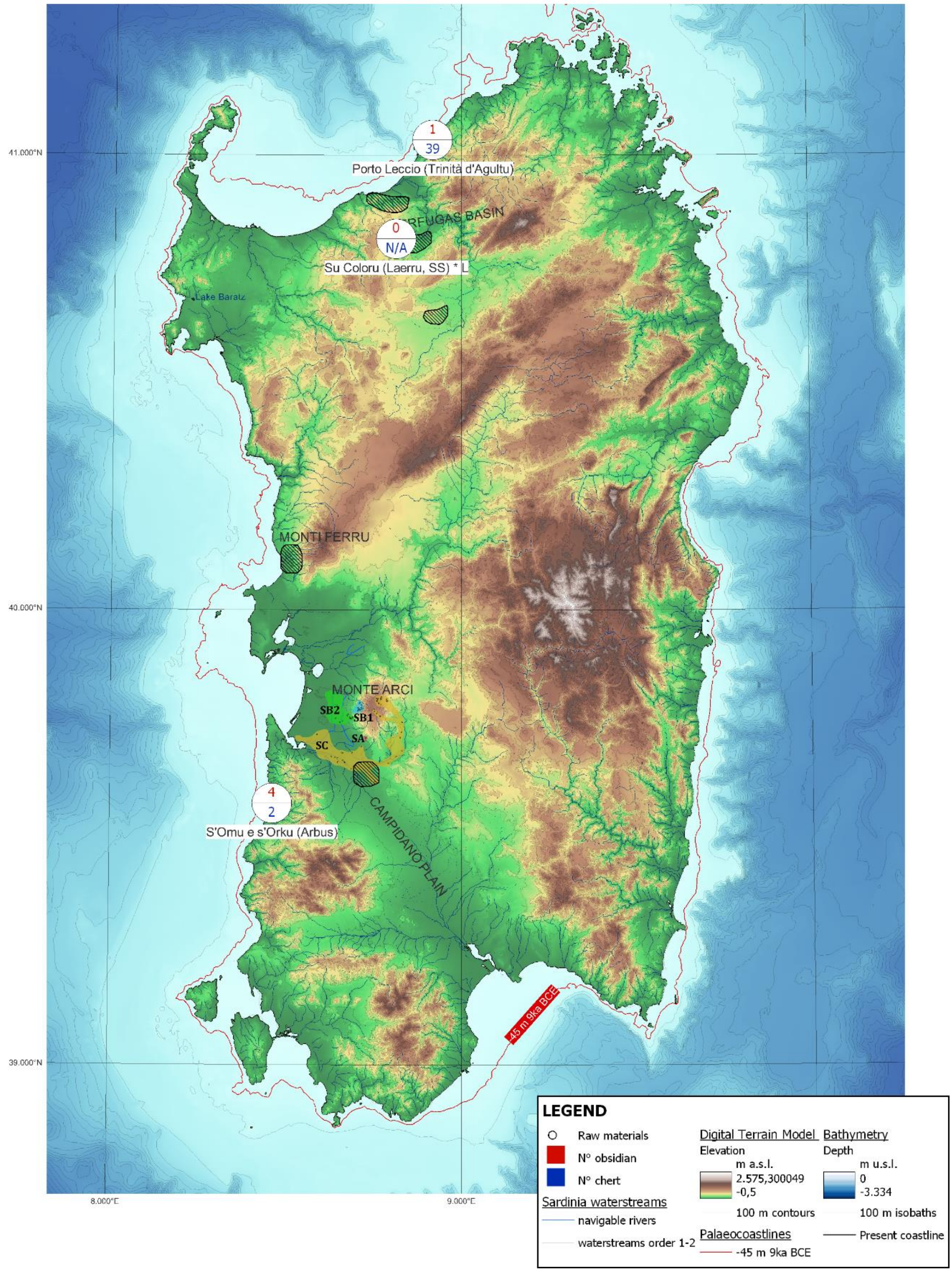


Figure 12. Thematic map of absolute quantities of chert and obsidian items in Sardinian Mesolithic sites, constructed with QGIS 3.20.

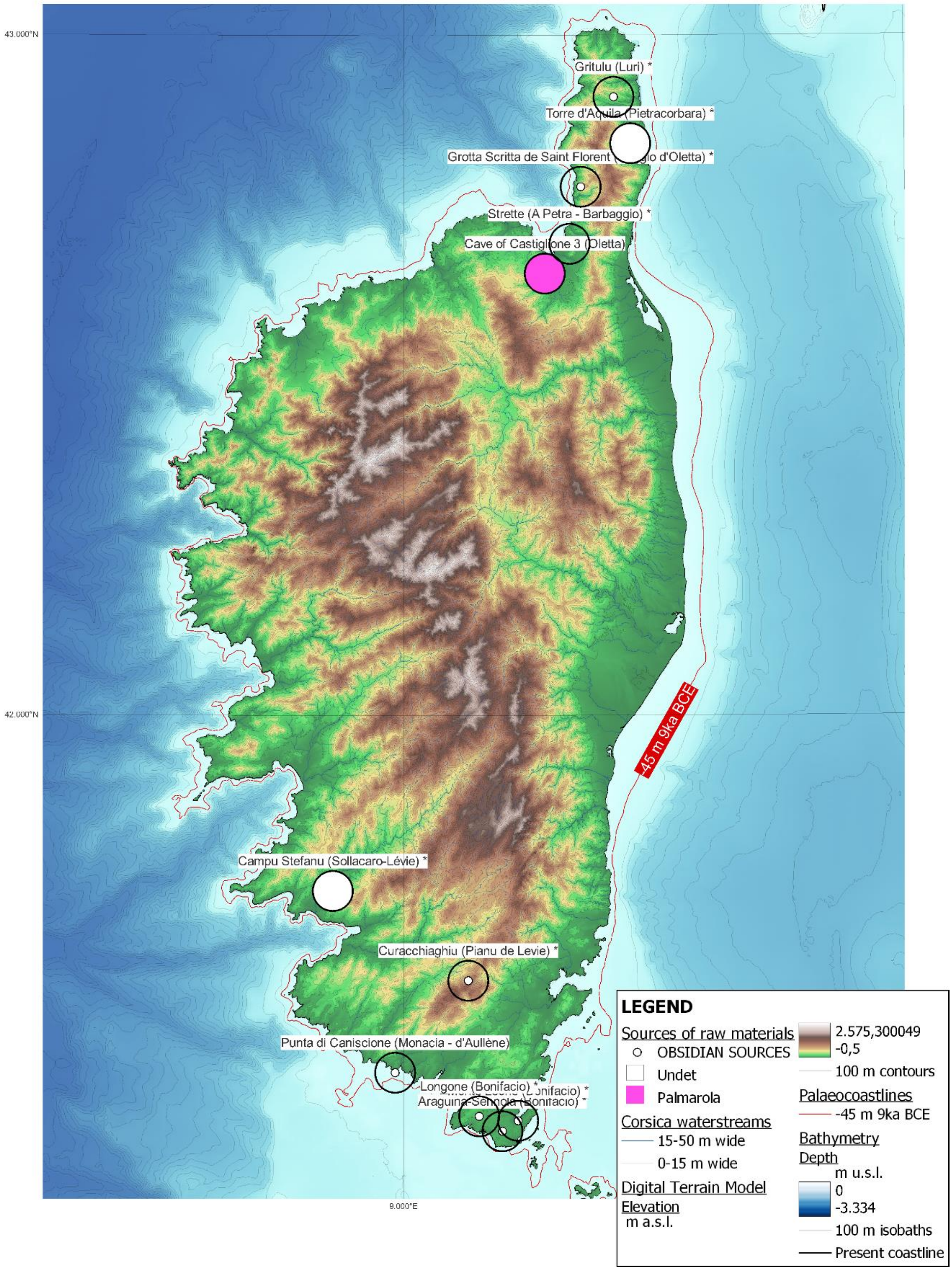


Figure 13. Thematic maps representing through pie charts the results of the sourcing of obsidian items found in Corsican Mesolithic archaeological sites.

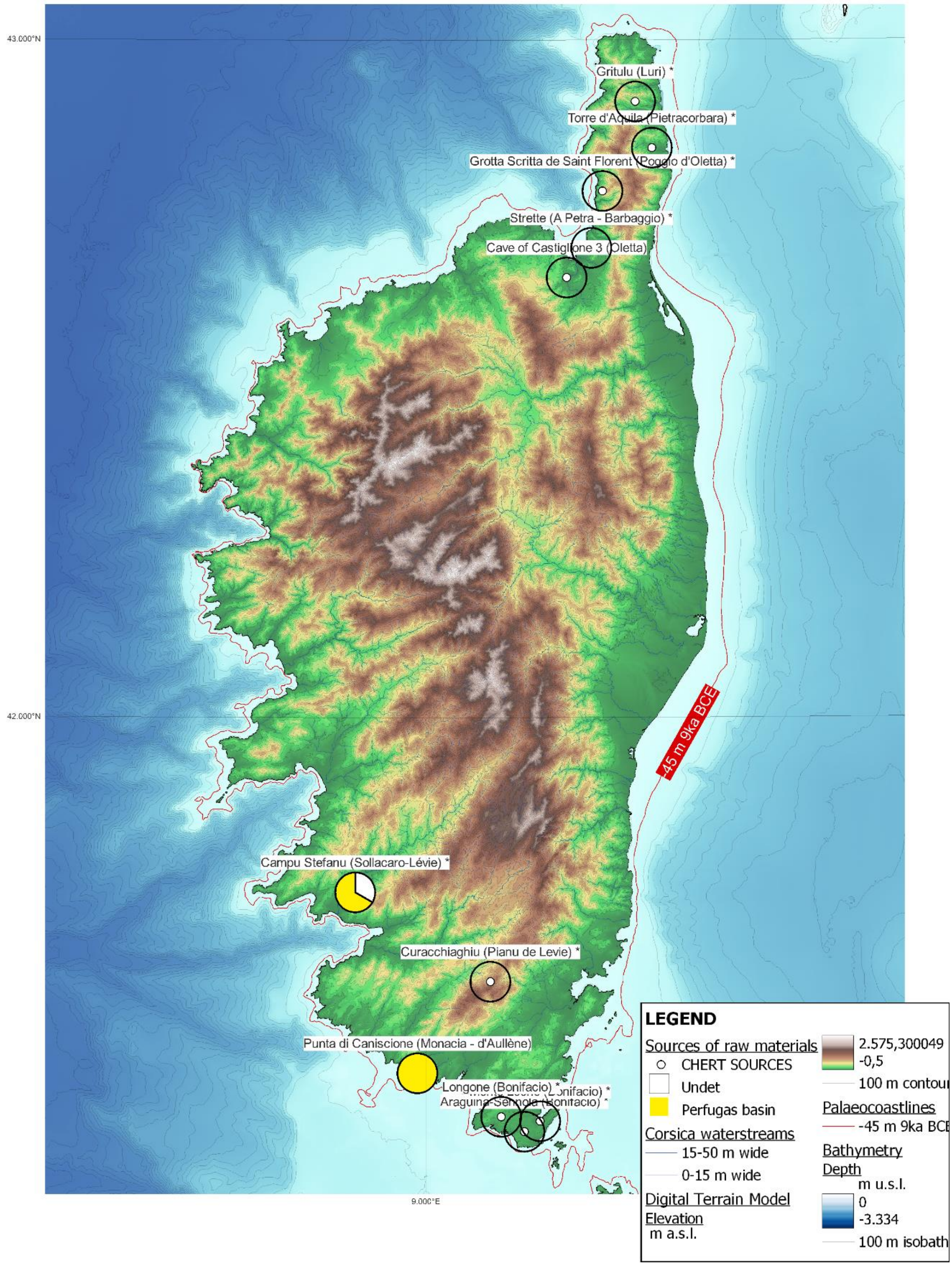


Figure 14. Thematic maps representing through pie charts the results of the sourcing of chert items found in Corsican Mesolithic archaeological sites.

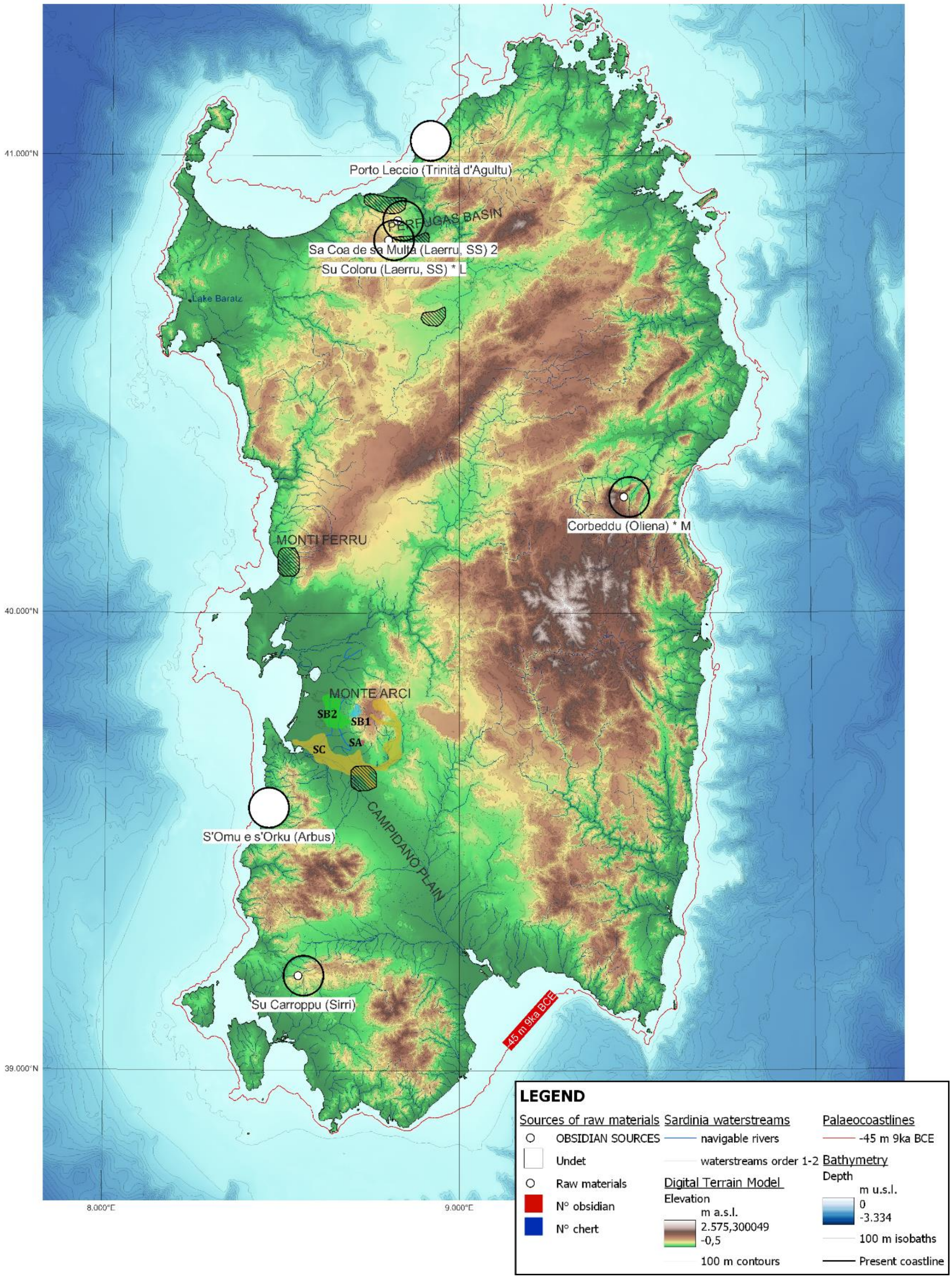


Figure 15. Thematic maps representing through pie charts the results of the sourcing of obsidian items found in Sardinian Mesolithic archaeological sites.

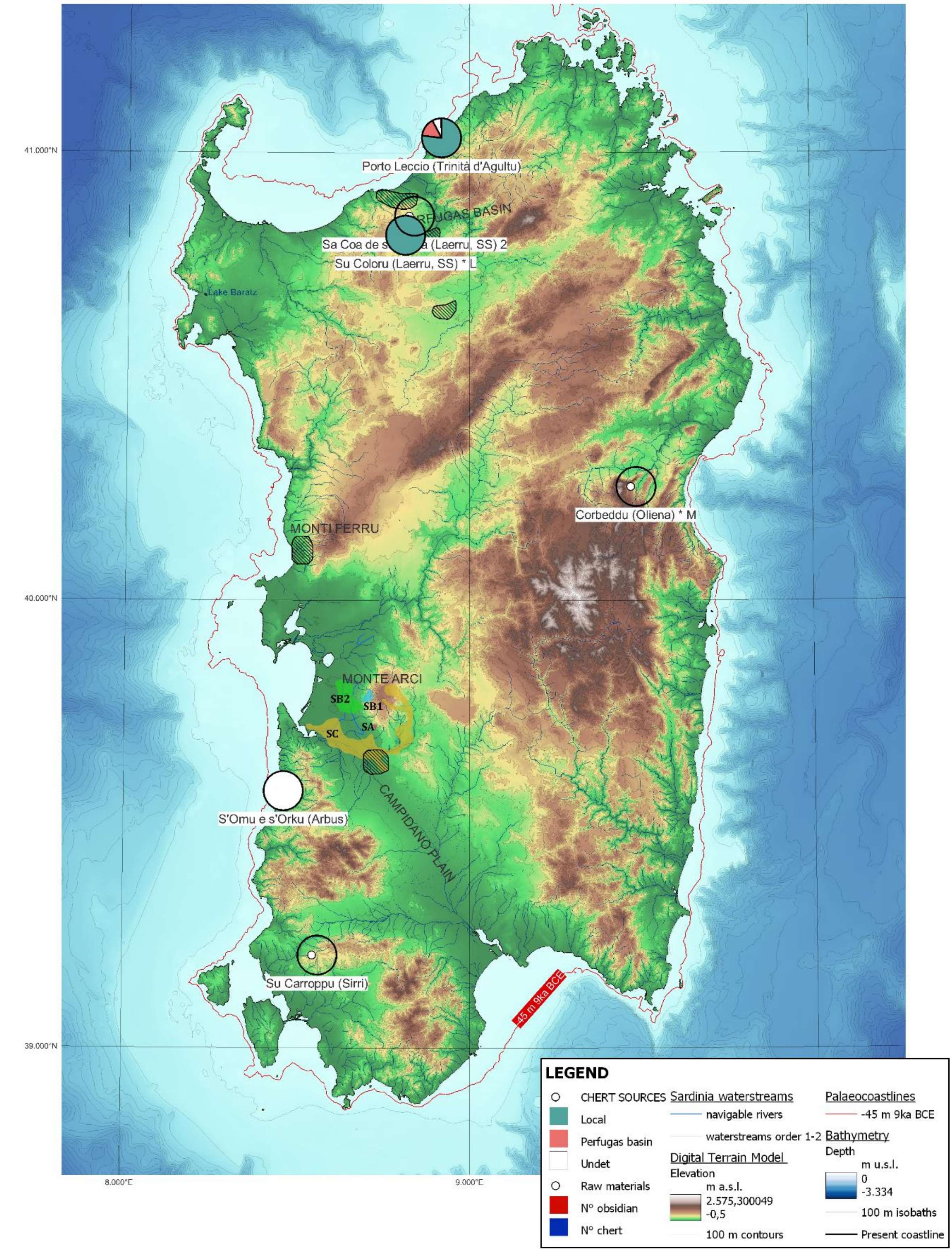


Figure 16. Thematic maps representing through pie charts the results of the sourcing of chert items found in Sardinian Mesolithic archaeological sites.

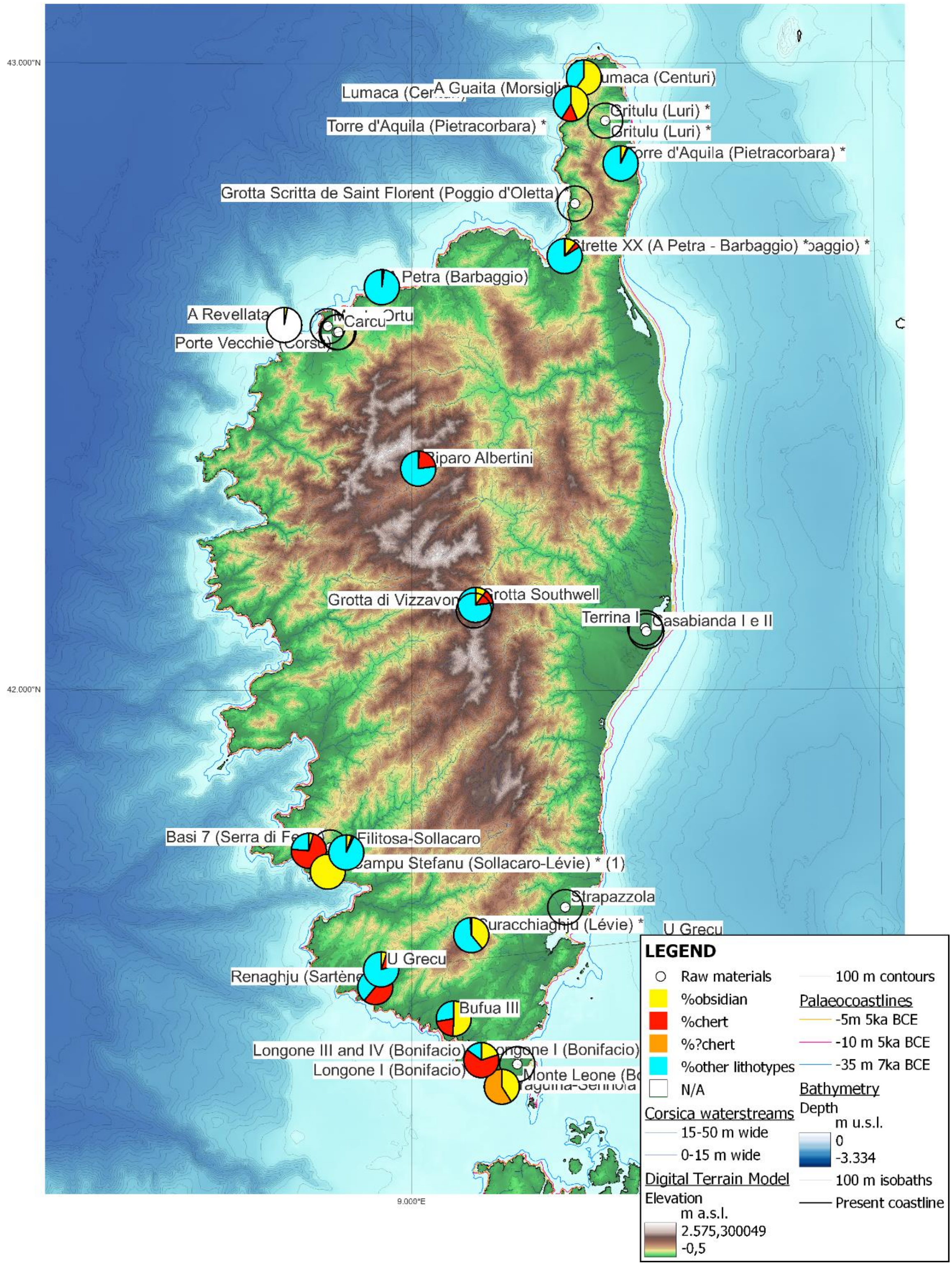


Figure 17. Thematic map representing the percentages of obsidian, chert and other lithotypes in the lithic assemblages of archaeological deposits pertaining to Corsican Early Neolithic. Constructed with QGIS 3.20.

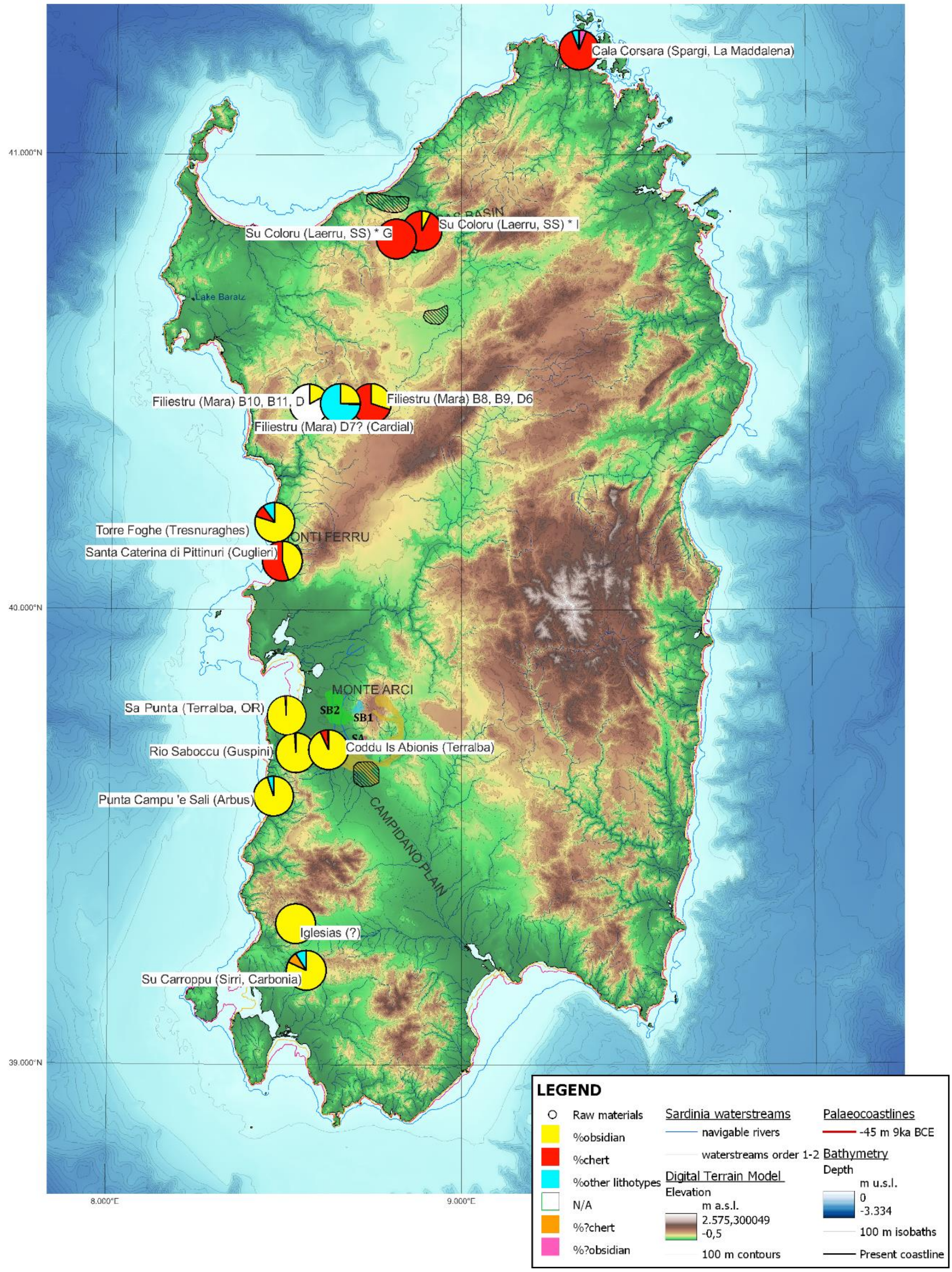


Figure 18. Thematic map representing the percentages of obsidian, chert and other lithotypes in the lithic assemblages of archaeological deposits pertaining to Sardinian Early Neolithic. Constructed with QGIS 3.20.

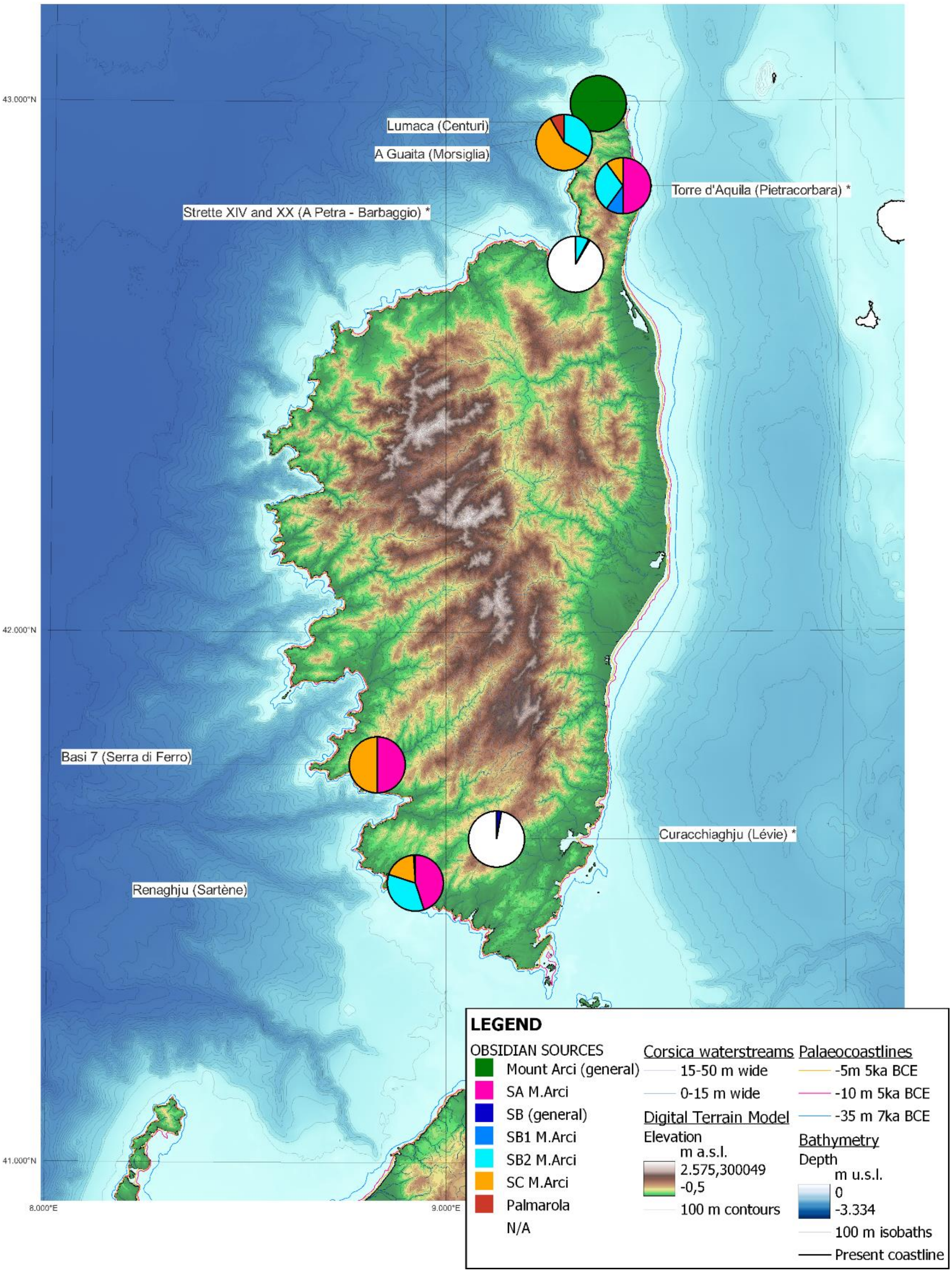


Figure 19. Thematic maps representing through pie charts the results of the sourcing of obsidian items found in Corsican Early Neolithic archaeological sites.

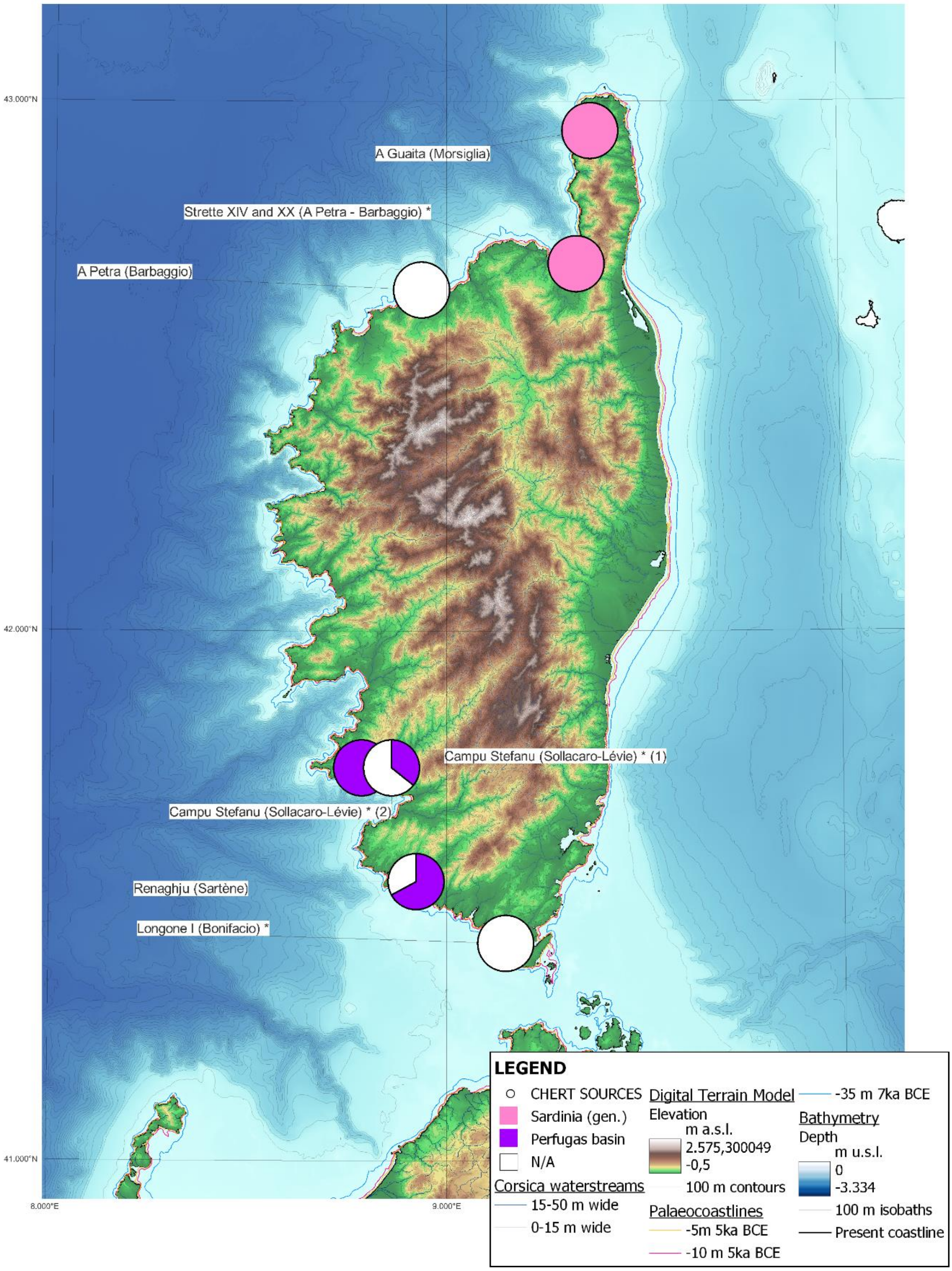


Figure 20. Thematic maps representing through pie charts the results of the sourcing of chert items found in Corsican Early Neolithic archaeological sites.

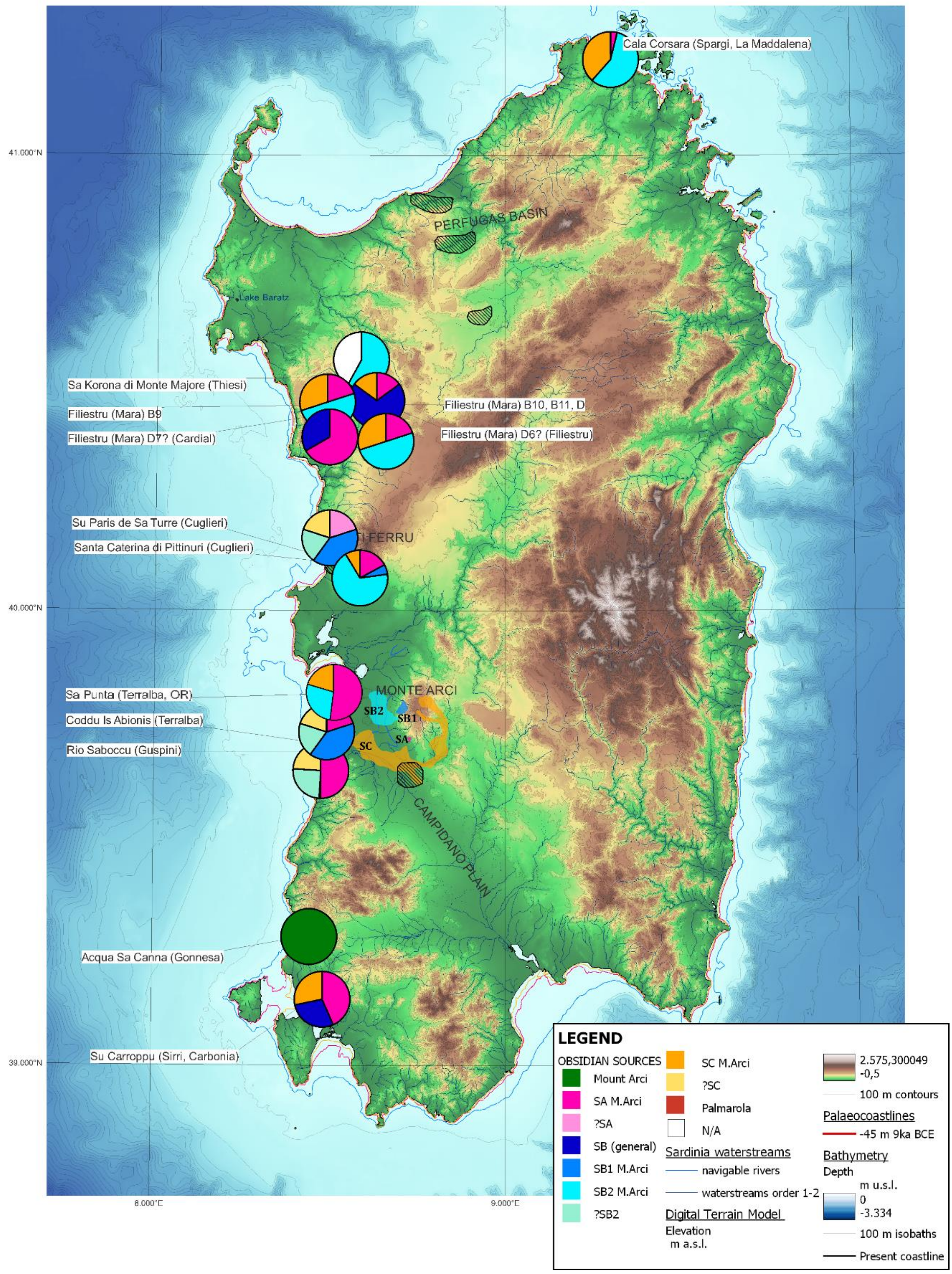


Figure 21. Thematic maps representing through pie charts the results of the sourcing of obsidian items found in Sardinian Early Neolithic archaeological sites.

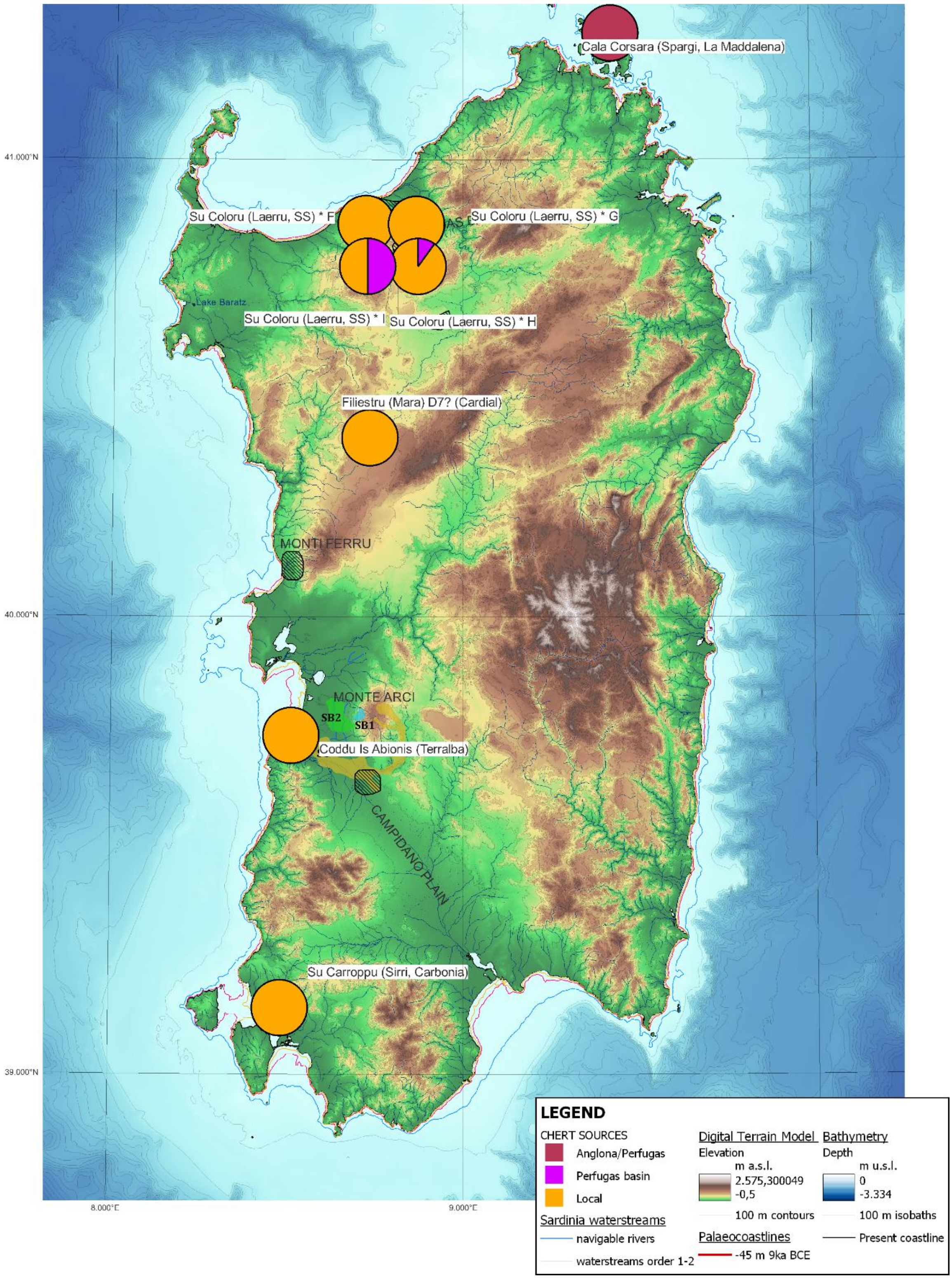


Figure 22. Thematic maps representing through pie charts the results of the sourcing of chert items found in Sardinian Early Neolithic archaeological sites.

6.2.2. Least Cost Paths

With the construction of least cost paths, four maps were obtained representing the likely routes taken by humans for the procurement of lithic raw materials, respectively: for the Mesolithic (Figure 23); for the procurement of obsidian from Corsica during the Early Neolithic (Figures 24 and 25); for obsidian within EN Sardinia (Figure 28); and for chert in both islands during the EN (Figure 30).

As previously highlighted, very few data are available for the Pre-Neolithic, especially in relation to the sourcing of raw materials. As a result, the map of Least Cost Paths was obtained for the sole Mesolithic and for the procurement of chert, referring to a total of three settlements: Campu Stefanu and Punta di Caniscione in Corsica and Porto Leccio in Sardinia, whose chert artefacts were sourced to the Perfugas basin (Figure 23).

From Campu Stefanu the route follows the course of the river Taravo towards the sea, then the coastline until it crosses the course of the river U Rizzanese, which follows upstream for a few kilometres; cuts southwards through a short ridge across a valley and descends the course of the river De Navara to the sea, then bordering the coast. At this point it reaches Punta di Caniscione: from here on, the route from the two settlements is common, going up the course of the river De Spartano and then crossing the valley in a south-easterly direction, preferring terrain less than 100 metres above sea level, finally curving southwards to reach the southern tip of the island (Figure 72).

There are two proposed routes for crossing the sea at that spot at 9 ka BCE, when the sea level was -45 m under the present (Pasquet and Demouche 2012): in north-eastern direction for a distance of 1.8 km as the crow flies, or in north-western direction for more than four km. Both possibilities have been considered and the route calculation starts again on the present coast at the two probable closest points that can be reached after crossing the currently submerged land.

From there on, the two paths remain divergent: the one to the east descends near the coastline, while the one to the west follows the course of the river Liscia for long distances, climbing up the tributaries to an altitude of 300 metres above sea level, when it deviates, along the valley of the river Di San Biagiu, crossing the Limbara massif. The two routes rejoin just before reaching the vicinities of the Sardinian settlement of Porto Leccio. From the latter, the least cost path goes up the river Pirastru (at whose mouth the site is located) and then descends along the course of the Lu Rinaggio to skirt the coast before joining the routes coming from Corsica. From here it goes up the course of the river Coghinas towards the source until it reaches the riu Altana and the area of the Perfugas basin for the supply of chert.

During the Mesolithic, **the distance covered from Corsican sites to the outcrops of chert** was thus: 91 km from Campu Stefanu to the coast and 37 km from Punta di Caniscione, plus 86 km from the NW dock in Sardinia or 94 km from the NE dock, for a total of **177/185 km from Campu Stefanu** and **123/131 km from Punta di Caniscione**. The distance **from the settlement of Porto Leccio** in Sardinia **to the Perfugas basin was 45 km.** Another chert outcropping area is located near the mouth of the Coghinas and it seems likely that the raw material was collected here (or *even* here) because it is very close to the LCPA route and several km before Perfugas (Figure 27).

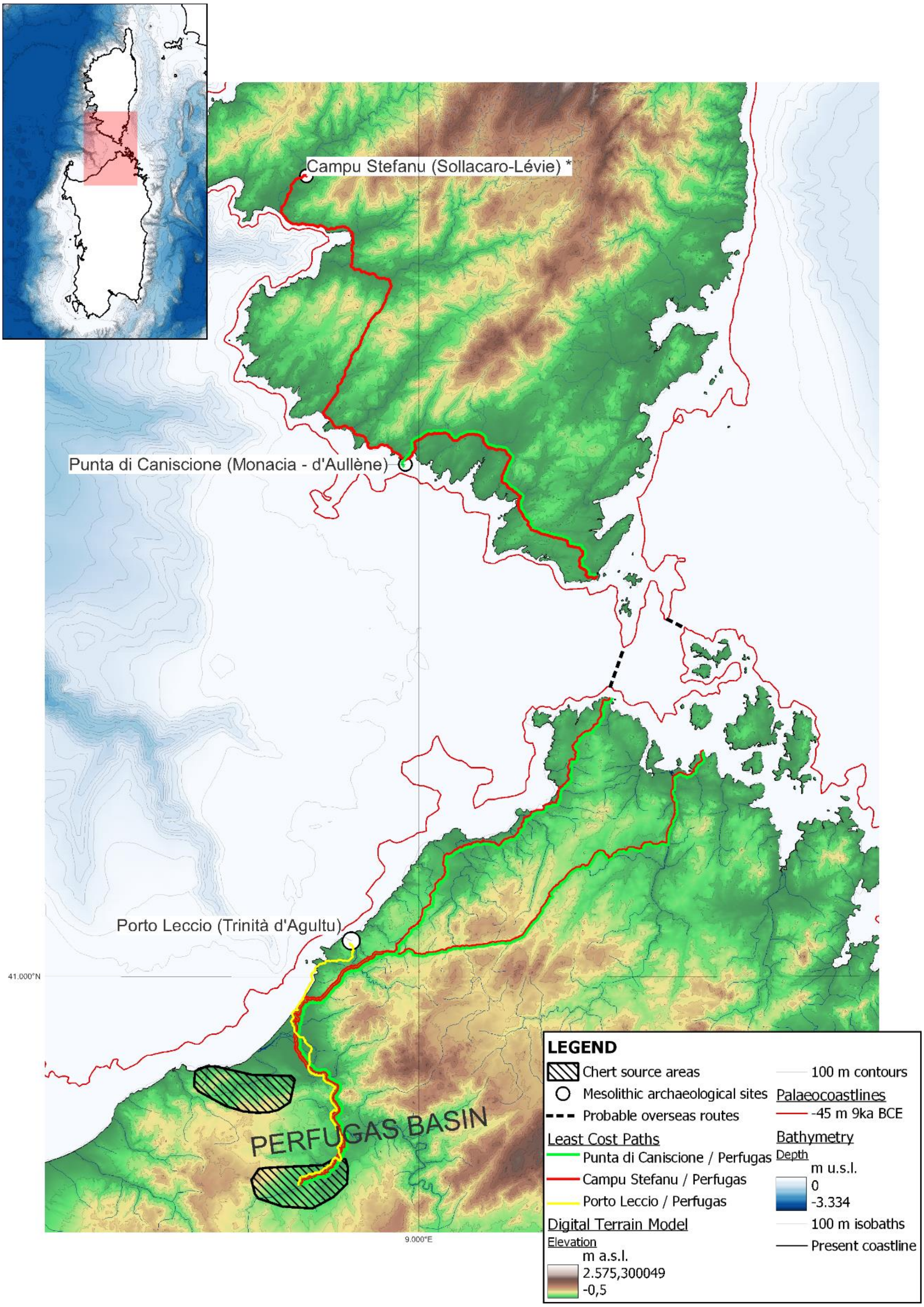


Figure 23. Least Cost Paths from Corsican and Sardinian Mesolithic archaeological sites towards the sources of chert, constructed with QGIS 3.20.

As regards the map of obsidian supply from Corsica in the Early Neolithic, the sites of Basi and Renaghju in the south-west essentially follow the same route as Mesolithic Campu Stefanu and Punta di Caniscione to reach the shore. The others – Lumaca, a Guaita, Torre d'Aquila and Strette, which are instead located in the Corsican cape – all follow the same route along the entire western coast at a very close proximity to the sea and at zero slope, moving away from the sea only at present lagoons or at slight elevations. The path descending from Curacchiaghju joins the others at river U Stabiacciu. The descent from the elevated mountain site is made by following the river De Spinu; once it reaches the valley it keeps following the watercourses, without passing through the canals but rather crossing them – since several points of intersection are visible. The point of departure from Corsica is then reached by proceeding towards the valley traced by the rivers De Punta Rossa, De Truone and De Francolu (Figure 24).

For the crossing of the strait between Corsica and Sardinia during the Early Neolithic different routes have been proposed, considering, as previously stated (see section 2.1.2.), that the palaeocoastline was at -35 m at 7 ka BCE (Shackleton, Van Andel *et al.* 1984) and around -5/-10 metres at 5 ka BCE (Allegrini-Simonetti 2000). The most probable crossing with a sea level between -35 and -10 metres seems to be the south-west route proposed for the Mesolithic; while there would be a shorter route as the crow flies in a south-eastern direction at -5m, but this would only be up to the currently emerged La Maddalena archipelago, and thus actually longer to reach the mainland (Figure 27).

Once in Sardinia, the route to the obsidian supply sources in Monte Arci is very long, up to 321 km for the most distant outcrop. To this distance must be added the journeys to reach the Sardinian coast from Corsican settlements: this means that **to get to procure obsidian directly from its source at Monte Arci, human groups living in Corsica should have had to face a minimum journey of 370 km** (from Renaghju and Curacchiaghju) **and a maximum of 577 km** (from Lumaca in Cap Corse) (Figures 24 and 25).

The least expensive route through Sardinia also makes ample use of river valleys, first proceeding eastwards to bypass the Limbara massif, then crossing the valley in a south-westerly direction passing north of the Alà mountains and then the Marghine and Goceano ridges. Instead of proceeding towards the coast, circumventing the Monti Ferru massif, it is less expensive from an energy point of view to cross the Campeda plateau in a north-south direction at an altitude of 700 metres above sea level and then descend on the other side to join the Tirso river downstream (Figure 25).

In order to reach the obsidian outcrop of type SB1, the route diverges at the height of the Mannu river reaching the western slopes of M. Arci and the nearest outcrop at an altitude of 235 m above sea level. Obsidian outcrops of type SB2 and SC are instead reached in the valley, at 11 and 9 metres above sea level respectively, which means for the SC group to avoid the climb up to the sources located on the Mount Arci up to 700+ metres height. Finally, the SA obsidian geochemical group is last reached on the southern slopes of the massif at an elevation of about 200 metres above sea level (Figure 26).

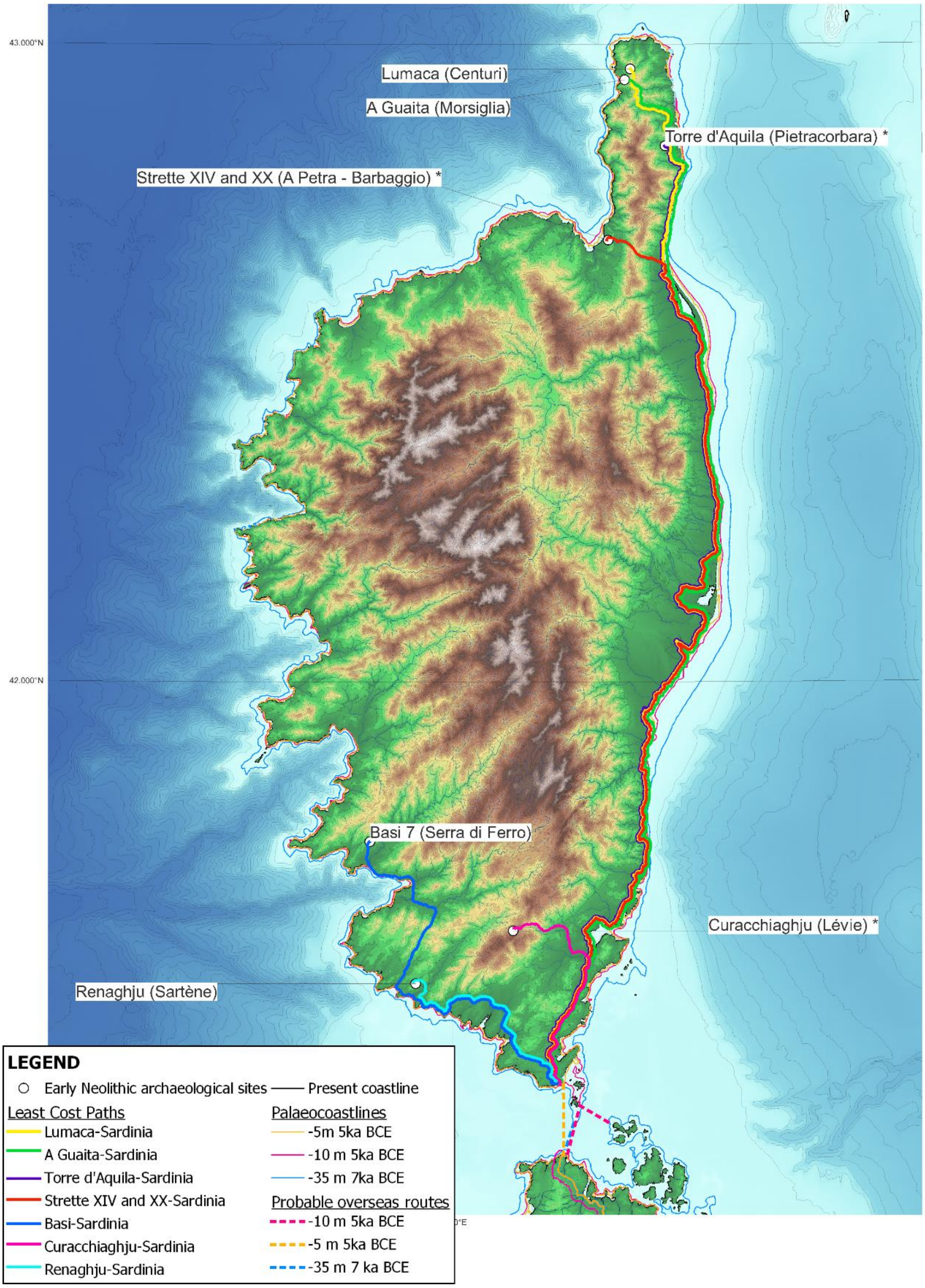


Figure 24. Least Cost Paths from Corsican Early Neolithic archaeological sites towards the sources of obsidian in Sardinia, 1/2. Constructed with QGIS 3.20.

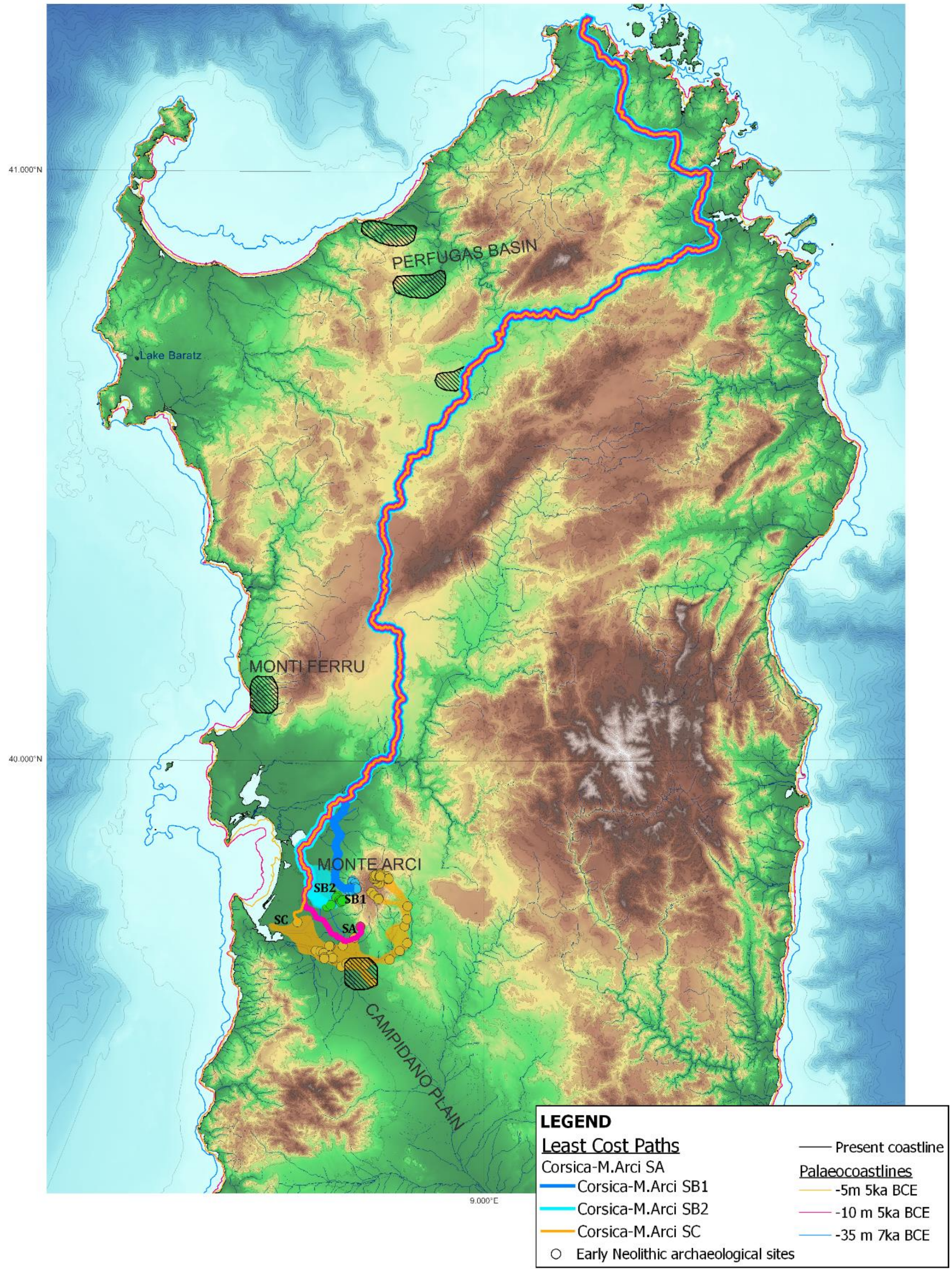


Figure 25. Least Cost Paths from Corsican Early Neolithic archaeological sites towards the sources of obsidian in Sardinia, 2/2. Constructed with QGIS 3.20.

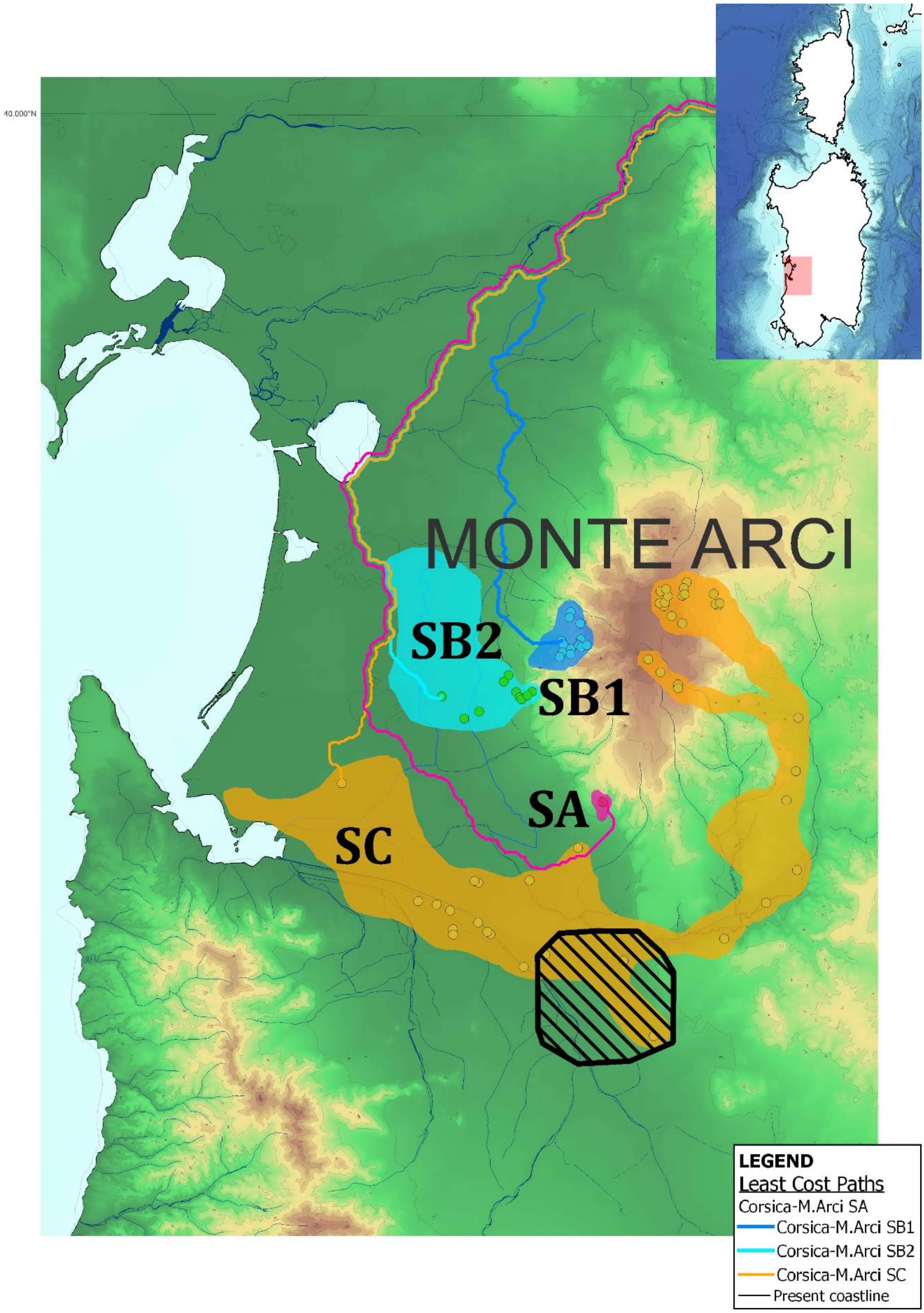


Figure 26. Detail of the Least Cost Paths for the provisioning of Monte Arci's obsidian from settlements in Corsica during the Early Neolithic. Constructed with QGIS 3.20.

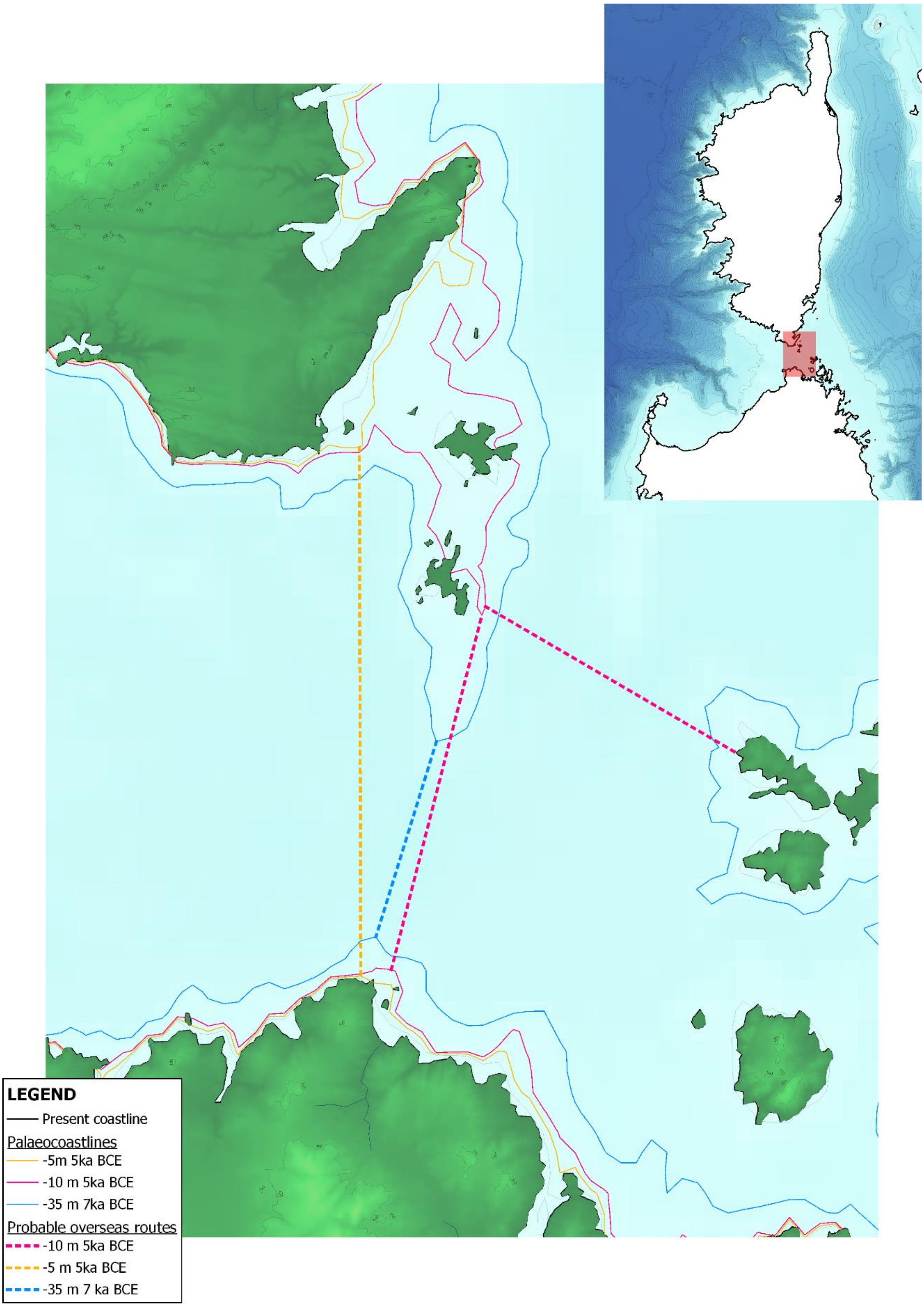


Figure 27. Detail of the probable overseas routes from Corsica to Sardinia during the Early Neolithic, constructed following the shortest distance as the crow flies according to palaeocoasts with QGIS 3.20.

The procurement of obsidian during the Early Neolithic from Sardinian settlements necessarily involves shorter routes than those from Corsica. The most distant site is Cala Corsara on the island of Spargi, La Maddalena, in the far north of Sardinia. After crossing an arm of sea about 3 km wide, the route goes up the river Surrau until it rejoins the same least cost path followed when coming from Corsica, namely to the east by circumventing the Limbara and then in a south-western direction until it crosses the Campeda plateau and reaches Mount Arci from the west (Figure 28).

The western sites of Sa Korona di Monte Majore and Filiestru also join the Cala Corsara route by crossing the Campeda plateau at the same point. From Santa Caterina di Pittinuri and Su Paris de Sa Turre in the vicinities of Monti Ferru, the route skirts the coast and part of the gulf of Oristano to reach the sources of Mount Arci again from the north-west (Figure 28).

The route changes considerably for southern sites (Acqua sa Canna and Su Carroppu), from which it climbs along the course of the Cixerri river until it reaches the Campidano plain, which is crossed in its north-west direction, thus reaching the obsidian sources from the south. The first SC outcrop reached is the southernmost, at an altitude of about 59 m asl; but since the route continues towards the other sources, SC outcrops immediately to the north are also reached even though they do not appear in the LCPA, whereas the others on the north-eastern peak of the mountain are decidedly less accessible. Even for SB2 type the southernmost outcrop is the most easily accessible, at an altitude of only 17 m asl, whereas the nearest SB1 and SA outcrops are the same as those reached with Corsican routes (Figure 29).

Finally, the nearby sites of Coddu Is Abionis, Rio Saboccu and Sa Punta are so close that they could exploit the sole SC type remaining within a local range; but both have also yielded obsidian from other sources. For Coddu Is Abionis it has been suggested that the exploited outcrops could be Conca Cannas and Santa Maria Zuarbara, while Perdas Urias would probably be too far – almost 50 km away on foot, although only 19 as the crow flies (see Appendixes 7 and 8). From Rio Saboccu the outcrops are reached from the south-west and are the same as those exploited by routes coming from Corsica. From Sa Punta on the coast of the Oristano Gulf it is possible to access the same outcrops as Rio Saboccu, but from the west (Figure 28).

The routes *within* Sardinia for the supply of obsidian during the Early Neolithic thus **do not exceed 294 km** in length (Cala Corsara – SC outcrops) but, except in the case of Coddu Is Abionis, Rio Saboccu and Sa Punta, **require to cover a distance of at least 63 km** from the settlement in order to reach the nearest source (S. Caterina di Pittinuri – SB2 outcrop) (Figure 28).

Regarding the **supply of chert in the Early Neolithic**, which involves the sole sites of A Guaita, Strette, Campu Stefanu and Renaghju in Corsica and Cala Corsara in Sardinia, the routes are the same as previously observed, towards the Perfugas basin. In this case the **maximum distance covered from Corsica reaches 340 km** (from the northern Cap Corse, A Guaita site), **while the minimum is 135 km** (from Renaghju). From the only **Sardinian** site examined (Cala Corsara), **the distance covered** (without considering the short sea stretch) **is 94 km** (Figure 30).

All distances are calculated for the outward journey from the settlement to the source and must be doubled to get the full calculation of the kilometres travelled to get the raw material and back to the place of departure.

Figure 28. Least Cost Paths from Sardinian Early Neolithic archaeological sites towards the sources of obsidian in Mount Arci, constructed with QGIS 3.20.

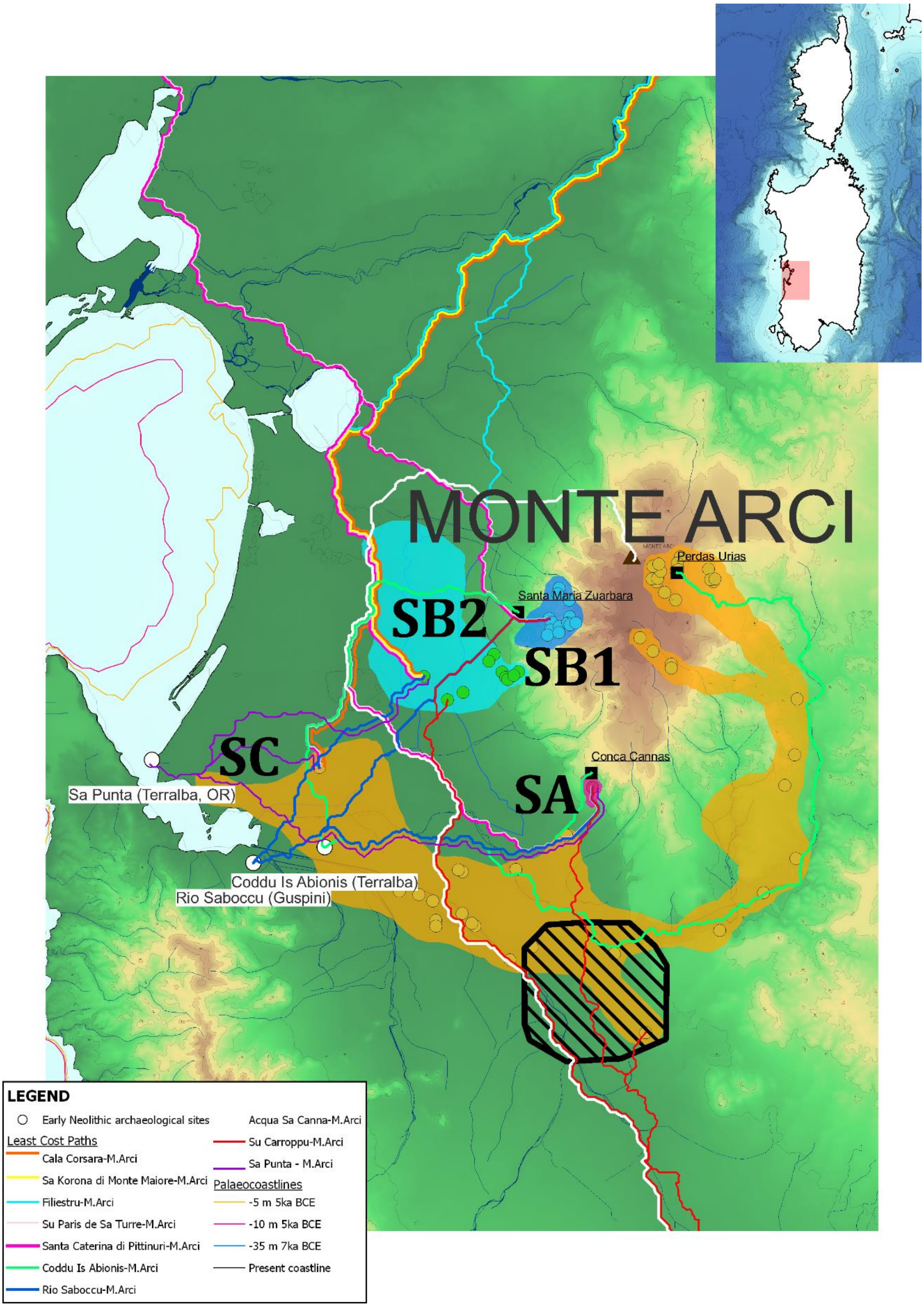


Figure 29. Detail of the Least Cost Paths for the provisioning of Monte Arci's obsidian from settlements in Sardinia during the Early Neolithic. Constructed with QGIS 3.20

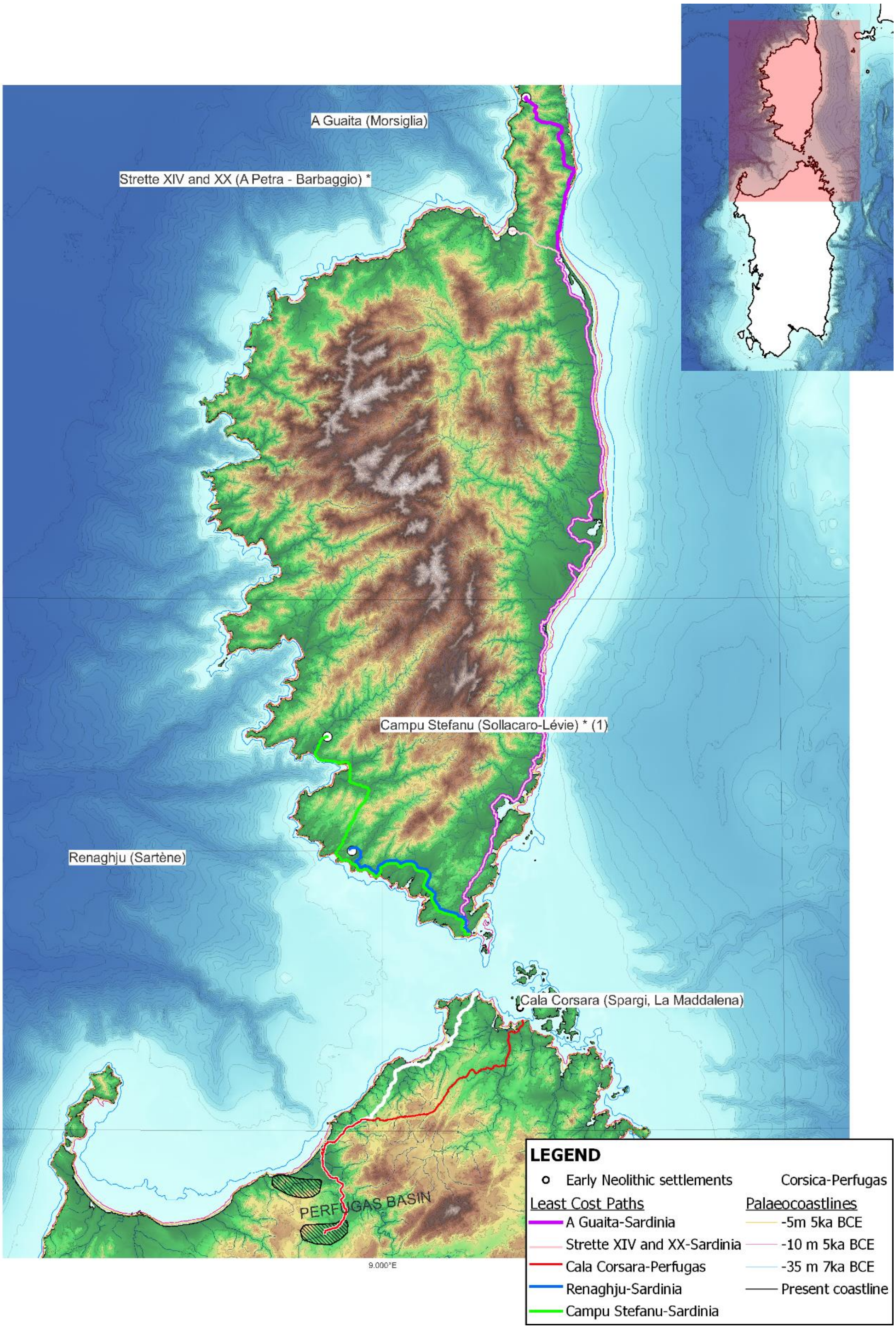


Figure 30. Least Cost Paths from Sardinian and Corsican Early Neolithic archaeological sites towards the sources of chert, constructed with QGIS 3.20.

7. DISCUSSION

7.1. Research Issues

Several problems were encountered during the construction of the database. It is considered necessary to present them here to explain any gaps and contradictions possibly found in the tables and to describe the current state of research observed during literature review.

7.1.1. Research Data

In Corsican-Sardinian Pre-Neolithic and Early Neolithic we are generally dealing with very few published and studied sites. The recovery of data on prehistoric Corsican-Sardinian sites and their lithic assemblages is particularly difficult because few of these sites have been excavated and their assemblages fully studied. Moreover, most research have been published only superficially, as preliminary reports and notes in conference proceedings and journals.

With regard to the published studies, in most cases it is difficult to understand where the described lithic artefacts come from, since either a stratigraphic context is lacking – artifacts stem from sampling in uncontrolled museum collections or old surface collections – or because the exact references to the level, layer or stratigraphic unit are missing or the definitions are vague. It is thus even more difficult to combine information on the same site from different publications, given that the description of the stratigraphy is often unclear and if the radiocarbon dates do not coincide because they come from different studies and samples. Furthermore, incoherence and contradiction among publications are not uncommon and the terminologies used by various authors often do not coincide (see section 11. Supplementary Data).

As regards provenance studies, few have examined significant numbers of artifacts, and many of them belong to insecure archaeological contexts. Those contexts whose artifacts have been examined in low numbers cannot provide reliable data since they do not provide any statistical confidence. The same problem of insufficient quantity of data also concerns those sites which have been well studied from the point of view of sourcing, since they alone cannot be considered representative of settlement patterns in their location, chronology, or site type.

Furthermore, little to no paleoenvironmental evidence is available for precise portions of the territory, apart from general data that apply to the entire region, and very few sites have been studied extensively in this respect.

7.1.2. Chronology: Absolute Dating

The chronology of archaeological sites pertaining to the Late Pleistocene and the first millennia of the Holocene in the islands of Corsica and Sardinia is rather problematic for several concurrent reasons. The most apparent is the **paucity of published absolute dates**, particularly affecting Pre-Neolithic evidence – mostly ascribed to the Mesolithic or Palaeolithic using relative dating – and the sites located in Sardinia; the same problem applies even if to a lesser extent to Early Neolithic Corsican sites.

Most of Sardinian Pre-Neolithic archaeological sites (9 over 14) have not been dated with absolute dating methods: for some there is no date available, for the others the attribution is based on relative dating. Of the remaining five, one is questionable in both proposed chronological ranges (Grotta Corbeddu) and two have an excessively wide range (Porto Leccio and Su Carroppu). Only

Su Coloru has a precise dating, and it is also the only one for which dates are recorded in relation to stratigraphic levels, the standard deviation is expressed and so are the years in BP and calibrated BCE (Appendix 1).

In contrast, most Corsican PN archaeological sites have a precise chronological range obtained by absolute dating, except for Longone for which no date is available and Grotta Scritta which has too wide a chronological range and no specification of the dating method. Curacchiaghju and Gritulu are dated in years BP and cal BCE with expressed standard deviation, but no dating method is recorded in the literature. The date of Punta di Caniscione is also approximate and there are no specifications on the standard deviation or whether it was calibrated. The dating of Torre d'Aquila is debated because the standard deviation is very high and the sample on which the analysis was carried out is too small. Since the date is very recent, some authors have even stated that it could be a pre-ceramic or aceramic Neolithic (Weiss, 2000), although the similar chronology of Campu Stefanu US109 and Su Coloru L1 would also be consistent with a persistence of Mesolithic cultural groups in a late period (Appendix 1).

In Sardinia as many as 74 out of 82 of the sites listed as Early Neolithic in the literature have not been dated at all, in addition to level G of Su Coloru (Sarti, Fenu *et al.* 2012); levels B10, B11 and D of Filiestru(Tykot 1996, Tykot 2002); Santa Maria is Acquas whose chronology has been obtained with relative dating (Mussi and Melis 1999) and Sa Korona di Monte Majore whose attribution is approximate and which lacks any indication of dating methods (Foschi-Nieddu 1982). In fact, a total of only 12 absolute dates of archaeological deposits are available for the Early Neolithic of Sardinia, belonging to the sole sites of: Corbeddu cave, Filiestru cave, Rio Saboccu, Sa Punta, Su Carroppu and Su Coloru (Appendix 5).

Of the 29 Corsican Early Neolithic archaeological sites, 18 have not been dated and one (A Guaita) has been dated with relative methods (Lorenzi 2012, Le Bourdonnec, Poupeau *et al.* 2014b). For most of the remaining sites, no indication of the dating method used could be found in the literature (Appendix 5).

Among relative methods, chrono-typological comparisons are quite frequent, along with the micromorphological and pedological study of the stratigraphic profile. Nevertheless, it is doubtful that techno-typological characteristics could be considered reliable for dating a lithic complex because they alone are not chronologically significant. Some authors have been raising doubts about the very existence of taxonomical categories when applied to knapping techniques, questioning the heuristic value of this grouping of industries (Delagnes and Roche 2005); not to mention the fact that many variables could influence the ascription of a group of lithic artefacts to a techno-complex or another.

An example is the case of the Clactonian techno-complex allegedly identified in some Sardinian archaeological sites which have thus been attributed to the Palaeolithic (see 2.2.1. and 2.3.3.). Unsophisticated retouch and massive striking platforms (Martini 1992) are general indicators of an expeditive knapping aimed at producing cutting edges; they could be used to describe several different technocomplexes but could also be the result of some knapping episodes ascribable to any period in prehistory. In fact, any lithic remain belonging to a phase of the operational chain in the absence of finished products could actually be mistaken as pertaining to this facies, since it is generally described as a core-and-flake industry without bifaces (Martini 2017). This possibility should be addressed for the so-called Sardinian Clactonian, especially in the absence of refitting. As Lugliè observes, it is inevitable that attributions of this sort, lacking absolute chronological data, are problematic, especially in the cases in which they have been proposed based on virtually isolated artefacts (Luglié 2009b).

When absolute dating is available, in some cases we are dealing with an **uncertain reliability of the date** itself. Several dates available for both the Early Neolithic and the Pre-Neolithic are characterised by too high standard deviation values to be considered reliable: such is the case of the Mesolithic chronology of Corsican Torre d'Aquila (Petracorbara), with a standard deviation at about 300 calculated from a rather small sample (Magdeleine 1995, Fenu, Martini *et al.* 1999-2000).

Furthermore, as Luglié has pointed out, nearly all dates for the Early Neolithic have been obtained from carbon – factor that may generate a data ageing error, if the sample is not defined or if it comes from long-lived tree species (so-called «old wood error») (Schiffer 1986, Luglié 2017). Another reason for such a large margin of error may also be the excessively small size of the carbonaceous sample - as is the case for Torre d'Aquila (Magdeleine 1995). Some datings may be doubtful if there is no certainty regarding the absence of postdepositional disturbances in the stratigraphic unit or if they were not made directly on the archaeological evidence.

In fact, another recurring problem is the lack of reliability of the **stratigraphic sequence**, due to the suspected presence of postdepositional processes. Such is the case of some Pre-Neolithic sites, such as Grotta Corbeddu, where no direct dating has been performed on the human bones and where some dates on charcoals from the same level contradict each other (Cherry 1992, Hofmeijer and Sondaar 1992). In Corsican Cave of Castiglione 3 (Oletta) a single obsidian fragment was found in a sediment dated by C14 to the 7th millennium BCE (Salotti, Bellot-Gourlet *et al.* 2000) but, since it was a cave-fill, it is not certain whether charcoals, marine shells and obsidian belonged to the same depositional episode, or whether they originated from different levels (ex. higher levels, as a result of a falling episode) (Le Bourdonnec, Poupeau *et al.* 2014b).

Similar problems occur for some Early Neolithic sites, where the presence of wild boar and mouflon in association with Cardial pottery has cast doubt on the integrity of the deposit, since it would have been too early for domesticated species to have become feral. From a broader perspective, this has called into question the reliability of the stratigraphy on which the reconstruction of the faunal complex for the whole 6th millennium BC is based (Luglié 2009b).

Because of these problems, several debates are still open regarding certain dates, such as the previously mentioned very early Neolithic of Curacchiaghju (layer 6c: 7600 ± 150 BP (cal BCE 6994-6038); layer 6a: 7310 ± 170 BP (cal BCE 6456-5779); layer 6: 7300 ± 160 BP (cal BCE 6426-5805) (De Lanfranchi 2000, Weiss 2000)and of Basi (7700 ± 150 BP) (De Lanfranchi and Weiss 1997, Manen and Sabatier 2003), cal BCE 7030-6250 (Bailloud 1969, Cesari 2011) or cal BCE 7002-6187(De Lanfranchi 2000, Fenu, Martini *et al.* 2002).

7.1.3. Geographic Location: Coordinates

Virtually no coordinates of the archaeological sites relevant to this research are given in the reference literature. As a result, all archaeological sites that have been located on the map have not accurate coordinates, because they were georeferenced either with Google Maps or via non-detailed maps. This discrepancy is especially visible in sites for which altitudes have been reported in the literature: in fact, when calculated on the map, altitudes can differ by as much as several tens of metres from the heights given in reference texts.

Furthermore, some maps contradict each other in the location of the sites, making the choice between one or the other random, despite the support of the perimeter of the municipal boundaries in which the sites are located. Finally, Google Maps cannot be considered a reliable source since discrepancies have been noted with points recorded in layers from national geoportals: such is the case of several cave or shelter sites – although their localization should have been less problematic as they are fixed elements of the landscape.

The details of such inconsistencies related to site elevation have been recorded in the Supplementary data section, while in QGIS it has been chosen to represent the sole elevations calculated by the software to be able to proceed later with the Least Cost analysis. The same applies to approximated coordinates, which have been left displayed in QGIS attribute table but were removed from the database in the Annexes. Most of Sardinian Pre-Neolithic archaeological sites have not been located at all, and it was thus chosen to roughly record them on the map in correspondence of the nearest municipality: such is the case of Codrovulos, Giuanne Malteddu, Interiscias, Preideru, Riu Altana and Sa Pedrosa in the north and of Ottana-A in the inland (Appendix 1).

7.1.4. Heterogeneity on Chert Studies

Unlike obsidian, chert is a non-homogeneous raw material of which many characteristics are not yet fully known. Its chemical composition, response to mechanical stress, mode of origin and appearance can be highly variable. In fact, it can form under widely diverse circumstances and through various processes, and its chemical composition could vary greatly even within the same source. Even though its mechanical properties are essentially those of quartz (its predominant mineral), they are modified by the internal structure of the rock and the impurities it may bear (Luedtke 1992).

Furthermore, there is **no universally agreed terminology** among researchers, whether archaeologists, geologists, mineralogists, to distinguish between a general definition for the lithotype and its numerous variants. Even if we were to include in the taxonomic category all sedimentary rocks composed mainly of microcrystalline quartz, the definition would still be unclear since some may form partly through metamorphic rather than or in addition to sedimentary processes (Luedtke 1992).

In such a context, the terminology used is mainly a result of choice and should be made explicit before developing the discourse. In this research, «**chert**» as a general term has been preferred over «flint», even though other authors argue differently (for further information, please refer to Luedtke, 1992). However, many different terminologies were encountered during the bibliographic survey, often without specification. The lack of consistency among different terminologies, combined with the fact that some references were in English, others in Italian and French, made it challenging to build the database with all the data related to this raw material.

As an example, the raw material processed in the site of Sa Coa de Sa Multa from Sardinian pre-Neolithic is termed «*selce*» in Italian-written papers, but actually comprises several coarse-grained lithotypes, well-silicified but not very homogeneous in terms of quality and unsuitable for knapping due to the presence of internal fractures and impurities: breccias, brecciolas, limestones, dolomites (Romagnoli and Martini 2012, Martini 2017).

Lithotypes identified as «*chert*» and «*flint*» in English-written papers and «*selce*» or «*silex*» in Italian or French publications about sites belonging to the relevant period in Corsica-Sardinia are

rarely, if ever, geo-chemically analysed and **are solely sourced through visual characterisation**. Visual characterisation is a limited tool from the point of view of the sourcing of lithotypes because, if not accompanied by geo-chemical analyses, it provides very poor results. Nevertheless, even geo-chemical analyses may be not resolutive for provenance purposes in the case of chert, since a wide convergency of geo-chemical characteristics may be common to very different and distant geological zones.

Although chert in Sardinia is ubiquitous, no outcrop other than that of Perfugas is identified in the literature as source through visual characterisation of archaeological evidence - even though they are sometimes found closer to the site than the Perfugas basin. Furthermore, chert assemblages which have been traced back to their local context – such as Mesolithic Porto Leccio, Sa Coa de Sa Multa, Sa Pedrosa-Pantallinu, Santa Maria Is Acquas, Su Coloru; and Early Neolithic Coddu Is Abionis, Filiestru D7, Su Carroppu and Su Coloru again (Appendixes 4 and 8) – are never further geochemically analysed, even though useful information could be provided in this respect.

In Corsica most chert assemblages have not been subjected to any analysis of provenance apart from being obviously classified as allochthonous, since the island lacks geological outcrops of this lithotype (see section 2.3.2.). Some authors have even suggested that the origin of some chert items in this region could also be traced back to the Tuscan archipelago (Grifoni, Tozzi *et al.* 2000).

7.2. Least Cost Modelling

Least Cost Path Analysis is a tool for studying the relationship between humans and environment that is becoming increasingly popular in archaeological research (White and Surface-Evans 2012). It is based on the assumption that human beings tend to economize their behaviour in terms of energetic cost (Zipf 1949), thus choosing to conduct their activities with as little energy as possible for the result they want to achieve.

In LCPA the principle of the lowest energy cost is applied to the interactions between humans and landscape during a displacement of varying length from point A to point B: it is assumed that they will adjust their movements in order to follow the most easily accessible areas and paths rather than proceeding in a straight line if this meant encountering obstacles – i.e. natural or cultural features that impede movement (White and Surface-Evans 2012, Gustas and Supernant 2017). The Least Cost Path would thus be the most energy-efficient route, namely the one in which there is minimal accumulation of these impediments that increase the energy expenditure required to cover the distance (Howey 2011).

The main variable that is considered in terms of cost when studying human movement is the land slope. It is a type of variable that is defined as «anisotropic» i.e. on the basis of which the cost of movement changes depending on the direction: at the same slope, the cost will be different if one ascends or descends the path (Herzog 2014). Although many physical factors may be considered in the development of a Least Cost Analysis – topography, hydrology, vegetation, availability of resources, climate; or cultural factors, such as the presence of trails(White and Surface-Evans 2012)– in this research, **slope** has been chosen as the only variable because it was the only one for which complete data were available.

In fact, only fragmentary and scattered data were available for the palaeoenvironment of the two islands in the examined chronologies, both regarding vegetation and climate. No relevant information was either available concerning **watercourses**, such as the width and possible presence of fords, the flow rate and regime, the navigability. The nature of these factors can drastically change the way one choses to interpret the river as a variable in the calculation of cost.

In fact, it is still subject to debate among researchers whether rivers are to be considered as rather obstacles or facilitators of movement. Several studies have posited that waterstreams, in addition to maritime routes, have sometimes been chosen or even preferred for transporting goods as well as for travelling (Moutsiou and Agapiou 2019, Carter, Moir *et al.* 2021). Nevertheless, this depends firstly on the characteristics of the stream, e.g. its navigability and the time of the year according to seasonal variations in its flow. Technological capabilities of human groups in the examined chronologies must also be considered, in particular navigation skills and boat production technology. Some authors have preferred to consider bodies of water (such as lakes) as physical constraints prior to chronologies in which evidence of navigation is widely attested; and waterstreams as obstacles rather than facilitators of movement, proportionally as the width increases (Barge, Kharanaghi *et al.* 2018).

In the case of Corsica and Sardinia, navigation skills are assumed to be good in both the Pre-Neolithic and Early Neolithic, at least for the maritime cabotage that would have been necessary to reach the islands in the first place. Nevertheless, as regards Corsica, no detailed data on the navigability of the rivers are known (they are all classified as non-navigable in the reference layer), while as regards Sardinia, no data are available on the width and only some rivers are indicated as navigable in the vicinity of Mount Arci, while there are no specifications on the remaining streams.

Given the situation, both rivers and bodies of water of natural origin were excluded from the calculation of the LCPA due to the lack of relevant information to formulate a hypothesis on whether they were obstacles or facilitators of movement. It was nevertheless decided to depict them on the map to show their position in relation to the LCPA and to set the stage for further analyses on the same territory in the future.

Potential **sea routes** have also been excluded from the LCP calculation; again, this was due to a lack of data that would have been necessary to formulate a reliable proposal. Several variables should in fact be taken into account in the calculation of least cost sea routes: given that the horizontal surface of waters acts as cost surface zero and thus cannot be evaluated according to slope, cost must be calculated in different ways (Gustas and Supernant 2017).

Several factors have been examined in recent studies for this purpose. Bar-Yosef Mayer et al. (2015) have chosen to consider: sea level; options of available watercraft and navigational skills; sea conditions and currents; sailing routes; and prevailing seasonal and diurnal wind patterns. Present wind and sea currents were assumed to be generally similar to those of the Final Pleistocene, while the type of watercraft was speculated based on available materials and technology and on the characteristics of the load.

In fact, the rationale behind the study was that present weather conditions can be used to deduce the context within which Mediterranean mariners voyaged from the Pre-Neolithic onwards, together with different sea level and palaeocoastlines (McGrail 1991). Gustas & Supernant (2016) have instead focused on variables such as the identification of low slopes on the coastline to locate the most suitable spot for landing a boat; the maximum distance that can be travelled by boat in a 12h period; the intervisibility and the location of protected waters, i.e. on the inland side of landmasses; etcetera.

In this research it was rather decided to focus on movements through the landscape and to trace sea routes only when crossing from Corsica to Sardinia or vice-versa, namely in the Bonifacio strait. Since available data were believed not to be sufficient to do otherwise, it was chosen to only trace the **shortest marine routes as the crow flies** based on the intervisibility between lands – thus without considering winds and possible currents that at present continuously and quite intensely affect this stretch of sea.

It was also decided not to use an anisotropic function (but an **isotropic** one) for the Least Cost Path Analysis since it was aimed at depicting general directions of outward-return movement on a regional scale rather than actual routes, considering the uncertainty of geographic coordinates presented. Furthermore, given the low gradients encountered, the development of more complex functions would have brought little in terms of results; in fact, the territory of the two islands has several accessible routes with a gradient tending to zero, for which the difference in cost based on the gradient is not relevant depending on the direction.

Moreover, the least cost routes have been understood as being undertaken **on foot** by human beings: the possibility that transport was carried out by animals is to be excluded in these chronologies, since the only ones capable of doing so (namely, cattle) must have been still very rare in the Early Neolithic and absent in the Pre-Neolithic (Tykot 1996, Luglié 2017) (see section 2.2.2.).

The results of the analysis depict a pattern of Least Cost Paths that always **follow the coastline wherever possible** – which was to be expected in a LCPA where slope was considered as the only variable. Whenever the morphology of the coastline consists of inlets and headlands or when it moves away from the desired destination, the routes tend to deviate inland **following the course of rivers**. Several sites are located along the paths of the LCPAs or in their vicinities (such as Punta di Caniscione and Porto Leccio), which could confirm that humans tend to establish their settlements within reach of communication networks, as stated by several authors (Murrieta-Flores 2012, Herzog 2014).

As the presence of watercourses was not calculated in the analysis, in several cases the least cost paths not only follow the rivers by overlapping the flow channel but also cross them horizontally following the lower gradient terrain. This is clearly visible for example in the route from Curacchiaghju to Sardinia, where there are several crossing points with downstream rivers (see 6.2.2.), which would probably not be possible if the permanent presence of water were considered. The itinerary of the lowest cost routes could thus change significantly if waterways were considered as variables, both as obstacles or as facilitators of movement.

As other authors have highlighted, the more variables that can be incorporated into the model, the more realistic the model will be; nevertheless, one must take care in the construction of variables, which have to be robust (White and Surface-Evans 2012).

Notwithstanding, **predictive approaches to the study of human behaviour can never incorporate all the variables that are actually in play in real life** – which is one of the reasons why least cost path analyses are still widely debated in the field of archaeological research. In fact, apart from the physical characteristics of landscape and environment, which are rarely fully traceable (especially in prehistory) – such as vegetation, climate and weather conditions, water sources etc., as previously mentioned – several intangible variables may condition the choices of human beings in relation to the selection of routes.

The physical parameters chosen by archaeologists, although numerous, may in fact be very different from the factors that have actually conditioned the way peoples traversed their landscape in the past (Campbell and Healey 2018), both since past landscapes are estimated with features quantified in the present (Moutsiou and Agapiou 2019) and in terms of human choice. The cost may in fact be the last of the variables considered by past humans: as is attested by ethnographic observations, movement in some hunter-gatherers communities is mostly influenced by the desire to visit or avoid certain places or by cultural reasons than by energetic efficiency (Carter, Moir *et al.* 2021). Furthermore, although travelers could attempt to limit the energy cost of the journey by using all their knowledge to make the best choice (White and Surface-Evans 2012), they actually may not have a complete knowledge of the landscape they are traversing or could be both unable and unwilling to select the lowest cost path despite their expertise (Howey 2011). Individual behaviour might also play a role, and it is largely unpredictable (Pinto and Keitt 2009, Howey 2011).

In conclusion, the main problem of the least cost principle is its very premise: that humans act efficiently, which is not always true (Moutsiou and Agapiou 2019). For this reason, the least-cost paths should be considered as simulations of the mobility of prehistoric populations in relation to topographical barriers, not as exacts physical locations of the routes in the past (Barge, Kharanaghi *et al.* 2018, Carter, Moir *et al.* 2021).

As Bradley et al. have stated (1994), «landscape is permeated by meanings, it is not a simple source of provisions»: it is clear that human movements in the landscape cannot be understood as a sole and mere calculation of energy cost. Nevertheless, it is mostly impossible to reconstruct the system of meaning of past humans. Energy cost is a variable among others that are usually considered by humans as they move through a territory; as opposed to variables concerning habits, behaviour and symbolism, it *can* be studied. In this sense, the tracing of least cost paths is useful, insofar as it provides a **model of mobility** that can be a basis for further study; a model that considers only one aspect that may have oriented human behavioral choices and does not claim to be an all-encompassing proposal.

While applying LCPA analyses to the procurement of raw materials, it should also be understood that mobility patterns traced from the sources to the settlements do not correspond to a network of uninterrupted journeys. Instead, and especially for long travels, they are best understood as a sum of **cumulative actions** over time (Tykot 1996) whose time-scale could have reached the order of generations (Williams-Thorpe 1995), the result of which is the arrival of the raw material at the findspot.

7.3. Pleistocene-Holocene lithic procurement and mobility patterns in Sardinia and Corsica

As observed along this research, **the occasional presence of obsidian and chert in settlements dated to Pre-Neolithic Sardinia and Corsica** can be ascribed with the support of absolute datings to **no earlier than the second half of the IX millennium BP in Sardinia** (Melis and Mussi 2016) and **the second half of the IX millennium BCE in Corsica** (Pasquet and Demouche 2012) – that is, to the Late Mesolithic. Nevertheless, and especially for obsidian, their presence in these early chronologies – when stratigraphically confirmed – is neither evidence of systematic use nor can it be considered statistically representative for the period but is likely an epiphenomenal occurrence.

It can thus be stated that obsidian and chert *are* indeed occasionally found in the lithic assemblages ascribed to the Mesolithic, but **their quantity is low**. Furthermore, **it is not possible to state whether this is due to a general scarcity of lithic remains** in the deposits **or whether it is chert and obsidian that are present in small numbers** (while other raw materials of local origin are preferred), as data on lithic assemblages from this period are generally very scarce and thus statistically irrelevant.

The quantity of chert and obsidian in Pre-Neolithic archaeological deposits is in fact only a few units – apart from the case of Porto Leccio, whose assemblage has yielded a few tens chert artefacts (Lugliè 2009a, Skeates 2012, Tozzi 2012), and from some of the alleged Palaeolithic deposits which have yielded several hundred chert items (Martini 1992, Aureli 2012, Romagnoli and Martini 2012, Martini 2017) but whose chronological attribution remains dubious (Cherry 1992). **It is thus not even possible to observe a preference for chert over obsidian or vice versa among the raw materials used for lithic technology in Mesolithic Corsica and Sardinia** (Appendixes 3 and 4).

Provenance analyses of lithotypes are also extremely scarce for the archaeological assemblages pertaining to this period. **Regarding obsidian, there are no data that attest to where it was obtained**, apart from the sourcing of one single item from Corsican Cave of Castiglione to the island of Palmarola (Salotti, Bellot-Gourlet *et al.* 2000). Regarding **chert**, instead, provenance analyses – which are exclusively visual characterizations – have **traced back to the Perfugas basin** the sole **items of the two Corsican sites Campu Stefanu and Punta di Caniscione and of Sardinian Porto Leccio** (Cesari 2011, Pasquet and Demouche 2012, Tozzi 2012, Courtaud, Petersen *et al.* 2016). **Of the remaining Sardinian chert items, most have been traced back to an unknown local origin** while no Corsican chert has been (Appendix 4).

According to Least Cost Paths, **the distance covered from Corsica towards the outcrops of chert in northern Sardinia would have reached a total of 177/185 km from Campu Stefanu and 123/131 from Punta di Caniscione**, even though another chert outcropping area is located at the mouth of the Coghinas at shorter distances (although not sourced). Within Sardinia, **Porto Leccio** is the only Mesolithic assemblage which has been partially sourced to Perfugas, but for the most part it is a local hydrothermal chert, gathered in the close alluvial deposit (Lugliè 2009a, Tozzi 2012); towards the Perfugas basin, **the distance covered would have been of 45 km.**

The quantity of chert and obsidian found in archaeological deposits increases significantly with the Early Neolithic, reaching several thousand units studied and published on a regional scale (Appendixes 7 and 8).

On an intrasite scale, a predilection for chert is observable in EN Corsican settlements, with a total amount of 2978 chert items collected in archaeological deposits belonging to this period, compared to 1373 obsidian artifacts. In EN Sardinia there is instead a preference for obsidian on an intrasite scale, with 4523 of total items found in archaeological deposits compared to 2034 in chert. Nevertheless, these quantities are actually not significant since the percentage amount are almost equivalent, with a 5% difference, as they translate into 55% obsidian against 45% flint, and 54% flint against 46% obsidian, out of the total of lithic remains found in Early Neolithic archaeological deposits in Sardinia and Corsica respectively.

However, **there is a clear difference in the geographical distribution of the use of these lithotypes**, as **in Corsica chert is most frequently attested at sites in the south and is almost absent in the north**, while **obsidian is found in sites whose location varies widely, but it is**

present in higher percentages in the south. Furthermore, **lithotypes of local origin** – other than chert and obsidian – **are generally preferred over the latter** for lithic technology throughout Corsican Early Neolithic settlements. **As regards Sardinia, a sharp preference for obsidian is attested in the area around Mount Arci and in settlements south of it**, while **in the area of Perfugas and in the northern cape there is a predilection for chert**; whereas lithic materials of local origin are prevalent in just one deposit.

As regards provenance analyses, even in the Early Neolithic **no chert item found in Corsican archaeological sites has been traced back to a local origin**: this confirms what has been reported in the literature about the absence of sources of chert in the Corsican territory. Instead, **several Corsican assemblages have been sourced to Sardinia and two in particular to the Perfugas basin** (Bressy, D'Anna *et al.* 2008, Cesari 2011, D'Anna, Marchesi *et al.* 2012, Le Bourdonnec, D'Anna *et al.* 2014, Courtaud, Petersen *et al.* 2016).

On the other hand, **chert from Early Neolithic archaeological deposits of Sardinia has been mainly sourced locally**, although specifications on the exact outcrop are rare; whereas the sole Cala Corsara assemblage has been traced back to the Perfugas basin (Depalmas 1995, Skeates 2012). This also confirms what has been reported in the literature on the ubiquity of chert sources in the territory of Sardinia, but it also adds new data to the map of source distribution (Luglié 2005, Bressy-Leandri and Le Bourdonnec 2010, Bressy-Leandri 2012), suggesting that several outcrops or deposits of chert accessible to humans are also present outside these circumscribed areas.

According to Least Cost Paths, **the maximum distance covered from Corsica in order to reach the sources of chert in the Perfugas basin during the Early Neolithic would have been 340 km, while the minimum 135 km**; whereas within **Sardinia** the sole distance covered in order to procure a non-local chert is that **from Cala Corsara and reaches 94 km**.

Several sourcing methods are instead reported in the literature regarding obsidian items belonging to Early Neolithic deposits. Although again the analysed assemblages are few in comparison to the total, results have allowed a clearer picture to be drawn for the supply of obsidian in these chronologies. **Of the 8 Early Neolithic Corsican assemblages that were analysed, all obsidians came from Mount Arci in central-western Sardinia**, apart from one single artefact from A Guaita and one from Renaghju which were sourced to the island of Palmarola (D'Anna, Marchesi *et al.* 2012, Lorenzi 2012, Le Bourdonnec, Poupeau *et al.* 2014b). **Instead, in Sardinia no obsidian other than from Mount Arci has been found in EN archaeological deposits**. All geochemical groups for Mount Arci are used in the two islands, but the SB1 group is notably rare in comparison to the others (Appendix 7).

According to Least Cost Paths, **to procure obsidian from its source at Mount Arci, human groups living in Corsica** in the Early Neolithic **should have had to face a minimum journey of 370 km and a maximum of 577 km**. Instead, the routes **within Sardinia** for the supply of obsidian in the same period **would not exceed a maximum 294 km in length**, but except for settlements located at close distance from Mount Arci, **would have required to cover a distance of at least 63 km in order to reach the nearest source**.

7.3.1. Pre-Neolithic

According to published data, the presence of obsidian and chert in Pre-Neolithic archaeological sites in Corsica and Sardinia is rather scarce, as are also scarce analyses on the provenance of lithotypes employed to craft the few known tools.

Although no data are available on the origin of obsidian in these chronologies, it is highly probable that the small amount of obsidian present in Corsica is to be traced back to Sardinia rather than to the three islands of the western Mediterranean where other sources are located, at least due to geographical contiguity and easier logistics in travel. In fact, according to Occam's razor principle it is likely that humans obtained raw material from the nearest source; if long journeys by sea to Palmarola, Lipari and Pantelleria are possible, then so must journeys to Mount Arci, which is closer but can be reached by sub-coastal navigation (relatively protected from currents) and by land. The same applies to obsidian found in Sardinian Pre-Neolithic deposits and in this case sea travels were not necessary.

Data on the provisioning of chert also point to the existence of movements from Corsica towards Sardinia and vice-versa in the Pre-Neolithic (it is not known whether periodic, occasional, or frequent), or contacts among human groups within Sardinia and Corsica, even if we were to exclude long displacements such as those traced by the Least Cost Paths.

Least Cost Paths clearly trace the lowest energy cost routes over a territory which from the point of view of slope has always remained the same between Pre-Neolithic and Early Neolithic; many variables are not considered, including vegetation, subsistence strategies of human groups and above all knowledge of the territory which would have significantly influenced the choice of movements. The routes from the same starting points or areas towards the sources of raw material, which are always the same and localised, are also inevitably always the same between Pre-Neolithic and Early Neolithic if the sole variable of slope is considered.

Since the **Least Cost Paths** show neither the choices of these human groups (e.g. dictated by mobility and subsistence strategies) nor are they constructed on the basis of the knowledge of the territory that these first settlers must have had, it is thus not possible to distinguish a **difference between Pre-Neolithic and Early Neolithic** in terms of choice of paths, but only in **the presence/absence of routes**, in **the choice of raw materials** and in **the number of movements**. However, all of this is to be placed in a very long period of time - which, at best, falls within a known time span of one millennium (for the Early Neolithic), at worst covers at least three millennia (for the Mesolithic) or even longer (for the generic 'Pre-Neolithic').

In the case of the supply of chert **in the Mesolithic**, for example, movement could also have taken place solely by sea, or along the coast, without penetrating inland except for a few tens of kilometers – thus corroborating the thesis that Mesolithic settling in Corsica and Sardinia was sporadic and never reached inland areas. Nevertheless, a number of factors suggest that **travel took place** (if not solely, **also**) **by land**. These factors are in particular: (1) the presence of occupational deposits (although not necessarily traceable to a stable settlement) at locations considerably distant from each other or in inland areas, (2) the very procurement of raw materials in these chronologies, which shows that the sources were known and used, even at some distance, although in small quantities and against a probable preference for the use of lithic materials in a strictly local area.

If the occupation of mountainous inland areas is doubtful in Pre-Neolithic Sardinia due to the lack of reliability of the stratigraphic sequence in Ottana-A and Grotta Corbeddu, it is not the case for Corsica where the Curacchiaghju deposit is generally considered reliable for the Mesolithic.

It is thus apparent that in this period the territory was beginning to be explored, although perhaps not systematically, and a certain degree of knowledge of it had already been reached, at least of the coastal and sub-coastal areas in Sardinia and already of some mountainous areas in Corsica. This difference in the exploration of the two islands could be traced back to the physical conformation of the Corsican territory, where a mountainous site may be only a few tens of kilometres from the coast and easily accessible by ascending narrow pathways through valleys. This evidence indicates that these **human groups did not necessarily maintain a mobility restricted to the sole coastal areas**, even in case they reached the two islands during only seasonal/occasional settlements for the exploitation of punctual resources; thus, **that their mobility range was actually wider than previously assumed** (Costa, Vigne *et al.* 2003, Lugliè 2009a, Lo Vetro and Martini 2016) (see section 2.2.2.).

Given the predominantly fishing/hunting and gathering economy of Mesolithic human groups and the nature of settlements, which lack evidence for the emergence of a more sedentary lifestyle (e.g. spatial structuring systems, remains of buildings) and mostly exploit habitable places already present in the landscape – caves or shelters – the presence of Perfugas chert in Corsica could rather be the results of sporadic movements within the islands than of a displacement towards Sardinia aiming specifically at obtaining chert and then returning to the base camp.

The latter strategy is in fact typical of communities organized as *collectors* sensu Binford (Binford 1979), which live in relatively sedentary base camps and settle specialized groups for the obtention of resources (see section 2.3.1.): such a strategy would have been needed in this case, since the journey was several hundred kilometers long and would have required at least several days to be completed. In addition, there was the crossing of the sea stretch between Corsica and Sardinia and therefore the need of a boat; which, however simple, would have had to be either built or stored in situ near the coast. It would certainly have made more sense to store it near the settlement and set sail directly when needed than to reach the tip of Corsica by feet and take off from there; this, in the case of movements specifically organized and aimed at obtaining raw material. Furthermore, there are no remains of chert (nor obsidian) in Corsica that would quantitatively justify systematic long journeys.

Although the long distance to the source and the stretch of sea to be crossed could point to the likelihood that chert arrived at its findspot via various passages between different human groups (rather than having been originally collected by the same group that then brought it to the settlement) it seems unlikely that the supply of chert occurred indirectly, in the context of informal exchanges among communities, because the settling of the islands in the Mesolithic must have been occasional and spread over long periods of time.

Instead, it seems more probable that **one or more human groups moved occasionally throughout Corsica and Sardinia in the framework of a *foraging* strategy**, i.e. exploiting the resources immediately available in the vicinity of the camp and **possibly taking with them some useful raw materials** (in quantities that they could carry) **found along the way**, such as chert or obsidian – namely applying an *embedded* procurement. Nevertheless, the crossing of the Bonifacio Strait must not have been so frequent and in any case these movements should not be thought of in a linear way, towards Sardinia and then back to the original settlement in Corsica.

It is instead much more likely that **such few evidence of chert from Perfugas in Corsican Mesolithic settlements** (in total, only 6 items at Campu Stefanu and «a few» for Punta di Caniscione) (Appendix 4) **are to be understood as a simple epiphenomenon, as an absolutely sporadic and therefore anecdotal presence.**

Furthermore, it cannot be ruled out that chert assemblages whose provenance has not been identified could have been collected in Corsica from local outcrops which have not yet been located.

7.3.2. Early Neolithic

The use of chert and obsidian in Corsican-Sardinian settlements becomes significant with the Early Neolithic. Although the archaeological data are considerably better in both quantitative and qualitative terms compared to the Pre-Neolithic, it has remained unclear which strategies for raw material procurement were implemented and whether and how it differed from Mesolithic ones.

According to Tykot (2002), the general island's low population density in the Early Neolithic, combined with a relatively high mobility for a still incipient level of food production (especially herding), would suggest that direct obsidian supply from Mount Arci was more likely than a down-the-line exchange model. In particular, the procurement had to take place in the course of other activities, as long as they included the crossing of these territories: thus, in the form of an embedded strategy (Binford 1979).

Nevertheless, the strategies for the procurement of obsidian wouldn't have been the same for all groups inhabiting Sardinia but would have been different depending on the distance from the source. A distinction could be made between the Oristano area supply zone and the rest of the island, where obsidian was probably obtained through exchange (Tykot 1996).

In such a framework it would also be unlikely that specialised figures in the procurement, production and transport of obsidian from Mount Arci existed already in the Early Neolithic, at least on a full-time basis (Tykot 1995). Thus, procurement, production and transport of this raw material (and for all others) should likely be understood within a framework of group organisation and intergroup dynamics rather than of exchanges managed by individual specialists.

Lugliè (2017) also states that it is possible to detect evidence of mediated obsidian supply during the Thyrrhenian Cardial Neolithic. Different procurement strategies would in fact be visible corresponding to specific geographical areas: a direct supply zone, namely about 20 km around the source, where SA obsidian type was allegedly preferred over SB2; and a contact zone, namely from 20 km onwards, where obsidian arrived through indirect procurement and where SB2 type was preferred more and more as the distance from the source increased (Lugliè 2017). This pattern would be justified by the better qualities of obsidian from the SA group, which on the average is more transparent and glassy than SB2 (Lugliè, et al., 2008; Tykot, 1992), although the latter was more easily exploitable.

The mediated supply of obsidian would thus already have been operating within Sardinia itself in the Early Neolithic period; and, at a later stage, outside, towards Corsica, the Tuscan archipelago and the Italian peninsula. It follows that the exploitation of obsidian could not be considered unhindered or somewhat spontaneous during the VI millennium BCE, except for the communities living in the close vicinity of Mount Arci.

Nevertheless, although **Mount Arci does seem to be a pole of attraction for human communities**, **probably due to raw materials availability** (in fact, as many as 16 Early Neolithic settlements have been located in a radius of 25 km around the massif), such **filtering of obsidian procurement and circulation cannot actually be attested according to the results of this Thesis**.

Settling of the area does not exclude the possibility that neighbouring communities were able to procure the raw material from its source, freely or in exchange for small gifts, as happens in some societies of ethnographic interest (Tykot 1996). Even the possibility that obsidian was obtained by exchange, and thus by a down-the-line model, does not necessarily imply that a distinction was made between geochemical types that were traded and types that were kept for local exploitation.

Other authors have also suggested that the higher presence of a geochemical group of obsidian at a site could be explained, rather than by intentional selection or filtering through down-the-line exchange, by a geographical position that favours direct access to that source (Radi and Bovenzi 2007). However, in several cases the situation is opposite, such as in Rio Saboccu (Luglìè, Le Bourdonnec *et al.* 2008) and Sa Punta (Luglìè, Le Bourdonnec *et al.* 2008b) where, despite the close proximity of type SC secondary deposits, a marked predilection for obsidian of SA type is observed. In addition, unknown factors such as simple preference may also have influenced the predominant use of one geochemical group over another in a given settlement, not necessarily related to better technical qualities of the lithotype.

According to published data on provenance analyses (Appendix 7), **no clear relationship can be observed between proximity to the Gulf of Oristano and the proportional presence of one geochemical group with the progressive decrease of another** (Figure 21), as it should have been if a filter on procurement had been exerted.

The SB type is indeed prevalent in sites north of Mount Arci; in particular SB2 at Cala Corsara (Ferrarese Ceruti and Pitzalis 1987, Depalmas 1995, Skeates 2012), Sa Korona di Monte Majore (Foschi-Nieddu 1982, Tykot 1996), in deposits B9 and D6 at Filiestru (Trump 1982, Tykot 2002, Luglìè 2009b) and at Santa Caterina di Pittinuri (Dini 2007, Tykot 2007, Tykot, Karellas *et al.* 2007); and generic SB in deposits B10, B11 and D at Filiestru and SB1 at Su Paris de Sa Turre (Luglìè 2017). **Nevertheless, the presence of neither the other two geochemical groups (SA, SC) seem to increase proportionally with proximity to the source**. SA is in fact present as the prevalent geochemical group in Filiestru D7 deposit and in the distant southern site of Su Carroppu (Trump 1983, Depalmas 1995, Luglìè, Le Bourdonnec *et al.* 2007, Luglìè 2009b), while in the vicinity of M. Arci it is prevalent in the Rio Saboccu and Sa Punta sites (Luglìè, Le Bourdonnec *et al.* 2008, Luglìè, Le Bourdonnec *et al.* 2008b, Luglìè, Le Bourdonnec *et al.* 2011). Furthermore, in faraway Corsica, SA and SC types are largely prevalent compared to SB (Appendix 7) (Figure 19).

SB (SB1) is also prevalent at the site of Coddu Is Abionis, which is located at a distance of about 15 km from Monte Arci as the crow flies - thus, in theory, within a direct supply range – despite SC outcrops being closer. Nevertheless, one should highlight that Coddu is Abionis evidence is rather scarce (2 items for SB1, 1 for SA and the rest unsure) and it has been suggested that obsidian may also have been exploited locally in the form of pebbles/fragments transported by the rivers Mogoro and Mannu (Luglìè 2000).

It is indeed likely that the procurement of obsidian was actually mediated when conducted from areas far from the source, but **mostly because direct access would have required long distances to be covered**, either in the case of procurement *embedded* (Binford 1979) in other subsistence activities or if displacement was for the sole purpose of obtaining the lithotype (Gould 1978, Arroyo 2009) (see section 2.3.1.). Moreover, if long journeys for the obtention of obsidian were to be posited, this would not explain why the latter is found in Corsican archaeological sites even though there are several good quality chert outcrops along the routes to Mount Arci – which would have offered a viable alternative for lithic knapping; thus, making it unnecessary to continue the journey for several hundred kilometres towards the obsidian source.

Although several data point to an incipient level of sedentism in these human communities, a predominantly mobile lifestyle is still maintained, linked to the introduction of pastoralism alongside the resilience of hunting-gathering economy. **The same community must have gravitated around several settlements** rather than being permanently based in one of them. Human groups were dispersed over the regional territory but very interconnected, that is, continually in contact with each other thanks to a **degree of mobility that paradoxically seems to increase in the Early Neolithic compared to the Pre-Neolithic** rather than decrease. The circulation of raw materials occurred over much longer distances and was likely the result of **indirect procurement** – since frequent informal exchange habits were in place among communities – together with **occasional embedded provisioning**, although to a much lesser extent, and **direct, purposeful exploitation in the vicinities of the source**. In fact, the highest presence of obsidian and chert in EN settlements compared to the Pre-Neolithic points to a more intensive exploitation of the sources which cannot be dismissed as the result of embedded procurement strategies alone; furthermore, the decrease in the number of obsidian artifacts as one moves away from the source agrees with a down-the-line procurement model.

It thus seems likely that the **provisioning was rather generalist** (i.e. unhindered at the source) or **mediated through a down-the-line model of informal exchange** when the settlement was distant. In the former case, as no clear difference can be observed between the geochemical groups circulating in the vicinities of Mt. Arci and those found elsewhere, it in fact **seems unlikely that local communities made a deliberate selection** to differentiate among types that were intended for exchange and those that were stored for local use.

The same discourse applies to the procurement of chert when long journeys for its obtention are proposed. But, in this case, **chert** has a much more ubiquitous presence than obsidian throughout the territory of **Sardinia** and according to the literature **it was mostly obtained within a local provisioning range**. **In Corsica**, instead, where natural chert outcrops are lacking, the above-mentioned **down-the-line informal mode of procurement** is likely to have been in place from most distant sources. It is instead unsure that direct procurement from the source as an embedded strategy during foraging activities was also in place from Corsica towards the sources of chert in northern Sardinia during these chronologies.

8. CONCLUSIONS

The aim of this Thesis was to investigate the circulation of obsidian and chert in Corsica and Sardinia up to the Early Neolithic. Ultimately, our goal was to propose interpretations related to procurement strategies and mobility patterns of the first humans who settled in both islands.

The process of research and analysis relied on the collection of data through bibliographic review, the construction of maps and the development of least cost analysis in QGIS 3.20. The results unveiled a marked difference between Pre-Neolithic and Early Neolithic periods, both in the amount of chert and obsidian explored for lithic technology, as well as in the number and length of the displacements that would have been necessary to procure the raw materials at the proposed sources.

- During the Mesolithic, humans were only occasionally settling the islands of Corsica and Sardinia and were organized in mobile groups whose main subsistence activities seem to have been the hunting of small prey (probably through traps), fishing and gathering of plant resources.

  They mostly settled in sub-coastal areas, but had started to explore inland territories, as evidenced by the fact that in Corsica they had reached and settled in a mountainous environment. Their movements were thus not only limited to sea cabotage but also extended to the mainland, which points to a wider mobility for these early settlers than previously assumed.

- During the Mesolithic, raw materials were probably obtained through occasional access to the outcrops in parallel to other subsistence activities of the «foraging» type *sensu* Binford, which involved frequent movements across the territory in order to exploit resources. The rather scarce presence of chert and obsidian in Mesolithic deposits seems to indicate that their use was very occasional and that these lithotypes were not at all sought after for the manufacture of stone tools.

  Between Corsica and Sardinia, «foraging» movements must not have been frequent, as the distances involved were long. Also, the fact that very few items have been found seems to indicate that the presence in Corsican sites of Perfugas chert is to be explained as a simple epiphenomenon of sporadic nature.

- To the onset of the Early Neolithic is to be dated the beginning of a stable colonisation of both Corsica and Sardinia and the shift towards an economy that incorporates herding along with hunting-gathering strategies. This type of economy is compatible with the persistence of a still relatively highly mobile lifestyle, although according to the archaeological evidence no relationship exists in both cultural and genetic terms among Pre-Neolithic and Early Neolithic settler.

  Actually, the degree of mobility seems paradoxically to increase in the Early Neolithic compared to the Pre-Neolithic rather than decrease. Settlements multiply and all environments are occupied, including the mountains and the inner areas, although whole regions remain uninhabited.

- The use of chert and obsidian increases significantly during this period in both Corsica and Sardinia, pointing to a more intensive exploitation of the sources than in the Pre-Neolithic, while the circulation of raw materials occurs over much longer distances.

  It is likely that human groups, although dispersed, maintained bonds and had frequent contacts during which they exchanged various types of goods: the procurement of raw materials at high distance from the source probably took place in this framework, as a result of an indirect procurement or «down-the-line» exchange. Direct procurement from distant settlements should in fact be ruled out because of the large distances involved and the scarcity of lithic evidence in archaeological deposits that could justify in quantitative terms an energy investment of such scale. Instead, direct procurement was likely from neighbouring settlements at the source areas, both in the form of an embedded strategy and as an activity exclusively aimed at exploiting the resource.

> In both long and short distances the provisioning was generalist, namely it didn't suffer any filter in terms of accessibility to the geochemical types of obsidian that could have been exerted by communities settled in the vicinities of the source. Control exercised by local communities over the Mount Arci source, such as to be able to determine the types of obsidian to be traded and select the best ones for local use, is still *in nuce* during the Early Neolithic and will only become apparent in the Middle Neolithic.

This research was carried out on data from predominantly poorly studied archaeological sites, which frequently have unreliable stratigraphy or dating, and whose lithic assemblages are rarely analysed in their entirety, especially regarding provenance surveys. These results are not to be considered as representative of the totality of the archaeological sites for the periods examined, but as an analysis of the currently published data.

Regarding provenance studies, this implies that we always refer to the sole evidence analysed, which in some cases may constitute a minimal percentage of the total lithic assemblages. The reliability of the observations is therefore higher for sites where provenance analyses have been carried out on enough evidence to be statistically significant, if not for all the assemblage. This is particularly remarkable since items do not necessarily correspond to entire artifacts, as they could be parts of the production chain and, thus, several items may actually belong to a single unit of raw material.

This research is to be understood as a premise for future developments, in a geographical context in which this type of analysis and research had not yet been implemented.

9. RESEARCH PERSPECTIVES

Prior to developing new investigations on raw material procurement strategies and mobility patterns in early Corsica and Sardinia, it is first necessary to reinforce the basic data that will be processed with the GIS software, addressing the research gaps that have been highlighted above (see section 7.1. Research Issues).

Firstly, for a better understanding of the territory and the construction of the cost surface, data are needed on waterstreams and bodies of water. For the same reason and to provide new information regarding the subsistence strategies and procurement of resources, detailed analysis of the palaeoenvironment - vegetation cover and climate above all - and studies on diet should be conducted, such as has been done in Monte Leone (Costa, Vigne *et al.* 2003).

Systematic surveys of inland territories would be desirable to cover possible research biases, which may have led to sites being sought mainly on the coast, thus resulting in an over-representation of coastal settlements. Furthermore, additional provenance analyses are needed on the raw materials. The research should however be restricted to assemblages found in stratigraphically reliable contexts; and a statistically significant sample of items out of the total should be selected for the analysis.

The research perspectives opened up by the use of GIS technologies in prehistoric archaeology are various. The construction of detail maps can allow several observations to be conducted in relation to site location in space and to geo-reference all the information related to the evidence found. GIS software allows data to be interrogated and interpreted according to spatial information. On the basis of data it is also possible to design predictive models providing a basis for further studies, i.e. by using the lowest cost routes to circumscribe areas where new sites are more likely to be identified. GIS cartography can also be a useful tool for planning conservation and valorisation interventions for archaeological sites and cultural heritage policies.

10. REFERENCES

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11. SUPPLEMENTARY DATA

SITE	TYPE OF SITE	REGION	AREA	AGE	CULTURE	DATING METHODS	FACIES (lithics)	ARCH LEVEL	COORDINATES REF	X	Y	H (m asl)	REFERENCE	NOTES
Araguina-Sennola (Bonifacio) *	shelter, grave	Corsica	S	8520 ±150 BP (cal BCE 7923-7105) (Weiss 2000)(De Lanfranchi 2000)	Mesolithic	radiometric dating (Martini 1993, Skeates e Whitehouse 1994, Guilaine 1996 in Fenu et al.1999-2000)	Undifferentiated Epipalaeolithic / Mésolithique insulaire	level XVIIIa	Google Maps	41,388587390851349	9,193189999999998	69	Fenu et al.1999-2000 (dating table) | Lanfranchi1998	
Campu Stefanu (Sollacaro-Lévie) *	shelter, grave	Corsica	SW (near Taravo river crossing)	7028-6658 BCE (Courtaud et al.2016. unclear level) | 7700 ± 30 BP (2σ 6595-6470 cal BCE) (US109)	Late Mesolithic	radiometric dating on human mineral carbon (Courtaud2016) | ? dating on faunal remains (Cesari et al.2011)	0	US109	Google Maps	41,741951575154872	8,861071727844759	94 NGF / *61 QGIS*	Courtaud et al.2016 | Cesari et al.2011	A parallel is made in Cesari et al.2011 between the chronology of this US and the one of Basi's couche 7, considered very Early Neolithic. Nevertheless, Campu Stefanu's US 109 doesn't bear any ceramics; no proposal of considering this US "Neolithic" is thus given.
Cave of Castiglione 3 (Oletta)	cave	Corsica	N	End of 7th millennium | 6985-6725 BCE (Dating questioned)	Late Mesolithic	C14 on charcoal	N/A	fracture PL, deposit OB -24 m	map Salotti et al.2000	42,649515632110429	9,281346787679931	29	Salotti et al.2000	

								from surface						
Curacchiaghju (Pianu de Lévie) *	shelter	Corsica	C/S	level 6: 8560 ± 170 BP (cal BCE 7967-7106) | level 7: 8300 ± 130 BP (cal BCE 7546-7313) (Weiss 2000)(De Lanfranchi 2000)	montane Mesolithic	N/A	Undifferentiated Epipalaeolithic / Mésolithique insulaire	level 6 and 7	approx. map Costa et al.2003 APPROX	41,610087970060867	9,126961920336074	700-800 / *991 QGIS*	De Lanfranchi 2000 | Fenu et al.1999-2000 (dating table) |De Lanfranchi 1998	There's no breach between Mesolithic and Early Neolithic levels. Lithic technology is solely based on local rocks (rhyolite and quartz).
Gritulu (Luri) *	small cave	Corsica	2,5 km NE coast (E Cap Corse)	8130 ± 70 BP (2σ cal BP 9298-8780)	Mesolithic	N/A	Undifferentiated Epipalaeolithic	US 47	municipalities .shp layer + map Costa et al.2003 APPROX	42,909062154789879	9,419987912630763	150 / *177 QGIS*	Costa et al.2003 | Weiss2000 | Magdeleine & Ottaviani2000 | Fenu et al.2002 | LoVetro&Martini2016	Lithics: only few quartz pieces and grainy rocks.
Grotta Scritta de Saint Florent (Poggio d'Oletta) *	cave	Corsica	NE	IX-VIII millennia BCE	Mesolithic	N/A	N/A	N/A	caves .shp layer	42,770505986758 35	9,353677902198964	362	Magdeleine&Ottaviani2000	
Grotte de la Coscia (Rogliano, Macinaggio)	cave	Corsica	NE (N Cap Corse)	about 60 ka BP or 50-44 ka BP (Upper Pleistocene, ancient Würm)	Middle Palaeolithic	U-Th and ESR	N/A	several levels	municipalities .shp layer + map Bonifay et al.1998	42,963929284402973	9,429987046374915	94	Bonifay et al.1998	
Longone (Bonifacio) *	open air?	Corsica	S	N/A	N/A	N/A	N/A	N/A	map Lugliè et al.2017	41,410584875590231	9,147882877931712	93		

Monte Leone (Bonifacio) *	shelter	Corsica	S	2nd half of 8th millennium BCE (7500-7000) - layers 5-12: 8225 ± 80 BP (cal. BCE: 7425-7043) | t.p.q. layer 2a US 22 sup: 8050 ± 60 BP	Mesolithic / Pre-Neolithic	C14 on bone	Undifferentiated Epipalaeolithic / Mésolithique insulaire	All	municipalities .shp layer + map Costa et al.2003	41,403939724332503	9,223992794922880	25	Vigne & De Lanfranchi 2012 | De Lanfranchi 1998 | Fenu et al.1999-2000 (dating table)	With Punta di Caniscione, it's the biggest Corsican Mesolithic archaeological site. The lithic industry was exclusively made from local rocks, from quartz pebbles or grained or micro-grained rocks. No microlithic tools, probably because of the raw material poor quality. NO OBSIDIAN NOR CHERT, over a total of 1194 artefacts. Possible use of wood implements, as suggested by anthracological proxies (high percentage of Celtis tree, probably hackberry).
Punta di Caniscione (Monacia - d'Aullène)	open air, grave	Corsica	S	approx 8400 BCE	Lower Mesolithic	AMS on wood charcoal	N/A	N/A	Google Maps	41,474875282167645	8,983559869898819	8	Pasquet & Demouche2012 | Le Bourdonnec et al.2014 | De Palmas 2013	Site placed on a promontory 1.5 km far from the nearest shoreline at the time of the occupation.
Strette (A Petra - Barbaggio) *	small shelter	Corsica	1 km NE coast	layer XXIV: 9140 ± 300 uncal BP (Weiss 2000)	Mesolithic	C14 on wood charcoal	Undifferentiated Epipalaeolithic / Mésolithique insulaire	layers XXIV and XXII	map + Google Maps. APPROX	42,6931666999999	9,330972200000000	20 / *44 QGIS*	Costa et al.2002 | De Lanfranchi 1998 | Weiss2000 | Fenu et al.1999-2000 (dating table)	Only local lithic raw material, most of it obtained from pebbles, collected in rivers or beaches: quartz, rhyolites, serpentinites and various other rocks. NO

														OBSIDIAN NOR CHERT.
Torre d'Aquila (Pietracorbara) *	small shelter, grave	Corsica	150 m NE coast (E Cap Corse)	level 8: 7840 ± 310 BP (Fenu et al.2002) | level 9: 6920 ± 300 BP (Weiss 2000). Small sample, too high standard deviation.	Mesolithic / Late Pre-Neolithic	C14 on charcoal	Undifferentiated Epipalaeolithic / Mésolithique insulaire	shelter 2, levels 8 and 9	municipalities .shp layer + map Costa et al.2003	42,84070102063 6992	9,452981611808 511	50 / *43 QGIS*	De Lanfranchi 1998 | Magdeleine&Ottaviani2000 | Magdeleine&Ottaviani2012 | Magdeleine1995 | Fenu et al.1999-2000 (dating table) | Fenu et al.2002	The dating has been questioned since it would be contemporary with some Neolithic sites. There's no breach between Torre d'Aquila's couche 6 (Early Neolithic) and couche 8 (Pre-Neolithic): evidence of no breach between the two cultural groups too?
Codrovulos-Pantallinu (Perfugas, SS)	N/A	Sardinia	N (Anglona)	N/A	Lower Palaeolithic?	chronotypological attribution	Clactonian	surface find	APPROXIMATE (Perfugas coord)	40,829338163629400	8,884421087942280	N/A	Martini2017	
Corbeddu (Oliena) * M	cave	Sardinia	C/E	11.040 ± 130 BP - 7.860 ± 130 BP	Mesolithic / Pre-Neolithic	AMS on bone collagen and charcoal (Robert J. Van de Graaff Laboratory of the Rijks-universiteit Utrecht)	Pre-Neolithic	hall 2 layer 2 and hall 1 boundary of levels C-B	Google Maps	40,253935014595700	9,485377728573630	160 / *200 QGIS*	Tykot1995 | Lugliè2009 | Hofmeijer & Sondaar1992 | Martini1992	Disputed. In H2 L2 some disarticulated human bones (a right temporal bone, a left maxilla and part of an ulna) are associated with butchered and burned bones of Prolagus, the presence of charcoals and very few limestone and chert artifacts. There is no sufficient lithic material for an

														exhaustive definition. Human bones have not been directly dated. Human fossils have also been found in H1 LB but the deposit is disturbed (mixture of Pre-Neolithic, Neolithic and Bronze Age material) and the absence of collagen on the bones makes it impossible to radiocarbon date them.
Corbeddu (Oliena) * UP	cave	Sardinia	C/E	13.620 ± 180 BP - 11.980 ± 140 BP	Upper Palaeolithic / Pre-Neolithic	AMS on bone collagen and charcoal (Robert J. Van de Graaff Laboratory of the Rijks-universiteit Utrecht)	Pre-Neolithic / Epigravettian?	hall 2 layer 3 and hall 1 levels C-D-E	Google Maps	40,2539350145957 00	9,4853777285736 30	160 / *200 QGIS*	Skeates2012 | Fenu et al. 1999-2000 | Hofmeijer & Sondaar1992 | Martini1992	Disputed. Accumulation of Megaloceros fossils (preferential selection and evidence of butchering?) in H2 L3 with only one possible stone artifact is associated with H1 LC-D-E several limestone and chert artifacts. Hypothesis of human presence in Corbeddu Cave from about 14.000 BP.
Giuanne Malteddu (SS)	N/A	Sardinia	N	N/A	Pre-Neolithic	N/A	Late Clactonian	N/A	APPROXIMATE (Sassari coord)	40,7250552537234 00	8,5590793850042 70	N/A	Martini1992	

Interiscias (SS)	N/A	Sardinia	N	N/A	Pre-Neolithic	N/A	Late Clactonian	N/A	APPROXIMATE (Sassari coord)	40,72505525372 3400	8,559079385004 270	N/A	Martini1992	
Ottana-A (NU)	N/A	Sardinia	Centre	N/A	Lower Palaeolithic?	chronotypological attribution	N/A	surface find	APPROXIMATE (Ottana coord)	40,23415000418 6500	9,043478682009 750	N/A	Martini2017	
Porto Leccio (Trinità d'Agultu)	tafone (small shelter)	Sardinia	10 m approx N coast	10.000-7700 BP (uncal)	Mesolithic	N/A	Undifferentiated Epipalaeolithic	N/A	map Lugliè2017	41,03348146623 9763	8,917428886069 761	0	Tozzi2012 | Martini2017 | Skeates2012 | Lugliè2009a	
Preideru (Anglona)	N/A	Sardinia	N (Anglona)	N/A	Lower Palaeolithic?	chronotypological attribution	Flakes without bifaces	surface find	APPROXIMATE (Perfugas coord)	40,82933816362 9400	8,884421087942 280	N/A	Martini2017	
Riu Altana (Anglona)	open air (river bed)	Sardinia	N (Anglona)	N/A	Lower Palaeolithic?	chronotypological attribution	Early Clactonian	surface find	APPROXIMATE (Perfugas coord)	40,82933816362 9400	8,884421087942 280	N/A	Martini2017 | Martini1992	
Sa Coa de sa Multa (Laerru, SS) 1	open air	Sardinia	N (Anglona)	no absolute date. Early Middle Pleistocene/Interglacial Mindel-Riss	Lower Palaeolithic?	Pedological study of the profile + Chronotypological attributions	Early Clactonian	layer B, levels α, β, γ (paleosurfaces)	map Lugliè2017	40,85864889006 9800	8,838307366386 920	210	Martini2017, Romagnoli2012	
Sa Coa de sa Multa (Laerru, SS) 2	open air	Sardinia	N (Anglona)	no absolute date. Holocene	Mesolithic?	Pedological study of the profile + Chronotypological attributions	N/A	layer A	map Lugliè2017	40,85864889006 9800	8,838307366386 920	210	Martini2017	

Sa Pedrosa-Pantallinu (Perfugas, SS)	open air	Sardinia	N (Anglona)	no absolute date. (Late) Middle Pleistocene/Riss (OIS 6)	Lower Palaeolithic?	Pedological study of the profile + Chronotypological attributions	Late Clactonian	layer B	APPROXIMATE (Perfugas coord)	40,8293381636294 00	8,8844210879 42280	N/A	Martini2017, Aureli2012, Martini1992	
Santa Maria Is Acquas (Sardara)	open air	Sardinia	SW (central Campidano)	no absolute date. Final OIS 3 and/or early OIS 2 (Late Upper Pleistocene)	Upper Palaeolithic	Micromorphological and pedological analysis, chronotypological attributions	Upper Palaeolithic	section A, units A1 and A2; section B	map Mussi& Melis1999	39,6321295148806 00	8,7617360277 27590	82	Mussi & Melis1999, Melis & Mussi2002	
S'Omu e s'Orku (Arbus)	collapsed shelter, grave	Sardinia	SW seashore	8500 cal BP	Mesolithic	C14 dates on human bones and charcoal + sedimentological analysis	0	whole sequence : levels f, e, d (SOMK1, 2 and 3: burials) - direct dating SOMK2: 8600-8400 cal BP - (t.a.q. SOMK2: 8150-7800 cal BP) - t.p.q. sequence (level f): 8950-8550 cal BP	map Lugliè2017	39,5742500476409 23	8,4619986230 47316	1 approx / *56 QGIS*	Melis & Mussi2016	The site is now just on the seashore, while in the Early Holocene the sea level was lower and the coastline at a distance of a few kms. There is scarcely any evidence of the use of the site for non-funerary purposes. Little is known about non-funerary activities related to the burials. A site or sites related to domestic activities probably existed in the vicinity, but haven't been spotted yet.

Su Carroppu (Sirri)	shelter, grave	Sardinia	SW	IX millennium BCE	Mesolithic	N/A	N/A	N/A	Google Maps	39,207257326886600	8,561747996309900	350 / *293 QGIS*	Lugliè2017	
Su Coloru (Laerru, SS) * L	cave	Sardinia	N	L1 horizon: 7400 ± 40 BP (2σ cal. BCE: 6380-6210; cal. BP: 8330-8160) - L2 horizon: 7740 ± 50 BP (2σ cal. BC: 6660-6420; cal. BP: 8610-8410) - L3 horizon: 7920 ± 50 BP (2σ cal BC: 7040-6660; cal BP: 8990-8610)	Mesolithic	AMS on carbon (performed by Beta Analytic Inc. Lab of Miami)	Undifferentiated Epipalaeolithic	layer L (horizons L, L1, L2, L3)	Google Maps	40,815883325318500	8,812020603013000	340 / *333 QGIS*	Fenu et al. 2002 | Lugliè2017 | Fenu et al.1999-2000 | Martini, Fenu et al.2012	

Appendix 1. Pre-Neolithic archaeological sites in Corsica and Sardinia.

SITE	TOTAL ITEMS IN ASSEMBLAGE
Campu Stefanu (Sollacaro-Lévie) *	N/A (6 obsidians; 3 chert, 1 indet and 2 from Perfugas)
Cave of Castiglione 3 (Oletta)	1 (obsidian)
Corbeddu (Oliena) * UP	N/A (silicified limestone, chert, quartz, goethite)
Porto Leccio (Trinità d'Agultu)	N/A (quartz, rock crystal, slate, rhyolite, 7,4/27/38% chert, obsidian)
Punta di Caniscione (Monacia - d'Aullène)	6905 (local -within a 6km radius- rhyolitic pebbles, hyaline quartz, few chert tools)
Sa Coa de sa Multa (Laerru, SS) 1	N/A (well silicified local breccias, brecciolas, limestones, dolomites)
Sa Pedrosa-Pantallinu (Perfugas, SS)	N/A (siliceous material)

SITE	TOTAL ITEMS IN ASSEMBLAGE
Santa Maria Is Acquas (Sardara)	>70 (almost solely chert, also chalcedony and rarely obsidian pebbles, scattered across the paleo landscape)
S'Omu e s'Orku (Arbus)	N/A (some chert and obsidian implements + ochre fragments, pencils and ochre-stained marine shells)
Su Coloru (Laerru, SS) * L	71 (mostly local chert, occasionally quartz)
Torre d'Aquila (Pietracorbara) *	N/A (mainly local quartz 30,8%, gabbro, serpentinite, rhyolite, grès + 2 small flakes of white chert + 2 small flakes of obsidian)

Appendix 2. Lithic raw materials from PN sites with obsidian and chert in Corsica and Sardinia. Part 1/3

SITE	OBSIDIAN	% IN ASSEMBLAGE	N° IN ASSEMBLAGE	N° ITEMS ANALYSED	ANALYSES	SOURCE	OUTCROP/SUBSOURCE	TECHNOLOGY	TYPOLOGY
Campu Stefanu (Sollacaro-Lévie) *	Yes	N/A	6	N/A	N/A	N/A	N/A	N/A	Laminar industry for 5 pieces, 2 retouched.
Cave of Castiglione 3 (Oletta)	Yes	100%	1	1	visual characterisation; PIXE	Palmarola	0	Pressure flaking or indirect flaking with a punch (absence of talon).	Fragment of bladelet (26,4x15,6x2,8 mm) with retouches on the distal end.
Corbeddu (Oliena) * UP	No	0	0	0	0	0	0	0	0
Porto Leccio (Trinità d'Agultu)	Yes	N/A	1 (perforating tool)	N/A	N/A	N/A	N/A	Non-predetermined knapping	Perforating tool
Punta di Caniscione (Monacia - d'Aullène)	No	0	0	0	0	0	0	0	0
Sa Coa de sa Multa	No	0	0	0	0	0	0	0	0

SITE	OBSIDIAN	% IN ASSEMBLAGE	N° IN ASSEMBLAGE	N° ITEMS ANALYSED	ANALYSES	SOURCE	OUTCROP/SUBSOURCE	TECHNOLOGY	TYPOLOGY
(Laerru, SS) 1									
Sa Pedrosa-Pantallinu (Perfugas, SS)	No	0	0	0	0	0	0	0	0
Santa Maria Is Acquas (Sardara)	Yes	N/A	N/A	70 obsidian + chert	N/A	N/A	N/A	N/A	N/A
S'Omu e s'Orku (Arbus)	Yes	N/A	4	N/A	N/A	N/A	N/A	N/A	Débitage elements (flakes, bladelets, fragments of core)
Su Coloru (Laerru, SS) * L	No	0	0	0	0	0	0	0	0
Torre d'Aquila (Pietracorbara) *	Yes	N/A	2	N/A	N/A	N/A	N/A	Rudimentary flaking, almost no retouching. Most of the flakes have been obtained from pebbles (collected locally) and some maintain their cortical part.	The toolset doesn't include proper "blades", but only points, scrapers and side-scrapers. Great abundance of pebbles (62.2% of the total), mostly small.

Appendix 3. Lithic raw materials from PN sites with obsidian and chert in Corsica and Sardinia. Part 2/3

SITE	CHERT	% IN ASSEMBLAGE	N° IN ASSEMBLAGE	N° ITEMS ANALYSED	ANALYSES	SOURCE	TECHNOLOGY	TYPOLOGY	NOTES
Campu Stefanu (Sollacaro-Lévie) *	Yes	N/A	3	N/A	Visual characterisation?	1 indet. and 2 from Perfugas basin (Sardinia)	Evidence of heat alteration	Geometric bitruncation, flake, blade	Preliminary study.

SITE	CHERT	% IN ASSEMBLAGE	N° IN ASSEMBLAGE	N° ITEMS ANALYSED	ANALYSES	SOURCE	TECHNOLOGY	TYPOLOGY	NOTES
Cave of Castiglione 3 (Oletta)	No	0	0	0	0	0	0	0	The proposed age of deposition of this item is around the end of the 7th millennium, based on 14C dating (Salotti et al., 2000), but, as this is a cave-fill site, this date should be treated with caution. (Le Bourdonnec et al.2014b).
Corbeddu (Oliena) * UP	Yes	N/A	N/A	N/A	N/A	N/A	Very elementary and undifferentiated technology with little organized flaking.	Almost solely scrapers and splintered pieces.	
Porto Leccio (Trinità d'Agultu)	Yes	7,4 / 27 / 38%	39	N/A	Visual characterisation?	30 hydrothermal origin (Local?) + 6 from Perfugas + 3 indet	Non-predetermined knapping	Low standardization and typological definition. Presence of blades and few retouched tools (short scrapers and denticulated). Prominent role of small, exceptionally microlithic, rarely laminar supports.	A fragment of coarse pottery was also found at the site.
Punta di Caniscione (Monacia - d'Aullène)	Yes	N/A	N/A («a few» (Le Bourdonnec et al.2014))	N/A	Visual characterisation?	Allochthonous: Perfugas basin (Sardinia)	The lack of chert debris indicates that the knapping has taken place elsewhere.	Flakes	The few chert fragments from the Perfugas basin testify to a punctual relationship with Sardinia: navigation in the Mouths of Bonifacio is therefore older than previously thought. Knapping of non-siliceous lithotypes: opportunist knapping to obtain
Sa Coa de sa Multa (Laerru, SS) 1	Yes	N/A	N/A	2280	Visual characterisation?	Local?	Characterized by a low degree of predetermination and simple operational chains. The aim is to obtain cutting edges. Production ascribable to an SSDA system, i.e. with alternating débitage surfaces (*sensu* Forestier1993) with a secondary branch of "Ko	Flakes without bifacial tools. High occurrence of denticulates and short scrapers. Size typically between 20-60 mm; some large between 80-200 mm.	Attention! The term "chert" in this case comprises what are actually several coarse-grained lithotypes, well-silicified but not very homogeneous in terms of quality and unsuitable for knapping due to the presence of internal fractures and i

SITE	CHERT	% IN ASSEMBLAGE	N° IN ASSEMBLAGE	N° ITEMS ANALYSED	ANALYSES	SOURCE	TECHNOLOGY	TYPOLOGY	NOTES
Sa Pedrosa-Pantallinu (Perfugas, SS)	Yes	N/A	N/A	1459	Visual characterisation?	Local?	Two distinct types of débitage: SSDA and laminar.	Flakes without bifacial tools. Presence of standardized laminar tools (blades, bladelets…).	Probable use of the site both as a "mine" for the supply of chert, available on site in the form of chert beds, and as specialised workshop for the processing of the raw material (Martini2017).
Santa Maria Is Acquas (Sardara)	Yes	N/A	N/A	70 obsidian + chert	Visual characterisation?	Local: Sedda su Cardu?	Bipolar technique associated with direct percussion on big flakes or pebbles. Evidence of resharpening and retouching.	Flakes, blades and bladelets. Some retouched elements (endscrapers, truncated blade, perforator, retouched blades and flakes, denticulate flakes, notched flake)	Quite bad quality chert, with internal fracture planes. It is suggested that the sources are local outcrops at a distance of about 4 km and/or pebbles carried by floods. Obsidian is rarely found in A1 flood deposit, in the form of pebbles, but it is
S'Omu e s'Orku (Arbus)	Yes	N/A	2	N/A	N/A	N/A	N/A	Débitage elements (flakes, bladelets, fragments of core)	Not specified which layers chert/obsidian implements come from. In the burial layers there's limited evidence of use of the shelter for purposes other than funerary. Uncontrolled excavations had been led on site, thus the goods possibly reflect only
Su Coloru (Laerru, SS) * L	Yes	N/A	N/A	N/A	Visual characterisation?	Local	The raw material (chert) is of local origin: blocks, some of cryoclastic origin. Non-predetermined knapping aimed at extracting flakes, on almost exclusively asymmetrical supports. Presence of retouching.	Undifferentiated typology. Clear prevalence of small and microlithic artifacts on flake, flat and very flat. Few micro-blades and laminar micro-flakes obtained with bipolar technique.	Outcrops of this same type of chert are also known in the nearby territory of Perfugas in relation to Lower Palaeolithic industries. Its characteristics are very similar to those of chert used for the Mesolithic site of Sa Coa de Sa
Torre d'Aquila (Pietracorbara) *	Yes	N/A	2	N/A	N/A	N/A	N/A	N/A	The chronological position of chert and obsidian implements is contemporary to Early Neolithic (Weiss2000).

Appendix 4. Lithic raw materials from PN sites with obsidian and chert in Corsica and Sardinia. Part 3/3

SITE	TYPE OF SITE	REGION	AREA	AGE	CULTURE	DATING METHODS	FACIES (ceramic)	ARCH LEVEL	COORDINATES REF	X	Y	H_ASL	REFERENCE	NOTES
A Guaita (Morsiglia)	open air	Corsica	N (NW Cap Corse)	2nd half of 6th - 1st half of 5th millennium BC	Final Early Neolithic	Chronocultural stratigraphy based on techno-typological attributions. C14 was not possible due to post-depositional disturbance caused by roots.	Cardial Ware mixed with Linear Ware (*ceramica a linee incise*)	lower terrace layer 3	Google Maps	42,944479462966400	9,3675199027044480	107 / *216 QGIS*	Lorenzi2012 | Le Bourdonnec et al.2014b	Access to the site is impossible from the south due to a rocky cliff.
A Petra (Barbaggio)	open air, now on seashore	Corsica	N (Île-Rousse)	6430 ± 80 cal BP (2nd half VI millennium)	Early Neolithic	N/A	Tyrrhenian Cardial and Epicardial	all layers: IId, IIc (Cardial), IIb, IIa (Epicardial)	Google Maps + photo	42,6440556000000000	8,9358611000000000	18	Weiss2012 | Grifoni et al.2000 | Weiss 2000b	During the Vth millennium the islands were linked and formed a peninsular probably used as a natural harbour.
A Revellata I	open air, now on seashore	Corsica	NW	6280 ± 75 BP	Early Neolithic	N/A	N/A	layer III survey 1	map Ugliè2017 + municipalities .shp layer	42,5834974807091 00	8,725376999458190	59	Grifoni et al.2000 | Costa2006	Shelter well protected from winds, near seashore. Presence of domestic structures (light huts).
Araguina-Sennola (Bonifacio) *	shelter, grave	Corsica	S	4700 ± 140 BCE	Early Neolithic	N/A	Tyrrhenian Cardial Ware and poinçonnée	layer XVII	map Luglié2017 + municipalities .shp layer	41,388587390851300	9,193189999999990	69	De Lanfranchi et al.1971 | Radi & Bovenzi2007 | Fenu et al.2002 | Weiss2000 | De Lanfranchi et Weiss1997	

SITE	TYPE OF SITE	REGION	AREA	AGE	CULTURE	DATING METHODS	FACIES (ceramic)	ARCH LEVEL	COORDINATES REF	X	Y	H_ASL	REFERENCE	NOTES
Basi 6 (Serra di Ferro)	open air	Corsica	12 km SW coast	VI-IV millennia BCE (Tykot 1996)	(EN III) Early Neolithic	N/A	Cardial Ware	level 6	map Lugliè2017 + municipalities .shp layer	41,749849408402400	8,826883744756640	220 / *103 QGIS*	Radi & Bovenzi2007 | Tykot1996 | Bailloud1969	From Basi one can see Filitosa.
Basi 7 (Serra di Ferro)	open air	Corsica	12 km SW coast	7700 ± 150 BP (De Lanfranchi et Weiss 1997; Manen et Sabatier 2003), cal BCE 7030-6250 (Bailloud 1971; Cesari et al. 2011) or cal BCE 7002-6187 (De Lanfranchi 2000). Dating questioned (see Fenu et al.2002)	(very high) Early Neolithic	N/A	Cardial Ware / Archaic Impressed Ware	level 7	map Lugliè2017 + municipalities .shp layer	41,749849408402400	8,826883744756640	220 / *103 QGIS*	Bailloud1969 | Radi & Bovenzi2007 | Costa et al.2000 | Tykot1996 | + other references for the dating	From Basi one can see Filitosa. Level 7 has returned one of the highest date for a Neolithic site with ceramics in Europe. Several authors believe the date is too high to be Early Neolithic (inconsistent with other dates from the same cultural period).
Bufua III	N/A	Corsica	S	N/A	Early Neolithic	N/A	N/A	N/A	map Lugliè2017 + municipalities .shp layer	41,476918151530400	9,089495591817200	26	Bressy et al.2008	
Campu Stefanu (Sollacaro-Lévie) * (1)	shelter	Corsica	SW (near Taravo river crossing)	N/A	Early / Medium Neolithic	Chronocultural stratigraphy based on techno-typological attributions. Stratigraphic evidence US 105: subsequent to US 108(a).	mixed (Tyrrhenian Cardial Ware Pienza-Basi-Filiestru; basien; poinçonnée)	US 105, abri 1. Post-depositional disturbance	map Lugliè2017 + municipalities .shp layer	41,741951575154800	8,861071727844750	91 / *61 QGIS*	Cesari et al. 2011	Disturbed level
Campu Stefanu (Sollacaro-Lévie) * (2)	shelter	Corsica	SW (near Taravo river	N/A	(very high) Early Neolithic	Chronocultural stratigraphy based on techno-	Archaic Impressed Ware	US 108(a), abri 1	map Lugliè2017 + municipali	41,741951575154800	8,861071727844750	91 / *61 QGIS*	Cesari et al. 2011 | Lugliè2017	The presence of Impressed Cardial Ware in this US is an indicator of Early

SITE	TYPE OF SITE	REGION	AREA	AGE	CULTURE	DATING METHODS	FACIES (ceramic)	ARCH LEVEL	COORDINATES REF	X	Y	H_ASL	REFERENCE	NOTES
			crossing)			typological attributions. Stratigraphic evidence US 108(a): subsequent to US 108(b) which is subsequent to US 114 (Late Mesolithic)			ties .shp layer					Neolithisation, even though it has to be considered a preliminary proposal and no absolute dating is available.
Carcu	open air, in a pass	Corsica	NW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017 + municipalities .shp layer	42,572535780603000	8,842159308991000	371	Lugliè et al.2017 (mention)	
Casabianda I e II	open air on hill	Corsica	E	6670 ± 130 BP uncal (5784-5283 cal BCE) (Fenu et al.2002)	Early Neolithic	N/A	Impressed Ware	N/A	map Lugliè2017 + municipalities .shp layer	42,093984343331300	9,502567961173490	48	Fenu et al.2002 | Tozzi & Weiss 2000	The oldest attested Impressed Ware in Corsica
Curacchiaghju (Lévie) *	shelter	Corsica	C/S	layer 6c: 7600 ± 150 BP (cal BCE 6994-6038)| layer 6a: 7310 ± 170 BP (cal BCE 6456-5779) | layer 6: 7300 ± 160 BP (cal BCE 6426-5805) (Weiss 2000) (De Lanfranchi 2000). Dating questioned	(very high) montane Early Neolithic	N/A	Céramique poinçonnée	layers 6c, 6a and 6	approx. map Costa et al.2003 APPROX	41,610087970060800	9,126961920336070	700-800 / *991 QGIS*	Radi & Bovenzi2007 | De Lanfranchi 2000 | Tykot1996	Several authors believe the date is too high to be Early Neolithic (inconsistent with other dates from the same cultural period)
Filitosa-Sollacaro	open air	Corsica	SW	N/A	N/A	N/A	Cardial Ware and poinçonnée	abri 1	Google Maps + figure	41,747051700000000	8,871719199999990	60 / *63 QGIS*	Lugliè2018 | Grosjean1961	Preliminary study. The chronological period is not precisely stated but it's referred to as the

SITE	TYPE OF SITE	REGION	AREA	AGE	CULTURE	DATING METHODS	FACIES (ceramic)	ARCH LEVEL	COORDINATES REF	X	Y	H_ASL	REFERENCE	NOTES
														"earliest occupation" of the shelter. From Filitosa one can see Basi.
Gritulu (Luri) *	small cave	Corsica	N (E Cap Corse)	N/A	Early Neolithic	N/A	N/A	N/A	municipalities .shp layer + map Costa et al.2003 APPROX	42,90906215478 9800	9,419987912630 760	177	Lugliè et al.2017 (mention)	
Grotta di Vizzavona	mountain shelter	Corsica	C	N/A	N/A	N/A	N/A	N/A	Google Maps APPROX	42,12813890000 0000	9,133527800000 000	920 / *910 QGIS*	Lugliè et al.2017 (mention)	
Grotta Scritta de Saint Florent (Poggio d'Oletta) *	cave	Corsica	NE	ca. 7800-7000 BP	N/A	N/A	N/A	N/A	caves .shp layer	42,77705059867 5800	9,353677902198 960	362	Revelles et al.2019	
Grotta Southwell	mountain cave	Corsica	C/N	N/A	N/A	N/A	N/A	N/A	caves .shp layer	42,13702808438 5800	9,137244084160 660	879	Lugliè et al.2017 (mention)	
Longone I (Bonifacio) *	open air?	Corsica	S	6320 ± 140 BP (5546-4944 cal BCE)	Early Neolithic	N/A	Epicardial	layer 4a2	map Lugliè2017 + municipalities .shp layer	41,41058487559 0200	9,147882877931 710	93	Weiss2000| De Lanfranchi et Weiss1997 | Tykot1996 | Bressy et al.2008 | Revelles et al.2019	
Longone III and IV (Bonifacio) *	N/A	Corsica	S	N/A	Early Neolithic	N/A	Poinçonnée	N/A	map Lugliè2017 + municipalities .shp layer	41,41058487559 0200	9,147882877931 710	93	Lugliè et al.2017 (mention)	

SITE	TYPE OF SITE	REGION	AREA	AGE	CULTURE	DATING METHODS	FACIES (ceramic)	ARCH LEVEL	COORDINATES REF	X	Y	H_ASL	REFERENCE	NOTES
Lumaca (Centuri)	open air, in a pass	Corsica	NE (NE Cap Corse)	N/A	Early Neolithic	N/A	Cardial Ware	lower terrace	map Lugliè2017 + municipalities .shp layer	42,9614954151466 00	9,3792312509037 60	450 / *363 QGIS*	Lorenzi2012 | Lorenzi 2000 | De Francesco et al.2012	
Monte Leone (Bonifacio) *	shelter	Corsica	S	N/A	N/A	N/A	N/A	N/A	municipalities .shp layer + map Costa et al.2003	41,4039397243325 00	9,2239927949228 80	25	Lugliè et al.2017 (mention)	
Monte Ortu	open air on terrace	Corsica	NW	N/A	N/A	N/A	N/A	N/A	mounts .shp layer	42,5815513350493 00	8,8192912924685 10	200	Grifoni et al.2000	High presence of local rhyolite in the lithic complex.
Porte Vecchie (Corsu)	open air on terrace	Corsica	NW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017 + municipalities .shp layer	42,5720922136418 00	8,8388235709631 00	235	Grifoni et al.2000	High presence of local rhyolite in the lithic complex.
Renaghju (Sartène)	open air	Corsica	SW	2nd half of 6th millennium BC (5700-5400 BP cal)	Early Neolithic	C14 on charcoal	Thyrrhenian Cardial geometric Ware (Filiestru-Basi-Pienza style)?	layer 1 (occupation phase 1)	Google Maps	41,5272250000000 000	8,9231292000000 00	109 / *110 QGIS*	Le Bourdonnec at al.2014 | D'Anna et al.2012 | Bressy et al.2008	
Riparo Albertini	mountain shelter	Corsica	C/N	N/A	Early Neolithic	N/A	N/A	tot excavation covered by 1973 and 1974 campaigns	caves .shp layer	42,3546616370533 00	9,0143265383871 80	950	Grifoni et al.2000	
Strapazzola	N/A	Corsica	N/A	N/A	N/A	N/A	Cardial Ware and	N/A	map Lugliè2017 +	41,6542837	9,32680362	44	Lugliè et al.2017 (mention)	

SITE	TYPE OF SITE	REGION	AREA	AGE	CULTURE	DATING METHODS	FACIES (ceramic)	ARCH LEVEL	COORDINATES REF	X	Y	H_ASL	REFERENCE	NOTES
							poinçonné e		municipalities .shp layer	30355300	5199290			
Strette XIV and XX (A Petra - Barbaggio) *	small shelter	Corsica	NE	range 5600-5000 cal BCE | layer XXb: 6480 ± 480 BP | 6420 ± 300 BP (very high standard deviation)	Early Neolithic	C14 on wood charcoal and chrono typology of ceramics	Cardial Ware (and poinçonné e?)	layer XIV	map + Google Maps. APPROX	42,69316669999900	9,33097220000000	20 / *44 QGIS*	Costa et al.2000 | Tykot2002 | Costa et al.2002	The distance from the coast was the same in the EN as it is now. From autumn to spring the nearby River Strette swells and regularly floods the site. However, it is likely that the position of the river has changed over time and that the site was not as prone to flooding in the Early Neolithic period.
Strette XX (A Petra - Barbaggio) *	small shelter	Corsica	NE	layer XXb: 6480 ± 480 BP | 6420 ± 300 BP (very high standard deviation)	Early Neolithic	C14 on wood charcoal	Cardial Ware and poinçonné e?)	layer XX	map + Google Maps. APPROX	42,69316669999900	9,33097220000000	20 / *44 QGIS*	Costa et al.2000 | Tykot2002	The distance from the coast was the same in the EN as it is now. From autumn to spring the nearby River Strette swells and regularly floods the site. However, it is likely that the position of the river has changed over time and that the site was not as prone to flooding in the Early Neolithic period.
Terrina I	open air on hill	Corsica	E	N/A	N/A	N/A	N/A	N/A	map Lugliè2017 + municipalities .shp layer	42,099233015351900	9,500002637841070	6	Lugliè et al.2017 (mention)	

SITE	TYPE OF SITE	REGION	AREA	AGE	CULTURE	DATING METHODS	FACIES (ceramic)	ARCH LEVEL	COORDINATES REF	X	Y	H_ASL	REFERENCE	NOTES
Torre d'Aquila (Pietracorbara) *	shelter	Corsica	NE (E Cap Corse)	N/A	Early Neolithic	Chronocultural stratigraphy based on techno-typological attributions (pottery).	Céramique poinçonnée	shelter 2, level 6	municipalities .shp layer + map Costa et al.2003	42,84070102063 6900	9,452981611808 510	50 / *43 QGIS*	Costa et al.2000 | Magdaleine 1995 | Tykot2002	
U Grecu	N/A	Corsica	S	N/A	Early Neolithic	N/A	N/A	N/A	map Lugliè2017 + municipalities .shp layer	41,55529916571 1000	8,935498735301 060	304	Bressy et al.2008	
Acqua Sa Canna (Gonnesa)	open air on highland, now on seashore	Sardinia	SW	N/A	Early Neolithic	N/A	Cardial Ware	N/A	map Lugliè2017	39.28434973751 9400	8.434667396862 160	0	Alba&Canino 2004	
Bau Angius (Terralba)	open air	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.68779769602 2500	8.632042657358 580	14	Lugliè et al.2017 (mention)	
Bucca Colorus	N/A	Sardinia	N/A	N/A	N/A	N/A	N/A	N/A	municipalities .shp layer	39.68269237541 3500	8.645921817937 720	13	Dini2007	Site of first obsidian processing.
C.I.S. (Cagliari)	open air	Sardinia	S	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.22087575998 7300	9.127268645677 800	16	Lugliè et al.2017 (mention)	
Cala Corsara (Spargi, La Maddalena)	tafone (shelter), now on seashore	Sardinia	NE	N/A	Early Neolithic	N/A	Tyrrhenian Cardial Ware I / Archaic Impressed Ware (Cesari et al.2011)	N/A (bottom sequence)	map Lugliè2017	41.23122272949 8400	9.342580602536 480	7	Skeates2012 | Depalmas1995 | Ferrarese Ceruti e Pitzalis 1987	

SITE	TYPE OF SITE	REGION	AREA	AGE	CULTURE	DATING METHODS	FACIES (ceramic)	ARCH LEVEL	COORDINATES REF	X	Y	H_ASL	REFERENCE	NOTES
Cala di Trana (Palau)	N/A	Sardinia	NE	N/A	Early Neolithic	N/A	Tyrrhenian Cardial Ware I	N/A	map Lugliè2017	41.202851506935800	9.352343746801610	1	Depalmas1995	
Cala di Villamarina (Santo Stefano, La Maddalena)	shelter	Sardinia	NE	N/A	Early Neolithic	N/A	Impressed (Cardial?) Ware	N/A	map Lugliè2017	41.194222199999900	9.407638900000000	3	Alba1976	
Calancoi (SS)	open air	Sardinia	NW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	40.763522144832800	8.626750460564200	330	Lugliè et al.2017 (mention)	
Campu Maggiore (Cuglieri)	open air	Sardinia	W	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	40.180408739150800	8.518205612906610	200	Lugliè et al.2017 (mention)	
Campu Scià Main (Calasetta)	open air	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.066160431891700	8.407463842723060	80	Lugliè et al.2017 (mention)	
Cirixì (Santadi)	cave?	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.046372845936300	8.798219297152690	422	Lugliè et al.2017 (mention)	
Coddu Is Abionis (Terralba)	open air	Sardinia	SW	N/A	Early Neolithic	N/A	Tyrrhenian Cardial Ware? no pottery	surface find	map Lugliè2017	39.695025320795700	8.592158679590640	13 / *6 QGIS*	Lugliè2000 | Lugliè et al.2007	
Colle del Buoncammino (Iglesias)	open air	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.313625298607800	8.520852649549790	310	Lugliè et al.2017 (mention)	
Colle Q. 202 (Iglesias)	open air	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.319072569359100	8.590856483336950	165	Lugliè et al.2017 (mention)	
Concas (Perfugas)	open air	Sardinia	N	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	40.841570858437300	8.888106732806890	94	Lugliè et al.2017 (mention)	

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Corbeddu (Oliena) *	cave	Sardinia	E	6690 ± 80 BP uncal (5730-5429 cal BCE) (Fenu et al.2002 from Hofmeijer & Sondaar1992) - 6.490 ± 90 BP (base level 1)	Early Neolithic	N/A	Cardial Ware	hall 2 layer 1b / lower part of layer 1a	caves .shp layer	40.25393501459570 0	9.485377728573630	200	Lugliè2009 | Fenu et al.2002 | Skeates 2012	Contains remains of hearths and wild animals, indicative of the maintenance of a mainly hunting and gathering economy focused on locally available species; but also of seashell, obsidian artefacts and Cardial Impressed Ware, reflecting new practices and long distance connections.
Corongiu de Mari (Iglesias)	open air	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.31482898429990 0	8.568801260148040	161	Lugliè et al.2017 (mention)	
Cortoghiana (Carbonia)	open air	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.19235978396040 0	8.488583148188810	70	Lugliè et al.2017 (mention)	
Cuccuru Ibba (Capoterra)	open air	Sardinia	S	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.18128717161710 0	9.005923326885910	5	Lugliè et al.2017 (mention)	
Donolariu (Calasetta)	open air	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.09917884439220 0	8.381670113018030	0	Lugliè et al.2017 (mention)	
Filiestru (Mara) B10, B11, D	cave	Sardinia	20 km NW coast	N/A	Early Neolithic	N/A	Cardial Ware N/A	trenches B (B10; B11 t.2 and t.3) and D (stratigraphic column)	caves .shp layer + municipalities .shp layer	40.45366221892790 0	8.652009877450860	410 / *389 QGS*	Tykot2002 | Tykot1996	

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Filiestru (Mara) B12	cave	Sardinia	20 km NW coast	2σ cal BC 5730-5491	Early Neolithic	C14	Cardial Ware I	trench B layer 12	caves .shp layer + municipalities .shp layer	40.4536622189279 00	8.6520098774508 60	410 / *389 QGS*	Lugliè et al.2007 | Trump1982	
Filiestru (Mara) B8, B9, D6	cave	Sardinia	20 km NW coast	level D6: 5200-4700 cal BCE (Skeates2012)	Final Early Neolithic	N/A	Cardial Ware III	trench B layers 8-9, trench D layer 6	caves .shp layer + municipalities .shp layer	40.4536622189279 00	8.6520098774508 60	410 / *389 QGS*	Depalmas 1995	
Filiestru (Mara) B9	cave	Sardinia	20 km NW coast	2σ 5216-4859 cal BCE || 2σ 4911-4682 cal BCE	Final Early Neolithic / Middle Neolithic ?	N/A	N/A / MN Bonu Ighinu ?	trench B layer 9 (cuts 1 and 4)	caves .shp layer + municipalities .shp layer	40.4536622189279 00	8.6520098774508 60	410 / *389 QGS*	Lugliè2009b | Lugliè et al.2007	4911-4682 cal BCE: earliest limit for the EN sequence / beginning of MN sequence
Filiestru (Mara) D6? (Filiestru)	cave	Sardinia	20 km NW coast	5200-4700 cal BCE (Skeates2012)	Final Early Neolithic	N/A	Cardial Ware III (Epicardial -Filiestru) / Cardial Ware II in lower cuts	trench D layer 6? (lugliè2009b)	caves .shp layer + municipalities .shp layer	40.4536622189279 00	8.6520098774508 60	410 / *389 QGS*	Skeates2012 | Tykot2002 | Lugliè2009b | Trump1982 | Tykot1996	
Filiestru (Mara) D7? (Cardial)	cave	Sardinia	20 km NW coast	5700-5350 cal BCE (Skeates2012) || 6710 ±75 BP (cal BCE: 5740-5480) - 6470 ±65 BP (cal BCE: 5530-5242) (Fenu et al.2002)	Early Neolithic	N/A	Cardial Ware I / Cardial Ware II in upper cuts	trench D layer 7? (lugliè2009b)	caves .shp layer + municipalities .shp layer	40.4536622189279 00	8.6520098774508 60	410 / *389 QGS*	Trump1982 | Skeates2012 | Lugliè2009b | Fenu et al.2002 | Depalmas1995	
Grotta "Sa Spilunca Manna" (Laconi)	cave	Sardinia	C/S	N/A	N/A	N/A	N/A	N/A	map Lugliè2017 + caves .shp layer	39.8569861989908 00	9.0567559025103 20	617	Lugliè et al.2017 (mention)	
Grotta Bariles (Ozieri)	cave	Sardinia	N/C	N/A	N/A	N/A	N/A	N/A	map Lugliè2017 + caves .shp layer	40.5946949322841 00	9.0295139525008 90	431	Lugliè et al.2017 (mention)	

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Grotta della Medusa (Alghero)	cave	Sardinia	NW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017 + caves .shp layer	40.5799694280477 00	8.16237101745482 0	16	Lugliè et al.2017 (mention)	
Grotta dell'Inferno (Muros)	cave	Sardinia	NW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017 + caves .shp layer	40.8346531458189 00	8.42549971989791 0	0	Lugliè et al.2017 (mention)	
Grotta Leori (Laconi)	cave	Sardinia	C/S	N/A	N/A	N/A	N/A	N/A	map Lugliè2017 + caves .shp layer	39.8567163040097 00	9.05592577261298 0	604	Lugliè et al.2017 (mention)	
Grotta Maimone (Laconi)	cave	Sardinia	C/S	N/A	N/A	N/A	N/A	N/A	map Lugliè2017 + caves .shp layer	39.8550408665231 00	9.05509441592701 0	539	Lugliè et al.2017 (mention)	
Grotta Rifugio (Oliena)	cave, grave	Sardinia	E	N/A	Early Neolithic / Middle Neolithic?	N/A	N/A	N/A	map Lugliè2017 + caves .shp layer	40.2913179551841 00	9.47706288280694 0	129	Alba1976 | Biagi & Cremaschi1980	
Grotta S'Acqua Gelara (Buggerru)	cave	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017 + caves .shp layer	39.3936446854141 00	8.41118530894031 0	188	Lugliè et al.2017 (mention)	
Grotta Sant'Elia (Cagliari)	cave	Sardinia	S	N/A	N/A	N/A	N/A	N/A	map Lugliè2017 + caves .shp layer	39.1813106214990 00	9.16004944868545 0	0	Lugliè et al.2017 (mention)	
Grotta Su Mrajani (Iglesias)	cave	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017 + caves .shp layer	39.3136440371573 00	8.51341053489364 0	292	Lugliè et al.2017 (mention)	
Grotta Ulari (Borutta)	cave	Sardinia	NW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017 + caves .shp layer	40.5214320690495 00	8.74757637780744 0	501	Lugliè et al.2017 (mention)	
Grotta Verde (Alghero)	cave, grave	Sardinia	NW (Capo Caccia)	N/A	Early Neolithic	N/A	Filiestru	N/A	map Lugliè2017 + caves .shp layer	40.5648229246760 00	8.16491948303971 0	75 / *28 QGIS*	Skeates2012	

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Guroneddu (Gonnesa)	open air	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.25716037307180 0	8.421135969119170	151	Lugliè et al.2017 (mention)	
Iglesias (?)	open air	Sardinia	SW	N/A	Early Neolithic	N/A	N/A	N/A	municipalities .shp layer	39.30974202481570 0	8.530859101274120	198	Alba1976	
Iloghe (Dorgali)	open air	Sardinia	E	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	40.35066018988880 0	9.527923274486200	169	Lugliè et al.2017 (mention)	
Interacquas (Santa Giusta)	open air	Sardinia	W	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.86720773432710 0	8.652481701908950	19	Lugliè et al.2017 (mention)	
Is Arenas (Sardara)	open air	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.62131340284760 0	8.778244532830100	85	Lugliè et al.2017 (mention)	
Lu Litarroni (Aglientu)	open air	Sardinia	NE	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	41.13658905693170 0	9.111624288252880	0	Lugliè et al.2017 (mention)	
Mitza Riu Sessini (Fluminimaggiore)	open air	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.45737734784790 0	8.479887207735400	55	Lugliè et al.2017 (mention)	
Molte Altari (Iglesias)	open air	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017 + mounts .shp layer	39.31841377403280 0	8.536230086922070	282	Lugliè et al.2017 (mention)	
Monte Crasta I (Osilo)	open air	Sardinia	NW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017 + mounts .shp layer	40.75645550485240 0	8.641312448397690	452	Lugliè et al.2017 (mention)	
Monte Crasta II (Osilo)	open air	Sardinia	NW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017 + mounts .shp layer	40.75645550485240 0	8.641312448397690	452	Lugliè et al.2017 (mention)	

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Monte d'Accoddi (SS)	open air	Sardinia	NW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017 + mounts .shp layer	40.7881064917990 00	8.46180590996310 0	65	Lugliè et al.2017 (mention)	
Murredda (Cuglieri)	open air	Sardinia	W	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	40.1421315276547 00	8.49935979881982 0	121	Lugliè et al.2017 (mention)	
Nido dei Passeri (Calasetta)	open air	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.0532609721939 00	8.36069869125763 0	0	Lugliè et al.2017 (mention)	
Nurchis (Santadi)	cave?	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.0474579969537 00	8.74481420243080 0	276	Lugliè et al.2017 (mention)	
Orri (Arborea)	open air	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.7467144654632 00	8.54605525202795 0	3	Lugliè et al.2017 (mention)	
Pabaranca (Sorso)	open air	Sardinia	NW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	40.7985166677463 00	8.58225890122907 0	130	Lugliè et al.2017 (mention)	
Pauli Annuas (Terralba)	open air	Sardinia	SW	N/A	Early Neolithic	N/A	Tyrrhenian Cardial Ware I	N/A	map Lugliè2017	39.7349004595111 00	8.60954682501805 0	6	Depalmas 1995	
Pauli Putzu (Terralba)	open air	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.7349004595111 00	8.60954682501805 0	6	Lugliè et al.2017 (mention)	
Perda Tuvùra (Santadi)	cave?	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.0725064318341 00	8.77563180795863 0	433	Lugliè et al.2017 (mention)	
Perdaias Mannas (Gonnesa)	open air	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.2706215830854 00	8.42653992957771 0	3	Lugliè et al.2017 (mention)	

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Pitzu 'e Pudda (Iglesias)	open air	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.326286626116200	8.613025657666220	200	Lugliè et al.2017 (mention)	
Platamona (SS)	open air	Sardinia	NW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	40.820116147521100	8.492383153779590	0	Lugliè et al.2017 (mention)	
Porto Pino (Sant'Anna Arresi)	open air	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	38.932641164813900	8.622733866837510	0	Lugliè et al.2017 (mention)	
Pranu Strintu (Siddi)	open air	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.674387866784800	8.866722939167580	345	Lugliè et al.2017 (mention)	
Punta Campu 'e Sali (Arbus)	open air	Sardinia	SW	N/A	Early Neolithic	N/A	Cardial Ware	N/A	map Lugliè2017	39.590027800000000	8.466388900000000	4 / *0 QGIS*	Alba1991	
Punta Is Arenas (Narbolia)	open air	Sardinia	W	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	40.080165675217700	8.489604442945740	3	Lugliè et al.2017 (mention)	
Rio Saboccu (Guspini)	open air	Sardinia	Coastal plain SW Monte Arci	2σ 5476-4999 BCE	Final Early Neolithic	C14 on two charcoals taken at the base of S2 structure	phase III (Epicardial ?). Very few pottery fragments	structures S1 and S2 (max. depth, -0.9 and -1.3 m respectively - min. -0.3 m)	map Lugliè2017	39.688759063577600	8.556106813637960	6 / *2 QGIS*	Lugliè et al.2009 | Lugliè et al.2008	At the time of EN occupation, the sea level was lower than today and the Rio Saboccu campsite more extended in the direction of the pond. Now we can only observe the remnant fraction of the terrace that has been eroded by the pond itself.
S. Chiara (Terralba)	open air	Sardinia	SW	N/A	Early Neolithic	N/A	Tyrrhenian Cardial Ware I	N/A	map Lugliè2017	39.697882696657300	8.612354229801110	11	Depalmas 1995	

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Sa Binza Manna (Ploaghe)	open air	Sardinia	N	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	40.687221529861500	8.816203507122940	350	Lugliè et al.2017 (mention)	
Sa Korona di Monte Majore (Thiesi)	cave	Sardinia	45 km N and 30 km W coast	2nd half of V millennium - threshold IV millennium BCE?	Final Early Neolithic / Middle Neolithic?	N/A	Cardial Ware (Filiestru)	trench A level 3	map Lugliè2017	40.513101823981400	8.609516194556410	540 / *530 QGIS*	Tykot1996 | Foschi-Nieddu1982	
Sa Punta-Marceddì (Terralba, OR)	open air	Sardinia	20 m SW seashore, near Monte Arci	5313-5028 2σ cal BCE (S.U.13) / 5476-5067 2σ cal BCE (S.U.11)	Final Early Neolithic	C14	phase III (Epicardial ?)	S.U. 9, 11-14	map Lugliè2017	39.728853260796200	8.504465295087150	0	Lugliè2009 | Lugliè et al.2008	
Sa Rocca 'e Palaggios (Padria)	cave?	Sardinia	NW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	40.427151844854900	8.607994491016380	312	Lugliè et al.2017 (mention)	
Sa Turre 'e Su Puttu (Cuglieri)	open air	Sardinia	W	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	40.089413759523600	8.491796173475090	0	Lugliè et al.2017 (mention)	
San Giovanni I (Terralba)	open air	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.688759063577600	8.556106813637960	2	Lugliè et al.2017 (mention)	
San Giovanni II (Terralba)	open air	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.688759063577600	8.556106813637960	2	Lugliè et al.2017 (mention)	
Santa Caterina di Pittinuri (Cuglieri)	open air	Sardinia	W	N/A	Early Neolithic	N/A	Cardial Impressed Ware? (no ceramic)	surface find	map Lugliè2017	40.106833299999900	8.487805600000000	32	Tykot, Karellas & Tozzi2007 | Dini2007 | Tykot2007	Pottery has not been preserved. The site has been interpreted as a workshop area for producing microliths, and preparing tools for hunting and purposes. This is supported by the absence of pieces

SITE	TYPE OF SITE	REGION	AREA	AGE	CULTURE	DATING METHODS	FACIES (ceramic)	ARCH LEVEL	COORDINATES REF	X	Y	H_ASL	REFERENCE	NOTES
														with any cortex, and of formal tools.
Santa Gilla (Cagliari)	open air	Sardinia	S	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.228562598510700	9.0778200227874 60	3	Lugliè et al.2017 (mention)	
Santa Maria Is Acquas (Sardara)	open air	Sardinia	SW (central Campidano)	No absolute dates. Early Holocene?	Early Neolithic	Micromorphological and pedological analysis, chronotypological attributions	0	section A, unit A2 surface horizon Ap; section B surface horizon Ap	map Mussi&Melis1999	39.6321295148806 00	8.7617360277275 90	82	Mussi & Melis1999	
Sant'Iroxi (Decimoputzu)	open air	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.3055521207402 00	8.8798516178857 40	35	Lugliè et al.2017 (mention)	
S'Arrocca Abbruxiada (Arbus)	open air	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.5854627273334 00	8.5258245107125 00	364	Lugliè et al.2017 (mention)	
Sella del Diavolo (Cagliari)	open air	Sardinia	S	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.1884080243375 00	9.1688746613436 50	13	Lugliè et al.2017 (mention)	
Sisineddu (Calasetta)	open air	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.0829255590265 00	8.3562835940574 20	0	Lugliè et al.2017 (mention)	
Sitzimurreddu (Fluminimaggiore)	open air	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.4547207253368 00	8.4625146991066 90	119	Lugliè et al.2017 (mention)	
Su Carroppu (Sirri, Carbonia)	shelter	Sardinia	10 km SW coast	5854-4609 BCE	Early Neolithic	Obsidian hydration	Tyrrhenian Cardial Ware I	layer U2.4 (depth -	caves .shp layer	39.2072573	8.56174799	350 / *293 QGIS*	Skeates2012 | Dini2007 |	

SITE	TYPE OF SITE	REGION	AREA	AGE	CULTURE	DATING METHODS	FACIES (ceramic)	ARCH LEVEL	COORDINATES REF	X	Y	H_ASL	REFERENCE	NOTES
			(Sulcis mountain)				and poinçonné e	1.40-1.55 m)		26886600	6309900		Michels et al.1984, p.98; tab.5.14. | Lugliè2009 | Lugliè et al.2007 | Depalmas1995	
Su Coddu 'e Santuanni (Guspini)	open air	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.6199238020433 00	8.6472561811143 20	36	Lugliè et al.2017 (mention)	
Su Coloru (Laerru, SS) * F	cave	Sardinia	12 km N coast	6400 ± 40 BP (2σ cal BC: 5470-5310; 2σ cal BP: 7420-7260)	Early Neolithic	AMS on carbon (performed by Beta Analytic Inc. Lab of Miami)	Cardial Ware ("Impressed")	layer F (paleosurface?)	caves .shp layer	40.8158833253185 00	8.8120206030130 00	340 / *333 QGIS*	Sarti, Fenu et al.2012 | Fenu et al. 2002	
Su Coloru (Laerru, SS) * G	cave	Sardinia	12 km N coast	N/A	Early Neolithic	N/A	Cardial Ware ("Impressed")	layer G	caves .shp layer	40.8158833253185 00	8.8120206030130 00	340 / *333 QGIS*	Sarti, Fenu et al.2012	
Su Coloru (Laerru, SS) * H	cave	Sardinia	12 km N coast	6680 ± 160 BP (2σ cal BC: 5870-5320; 2σ cal BP: 7820-7270)	Early Neolithic	AMS on carbon (performed by Beta Analytic Inc. Lab of Miami)	Cardial Ware ("Impressed") | Archaic Impressed Ware (Cesari et al.2011)?	layer H	caves .shp layer	40.8158833253185 00	8.8120206030130 00	340 / *333 QGIS*	Sarti, Fenu et al.2012 | Fenu et al.2002 | Cesari et al.2011 | Lugliè2009b	
Su Coloru (Laerru, SS) * I	cave	Sardinia	12 km N coast	6830 ± 80 BP (2σ cal BCE: 5850-5620; 2σ cal BP: 7800-7570 BP)	Early Neolithic	N/A	Cardial Ware ("Impressed")	layer I	caves .shp layer	40.8158833253185 00	8.8120206030130 00	340 / *333 QGIS*	Sarti, Fenu et al.2012	
Su Concali de Corongiu Acca (Villamassargia)	cave?	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.2539525639190 00	8.6575453059300 10	335	Lugliè et al.2017 (mention)	

SITE	TYPE OF SITE	REGION	AREA	AGE	CULTURE	DATING METHODS	FACIES (ceramic)	ARCH LEVEL	COORDINATES REF	X	Y	H_ASL	REFERENCE	NOTES
Su Paris de Sa Turre (Cuglieri)	open air	Sardinia	W	N/A	Early Neolithic	N/A	Tyrrhenian Cardial Ware I?	surface find	map Lugliè2017	40.115908249453100	8.487157158848340	56	Lugliè et al.2017 (mention)	
Su Stangioni (Portoscuso)	open air	Sardinia	SW	N/A	Early Neolithic	N/A	end of Thyrrhenian Cardial Ware	N/A	map Lugliè2017	39.113663443688900	8.482948270419420	9	Lugliè et al.2017 (mention)	
Tatinu (Santadi)	cave?	Sardinia	SW	N/A	N/A	N/A	N/A	N/A	map Lugliè2017	39.128670443449900	8.750058661436650	373	Lugliè et al.2017 (mention)	
Torre Foghe (Tresnuraghes)	open air	Sardinia	W	N/A	Early Neolithic	N/A	N/A	N/A	map Lugliè2017	40.191851118698800	8.465372544518400	3	De Francesco et al.2012	

Appendix 5. Early Neolithic archaeological sites in Corsica and Sardinia.

SITE	TOTAL ITEMS IN ASSEMBLAGE
A Guaita (Morsiglia)	*27* (majority of obsidians; rhyolite, chert, jasper, local green rocks, quartz, rock crystal)
A Petra (Barbaggio)	140 (97,86% local rocks, mostly rhyolite; very few obsidian and yellow chert)
A Revellata I	821 (obsidian and?)
Acqua Sa Canna (Gonnesa)	N/A (obsidian, jasper, grey chert and a few other microcrystalline rocks)
Araguina-Sennola (Bonifacio) *	325 (mostly chert; obsidian)
Basi 6 (Serra di Ferro)	N/A (obsidian and?)
Basi 7 (Serra di Ferro)	615 (mostly chert; quartz; few obsidian and rhyolite implements)
Bufua III	159 (27,7% local rocks; obsidian and chert)
Cala Corsara (Spargi, La Maddalena)	39 (prevalence of chert; obsidian, quartz, quartzite) + unprocessed raw material and debris
Cala di Trana (Palau)	N/A (obsidian, chert and?)
Cala di Villamarina (Santo Stefano, La Maddalena)	N/A (obsidian, granite, quartz, porphyry)

SITE	TOTAL ITEMS IN ASSEMBLAGE
Campu Stefanu (Sollacaro-Lévie) * (1)	N/A (13 chert, part allochthonous part indet; 16 obsidians; ?local quartz and rhyolites)
Campu Stefanu (Sollacaro-Lévie) * (2)	700 (14 chert, part allochthonous part indet; 35 obsidians; 74 local rhyolites; 423 local quartz)
Coddu Is Abionis (Terralba)	10.000, of which 764 retouched (obsidian, siliceous material and very few quartz, manna, rhyolite)
Corbeddu (Oliena) *	N/A (obsidian and?)
Curacchiaghju (Lévie) *	359 (obsidian, chert and?)
Filiestru (Mara) B10, B11, D	400 (obsidian and?)
Filiestru (Mara) B8, B9, D6	N/A (obsidian, chert and?)
Filiestru (Mara) B9	N/A (obsidian and?)
Filiestru (Mara) D6? (Filiestru)	N/A (obsidian and?)
Filiestru (Mara) D7? (Cardial)	1240 (obsidian, jasper and chert)
Filitosa-Sollacaro	2 (obsidian)
Grotta Rifugio (Oliena)	N/A (obsidian, chert, green stone)
Grotta Southwell	116 (76,7% local rocks, obsidian, chert)
Iglesias (?)	N/A (obsidian and?)
Longone I (Bonifacio) *	40 (15,5% local rocks; obsidian and chert)
Lumaca (Centuri)	N/A (rhyolite and obsidian)
Pauli Annuas (Terralba)	N/A (obsidian and?)
Punta Campu 'e Sali (Arbus)	39 (obsidian, schist, basalt)
Renaghju (Sartène)	4303 (39% local rhyolites, quartz et al. + 46% chert and 15% obsidian, non-local resources)
Rio Saboccu (Guspini)	1058 (local obsidian, chert and chalcedony)
Riparo Albertini	917 (77% local rocks, high presence of local silicified tuff and trachytic lava, 22,5% chert, very few quartz and obsidian)
S. Chiara (Terralba)	N/A (obsidian and?)
Sa Korona di Monte Majore (Thiesi)	N/A (grey and black stone, obsidian and chert)

SITE	TOTAL ITEMS IN ASSEMBLAGE
Sa Punta-Marceddì (Terralba, OR)	2819 (98,9% obsidian; flint/chert; rhyolite; silicified limestone)
Santa Caterina di Pittinuri (Cuglieri)	3090 (obsidian and chert)
Santa Maria Is Acquas (Sardara)	N/A (only obsidian)
Strette XIV and XX (A Petra - Barbaggio) *	1036 (local rocks 75/83%: quartz, rhyolite, granitoids, serpentinites; high quantity of obsidian; chert)
Su Carroppu (Sirri, Carbonia)	123 (obsidian, chert, quartzite and jasper + 3 indet. elements)
Su Coloru (Laerru, SS) * F	308 (silicified lithotypes and obsidian)
Su Coloru (Laerru, SS) * G	28 (local chert and obsidian)
Su Coloru (Laerru, SS) * H	229 (chert and obsidian)
Su Coloru (Laerru, SS) * I	31 (only chert)
Su Paris de Sa Turre (Cuglieri)	N/A (obsidian and?)
Torre d'Aquila (Pietracorbara) *	401 (mostly local quartz; local rhyolites and gabbro; 9,2% allochthonous chert and obsidian - mostly obsidian)
Torre Foghe (Tresnuraghes)	1045 (fonolitic rocks, chert, obsidian)
U Grecu	320 (76,3% local rocks; obsidian and chert)

Appendix 6. Lithic raw materials from EN sites with obsidian and chert in Corsica and Sardinia. Part 1/3

SITE	OBSIDIAN	% IN ASSEMBLAGE	N° IN ASSEMBLAGE	N° ITEMS ANALYSED	ANALYSES	SOURCE	OUTCROP/SUBSOURCE	TECHNOLOGY	TYPOLOGY
A Guaita (Morsiglia)	Yes	44%	12	12	visual characterisation; SEM-EDS; PIXE	11/12 Monte Arci; 1/12 Palmarola	4 SB2; 7 SC. No representation of SA. + 1 Palmarola.	Débitage, retouching and resharpening made on site. Obsidian is present with different appearances: opaque, bright, black, translucent, speckled, striated…	Above all, fragments and armatures tranchants (typical of Early Neolithic) of rectangular and trapezoidal form. There's a diversified use of the obsidian raw material according to its geochemical composition.
A Petra (Barbaggio)	Yes	1,45%	2	N/A	N/A	N/A	N/A	N/A	Sharp and microlithic armatures

SITE	OBSIDIAN	% IN ASSEMBLAGE	N° IN ASSEMBLAGE	N° ITEMS ANALYSED	ANALYSES	SOURCE	OUTCROP/SUBSOURCE	TECHNOLOGY	TYPOLOGY
A Revellata I	Yes	*2,9%*	24	N/A	N/A	N/A	N/A	N/A	N/A
Acqua Sa Canna (Gonnesa)	Yes	N/A	N/A	N/A	visual characterisation?	Monte Arci	Pebbles in local floodplain (transported and levigated by watercourses) or in situ outcrops	Mostly aimed at obtaining blades.	Scrapers, truncations (mostly geometric microlithic armatures, awls, burins).
Araguina-Sennola (Bonifacio) *	Yes	41%	132	N/A	N/A	N/A	N/A	N/A	Mostly flakes, also blades and one armature.
Basi 6 (Serra di Ferro)	Yes	4%?	N/A	70 ca. (30 in level 6.3, 29 in level 6.2, 11 in level 6.1)	Microprobe (see Tykot1995)	Monte Arci	In level 6.3: approx. 40% SC; 10% SB2; 50% SA | In level 6.2: approx. 60% SC; 10% SB2; 30% SA | In level 6.1: approx. 70% SC; 30% SA. / No SB1	N/A	Sharp armatures
Basi 7 (Serra di Ferro)	Yes	4%	26	2	N/A	Monte Arci	50% SC; 50% SA. No SB.	N/A	Flakes and blades
Bufua III	Yes	50,9%	*81*	N/A	N/A	N/A	N/A	N/A	N/A
Cala Corsara (Spargi, La Maddalena)	Yes	N/A	N/A	26	EMP (Electron Microprobe)	Monte Arci	1 SA; 15 SB2; 10 SC. No SB1.	N/A	N/A
Cala di Trana (Palau)	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cala di Villamarina (Santo Stefano, La Maddalena)	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Knives, scrapers on flake or blade, awls, geometric microlites. No bifaces.
Campu Stefanu	Yes	N/A	16	N/A	N/A	N/A	N/A	N/A	Non-laminar industry. Mostly aimed at obtaining cutting edges. The same technology has

SITE	OBSIDIAN	% IN ASSEMBLAGE	N° IN ASSEMBLAGE	N° ITEMS ANALYSED	ANALYSES	SOURCE	OUTCROP/SUBSOURCE	TECHNOLOGY	TYPOLOGY
(Sollacaro-Lévie) * (1)									been used for allochthonous and local raw materials
Campu Stefanu (Sollacaro-Lévie) * (2)	Yes	*5,14%*	36	N/A	N/A	N/A	N/A	N/A	Non-laminar industry.
Coddu Is Abionis (Terralba)	Yes	93,1%	711	4	INAA (Instrumental Neutron Activation Analysis) and visual characterisation	Monte Arci	1 SA; 2 SB1; ? SB2; 1? SC | Conca Cannas and Santa Maria Zuarbara | Or locally in the form of pebbles/fragments transported by watercourses (Riu Mogoro and Riu Mannu)	Complex débitage, although utilitarian	High typological differentiation: microlithic and geometric tools, scrapers, denticulated and backed tools
Corbeddu (Oliena) *	Yes	N/A	N/A	N/A	N/A	N/A	N/A	Abandonment of local raw materials and introduction of obsidian. Use of débitage.	Geometric microlithic armatures.
Curacchiaghju (Lévie) *	Yes	39% (layer 6)	141	9 (Tykot1996) | 4 (Radi & Bovenzi2007)	N/A	Monte Arci	8/9 SB (Tykot1996) | 4 SB (Radi & Bovenzi2007)	Obsidian is knapped in order to produce flakes that are then retouched to obtain armatures/arrowheads.	Microlithic armatures.
Filiestru (Mara) B10, B11, D	Yes	17%	*68*	27 + 45	27 with Electron Microprobe + 45 with visual characterization	Monte Arci	15% SA; 70% SB; 15 % SC	N/A	N/A
Filiestru (Mara) B8, B9, D6	Yes	30%	N/A	N/A	N/A	N/A	N/A	Obsidian is mostly from opaque type, with only 2 items of translucent type.	Almost all the items (>77%) are geometric armatures. Interestingly, this typology was almost completely absent in Filiestru EN phase I.
Filiestru (Mara) B9	Yes	N/A	N/A	20	visual characterization and EMP (Electron Microprobe)	Monte Arci	4 SA; 10 SB2, 6 SC. No SB1 (20% SA; 50% SB; 30% SC)	N/A	N/A
Filiestru (Mara) D6? (Filiestru)	Yes	N/A	N/A	20+155	20 with Electron Microprobe + 155 with visual characterization	Monte Arci	30% SC; 50% SB2; 20% SA	N/A	N/A

SITE	OBSIDIAN	% IN ASSEMBLAGE	N° IN ASSEMBLAGE	N° ITEMS ANALYSED	ANALYSES	SOURCE	OUTCROP/SUBSOURCE	TECHNOLOGY	TYPOLOGY
Filiestru (Mara) D7? (Cardial)	Yes	25%	*310*	N/A	N/A	Monte Arci	2/3 SA; 1/3 SB. No SC	N/A	N/A
Filitosa-Sollacaro	Yes	100%	2	N/A	N/A	N/A	N/A	Knapping on cobbles to obtain flakes.	A blade and a scraper with retouches.
Grotta Rifugio (Oliena)	Yes	N/A	21	N/A	N/A	N/A	N/A	N/A	Burin, scraper, truncated geometric armatures.
Grotta Southwell	Yes	10,3%	*12*	N/A	N/A	N/A	N/A	N/A	N/A
Iglesias (?)	Yes	100%	N/A	N/A	N/A	N/A	N/A	N/A	Geometric microliths and scrapers on blade
Longone I (Bonifacio) *	Yes	20%	*8*	N/A	N/A	N/A	N/A	N/A	N/A
Lumaca (Centuri)	Yes	60%	67	21	XRF (non-destructive X-Ray Fluorescence method)	Monte Arci	N/A	Débitage on flake and on blade	Armatures with transversal cutting edge
Pauli Annuas (Terralba)	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Punta Campu 'e Sali (Arbus)	Yes	95%	37	N/A	N/A	N/A	N/A	Knapping aimed at obtaining mostly blades. Retouching for microlithic armatures.	Mostly blades and microlithic armature on blade; flakes, one scraper, perçoir, zagaglia and grinder.
Renaghju (Sartène)	Yes	15%	653	622 (84% of the total obsidian assemblage)	visual characterization; non-invasive particle-induced X-ray emission spectroscopy (PIXE); energy dispersion spectrometer of a scanning electron microscope (SEM-EDS)	621/622 Monte Arci; 1/622 Palmarola	45,3% SA; 35,4% SB2; 19,1% SC types Monte Arci + >1% Palmarola	Monte Arci's SA and SB2 obsidians were procured in the form of small nodules that were then introduced in the site as relatively unprepared pieces and then reduced. While SC specimens arrived on site from more developed reduction	Very few formal implements, typical of the Tyrrhenian Cardial Early Neolithic. Ex. Geometrics and carving/boring tools

SITE	OBSIDIAN	% IN ASSEMBLAGE	N° IN ASSEMBLAGE	N° ITEMS ANALYSED	ANALYSES	SOURCE	OUTCROP/SUBSOURCE	TECHNOLOGY	TYPOLOGY
					on mm-sized polished fragments			stages. | Technology: expedient and intensive, aimed at producing flakes. Low technical investment. Limited number of elements with regular and consistent retouches. This involved a dominant production of uncured tools, a high level of core exploitation, a subsidiary blade/ bladelet production with minimal to non-existent use of pressure technique, plus a low to absent level of standardization in the few formal tools. Furthermore, there is no evidence of distinct modes of consumption by raw material, with each of the Sardinian obsidians being worked in the same manner and used to produce the same types of tool.	
Rio Saboccu (Guspini)	Yes	98,97%	1047	100% with visual characterisation; of which 38+16 other analyses	visual characterization; elemental composition analyses for 38 dubious artefacts (+ 24 from Monte Arci): particle-induced X-ray emission spectroscopy (PIXE) at AGLAE extracted-beam facility of the 'Centre de recherche et de restauration des musées de France' (Paris); elemental composition analyses for 16 artefacts (+ 7 from Monte Arci): PIXE using the nuclear	Monte Arci	very rare SB1 (collected at primary and sub primary deposits at a min. 17km distance NE); most abundant SA (primary deposit Conca 'e Cannas, 16km distance E); SB2 (primary deposit 9 km NE, sub primary deposit 14 km NE); SC (the only secondary deposits exploited, immediate vicinity of the site).	Non-opportunistic exploitation of the four-obsidian types of the nearby Monte Arci's source (see Notes). Generalized plain type of butts with no or minimum preparation, reduction carried out with the direct percussion technique with a soft stone and aimed mainly at producing flakes with a unipolar method and a recurrent shift of the striking platform. Intensive and extreme raw material exploitation, until reaching the technical limits for further reduction. The choice of the raw materials was guided by their	Mostly expedient industry. Thus, very few formal tools can be recognized. Laminar blanks (mainly bladelets) are rare. The more standardized category is the one of geometric pieces. Other formal tools (backed and double backed pieces, burins and scrapers) show a high variability, as they were produced from flake blanks of very different sizes and morphologies.

SITE	OBSIDIAN	% IN ASSEMBLAGE	N° IN ASSEMBLAGE	N° ITEMS ANALYSED	ANALYSES	SOURCE	OUTCROP/SUBSOURCE	TECHNOLOGY	TYPOLOGY
					microprobe lines of a Van de Graaff accelerator at the new AIFIRA facility of the 'Centre d'études nucléaires de Bordeaux–Gradignan (CENBG)'. Twelve artefacts were measured in a non-destructive mode, the others and the geological samples from polished sections.			intrinsic knapping qualities and in function of the maximum size of the expected final product. Obsidian reduction was almost entirely performed in-situ (all reduction sequence present). The greatest part of the assemblage is debitage. Exploitation of obsidians both from primary, sub-primary and secondary (alluvial) deposits. Sourcing strategies were oriented towards little angular blocks or small rounded pebbles (maximum length of less than 80 mm).	
Riparo Albertini	Yes	1,2%	3	N/A	N/A	N/A	N/A	N/A	N/A
S. Chiara (Terralba)	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sa Korona di Monte Majore (Thiesi)	Yes	N/A	N/A	26	N/A	Monte Arci	58% SB2	N/A	Cores, flakes and bladelets, one geometric tool.
Sa Punta-Marceddì (Terralba, OR)	Yes	98,9%	2789	626	visual characterisation + elemental composition (particle induced X-ray emission (PIXE) at the AGLAE facility of Centre de Recherche et de Restauration des Musées de France (Paris)	Monte Arci	52,5% SA; 24,8% SB2; 22,7% SC. No SB1	Direct percussion technique	Flakes, with subsidiary bladelets production and rare retouched tools.
Santa Caterina di	Yes	45%	1390	35	visual characterization; XRF spectrometer	Monte Arci	74,3% SB (of which 68,6% SB2 and 5,7% SB1); 17,1% SA; 8,6% SC	Poorly standardises and opportunistic technology. Direct percussion and bipolar	Irregular morphology (poorly standardised supports), generally microlithic laminar

SITE	OBSIDIAN	% IN ASSEMBLAGE	N° IN ASSEMBLAGE	N° ITEMS ANALYSED	ANALYSES	SOURCE	OUTCROP/SUBSOURCE	TECHNOLOGY	TYPOLOGY
Pittinuri (Cuglieri)								technique (knap on anvil) are attested. The high number of artefacts and debris attests that the raw material processing was taking place in situ.	flakes or very flat ipermicrolithic plus other less attested categories. Few presence of sharp armatures and microlites (armatures tranchantes et microlites). Few retouched artefacts.
Santa Maria Is Acquas (Sardara)	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Strette XIV and XX (A Petra - Barbaggio) *	Yes	11%	117	10	EMP (Electron Microprobe)	Monte Arci	9 SB2; 1 SC. No SA, no SB1.	Introduced as finished products. No evidence of knapping on site.	Poor typological variability. Mostly simple flakes. Few blades and retouched (sharp armatures).
Su Carroppu (Sirri, Carbonia)	Yes	82%	101	63 determined by PIXE; 38 with visual characterisation	visual characterization; Particle-Induced X-Ray Emission (PIXE)	Monte Arci	43%SA, 28%SB and 28%SC Monte Arci. No representation of SB1.	Tendency towards a fake production and a systematic utilisation of these flakes for the shaping of a large part of the toolkit (57 pieces - 55 obsidians - show intentional organized retouch). The production of blades and bladelets is documented almost exclusively in obsidian, because of the generally bad quality of other local raw materials for blade production.	Mostly geometric retouched tools (half of the toolkit). SC obsidian type was mainly used for the making of blades (occasionally also SA and SB2), whilst only SA and SB2 for flakes. Absence of blocks and cores.
Su Coloru (Laerru, SS) * F	Yes	N/A (very few)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Su Coloru (Laerru, SS) * G	Yes	*7.14%*	2	N/A	N/A	N/A	N/A	N/A	N/A

SITE	OBSIDIAN	% IN ASSEMBLAGE	N° IN ASSEMBLAGE	N° ITEMS ANALYSED	ANALYSES	SOURCE	OUTCROP/SUBSOURCE	TECHNOLOGY	TYPOLOGY
Su Coloru (Laerru, SS) * H	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Su Coloru (Laerru, SS) * I	No	0	0	0	0	0	0	0	0
Su Paris de Sa Turre (Cuglieri)	Yes	N/A	N/A	2	INAA (Instrumental Neutron Activation Analysis)	Monte Arci	? SA; 2 SB1; ? SB2; ? SC	N/A	N/A
Torre d'Aquila (Pietracorbara) *	Yes	*6%*	24	10	EMP (Electron Microprobe)	Monte Arci	5 SA; 1 SB1; 3 SB2; 1 SC	Industry with archaic characters: pebbles are abundant in general and many flakes still have cortex.	Very heterogeneous industry: no typology sharply dominates over the others. Armatures are the most represented element, all trapezoidal, except one with rounded base and one dubious point (6 in obsidian, 2 in rhyolite 4 in flint). There are also: points, scrapers, blades and laminated flakes.
Torre Foghe (Tresnuraghes)	Yes	80%	*836*	49	XRF (non-destructive X-Ray Fluorescence method)	Monte Arci	N/A	N/A	N/A
U Grecu	Yes	5,3%	*17*	N/A	N/A	N/A	N/A	N/A	N/A

Appendix 7. Lithic raw materials from EN sites with obsidian and chert in Corsica and Sardinia. Part 2/3

SITE	CHERT	% IN ASSEMBLAGE	N° IN ASSEMBLAGE	N° ITEMS ANALYSED	ANALYSES	SOURCE	TECHNOLOGY	TYPOLOGY	NOTES
A Guaita (Morsiglia)	Yes	*14,8%*	4	N/A	visual characterisation?	Sardinia	N/A	Some microlites	The presence of obsidian from Palmarola shows that occasional contacts with Italy (probably via the Tuscan

SITE	CHERT	% IN ASSEMBLAGE	N° IN ASSEMBLAGE	N° ITEMS ANALYSED	ANALYSES	SOURCE	TECHNOLOGY	TYPOLOGY	NOTES
									archipelago) were in effect from the 6th millennium BCE.
A Petra (Barbaggio)	Yes	0,7%	1	N/A	N/A	Allochthonous	N/A	Microlite	Chert microlite from oldest level (IId). High presence of local rhyolite in the lithic complex.
A Revellata I	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Acqua Sa Canna (Gonnesa)	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Araguina-Sennola (Bonifacio) *	Yes	>obsidian	N/A	N/A	N/A	N/A	N/A	Mostly flakes; blades and 8 armatures.	
Basi 6 (Serra di Ferro)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	The low frequency of obsidian SB in levels 7-6 of Early Neolithic Basi is an exception among Corsican Early Neolithic sites (Tykot1996)
Basi 7 (Serra di Ferro)	Yes	*72.35%*	445	N/A	N/A	N/A	N/A	Mostly flakes, few retouched. Some blades and few sharp armatures	
Bufua III	Yes	21,4%	*34*	N/A	N/A	N/A	N/A	N/A	
Cala Corsara (Spargi, La Maddalena)	Yes	88%	*34*	N/A	visual characterisation	Perfugas or Anglona?	N/A	Burins, scrapers, blades, geometrics, denticulated	Chert is completely absent from natural outcrops in the vicinity of the site, i.e. both in Corsica and Gallura (NE Sardinia).
Cala di Trana (Palau)	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

SITE	CHERT	% IN ASSEMBLAGE	N° IN ASSEMBLAGE	N° ITEMS ANALYSED	ANALYSES	SOURCE	TECHNOLOGY	TYPOLOGY	NOTES
Cala di Villamarina (Santo Stefano, La Maddalena)	No	0	0	0	0	0	0	0	
Campu Stefanu (Sollacaro-Lévie) * (1)	Yes	N/A	13	half (6-7)	visual characterisation?	Perfugas basin, Sardinia	N/A	Two geometric bitruncations (on bladelet and flake), one oblique truncation and some bladelets.	(preliminary study)
Campu Stefanu (Sollacaro-Lévie) * (2)	Yes	*2%*	14	N/A	visual characterisation?	5 Perfugas basin (brecciated and bedded), the rest indet (*calcédonieux ou gris à floculations*)	Laminar débitage.	Mostly geometric bitruncations.	(preliminary study) Tools with burning traces and ashes.
Coddu Is Abionis (Terralba)	Yes	6,3%	48	N/A	visual characterisation?	Local: chert and silicified marls in the alluvial deposits of the Mogoro and Mannu rivers	N/A	N/A	Microlites are mostly in obsidian, probably due to its better quality. Obsidian could have been procured in the Conca Cannas (12 km distance) or Santa Maria Zuarbara (13 km distance) sources; while Perdas Urias is 17 km as the crow flies but more in real distance. Obsidian could also have been provisioned in the form of blocks/fragments transported by Mogoro and Mannu rivers.
Corbeddu (Oliena) *	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Curacchiaghju (Lévie) *	Yes	N/A	N/A	N/A	N/A	N/A	Rhyolite and chert lithotypes are knapped in order to produce flakes that are then retouched to obtain microlithic armatures/arrowheads. Use of microburin technique.	Geometric microlithic armatures, mostly triangles, rectangles, trapezium and circle segments.	

SITE	CHERT	% IN ASSEMBLAGE	N° IN ASSEMBLAGE	N° ITEMS ANALYSED	ANALYSES	SOURCE	TECHNOLOGY	TYPOLOGY	NOTES
Filiestru (Mara) B10, B11, D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Filiestru (Mara) B8, B9, D6	Yes	70%	N/A	N/A	N/A	N/A	N/A	N/A	The tot amount of artefact is unclear. (Trump1982: "977 pieces in layer D6" vs. Depalmas1995: "27 pieces in layers B8-9 and D6"!)
Filiestru (Mara) B9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Filiestru (Mara) D6? (Filiestru)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Filiestru (Mara) D7? (Cardial)	Yes	N/A	N/A	N/A	N/A	Local? (several varieties of flint, most occurring naturally within the valley, though none in the cave)	N/A	Only six artefacts could be described as implements: a stout dagger-like point, a lunate arrowhead, an awl, a backed blade and two scrapers. Absence of transverse arrowheads (strange but perhaps not significant).	
Filitosa-Sollacaro	No	0	0	0	0	0	0	0	
Grotta Rifugio (Oliena)	Yes	N/A	2	N/A	N/A	N/A	N/A	A side-scraper and a core.	
Grotta Southwell	Yes	12,9%	*15*	N/A	N/A	N/A	N/A	N/A	
Iglesias (?)	No	0	0	0	0	0	0	0	

SITE	CHERT	% IN ASSEMBLAGE	N° IN ASSEMBLAGE	N° ITEMS ANALYSED	ANALYSES	SOURCE	TECHNOLOGY	TYPOLOGY	NOTES
Longone I (Bonifacio) *	Yes	65%	*26*	N/A	N/A	Imported	N/A	N/A	
Lumaca (Centuri)	No	0	0	0	0	0	0	0	X-ray fluorescence analyses have been led on 21 obsidian fragments, but it is not clear from which Neolithic period (occupation phase) the artefacts came from. It is also unclear to which Neolithic period the 60% obsidian proportion out of the total number of lithic tools refers.
Pauli Annuas (Terralba)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Punta Campu 'e Sali (Arbus)	No	0	0	0	0	0	0	0	
Renaghju (Sartène)	Yes	46%	1984	N/A	optical observations of sedimentary microfacies with stereomicroscope at magnifications 10×-60×	1331 Perfugas basin, Sardinia + 217 unknown and 436 indet	Raw material has been introduced in the site in the form of raw blocks or pre-shaped cores. Knapping has been done on site, as attested by the high presence of debris.	Small flakes, mostly trapezoidal geometric armatures or truncated blades and bladelets. Minor presence of "splintered tools" (*pièces esquillées*).	This is the largest sample of obsidian artefacts analysed from a Corsican Neolithic site.
Rio Saboccu (Guspini)	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	In spite of the in situ availability of SC obsidians and of nearby SB2 obsidians, there is a marked preference for the more transparent and vitreous SA type, whose exploitation required however a major energy investment, given the greater distance of the source from the site. The quasi-absence of SB1 obsidians, rich in phenocrysts and internal

SITE	CHERT	% IN ASSEMBLAGE	N° IN ASSEMBLAGE	N° ITEMS ANALYSED	ANALYSES	SOURCE	TECHNOLOGY	TYPOLOGY	NOTES
									flaws, might be accounted for by its lower knapping qualities. Cherts and chalcedonies, which exhibit quite variable knapping attitudes, are about as frequent as obsidian on the Rio Saboccu terrace. These raw materials were however much less frequently used. The small size of the selected raw materials is a culturally-oriented choice, given the presence of a wide range of dimensions of pebbles and blocks both in primary and in secondary sources.
Riparo Albertini	Yes	22,50%	*206*	N/A	N/A	N/A	N/A	N/A	
S. Chiara (Terralba)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sa Korona di Monte Majore (Thiesi)	N/A	N/A	87?	N/A	N/A	N/A	N/A	Cores, flakes and bladelets, one denticulated tool.	
Sa Punta-Marceddì (Terralba, OR)	Yes	0,77%	22	N/A	N/A	N/A	N/A	N/A	SA and SB2 obsidians were almost exclusively gathered in primary deposits + very few specimens in secondary (alluvial contexts). SC obsidians from local secondary deposits are dominant.
Santa Caterina di Pittinuri (Cuglieri)	Yes	55%	1700	N/A	N/A	Hydrothermal origin	N/A	N/A	Interpreted as a station for the second processing of obsidian of Monte Arci, which is about 42 km as the crow flies. The large number of pieces collected documents only

SITE	CHERT	% IN ASSEMBLAGE	N° IN ASSEMBLAGE	N° ITEMS ANALYSED	ANALYSES	SOURCE	TECHNOLOGY	TYPOLOGY	NOTES
									phases of full débitage; no corticated surface was found; the cores are at a late stage of processing: signs that the first shaping of the blocks of raw material was taking place elsewhere. This is an INTRASITE use of obsidian collected on the slopes of Mount Arci (importation - intensive exploitation - use - abandonment).
Santa Maria Is Acquas (Sardara)	No	0	0	0	0	0	0	0	
Strette XIV and XX (A Petra - Barbaggio) *	Yes	5%	50	N/A	visual characterisation?	Sardinia (probably)	Few evidence of knapping aimed at obtaining flakes with direct percussion (hard hammer) or knap on anvil. Most of the artefacts have been introduced as finished products	Poor typological variability. Mostly simple flakes. Few blades and retouched (sharp armatures).	Analyses have been led on level XIV. The dichotomy between the introduced pieces characterised by high technical investment and the local pieces characterised by low investment suggests that the occupants of the site were by no means specialists in lithic technology. This site was probably a subsidiary 'satellite' settlement, repeatedly inhabited by small groups originating from a stable site.
Su Carroppu (Sirri, Carbonia)	Yes	N/A	N/A	N/A	N/A	Local	N/A	N/A	
Su Coloru (Laerru, SS) * F	Yes	N/A	N/A	N/A	visual characterisation?	Local silicified lithotypes. NO Perfugas chert	SSDA and discoid centripetal débitage	Small and medium pieces, few microlites. No laminar industry. Denticulated, scrapers, geometric truncated tools.	

SITE	CHERT	% IN ASSEMBLAGE	N° IN ASSEMBLAGE	N° ITEMS ANALYSED	ANALYSES	SOURCE	TECHNOLOGY	TYPOLOGY	NOTES
Su Coloru (Laerru, SS) * G	Yes	*92.85%*	26	N/A	visual characterisation?	Local chert	N/A	Small and microlithic flakes	
Su Coloru (Laerru, SS) * H	Yes	N/A	N/A	N/A	visual characterisation?	Mostly local chert + few from Perfugas	N/A	Microlites and ipermicrolites. Few flakes and blades.	
Su Coloru (Laerru, SS) * I	Yes	100%?	31?	N/A	visual characterisation?	Local chert + allochthonous chert from Perfugas (high quality)	N/A	Blades, bladelets, ipermicrolites	
Su Paris de Sa Turre (Cuglieri)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Torre d'Aquila (Pietracorbara) *	Yes	*1,2%*	5	N/A	N/A	N/A	N/A	One flake and four sharp armatures	
Torre Foghe (Tresnuraghes)	Yes	10%	*104*	N/A	N/A	N/A	N/A	N/A	
U Grecu	Yes	15,3%	*49*	N/A	N/A	N/A	N/A	N/A	

Appendix 8. Lithic raw materials from EN sites with obsidian and chert in Corsica and Sardinia. Part 3/3

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