THE POLITICS OF OBSIDIAN CONSUMPTION IN THE WEST MEDITERRANEAN

A MULTI-SCALAR ANALYSIS OF THE POLITICS OF OBSIDIAN CONSUMPTION IN THE WEST MEDITERRANEAN (CA. 6TH - 2ND MILLENNIA B.C.)

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A Thesis Submitted to the School of Graduate Studies in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy

McMaster University DOCTOR OF PHILOSOPHY (2014) Hamilton, Ontario

(Anthropology)

TITLE: A Multi-Scalar Analysis of the Politics Of Obsidian Consumption in the West Mediterranean (ca. 6th - 2nd millennia B.C.)

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NUMBER OF PAGES: 337

Abstract

This dissertation details and contextualizes the changing nature of obsidian circulation and use in the West Mediterranean from the sixth to second millennia B.C., with a particular focus on the reflexive relationship between obsidian consumption and long-term socio-economic processes. Central themes in this work include, a) the significance of exchange and long-distance relations in the creation and maintenance of social distinction, b) the specific role of obsidian circulation and consumption in these processes, and c) a *longue durée* investigation of the history of obsidian use and maritime activity in the West Mediterranean from the Neolithic through Bronze Age.

Methodologically this is achieved through, a) the compilation and interrogation of a database of regional obsidian studies over the past 50 years, and b) the generation of new primary data via the typological analysis of 6,895 obsidian artifacts from 46 archeological sites in Sicily and Sardinia, 2,103 of which were also elementally characterized using X-ray fluorescence (XRF) spectrometry to determine their geological source.

Central to this work is the idea that obsidian 'characterization' studies represent a powerful means of engaging with major social science questions, where a particular regional dataset can be used to contribute to debates of global significance. Thus, while the focus of this work is on obsidian consumption in the West Mediterranean, its implications are far-reaching.

Acknowledgements

Many thanks to all the members of my committee who have worked so tirelessly to see this through completion. Special thanks to Tristan Carter and Robert Tykot for their comments and advice that have helped me to grow as a scholar and professional. I also thank Andrea Vianello for aid in securing permissions and helping with analyses in Sicily.

I gratefully acknowledge Dr. Alessandro Usai for allowing me access to the Sardinian artifacts, excavated under the auspices of the Regione Autonoma della Sardegna. I also thank the Soprintendenza per i Beni Archeologici di Cagliari for permission to export the artifacts to Canada for analysis; all artifacts have been safely returned. The elemental characterization was undertaken at the McMaster Archaeological XRF Lab (MAX Lab), which was created and is currently financed by a Canada Foundation for Innovation Leader's Opportunity Fund / Ontario Research Fund (awarded to Dr. Tristan Carter).

I would also like to thank the Director of the Paolo Orsi Regional Archaeological Museum, Dr. Beatrice Basile, for allowing access to the analyzed material and the invaluable help of Dr. Anita Crispino and all technical staff at the museum. I would also like to acknowledge Dr. Giuseppina Monterosso for her support. In Lipari, the warm welcome provided by Dr. Maria Clara Martinelli was much appreciated. I also thank the superintendent of Caltanissetta, Dr. Salvatore Gueli, and Dr. Carla Guzzone of the same superintendency for granting access to the Antiquarium in Milena and Mr. G. Palumbo for his assistance on-site.

My fieldwork in Sicily and Sardinia was generously funded through an Edith M. Wightman Travel Scholarship, a James F. Harvey and Helen S. Harvey Travel Scholarship, a Society for Archaeological Sciences (SAS) Student Research International Travel Award, two McMaster Department of Anthropology Travel Grants, and a McMaster School of Graduate Studies (SGS) Grant-in-Aid of Research.

I also thank my family for their support, Patrick Deluca for help with GIS issues, Deanna Aubert for artifact photography, and Dr. Carlo Lugliè for help in procuring geological material. Special thanks go out to Christine Cluney and my office mates Robert Stark, Kandace Bogaert, and especially Laura.

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Declaration of Academic Achievement

The following is a declaration that the content of the research in this document has been completed by Kyle Freund, recognizing the important contributions of Dr. Tristan Carter, Professor Robert Tykot, and Professor Aubrey Cannon.

Chapter 1: Introduction

This dissertation centers on the changing circumstances behind the circulation and use of obsidian in the West Mediterranean from the sixth to second millennia B.C., with a particular focus on the reflexive relationship between obsidian consumption and long-term socio-economic processes. This work specifically highlights how the gifting and exchange of obsidian objects during the Neolithic facilitated the creation and maintenance of social relations across space. It also discusses how in certain contexts the accumulation and redistribution of obsidian acted as a means through which groups could enhance their own social standing through control over the esoteric knowledge needed to acquire these island-based and often distant resources. This dissertation also addresses post-Neolithic obsidian consumption in detail for the first time, describing the effects of incipient metallurgy on the stability of prior social structures and the role these developments played in the collapse of long-distance obsidian exchange networks.

Brief Background

The Mediterranean is an extensive area comprising the land and islands bordering the Mediterranean Sea, beginning in the west at the Strait of Gibraltar and ending in the east at modern-day Israel, stretching as far south as central Libya and as far north as the Adriatic Coast of northern Italy (Figure 1.1). For purposes of this survey, the West Mediterranean will be considered the lands in which obsidian from any of the four Italian sources are found, including modern-day Italy, Croatia, France, Spain, Tunisia, and

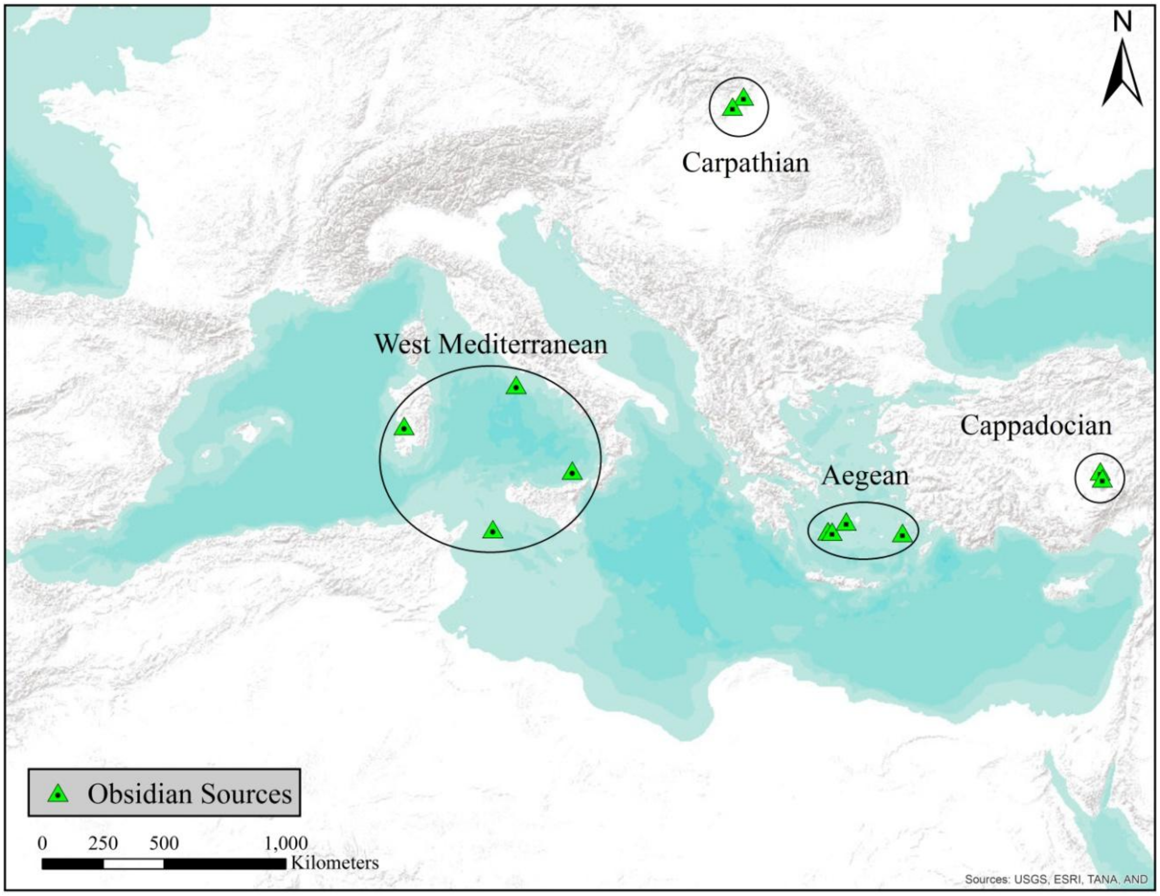

Figure 1.1 Map of the Mediterranean along with the locations of obsidian sources exploited in prehistory.

Algeria, as well as various islands such as Sicily, Sardinia, Corsica, the Balearics, and Malta (Figure 1.2).

Obsidian is an igneous rock and a type of volcanic glass that is usually black in color. It is an excellent raw material for the flaking of tools and was widely exploited by past peoples of the West Mediterranean, frequently across vast geographic distances. In the West Mediterranean, there are four geological island sources of obsidian: Lipari, Monte Arci, Palmarola, and Pantelleria. The next closest archaeologically significant sources are located to the east in the Aegean and to the northeast in the Carpathian

Figure 1.2 Map of the West Mediterranean.

Mountains (Figure 1.1). Despite possible and often tenuous claims of Mesolithic exploitation of West Mediterranean obsidian in southern France, Tunisia, and Sicily (see Aranguren and Revedin 1998; Iovino et al. 2008a; Laplace 1977; Leale Anfossi 1972, 1974; Mulazzani et al. 2010) it is not until the beginning of the Neolithic (ca. 6th millennium B.C.) that we see the widespread proliferation of obsidian technology throughout the West Mediterranean. At present, the vast majority of obsidian artifacts found at archaeological sites in the western Mediterranean were made of raw materials from one of these four sources, although a small quantity of items made of Carpathian obsidian have been documented from several Neolithic sites in northern Italy (Randle et al. 1993; Williams Thorpe et al. 1979), while a few possible pieces of Aegean (Melian) obsidian have been reported at Grotta del Leone in the province of Tuscany (see Bigazzi et al. 1986). By the end of the Late Neolithic and into the Chalcolithic (ca. late 4th-3rd millennia B.C.), long-distance obsidian exchange networks collapse, and these materials virtually disappear from archaeological assemblages outside of the immediate vicinities of the source areas. Obsidian exploitation continues under varying circumstances on the islands of Sicily and Sardinia in the Bronze Age.

Research Objectives

Robb (2007: 326) argues that obsidian was relatively unimportant to the people who used it, describing its consumption in the West Mediterranean as a "low-profile genre of action in restricted contexts using a material whose use life was short and inherently limited". In contrast, I argue that this viewpoint is somewhat limiting and fails to portray the diverse range of roles that these objects played in prehistory, including as a raw material for specialized and generalized tool production and as a medium through which social relations were both formed and negotiated. Due to its rarity and difficulty to access (cf. Gero 1989; Helms 1988), it is also likely that the accumulation of these objects in certain contexts was a means of enhancing social status and prestige.

Through an in-depth analysis of data compiled from the past 50 years of regional obsidian studies, in combination with a detailed study of obsidian assemblages from the islands of Sicily and Sardinia, this dissertation addresses several interrelated questions, including:

1. How and why did complex networks of circulation develop through time? How and why did they end?
2. What are the exact pathways through which obsidian was distributed? What does this imply in terms of how obsidian was obtained?
3. What role did obsidian consumption play in the creation and maintenance of social relations/distinction?

While these questions are specifically addressed to the West Mediterranean data and are at face value of particular interest to regional prehistorians, my means of answering these questions necessitated an engagement with broad anthropological issues concerning how peoples' relationships with material culture both underpin and reflect social structure. Hence, this dissertation is of much wider archaeological significance and cross-cultural relevance. Central to this work is the idea that integrated 'characterization' programs that meld raw material sourcing with techno-typological considerations and an object biography approach combining data from multiple stages of artifact life histories represent a powerful means of engaging with major social science questions, where a particular regional dataset can be used to contribute to debates of global significance.

Outline

Chapter 2 discusses how archaeologists have attempted to contextualize long-term archaeological patterning. More specifically, this research is situated within the intellectual tradition of Fernand Braudel, who emphasized the role of large-scale social and economic processes in the making of Mediterranean prehistory (see Braudel 1949, 1982). Explicit within this approach is the recognition that one must operate at the appropriate temporal and spatial scales of analysis to address specific research questions.

Chapter 3 provides an overview of major developments in West Mediterranean prehistory from the Neolithic through Bronze Age, including basic descriptions of settlement and subsistence patterns, exchange relations, and changing social structures through time. This sets the stage for a general discussion of how recent obsidian characterization studies have been employed by archaeologists followed by an overview of previous literature on obsidian consumption in the West Mediterranean and the research questions that have driven past analyses.

Chapter 5 discusses the methods used in this dissertation to answer the relevant research questions, including a review of how information was compiled into a comprehensive database of West Mediterranean obsidian studies and how obsidian artifacts were sampled and analyzed from the islands of Sicily and Sardinia. In total, 6,895 obsidian artifacts from 46 archeological sites were typologically analyzed, although only 2,103 of these underwent more extensive X-ray fluorescence (XRF) elemental sourcing to determine their geological origin. Because of differences in regional exploitation histories, the results from Sicily and Sardinia are addressed separately.

Chapter 6 provides a fresh perspective on West Mediterranean obsidian consumption and interaction spheres through time. Using compiled data from my own analyses and previous obsidian studies, I discuss the reflexive relationship between obsidian consumption and long-term socio-economic processes, i.e. how broader historical developments were affected by, and in turn influenced, the relationships structured through obsidian consumption.

Chapter 7 details the results from Sicily while Chapter 8 discusses those from Sardinia. In combination, these data represent the largest compilation of post-Neolithic obsidian analyses to date. All of results are then combined and contextualized in a Discussion section before Chapter 10 presents concluding remarks and avenues for future research.

Chapter 2: Scales of Analysis

This research can in part be located within the intellectual tradition of the French *Annales* school of history championed by Fernand Braudel, who emphasized the role of long-term environmental and social processes in the making of Mediterranean prehistory. According to Braudel (1972, 1982), historical processes result from the interplay of three different kinds of histories, or temporal scales. At one end of the spectrum, there are *événements*, or short-term events with little temporal depth. In the middle, there are *conjonctures* that occur over a longer duration with slow but perceptible rhythms, while at the far end of the spectrum there are long-term processes that develop over the *longue durée*. History is seen to result from the interweaving of these different rhythms of time, thus downplaying the importance of specific events and political figures in favor of locating them within their broader environmental, geographic, and social contexts. In this sense, the temporal and geographic scales of analysis affect, and indeed determine, the archaeological patterns with which archaeologists engage (cf. Ames 1991: 935; Bailey 2007; Crumley 1979; Dobres and Robb 2000: 6; Knapp 1992).

While the *Annales* school is a much broader philosophical movement beginning in the early twentieth century (see Wallerstein 2001: 219), specific epistemological elements of its philosophy - and Braudel's work in particular - have since been adopted by archaeologists as a means of analyzing long-term histories of the Mediterranean (see Barker 1995; Blake and Knapp 2005; Broodbank 2013; Horden and Purcell 2000). Parallel debates concerning continuity and change in the past have also played out in archaeology more generally, viewing history, for example, as an accumulation of palimpsests (Bailey 2007) or as a dynamic relationship between long-terms structures and human and material agency (Hodder 1987; Giddens 1979; Dobres 2000; Meskell 2004).

Although these perspectives differ in their approach to long-term cultural change, they are relevant to the current research in that they force an explicit recognition of time depth and the inherent limitations one's scale of analysis has on the types of questions that can be answered in any particular context (see Ames 1991; Gamble 1986; Holdaway and Wandsnider 2008; Knapp 1992; Robb and Pauketat 2013). One must therefore operate at the appropriate temporal and spatial scales of analysis to address specific research questions.

Temporal Resolution

Temporal scales of analysis in *Annales* approaches are highly variable depending on the research questions being asked. For example, the focus of Braudel's (1972) original treatise on the Mediterranean was the sixteenth century A.D. His discussion of broader temporal developments thus served to contextualize a relatively short period of time. More general overviews of Mediterranean prehistory include Broodbank's (2013) survey of the region from the Lower Palaeolithic to Iron Age, Horden and Purcell's (2000) survey of the Classical and Medieval eras, and Barker's (1995) examination of the history of the Italian Biferno Valley from the Lower Palaeolithic to present day. With such diversity, Braudel's original conception of the time depth that constitutes the *longue durée* is relative.

For this study, the focus is on the Neolithic, Chalcolithic, and Bronze Ages of the West Mediterranean from the sixth to second millennia B.C. It differs from previous long-term regional histories in that it focuses on one particular aspect of prehistoric life, obsidian consumption, albeit contextualizing its procurement and use within broader socio-economic and political developments. These larger narratives are constructed from the ground up by examining patterns in the exploitation of these raw materials in 1,000 year units and then locating these data within their long-term contexts. The roles of exchange, interaction, and material culture in the constitution of society are emphasized as well as the role of topography, cultural traditions, value regimes, and maritime technology in the distribution of obsidian across the landscape through time.

While a number of regional syntheses on obsidian consumption have been produced previously (see Léa 2012; Pessina and Radi 2006; Vaquer 2007; Tykot 1996), these studies typically focus on the Neolithic (ca. 6th - 4th millennia B.C.) without fully discussing the collapse of long-distance exchange networks at the end of the Neolithic and the continued use of these products in the Chalcolithic and Bronze Ages. This is in part due to the lack of attention post-Neolithic obsidian assemblages have received in the literature and the dearth of available data upon which to make interpretations.

This research is able to take such a long-term perspective because this project involved generating a significant quantity of new primary data from Chalcolithic and Bronze Age artifact analyses on assemblages from Sicily and Sardinia. These data provide a foundation upon which to discuss post-Neolithic obsidian use, allowing us for the first time to discuss the entire history of obsidian use in the West Mediterranean and the role these materials played in larger cultural processes.

Spatial Resolution

One of the central tenets of Braudel's (1972) work was that the Mediterranean region could only be understood as a whole, an analytical unit that has since been adopted by more recent long-term analyses of the region (see Blake and Knapp 2005; Broodbank 2013; Horden and Purcell 2000). For these scholars, the Mediterranean represents a communications infrastructure organized around a central sea and a network of connected peoples, places, and things that are constantly in flux (Braudel 1972: 276).

While this unit of analysis makes sense for studying periods when one has the development of supra-regional socio-economic traditions such as those in the Classical and Medieval worlds, it is problematic for analyses of a pre-Bronze Age past in which there is little evidence for pan-Mediterranean connections. For analyses of the pre-Iron Age Mediterranean, the nature of the research questions being addressed should define the boundaries of the analysis.

Since the focus of this study is on the exploitation of obsidian sources in the western half of the Mediterranean Sea, the spatial resolution of the analysis is defined by where these materials were distributed. This includes modern-day Italy, Croatia, France, Spain, Tunisia, and Algeria, as well as various islands such as Sicily, Sardinia, Corsica, the Balearics, and Malta.

Chapter 3: Background to West Mediterranean Prehistory

This chapter provides an overview of major developments in West Mediterranean prehistory, with an emphasis on the Neolithic, Chalcolithic, and Bronze Age cultures of the sixth to second millennia B.C. This background will be critical for a later contextualization of the role of obsidian within these societies. While the main focus of this discussion is on obsidian use by sedentary agro-pastoralists, it is necessary to briefly introduce the indigenous peoples that occupied the regions of the West Mediterranean before the adoption of farming. Figure 3.1 provides a map of archaeological sites mentioned in the text.

Hunter-gatherers of the Mesolithic (ca. 10th - 7th millennia B.C.)

In the West Mediterranean, the Mesolithic refers to a cultural period beginning at the onset of the Holocene in the mid-tenth millennium B.C. when post-glacial climatic ameleoration took full effect throughout much of Europe, with mobile hunter-gatherer groups having to adjust to the continent's increased reforestation (Broodbank 2013: 130). In regional cultural terminology the Mesolithic comprises the transitional period between the Upper Palaeolithic and Neolithic characterized by broad social, economic, and technological transformation.

Compared to the Upper Palaeolithic, the early phases of the Mesolithic across Europe saw a diversification in subsistence economies, with more resources appearing in the diet such as deer, boar, elk, and a variety of small mammals; fishing also became common around inland lakes as seen by the appearance of fishhooks, harpoons, and bone

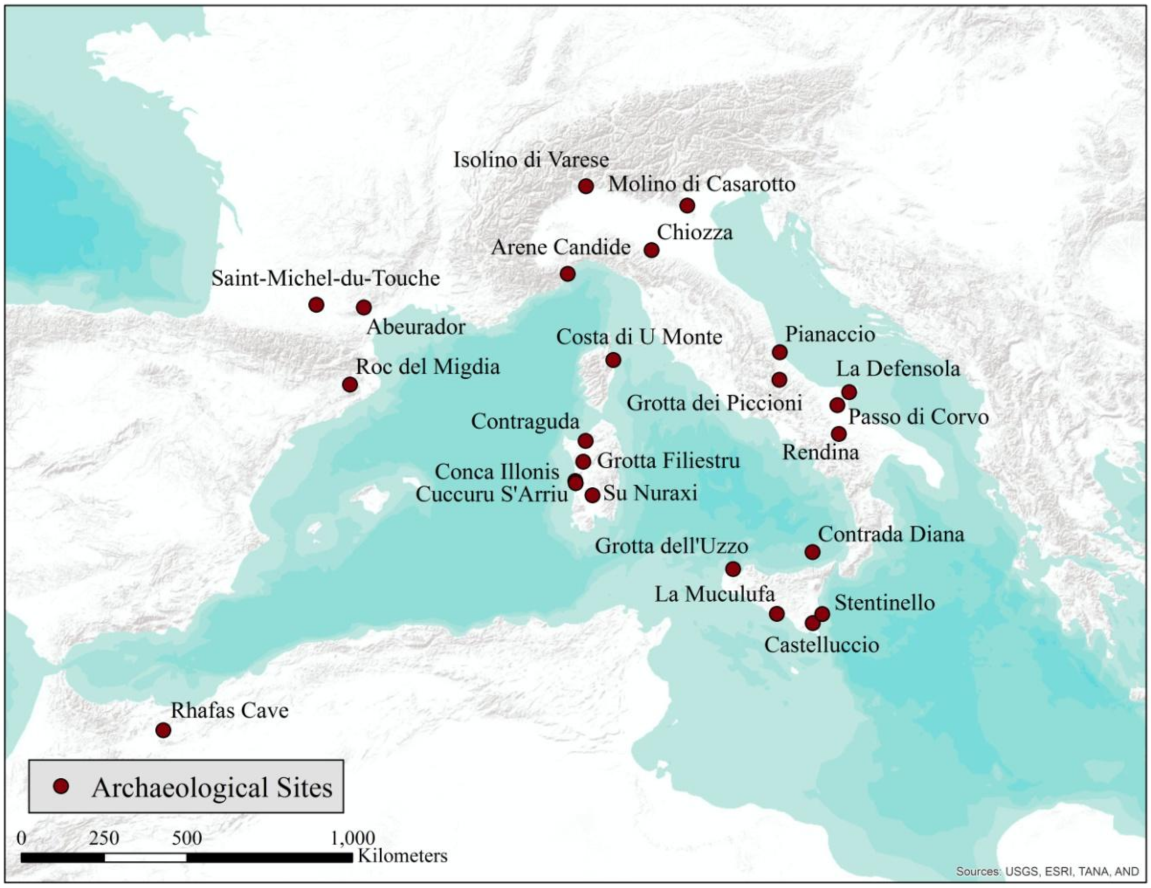

Figure 3.1 Map of archaeological sites mentioned in the text.

prongs in archaeological assemblages (Jochim 2002: 122). Perhaps in response to these changes, we see a corresponding adoption of microlithic tool technology and a move away from the large hunting implements that characterize Palaeolithic assemblages. At the same time, small groups began to inhabit previously unoccupied areas of northern and central Italy (see Fedele 1999; Tozzi and Notini 1999) as well as the islands of Corsica and Sardinia (Costa 2004; Sondaar and Van der Geer 2000). Although small-scale island hopping was occuring at this time, there is little evidence for sustained seafaring activities in the West Mediterranean, and by extent there is little evidence for the procurement of island-based obsidians at this time.

By the later phases of the Mesolithic (ca. 8th - 7th millennium B.C.), settlement patterns began to change with a sharp rise in the number of coastal settlements and a corresponding increase in the exploitation of marine resources (Biagi 2003; Costa et al. 2003; Mannino et al. 2007). As such, what we see throughout the West Mediterranean during the period just prior to the adoption of farming lifeways (the 'Neolithic') is a largely uninhabited landscape (see Biagi 2003: 141; Leighton 1999: 23; Kaczanowska and Kozłowski 2013: 20) occupied by small groups of seasonally mobile hunter-gatherers clustered around the Mediterranean coast.

The Neolithic: Definition and Origins (ca. 6th millennium B.C.)

The Neolithic in the Mediterranean Basin is primarily defined by the first appearance and co-presence of a 'package' of traits, including domesticated plants and animals, pottery, ground stone tools, sedentary villages, and long-distance exchange items (Barker 2006: 327; Whitehouse 1986: 42). Nevertheless, there is a high degree of variability in terms of the timing of these changes and in the presence or absence of these various traits across space. The Neolithic is also claimed to be not only a change in subsistence bases, technological practices, and residency, but also as a larger symbolic, religious, and artistic revolution (Cauvin 1994). Concerning the origin of Neolithic practices in the western Mediterranean, the consensus is that its roots - certainly with regard to the beginnings of plant cultivation and animal husbandry, can be traced to developments in Southwest Asia between 9000 and 7300 B.C. (Bellwood 2005: 46).

In the West Mediterranean, the beginning of the Neolithic can be traced to the rapid appearance of stylistically similar Cardial and Impressed ware ceramics across the region by the first half of the sixth millennium B.C., a type of pottery that excavations have shown to be associated exclusively with village farming life. Based on an analysis of the radiocarbon evidence, Skeates (2003: 170) shows that the earliest Neolithic sites are found in southern Italy, where distinctive ditched villages appear across the Tavoliere Plain and eastern Sicily by the first half of the sixth millennium B.C. From there, it is believed that small groups moved north up the two coasts of Italy and along the Adriatic coast of Dalmatia (see Forenbaher and Miracle 2005). Some went on to colonize the islands of Corsica and Sardinia, where Cardial Impressed wares are found at over 50 sites on the two islands and particularly along the west coast of Sardinia (Tykot 1999: 70). Eventually Neolithic settlers reached the Iberian Peninsula by the middle to late sixth millennium B.C. (Zilhão 2001). The islands of Malta and Gozo were also settled by the second half of the sixth millennium B.C., where they produced local impressed pottery related to Stentinello types of southern Italy (Malone 2003: 256).

Because farming and the larger adoption of the Neolithic 'package' in the West Mediterranean were clearly influenced by cultural practices in the east, a central concern for many scholars studying the origins of the Neolithic is the degree to which the adoption of farming occurred as a result of demic diffusion, cultural diffusion, or independent invention. Demic diffusion implies that farming practices spread though the movement of farming colonists while cultural diffusion is the idea that farming techniques spread from one group to the next without the displacement of people (i.e.

ideational flow). The interplay between these various models has been one of the key facets of archaeological discourse on the subject since the late 1960s, and archaeologists have used a wide range of data to address the issue, including archaeobotanical, skeletal, ceramic, lithic, architectural, ethnographic, isotopic, genetic, linguistic, environmental, and radiocarbon evidence.

It was initially proposed that the Neolithic spread steadily along a single 'wave of advance' through a model of demic diffusion alone, which was supported by the rapid increase in population density across the West Mediterranean at the onset of the Neolithic and by corresponding studies of the earliest radiocarbon dates and population genetics (Ammerman and Cavalli-Sforza 1971, 1984). While this general model is still upheld by more recent studies of ancient DNA (Lacan et al. 2011), it has since become clear that the archaeological record is more regionally complex and varied than originally thought.

For example, cladistic analyses of the morphology of sheep bones at coastal sites in northern Italy and southern France indicate multiple axes of advance across the Mediterranean Sea, not a single 'wave' as initially proposed (Broodbank 2013: 192). Moreover, there is evidence that hunter-gathering communities experimented with plant cultivation at pre-Neolithic sites such as Grotta dell'Uzzo in modern-day Sicily (Costantini 1989), Abeurador in southern France (Vaquer et al. 1986), and Roc del Migdia in Catalonia (Holden et al. 1995), although these examples appear in hindsight to be anomalous. While it is likely that inland Mesolithic populations adopted certain Neolithic traditions through contact with coastal farmers - as in the case of northern and central Italy where there is a selective adoption of Neolithic traits by the latter half of the sixth millennium B.C., most evidence indicates a maritime movement of Neolithic farmers from east to west across the Mediterranean Sea (Broodbank 2013: 186; Zilhão 2001). The maritime proclivity of this expansion does not fit with what is known about Mesolithic peoples, who show little to no evidence of boat use before this point.

Settlement and Subsistence

By the end of the sixth millennium B.C., various aspects of the Neolithic way of life had been adopted throughout the West Mediterranean. In southern Italy and Sicily, ditch-enclosed villages of up to 200-300 people were interspersed across arable plains and river valleys where communities such as Rendina and Stentinello practiced a combination of cereal cultivation and animal husbandry (Robb 2007: 34). Similar subsistence strategies are also evident along the coastal regions of northern Italy and southern France, although most of the known sites are located in caves and rockshelters as opposed to the open-air villages that characterize southern Italy. The degree to which this is a bias in archaeological data collection is debatable (see Maggi 1999).

In contrast to the coastal regions of central and northern Italy where sedentary farmers and herders settled at cave sites such as Arene Candide in the earliest phases of the Neolithic (Bernabò Brea 1956), the people living in the interior regions of the Po valley and the lower Alps only adopted various parts of the Neolithic package by the second half of the sixth millennium B.C. Thus while sites is this region produced typical Neolithic ceramics and a wide range of exchange items (Price 2000: 12), their lithic technologies show clear continuity from Mesolithic traditions; similarly, hunting also continued to play a major role in their subsistence base (Binder 2000; Broodbank 2013: 192).

On Corsica and Sardinia, we see a mixed economy of animal husbandry and to a lesser degree plant cultivation at open-air settlements and cave sites such as Grotta Filiestru in northwest Sardinia (Tozzi and Weiss 2001; Trump 1982). While there is clear evidence for the exploitation of domesticated cereals such as emmer and einkorn at a number of sites throughout the region (Pittau et al. 2012), the rocky and hilly terrain that characterizes much of Corsica and Sardinia made sheep and goat herding especially viable.

Exchange

With long-distance exchange intensifying at the onset of the Neolithic, it is likely that the colonization of the West Mediterranean by non-local farming populations was facilitated by networks of communication predicated upon the circulation of exotic raw materials, where communities became increasingly entangled within larger webs of interaction and connectivity (cf. Di Lernia 1998; Robb and Farr 2005: 26-27). By the earliest phases of the Neolithic, a wide range of exchange items and prestige goods were beginning to be distributed throughout the West Mediterranean, including obsidian, polished greenstone and jadeite axes, and high quality flint. While it is likely that pottery and a range of other perishable goods also circulated at a more local level, there have been few studies to confirm or deny these hypotheses.

Prestige goods in this context are considered objects in which a high symbolic value would have been ascribed due to their rarity or difficulty in acquiring or producing (Skeates 1993a: 110; see also Gero 1989). While it may seem that long-distance exchange items would have had an inherent social value, archaeologists must appreciate that Neolithic groups – due to their sedentary nature - would would have had a much more localized geographic knowledge, to the point at which an object from 100 or 1,000 kilometers away would have been equally 'exotic' (Helms 1988; Robb 2007: 200). Regardless, these objects still served important social functions and were not available to everyone.

The most prevalent and widely distributed raw material during this time was obsidian, which is found at archaeological sites throughout mainland Italy, Sardinia, Sicily, and parts of northern Africa. While there are distinct regional differences in the specifics of how obsidian was being worked, it remains that simple unretouched blades were by far the most common tool type being made and used, particularly outside of Sardinia and Corsica where flake-based tools are more common (see Lugliè et al. 2007).

While most attention in the archaeological literature has focused on obsidian, a range of other objects were also in circulation. Polished greenstone and jadeite axes of about 10-15 centimeters in length are common throughout much of mainland Italy and Malta, with sources in Calabria and northern Italy (Robb and Farr 2005: 28). While there is evidence for the use of axes as functional tools, their finely polished appearance over the entirety of their surface suggests that these objects were appreciated for their aesthetic properties and may have circulated unhafted (Skeates 1995).

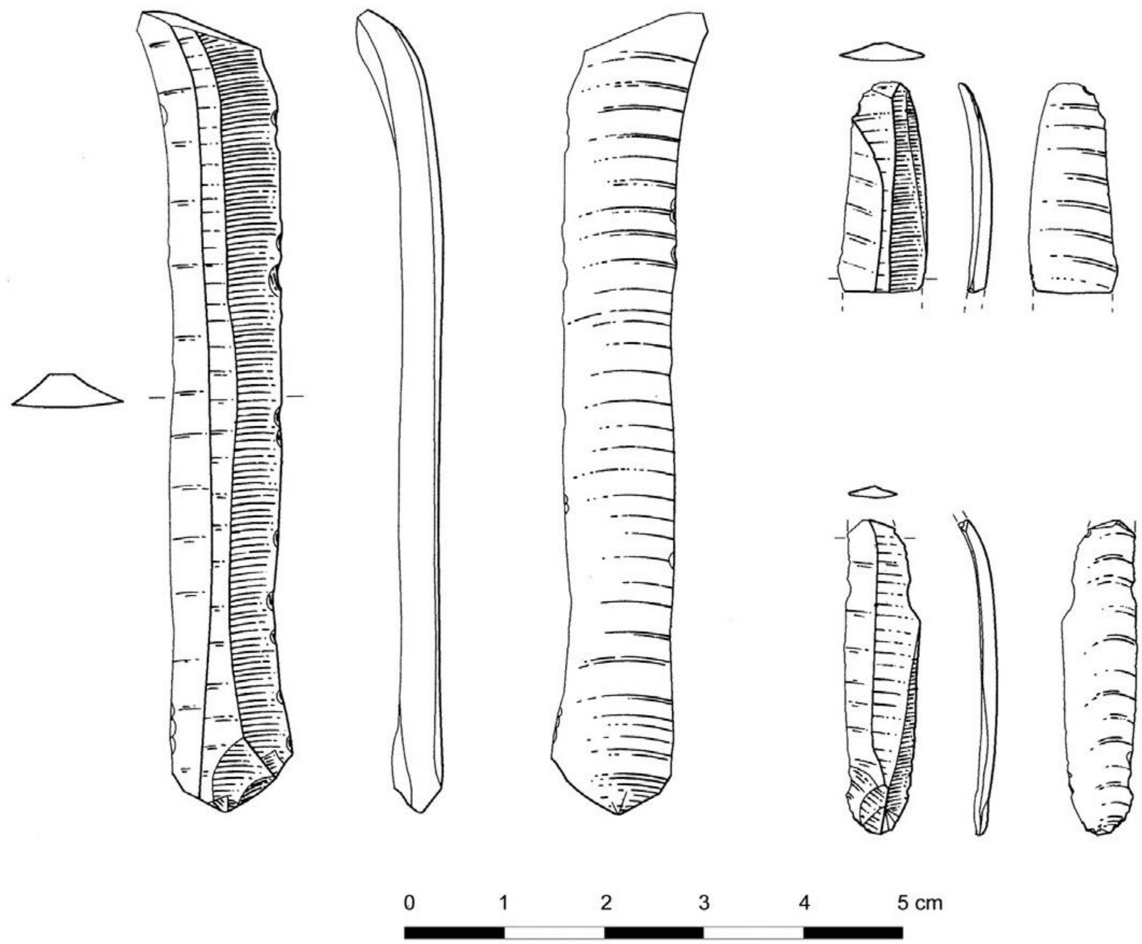

Figure 3.2 Examples of pressure-flaked blades from Catalonia, Spain (after Terradas et al. 2014: 75).

High quality flint sources are found in southeast Sicily, the Gargano Peninsula of east-central Italy, and the southern Alps. Due to the lack of archaeological study, it is not known exactly how far these raw materials were displaced, although there is evidence for the systematic extraction of flint at La Defensola on the Gargano Peninsula as early as the sixth millennium B.C. (Di Lernia 1998). While there is evidence for finely made flint blades in southern France, Corsica, and Sardinia in later periods of the Neolithic, most evidence indicates that these materials served a strictly functional role in society, being used to perform the bulk of everyday activities.

Social Organization

Early Neolithic communities across the West Mediterranean are considered to have been similar in their overall social organization. For example, an analysis of settlement patterning indicates an overall lack of large central buildings or elite residences. Moreover, there is no evidence for territorial control or settlement hierarchies (Malone 2003: 298).

Despite several isolated cases, an analysis of skeletal evidence indicates a lack of inter-personal violence (Robb 1994), while a further examination of funerary evidence and settlement patterning data gives the impression of relatively egalitarian social groups divided according to gender and kin relations (Robb 2007: 40-43). Burials during this time typically consist of single inhumations in simple pits within villages and inhabited caves with few grave goods (ibid 2007: 63).

North Africa

Unfortunately, the lack of archaeological data from well-excavated contexts in North Africa puts the focus of the present work on European cultures of the West Mediterranean. Nevertheless, future work in the region is sure to provide interesting and relevant results as it relates to the nature of obsidian consumption and larger interaction spheres in the West Mediterranean.

What is currently known, however, is that in northern Africa the 'Neolithic of Capsian Tradition' began around 5000 B.C. and is characterized by small mobile communities practicing pastoralism and seasonal shellfish gathering along the coasts, complete with pottery and a mixed hunting and gathering subsistence economy at sites farther inland (Broodbank 2013: 209). These patterns continue largely unchanged throughout the Neolithic.

While there is clear evidence for the use of western Mediterranean obsidians at a number of undated sites throughout Tunisia (Mulazzani et al. 2010) and the use of Cardial pottery at Rhafas Cave in eastern Morocco (Weninger et al. 2006: 58-59), most data indicate that these populations were more influenced by cultural developments farther south (Broodbank 2013: 210).

Middle to Late Neolithic Regional Diversification (ca. 5th - late 4th millennia B.C.)

While the Early Neolithic is characterized as a relatively homogenous cultural landscape in terms of settlement size, material culture, and social organization, the Middle to Late Neolithic of the fifth to fourth millennia B.C. are viewed as periods of increasing regional diversity (Table 3.1). Milisauskas and Kruk (2002: 223) highlight technological innovation, demographic growth, improved subsistence, and novel ideologies and beliefs as key factors in the emergence of regional distinctions.

Settlement and Subsistence

Due to a range of circumstances such as land exhaustion and environmental change, there is a partial abandonment of ditched villages across the Tavoliere Plain as populations moved to higher terraces and previously unoccupied lowlands farther south (Broodbank 2013: 224). This is nevertheless a period of population growth and expansion, with numerous small hamlets and villages established over vast swaths of the arable lowlands. Large farming villages such as Passo di Corvo also developed from smaller hamlets, eventually occupying an area of up to 172 hectares (425 acres; Tinè 1983). In turn, painted pottery slowly replaced earlier Impressed wares (Malone 2003: 276).

By the Middle Neolithic in central Italy, sedentary farming villages are increasingly found in valleys along inland rivers and lakes. At the site of Pianaccio, for example, lowland ridges were exploited to produce a mixed economy of cereal cultivation and ovicaprid husbandry (Malone 2003: 267). Neolithic groups also settled in the remote upland caves of the Apennines, where residents at sites such as Grotta dei Piccioni practiced a mix of pastoral herding (goat, sheep, etc.) and hunting (Radmilli et al. 1978). By the later phases of the Neolithic (ca. 4th millennium B.C.), a high degree of cultural uniformity develops between central and southern Italy. This is characterized by the ubiquitous presence of distinctive Diana ware ceramics and the consumption of obsidian blades and bladelets produced by communities in Calabria and on the island of Lipari at Contrada Diana (Ammerman 1985; Bernabò Brea and Cavalier 1960).

Northern Italy is composed of a diverse range of environments and landscapes, ranging from the lowlands of the Po Plain to the mountainous regions and inland lakes of the lower Alps and the Adriatic coast; settlement patterns are equally diverse. In the lower Alps, communities such as Isolino di Varese and Molino di Casarotto built wooden structures alongside inland lakes (Barfield and Broglio 1986; Guerreschi et al. 1991) while farther south on the Po Plain sites such as Chiozza reveal large structures and a mass of shallow cavities and pits (Bagolini 1972). Despite such diversity, however, communities in this region are similar in their production of distinctive square-mouthed pottery (ca. 4600-3800 B.C.) and in the consumption of obsidian and other exchange items. These groups also continued to hunt, fish, and gather foods; domesticates were not a dominant part of the diet in northern Italy until the later Lagozza phase of the Neolithic, when a mixed economy of agriculture and pastoralism was slowly adopted in many regions, although hunting and fishing were still important (Malone 2003: 271).

In southern France, the Chasséen culture (ca. 4400-3300 B.C.) develops by the second half of the fifth millennium B.C. and extends along the arable pastures of the Rhône, Aude, and Garrone valleys. These communities were sedentary farmers and herders who lived in small hamlets, villages, and caves interspersed across the landscape, sharing a number of cultural affinities with Lagozza communities of northern Italy (Broodbank 2013: 224; Martin et al. 2008). While settlement patterns are variable, ranging from large villages like Saint-Michel-du-Touche to small cave sites, Chasséen

	Sardinia	Corsica	Sicily	S. France	N. Italy	C. Italy	S. Italy	Malta	N. Africa
Mesolithic	Corbeddu	Preneolithic	Uzzo	Sauvetterien Castelnovian	Sauvetterien Castelnovian	Sauvetterien Castelnovian	Sauvetterien Castelnovian	—	Capsian
E. Neolithic	Impressed Filiestru	Impressed Curasien Presien	Impressed Stentinello	Impressed	Impressed Fiorano	Impressed Sasso	Impressed	Ghar Dalam	Impressed/ Capsian
M. Neolithic	Bonu Ighinu San Ciriaco	Basien	Trichrome Serra d'Alto	Chasséen	VBQ/ Chiozza	Ripoli	Serra d'Alto	Grey Skorba	Middle NCT
L. Neolithic	Ozieri Sub-Ozieri	Terrinien	Diana	Ferrières Treilles Fontbuisse	Lagozza	Diana	Diana	Red Skorba	Upper NCT
Chalcolithic	Filigosa Abealzu Monte Claro		Conzo Malpasso	Beaker	Remedello	Rinaldone	Gaudo	Zebbug Ggantija Tarxien	Beaker
Bronze Age	Bonnanaro Nuragic	Torrean	Castelluccio Thapsos Pantalica	Urnfeld	Terramare	Apennine	Apennine	Tarxien Cemetery	

Table 3.1 Simplified chronological sequence for the West Mediterranean (after Milisauskus 2002: 149; Tykot 1995: 14).

communities are given a common cultural name on the basis of their shared ceramic traditions. Megalithic architecture is also prevalent, being constructed as burial tombs and freestanding stone menhirs (Milisauskas and Kruk 2002: 225). This tradition of megalithic construction is by no means limited to France, but forms part of a much wider tradition that extends across Europe and the islands of Corsica, Sardinia, and Malta.

Interspersed among the rugged terrain of Corsica, Neolithic caves and rockshelters were exploited in combination with open-air settlements such as Costa di U Monte (Marini et al. 2007). These communities heavily relied on pastoral herding and to a lesser degree plant cultivation at select sites (Lewthwaite 1985: 47). Farther south in Sardinia, sedentary farming villages of the Bonu Ighinu phase (ca. 4700-4000 B.C.) are found throughout coastal and inland plains as well as the mountainous uplands of the interior, where communities settled in caves and rockshelters and practiced a mix of ovicaprid husbandry and plant cultivation. The exploitation of inland marine resources is also evident at sites such as Cuccuru S'Arriu and Conca Illonis (Malone 2003: 262). The later Ozieri phase of the Neolithic sees a continuation and intensification of these trends.

Exchange

Similar to the Early Neolithic, the Middle to Late Neolithic sees the continued circulation of a wide range of exchange items and prestige goods among communities throughout the West Mediterranean, including obsidian, high quality flints, polished greenstone and jadeite axes, and the first copper tools and ornaments.

Obsidian was still the most widely distributed raw material, being found throughout mainland Italy, Sardinia, Sicily, Malta, and now for the first time at a large number of sites in southern France and Spain in the form of pressure-flaked blades. Considering that obsidian is quite fragile and is found in limited quantities outside of the immediate source areas, Robb (2007: 203) argues that these blades served a distinct social function in body modification, including hair cutting, shaving, scarification, tattooing and piercing. While there is little direct evidence for these practices in the western Mediterranean (i.e. usewear analyses), the use of obsidian blades for body modification is well attested in the ethnographic record of the western Pacific (Kononenko and Torrence 2009; Specht 1981), while in the 3rd - 2nd millennium B.C. Bronze Age Aegean there is good contextual and functional evidence for such practices (Carter 1997). Further indirect evidence comes from the Tyrolean Iceman of the Late Neolithic/Early Chalcolithic, who had his hair cut and displayed several tattoos (Pabst et al. 2009).

The exchange of polished stone axes also intensified by the beginning of the fifth millennium B.C., and these objects circulated over a large area that includes mainland Italy, southern France, and much of western Europe (Pétrequin et al. 2006). Other exotic exchange items found at sites in southern France and northern Italy include rocks such as eclogite (Ricq de Bouard 1993), minerals such as variscite (Camprubi et al. 2003), and amber (Phillips et al. 1977).

This period also saw an intensification of flint mining at La Defensola in east-central Italy (Di Lernia 1998). While flint products in central and southern Italy were used to produce retouched tools for everyday use, finely worked Bédoulien pressure flint blades of up to 50 centimeters in length were also distributed throughout many regions of southern France (Galiberti 2005; Gassin et al. 2011). On Sardinia, similar large blades were produced from local flint sources at Contraguda (Costa and Pélegrin 2004).

As early as the mid-to-late fourth millennium B.C., Neolithic communities began to experiment with metal technology, mainly in northern Italy and Sardinia, where locally available sources of copper and silver made smelting possible (Kassianidou and Knapp 2005: 219). In contrast to Sardinia where it appears that metalworking was independently invented, metallurgy in northern Italy was likely adopted from elsewhere, either from the Balkans, the East Mediterranean (Strahm 2007), or from Iberia (Maggi and Pearce 2005). In these early phases, metal use appears to have been highly restricted and is only represented by a small number of total artifacts, the products including items for personal adornment, weaponry, and simple tools such as awls, points, and axes (Dolfini 2013: 495).

Social Organization

Most evidence indicates that Middle to Late Neolithic societies were egalitarian in nature and lacked any formal social hierarchy (Malone 2003; Robb 1999). While there is more diversity in settlement sizes when compared to the Early Neolithic, there is no evidence of territorial control or large central places (Malone 2003: 298). Nevertheless, by the late 4th millennium B.C., there are a number of socio-economic changes that signal a much broader shift in social organization. Although the archaeological record is highly variable, there seems to be a highly significant change in funerary practices, with a move away from single inhumations toward collective tombs in formal cemeteries (Malone 2003: 294). Moreover, the introduction of metal technology is argued to have led to a shift toward more gender-based ideologies and male representation (Robb 1999: 113). By the third millennium B.C., these changes are fully realized as a new suite of prestige items and cultural practices took hold in the West Mediterranean and beyond.

The Chalcolithic and Cultural Reconfigurations (ca. late 4th - 3rd millennia B.C.)

The Chalcolithic, or Copper Age, is a transitional period between the Neolithic and Bronze Age characterized by large-scale cultural and socio-economic changes throughout the West Mediterranean, including a marked decline in the tradition of exchanging and using obsidian. The period is often associated with the widespread adoption of metalworking as well as broader social and symbolic transformations represented by new forms of inter-personal violence (e.g. daggers, halberds, etc.) and funerary practices (see Vander Linden 2006). In certain instances these changes are viewed as part of an inter-related cultural whole, referred to as the Beaker Culture.

The Chalcolithic of peninsular Italy is commonly divided into four distinct archaeological cultures based upon different burial traditions: Remedello in the north, Rinaldone in the center, Gaudo in the southwest, and Laterza in the southeast (cf. Trump 1966). In contrast, the Chalcolithic of southern France, Sicily, and Sardinia are defined by different ceramic traditions, while on Malta the Tarxien phase is named after the so-called temple complexes of Hal Tarxien and the other the 25 or so monumental buildings and temples found throughout the island that typify this period.

Settlement and Subsistence

Chalcolithic settlement and subsistence is a surprisingly underdeveloped field of study and has typically been discussed in relation to the rise of pastoralists and warlike nomadic herders (Robb 2007: 300). This is supported by a general expansion of populations from arable lowlands to more mountainous uplands as well as an increase in archaeological evidence for the exploitation of secondary animal products such as wool and milk (Barker 2005: 56).

Over the past decade, however, isotopic and archaeobotanical analyses have shown that the situation is more complex. While there are changes across the West Mediterranean in settlement patterning as a result of population increase and evidence for a diversification of subsistence resources, there is little evidence to indicate a substantial shift in human-environment interaction when compared with earlier periods. For example, through the isotopic analysis of human remains from Sardinia, Lai (2008) demonstrates that there is actually an increase in the contribution of plant foods to the diet from the Late Neolithic to Chalcolithic. Moreover, in northern Italy, Rotolli and Castiglioni (2009: 98) show that a wide range of cereals, grains, and pulses were exploited throughout the region over the course of the third millennium B.C.

Exchange

With such a diverse range of cultural terms for Chalcolithic societies (e.g. Gaudo, Rinaldone, etc.), it is easy to forget just how connected these regions actually were, considering that this is a period characterized by increased maritime mobility and the proliferation of new long-distance exchange items and a widespread shared ceramic tradition. The latter comprise the so-called ‘Bell Beakers’, a distinctive ceramic form that is found throughout modern-day Spain, France, northern Italy, Sardinia, western Sicily, and parts of northern Africa (Salanova 2002). These Beakers were likely drinking vessels for the consumption of beer or other fermented liquids and are often found in funerary contexts. Because the burials in which Beakers are found vary along social axes such as age and gender, these vessels are often associated with gender-specific ideologies and new ways of defining the 'self' (Brodie 1997). In addition to this particular type of pottery, a range of other prestige goods have been defined on the basis of their rarity, skill of manufacture and/or context of discovery, including archery wrist guards, jasper, large flint blades, and clay figurines (Broodbank 2013: 333; Robb 1999). Other significant changes in social practices include the collapse of certain exchange networks and value regimes with the cessation of obsidian consumption at distance by populations in mainland Italy and France; obsidian did, however, continue to be used by communities close to the sources on the islands of Sardinia and Sicily.

Metalworking also proliferated dramatically during the third millennium B.C. as copper axes, daggers, and halberds become increasingly common throughout Italy, although still concentrated in Sardinia and northern and central Italy. Usewear studies reveal that axes were normally employed as working tools while weapons such as daggers and halberds show few signs of use. As such, these weapons can be seen as symbolically charged items related to new modes of social distinction and personal expression, which are further embodied in iconographic and artistic representations (Dolfini 2011: 1047; Robb 2007: 315).

Social Organization

The Chalcolithic is viewed as an important turning point in West Mediterranean prehistory, not just because of the adoption and proliferation of metal technology, but rather due to the social and symbolic transformations these materials embodied. The period is marked by the collapse of obsidian interaction networks and is best understood as a much broader movement with roots to the Late Neolithic, in which new material culture, technologies, ideologies, and practices formed the bases of social structure (see Broodbank 2013: 260-262; Vander Linden 2006).

While Neolithic societies are typically characterized as egalitarian and lacking in any formal social hierarchy, Robb (2007: 337) argues that the reorganization of prestige around a central male gender ideology during the course of the late fourth to third millennia B.C. would have allowed certain individuals, or 'Big Men', to accumulate social capital through the manipulation of the inherent inequalities certain prestige goods embodied.

The Bronze Age (ca. late 3rd - 2nd millennia B.C.)

The Bronze Age saw a continuation and intensification of many of those trends that I just outlined for the Chalcolithic. It also represents a pivotal junction between the dominance of small-scale societies with transient power structures and the emergence of communities with clear social hierarchies, on the margins of the great state-level 'civilizations' of the eastern Mediterrnean. The West Mediterranean Bronze Age is composed of a complex mosaic of cultures with increasingly long-distant connections with far-away lands, particularly with the Aegean Mycenaean states of the second millennium B.C.

With obsidian use at this time largely restricted to populations living close to the sources, it makes little sense to provide an overview of Bronze Age cultures across the West Mediterranean. The focus is therefore placed upon those groups that were involved in the procurement, exchange, and use of obsidian. This includes the Bonnanaro and Nuragic communities of Sardinia and the Castelluccio groups from Sicily.

Settlement and Subsistence

The Sardinian Bronze Age begins around 2200 B.C. and ends with the arrival of Phoenician colonists at the start of the Iron Age around 850 B.C. The earliest phase is divided into two parts: Bonnanaro A and Bonnanaro B. Bonnanaro A (ca. 2200-1900 B.C.) shares cultural affinities with earlier Chalcolithic phases while the Middle Bronze Age Bonnanaro B (ca. 1900-1600 B.C.) sees the construction of the first proto-nuraghi, low stone platforms with internal corridors and chambers hypothesized to be a central meeting place related to a range of ritual activities (Tykot 1994: 125; Webster 1996: 68). This era marks the beginning of a significant shift in architectural design, although it is not until the beginning of the Nuragic that we see the full expression of these changes.

The beginning of the Nuragic period dates to around 1600 B.C. and is characterized by increasingly dense populations of pastoral herders and farmers. The period is named after the approximately 7,000 truncated cone-shaped residential stone structures called *nuraghi* that are found throughout the island. These structures are corbelled domes made of cut granite and basalt; they average approximately 12 meters in diameter and originally rose to around 15-20 meters high, although there is a wide range of variation. Two types of nuraghi are present: 'simple' and 'complex'. Simple towers had low doors, interior stairways, and one or two chambers while complex nuraghi are characterized by additional stories and multiple chambers and walls (Figure 3.3). These likely represent a chronological progression with an increase in complexity over time. Melis (2003: 21-24) argues that nuraghi served as fortified nuclear family homesteads that took on a variety of roles ranging from a residence, territorial marker, watchtower, and symbol of status and prestige for the entire community.

In contrast, the Bronze Age of Sicily is divided into several phases based on distinct pottery types and burial practices. Archaeological sites dating to the Castelluccio phase of the Early Bronze Age (ca. 2500-1430) are widespread, often taking form as villages on promontories and hills overlooking coastal plains and river valleys (Procelli 1996: 92). These communities practiced a combination of agriculture and pastoral herding. At La Muculufu, for example, plant remains include cereals such as wheat and barley as well as other fruits and wild plants; sheep and goat make up 70% of the faunal assemblage, while pig and cattle were of lesser importance (Cruz-Uribe 1990).

Figure 3.3 The complex nuraghe and surrounding village of Su Nuraxi.

Exchange

On Sardinia, copper and obsidian are the main local raw materials in circulation across the island (see Webster 1996), although a range of other perishable goods were also likely exchanged. As is the case throughout much of Sardinian prehistory, the island remains isolated from many of the cultural developments occurring on mainland Italy, including increasingly common exchange ties to the Aegean.

While it is unclear exactly when the tradition of using obsidian died out, this research presents evidence for the exploitation and exchange of these products on Sardinia until at least the end of the second millennium B.C., i.e. up until the later stages of the Bronze Age. More specifically, there is evidence for the circulation of distinctive lunate tools that have been shown to be used for plant processing (Figure 3.4; Hurcombe 1992). It is at this same time that metals became increasingly common at archaeological sites throughout the island, taking form as bronze weapons, jewellery, and votive figurines/*bronzetti* (Webster 1996). Bronzetti are bronze figures of up to 30 centimeters in size depicting male archers, wrestlers, and warriors as well as animals, boats, and nuraghi.

On Sicily, the use of raw materials such as Monte Hyblaea flint from southeastern Sicily continued until the later phases of the Bronze Age; however, by the mid-second millennium B.C. obsidian use was virtually non-existent. Just as obsidian use was dying out, a wide range of other exchange items and prestige goods were in circulation, including bronze weapons, jewellery, faience, pottery, and gold and silver ornaments, that clearly attest to intensified interaction with the Aegean world (Broodbank 2013: 351).

Social Organization

A major debate for archaeologists studying the Nuragic is the degree to which society was socially stratified (see Blake 2002; Bonzani 1992; Dyson and Rowland 2007; Lilliu 1982). Nuragic architecture and burial construction have been key facets in these discussions. For example, Dyson and Rowland (2007) relate changes in Nuragic construction (i.e. simple vs. complex nuraghi) to a concomitant outgrowth of social and economic stratification while others argue that nuraghi are far too common to be emblematic of an elite (Broodbank 2013: 424). While the presence of an 'elite' class in Nuragic Sardinia is perhaps unlikely until at least the beginning of the first millennium

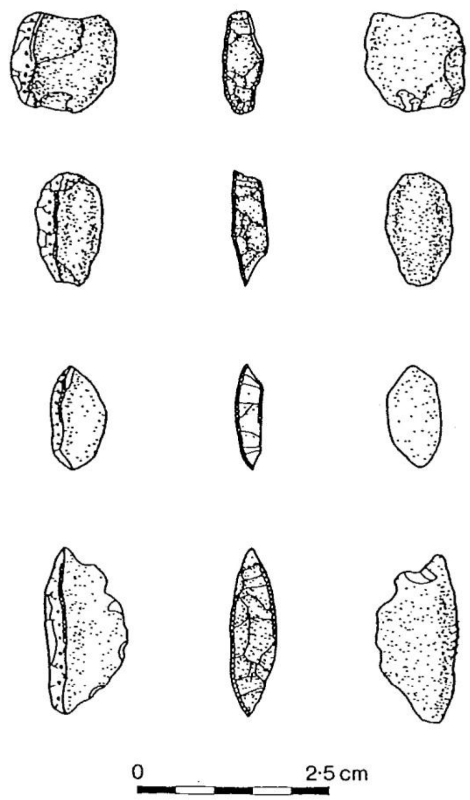

Figure 3.4 Examples of lunates from Nuraghe Ortu Còmidu (after Hurcombe 1992: 91).

B.C, it is undeniable that settlement sizes are quite variable and that prestige goods are often found at the biggest sites (Chapman 2005: 86). Nevertheless, there is much work to be done in the region in terms of establishing a reliable chronology for these developments.

While these debates are important, the focus on diversification and differentiation often averts attention from the remarkably interconnected cultural landscape represented by similar material culture, settlement patterns, subsistence practices, burial traditions, and artistic representations. Considering the relative isolation of the island from outside

Figure 3.5 Rock-cut tombs from the necropolis at Castelluccio.

influences compared to contemporaneous communities elsewhere in the Mediterranean, it is in these similarities that a uniquely Sardinian Bronze Age culture is born.

On Sicily, burial architecture and funerary ritual are key components in the analysis of social organization. This includes, for example, Early Bronze Age rock-cut tombs such as those from the necropolis at Castelluccio (Figure 3.5). These are typically multi-chambered tombs with collective inhumations, sometimes up to 100 individuals. Grave goods are common, but never highly elaborate, and include items such as jewellery, pottery, lithics, and to a lesser degree metals (Leighton 1999: 130). Because of the placement of many of these tombs in prominent locations on the landscape, it is hypothesized that these burials represented kin groups and extended families who expressed their social standing through burial architecture (Procelli 1996: 96).

In general, the Sicilian Bronze Age is characterized by population growth and growing social inequality, particularly during the later phases (Leighton 1999). Sicily's prominent position between the East and West Mediterranean in part fueled an increasingly competitive cultural landscape characterized by the accumulation of prestige goods and growing social inequality and centralized leadership (Leighton 1999: 147), a world in which obsidian was no longer relevant.

Chapter 4: Obsidian Characterization Studies in Archaeology

Having just provided an overview of major developments in West Mediterranean prehistory, I will now turn my attention to obsidian consumption more specifically and the ability for its study to contribute to debates of cross-cultural significance. This section begins with a brief introduction to the relevant obsidian sources in the West Mediterranean before providing a background to obsidian characterization studies in archaeological research. This includes an overview of the scientific techniques that have been used to study obsidian and the archaeological questions these analyses have been used to address, with specific reference to the West Mediterranean.

The Obsidian Sources of the West Mediterranean

There are four island sources of obsidian in the West Mediterranean, including Monte Arci, Lipari, Palmarola, and Pantelleria (Figure 1.1). Over the course of geological history numerous eruptive events have occurred amongst these island volcanic complexes, a number of which produced flows of obsidian. An obsidian 'source' in this sense represents one or more volcanic events within a restricted area (Pollard and Heron 2008: 77). When as geo-archaeologists we refer to a ‘subsource’ of obsidian, we are specifically talking about the products of a distinct eruptive event from the same magma source; these products can be distinguished from those associated with other flows on the basis of their date (elicited by various geo-chronoloical methods) and/or their different physical properties. Thus, there are two archaeologically significant outcrops/subsources on Lipari, four at Monte Arci, two on Palmarola, and two on Pantelleria (see Appendix A for further geological details). For archaeologists, the differentiation between these subsources is relevant because there are distinct differences in the exploitation of various outcrops through both time and space.

Lipari

Lipari is an Eolian Island situated about 30 kilometers north of the island of Sicily, occupying an area of slightly less than 40 square kilometers. The earliest exploitation of Lipari obsidian both locally and by distant populations occurred during the sixth millennium B.C., continuing through the mid-2nd millennium B.C. on the island of Sicily. Lipari has a long history of volcanic activity with multiple outcrops of obsidian, although most of what is visible today resulted from more recent eruptions within the past 2,000 years. The main flow exploited by prehistoric communities at Gabellotto Gorge was originally dated by Bigazzi and Bonadonna (1973) to 11400 ± 1800 B.P., although later work by Wagner et al. (1976) revealed a slightly younger date of 8600 ± 1500 B.P. Bigazzi et al. (2005: 4) suggest that the younger date is more accurate. Regardless, this rules out any possibility of obsidian exploitation by human populations before the middle to late phases of the Mesolithic. Although excavations have taken place at Neolithic settlements on the island itself, there is little evidence for the primary extraction of raw materials from the source, likely due to more recent volcanic activity obscuring such activities.

Monte Arci (Sardinia)

Monte Arci is a volcanic massif located in west-central Sardinia extending over an area of approximately 25 x 5 kilometers. The exploitation of the source began during the sixth millennium B.C. and continued locally through the late 2nd millennium B.C. Although there has yet to be a comprehensive dating of obsidians from all of the various subsources (SA, SB1, SB2, and SC), the most recent fission-track dates of unspecified obsidians from the source are 3.59 ± 0.22 and 3.50 ± 0.21 mya (Bellot-Gurlet et al. 1999: 642).

Within the past decade, excavations at Monte Arci itself have revealed the presence of specialized Late Neolithic sites for the extraction and reduction of obsidian nodules (Lugliè 2003b; Tykot et al. 2006b). For example, large amounts of primary reduction material have been recovered from workshops such as Sennisceddu in the northeast of Monte Arci associated with source SC and continue to provide critical insight into the initial stages of obsidian reduction and the consequent exchange of these products to sites farther afield.

Palmarola

Palmarola is a small uninhabited island of the Pontine Archipelago located in the Tyrrhenian Sea approximately 35 kilometers off the west coast of Italy. Obsidian from the island was first exploited by mainland populations during the sixth millennium B.C. While there are several sites of possible Chalcolithic date, there is little evidence for post-Neolithic use of the material, either on Palmarola or beyond. Fission-track dating of the

Monte Tramontana and Punta Vardella subsources reveal dates of 1.57 ± 0.21 and 1.69 ± 0.10 mya respectively (Bellot-Gurlet et al. 1999: 642). Since Palmarola was never occupied in prehistory, there has been little archaeological work conducted on the island.

Pantelleria

The island of Pantelleria is located in the Strait of Sicily about 100 kilometers to the southwest of modern-day Sicily and extends over an area of approximately 80 square kilometers. All of the obsidian on the island is peralkaline and can be distinguished from other western Mediterranean sources by their distinctive greenish hue. Fission-track dating from the largest of the subsources, Balata dei Turchi, reveal dates of 127,000 ± 15,000 and 141,000 ± 17,000 B.P. (Arias-Radi et al. 1972; Bigazzi et al. 2005).

Although excavations have taken place at archaeological sites on the island, little work has been undertaken at the subsources themselves, likely because Pantelleria obsidian was never as heavily exploited in prehistory when compared with Monte Arci and Lipari. The use of Pantelleria obsidian appears to have begun in the sixth millennium B.C., continuing locally and on the island of Sicily through the mid-second millennium B.C.

A Brief Review of Obsidian Sourcing Studies: Methods

Sourcing Raw Materials

Obsidian studies have traditionally focused on the sourcing of raw materials from archaeological assemblages to answer a range of relevant research questions. The basic premise behind these techniques is that by studying the unique characteristics of obsidian artifacts and comparing them with geological material, one can match artifacts to the geological sources from which they originated. This can be achieved in a number of different ways, and factors such as time, cost, size of the artifact, and destructiveness of the analysis must be considered.

The most cost-efficient method is visual inspection. Some obsidian sources can be distinguished based on an artifact's color, transparency, and/or presence of phenocrystic inclusions. In the West Mediterranean, for example, the green peralakaline obsidians of Pantelleria can easily be visually discriminated from other West Mediterranean source products, although it cannot be used to distinguish between the different Pantellarian subsources. Another cheap and non-destructive method is calculating the artifact's density and comparing it with known measurements (Tykot 2004). Non-elemental analyses such as fission-track dating have also been shown to be effective in obsidian sourcing, discriminating the products of different sources on the basis of their different eruptive dates (Badalian et al. 2002; Bigazzi et al. 1986).

The fourth and by far most common method is to use elemental analyses. This method is the most precise, but it can be only used in particular cases. Before an elemental analysis can be undertaken, one must understand what elements are relevant for distinguishing the likely sources represented in an archaeological assemblage. One or more of the elements tested must also be homogenous within the source as well as statistically different from any other source (Tykot 2003: 63). If these prerequisites are met, then a choice can be made as to the appropriate type of analysis to be used. Since not all sources can be distinguished by the same elements, one must choose the appropriate instrumentation based on the elements of interest (see Tykot 2003 for a more in-depth review).

Some common elemental sourcing techniques in modern archaeology include neutron activation analysis (NAA), proton induced X-ray/gamma ray emission (PIXE/PIGME), inductively coupled plasma mass spectrometry (ICP-MS), scanning electron microscope (SEM) with energy dispersive spectrometry (EDS), electron microprobe with wavelength dispersive spectrometry (WDS), and X-ray fluorescence (XRF) with WD or ED spectrometry.

While all of these options are available, portable analytical instruments and non-destructive techniques such as portable XRF are now especially attractive because they allow archaeologists to analyze large numbers of artifacts in relatively short periods of time, even in the field or on-site with little to no harm to the artifacts (see Frahm 2014). Such developments also allow archaeologists to analyze larger percentages of individual assemblages and consequently address a broader range of archaeological questions about how obsidian was used at any one particular site or where underrepresented sources were distributed.

Broader Contextualization

One of the main contributions of obsidian sourcing studies, particularly in the West Mediterranean, has been the formation of a large body of published provenance data that can be interpreted by future scholars. Indeed, this is exactly what this dissertation hopes to do. However, by concentrating on only one aspect of obsidian consumption, i.e. the raw material, without considering the specific forms in which these raw materials were circulated (nodule, core, end-product, etc.), the techniques by which they were worked, and the form of the final tools, the interpretive potential of these studies is somewhat limited.

In light of this, I follow a form of artifact characterization that takes all of these considerations into account, rather than focusing on raw material source alone. Ultimately my aim is to appreciate the full range of social processes and cultural traditions that underpin the archaeological record. I in part take my cue from Dietler and Herbich (1998: 260), who argue that a "more integrated approach that incorporates an understanding of choices and demands at various stages of *chaîne opératoires* holds much greater promise in producing a realistic perspective of the complexities of material culture patterning". The *chaîne opératoire* represents the successive stages of lithic production, begining when raw materials are first procured and ending when they are discarded; it is also contextualized as an archaeological approach to the study of lithic artifacts that considers the production of stone tools as a cultural process involving multiple stages of manufacture (Inizan et al. 1999: 14; Leroi-Gourhan 1964).

A Brief Review of Obsidian Sourcing Studies: Aims

The field of obsidian sourcing is flourishing, with a clear upward trend in the number of published studies in the past decade (Freund 2013: 779). Considering that obsidian has been used by prehistoric populations as early as 1.8 mya (Piperno et al.

2009) it is perhaps unsurprising that obsidian sourcing studies have been employed to engage with a wide range of debates, given that this raw material has been used by a wide range of cultures, from hunter-gatherers to state-level societies.

At its core, obsidian sourcing is a relatively simple procedure in that it reveals where raw materials at archaeological sites come from. Nevertheless, understanding the geological sources from which raw materials were obtained has far-reaching implications. Pollard and Heron (2008: 87) state that the “principal aim of any archaeological provenance study is an assessment of the economic and social factors which underlie the movement of materials”. I would argue that this viewpoint fails to portray the full diversity of questions that archaeologists have used obsidian sourcing data to answer. To demonstrate this point, this section briefly outlines the archaeological questions that are driving obsidian sourcing studies in current archaeological research and discusses their capacity to contribute to debates of cross-cultural significance. Based on an analysis of the literature, I see four recurrent themes within these global studies: procurement, cultural contact, identity, movement (see Carter 2014; Freund 2013 for more in-depth reviews)

Procurement

Since obsidian sourcing determines where the raw materials employed to make artifacts originate, a primary goal of many scholars is to reconstruct ancient procurement by describing the provenance of obsidian artifacts. In many cases, these descriptions of provenance are informative because they outline the exploitation history of a particular source, or sources, and can help reconstruct patterns of procurement amongst various populations, synchronically and diachronically. These raw material sourcing data do not, however, provide in themselves a particularly clear idea as to how the obsidian was procured by the community (directly or via intermediaries), the form in which it was accessed (raw material, preform, end-product), or the specific routes and means of transport involved from source to site.

Another large body of literature attempts to reconstruct the mechanisms by which obsidian was obtained through advanced mathematical modeling and integrated characterization studies that combine obsidian sourcing with techno-typological analysis (e.g. Barge and Chataigner 2003; Carter et al. 2013; Contreras 2011; Freund and Batist in press; Ortega et al. 2014). These studies can trace their intellectual roots to the rise of economic anthropology in the 1960s and 1970s, and more specifically to the work of prominent archaeologists studying the rise of social complexity using sourcing data in places such as the Near East and Mesoamerica (see Renfrew 1969, 1975; Rathje 1971; Sidrys 1976). Moreover, a surge of archaeological literature on the subjects of exchange, specialization, and lithic procurement in the 1980s are often cited as foundational texts in the current discourse (see Ericson and Earle 1982; Ericson and Purdy 1984; Brumfield and Earle 1987a; Torrence 1989).

Cultural Contact

While many obsidian sourcing studies focus on procurement, other studies see obsidian exploitation as indirect evidence of cultural contact between different groups of people. In contexts where it is likely that obsidian was obtained through exchange, artifacts are seen as representative of socio-economic interaction.

In other cases, cultural interaction has been conceptualized in the context of 'exotica', defined as "something non-native or foreign which has been imported and appreciated by the receiving culture" (Tykot 2011: 34). This can be seen in the work of Le Bourdonnec et al. (2011), who describe a find of Lipari obsidian in Neolithic Corsica, a rare occurrence. The authors state that the archaeological significance of this find is that it provides evidence for the occasional contact between "members" of different socio-economic systems (Le Bourdonnec et al. 2011: 268). However, there is no discussion about what "members" are being discussed. Indeed, the mechanism by which this obsidian was procured (i.e. directly or through exchange) has serious implications concerning cultural contact and the "members" involved in such a transaction. Similar discussions of exotica have been applied to contexts ranging from 3rd millennia B.C. Fiji (see Best 2002; Reepmeyer and Clark 2010), to 13th century A.D. New Zealand (see Sheppard et al. 2011), to the entire Mediterranean region (see Pollard and Heron 2008: 87-91).

It is true that exotic artifacts can be significant, but merely describing their presence in an archaeological assemblage is not enough. While exotic artifacts can be especially informative in terms of understanding ancient social interaction, they must be appreciated within the larger circumstances of their discovery. Through a careful consideration of the mechanisms by which artifacts were procured, made, used, and discarded, archaeologists can properly contextualize the nature and degree of contact between different groups of people (Carter and Kilikoglou 2007: 116; Tykot 2011: 35). This approach has been applied in several studies to great effect (see Carter et al. 2008; White and Weinstein 2008; Perlès et al. 2011).

Identity

Archaeologists often assume that people who share the same material culture also share similar cultural practices, kin relations, or ethnic identities (Shackley 2002: 78). This has been applied in the context of obsidian sourcing studies through the analysis of patterns of exploitation that are used to infer the existence of distinct cultural or ethnic groups.

This theoretical framework is implemented by Ogburn et al. (2009) in the context of the Inka army and the local Cayambes people who were resisting Inka conquest. Ogburn demonstrates that the Cayambes were utilizing obsidian sources that were off limits to the Inka because of territorial borders, thus it is inferred that the Cayambes were not subject to Inka domination and were expressing their distinct cultural identity through obsidian procurement, consciously or not (2009: 750). Similarly, Shackley (2002) infers the existence of distinct ethnic groups within the larger Hohokam and Mogollon worlds in the American Southwest based on distinct traditions of consumption. He suggests that "during the Classic period, the Tonto arm of the Tonto Basin was inhabited by an ethnic group that had its strongest ties to the Hohokam, and the Salt River arm in the basin was inhabited by an ethnic group that had its strongest ties to the Mogollon" (2002: 78). This conclusion is drawn based on similar patterns of obsidian source representation at various

Tonto arm and Salt River arm archaeological sites compared with Hohokam and Mogollon sites. These ethnic groups likely had ongoing exchange relationships with the Hohokam and Mogollon, perhaps even sharing kin and social ties (Shackley 2002: 78).

In several Mesoamerican cases, identity is discussed on a broader scale, where spheres of interaction are delineated through multi-site spatial analyses of obsidian source procurement (e.g. Braswell 2003). This works well in Mesoamerica because there are a large number of obsidian sources present in the region, thus potentially allowing for a much more nuanced discussion of similarities and differences in obsidian exploitation across space. Obsidian exchange spheres are collections of sites that obtained obsidian from the same sources (Braswell 2003: 131). By spatially delineating sites that share similar patterns of obsidian exploitation, distinct spheres of interaction can be recognized, although these borders do not necessarily mirror political, ethnic, or linguistic boundaries.

Movement

In many cases, obsidian sourcing data are used as a means of mapping the movement of people. This approach is primarily focused on two fronts: a) in relation to hunter-gatherer mobility and the reconstruction of ancient procurement ranges (e.g. Shackley 2002; Vogel et al. 2006), and b) in the sense of large-scale migrations and colonization events (e.g. Civalero and Franco 2003; Torrence and Swadling 2008). In addition, the exploitation of island obsidian sources has been used as indirect evidence for the existence of boat technology, as for example with the recovery of obsidian from the Aegean island source of Melos at the mainland site of Franchthi Cave from Upper

Palaeolithic (mobile hunter-gatherers) strata (Perlès 1990). Maritime technology has been included here because it has been related to human colonization, and its implied existence reveals human innovation in the context of mobility. However, in several cases, the use of watercraft is merely implied with no further discussion of its significance (see Freund 2013 for further detail).

West Mediterranean Obsidian Characterization Studies in Context

Now that a global perspective on the place of obsidian characterization studies in archaeological research has been detailed, this section discusses the development of obsidian sourcing studies in the West Mediterranean and the archaeological questions these analyses have sought to address. Based on an examination of the literature, most characterization studies in the West Mediterranean have focused on assigning raw material provenance as a means of reconstructing procurement/exchange mechanisms. While there are several studies that fall into other categories laid out in the previous section such as cultural contact and exotica (see Le Bourdonnec et al. 2011; Tykot 2011) as well as movement and maritime technology (see Farr 2007), these are isolated cases that fall outside the purview of the vast majority of literature on the subject.

Assigning Provenance

Much of the work on obsidian in the West Mediterranean has consisted of analyzing particular archaeological assemblages to document how a specific analytical technique can be used to discriminate the products of the region's various obsidian sources. These types of methods-driven studies have a long history in the discipline and are best understood by locating them within the broader circumstances of their occurrence (i.e. through a chronological overview of characterization studies through time).

The prehistoric use of obsidian in the West Mediterranean was documented as early as the late 19th and early 20th centuries by scholars such as H. Müller, A. Taramelli, and P. Tomasi (see Müller 1914; Taramelli 1918; Tomasi 1904), though its potential to reveal information about past human behavior was only recognized several decades later. By the late 1940s, a number of scholars focused their attention on the increasing number of obsidian artifacts found at early sites throughout Italy and France (e.g. Buchner 1949; David 1948-1949; Malavolti 1953; Puxeddu 1958; Radmilli 1954), a prevalent component of which was speculation about the geological origins of the raw materials used to make the artifacts. While the locations of the sources were already known, archaeologists were unable to match an artifact's raw material to the outcrops from which they originated.

This all changed when Cann and Renfrew (1964) demonstrated that the majority of the West Mediterranean obsidian sources could be distinguished from one another on the basis of their source-specific elemental profiles, as determined using the technique of optical emission spectroscopy (OES). Trace elements barium, zirconium, niobium, and yttrium were shown to be of particular significance in discriminating these raw materials. While OES was not capable of distinguishing between products of the Monte Arci and Palmarola sources, subsequent analyses using the more precise technique of neutron activation analysis (NAA) enabled archaeometrists to distinguish all four of the relevant sources as well as several subsources from Monte Arci (see Hallam et al. 1976; Williams Thorpe et al. 1979, 1984a). That said, the compositional groups as determined through NAA were based on artifact analyses as opposed to geological samples taken from *in situ* source deposits. Therefore, the exact locations of the various subsources from Monte Arci - and indeed all of the sources - were still not known.

Following this work, other non-elemental sourcing techniques such as isotope analyses (Gale 1981), Mössbauer spectroscopy (Longworth and Warren 1979), fission-track dating (Bigazzi and Radi 1981; Bigazzi et al. 1986) and magnetic parameters (McDougall et al. 1983) were employed with varying success in distinguishing between the West Mediterranean sources. Because the formation dates of the four sources are so variable, fission-track dating proved to be especially effective, although it could not distinguish between the various subsources of Monte Arci.

By the 1980s, a number of scholars set out to locate, map, and formally document the chemical composition of the different geological sources and subsources of the West Mediterranean, the latter process involving a variety of elemental characterization techniques, including XRF, ICP-MS, SEM-EDS, atomic absorption spectroscopy (AAS), and electron microprobe. These projects included geoarchaeological work on Lipari (Cortese et al 1986; Crisci et al. 1991; Francaviglia 1984), Pantelleria (Francaviglia 1988), Monte Arci (Mackey and Warren 1983; Michels et al. 1984; Tykot 1997), and later, Palmarola (see Bellot-Gurlet 1999; Tykot et al. 2005b). Not only were these studies successful in locating the majority of subsources on these islands, they also demonstrated that all four sources of the West Mediterranean, including the three main subsources of

Monte Arci, could be distinguished through trace elemental analysis as well as through major/minor elements alone.

This tradition of scholarship continues today, being used to show that the various sources and subsources of the West Mediterranean can be distinguished with varying success using analytical techniques such as PIXE, NAA, ICP-MS, Mössbauer spectroscopy, electron paramagnetic resonance, and XRF (Barca et al. 2007; Le Bourdonnec et al. 2005; De Francesco et al. 2011; Scorzelli et al. 2001; Seccaroni et al. 2008). Non-elemental characterization methods such as density measurements have also been shown to be effective in distinguishing between three of the four main sources (Tykot 2004).

While this work represents a great success story in geoarchaeological research, questions of broader anthropological significance are less well developed, and it is only in the past two decades that more archaeologically driven questions have been forefronted (see Tykot and Ammerman 1997; Tykot 2003: 72). This is not to say that issues surrounding exchange mechanisms and the transportation of obsidian across the sea- and landscape have not been addressed, it is just that the results from so many analyses over the past 50 years make it almost impossible to determine the relative importance of different sources at any one particular site or how the uses of the various source products may or may not have changed through time. By focusing on one aspect of obsidian consumption, i.e. the raw materials involved, without considering the specific forms in which the obsidian circulated (nodule, core, end-product, etc.), the techniques by which they were worked, and the form of the final tools, the interpretive potential of much of this work is limited.

While early obsidian sourcing studies in the West Mediterranean were limited to a small of number of individuals, the past two decades have seen a proliferation of scholarship on the subject. Many archaeologists of this new generation recognize the importance of combining sourcing data with other information about form and function of the artifacts themselves in order to address a wider range of questions about how obsidian was incorporated into the lives of the people who used it; this has taken form most notably in Sardinia, Corsica, Liguria, Calabria, and southern France (see Bressy et al. 2008; Diamond and Ammerman 1985; Le Bourdonnec et al. 2010; Léa 2012; Lugliè et al. 2007, 2008).

A central component of these analyses has been the reconstruction of source-specific obsidian reduction sequences and the specification of which parts of these sequences are represented at particular sites - i.e. whether an assemblage attests to on-site production commencing with the reduction of raw nodules or merely contains end-products. At the Early Neolithic site of Rio Saboccu, for example, Lugliè et al. (2008) show that the residents of the site exploited all four main subsources from Monte Arci to produce expedient flake tools. At the contemporaneous site of Su Caroppu, however, Lugliè et al. (2007) note that two distinct *chaînes opératoires* are present for the production of SC blades and SA/SB2 flake-based tools. Similarly, Bressy et al. (2008) combine sourcing studies with techno-typological analysis on both chert and obsidian assemblages at three Neolithic sites on the island of Corsica, in turn demonstrating variations in both the procurement and reduction of these products through space and time.

A central conclusion drawn from these analyses is that multiple knapping traditions existed across the West Mediterranean region over the course of the Neolithic, including pressure-flaked blade industries in southern France and Corsica (Bressy et al. 2008; Le Bourdonnec et al. 2010; Léa 2012), direct percussion blade technology in southern Italy (Diamond and Ammerman 1985), and flake-based industries in Sardinia (Lugliè et al. 2007, 2008). Nevertheless, these conclusions are based on a small number of total analyses and there is still much work to be done in terms of understanding how and where obsidian was acquired, reduced, and consequently used. Moreover, the vast majority of techno-typological analyses in the West Mediterranean have focused solely on the Neolithic, although over the past several years this is changing (see Freund and Tykot 2011; Freund 2014). This is why integrated characterization studies combining sourcing data with techno-typological analyses and usewear studies are so critical in interpreting the role of obsidian in larger socio-economic processes through time, and therefore a central component of this research.

Reconstructing Transportation Routes and Exchange Mechanisms

Exchange is a central focus of a large portion of archaeological literature on the subject of obsidian in the West Mediterranean. This includes debates about specific exchange mechanisms as well as discussions about how and where archaeological materials were transported across the sea- and landscape. The study of exchange in the

Mediterranean began with the early work of Renfrew et al. (1966, 1968). In contrast to his predecessors, Renfrew saw obsidian sourcing as a means of addressing large-scale archaeological questions about the nature of trade, cultural contact, and social change in the prehistoric past. Obsidian exchange networks were seen as the social conduits through which new ideas and practices traveled, thus leading to an increase in cultural complexity though time.

By 1969, Renfrew's ideas concerning the economic implications of obsidian trade became a unified theoretical model highlighting the role of trade and exchange in the rise of social complexity in the Near East. Influenced by Haggett (1965), Renfrew's underlying 'law of monotonic decrement' stated that the farther one moves away from an obsidian source, the less material one would expect to find at an archaeological site (Renfrew 1969: 157). This was represented by two-dimensional plots of site distances from a particular source and the corresponding abundance of obsidian in the assemblages - as a percentage of the overall lithic assemblage. The rapid decrease of obsidian at a certain distance for Early Neolithic sites in the Near East (in this case 300 kilometers) resulted in the identification of two zones of interaction: a supply zone characterized by direct procurement and a contact zone typified by down-the-line exchange (Figure 4.1; Renfrew 1969: 157). Down-the-line exchange is the term applied to a mode of procurement in which residents within the supply zone procure obsidian directly and then exchange a certain percentage of that obsidian with neighboring communities. This process continues as diminished quantities of obsidian are found in direct correlation with distance from the source (Ortega et al. 2014; Renfrew 1969). By 1975, this simple fall-off

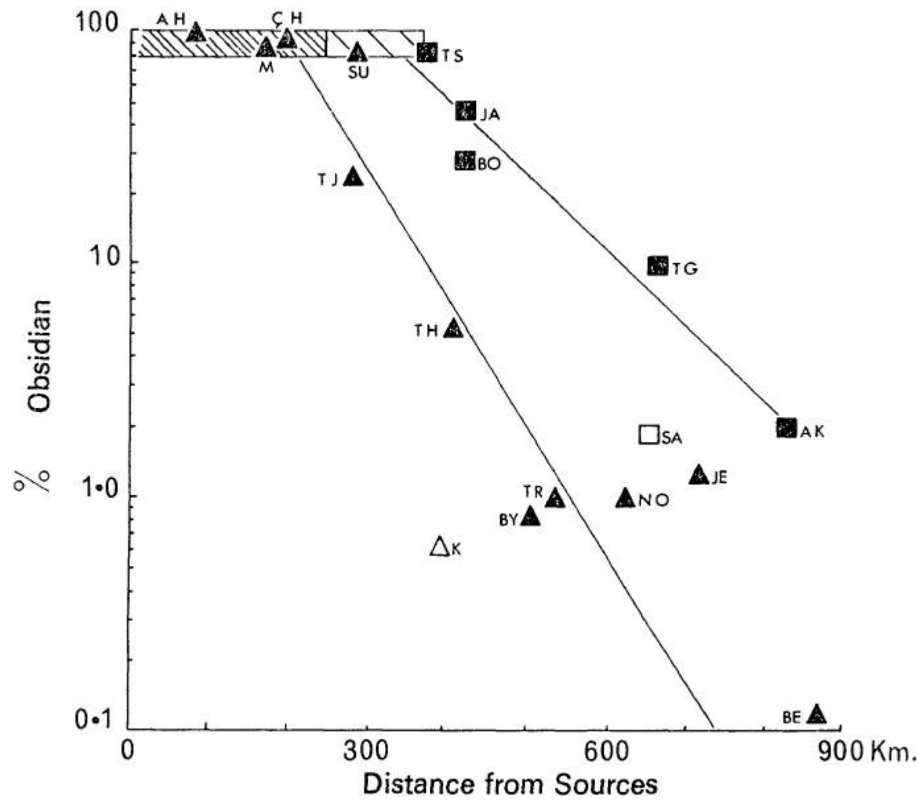

Figure 4.1 Fall-off curve representing down-the-line exchange of obsidian at Early Neolithic sites in the Near East (triangles and squares). Sites within the shaded area represent those within the supply zone (Renfrew 1969: 157).

curve was replaced by a host of other graphical representations that were indicative of other exchange mechanisms such as free-lance trade, prestige chain trade, and redistribution (Figure 4.2; Renfrew 1975: 47-49). While it has since been recognized that similar distributions of goods can be produced by a variety of processes (Bradley and Edmonds 2005: 5-11; Hodder and Orton 1976), this early work set the foundation for an entire generation of obsidian studies in the West Mediterranean and beyond. Hence, while these models were developed as a means of reading data with regard to Anatolia and the Aegean, they were believed to be globally applicable and were invoked in due course by

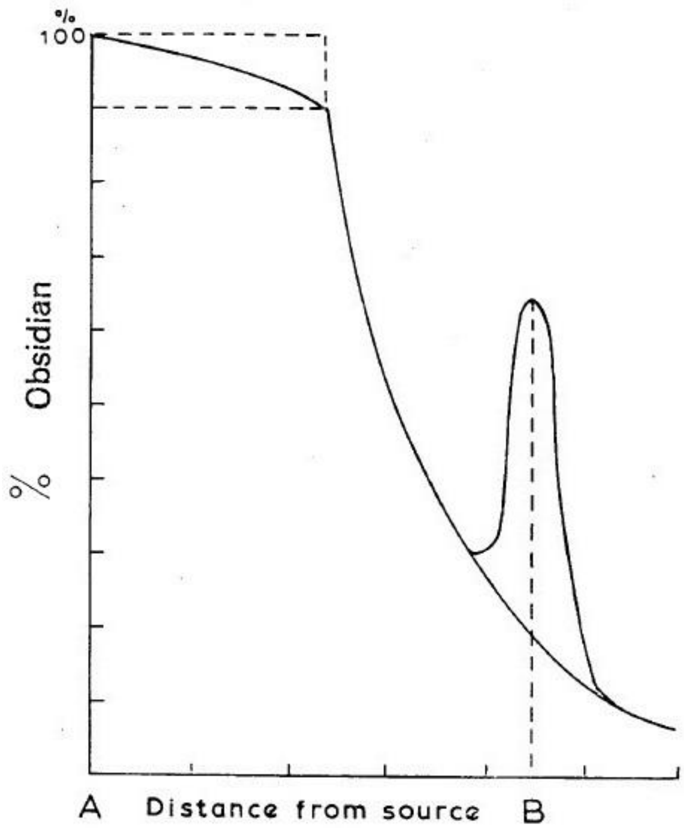

Figure 4.2 Hypothetical fall-off curve representing the redistribution of obsidian (letter B) in the archaeological record (after Renfrew 1975: 49).

those working in the West Mediterranean and elsewhere (e.g. Hallam et al. 1976; Sidrys 1976).

Building upon the early work of Renfrew, the 1970s saw the proliferation of large-scale obsidian sourcing programs across the West Mediterranean with the goal of analyzing small numbers of artifacts from large numbers of archaeological sites to map the distribution extents of the various source products and quantitatively define interaction spheres and transportation routes (see Hallam et al. 1976; Williams Thorpe et al. 1979, 1984a). For the first time, archaeologists began to document the scope of obsidian use in the West Mediterranean and the general patterns in the movement of the various source products across space, with specific reference to the Neolithic. Nevertheless, the graphical models purported by Renfrew (1975) were not directly applied to argue for any specific form of exchange, although behind the reconstruction of these transportation routes was an inherent assumption that these products moved through a model of down-the-line exchange.

In contrast to early obsidian sourcing studies that typically analyzed one or two artifacts per site (e.g. Hallam et al. 1976), subsequent scholars recognized the importance of analyzing statistically significant numbers in order to study distribution patterns in "more quantitative terms" (Tykot and Ammerman 1997: 1003). As a result, regional characterization programs took form in Sardinia and southern Italy in the 1980s and 1990s with the goal of reconstructing exchange mechanisms through detailed inter-site comparisons (see Ammerman 1985; Ammerman and Polglase 1993; Tykot 1995, 1996).

For example, on the basis of sourcing analyses of a large number of artifacts from sites throughout Sardinia and Corsica, it was argued that during the Neolithic down-the-line exchange was the dominant mode of raw material acquisition because of the broad geographic similarity in the distribution of the various Monte Arci subsources across space and in the uniform decrease in obsidian abundance as one moves farther from the source (Tykot 1996, 2003; Tykot et al. 2008: 179).

Moving beyond sourcing analyses alone, a large-scale surface survey project at Acconia in the province of Calabria in southern Italy demonstrated that an integrated characterization program could address a wide range of questions about the exchange of

Lipari obsidian during the Neolithic (see Ammerman 1985; Ammerman et al. 1979). Ammerman (1985) began by systematically collecting obsidian reduction debris throughout Acconia before analyzing a portion of these artifacts using NAA to show that all of the raw materials came from Lipari (see Crummett and Warren 1985). While simply applying these data to Renfrew's (1975) models would have put these sites within an apparent supply zone, further techno-typological analysis by Diamond and Ammerman (1985) demonstrated that the primary reduction of obsidian raw materials coming from the island source of Lipari occurred at specialized coastal sites in Calabria before being transported to larger redistributive centers farther inland. This was accomplished through detailed inter-site comparisons of the proportions of cores and core reduction debris to flakes and final products. Moroever, by combining sourcing data with techno-typological analysis at the Ligurian site of Arene Candide, Ammerman and Polglase (1993) further argued that Lipari blades were acquired as finished products in northern Italy while Monte Arci and Palmarola products circulated as raw nodules. This type of *chaîne opératoire* approach was especially effective not only in understanding how and where raw materials were reduced, but also in recognizing various exchange mechanisms in a way that moved beyond the reductive mathematical models purported by Renfrew (1969, 1975).

In the past decade, several scholars have begun to compile results from sourcing analyses and techno-typological studies throughout mainland Italy and France in order to reconstruct transportation routes and contextualize these results within their broader socio-economic contexts through time (e.g Léa 2012; Pessina and Radi 2006; Robb 2007:

312; Vaquer 1999, 2007). These scholars typically highlight how the exchange of raw materials during the Neolithic created and maintained "relationships of interdependency" and facilitated the the flow of information and goods between communities (Léa 2012: 147). Vaquer (2007: 115) further argues that the presence of obsidian in small quantities far from the sources likely attests to its importance within larger value regimes that also included polished stone axes and other prestige goods.

These overviews of Neolithic transportation routes and distribution patterns have also led to a re-evaluation of the role of down-the-line exchange in regions outside of the immediate source areas. For example, the uneven distribution of obsidian in mainland Italy and France and the relatively large quantities of artifacts at certain archaeological sites have led some to suggest that obsidian accumulation and redistribution were occurring at the archaeological sites such as Terres Longues, La Cabre, and Giribaldi in southern France (Binder and Courtin 1994; Léa 2012) as well as Gaione and Pescale in northern Italy (Polglase 1990; Tykot et al. 2005a). The implications of this redistributive model are just now beginning to be explored (see Freund and Batist in press; Léa 2012; Robb and Farr 2005; Robb 2007: 312; Vaquer 1999, 2007).

Chapter 5: Methods

This chapter details the methods used in this dissertation to study prehistoric obsidian consumption in the West Mediterranean. It is divided into two broad sections focusing on database creation and artifact analysis. The first stage of the research involved bringing together in a standardized manner all published references to sites with obsidian and their corresponding contextual information. These data then served as the foundation upon which to visualize and then interpret changes in obsidian consumption through time (as indices of different socio-economic practices), enabling me to view the prehistoric West Mediterranean in a level of detail rarely attempted before. In addition, a large number of artifacts from both Sicily and Sardinia were analyzed in order to provide a more detailed discussion of obsidian procurement mechanisms and reduction strategies at the regional level. The results from a) the West Mediterranean as a whole using compiled results from existing obsidian studies, b) my personal artifact analyses in Sicily, and c) my personal artifact analyses in Sardinia will be discussed separately in Chapters 6, 7, and 8.

This research differs from previous studies of obsidian consumption in the West Mediterranean (e.g. Costa 2007; Tykot 1996; Vaquer 2007) in that it considers such a large amount of contextual data, including information about specific site types, dates, and locations as well as results from sourcing studies and techno-typological analyses. This type of integrated approach allows one to explore not only how and where obsidian was distributed through time, but also the socio-economic importance of these raw materials - and the artifacts fashioned from them - in larger cultural processes. This study also provides the first detailed study of post-Neolithic obsidian use.

Obsidian Database

Over the past 50 years, a large number of sourcing studies have been published on obsidian in the West Mediterranean. While these include geo-archaeological studies of the sources themselves (cf. Bigazzi et al. 2005), the majority relate to the sourcing of archaeological objects (cf. Tykot 2003). In total, approximately 10,600 artifacts have been elementally or visually characterized from 432 archaeological sites. These data, along with that generated by my own analyses (see below), form the basis of my diachronic study of the role of obsidian in larger socio-economic and cultural processes. More specifically, I used these data to create a number of visualizations showing how obsidian was distributed across the landscape through time, including source specific distribution maps as well as maps of absolute artifact counts and pie charts showing the relative percentages of obsidian in larger chipped stone assemblages.

The process began by compiling the bibliographic references from several larger publications on the subject (e.g. Costa 2007; Pollmann 1993; Tykot 1995) as well as other recent articles and chapters with which I was familiar. I then went through this literature and constructed a Microsoft Excel database of archaeological sites in which obsidian had been reported, including corresponding information on the sources represented in each artifact assemblage, the site dates, the techniques used to analyze the material, and any techno-typological information about the artifacts themselves (see Appendix B for a complete list of attributes). Because of regional differences in relative chronology, I avoided using terms such as Early, Middle, and Late Neolithic, and instead employed absolute dating, dividing everything into 1,000 year blocks from the sixth to second millennia B.C. Sites that were occupied for multiple millennia were included in each pertinent block of time. While I cannot claim that this database is exhaustive, it represents an extensive and statistically significant dataset, whereby if studies were overlooked, it can be argued strongly that their results are unlikely to change the overall patterns (based on the sample size employed), and by extent the interpretations drawn from them.

After compiling a spreadsheet of 1,199 archaeological sites, I located these sites on a map using Geographic Information Systems (GIS) software. The power of this software lies in its ability to combine spatial and non-spatial information together. Hence, each point on the map becomes associated with a large amount of contextual information about obsidian use at the site. This made it easy to query the data in meaningful ways (e.g. relative quantities of source X obsidian across the region in the Xth millennium), and generate a wide range of visual representations of the data that could then be interrogated to answer the relevant research questions.

During the course of compiling these data, there were several issues that made it difficult to enter accurate information. There were also several patterns in the publication of archaeological data that should be addressed in future work so that results can be easily understood and interpreted. One of the main issues concerned providing basic contextual information about archaeological sites and making results easily accessible. While all of the published literature recorded the archaeological sites from which materials originated, a large number of publications provided no maps of the sites being analyzed and limited information about specific dates and basic chronologies. Without this information, it was often incredibly difficult to track down the location of a particular site and determine its date of occupation. Moreover, many studies hid their data in the text without providing compiled tables of the results. Particularly for non-English publications, it took much longer to extract the specific information I needed.

Another issue that arose concerned the re-publication of data without explicit acknowledgement. Several scholars publish their results in large tables that build upon previous analyses, often without detailing what analyses are new and what have already been published. This made it difficult to determine when particular analyses actually took place. In these cases, I took a conservative outlook and did not include what appeared to be re-published data (i.e. the same number of artifacts analyzed from the same sites).

The publication of techno-typological data was also a concern. Since archaeologists working in the West Mediterranean come from such diverse academic backgrounds, there are multiple typological schema for the analysis of lithic artifacts. A common occurrence in Italy, for example, is the use of morphological typologies originally outlined by Laplace (1968). In France, a *chaîne opératoire* approach is common. Other studies combined all chipped stone artifacts without separating out obsidian. Another concern was providing counts of retouched artifacts without explicitly stating what types of artifacts were retouched (e.g. blades, flakes, etc.). Such inconsistencies in the recording of basic typological counts made inter-site comparisons largely impossible, not to mention the overall lack of typological analyses in general.

Artifact Analyses

In addition to compiling a database of all known information on sourced obsidian artifacts, a further total of 6,895 obsidian artifacts from 46 archaeological sites throughout Sicily and Sardinia were categorized typologically. Of these, 2,089 underwent a more extensive analysis that included XRF elemental sourcing and more-detailed techno-typological classification. Although all artifacts from Sicily and Sardinia underwent a similar analysis combining XRF obsidian sourcing and techno-typological classification, there were significant differences in how and where these analyses were undertaken.

X-ray Fluorescence (XRF) Characterization

Principles

As detailed in Chapter 4, the basic premise behind elemental obsidian sourcing is that by studying the unique elemental signatures of obsidian artifacts and comparing them with geological material, one can match artifacts to the geological sources from which they were collected. In this case, artifacts were analyzed non-destructively using two types of energy dispersive XRF instruments. XRF analysis involves the shooting of primary X-rays generated from a tungsten anode at a sample to excite the electrons of the atoms on the surface of the material. If the energy of the radiation is high enough to dislodge an inner-shell electron, then the atom becomes unstable and an outer-shell electron replaces the missing inner electron. When this occurs, fluorescent X-ray radiation is released that is characteristic of the specific element from whence it came and consequently read by the machine's detector (Figure 5.1; Shackley 2011: 16). Once a

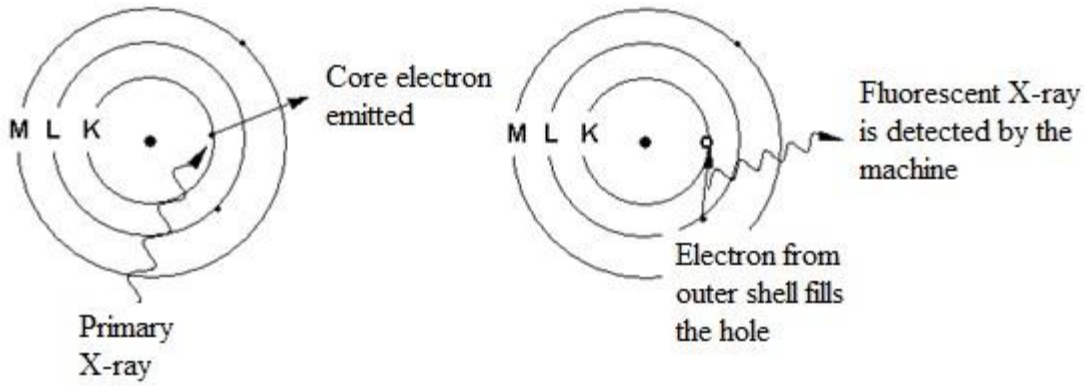

Figure 5.1 XRF process within an atom of a hypothetical sample (after Elemental Analysis, Inc. 2014). Capitalized letters represent electron shells.

sample is irradiated for a set period of time, then the resultant data is calibrated against international standards to determine the actual concentrations of specific elements within the sample, typically in parts per million (ppm).

Since the voltage and amperage settings of XRF machines are fixed, they can only create enough energy to analyze elements within a specific range on the periodic table. It just so happens that the mid-Z elements within this range are found in minor and trace quantities in West Mediterranean obsidians and can be used to discriminate between the products of the various geological sources (Crisci et al. 1994; Freund and Tykot 2011; Tykot et al. 2013).

XRF Analyses in Sicily and Sardinia

Because the export of artifacts from Sicily was not permitted, all of the analyses took place on-site during the summers of 2012 and 2013 at the Paolo Orsi Regional Archaeological Museum (Syracuse), the Regional Archaeological Museum of Gela (Gela), the Luigi Bernabò Brea Regional Archaeological Museum (Lipari), the Regional

Archaeological Museum of Agrigento (Agrigento), the Regional Archaeological Museum of Milena (Milena), the Regional Archaeological Museum of Taormina (Taormina), the Baglio Anselmi Archaeology Museum (Marsala), and the Basso Belice Prehistoric Archaeology Museum (Partanna). The analyses were conducted with the help of Prof. Robert Tykot and Dr. Andrea Vianello. In contrast, artifacts from Sardinia were allowed to be exported, enabling me to analyze them in the winter of 2012/2013 at the McMaster Archaeological XRF Laboratory (MAX Lab).

In Sicily, a Bruker Tracer III-SD portable XRF (pXRF) instrument was used to elementally characterize the artifacts (Figure 5.2). The use of pXRF in obsidian studies is a relatively recent development that over the course of the past decade has greatly expanded the number of published characterization studies (Freund 2013; Nazaroff et al. 2009). This is the result of the machine's relatively low cost when compared with other instruments and its ability to analyze large numbers of artifacts relatively quickly (Milić 2014). Moreover, its portability allows archaeologists to take the machine directly into the museum (see Frahm 2014).

The analyses used a methodological protocol already shown to be successfully in discriminating between the West Mediterranean obsidian sources (Freund and Tykot 2011; Tykot et al. 2013). The Bruker Tracer III-SD instrument was equipped with a silicon-drift detector operating at 40 kV and 11 uA from an external power source. A filter of 12 mm. aluminum (Al), 1 mm. titanium (Ti), and 6 mm. copper (Cu) was then placed into the machine that enhanced results for the elements of interest. The artifacts were placed directly on the machine and analyzed for a period of two minutes, having

Figure 5.2 A Bruker Tracer III-SD portable XRF machine in use at the Paolo Orsi Archaeological Museum in Syracuse, Sicily.

first been cleaned with water to remove any dirt or other contaminants that could affect the results. The raw analytical data were then calibrated against standard reference materials to determine the actual elemental concentrations (in ppm) using the S1pXRF spectra program developed by Bruker that utilizes the Compton scatter derived from rhodium backscatter. Raw material source assignments were then achieved by comparing the results with data generated from known geological samples using the same instrumentation through bi-variate plots of the element ratios of iron (Fe) and rubidium (Rb) to strontium (Sr) for the Lipari subsources, and niobium (Nb) to zirconium (Zr) for the Pantelleria source products (see Tykot et al. 2013).

In contrast, Sardinian artifacts were analyzed using a desktop instrument based at McMaster University, specifically a Thermo Scientific ARL Quant'X energy-dispersive

X-ray fluorescence (EDXRF) spectrometer (Figure 5.3). Before analysis, each piece was given a unique 'Mac' identification number and then cleaned in an ultrasonic tank with distilled water for ten minutes. The spectrometer is equipped with an end window Bremsstrahlung, air cooled, Rh target, 50 watt, X-ray tube with a ≤7.6 micron (0.3 mil) beryllium (Be) window, an X-ray generator that operates from 4 to 50 kV in 1kV increments (current range, 0 – 1.98mA in 0.02mA increments), and an Edwards RV8 vacuum pump for the analysis of elements below titanium (Ti). Data is acquired with a pulse processor and analog to digital converter. In this case, the samples were run under two analytical conditions following the analytical protocols and methods devised by Shackley (2005: appendix). The artifacts were first run under a Mid Zb analysis condition with the X-ray tube operated at 30 kv using a 0.05 mm (medium) Pd filter in an air path for 200 seconds livetime to generate X-ray intensity Kα-line data for elements iron (Fe), zinc (Zn), rubidium (Rb), strontium (Sr), yttrium (Y), zirconium (Zr), and niobium (Nb). The second was a High Zb analysis condition with the X-ray tube operated at 50 kv using a 0.63 mm (thick) Cu filter in an air path to detect the element barium (Ba).

Trace element intensities were converted to concentration estimates by employing a least-squares calibration line ratioed to the Compton scatter established for each element from the analysis of international rock standards. These comprise AGV-2 (andesite), BCR-2 (basalt), BHVO-2 (hawaiite), BIR-1a (basalt), GSP-2 (granodiorite), QLO-1 (quartz latite), RGM-2 (rhyolite), SDC-1 (mica schist), STM-2 (syenite), TLM-1 (tonalite), and W-2a (diabase) from the US Geological Service [USGS], plus JR-1 and JR-2 (both obsidian) from the Geological Survey of Japan. In turn, the USGS standard

Figure 5.3 A Thermo Scientific ARL Quant'X EDXRF spectrometer used to analyze artifacts from the Italian island of Sardinia.

RGM-2 was analyzed during each sample run to check machine calibration and accuracy. The data was then translated directly into Microsoft Excel for manipulation and analysis. Artifacts displaying anomalous values were re-run to ensure accuracy and precision. The quantitative results were ultimately compared with data generated from geo-referenced in situ geological samples of obsidian using the same instrumentation.

Techno-typological Classification

In addition to elemental characterization, each artifact was analyzed techno-typologically in order to reconstruct obsidian reduction sequences and to specify which part of those sequences were represented at each site - i.e. whether an assemblage attested to on-site production commencing with the reduction of raw nodules or merely contained end-products. Such distinctions are critical in reconstructing various exchange mechanisms and in determining how and where raw materials were transported across the sea- and landscape through time.

For this study, artifacts were first categorized as nodules, cores, flakes, blades, or angular waste, data that along with the presence of cortex (divided into distinct percentage categories) allowed for the reconstruction of the obsidian reduction sequences. Only the percentage of dorsal cortex was recorded on the flake categories. This in turn allowed for the identification of the various forms in which obsidian entered the site prior to its reduction. Note that in the case of blades, I have adopted a definition that avoids a simple ratio of length to width, but instead highlights intentionality through the documentation of an artifact's parallel edges and dorsal scar patterning that implies conscious core management (see Ammerman and Andrefsky 1982: 157). This is particularly relevant in the case of Sardinian Nuragic blade production.

In order to discriminate between pressure and percussion products, a number of attributes pertaining to flaking type were also noted, such as the shape of the platform, the presence of absence of a diffuse bulb of percussion, and the presence or absence of a lip on the ventral edge of the platform (see Andrefsky 2005: 118-119; Crabtree 1972: 44).

Finally, any form of deliberate modification in the form of retouch was documented as a means of describing tool types *sensu strictu*.

Since blade technology was such a major component of Sicilian assemblages and this was the first systematic study of obsidian reduction strategies across the entirety of the island, I thought it useful to record additional attributes on these artifacts. This allowed for comparisons to be made between Sicilian artifacts and those analyzed during the course of the Acconia Survey in Calabria (see Diamond and Ammerman 1985). This included noting the maximum length, width, and thickness on all cores, flakes, and blades. Considering that there is a large degree of variability within the Lipari subsources in terms of color and knapping quality that would not be detected through elemental analysis, I also though it useful to record attributes pertaining to raw material characteristics, including the color (black or gray) and the presence or absence of spherulites, to see if certain materials were preferred for certain endeavors (e.g. blade creation) or were specifically selected for at certain sites. This was not done for the Sardinian obsidian because the physical characteristics of the materials are well documented and are not highly variable among each of four subsources (Tykot 1997: 470-472).

Background to the Sites

Sicily

In total, obsidian from 43 archaeological sites in Sicily dating from the Early Neolithic through Bronze Age were characterized (Figure 5.4). Of these sites, the

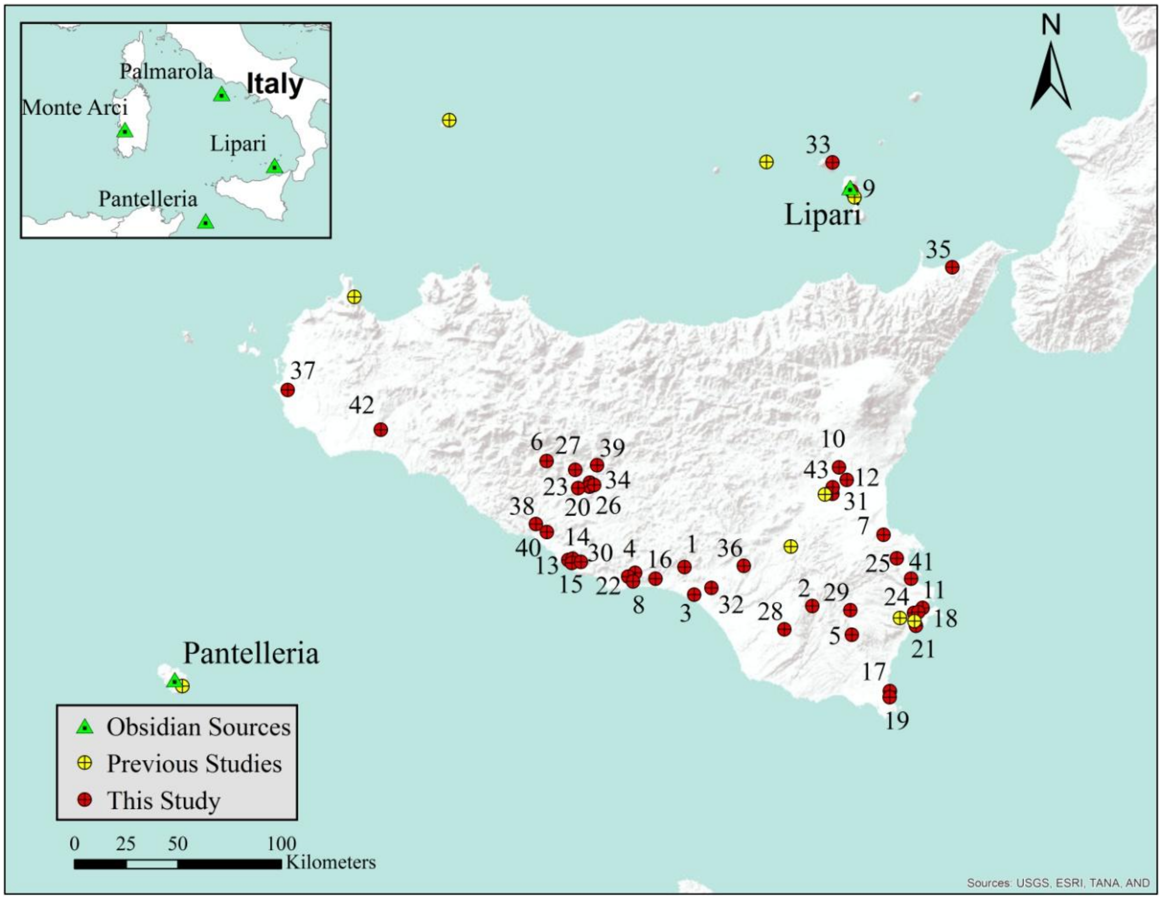

Figure 5.4 Map showing the analyzed archaeological sites and relevant obsidian sources. 1. Butera 2. Calaforno 3. Capo Soprano 4. Casalicchio-Agnone 5. Castelluccio 6. Casteltermini 7. Cava Canabarbara 8. Contrada Caduta 9. Contrada Diana 10. Contrada Orto del Conte 11. Cozzo del Pantano 12. Fontana di Pepe 13. Fontanazza Monte Grande Grotta 2 14. Fontanazza Monte Grande Grotta 4 15. Fontanazza Monte Grande Sommità 16. Gela Manfria 17. Grotta Calafarina 18. Grotta del Conzo 19. Grotta Corruggi 20. Iannicu 21. Isola di Ognina 22. La Muculufu 23. Malpasso 24. Matrensa 25. Megara Hyblaea 26. Menta 27. Mizzebbi 28. Monte Sallia 29. Palazzola Acreide 30. Palma di Montechiaro 31. Poggio Rosso 32. Ponte Olivo 33.Rinicedda 34. Rocca Aquilia 35. San Martino 36. Sant'Ippolito 37. Sant'Onofrio 38. Scintillia Capanna Alfa 39. Serra del Palco Mandria 40. Serraferlicchio 41. Stentinello 42. Stretto Partanna 43. Tre Fontane.

majority are located on mainland Sicily, while two Neolithic sites are found on the islands of Lipari and Salina respectively. Twenty-one of the analyzed sites date to the Neolithic, eight to the Chalcolithic, and nine to the Bronze Age. Five sites came from unstratified contexts or were occupied for multiple periods (i.e. Neolithic to Chalcolithic). Of the 43 sites, 38 can be considered residential settlements while the other five are from burial contexts. Four of the five burials date to the Early Bronze Age while the other dates to the Chalcolithic. More specific details about each of these sites can be found in Appendix C.

Sardinia

In addition, three residential sites on the island of Sardinia were analyzed (Figure 5.5). Of these sites, two date to the Nuragic phase of the Bronze Age while the other was occupied separately during the Chalcolithic and Nuragic periods. More specific details about each of these sites is provided below.

Bingia 'e Monti

Bingia 'e Monti is located in south-central Sardinia (Figure 5.5). The site was excavated in the years 1983-1985 and 1988-1990, originally led by Dr. Giorgio Murru and later by Dr. Enrico Atzeni and Dr. Alessandro Usai. Its earliest occupation dates to the Monte Claro phase of the Chalcolithic (ca. 2700-2200 B.C.). This initial phase of occupation is represented by two circular residential stone structures that underlay later Nuragic Bronze Age construction (Figure 5.6). A Chalcolithic burial was also found approximately 180 meters northwest of the settlement (Atzeni 1996). The site is dated on the basis of its characteristic ceramic assemblage, the Monte Claro pottery differing from the preceding Abealzu-Filigosa phase of the Chalcolithic in that they are decorated and well-fired, often resembling the form and decoration of Beaker pottery from mainland

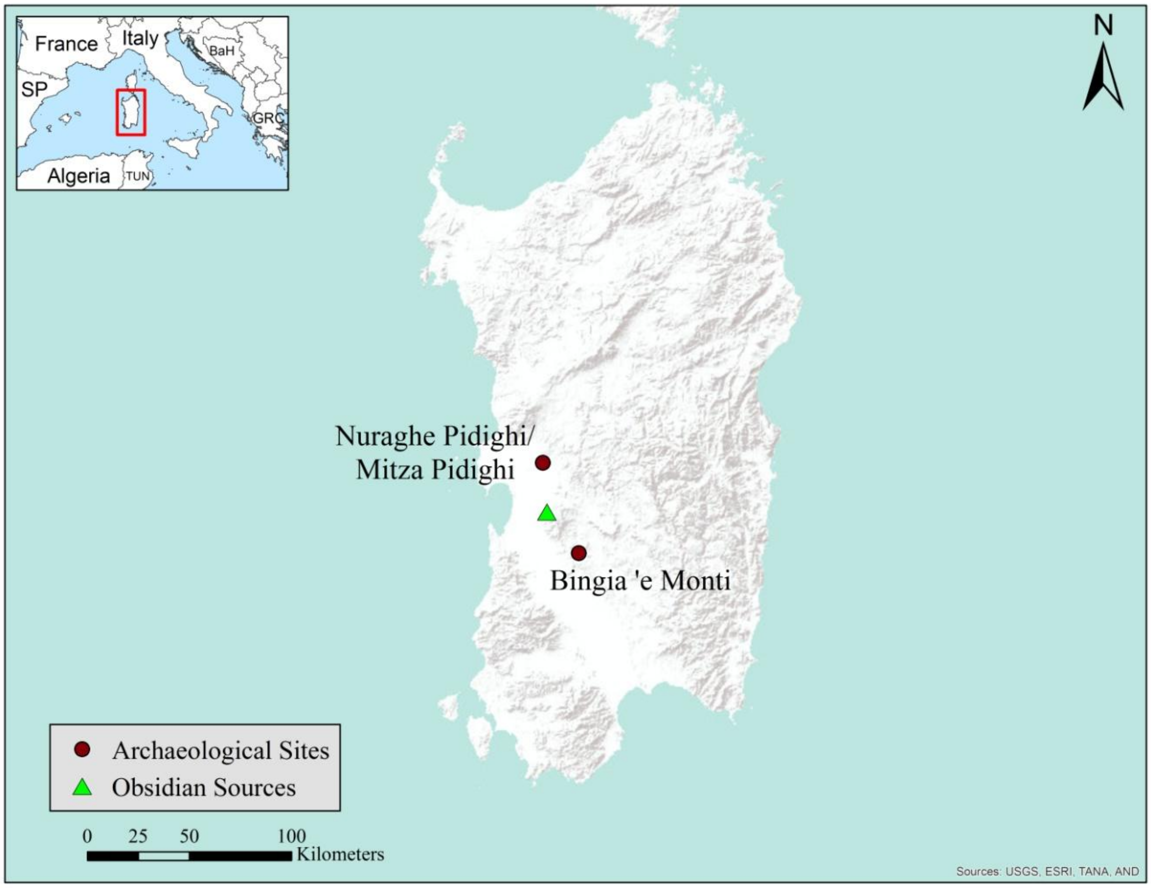

Figure 5.5 Map showing the locations of the analyzed sites in relation to the various obsidian sources in the West Mediterranean.

France (Webster 1996: 52). Although copper artifacts are found at many Monte Claro phase sites throughout Sardinia (Melis 2000), Bingia 'e Monti produced no metal objects.

Approximately 500 chipped stone artifacts were recovered from the Monte Claro strata at Bingia 'e Monti, of which about 85% was obsidian. The remaining artifacts were made of black/gray rhyolites of likely local origin (see Tykot 1997: 469-470) and a small number of chert flakes.

Approximately 410 chipped stone artifacts were recovered from the Nuragic phases of the excavation (ca. 1400-1150 B.C.). The site is dated on the basis of its

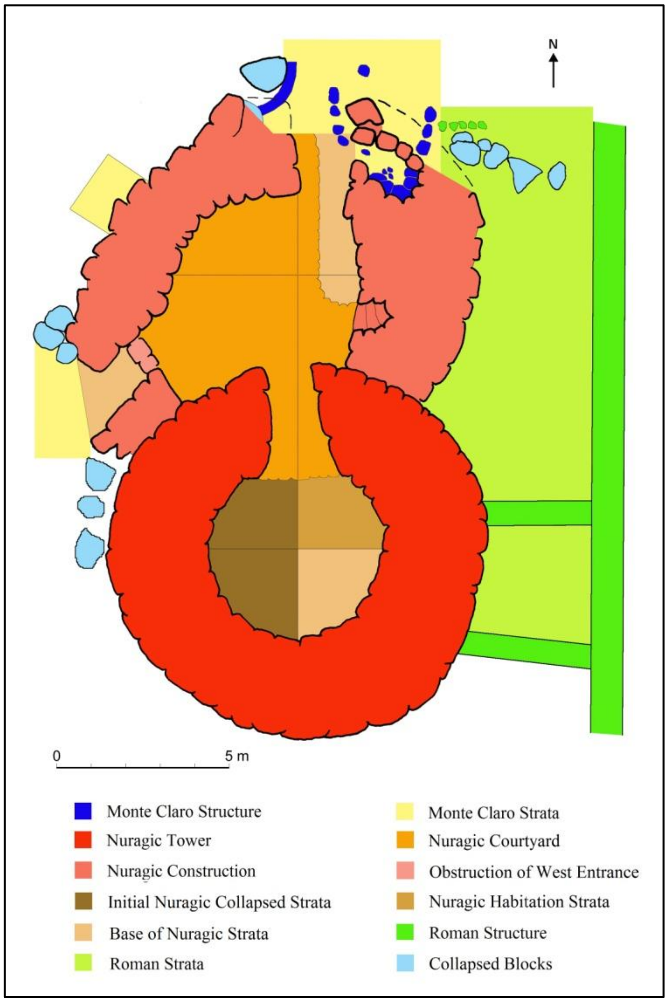

Figure 5.6 Plan of the excavation at Bingia 'e Monti (A. Usai). Note that the area inside the nuraghe was not completely excavated.

characteristic ceramic assemblage and was occupied in the late Nuragic I and Nuragic II periods. Of the 410 artifacts, approximately 92% was obsidian, with the remaining material made up of black/gray rhyolites and a small number of chert flakes. All of the artifacts came from within the single-tower nuraghe and the attached enclosed courtyard.

Nuraghe Pidighi

Nuraghe Pidighi is located in west-central Sardinia approximately 25 kilometers north of Monte Arci (Figure 5.5). The excavation was led by Dr. Alessandro Usai from 1999-2008 and includes a single tower nuraghe with an enclosed courtyard and a partially excavated village whose characteristic ceramic assemblage suggests an occupation date from the late Nuragic I to Nuragic III phases of the Bronze Age (ca. 1350-850 B.C.; Usai 2013). The site extends approximately 150 meters north to south and 120 meters east to west (Figure 5.7; Usai 2000: 41). In total, approximately 660 chipped stone artifacts were recovered from the village of Nuraghe Pidighi (i.e. the nuraghe was unexcavated), of which about 76% was obsidian and the remaining material black/gray rhyolites. Just to the west of the village is the sacred spring of Mitza Pidighi. Because the spring is not a residential structure and likely served a different social and religious function, the obsidian artifacts from Mitza Pidighi are treated separately.

Mitza Pidighi

Mitza Pidighi is contemporaneous with the village of Nuraghe Pidighi and is found 20-30 meters east of the site. Mitza Pidighi consists of a natural spring surrounded by an oval-shaped construction of basalt blocks approximately 15 x 6 meters in size (Figure 5.8; Usai 2013), a common construction type found throughout the island hypothesized to be related to a range of ritual activities. In total, 801 chipped stone artifacts were recovered from Mitza Pidighi, of which approximately 78% was obsidian and the remaining material black/gray rhyolites.

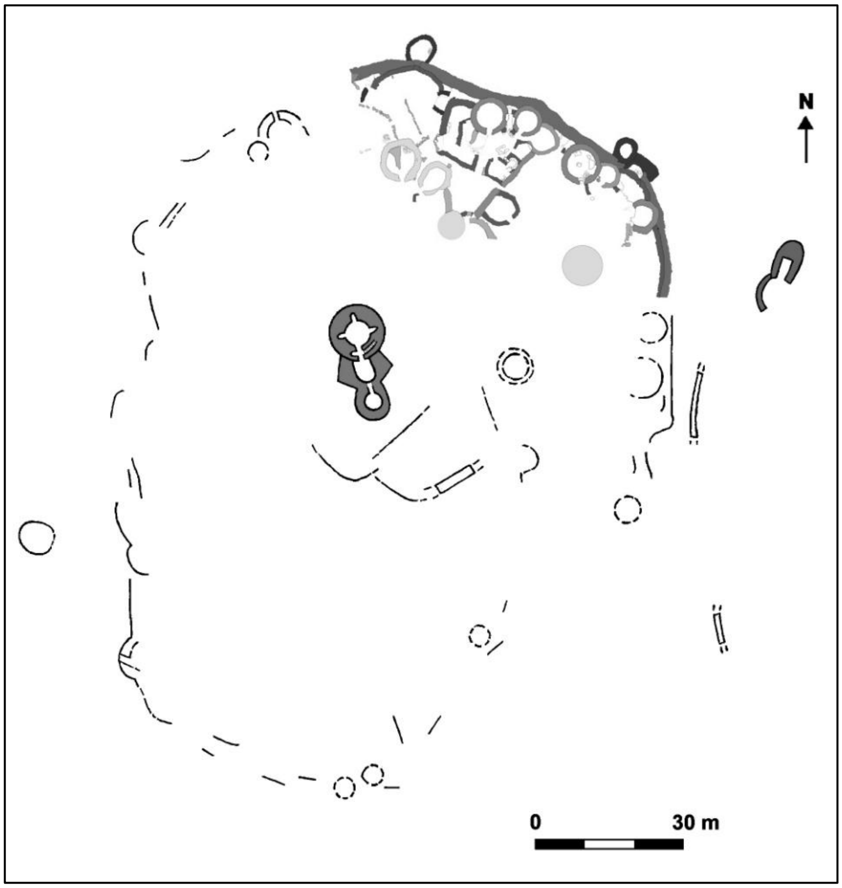

Figure 5.7 Plan of the excavation at Nuraghe Pidighi (after Usai 2013: 205).

Sampling

Sicily

Due to time restrictions and other logistical constraints, it was not possible to fully characterize (elementally and techno-typologically) the entire assemblages from the Sicilian sites of Rinicedda, Matrensa, Stentinello, Megara Hyblaea, Contrada Caduta, Palma di Montechiaro, Contrada Diana, Casalicchio-Agnone, Stretto Partanna, and the Diana phase of San Martino. Instead, representative samples were selected for analysis when possible. The eight museums that hosted my studies presented me with slightly different logistical constraints that resulted in small differences in the sampling strategies.

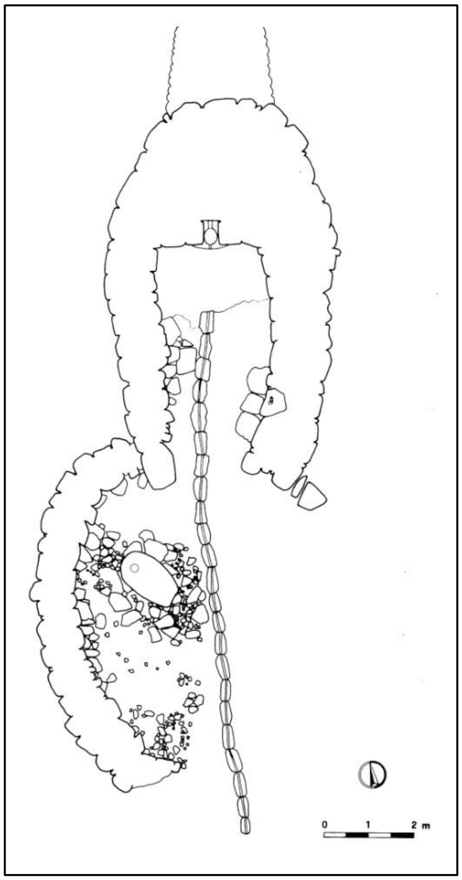

Figure 5.8 Plan of the excavation at Mitza Pidighi (after Usai 1996: 66).

Despite the varied sampling strategies, there are counts of the total number of artifacts from all sites. Moreover, basic typological information was recorded on all of the artifacts I had access to, not just the sampled ones.

For the site of Rinicedda, all of the obsidian artifacts recovered from the excavation were bagged together according the unit and stratum from which they were recovered. To answer the relevant research questions, 20% of the obsidian artifacts were randomly selected for analysis. In order to get a representative sample of artifacts recovered from throughout the site, all of the materials were laid out in their provenience-specific bags and 20% of the bags (i.e. every fifth) were randomly selected for analysis.

Later, when the remaining artifacts from the site were counted and categorized, any remaining cores were analyzed. All cores were analyzed because they represent the first stage of reduction and were more likely to come from diverse subsources. For example, multiple flakes can be removed from the same core all having the same elemental signature; this is less likely to occur among cores.

For Matrensa and Stentinello, all of the artifacts on display in the museum were analyzed first. Later, when the rest of the collections from these sites were received, the artifacts were divided into categories based on their stages of reduction, including nodules, cores, flakes, blades, and angular waste. I then randomly selected a 20% sample of artifacts within each of the remaining categories, including flakes, blades, and angular waste. This was achieved by laying out the divided material on a table and selecting every fifth artifact.

Because I never had complete access to the entire assemblage from Megara Hyblaea at one time and I was told that there were a large number of artifacts, I decided to take a 10% random sample from each box received. This was achieved by laying out the material from each box and then selecting every tenth artifact for analysis.

For Contrada Caduta, there was only time to analyze 15% of the assemblage. All 365 of the artifacts were laid out on a table and every 24th piece was randomly selected for analysis.

Due to time constraints, it was only possible to analyze 5 randomly selected artifacts from Palma di Montechiaro. This material was not given priority because it came from an unstratified context. Nevertheless, all of the 43 artifacts from the site were typologically classified.

At Contrada Diana, a vast amount of obsidian has been recovered from excavation, far more than would have been countable during the time I was there. Moreover, an analysis of a selection of artifacts from the site has also been recently published (see Iovino et al. 2008b). Because of these reasons, I thought it best to put more effort and time into analyzing other assemblages. Because I wanted to know whether residents on the island of Lipari exploited both local subsources, a random selection of 54 artifacts was elementally analyzed.

Because of time constraints, I estimated that there was only time to fully analyze 70 artifacts from Casalicchio-Agnone. All of the artifacts were laid out on a table and every 14th artifact was selected for analysis. At the end of the day, there was extra time, so I decided to analyze as many cores as possible before finishing.

The only artifacts that were analyzed from Stretto Partanna were those on display at the Basso Belice Prehistoric Archaeology Museum (Partanna). Museum curators did not have access to the remaining material.

Due to time constraints, it was only possible to elementally analyze 40 randomly selected artifacts from the Late Neolithic Diana phase of San Martino. Because of the large number of artifacts from the site (n=1,237), priority was placed on doing a basic categorization of all of the artifacts. It was therefore not possible to undertake a full typological analysis of any of the artifacts.

Sardinia

Only a selection of artifacts were analyzed from all three Sardinian sites included in this study. This included separate, but similar, sampling strategies on artifacts from the Chalcolithic and Bronze Age phases of Bingia 'e Monti as well as at Nuraghe Pidighi and Mitza Pidighi.

At Bingia 'e Monti, all of the lithics recovered from the excavations were bagged together according the unit and stratum from which they were recovered. To answer the relevant research questions, just over a third of the bags from the Monte Claro phase at Bingia 'e Monti were randomly selected for analysis. In order to get a representative sample of artifacts recovered throughout the Monte Claro strata, both inside and outside the structures, all of the materials were laid out in their provenience-specific bags and one-third of the bags (i.e. every third) were randomly selected for analysis. This percentage was chosen because it would result in a robust enough sample to make valid interpretations while still fitting within logistical constraints such as time and money.

Because of the visual similarities between the black/gray rhyolites in the assemblage and the obsidian, it was not possible to distinguish between the two with any certainty. Therefore all artifacts, including the rhyolites, were elementally analyzed. In the end, a total of 154 (36%) Monte Claro obsidian artifacts from Bingia 'e Monti were analyzed. Out of this selection, eight obsidian artifacts were too small to be run by EDXRF (cf. Davis et al. 1998), but were nevertheless included in the typological analysis as their presence in the assemblage has important implications.

The same sampling strategy was undertaken at the other sites. In the end, 39% (n=147) of the obsidian artifacts from the Nuragic phase of Bingia 'e Monti were selected for analysis, one of which was too small to be run by EDXRF. At Nuraghe Pidighi, 43% (n=220) of the obsidian artifacts were selected for analysis, one of which was too small to be run by EDXRF. One hundred and forty-two (23%) obsidian artifacts from Mitza Pidighi were analyzed, two of which were too small to be run by EDXRF. Note that the varying percentages of analyzed artifacts are the result of keeping artifacts together in their provenience-specific bags. One-third of the total bags were sampled, not one-third of the artifacts.

Since it was necessary to catalogue and photograph all of the assemblages before export, it can be confirmed that that the selected material is representative of the whole in that the Monte Claro assemblage is mainly composed of flakes as well as highly cortical cores and angular waste; the Nuragic material is mainly composed of flakes, blades, angular waste, and non-cortical cores.

Chapter 6: West Mediterranean Obsidian Consumption through Time

This chapter comprises an in-depth examination of West Mediterranean obsidian consumption through time. Based on my complied database of published obsidian studies over the past 50 years (see Appendix D), I address central questions about the distribution of the various source products and the timing and nature of the development and disintegration of complex networks of circulation through time.

Figure 6.1 shows a map of archaeological sites in which obsidian has been reported in the West Mediterranean from the sixth to second millennia B.C. To date, it comprises 1,199 sites spread over a large area that includes modern-day Italy, France, Slovenia, Croatia, Bosnia and Herzegovina, Albania, Tunisia, Algeria, Malta, and Spain. This spans an area of about 2,100 kilometers east to west and 1,800 kilometers north to south. Most of the sites where obsidian has been documented are residential in nature, including both open-air settlements and caves. Obsidian has also been found in association with human burials at 25 sites throughout the region (Figure 6.2); as I shall discuss below, these latter contexts provide evidence for reconfigured modes of obsidian consumption in Bronze Age Sicily.

Source Specific Distributions

Lipari

Lipari obsidian has the largest distribution of the four sources in terms of area (Figure 6.3), being found at 203 archaeological sites throughout mainland Italy, southern France, northern Africa, and Sicily. The earliest exploitation of Lipari obsidian is during

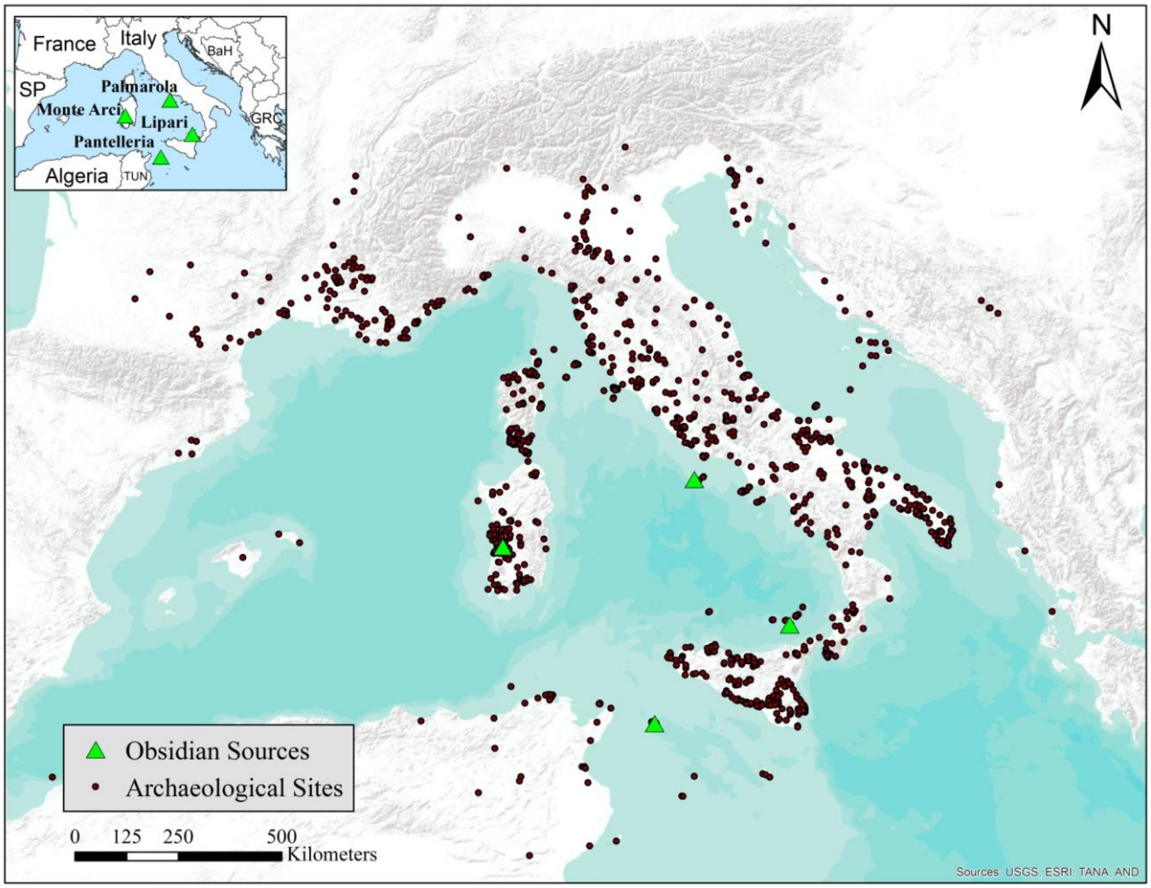

Figure 6.1 Map of archaeological sites in which obsidian has been reported in the West Mediterranean (ca. 6th-2nd millennia B.C.).

the sixth millennium B.C. as represented at Impressed Ware sites in southern Italy such as Favella della Corte and Torre Sabea (Bigazzi and Radi 1998; Gratuze and Boucetta 2009). The use of Lipari obsidian continues through the mid-2nd millennium B.C. on the island of Sicily. While no Lipari material has been reported on Sardinia, a small amount has been recovered from sites in the Tuscan Archipelago and at A Fuata and Teghja di Donna on the island of Corsica (Le Bourdonnec et al. 2010, 2011). Lipari obsidian has also been found on several islands linking the Gargano Peninsula of eastern Italy with

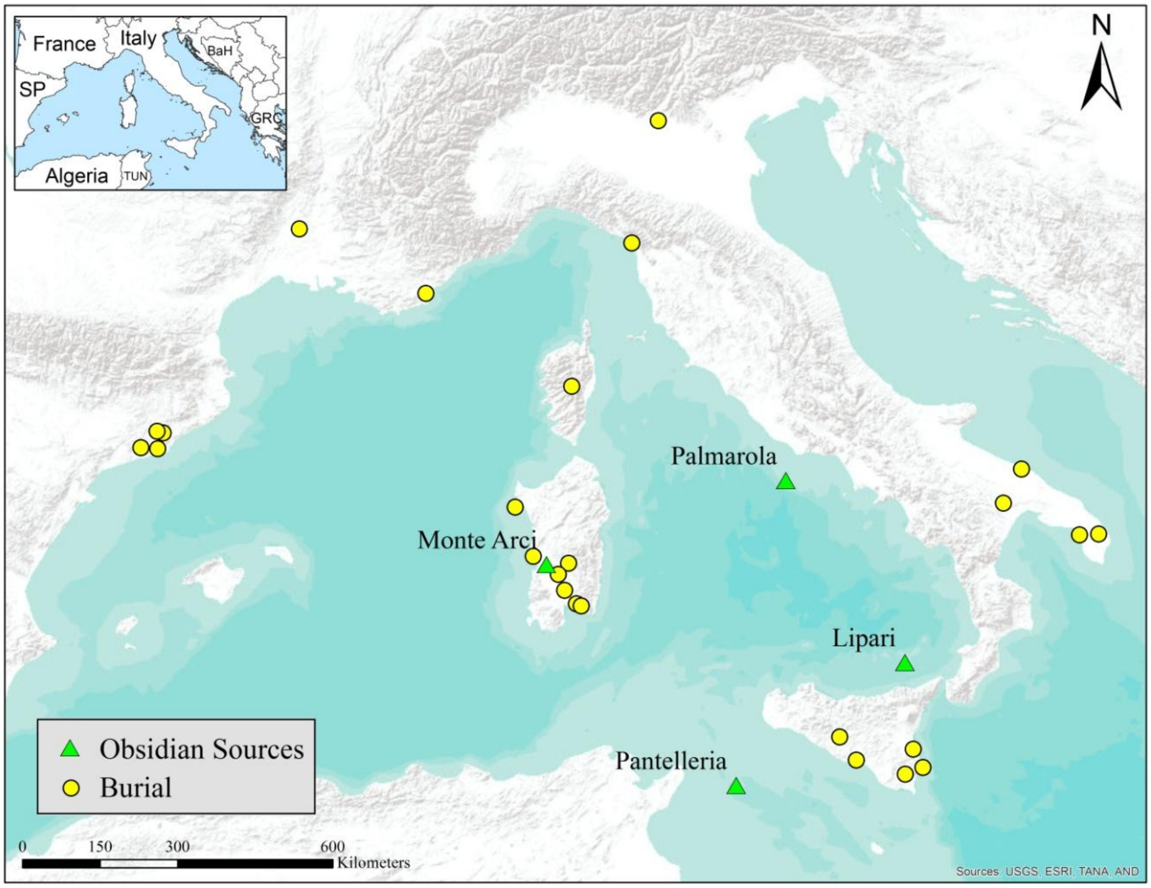

Figure 6.2 Map of sites in where West Mediterranean obsidian has been found in association with human burials (ca. 6th-2nd millennia B.C.).

southern Croatia, offering evidence for early cultural links that are relevant in the context of the spread of farming (Forenbaher 2009: 223-224).

Monte Arci (Sardinia)

Obsidian from the Monte Arci source on Sardinia has been reported at 196 archaeological sites in the West Mediterranean (Figure 6.4). In general, its use is restricted to sites on Corsica, northern Italy, southern France, Spain, and on the island itself. The exploitation of the source began during the sixth millennium B.C. and

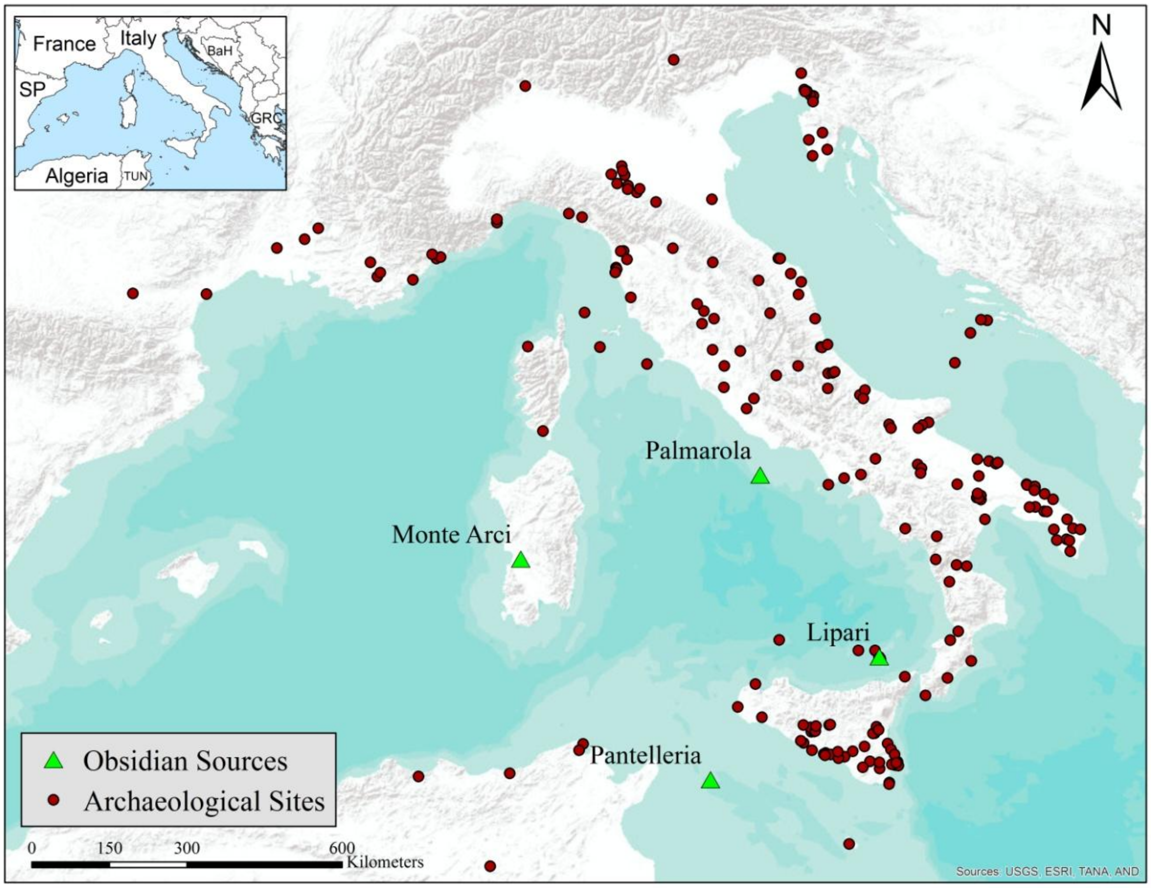

Figure 6.3 Map illustrating the distribution of Lipari obsidian at archaeological sites from the sixth to second millennia B.C.

continued locally through the late 2nd millennium B.C. Interestingly, a single bladelet of SC obsidian has also been recovered at the Middle to Late Neolithic (ca. 5th-4th millennia B.C.) site of Pulo di Molfetta in southern Italy (Acquafredda and Muntoni 2008), an eccentric find that Tykot (2011: 40) believes to support in part the hypothesis of a "non-systematic, down-the-line type exchange system" during the Neolithic.

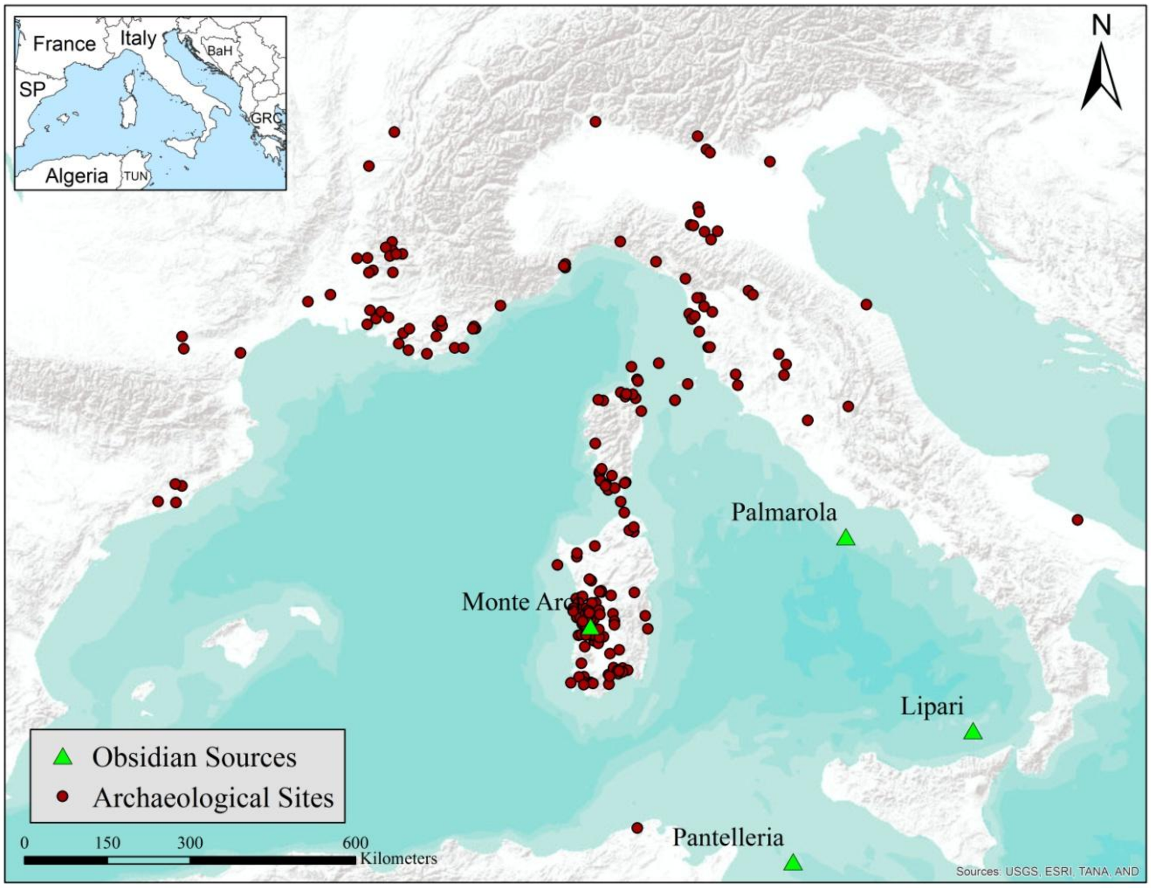

Figure 6.4 Map illustrating the distribution of Monte Arci obsidian at archaeological sites from the sixth to second millennia B.C.

Palmarola

Palmarola obsidian has been found at 44 archaeological sites (Figure 6.5) dating to as early as the sixth millennium B.C. at Impressed Ware settlements such as La Marmotta and La Secche (Bigazzi and Radi 1998). While there are several sites of possible Chalcolithic date such as Chiarentana (De Francesco et al. 2006a), there is very little evidence for post-Neolithic use of the material. Its distribution extends throughout much of central and northern Italy, being found at numerous sites along the Adriatic coast of eastern Italy.

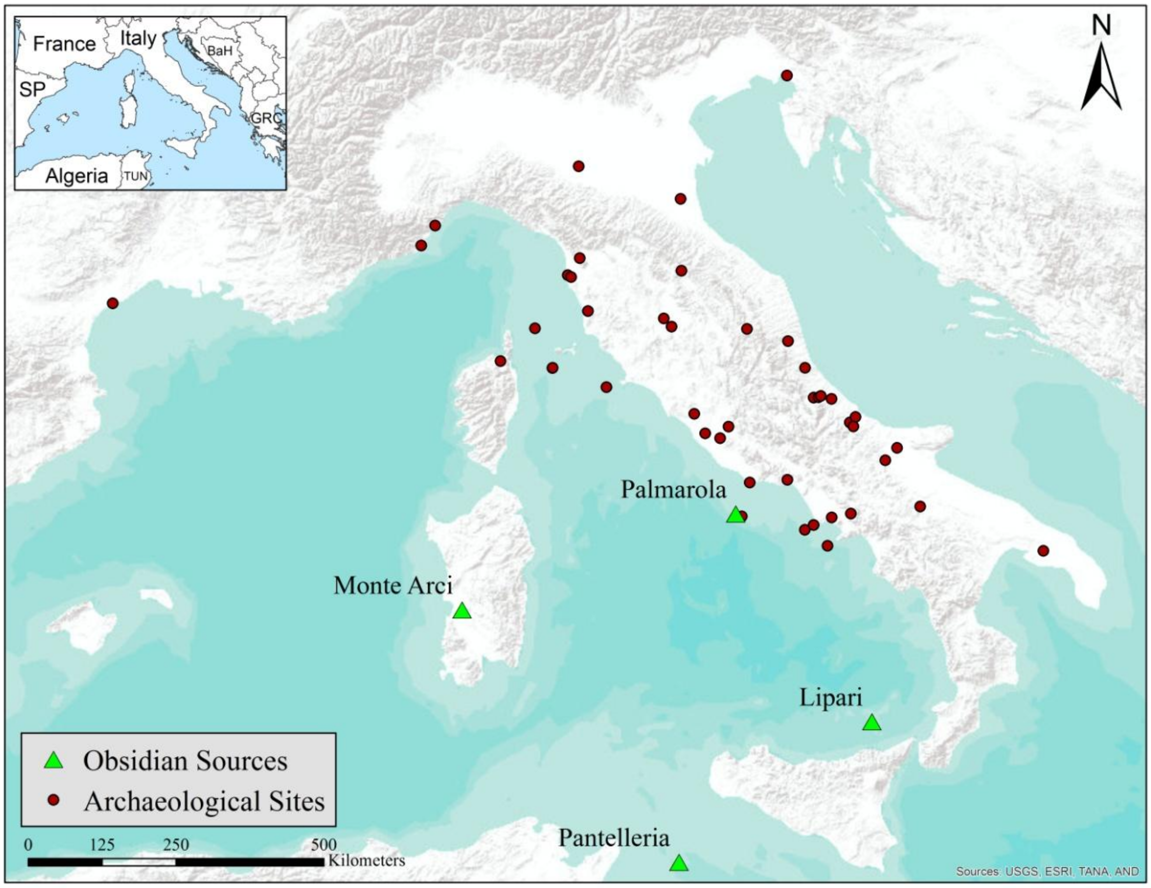

Figure 6.5 Map illustrating the distribution of Palmarola obsidian at archaeological sites from the sixth to third millennia B.C.

Considering that Palmarola obsidian is almost never found at sites along the coasts of southern Italy, it is likely that these raw materials were transported to eastern Italy by land over the Apennine mountains as opposed to around the tip of southern Italy by boat. The north-south distribution of Palmarola obsidian along the Adriatic suggests that it was subsequently integrated into maritime networks operating along the coast.

Pantelleria

Pantelleria obsidian can be easily recognized by its distinct greenish hue and has been found at 40 archaeological sites in Malta, northern Africa, and Sicily (Figure 6.6). Its use likely began in the sixth millennium B.C., continuing locally and on the island of Sicily through the mid-second millennium B.C. There have, however, been claims of pre-Neolithic exploitation of Pantelleria obsidian in northern Africa, although there is still much work to be done in the region in terms of establishing reliable chronologies and in recovering obsidian from well-excavated contexts (see Mulazzani et al. 2010). One of the few radiocarbon dates associated with obsidian comes from Kef Hamda in Tunisia, where associated materials indicate an early sixth millennium B.C. date (7610 ±125 B.P., 5660 B.C.; Camps 1986).

Early Obsidian Procurement and Maritime Navigation

If we begin with the recognition that all obsidian sources in the West Mediterranean are island-based and thus required boats to access them, then early obsidian consumption is best understood by locating it within broader traditions of early maritime navigation and boat use (see Table 6.1; Farr 2007; Freund and Batist in press). Of the 1,199 total sites with obsidian, 74% (n=883) are located within 25 kilometers of the sea, thus highlighting the coastal/maritime nature of obsidian circulation.

In contrast to the Aegean where there are clear indications of obsidian being procured from island sources as early as the 11th millennium B.C. (Upper Palaeolithic) and throughout the Mesolithic from about 9000 - 7000 B.C. (Perlès 1990; Powell 2003;

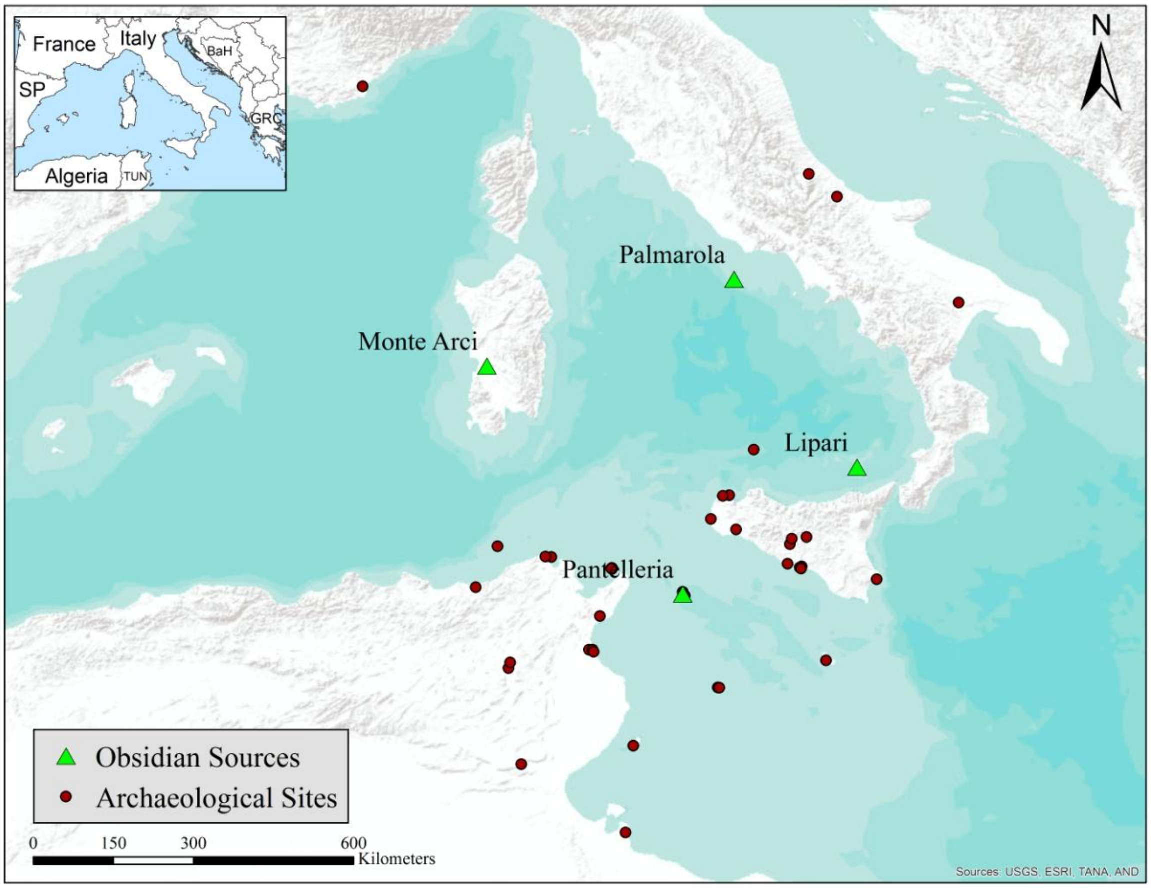

Figure 6.6 Map illustrating the distribution of Pantelleria obsidian at archaeological sites from the sixth to second millennia B.C.

Strasser et al. 2010), evidence for hunter-gatherer maritime navigation in the West Mediterranean is comparatively lacking. While there have been several claims of small numbers of obsidian artifacts at Mesolithic sites in southern France, Corsica, and Sicily (see Aranguren and Revedin 1998; Bressy et al. 2008; Iovino et al. 2008a; Laplace 1977; Leale Anfossi 1972, 1974), few of these contexts have been reliably dated and must be viewed with caution. In terms of maritime navigation, there is also evidence for small open-water crossings from mainland Italy to the then connected islands of Corsica and Sardinia (Corsardinia) during the Upper Palaeolithic and Mesolithic (Costa et al. 2003;

Source	Distance
Pantelleria	100
Monte Arci	60
Palmarola	50
Lipari	30

Table 6.1 Longest open-sea distances (in km.) from West Mediterranean obsidian sources to the nearest mainland. Note that these measurements take into account intermediary islands. The distance from Monte Arci was calculated from the north end of Corsica to mainland Italy due to the complete lack of evidence for journeys directly from the source itself.

Sondaar and van der Geer 2000); nevertheless, these journeys are quite distinct from the directed island expeditions occurring elsewhere in the eastern Mediterranean at this time (Aegean islands and Cyprus; see Broodbank 2006).

Sixth Millennium B.C.

By the beginning of the Neolithic (ca. 6th millennium B.C.), we begin to see the widespread proliferation of obsidian consumption throughout the West Mediterranean. Given that obsidian use is virtually absent during the seventh millennium B.C., it is remarkable just how rapidly the tradition of using these distinctive raw materials was adopted, being found at 144 sixth millennium B.C. sites throughout all of Italy, Croatia, Tunisia, and several sites in southern France (Figure 6.7). While it is true that obsidian is found at a large number of sites spread over a vast area, it is rarely the primary raw material in lithic assemblages outside of the immediate vicinities of the source areas (Figure 6.8). While this could be due to its lack of durability in performing everyday tasks (i.e. obsidian dulls easily), it is more likely related to its difficulty to access and obtain. The fact that its presence is so ubiquitous is likely related to its symbolic status within a

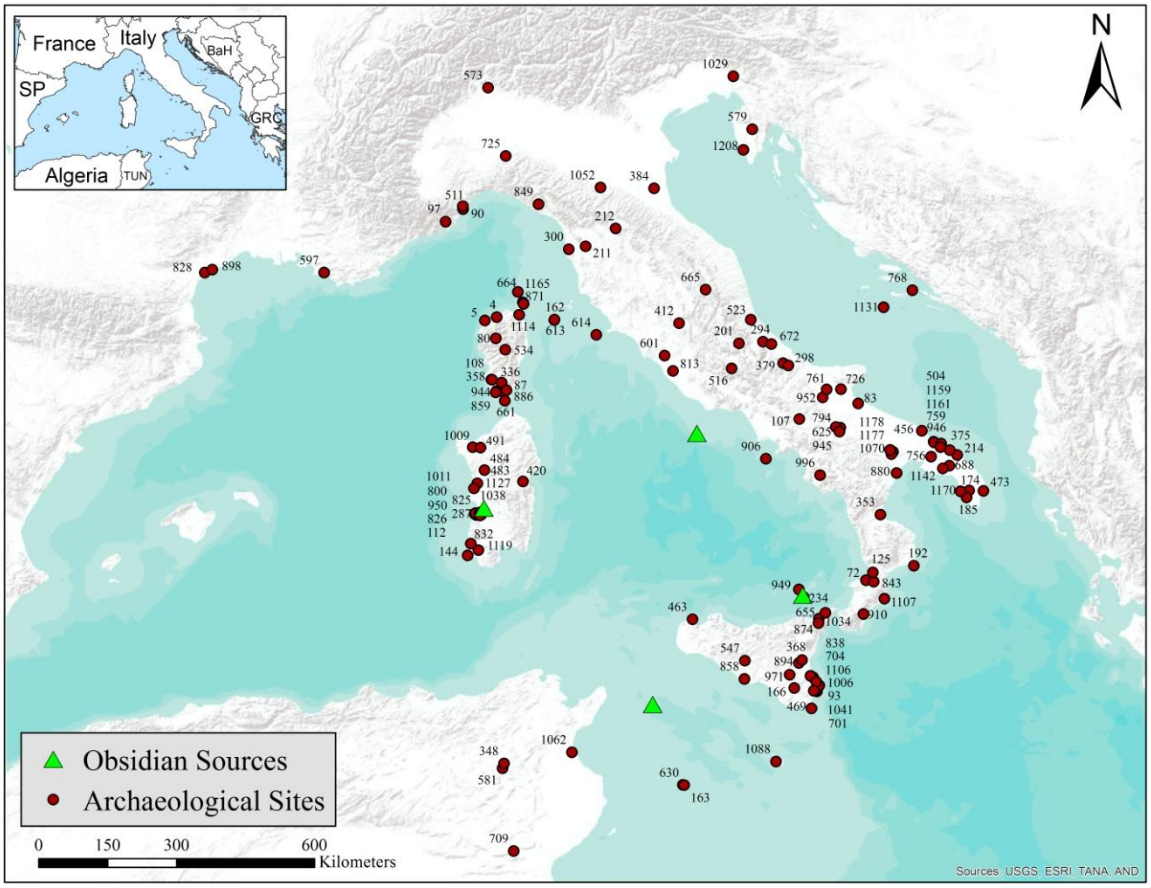

Figure 6.7 Sixth millennium B.C. archaeological sites with obsidian. Numbers correspond with those listed in Appendix D.

larger network of connected sites and therefore a reflection of peoples' desire to participate in maritime networks of interaction, with obsidian as a recognized medium of exchange as much as a desired material in its own right.

Because early obsidian use is so closely associated with Neolithic farming communities, it is best seen as one facet of a much broader cultural tradition associated with the adoption of domesticated plants and animals, ceramic production, long-distance exchange, and a sedentary village lifestyle (Barker 2006: 327; Whitehouse 1986: 42), a

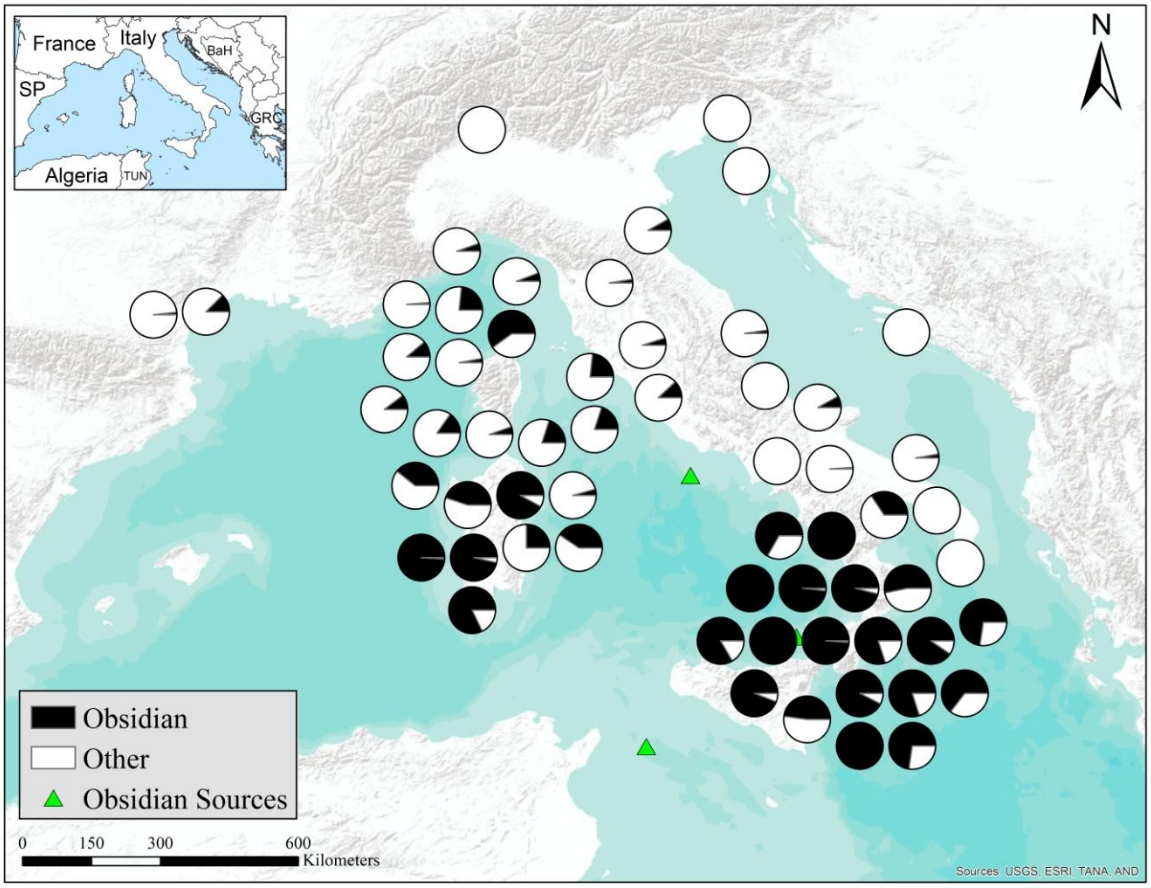

Figure 6.8 Distribution map of the percentage of obsidian in chipped stone assemblages dating to the sixth millennium B.C. Black: obsidian; White: other lithic material.

world in which people were increasingly defined through their involvement with material goods (see Hodder 2004).

While the overall lack of detailed techno-typological studies of these early obsidian assemblages the West Mediterranean does not allow for a particularly nuanced discussion of how obsidian was being consumed at this time, some basic spatial patterns can be elicited from the data available. In general, Sicilian Early Neolithic communities appear to have used Lipari obsidian to manufacture pressure-flaked blades while those living in the province of Calabria in southern Italy used the same raw material to make larger blades by a direct percussion technique (Diamond and Ammerman 1985). As one moves north into central and northern Italy, smaller blades and bladelets made from Lipari, Palmarola, and Monte Arci obsidian become prevalent (Robb and Farr 2005). At the Ligurian site of Arene Candide, for example, Monte Arci and Palmarola obsidian make up roughly equal percentages of the assemblage. Bi-polar blades and bladelets make up 65% of the collection while cores comprise almost 8% (Ammerman and Polglase 1993). On Sardinia and Corsica, flake-based tools and direct percussion blades made of SA, SB2, and SC obsidians are found at sites such as Rio Saboccu (Lugliè et al. 2009), Coddu is Abbionis (Carboni and Lugliè 2010), Strette (Costa 2006), and Basi (Bressy et al. 2008).

At the tail-end of this network of connected sites are those east of the Adriatic Sea. It is clear that Lipari obsidian and to a much lesser degree Palmarola obsidian reached several sites in Croatia as early as the sixth millennium B.C., a journey of well over 2,000 kilometers by sea. These artifacts are mainly finished blades, likely created through pressure flaking (Farr 2007; Williams-Thorpe et al. 1979). Considering that these artifacts represent the farthest displacement of West Mediterranean obsidian, these sites deserve further attention.

Figure 6.9 shows a map of the total number of obsidian artifacts found at sixth millennium B.C. sites throughout the West Mediterranean. Two patterns are immediately evident. The first is that sites near the source areas such on Sardinia, Corsica, Sicily, and Calabria are characterized by lithic assemblages with relatively high numbers of obsidian artifacts that comprise a high percentage of the overall assemblages. The second pattern is

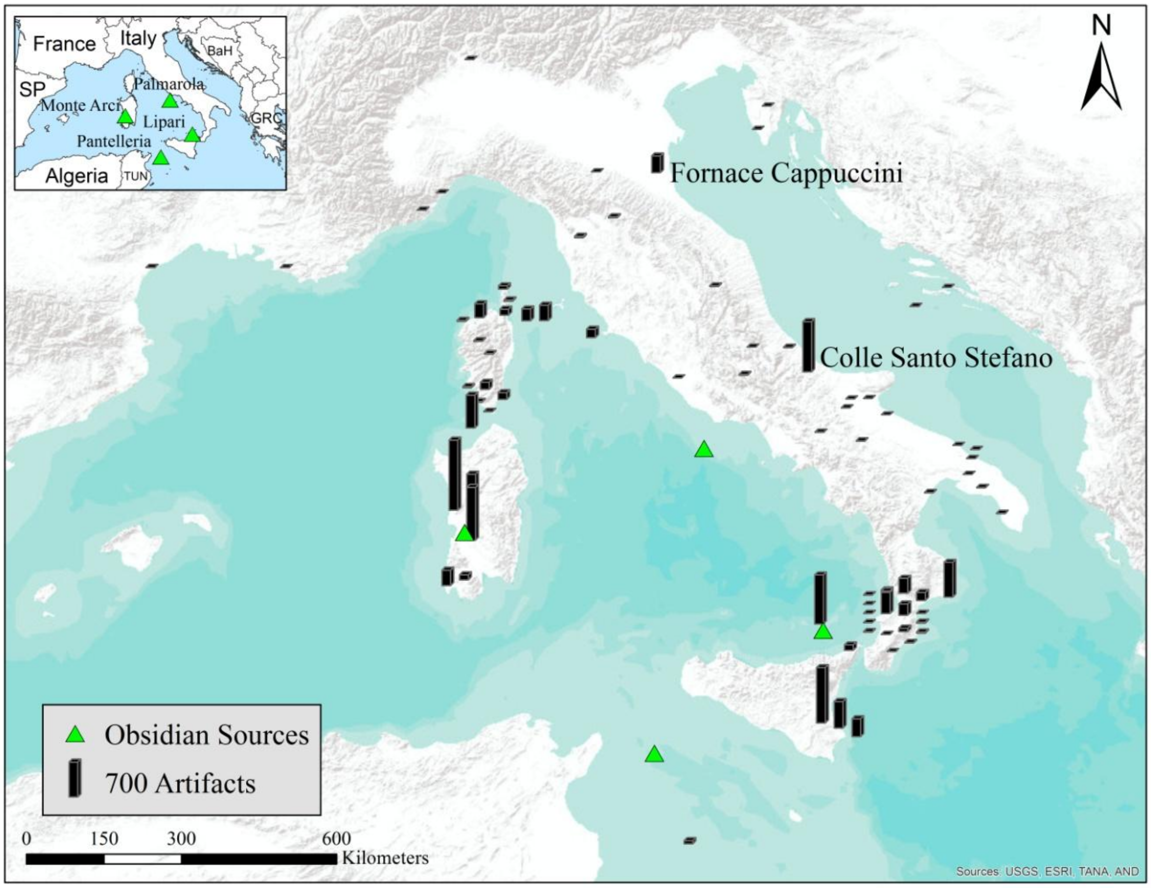

Figure 6.9 Map showing the frequencies of the total number of recovered artifacts at individual sites dating to the sixth millennium B.C. Bar size corresponds with artifact counts. Note: Counts do not necessarily correspond with the number of analyzed artifacts.

that the majority of sites throughout mainland Italy contain low numbers of obsidian artifacts. However, certain sites contain far more artifacts than the surrounding areas, most notably Colle Santo Stefano in east-central Italy and Fornace Cappuccini in north-central Italy. These results suggest the existence of multiple exchange spheres operating to distribute obsidian across the land/sea-scape.

Interpreting the Sixth Millennium B.C. Circulation of Obsidian in the West Mediterranean: Direct Procurement and Maritime Down-the-line Exchange near the Source Areas

As previously discussed, down-the-line exchange is a mode of procurement in which communities near an obsidian source procure raw materials directly and then exchange a certain percentage of that obsidian with neighboring communities, i.e. beyond them with regard to location of source. This process continues as diminished quantities of obsidian are found in direct correlation with distance from the source (Ortega et al. 2014; Renfrew 1969). Based on an examination of both the quantity of obsidian at archaeological sites in Sardinia and Corsica and the manner in which these materials were reduced, I argue that a model of down-the-line exchange best explains what is occurring. Considering that sites in the immediate vicinity of the Monte Arci source, such as Rio Saboccu (Lugliè et al. 2009), have such high numbers of obsidian artifacts and a large amount of primary reduction material, it is likely that these sites procured obsidian directly from the source. These communities then exchanged/gifted these products with sites in southern Sardinia and Corsica, where similar percentages of the various subsources are found in much smaller numbers and as much smaller percentages of overall lithic assemblages (Tykot 1996).

Nevertheless, the fall-off is not linear, particularly in Corsica where we see inland sites with relatively small numbers of obsidian artifacts. This is likely due to the coastal nature of obsidian distribution (Freund and Batist in press; de Lanfranchi 2010), where small groups would have traveled northward along the coast to exchange a range of goods and information with their nearby neighbors/kin relations. Similar journeys likely occurred in the other direction as well. On Corsica, obsidian has been reported at 16 sixth millennium B.C. sites. Of these, two sites (Albertini and Grotte Southwell) are greater than 20 kilometers from the coast. Obsidian at these sites comprises 1% and 10% of the lithic assemblages respectively (Bressy et al. 2008). For the remaining coastal sites, obsidian averages 27% of the lithic assemblages and ranges from 3% to 92%. The presence of 92% obsidian at the site of Lumaca (see De Francesco et al. 2010) on the northern tip of Corsica is anomalous and could suggest that the residents of the site shared a more direct relationship with communities in Sardinia that those with lower percentages did not.

A similar model of obsidian distribution is also applicable to Sicily and southern Italy at this time. Based on an examination of Figures 6.8 and 6.9 and based on results obtained from my analyses of obsidian at sites throughout Sicily and the Eolian islands (to be discussed later), I argue that the primary reduction of Lipari obsidian occurred at the source area by local populations, with these raw materials being brought from the island to eastern Sicily and Calabria in the form of preformed cores. Despite similarities in the initial procurement of Lipari obsidian, there is little evidence to suggest that sites in eastern Sicily acted as nodes for the subsequent redistribution of obsidian as appears to be the case in many regions of mainland Italy. Indeed, at the present moment there are very few sixth millennium B.C. sites in western Sicily with obsidian anyway.

Concerning the distribution of Pantelleria obsidian, these raw materials are found on several islands south of Sicily as well as a number of sites throughout Tunisia. Nevertheless, an analysis of 121 obsidian artifacts from Skorba on the island of Malta revealed that the majority (81%) of the assemblage was composed of Lipari obsidian, not Pantelleria (Cann and Renfrew 1964). Moreover, while Pantelleria obsidian makes it to the island of Sicily and is consequently introduced into a tradition of pressure-flaked blade production, particularly in later periods, it is never in large quantities. As such, the overall lack of Pantelleria material in archaeological assemblages in combination with its presence at coastal sites closest to the source would seem to indicate that these materials were being acquired unsystematically by people traveling between Pantelleria and other islands like Sicily, Malta, Lampedusa, and Ustica. This is also supported by the presence of varying percentages of the two Pantelleria subsources in archaeological assemblages, although more data are needed to make more concrete interpretations.

Interpreting the Sixth Millennium B.C. Circulation of Obsidian in the West Mediterranean: Direct Procurement and Local Redistribution outside the Source Areas

While a model of maritime down-the-line exchange can be used to explain the distribution of obsidian from communities in the source areas around Monte Arci and Lipari to those residing in southern/northern Sardinia, Corsica, and Calabria, it cannot explain the patterns we view throughout much of mainland Italy. By examining Figures 6.8 and 6.9, we see that most sites on the mainland have very small numbers of obsidian artifacts with several sites containing far more than would be expected through a model of down-the-line exchange given their distance from source. This includes the sites of Colle Santo Stefano (n=1,000) in east-central Italy and Fornace Cappuccini (n=334) in north-central Italy. If we consider these patterns within the context of Renfrew's (1975: 48-49) models, then what we see best fits under what is described as "Central-place

Redistribution", a fall-off pattern that was considered indicative of market-place exchange and characteristic of more-complex chiefdoms and state-level societies. As previously discussed, however, there is little to no evidence for social stratification, large regional centers, or extensively rich sites during the Early Neolithic in the West Mediterranean. This forces a recontextualization of the role of obsidian accumulation in small-scale societies.

Colle Santo Stefano is a open-air residential site dated to the first half of the sixth millennium B.C. with Impressed ware ceramics that show affinities to sites farther south (Pessina and Radi 2006; Radi and Danese 2003). Excavations at the site revealed three levels of occupation, with obsidian from Palmarola and Lipari comprising 8% of the lithic assemblage (Bigazzi and Radi 2003). Most of the artifacts were flakes, blades, and bladelets; only a small number of cores were recovered (~1%), suggesting limited on-site reduction.

Fornace Cappuccini is a large open-air village with Impressed ware ceramics dating to the earliest phases of the Neolithic (Montanari et al. 1994). While obsidian from Lipari and Palmarola were found at the site, the majority of the assemblage is comprised of local cherts with typological affinities to the preceding Mesolithic phases. As such, this site can be seen as occupying the borderlands between early farming communities from the south and hunter-gatherer groups with long-term ties to the region.

In terms of the transport and exchange of obsidian, the lack of sites with obsidian along the west coast of Italy suggests that the majority of raw materials from Lipari were transported by boat along the southern coast of Italy, where large numbers of artifacts are found at sites such as Capo Alfiere (Farr 2007; Vaquer 2007). From there, these products were integrated into obsidian circulation networks operating along the Adriatic coast. In contrast, Palmarola obsidian was likely transported over the Apennine mountains by foot, where it would have entered into these same maritime networks operating along east coast of Italy.

Due to the lack of cores found at sixth millennium B.C. sites (Figure 6.10), these products likely circulated in finished or semi-finished form or were quarried by itinerant specialists who then knapped and traded the material (cf. Perlès 1990). While the existence of itinerant specialists is possible, the current data suggest that the initial procurement and subsequent redistribution of these products were undertaken by a select number of communities who had the capacity to organize and crew long-distance voyages to the quarry sites (cf. Broodbank 1989). Under this model, however, we must be careful to avoid simple explanations in which obsidian is simply taken from the quarry to the site. For example, evidence from southern Italy suggests that much of the primary reduction of obsidian raw materials coming from the island source of Lipari occurred at specialized coastal sites before being transported to larger redistributive centers farther inland (Ammerman 1985; Ammerman and Andrefsky 1982).

Although I am putting the primacy on the movement of obsidian, it must be kept in mind that these materials' circulation and exchange were not necessarily the main objects of interest for those undertaking maritime ventures and participating in long-distance exchange networks. Indeed, the circulation of a range of items, including flints from the Gargano Peninsula and Sicily, groundstone axes, and jadeite was also occurring

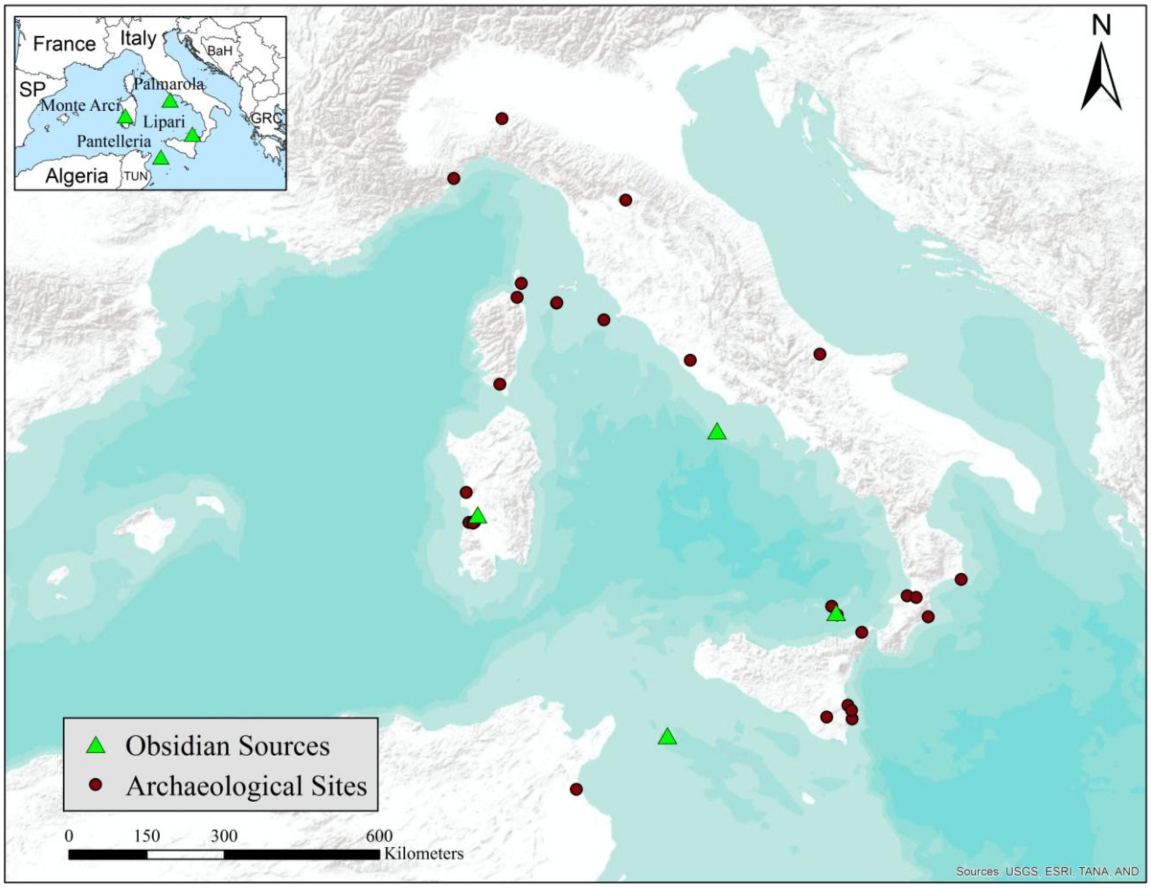

Figure 6.10 Map of sixth millennium B.C. sites where obsidian cores have been reported.

at this time (Di Lernia 1998; Pétrequin et al. 2006). In this sense, the gifting and exchange of exotic objects can be seen as a medium through which social relations were both formed and negotiated, similar to Kula Ring of Melanesia described by Malinowski (1922). While not wishing to reduce the use of razor sharp obsidian in the Neolithic to an epi-phenomenon, I argue that the accumulation of these materials was a means by which individuals or groups could enhance their own social standing through control over the esoteric knowledge needed to acquire them (i.e. long-distance maritime travel, navigational skills, social ties, etc.; Broodbank 1989; Farr 2007; Helms 1988). In this capacity, the accumulation of obsidian was a form of competitive aggrandizement and a means of accruing social capital, although this does not imply that these groups would have been able to transfer this power to leadership roles over multiple aspects of daily life (cf. Robb 1999). In this context, certain sites acted as 'gateway communities' (see Carter 2004; Hirth 1978) or 'central nodes' (see Mizoguchi 2009; Peregrine 1991), where gifting practices resulted in the subsequent redistribution of obsidian to the surrounding areas. The full implications of these claims will be discussed further in Chapter 9.

Fifth Millennium B.C.

In general, the fifth millennium B.C. sees a continuation and expansion of previous trends, particularly in the latter half of the fifth millennium. To date, obsidian has been reported at 219 archaeological sites (Figure 6.11), a 52% increase from the previous millennium, largely the result of obsidian now being documented at/expanding to sites in southern France and Spain. As before, obsidian is rarely the primary raw material in chipped stone assemblages outside of the immediate vicinities of the source areas (Figure 6.12).

In general, obsidian reduction sequences/knapping traditions remain consistent throughout much of the West Mediterranean, although there is more evidence for source based differences in obsidian reduction strategies. For example, at the site of Gaione in north-central Italy, obsidian from Sardinia, Palmarola, and Lipari is present. The Lipari

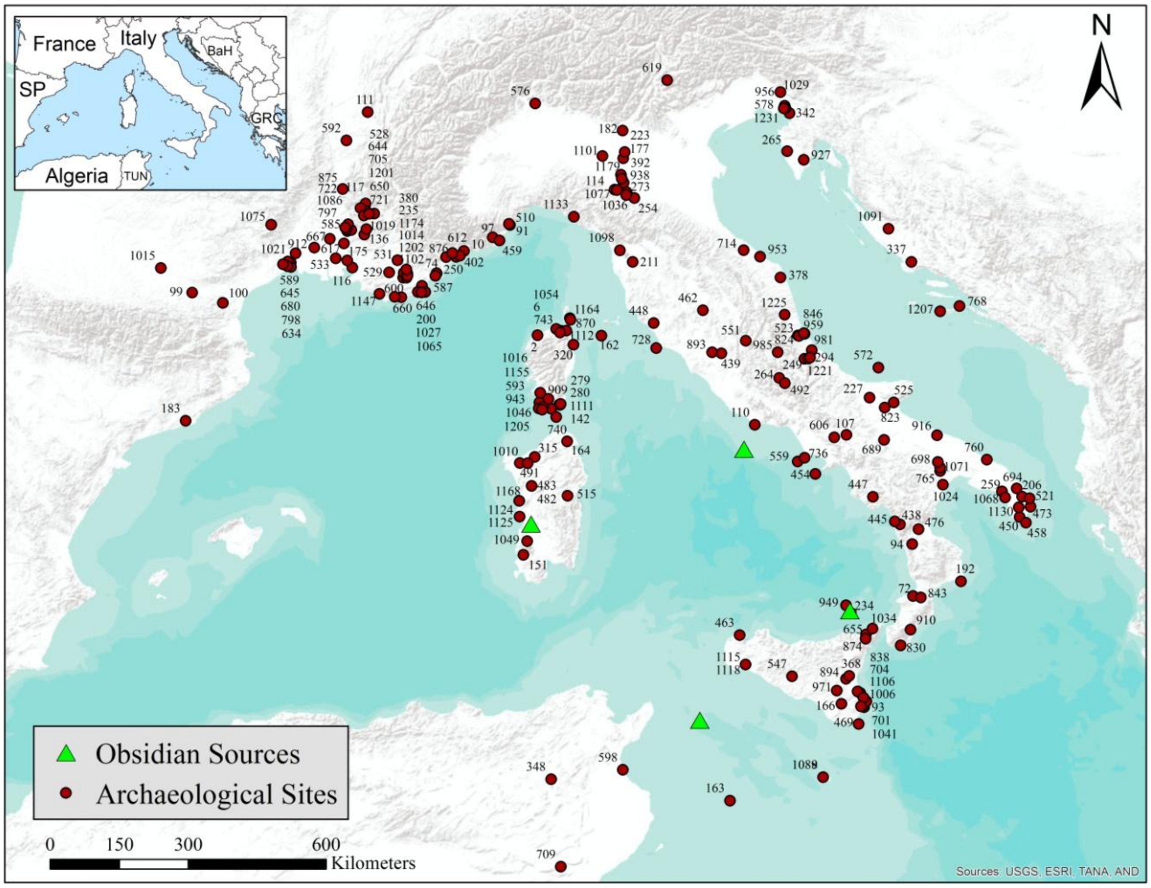

Figure 6.11 Fifth millennium B.C. archaeological sites with obsidian. Numbers correspond with those listed in Appendix D.

material mainly consisted of finished blade products, while Sardinian and Palmarola materials took form as cores and flake-based tools (Polglase 1990).

Other source-specific reduction strategies are also evident in southern France, where pressure-flaked blade production became the dominant technical tradition amongst a number of Middle Neolithic Chasséen period communities in southern France. In these areas, the overwhelming majority (92%) of obsidian is of the SA type from Sardinia (Figure 6.13). Most of the French material consists of pressure-flaked blades (Costa 2007: 57), with related cores only found at two sites, namely Terres Blanches and Terres

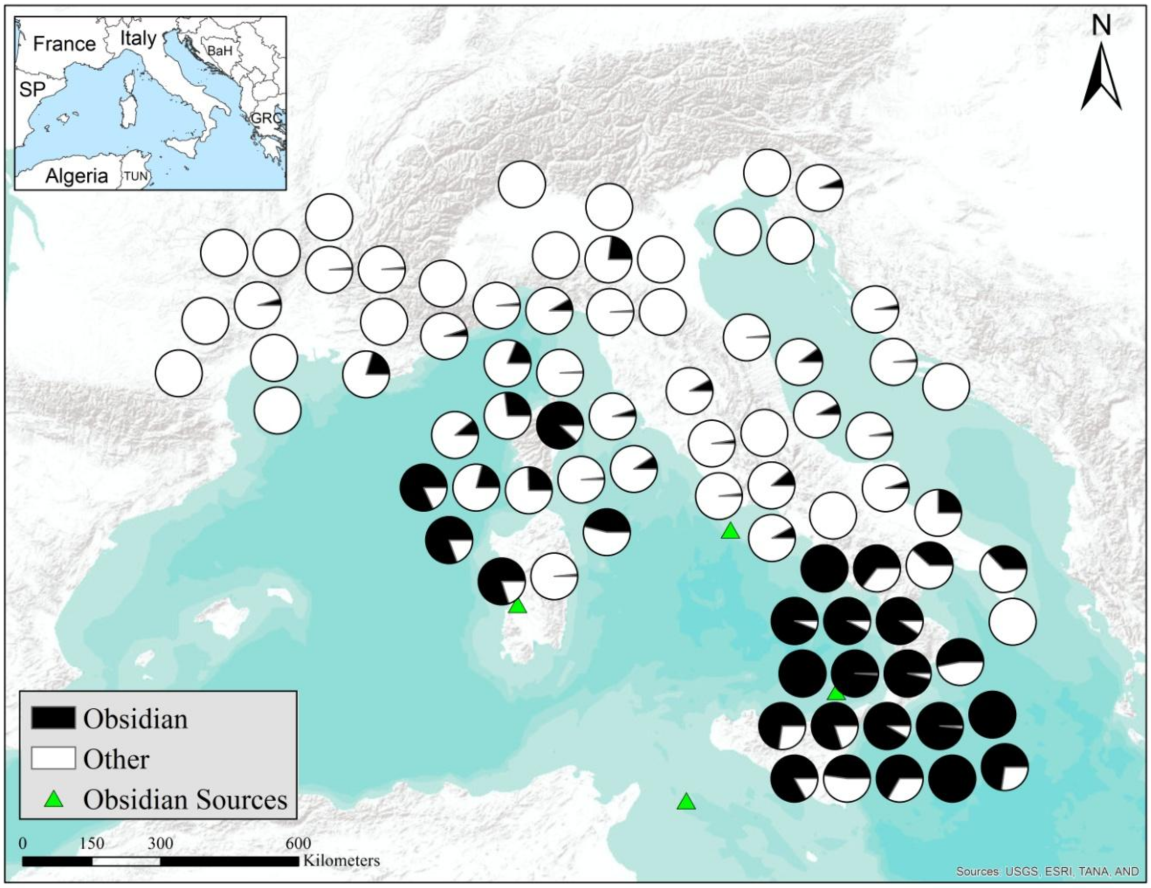

Figure 6.12 Distribution map of the percentage of obsidian in chipped stone assemblages dating to the fifth millennium B.C. Black: obsidian; White: other lithic material.

Longues. Small numbers of pressure-flaked blades and debitage are also found at several burial sites in southern Spain dating to the latter half of the fifth millennium B.C. and into the fourth millennium B.C. (Terradas et al. 2014).

On Sardinia and Corsica, obsidian of type SC becomes more prevalent, comprising 53% and 63% percent of archaeological assemblages respectively, compared with 17% and 35% during the sixth millennium B.C. Differences in the reduction of the various Sardinian subsources are also apparent, with SC obsidian being restricted to use

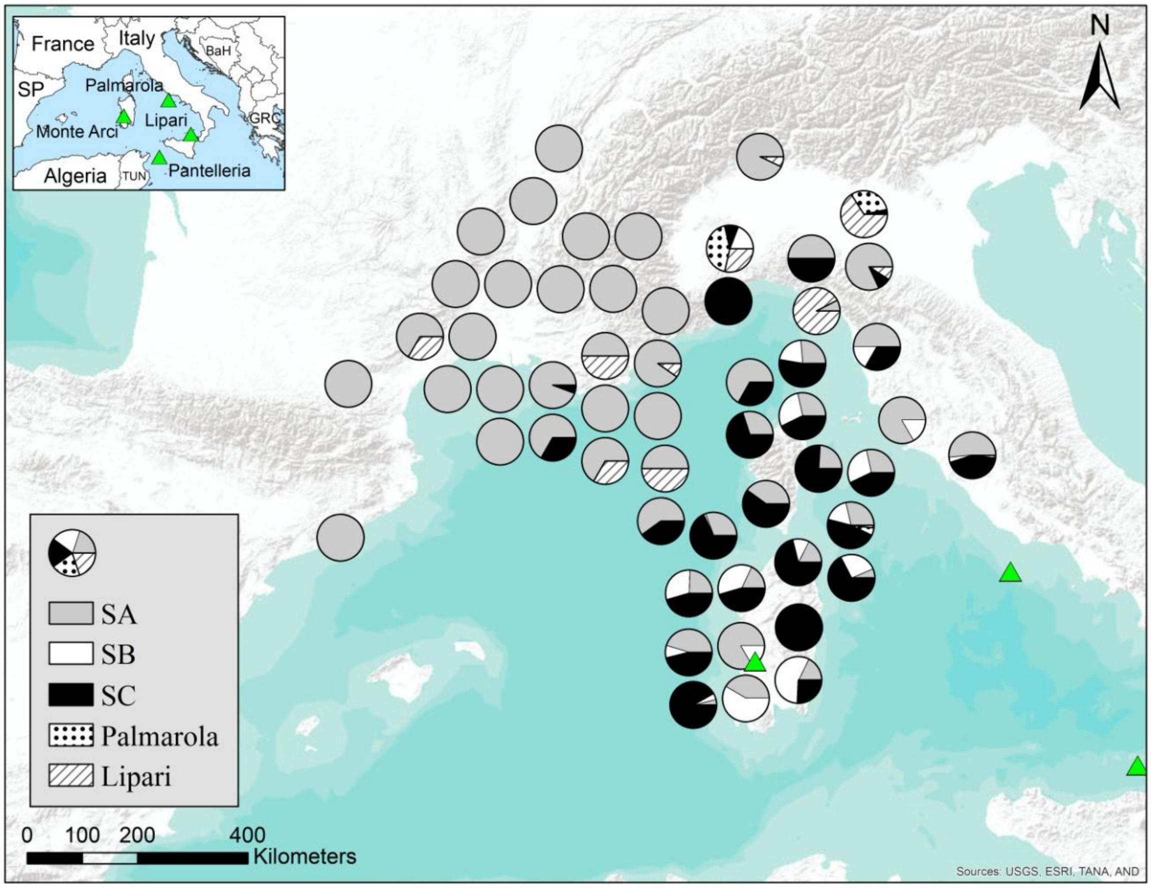

Figure 6.13 Distribution map of fifth millennium B.C. archaeological sites where Monte Arci obsidian has been analyzed.

on Sardinia and Corsica and SA obsidian being specifically prepared as polyhedral pressure blade cores for export to Corsica and mainland France (Figure 6.14; Lugliè 2009; Lugliè et al. 2011; Vaquer 2007). By the latter half of the fifth millennium B.C., there a shift in obsidian reduction strategies on Sardinia and Corsica away from informal flake-based traditions towards the production of blades and bladelets as well as more formal points and arrowheads (Lugliè et al. 2011: 259).

Concerning the distribution of Sardinian obsidian, scholars have typically emphasized the role of the intermediary islands of the Tuscan Archipelago in the

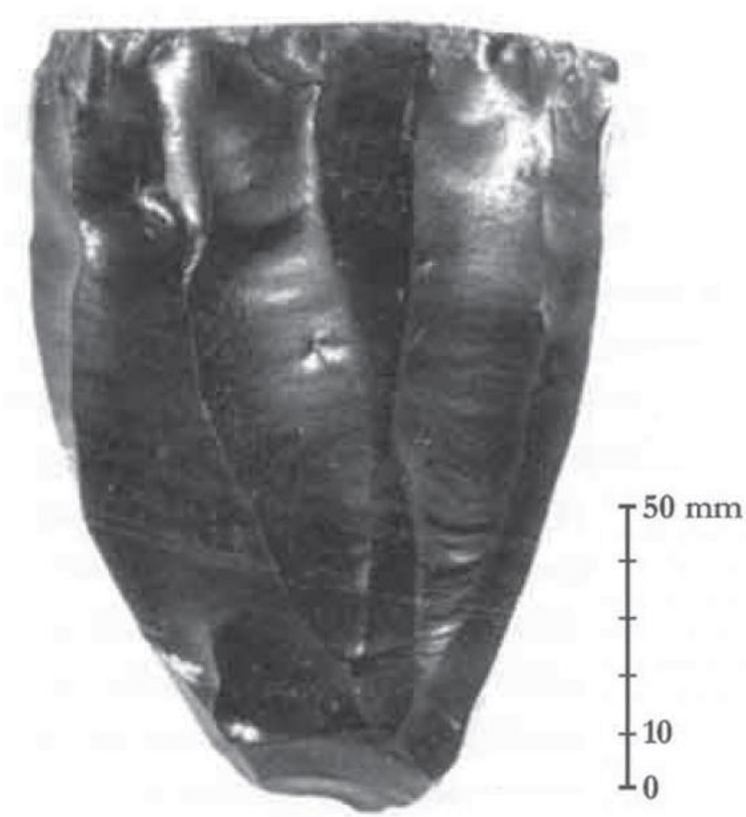

Figure 6.14 Example of a polyhedral blade core of Monte Arci SA obsidian (after Lugliè 2009: 218).

exchange of obsidian down-the-line from the geological sources of Sardinia along the coast to northern Italy and France (Hallam et al. 1976: 99; Le Bourdonnec et al. 2010: 101; Tykot 1996: 54; Tykot et al. 2005a: 105; see Freund and Batist in press; Léa 2012 as exceptions). Although Neolithic obsidian consumption in southern France is notably distinct from Italian sites to the east in terms of the obsidian sources represented and in the relative quantities of obsidian present, scholars have been hesitant to suggest a more direct link between either Sardinia or Corsica and southern France. For example, Tykot (1996: 55) argues that "Sardinian obsidian could have reached southern France by several routes: directly from the Monte Arci supply zone; via Corsica; or via Tuscany and

Liguria. The first and second choices would suppose much greater confidence and capability in open-water crossings than most scholars are willing to credit to Neolithic sailors".

Instead, similarities in the consumption of other exchange objects such as amber (Phillips et al. 1977), axes (Pétrequin et al. 2006), eclogites (Ricq de Bouard 1993), and Lipari obsidian (Guilane and Vaquer 1994) are highlighted as a means of demonstrating direct relationships between the residents of the French regions of Provence, Languedoc, and the Rhone Valley and northern Italy. Differences in raw material selection are explained as resulting from cultural preferences related to differential fracture characteristics and aesthetic properties (Tykot 1996: 56, 2011: 39; Lugliè 2009: 220).

Nevertheless, with the relatively recent discovery of a large quantity of obsidian at the Chasséen period site of Terres Longues near the coast of southern France, new evidence is emerging that challenges previously held assumptions about early maritime navigation in the West Mediterranean (see Freund and Batist in press; Léa 2012; Léa et al. 2010). For example, through the use of social network analysis (SNA), I have previously argued that SA obsidian from Sardinia also took a more direct open-sea path upwards of 200 kilometers from Corsica to the coastal regions of Provence and Languedoc in southern France (see Freund and Batist in press). While I do not deny that comparatively smaller amounts of Lipari obsidian were obtained from sites in Liguria and elsewhere in northern Italy, I disagree with previous suggestions that obsidian from Sardinia was acquired in a similar manner, especially when considering that SA obsidian is absent from Italian coastal sites such as Arene Candide. Moreover, certain sites in southern France such as Terres Longues contain more obsidian than all of the sites in northern Italy combined (Figure 6.15).

Redistribution Centers in Mainland France and Italy

Due to the large number of obsidian artifacts recovered from Terres Longues (n=4,548) when compared with contemporary sites in the surrounding area, Léa (2012) suggests that the site acted as a center of redistribution. Léa (2012: 168) further argues that similarities in the archaeological distribution of Bédoulian flint and obsidian opens the possibility that pressure-flaked obsidian bladelets were created at the site from preformed cores and core-on-flakes and then introduced into pre-existing networks of flint exchange. This redistributive model has also been proposed at the sites of La Cabre (n=70) and Giribaldi (n=57) in southern France (Binder and Courtin 1994).

A similar situation was also likely occurring in mainland Italy at this time, where sites such as Gaione (n=99) and Pescale (n=950) contain more than 80% of all known obsidian in northern Italy (Polglase 1990; Tykot et al. 2005a; Williams-Thorpe et al. 1979). While the sixth millennium B.C. sites of Fornace Cappuccini and Colle Santo Stefano were no longer occupied during this period, other sites such as Catignano (n=577) in east-central Italy and Masseria S. Gaetano (n=173) in Apulia contain large amounts of Lipari and Palmarola obsidian when compared contemporaneous sites in the region (Bigazzi and Radi 1998; Pessina and Radi 2006). Certain sites in Calabria also still continued to acquire large quantities of Lipari obsidian for the production of direct percussion blades (Ammerman 1985).

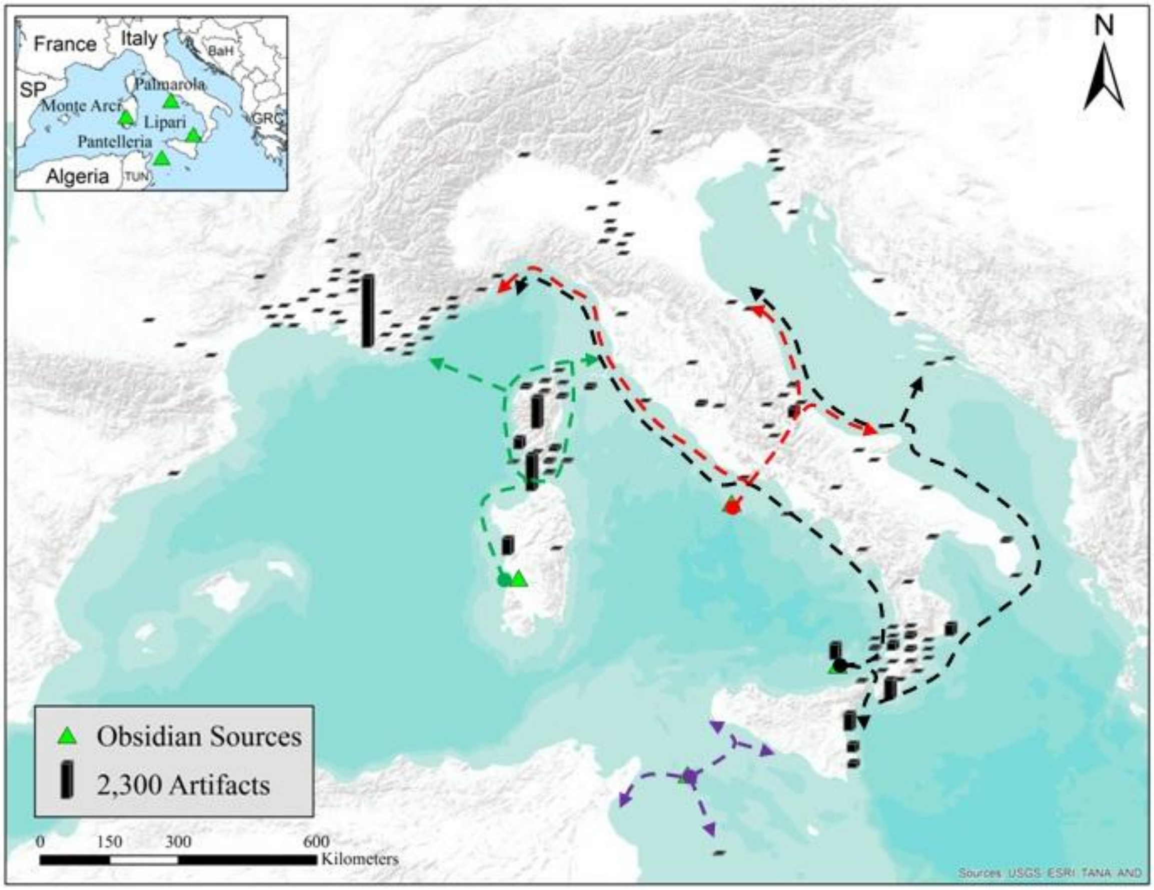

Figure 6.15 Map showing the frequencies of the total number of recovered artifacts at individual sites dating to the fifth millennium B.C. as well as the likely routes through which obsidian from the various sources were distributed. Bar size corresponds with artifact counts. Note: Counts do not necessarily correspond with the number of analyzed artifacts.

Fourth Millennium B.C.

To date, obsidian has been reported at 219 archaeological sites dating to the fourth millennium B.C. (Figure 6.16), the distribution of obsidian largely mirroring that witnessed during the latter half of the previous millennium. As is the case during the entirety of the Neolithic, obsidian makes up a small percentage of lithic assemblages outside of the source areas (Figure 6.17).

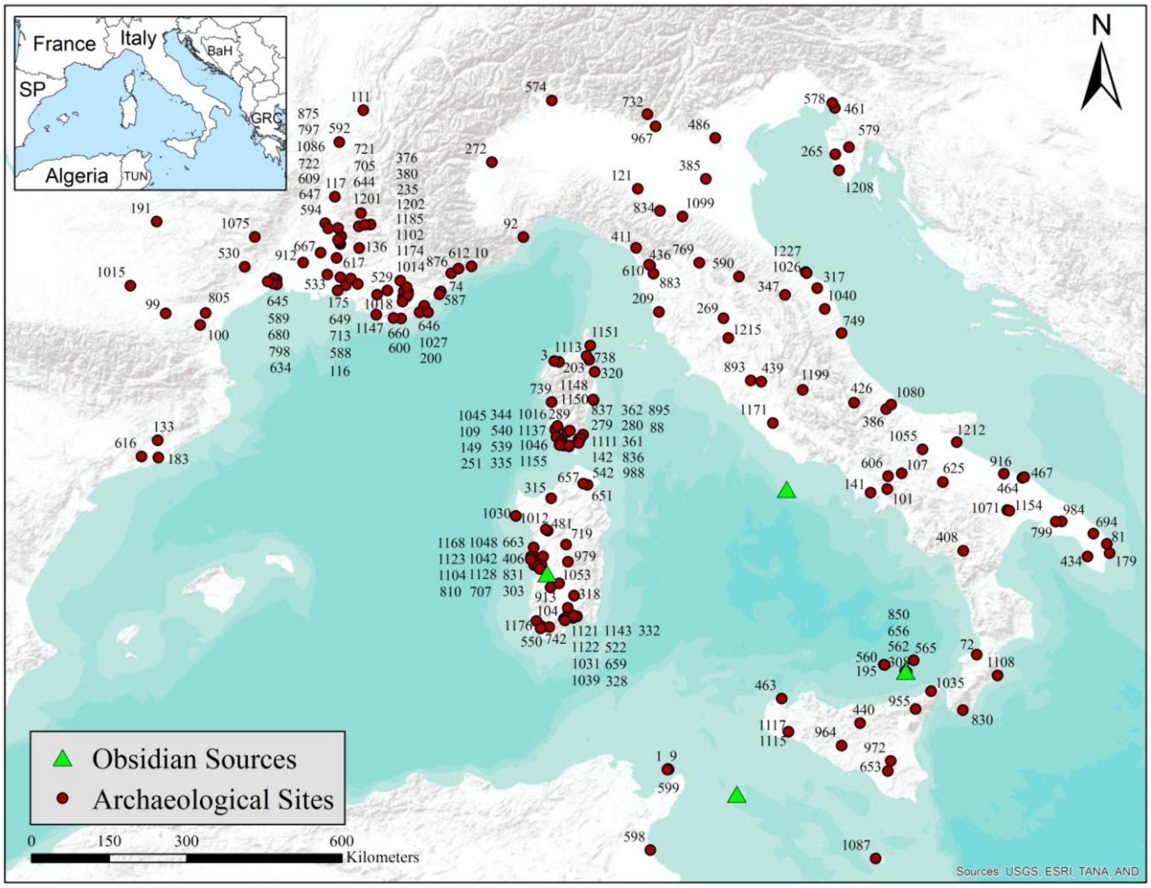

Figure 6.16 Fourth millennium B.C. archaeological sites with obsidian. Numbers correspond with those listed in Appendix D.

Once again, I argue that for most communities throughout mainland Italy and France, obsidian was procured from 'gateway communities' where local individuals or groups amassed these raw materials for their own socio-political purposes, and the exchange and gifting of these valuables became an arena for enhancing social status and prestige (Figure 6.18). During the fourth millennium B.C., this includes the sites of Terres Longues (n=4,548), Pescale (n=950) in north-central Italy, Fossacesia (n=816) to the west of the Gargano Peninsula, and Masseria S. Gaetano (n=173) in southeast Italy (Bigazzi and Radi 1998; Pessina and Radi 2006; Vaquer 2007).

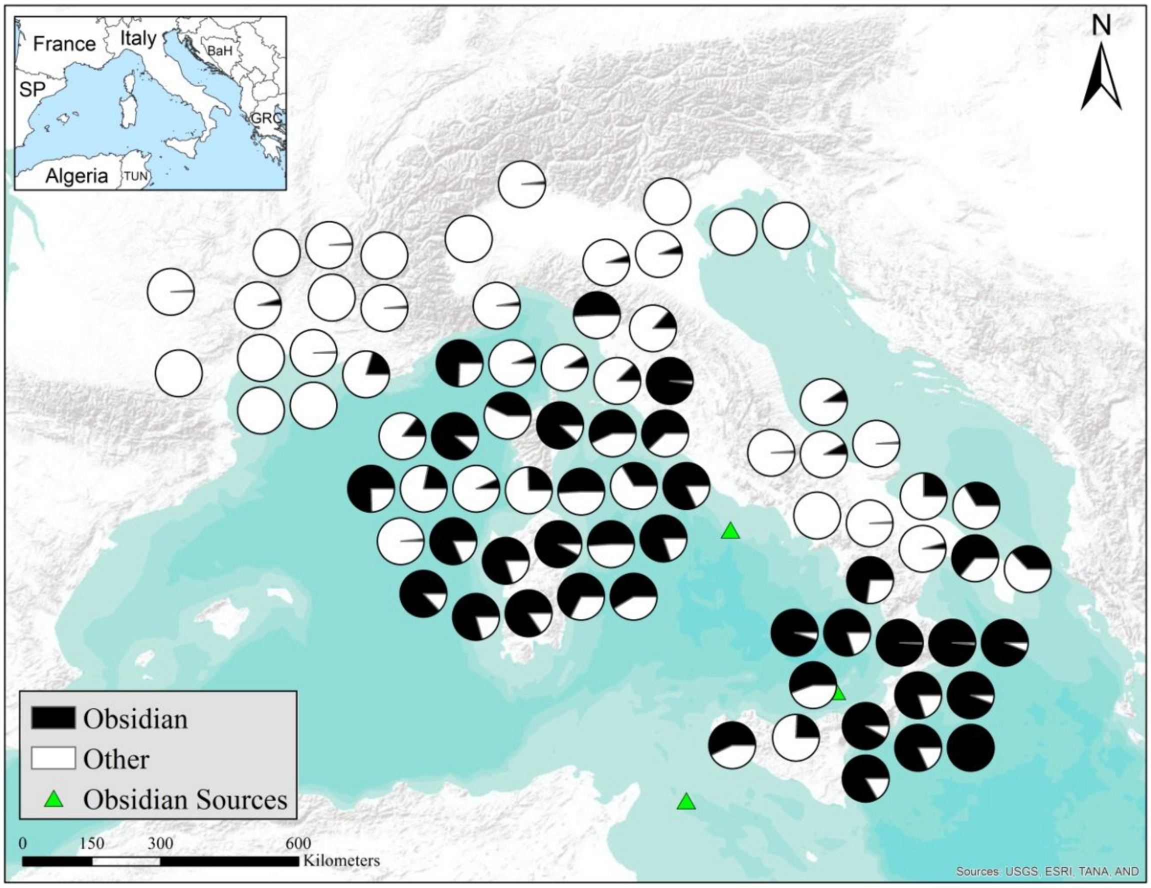

Figure 6.17 Distribution map of the percentage of obsidian in chipped stone assemblages dating to the fourth millennium B.C. Black: obsidian; White: other lithic material.

In contrast to earlier periods, there is now consistent evidence of Lipari obsidian being transported north along the coast of western Italy, where it is found at coastal sites such as Podere Casanuova and Botteghelle (De Francesco et al. 2012). While obsidian from Lipari was absent from the Ligurian site of Arene Candide during the initial phases of the Neolithic, by the fourth millennium B.C. it comprises 88% of the obsidian assemblage (Ammerman and Polglase 1993: 105). Nevertheless, this does not necessarily signal a shift away from the exploitation of Sardinian obsidian in northern Italy, as it is

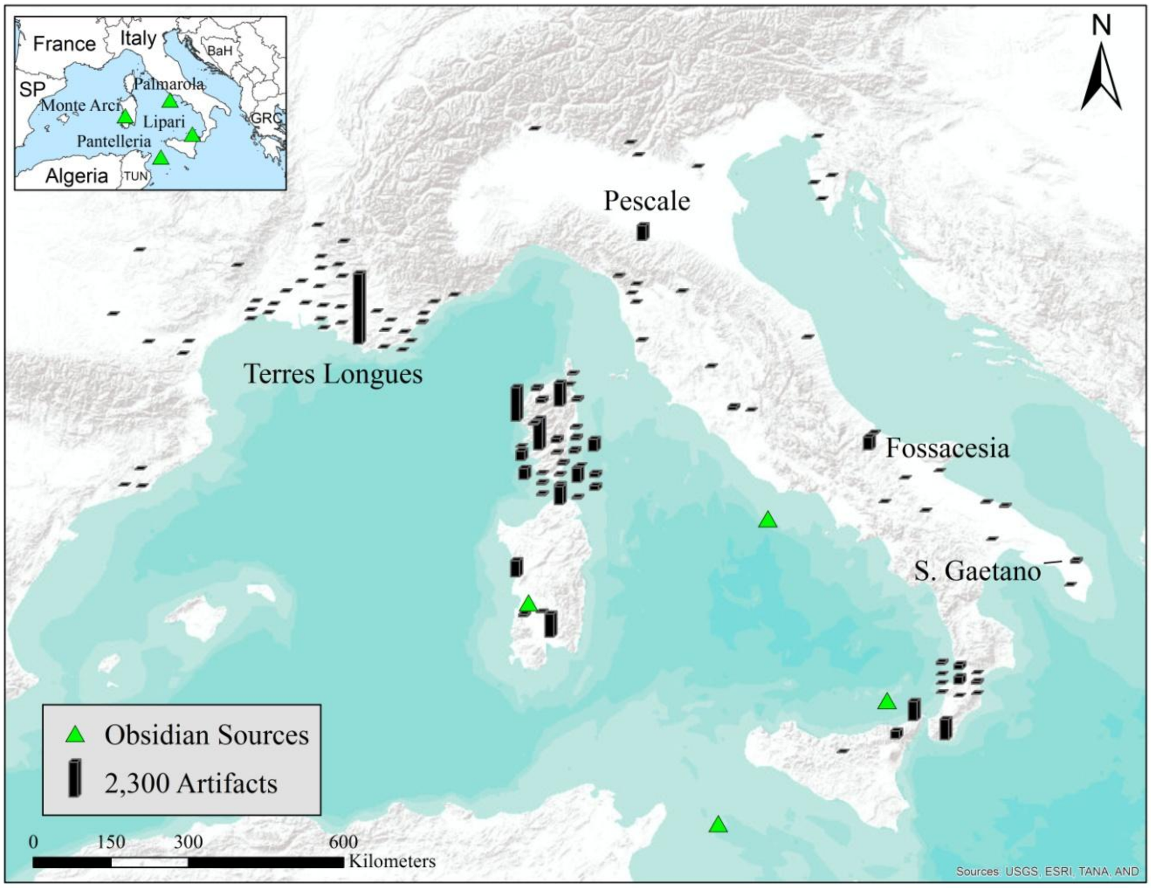

Figure 6.18 Map showing the frequencies of the total number of recovered artifacts at individual sites dating to the fourth millennium B.C. Bar size corresponds with artifact counts. Note: Counts do not necessarily correspond with the number of analyzed artifacts.

found at a number of coastal sites in the region, including Grotta all'Onda, Podere Casanuova, and Grotta del Leone (Bigazzi et al. 1986; Bigazzi and Radi 1998; Vaquer 2007). Grotta del Leone is also important in that Bigazzi et al. (1986) make the controversial claim that several pieces of Melian obsidian are present at the site. While this may be possible, it is certainly an aberration as there is little to no evidence for trans-Mediterranean interaction at such an early date.

Although Lipari obsidian is present at the Corsican site of A Fuata (Le Bourdonnec et al. 2010), obsidians from Lipari and Palmarola are restricted to the mainland. On Sardinia and Corsica, obsidian of type SC still continues to dominate, comprising 69% and 60% of archaeological assemblages respectively. While the percentage of SC obsidian at sites throughout Corsica remains roughly consistent when compared with the 5th millennium B.C., on Sardinia there is a 16% increase. This corresponds with the development of SC workshops located at the quarry (e.g. Sennisceddu), which produced core blanks that were circulated amongst populations on Sardinia and Corsica for the production of blades and bladelets as well as more formal points and arrowheads (Lugliè 2003b; Tykot et al. 2006b).

Third Millennium B.C.

Compared with the fourth millennium B.C., there is a 68% drop-off in the total number of sites in which obsidian has been reported during the third millennium B.C., thus signaling the end of the 'Golden Age' of Neolithic obsidian circulation in the West Mediterranean (Figure 6.19). Considering that obsidian circulation declines just at a time of increasing maritime mobility and long-distance exchange throughout most of Europe, this represents a major restructuring of socio-economic interaction spheres and symbolic systems. In this sense, I argue that obsidian consumption was gradually usurped by new modes of social distinction, in part defined through an affiliation with a new set of practices/traditions that we refer to as the European Bell Beaker Culture, which in part

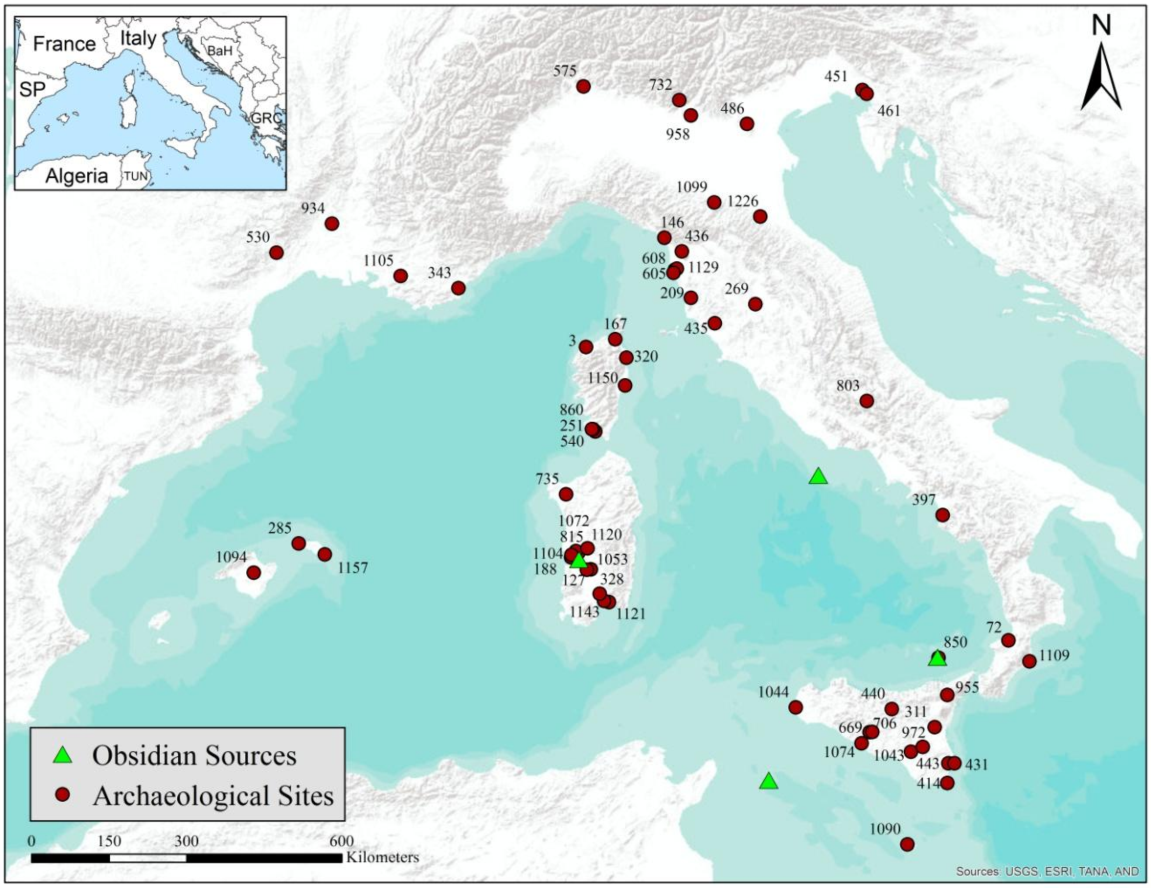

Figure 6.19 Third millennium B.C. archaeological sites with obsidian. Numbers correspond with those listed in Appendix D.

involved access to incipient metallurgy and new definitions of ‘the self’ - as inferred through changing burial patterns (see Robb 1994).

Outside of the source areas, small amounts of obsidian are found in central and northern Italy as well as in southern France, although many of these sites have not been properly dated and are often associated with both Late Neolithic and Chalcolithic phases. Of those sites with more secure Chalcolithic dates only a handful of artifacts have been analyzed; nevertheless, some basic patterns can be elucidated. Based on the analysis of four artifacts from Riparo Valtenesi in north-central Italy, both SA and SC obsidians are present (Randle et al. 1993). Both Sardinian and Lipari material are also present at the coastal sites of Suese and La Padula in northern Tuscany (Bigazzi and Radi 1998). In southern Italy, 11 sites have been tentatively dated as post-Neolithic, all from the Acconia survey area (Ammerman 1985).

As a whole, all of these finds suggest that obsidian use does continue in mainland Italy and France, but we must be careful in how we contextualize it. Based on the fact that only a small number of total artifacts have been recorded - many from dubiously dated sites, in combination with the interspersed nature of its distribution, it is possible that obsidian use in these regions resulted from the reuse of raw materials from earlier periods. Whether or not this is the case, it is undeniable that obsidian exchange is drastically reduced and there is little evidence for a fall-off in the amount of material through space as would be expected through a model of down-the-line exchange.

While obsidian exchange and accumulation was no longer one of the principal means through which individuals or communities created and expressed social distinction, there is still evidence that these materials could play a role in social practices in a now reconfigured socio-cultural context. For example, two pieces of Pantelleria obsidian are found in a Late Neolithic/Chalcolithic burial at San Sebastien in southern France (Crisci et al. 1994; Tykot 2011: 39), the only example of Pantelleria obsidian outside of southern Italy in all of prehistory. Moreover, obsidian is reported in the Balearic Islands for the first time in prehistory (Massanet 2004; Tykot 2011: 39), only shortly after the island had been colonized.

In contrast to the significant decline in obsidian consumption in mainland Italy and France, these raw materials continued to be used in significant quantities near the source areas at sites in Sardinia, Corsica, and Sicily, although there are major changes in how the material was now being worked. For example, while pressure-flaked blade technology continued in Sicily, there were considerable differences in the size and shape of these blades when compared to those from previous periods. Similarly, an analysis of 154 artifacts from the Sardinian site of Bingia 'e Monti showed that mainly SC obsidian was used to create expedient flake tools and lunates, a significant difference from the formal tools and blades that characterize much of the Late Neolithic (Freund 2014). Based on the uneven distribution of the various source products throughout the island during this period, it is likely that communities became more isolated and sub-regional traditions took form.

Structural Reconfiguration in the Chalcolithic

In stark contrast to the East Mediterranean where obsidian use continues throughout the Bronze Age until the end of the second millennium B.C. (see Carter 2008; Coqueugniot 1998), large-scale West Mediterranean obsidian circulation networks experience a dramatic collapse by the third millennium B.C., corresponding with the arrival of a new suite of prestige items and cultural practices often associated with Bell Beaker Culture and incipient metallurgy.

While metal does not replace obsidian in any functional sense, its introduction in the form of copper axes, daggers, and halberds can be seen to represent a cognitive and symbolic shift in the relative importance of obsidian in the minds of the people who used it (cf. Freund and Tykot 2011: 162). In this sense, metals replace obsidian as a marker of social distinction and symbol of a community's place within a larger network of connected sites. This is supported by usewear studies showing that axes were normally employed as working tools while weapons such as daggers and halberds show few signs of use (Dolfini 2011: 1047), likely representing new kinds of social distinction based upon conspicuous display and inter-personal violence. Nevertheless, it is not just metal technology that is the impetus behind this reconfiguration, but rather a much broader movement beginning in the late fourth millennium B.C. in which new material culture, technologies, ideologies, and practices formed the bases of social structure (see Broodbank 2013: 260-262; Vander Linden 2006).

Second Millennium B.C.

By the second millennium B.C., obsidian consumption becomes a localized phenomenon largely restricted to sites in Sardinia and Sicily (Figure 6.20). While it is easy to explain the continued use of obsidian in these areas as being the result of its ease of procurement, the last vestiges of a dying practice, the situation is slightly more complex.

On Sardinia, for example, there actually appears to be an intensification of obsidian use when compared with the previous millennium, continuing from the second millennium B.C. until the beginning of the Iron Age in the first half of the first millennium B.C. At this time, SC obsidian becomes the dominant subsource utilized

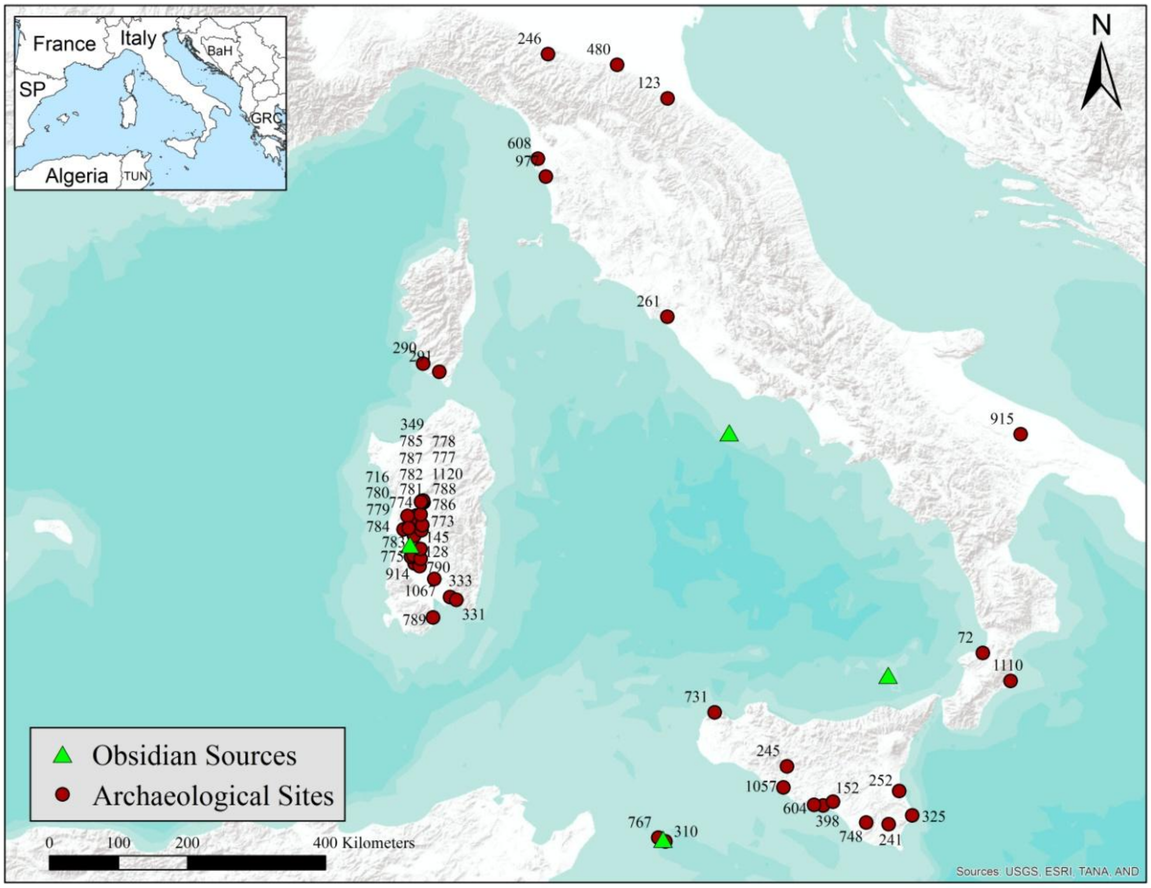

Figure 6.20 Second millennium B.C. archaeological sites with obsidian. Numbers correspond with those listed in Appendix D.

throughout the island (Freund and Tykot 2011), corresponding with the widespread adoption of lunate tools that have been shown to be used for plant processing (see Hurcombe 1992). Based on the fact that the vast majority of lunates are made from SC obsidian and reduced through a specialized Kombewa reduction strategy (see Inizan et al. 1999: 68-71), it is possible that these artifacts circulated as finished products through an island-wide network of connected sites. Nevertheless, more work in the region is still needed before more concrete interpretations can be made. Current excavations at the source areas are likely to help in clarifying these issues (Carlo Lugliè, personal communication).

In contrast to Sardinia where obsidian was used in residential contexts to carry out daily and seasonal activities such as the grain harvesting and plant processing (Freund and Tykot 2011; Hurcombe 1992), obsidian use in Sicily becomes associated with burial rites and funerary ritual during the first half of the second millennium B.C. Table 6.2 shows the total number of burial sites with associated obsidian artifacts throughout West Mediterranean prehistory. What is evident is that there is an increase in the number of burial sites through time. While burials only represent 12% of the total number of second millennium B.C. sites, four of the 10 known sites with obsidian in Sicily are found in burial contexts. This is well above the average and represents an important socio-economic and symbolic reconfiguration.

Interestingly, this mirrors what began during the previous millennium in the Early Bronze Age I Cyclades, where fine pressure-flaked obsidian blades became a regular feature of burial assemblages (Carter 1997), although no direct link is being suggested. These Aegean blades were especially long and required a great deal of skill to create, thus making it likely that only a small number of individuals possessed the esoteric knowledge to make them. As such, Carter (2007: 102) argues that Cycladic leaders may have used the esoteric knowledge of one or multiple blade knappers to demonstrate their power through the conspicuous consumption/destruction of these prestige goods.

While Sicilian pressure-flaked blades are also found in burials, they are not as finely made as their Aegean counterparts. Moreover, they are not universal since some

Date	Number of Burial Sites
Sixth Millennium B.C.	0
Fifth Millennium B.C.	4 (2%)
Fourth Millennium B.C.	5 (2%)
Third Millennium B.C.	6 (9%)
Second Millennium B.C.	7 (12%)

Table 6.2 Total number of burial sites with associated obsidian artifacts through time. Percentages relate to the total number of sites within a given period.

burials are only found with flakes or other debitage. It is therefore likely that the conspicuous creation of these artifacts did not play a critical role in ancient burial rites. Nevertheless, the very presence of these symbolically charged objects suggests that they were an integral component of ritual and ceremonial behavior.

Chapter 7: Obsidian Consumption in Prehistoric Sicily

Now that West Mediterranean obsidian consumption has been explored at the macro-scale, I will zoom-in to a more localized context to examine how broader socio-economic developments played out at the regional level. Through the analysis of 6,287 obsidian artifacts from 43 sites throughout mainland Sicily and the Eolian islands (Figure 5.3), this section details the procurement and consumption of obsidian from the Neolithic through Bronze Age. Since several sites represent finds from unstratified contexts, these results are not emphasized in the interpretations. Table 7.1 provides a list of relevant periods and associated dates.

Previous studies have led to the general impression that Lipari was the primary obsidian source exploited by Neolithic peoples of southern Italy and Sicily, with lesser quantities of Pantellerian obsidian being procured by communities in western Sicily (see Crummett and Warren 1985; Francaviglia and Piperno 1987; Hallam et al. 1976; Iovino et al. 2008a; La Rosa et al. 2006; Nicoletti 1997; Tykot 1995). It has to be noted, however, that these interpretations were based on the analysis of a relatively small number of total artifacts and there is not a clear understanding of the spatial and temporal differences that exist regarding how obsidian from the various sources and subsources was procured, reduced, and consequently used. Moreover, there have until now been limited studies of post-Neolithic obsidian use in the region.

This study is therefore an initial step towards a more comprehensive understanding of the nature of obsidian exploitation in Sicily through time and a more

Period		Cultural Phase	Absolute Dates
Mesolithic		Uzzo/Perriere Sottano	10000 - 6000 B.C.
Neolithic	Early	Impressed/Stentinello	6000 - 5000 B.C.
	Middle	Stentinello/Trichrome/ Serra d'Alto	5000 - 4000 B.C.
	Late	Diana	4000 - 3500 B.C.
Chalcolithic	Early	Conzo/P. Notaro/S. Cono	3500 - 2500 B.C.
	Late	Serraferlicchio/Malpasso/ Beaker	3000 - 2500 B.C.
Bronze Age	Early	Castelluccio	2500 - 1430 B.C.
		Rodi-Tindari/Vallelunga	2000 - 1430 B.C.
	Middle	Thapsos/Milazzese	1430 - 1250 B.C.
	Late	Pantalica I/Ausonian I	1250 - 1050 B.C.
		Pantalica II/Ausonian II	1050 - 900 B.C.

Table 7.1 The periods, cultural phases, and absolute dates (calibrated) of Sicilian prehistory (after Leighton 1996: 9).

thorough comprehension of how obsidian was distributed from the islands of Lipari and Pantelleria during the Chalcolithic and Bronze Ages.

Results by Period

Appendix E provides a compiled list of the sourcing and typological results from all time periods. Source designations were assigned based on an examination of the graphs of the element ratios of iron (Fe) and rubidium (Rb) to strontium (Sr) for the Lipari subsources (Figure 7.1), and niobium (Nb) to zirconium (Zr) for the Pantelleria source products (Figure 7.2; see Tykot et al. 2013). For those artifacts from Lipari whose subsource designations were not immediately apparent, the calibrated concentrations of a

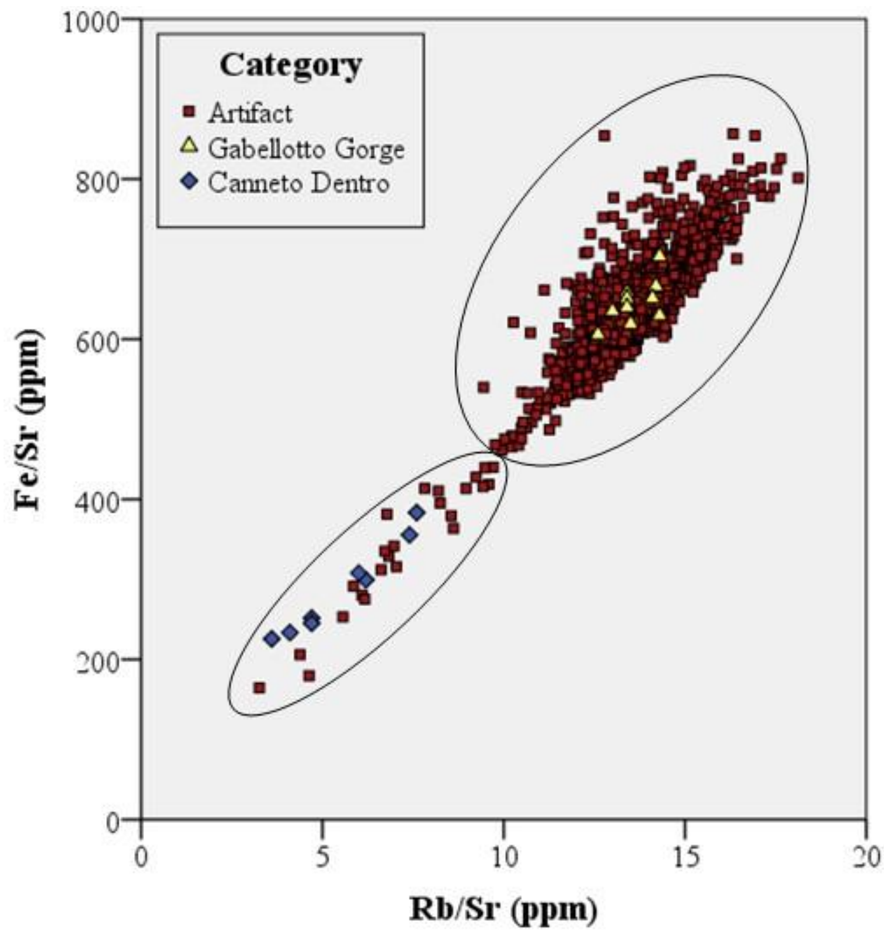

Figure 7.1 Bi-variate plot of Rb/Sr vs. Fe/Sr (in ppm) for archaeological samples capable of distinguishing between the relevant Lipari subsources.

range of elements were examined in further detail. Most importantly, I looked for the presence or absence of a high Sr peak that is characteristic of Canneto Dentro material.

Stentinello Neolithic

Of the 43 analyzed sites, 10 date to the Stentinello phase of the Neolithic (Figure 7.3). Note that I place the Stentinello period at ca. 5500-4000 B.C. based on radiocarbon evidence cited by Ammerman (1987: 345) and Skeates (1994: 167), pushing back

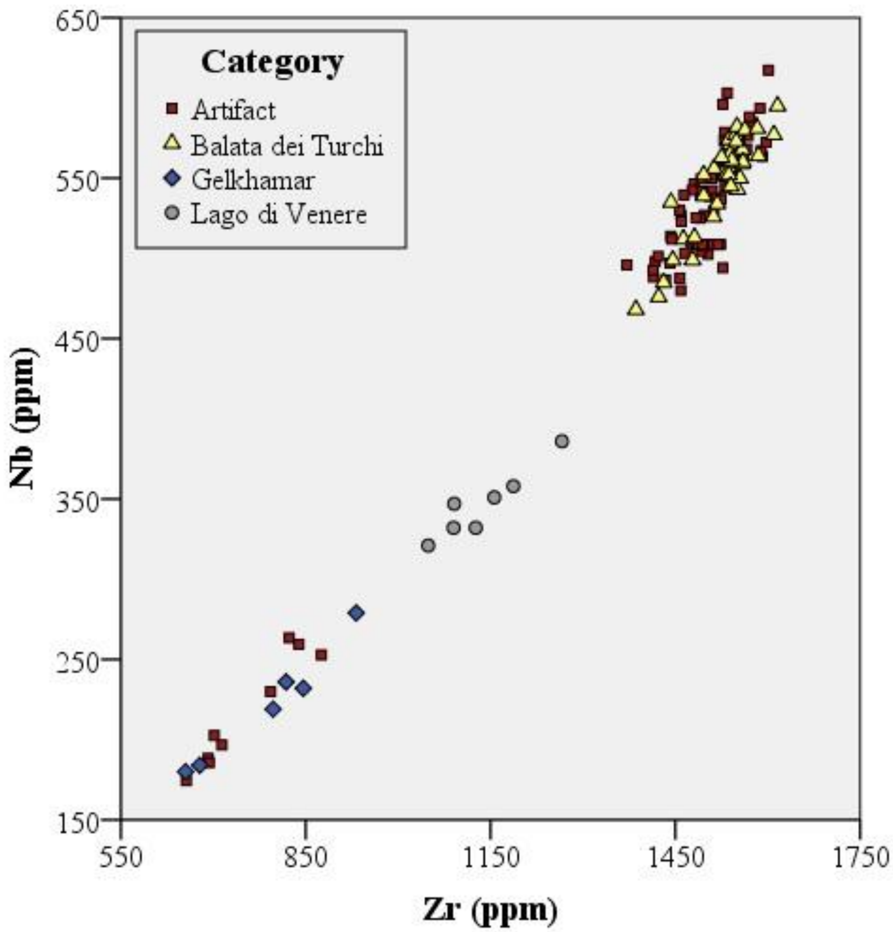

Figure 7.2 Bi-variate plot of Zr vs. Nb (in ppm) for archaeological samples capable of distinguishing between the relevant Pantelleria subsources.

traditional chronologies that place the beginning of Stentinello at ca. 5000 B.C. (see Tusa 1997: 647).

Table 7.2 displays the results of the elemental analyses. Of the 720 artifacts analyzed, 716 came from the Gabellotto Gorge subsource on the island of Lipari while four came from Canneto Dentro. The material from Canneto Dentro included an unretouched distal flake and an unretouched medial blade segment from Stentinello, an unretouched whole flake from Fontana di Pepe, and an irregularly shaped multi-platform flake core from Rinicedda.

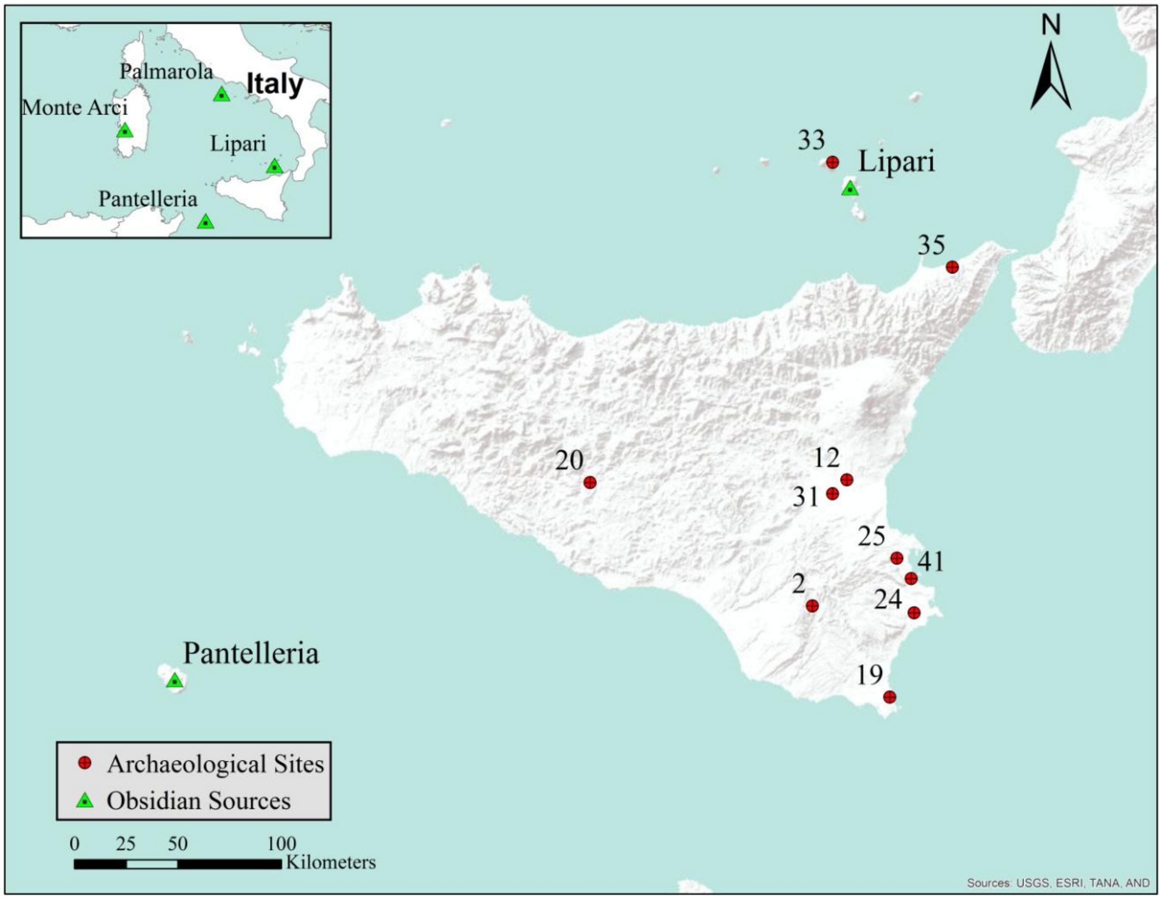

Figure 7.3 Map of analyzed Stentinello period sites. Note that numbers correspond to those of Appendix C; 2. Calaforno 12. Fontana di Pepe 19. Grotta Corruggi 20. Iannicu 24. Matrensa 25. Megara Hyblaea 31. Poggio Rosso 33. Rinicedda 35. San Martino 41. Stentinello.

While the elemental data show that the Gabellotto Gorge subsource was the primary outcrop exploited during this time, there is still a fair amount of variability within the subsource itself in terms of color and knapping quality. Figure 7.4 displays the raw material characteristics of artifacts from sites in which 90 or more objects were analyzed. Although an even inter-site distribution exists between artifacts that contain spherulites and those that do not, there is more variation in terms of color. For example, at the site of Rinicedda there is a higher percentage of gray obsidian (69%) than black obsidian (31%).

Site	Dating	Total	GG (Li)	CD (Li)	BdeiT (Pa)	Gelk (Pa)
Calaforno	Stentinello	9	9	0	0	0
Fontana di Pepe	Stentinello	4	3	1	0	0
Grotta Corruggi	Stentinello	2	2	0	0	0
Iannicu	Stentinello	3	3	0	0	0
Matrensa	Stentinello	124	124	0	0	0
Megara Hyblaea	Stentinello	125	125	0	0	0
Poggio Rosso	Stentinello	22	22	0	0	0
Rinicedda	Stentinello	206	205	1	0	0
San Martino	Stentinello	92	92	0	0	0
Stentinello	Stentinello	133	131	2	0	0

Table 7.2 List of analyzed sites with counts of artifacts from each subsource. Li: Lipari; Pa: Pantelleria; GG: Gabellotto Gorge; CD: Canneto Dentro; BdeiT: Balata dei Turchi; Gelk: Gelkhamar.

This is especially high considering that the average percentage of gray obsidian from the other sites is 38%. This could suggest that the residents of Rinicedda were obtaining raw materials in a different manner than contemporaneous communities on mainland Sicily. This would make sense considering the site's relatively isolated location north of the source itself; however, more information about lithic reduction strategies is needed before more reliable interpretations can be made.

By comparing raw material characteristics with typological categories, it becomes possible to see if certain raw materials were selected for the creation of specific artifacts. For example, it may be possible that the best quality raw materials (i.e. those without spherulites) were selected for the creation of blades due to differential fracturing dynamics. Figure 7.5 displays raw material characteristics by artifact category at the same

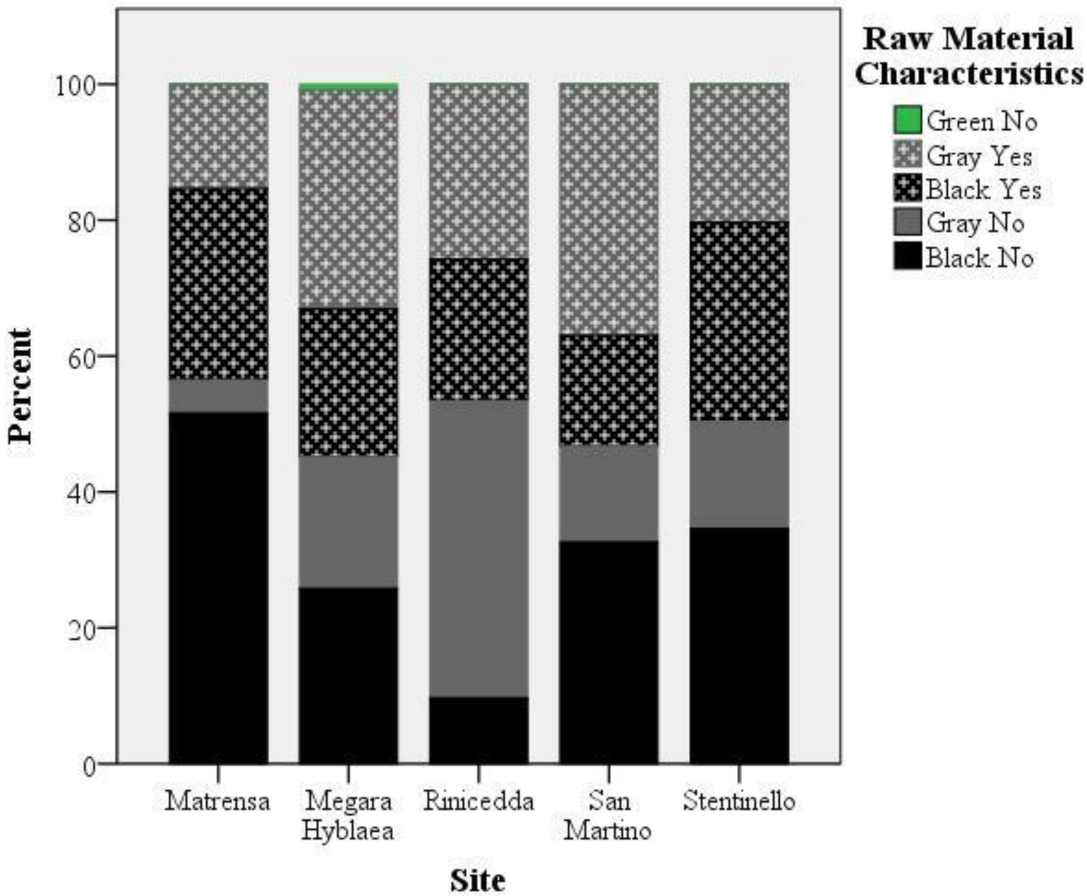

Figure 7.4 Raw material characteristics from sites in which 90 or more artifacts were analyzed. 'Black' and 'gray' refer to artifact color while 'yes and 'no' refer to the presence or absence of spherulites.

sites considered in Figure 7.4. It is immediately evident that the analyzed blade cores were highly spherulitic when compared to the blades themselves, which makes little sense if one assumes that blades were created from cores from the same sites. Nevertheless, any such interpretation is not particularly convincing considering the low number of analyzed blade cores. However, blades in general were created from less spherulitic material than flakes. When considering flakes, the raw material characteristics between flake cores and flakes are roughly similar. Despite minor differences, these results do not support the

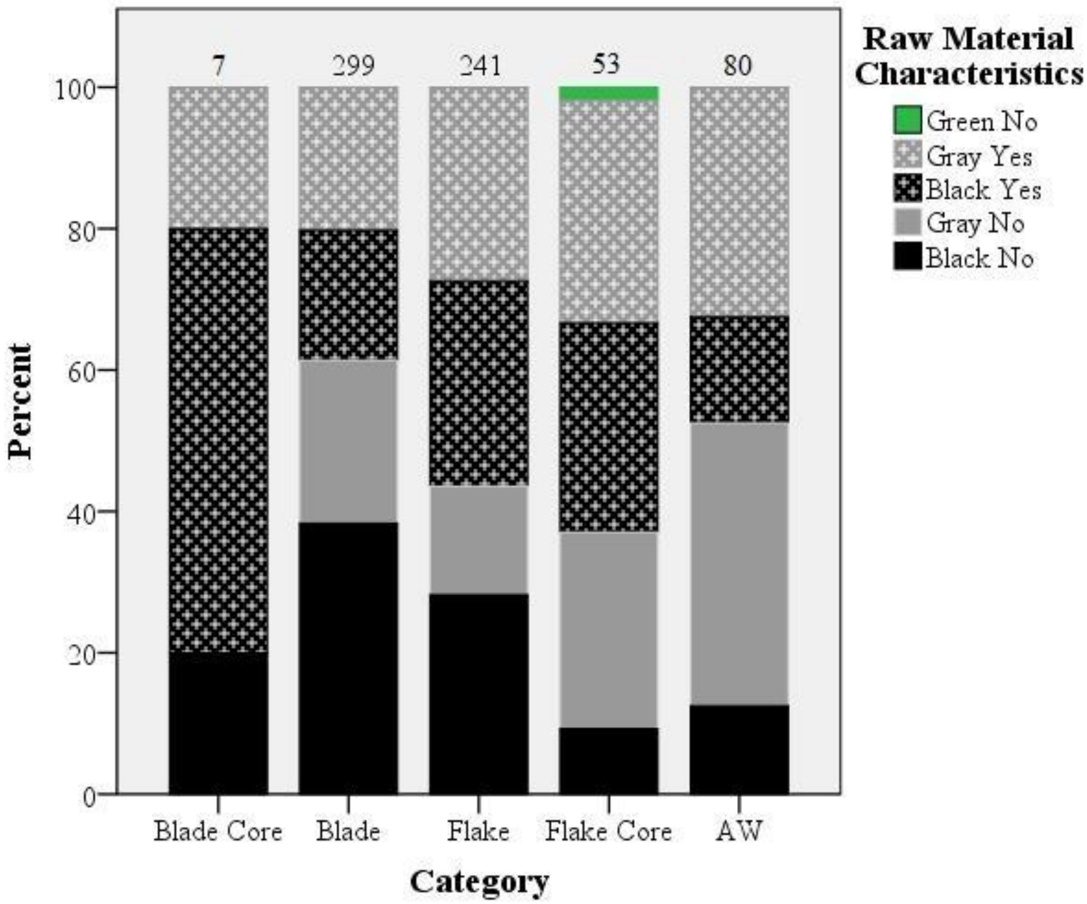

Figure 7.5 Raw material characteristics from Stentinello sites in which 90 or more artifacts were analyzed. 'Black' and 'gray' refer to artifact color while 'yes and 'no' refer to the presence or absence of spherulites. Total counts within each category are listed above the bars.

existence of separate operational sequences in the reduction of flake-based artifacts versus blades.

Recording the amount of cortex on an artifact can be informative when discussing the various stages at which raw materials enter a site (Andrefsky 2009). If raw nodules were reduced on site, then one would expect to find lithic debris that includes both highly cortical primary reduction and later secondary and tertiary flakes with less cortex. Only the percentage of dorsal cortex was recorded on the flake and blade categories. Of the analyzed artifacts, 97% of them had less than 20% cortex. Twenty artifacts had 20-80% cortex and only two artifacts had more than 80% (see Table 7.3). While nine of the 206 artifacts from Rinicedda had more than 20% cortex, 96% of the site's assemblage had less than 20% cortex. It is therefore clear that the majority of artifacts from all sites were in the secondary and tertiary stages of reduction, and primary reduction occurred elsewhere, likely at the source area.

Artifact counts and basic typological data are summarized in Table 7.4 while Figure 7.6 displays examples of the analyzed artifacts. While artifacts from 10 sites were analyzed, it is only at five sites that we see a true representation of Neolithic reduction sequences (see Figure 7.7). This is because some of the analyses included artifacts on display at the museum that were biased representations of lithic reduction sequences at the various sites. I therefore focus here on assemblages in which there are robust enough samples to make meaningful interpretations.

Based on the results displayed in Figure 7.7, it is immediately evident that blades and flakes are the primary artifact categories represented at the five sites. Of the 60 total analyzed cores, six were prismatic pressure-flaked unipolar blade cores - found at four of the five sites (e.g. Figure 7.6b), while the other 54 were irregularly shaped flake cores.

A further analysis of Figure 7.7 reveals that proportionally more cores and angular waste were found at the island site of Rinicedda than at contemporaneous sites on mainland Sicily. The high number of cores at Rinicedda (n=39) could be a reflection of the site's close proximity to Lipari, where residents had more ready access to raw materials from the nearby island. Nevertheless, this is not the case at the other nearby site

Site	0-20% Cortex	20-80% Cortex	80-100% Cortex	Total Artifacts
Calaforno	9 (100%)	0	0	9
Fontana di Pepe	4 (100%)	0	0	4
Grotta Corruggi	2 (100%)	0	0	2
Iannicu	3 (100%)	0	0	3
Matrensa	123 (99%)	1 (1%)	0	124
Megara Hyblaea	118 (94%)	6 (5%)	1 (1%)	125
Poggio Rosso	22 (100%)	0	0	22
Rinicedda	193 (95%)	8 (4%)	1 (1%)	206
San Martino	89 (97%)	3 (3%)	0	92
Stentinello	131 (98%)	2 (2%)	0	133

Table 7.3 Breakdown of cortex percentages on all analyzed Stentinello artifacts by site.

of San Martino, where cores only make up 5% of the analyzed assemblage, versus 19% at Rinicedda. It is therefore likely that communities at Rinicedda obtained obsidian in a different manner than communities on the mainland. The high prevalence of angular waste at Rinicedda could be a reflection of a more flake-based reduction strategy, although it is more likely a result of the modern excavation techniques being employed, which is why one must be careful about making comparisons with assemblages recovered from early excavations that did not employ modern excavation techniques. Regardless, such limitations likely result in the loss of smaller reduction debris and therefore do not affect most of the interpretations.

Site	Nodules	Cores	Blades	Flakes	Angular Waste	Total
Calaforno	0	1 *(1)*	3 *(3)*	5 *(5)*	0	9 *(9)*
Fontana di Pepe	0	0	2 *(2)*	2 *(2)*	0	4 *(4)*
Grotta Corruggi	0	0	2 *(2)*	0	0	2 *(2)*
Iannicu	0	0	3 *(3)*	0	0	3 *(3)*
Matrensa	0	2 *(2)*	107 *(71)*	217 *(46)*	27 *(5)*	353 *(124)*
Megara Hyblaea	0	18 *(11)*	508 *(62)*	563 *(44)*	9 *(8)*	1098 *(125)*
Poggio Rosso	0	0	22 *(22)*	0	0	22 *(22)*
Rinicedda	0	39 *(39)*	233 *(69)*	441 *(51)*	260 *(47)*	974 *(206)*
San Martino	0	5 (5)	42 (42)	33 (33)	12 (12)	92 (92)
Stentinello	0	3 *(3)*	139 *(55)*	339 *(67)*	44 *(8)*	525 *(133)*

Table 7.4 Basic typological counts of obsidian artifacts at the analyzed sites. Numbers in italics denote the number of artifacts that underwent more extensive analysis (length, width, etc.) as well as elemental characterization.

The majority of blades from all Stentinello sites were highly regular in thickness with parallel edges (Figure 7.6d). The blade platforms were generally small and elliptical; lips on the ventral edge of the platform were common. For these reasons, I argue that blades from Stentinello period sites in Sicily were produced using a technique of pressure flaking (see Andrefsky 2005: 118-119; Pélegrin 2012: 483). The high degree of regularity in shape and thickness in combination with the small elliptical platforms, the relatively diffuse bulbs of percussion, and the presence of lips on the ventral edge of the platform preclude direct percussion (see Andrefsky 2005: 118-119; Crabtree 1972: 44). They also lack the uniform curved profile and large platforms indicative of indirect percussion. This

Figure 7.6 A) Stratigraphic profile of in-situ obsidian from Gabellotto Gorge; B) Pressure-flaked blade cores from Megara Hyblaea; C) Flakes from Matrensa; D) Blades from Stentinello.

tradition of pressure flaking is mirrored in a portion of flint artifacts from the same sites (Figure 7.8a).

In a previous study of obsidian artifacts from southern Italy, Diamond and Ammerman (1985: 65) argue that the majority of blades from Stentinello period sites in Calabria were created using direct percussion with either a soft or organic hammer, ranging in width from 8-15 mm.; these blades were characteristically wide, often reaching more than 20 mm. in width. Despite possible differences in how these blades were produced (pressure vs. direct percussion), the artifacts analyzed in Sicily were similar. Based on the analysis of 331 blades from the 10 Stentinello sites, the average width was

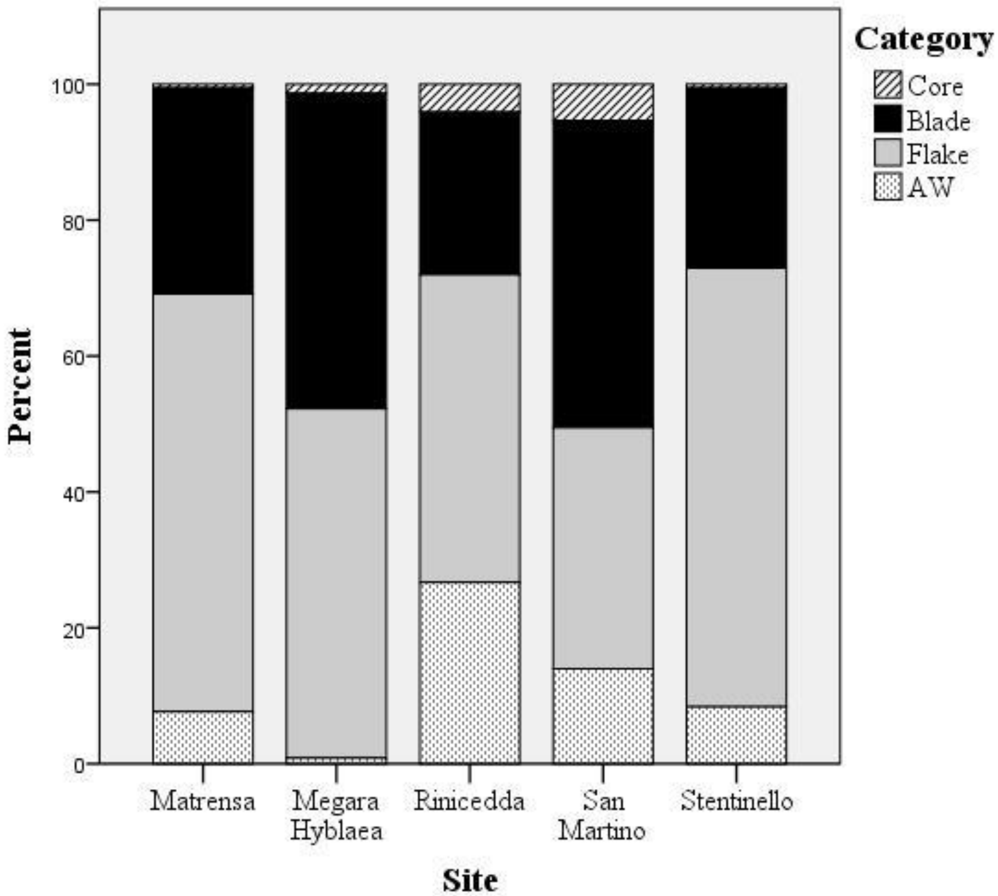

Figure 7.7 Typological breakdown from sites with representative Stentinello assemblages.

14.3 mm. with a standard deviation of 5.5 mm.; 39 blades from six separate sites were more than 20 mm. wide. The median length of whole blades (n=145) was 31.0 mm. with a standard deviation of 13.6 mm., indicating a large degree of variability. The median is reported here because of the highly skewed distribution of maximum length measurements. This is likely a reflection of the size of the initial cores as well as the skill of the knappers themselves. Regardless, an analysis of the median lengths of whole blades by site (Table 7.5) shows that the entire range of inter-site variation is small, only

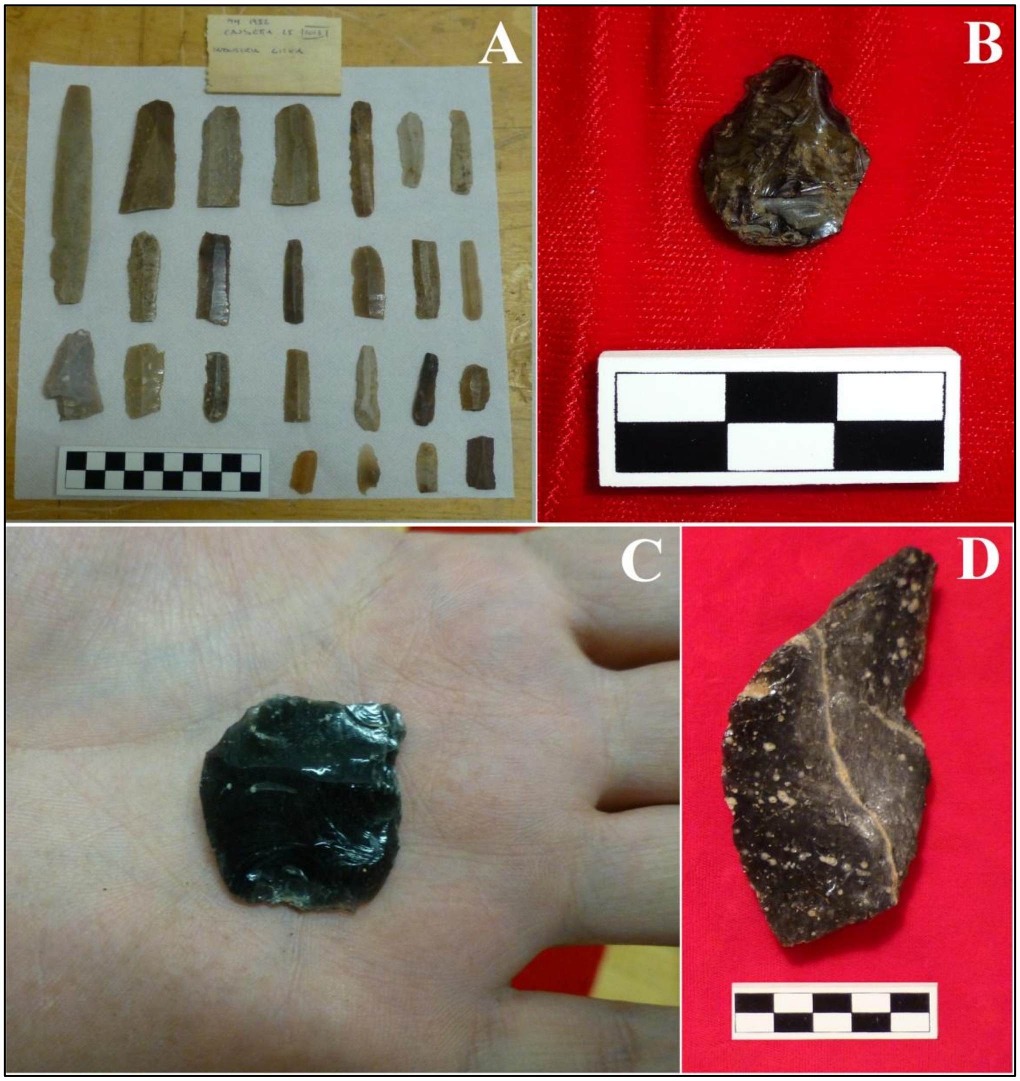

Figure 7.8 A) Examples of pressure-flaked flint blades from Megara Hyblaea; B) Retouched perforator from Calaforno; C) *Pièce esquillée* from Megara Hyblaea; D) Notched piece from Rinicedda.

Site	Blade Count	Median Length
Grotta Corruggi	1	32
Matrensa	25	31
Megara Hyblaea	36	33
Poggio Rosso	9	26
Rinicedda	37	37
SanMartino	19	26
Stentinello	18	28

Table 7.5 Median lengths of whole blades by site (in mm.).

11 mm. This means that sites have similarly sized blades and that most variability in size is among the assemblages as opposed to between them.

Most of the artifacts were unmodified. Of the 331 analyzed blades, 19% were intentionally modified, mainly in the form of marginal retouch. Only 8 blades were invasively retouched, although none in the form of recognizable tool types. Of the 248 analyzed flakes, 20% displayed intentional retouch. Twelve of these flakes were heavily retouched and included denticulates, notched pieces, small perforators, abruptly retouched transverse scrapers, and a *pièce esquillée* (see Table 7.6; Figure 7.8). Despite the low prevalence of retouch among the flakes, they were still likely used for a variety of everyday tasks, especially considering that 90% of the cores analyzed were flake cores. It is also possible that a large portion of flakes were the result of blade core creation and maintenance. Further studies on obsidian usewear will help clarify how and where Stentinello flakes were used.

Middle to Late Neolithic

Because of the low number of pure Middle Neolithic assemblages in this study, their results have been combined with those from Late Neolithic Diana period sites. Of the 43 analyzed sites, 4 date to the Serra d'Alto and Diana phases of the Neolithic (ca. 5000-4000 B.C.; Figure 7.9).

Table 7.7 displays the results of the elemental analyses. Of the 112 artifacts analyzed, 111 were made of obsidian from the Gabellotto Gorge subsource of Lipari, while only one was made of Gelkhamar obsidian from Pantelleria. The material from

Site	Dent.	Notch	Perf.	Trans. Scr.	*P.E*	Total
Calaforno	0	0	1	0	0	1
Fontana di Pepe	0	0	0	1	0	1
Grotta Corruggi	0	0	0	0	0	0
Iannicu	0	0	0	0	0	0
Matrensa	0	0	0	1	0	1
Megara Hyblaea	1	0	0	1	1	3
Poggio Rosso	0	0	0	0	0	0
Rinicedda	0	2	2	0	0	4
San Martino	0	0	0	0	0	0
Stentinello	0	0	0	1	0	1

Table 7.6 Breakdown of flake tool categories by site. Dent: Denticulate; Perf: Perforator; Trans. Scr.: Tranverse Scraper; *P.E.*: *Pièce esquillée*.

Gelkhamar included a whole pressure-flaked blade from Stretto Partanna in western Sicily. While the dominance of Lipari obsidian at the analyzed sites is not surprising, the high prevalence of Gabellotto Gorge at the site of Contrada Diana is particularly noteworthy. If any site would be expected to have a larger percentage of Canneto Dentro obsidian, it would be the local site on the island of Lipari because its residents would be the most likely to be aware of the existence of multiple outcrops of workable obsidian. While these analyses only comprise a tiny portion of the entire assemblage from Contrada Diana, they nevertheless highlight the relative insignificance of the Canneto Dentro subsource in prehistory, likely a reflection of its small geo-spatial extent.

Because only a small number of Middle to Late Neolithic artifacts underwent a full typological analysis, there is little data on raw material characteristics and cortex

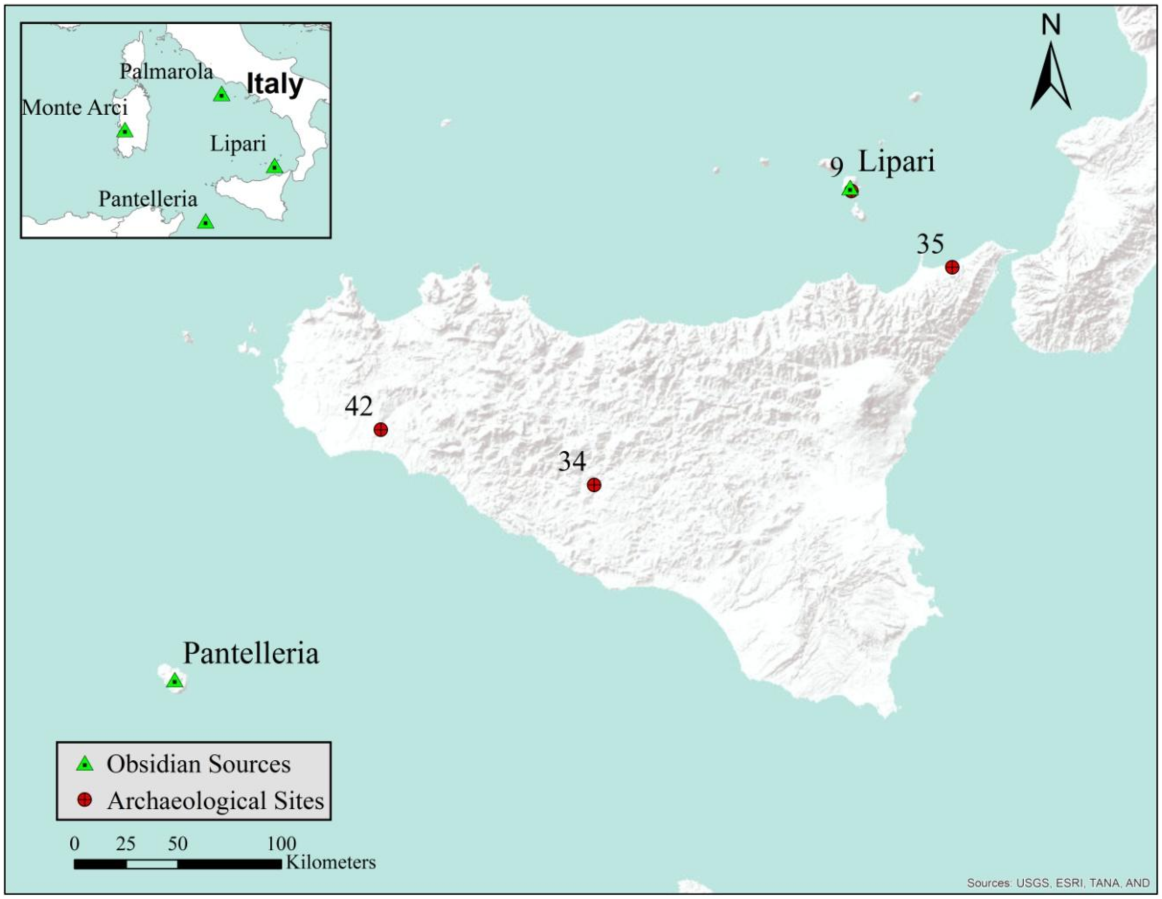

Figure 7.9 Map of analyzed Middle to Late Neolithic sites. Note that numbers correspond to those of Appendix C; 9. Contrada Diana 34. Rocca Aquilia 35. San Martino 42. Stretto Partanna.

percentages. However, a full typological breakdown of artifacts from the Diana phase of San Martino is available, and it is especially revealing in that it allows for comparisons to be with contemporaneous sites in western Sicily.

Table 7.8 displays the results of the typological classification. What is striking is the relatively large number of total artifacts recovered from San Martino (n=1,237), including a large number of pressure-flaked blades and primary knapping debris (Figure 7.10). Aside from Contrada Diana (Iovino et al. 2008b), no other analyzed site from any time period contained as many large cores in the first stages of reduction.

Site	Dating	Total	GG (Li)	CD (Li)	BdeiT (Pa)	Gelk (Pa)
Contrada Diana	Diana	54	54	0	0	0
Rocca Aquilia	Diana	3	3	0	0	0
San Martino	Diana	40	40	0	0	0
Stretto Partanna	Middle Neolithic	10	9	0	0	1
Stretto Partanna	Middle to Late Neolithic	1	1	0	0	0
Stretto Partanna	Late Neolithic	4	4	0	0	0

Table 7.7 List of analyzed sites with counts of artifacts from each subsource. Li: Lipari; Pa: Pantelleria; GG: Gabellotto Gorge; CD: Canneto Dentro; BdeiT: Balata dei Turchi; Gelk: Gelkhamar.

Site	Nodules	Cores	Blades	Flakes	Angular Waste	Total
Contrada Diana	NA	NA	NA	NA	NA	NA
Rocca Aquilia	0	0	3 *(3)*	0	0	3 *(3)*
San Martino	0 (NA)	89 (NA)	517 (NA)	435 (NA)	196 (NA)	1237 (40)
Stretto Partanna (MN)	0	0	10 *(10)*	0	0	10 *(10)*
Stretto Partanna (MN-LN)	0	0	1 *(1)*	0	0	1 *(1)*
Stretto Partanna (LN)	0	0	3 *(3)*	1 *(1)*	0	4 *(4)*

Table 7.8 Basic typological counts of obsidian artifacts at the analyzed sites. Numbers in italics denote the number of artifacts that underwent more extensive analysis (length, width, etc.) as well as elemental characterization. MN: Middle Neolithic; LN: Late Neolithic.

Figure 7.10 A) Pressure-flaked blade core from San Martino; B) Pressure-flaked blades from San Martino; C) Large cores from San Martino; D) Museum display of a small portion of artifacts from Contrada Diana.

While not all of the artifacts from Stretto Partanna were able to be analyzed, it can safely be assumed that differences exist in the nature of obsidian procurement between sites of inland Sicily and those along the coast of northeast Sicily. The low number of total artifacts at sites such as Rocca Aquilia is likely an indication that people farther inland obtained obsidian from communities who had better access to raw materials. It is unfortunate that obsidian from so few Diana period sites has been analyzed because it makes interpretations about directionality difficult. What can safely be said is that certain sites contain more obsidian than others. Although there is a clear drop-off in the amount of obsidian in archaeological assemblages the farther one gets from the source, the pattern is not necessarily linear.

Chalcolithic

Because of the low number of sites specifically dating to the Early and Late phases of the Chalcolithic, in combination with extremely localized nature of such divisions (see Leighton 1999: 91; Tusa 1997: 326), all analyses were combined in a single section on Chalcolithic (ca. 3500-2500 B.C.) obsidian consumption, which included a total of eight sites (Figure 7.11). Most of the analyzed artifacts were found in habitation contexts, although the artifacts from Menta were recovered from a circular tomb (La Rosa 1994, 1997a: 153).

Of the 106 analyzed artifacts, 98 came from Gabellotto Gorge and two came from Canneto Dentro (see Table 7.9). The material from Canneto Dentro included two blade fragments, one proximal and one distal. Six artifacts from two sites were sourced to Pantelleria, including five artifacts from Balata dei Turchi and one from Gelkhamar. Artifacts from Balata dei Turchi included a proximal blade, two whole flakes, and two pieces of angular waste. A whole Gelkhamar flake was also recovered from Sant'Onofrio. While Pantelleria obsidian is common at sites in central and western Sicily, it is rarely dominant, nor is it universally found. For example, no Pantelleria obsidian is found at Serraferlicchio in central Sicily.

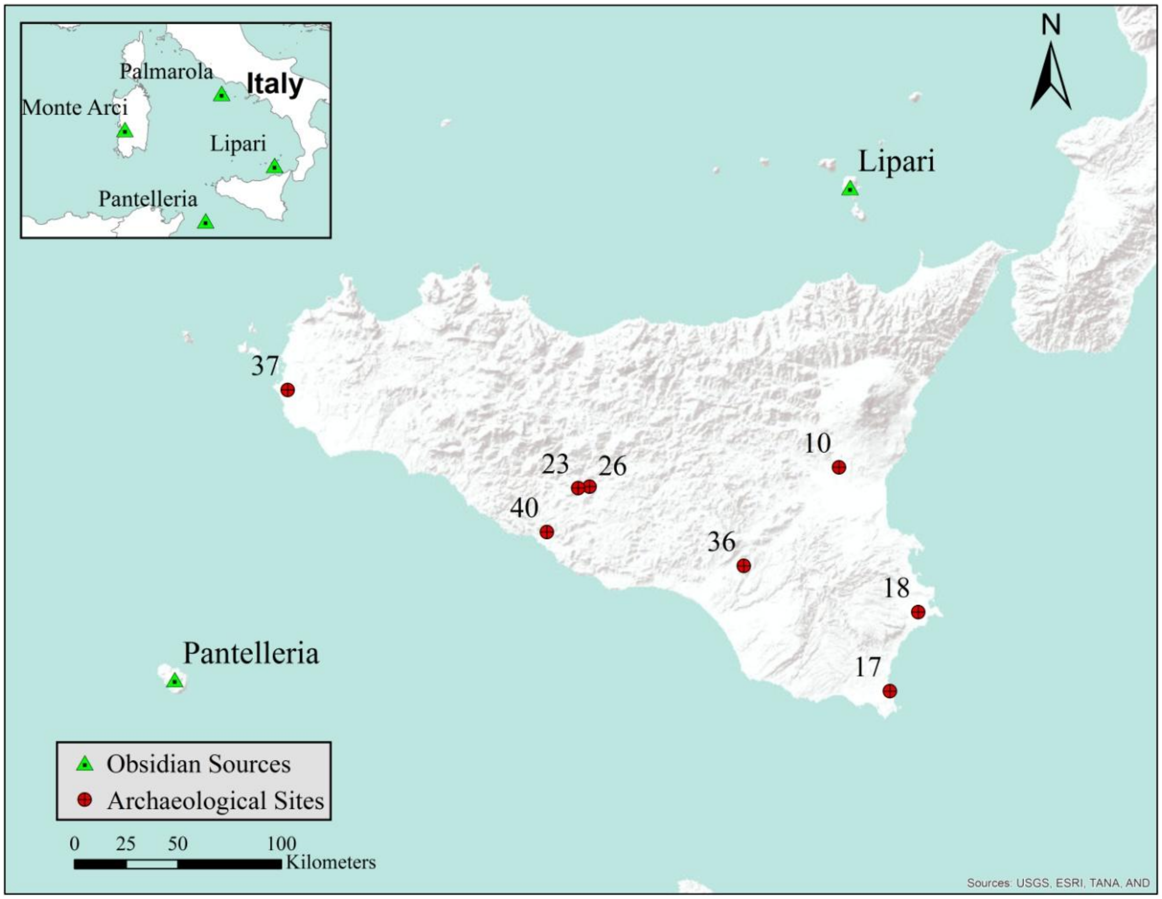

Figure 7.11 Map of analyzed Chalcolithic sites. Note that numbers correspond to those of Appendix C; 10. Contrada Orto del Conte 17. Grotta Calafarina 18. Grotta del Conzo 23. Malpasso 26. Menta 36. Sant'Ippolito 37. Sant'Onofrio 40. Serraferlicchio.

An analysis of the raw material characteristics of the analyzed artifacts reveals a broad range of diversity (Figure 7.12). Unfortunately, the low number of total artifacts from most sites prevents making statistically valid comparisons. What is striking, however, is the low number of spherulitic artifacts from Contrada Orto del Conte, a site in which 70 artifacts were analyzed. A further analysis of raw material characteristics divided according to their typological category highlights this diversity (Figure 7.13). While there are no clear patterns among other artifact categories, it is evident that Chalcolithic blades (n=76) were mainly produced from black, non-spherulitic obsidian.

Site	Dating	Total	GG (Li)	CD (Li)	BdeiT (Pa)	Gelk (Pa)
Contrada Orto del Conte	Early Chalcolithic	70	70	0	0	0
Grotta Calafarina	Early Chalcolithic	9	9	0	0	0
Grotta del Conzo	Early Chalcolithic	1	1	0	0	0
Malpasso	Late Chalcolithic	4	4	0	0	0
Menta (Burial)	Late Chalcolithic	3	1	0	2	0
Sant'Ippolito	Chalcolithic	7	7	0	0	0
Sant'Onofrio	Chalcolithic	6	2	0	3	1
Serraferlicchio	Chalcolithic	6	4	2	0	0

Table 7.9 List of analyzed sites with counts of artifacts from each subsource. Li: Lipari; Pa: Pantelleria; GG: Gabellotto Gorge; CD: Canneto Dentro; BdeiT: Balata dei Turchi; Gelk: Gelkhamar.

While about 60% of Stentinello blades were produced from non-spherulitic obsidian, almost 90% were produced from non-spherulitic obsidian during the Chalcolithic. This seems to suggest a clear selection of better quality raw materials for blade production.

An analysis of cortex demonstrates that most of the artifacts were in the tertiary stages of reduction. Only a single whole flake from Serraferlicchio displayed more than 20% cortex. This is further emphasized by the low number of cores (n=2) and other primary knapping debris found at the sites (Table 7.11). Both cores came from Sant'Ippolito and were categorized as unipolar pressure-flaked blade cores. In contrast to earlier time periods, there is little evidence of the working of raw materials on-site.

Despite the lack of evidence for local production, the finished products are similar to earlier time periods in that blades appear to be produced through the same technique of

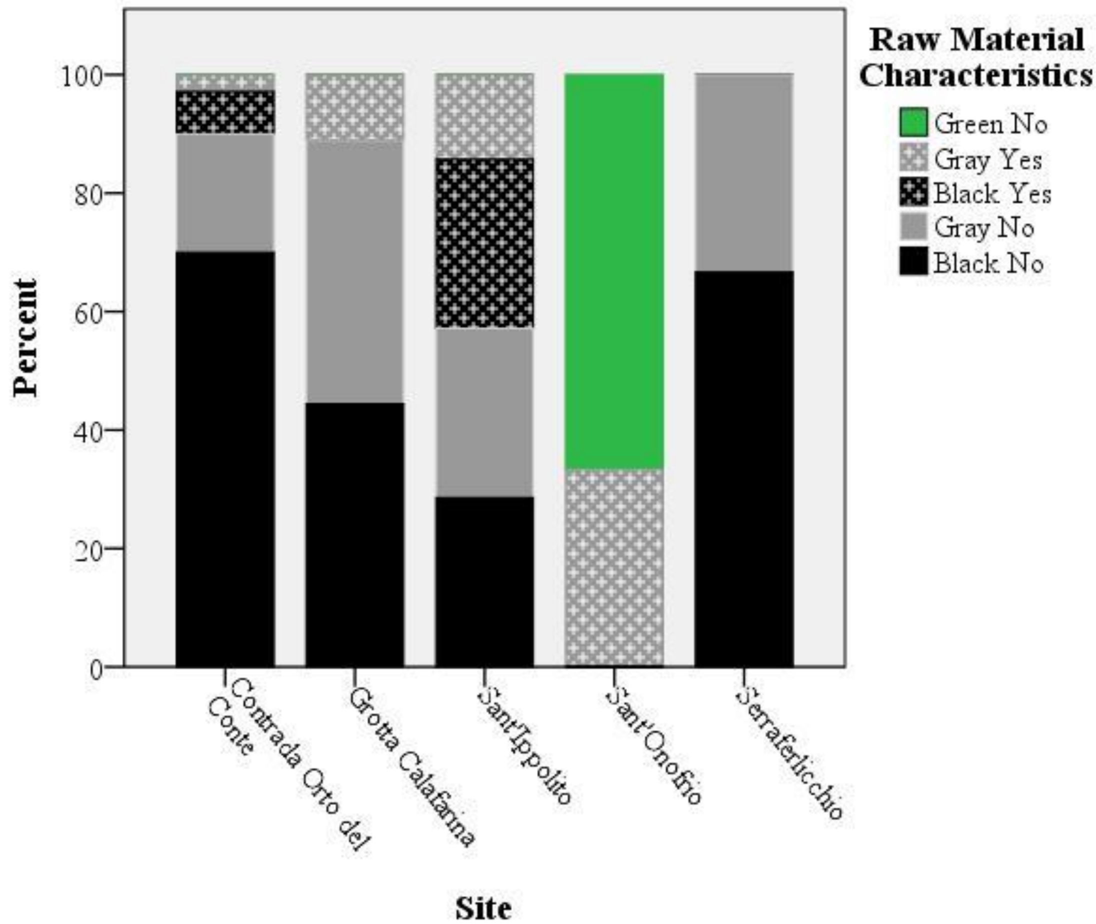

Figure 7.12 Raw material characteristics from sites in which 5 or more artifacts were analyzed. 'Black' and 'gray' refer to artifact color while 'yes and 'no' refer to the presence or absence of spherulites.

pressure flaking (e.g. Figure 7.14). However, the average width of Chalcolithic blades was less than Stentinello blades. While the average width of Stentinello blades was 14.3 mm., Chalcolithic blades (n= 92) averaged 11.4 mm. with a standard deviation of 2.9 mm.; only a single blade from Malpasso was over 20 mm. The median length of whole blades (n=43) was 33 mm. with a standard deviation of 12.7 mm.

In order to test whether the widths of Stentinello blades were significantly different from those of Chalcolithic blades, a t-test was run using SPSS 21 Statistical

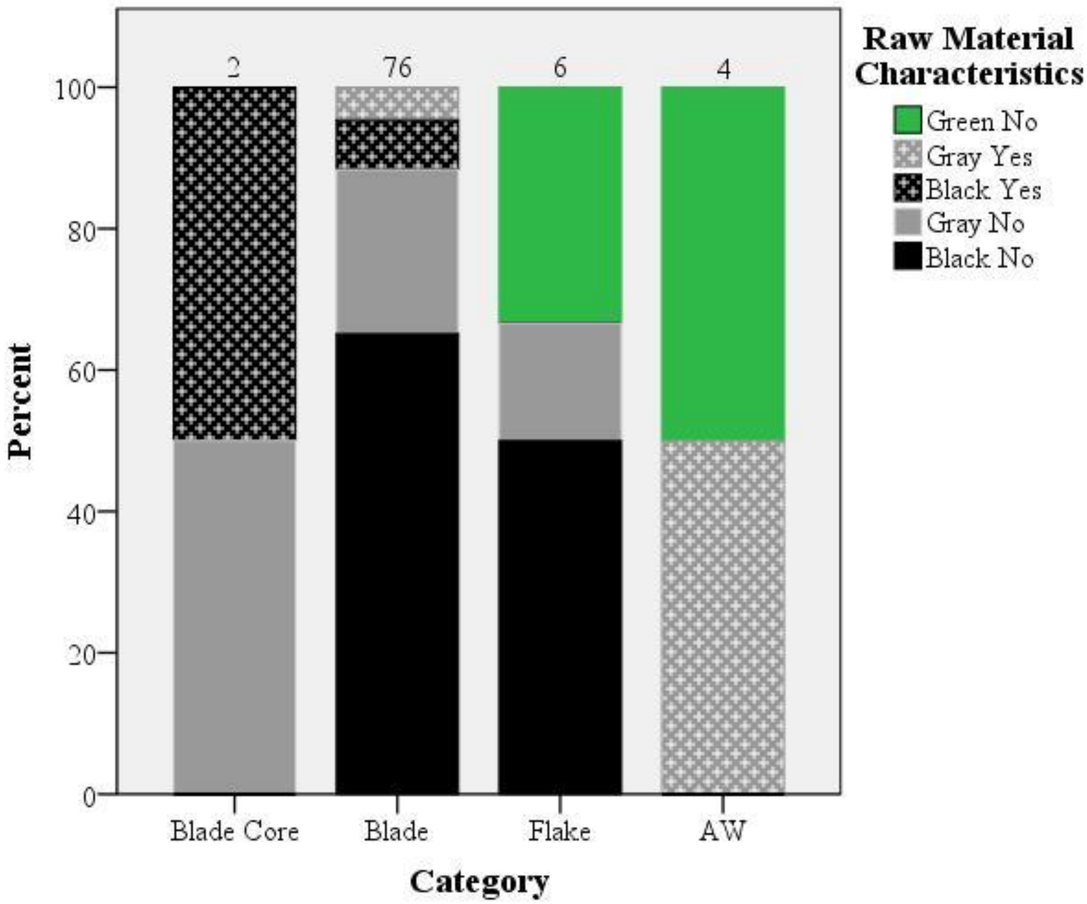

Figure 7.13 Raw material characteristics from sites in which 5 or more artifacts were analyzed. 'Black' and 'gray' refer to artifact color while 'yes and 'no' refer to the presence or absence of spherulites. Total counts within each category are listed above the bars.

software. I initially attempted to run the analysis using the widths of all blades, including whole, proximal, medial, and distal blades. However, what I found was that their distributions were highly skewed and not capable of being normalized using logarithmic or Box-Cox transformations. This is likely due to the fact that many of the larger blades were slightly wider in the middle than at the proximal of distal ends. By including both distal and proximal blade fragments, the distribution became quite skewed. However, by only comparing the widths of whole blades, a simple log10 transformation normalized the

Site	0-20% Cortex	20-80% Cortex	80-100% Cortex	Total Artifacts
Contrada Orto del Conte	70 (100%)	0	0	70
Grotta Calafarina	9 (100%)	0	0	9
Grotta del Conzo	1 (100%)	0	0	1
Malpasso	4 (100%)	0	0	4
Menta (Burial)	3 (100%)	0	0	3
Sant'Ippolito	7 (100%)	0	0	7
Sant'Onofrio	6 (100%)	0	0	6
Serraferlicchio	5 (83%)	1 (17%)	0	6

Table 7.10 Breakdown of cortex percentages on all analyzed Chalcolithic artifacts by site.

Site	Nodules	Cores	Blades	Flakes	Angular Waste	Total
Contrada Orto del Conte	0	0	67 *(67)*	3 *(3)*	0	70 *(70)*
Grotta Calafarina	0	0	9 *(9)*	0	0	9 *(9)*
Grotta del Conzo	0	0	1 *(1)*	0	0	1 *(1)*
Malpasso	0	0	4 *(4)*	0	0	4 *(4)*
Menta (Burial)	0	0	1 *(1)*	2 *(2)*	0	3 *(3)*
Sant'Ippolito	0	2 *(2)*	5 *(5)*	0	0	7 *(7)*
Sant'Onofrio	0	0	0	2 *(2)*	4 *(4)*	6 *(6)*
Serraferlicchio	0	0	5 *(5)*	1 *(1)*	0	6 *(6)*

Table 7.11 Basic typological counts of obsidian artifacts at the analyzed sites. Numbers in italics denote the number of artifacts that underwent more extensive analysis (length, width, etc.) as well as elemental characterization.

Figure 7.14 Ventral surfaces of pressure blades from Contrada Orto del Conte.

data, as confirmed through a Shapiro-Wilk test of normality. Based on the results from Table 7.12, it is clear that the variances of the two populations were not equal. Therefore the output for unequal variances was used. The t-score was 2.950, df=99.077, p=.004. Therefore, with an alpha of 0.05, one can claim that Stentinello blades are significantly wider than those of the Chalcolithic.

Twenty percent of the 92 analyzed blades were intentionally modified, mainly in the form of marginal retouch. Only two blades were invasively retouched, although neither in the form of recognizable tool types. Of the eight analyzed flakes, two displayed

		Levene's Test for Equality of Variances		T-test for Equality of Means						
		F	Sig.	t	df	Sig.	Mean Diff.	Std. Error Diff.	95% Confidence Interval Lower	95% Confidence Interval Upper
Width	Equal Variances	**4.538**	**.034**	2.428	186	.016	.06496	.02675	.01218	.11773
	Unequal Variances			**2.950**	**99.077**	**.004**	.06496	.02202	.02126	.10865

Table 7.12 Results obtained from independent t-tests relating to maximum widths of whole blades from Stentinello and Chalcolithic sites.

intentional retouch. They included a transverse scraper and a *pièce esquillée* from Sant'Onofrio, made of Balata dei Turchi and Gelkhamar obsidian respectively.

Bronze Age

Nine of the analyzed sites date to the Bronze Age (ca. 2500-900 B.C.), seven of which specifically to the Castelluccio phase (ca. 2500-1430 B.C.; see Figure 7.15). Of these nine sites, four came from burial contexts, likely signaling a shift in the socio-economic function of obsidian and its cultural significance in the lives of the people who used it. Sixty-four of the 72 analyzed artifacts matched the elemental signature of Gabellotto Gorge. The material from Canneto Dentro included an unretouched whole flake from Casteltermini, as well as an unretouched distal flake, an unretouched proximal flake, and two whole blades from La Muculufu, one of which was retouched. Two unretouched whole blades from Balata dei Turchi were also recovered from La Muculufu (Table 7.13).

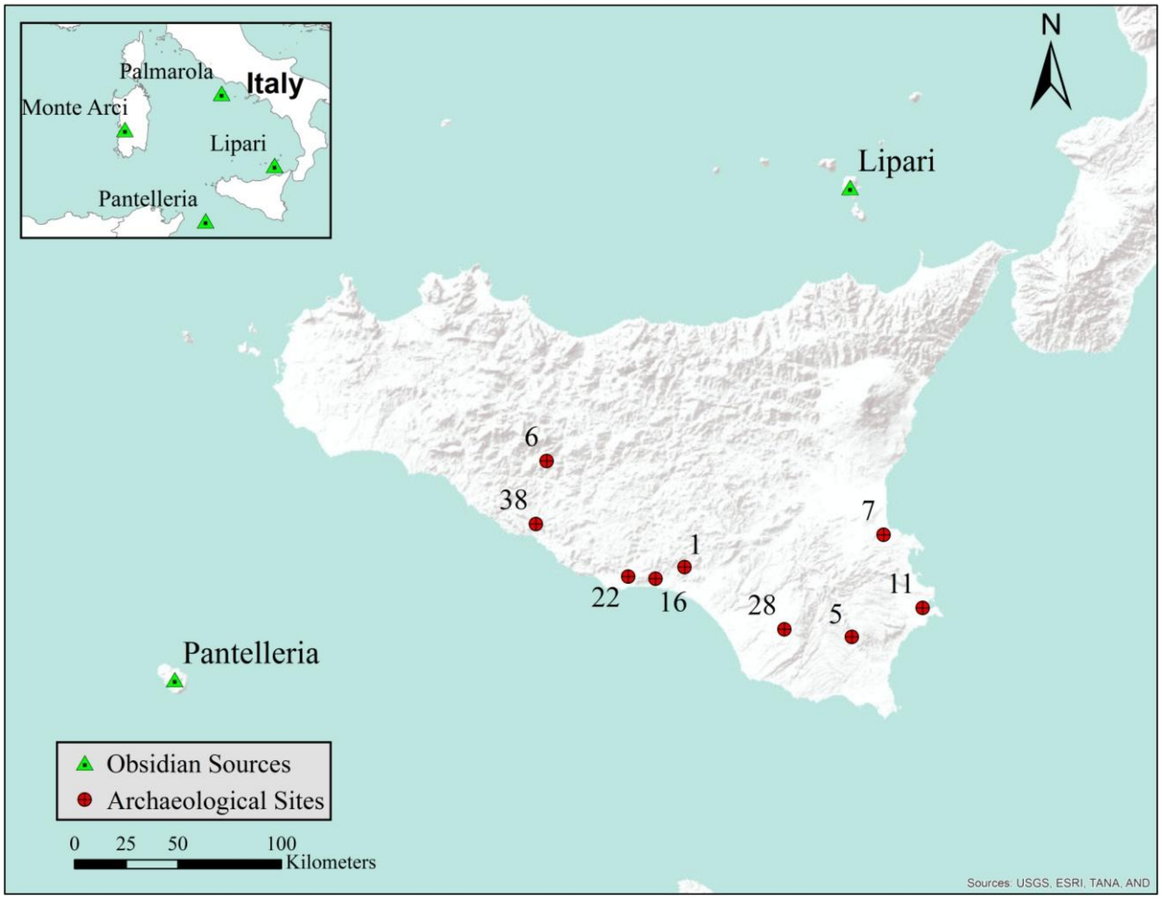

Figure 7.15 Map of analyzed Bronze Age sites. Note that numbers correspond to those of Appendix C; 1. Butera 5. Castelluccio 6. Casteltermini 7. Cava Canabarbara 11. Cozzo del Pantano 16. Gela Manfria 22. La Muculufu 28. Monte Sallia 38. Scintillia Capanna Alfa.

Figure 7.16 displays the raw material characteristics of artifacts from sites in which 10 or more objects were analyzed. The diversity of raw material characteristics between these sites is apparent. Approximately 70% of artifacts from both Casteltermini and La Muculufu were spherulitic, while eight out of the 10 artifacts from Cava Canabarbara were non-spherulitic. This could be because better quality raw materials were reserved for the burial at Cava Canabarbara, although this is not necessarily the case considering that only two of the four artifacts from the other burials were spherulitic.

Site	Dating	Total	GG (Li)	CD (Li)	BdeiT (Pa)	Gelk (Pa)
Butera	Early Bronze Age	1	1	0	0	0
Castelluccio (Burial)	Early Bronze Age	1	1	0	0	0
Casteltermini	Bronze Age	35	34	1	0	0
Cava Canabarbara (Burial)	Early Bronze Age	10	10	0	0	0
Cozzo del Pantano (Burial)	Middle Bronze Age	1	1	0	0	0
Gela Manfria (Burial)	Early Bronze Age	2	2	0	0	0
La Muculufu	Early Bronze Age	20	13	5	2	0
Monte Sallia	Early Bronze Age	1	1	0	0	0
Scintillia Capanna Alfa	Early Bronze Age	1	1	0	0	0

Table 7.13 List of analyzed sites with counts of artifacts from each subsource. Li: Lipari; Pa: Pantelleria; GG: Gabellotto Gorge; CD: Canneto Dentro; BdeiT: Balata dei Turchi; Gelk: Gelkhamar.

Such diversity is in line with general patterns that began in the Chalcolithic, but certainly differ from the fairly even proportions of raw material categories at Stentinello period sites. One must nevertheless be careful when comparing materials from burials with those from other contexts.

When broken down according to typological categories (Figure 7.17), there is a clear difference in the percentage of spherulitic blades (46%) versus spherulitic flakes

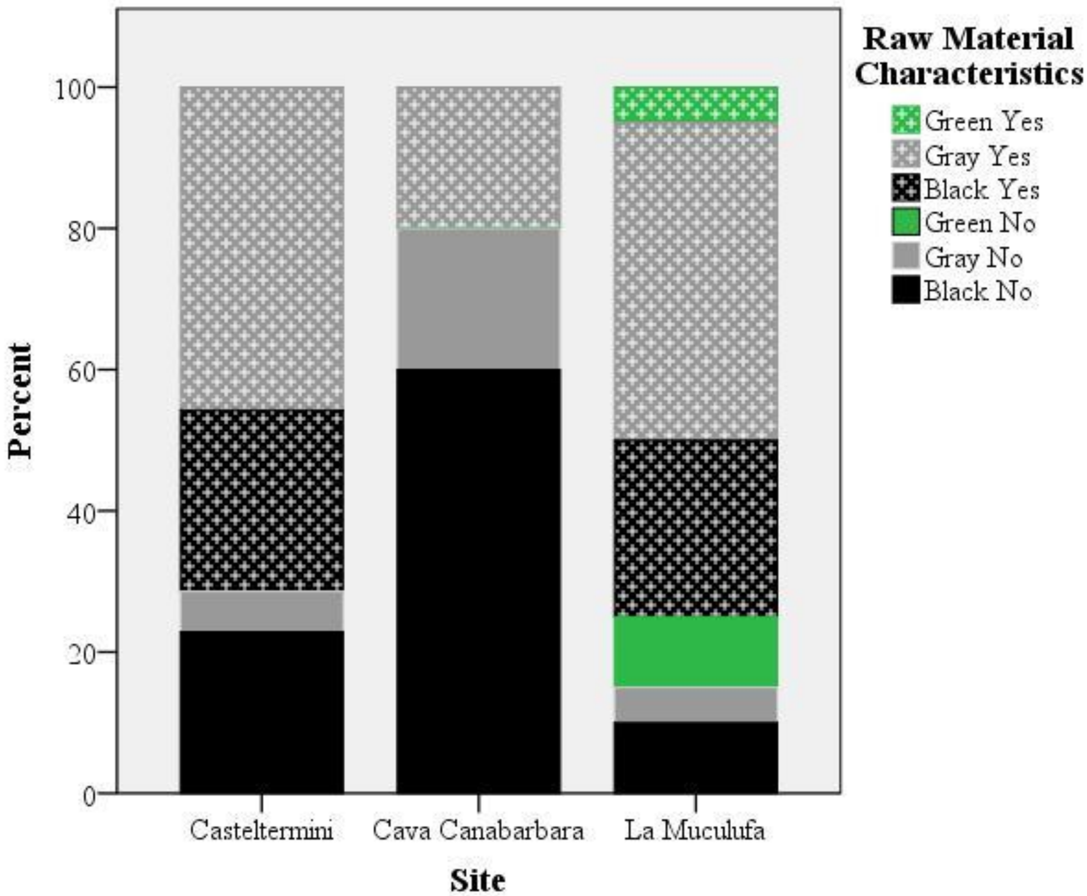

Figure 7.16 Raw material characteristics from sites in which 10 or more artifacts were analyzed. 'Black' and 'gray' refer to artifact color while 'yes and 'no' refer to the presence or absence of spherulites.

(17%). This could suggest that better quality raw materials were being selected for the creation of blades.

An analysis of cortex (Table 7.14) shows that most artifacts are in the latest stages of reduction. It is only at Casteltermini where any artifacts display more than 20% cortex. It is also the only site of all 43 total sites in which a raw nodule of 100% cortex was recovered. An analysis of Table 7.15 further shows that Casteltermini is the only Bronze Age site in which any cores were recovered, including two blade cores and three

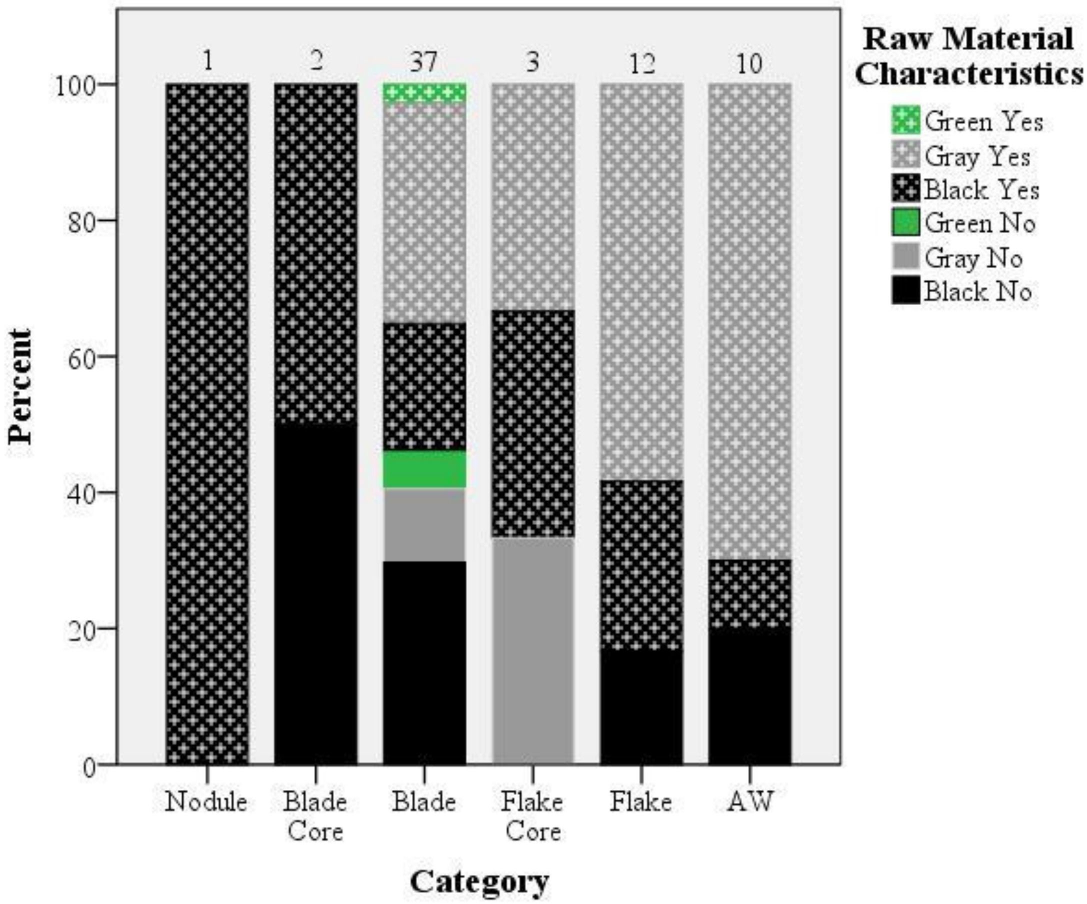

Figure 7.17 Raw material characteristics from sites in which 10 or more artifacts were analyzed. 'Black' and 'gray' refer to artifact color while 'yes and 'no' refer to the presence or absence of spherulites. Total counts within each category are listed above the bars.

flake cores. While several flakes and angular waste were found at La Muculufu, Casteltermini is the only site in which there is evidence for the on-site working of raw materials.

The material from burial contexts included 10 blades, one flake, and three pieces of angular waste, all from Gabellotto Gorge. Only the material from Castelluccio did not contain any blades. While it can certainly be stated that blades were the primary obsidian artifact type found in the Bronze Age burials, they were not necessarily whole blades

Site	0-20% Cortex	20-80% Cortex	80-100% Cortex	Total Artifacts
Butera	1 (100%)	0	0	1
Castelluccio (Burial)	1 (100%)	0	0	1
Casteltermini	33 (94%)	1 (3%)	1 (3%)	35
Cava Canabarbara (Burial)	10 (100%)	0	0	10
Cozzo del Pantano (Burial)	1 (100%)	0	0	1
Gela Manfria (Burial)	2 (100%)	0	0	2
La Muculufu	20 (100%)	0	0	20
Monte Sallia	1 (100%)	0	0	1
Scintillia Capanna Alfa	1 (100%)	0	0	1

Table 7.14 Breakdown of cortex percentages on all analyzed Chalcolithic artifacts by site.

(Figure 7.18). The blades from burial contexts included three whole blades, three proximal, three medial, and one highly retouched blade in which the initial state could not be determined.

The blades from the analyzed sites were created through the same technique of pressure flaking seen throughout Sicilian prehistory. The blades were highly regular in width and thickness and possessed small elliptical platforms with relatively diffuse bulbs of percussion. The average width of Bronze Age blades (n=40) was 12.4 mm. with a standard deviation of 3.8 mm. Two of the 40 blades were more than 20 mm., although

Site	Nodules	Cores	Blades	Flakes	Angular Waste	Total
Butera	0	0	1 *(1)*	0	0	1 *(1)*
Castelluccio (Burial)	0	0	0	1 *(1)*	0	1 *(1)*
Casteltermini	1 *(1)*	5 *(5)*	16 *(16)*	8 *(8)*	5 *(5)*	35 *(35)*
Cava Canabarbara (Burial)	0	0	8 *(8)*	0	2 (2)	10 *(10)*
Cozzo del Pantano (Burial)	0	0	1 *(1)*	0	0	1 *(1)*
Gela Manfria (Burial)	0	0	1 *(1)*	0	1 *(1)*	2 *(2)*
La Muculufu	0	0	13 *(13)*	4 *(4)*	3 *(3)*	20 *(20)*
Monte Sallia	0	0	0	1 *(1)*	0	1 *(1)*
Scintillia Capanna Alfa	0	0	0	1 *(1)*	0	1 *(1)*

Table 7.15 Basic typological counts of obsidian artifacts at the analyzed sites. Numbers in italics denote the number of artifacts that underwent more extensive analysis (length, width, etc.) as well as elemental characterization.

none were more than 22 mm. The median length of whole blades (n=16) was 19 mm. with a standard deviation of 17.3 mm, once again indicating a large degree of variability.

Because there were clear differences in the widths of Stentinello blades when compared with Chalcolithic blades, I decided to test whether Bronze Age blades were significantly wider than those of the Chalcolithic. Once again, only the widths of whole blades were used because of issues with normality. Although a non-parametric Mann-Whitney U Test could have been run because the sample size of Bronze Age blades was 16, I decided against this because the transformed data were normal and I felt that a t-test would give more accurate results. To undertake the test, a log10 transformation was used

Figure 7.18 Examples of obsidian artifacts found in the burial context at Cava Canabarbara.

to normalize the data, as confirmed through a Shapiro-Wilk test of normality. Based on the results from Table 7.16, it is clear that the variances of the two populations are equal. Therefore the output for equal variances was used. The t-score was 0.544, df=57, p=.589. Therefore, with an alpha of 0.05, one can claim that Bronze Age blades are not significantly wider than those of the Chalcolithic.

Eight of the 40 analyzed blades were modified, mainly in the form of marginal retouch, although one blade from La Muculufu was used as a *pièce esquillée*. A *pièce*

		Levene's Test for Equality of Variances		T-test for Equality of Means						
		F	Sig.	t	df	Sig.	Mean Diff.	Std. Error Diff.	95% Confidence Interval	
									Lower	Upper
Width	Equal Variances	**.040**	**.842**	**.544**	**57**	**.589**	.01880	.03458	-.05045	.08804
	Unequal variances			.510	23.998	.615	.01880	.03685	-.05727	.09486

Table 7.16 Results obtained from independent t-tests relating to maximum widths of whole blades from Chalcolithic and Bronze Age sites.

esquillée was also formed from a piece of angular waste at Casteltermini. Of the 15 analyzed flakes four were retouched, including two *pièces esquillées* from Casteltermini.

Summary of the Results

These results suggest that Neolithic communities in eastern Sicily obtained Lipari obsidian in a similar manner to that of their contemporaries in Calabria. While Pantelleria obsidian is present in small quantities in western and central Sicily, Lipari obsidian is of much greater importance, although it is found in lesser quantities than in the east.

Because of the low prevalence of primary knapping debris at the analyzed sites, I argue that the first stages of reduction occurred at the source area by local populations, with obsidian being transported from Lipari to Sicilian sites such as San Martino as well as Calabria in the form of preformed cores, likely by sea through the tumultuous Strait of Messina and then further east along the southern coast of Italy where obsidian is present at coastal sites such as Capo Alfiere (Robb and Farr 2005; Vaquer 2007) and the Stilo

Region (see Hodder and Malone 1984). Once acquired, communities throughout Sicily used these raw materials to create distinctively wide pressure-flaked blades.

Despite similarities in the initial procurement of Lipari obsidian, there is no evidence to suggest that certain sites in Sicily acted as nodes for the subsequent redistribution of obsidian as appears to be the case in many regions of mainland Italy, especially when considering that cores were recovered from five of the eight Stentinello period sites. Regardless, it is unlikely that every village or settlement in Sicily had a person with the expertise and knowledge required to create pressure-flaked blades, so I tentatively suggest that down-the-line exchange resulted in the distribution of finished products from sites in eastern Sicily to those in the west. More data from well-excavated contexts is needed before more concrete interpretations can be made.

Although the vast majority of obsidian found in Sicily comes from a single Lipari subsource, differences still exist in both the appearance and knapping quality of artifacts in archaeological assemblages. The island site of Rinicedda is particularly noteworthy in terms of the high proportion of gray to black obsidian recovered. This could suggest that the residents of Rinicedda were obtaining raw materials in a different manner than contemporaneous communities on mainland Sicily, which would make sense considering the high number of cores found at the site in combination with the site's relatively isolated location north of the source itself. Nevertheless, the residents of Rinicedda were still plugged into the larger Stentinello world as attested by the presence of distinctive Stentinello pottery and pressure-flaked blades.

Although Chalcolithic blades are significantly thinner than those from earlier periods, the overall differences in the reduction strategies being employed are negligible. This differs significantly from Sardinia where we see drastic changes in obsidian use by the time of the Chalcolithic. Nevertheless, this period in Sicily did see the disintegration of large-scale obsidian exchange networks originating from Lipari, resulting in a drop-off in the amount of post-Neolithic materials in circulation.

In contrast to the Neolithic and Chalcolithic where obsidian is primarily associated with residential contexts, Early Bronze Age obsidian use is often associated with human burials, likely signaling a shift in the symbolic importance of these materials in the lives of the people who used it. Regardless, this tradition is short-lived, and the practice dies out by the Middle Bronze Age.

Chapter 8: Obsidian Consumption in Prehistoric Sardinia

This chapter builds upon the previous chapter in that it examines how broader socio-economic developments played out at the regional level, in turn exploring obsidian consumption on the Italian island of Sardinia from the Chalcolithic to Bronze Age Nuragic phases (ca. 3200-850 B.C.) through the analysis of 662 obsidian artifacts from three sites in west-central Sardinia (Figure 5.4). While the circulation of Sardinian obsidian in the Neolithic is well documented (Hallam et al. 1976; Le Bourdonnec et al. 2010; Lugliè et al. 2007, 2008; Tykot 1996 *inter alia*), the use of these raw materials in later time periods has received far less attention in what appears to be an important transitional period characterized by the decline of long-distance Neolithic exchange networks.

While there are four obsidian sources in the West Mediterranean, only obsidian from the four subsources of Monte Arci is known to have been exploited by people on the island itself. Despite the presence of Mesolithic populations on Sardinia (see Table 8.1 for a list of relevant time periods and dates), it is not until the beginning of the Neolithic that we see the first evidence of obsidian use by the islanders (see Lugliè et al. 2007, 2008; Tykot 1996) and the long-distance procurement of Sardinian raw materials by populations on Corsica and mainland Italy (Ammerman and Polglase 1993; Bigazzi and Radi 1998; Léa 2012; Tykot et al. 2003 *inter alia*). While the long-distance procurement of Sardinian obsidian continues into the Chalcolithic, used by communities on Corsica and mainland Italy (see Bigazzi and Radi 1998; Hallam et al. 1976; Randle et al. 1993), there is a sharp fall-off in the number of sites at which obsidian has been reported. The declining use of

Period		**Cultural Phase**		**Absolute Dates**
Mesolithic		Grotta Corbeddu		11000 - 6000 B.C.
Neolithic	Early	Su Carroppu		6000 - 5300 B.C.
		Filiestru-Grotta Verde		5300 - 4700 B.C.
	Middle	Bonu Ighninu		4700 - 4000 B.C.
	Late	--------San Ciriaco-------- Ozieri		4000 - 3200 B.C.
Chalcolithic	Early	Sub-Ozieri Filigosa Abealzu		3200 - 2700 B.C.
	Middle	Monte Claro	Beaker A	2700 - 2200 B.C.
	Late			
Bronze Age	Early	Bonnanaro A	Beaker B	2200 - 1900 B.C.
	Middle	Bonnanaro B		1900 - 1600 B.C.
		Nuragic I		1600 - 1300 B.C.
	Late	Nuragic II		1300 - 1150 B.C.
	Final	Nuragic III		1150 - 850 B.C.

Table 8.1 The periods, cultural phases, and absolute dates (calibrated) of Sardinian prehistory (after Tykot 1994: 129).

Sardinian obsidian in the Chalcolithic mirrors the diminished exploitation of other West Mediterranean sources in the 3rd millennia B.C. in that obsidian consumption becomes a more local phenomenon, largely restricted to populations within the immediate vicinity of the various sources. Nevertheless, there is a complexity to Bronze Age obsidian exploitation on Sardinia that has yet to be fully explored.

Through the integration of raw material sourcing and techno-typological analysis, this broad-based artifact characterization study uses the analysis of obsidian from three archaeological sites as a means of undertaking a more general consideration of obsidian consumption in Chalcolithic and Bronze Age Sardinia. The resultant data allow it to be argued that the community's residents obtained obsidian directly from the source areas, then reduced the material on-site for the production of lunates and expedient flake tools. It is further posited that the nature of obsidian exploitation on Sardinia during the Chalcolithic differs from that of the Neolithic, a change in tradition that is related to a larger reconfiguration of interaction spheres and exchange networks.

Results by Period

Appendix G provides a compiled list of the sourcing and typological results from all time periods. The results are presented chronologically in order to discuss the differential patterns of obsidian consumption through time.

Chalcolithic

While it has long been recognized that obsidian is present at many Chalcolithic sites in Sardinia (Puxeddu 1958), only obsidian from nine of them had been elementally analyzed (see Table 8.2). Such studies are informative in that they determine where the products of the four obsidian subsources were distributed; however, they have tended to focus on one aspect of obsidian consumption, i.e. the raw materials involved, without considering the specific forms in which the obsidian circulated (nodule, core, end-product, etc.), the techniques by which they were worked, and the form of the final tools. In contrast, this study integrates all of these considerations in order to appreciate the full

Site	Date	Total	SA	SB	SC	Method	Citation
Bingia 'e Monti	Chalc.	146	7	1	138	XRF	This work
Cantoniera Frumini	Chalc.	20	9	2	9	Visual; XRF	Tykot 1995, 2010
Monte d'Accodi	Chalc.	12	9	0	3	EMP-WDS	Tykot 1995
Palmas Arborea	Chalc.	8	6	0	2	Visual; XRF	Tykot 1995, 2010
Scaba 'e Arriu	LN-Chalc.	31	10	0	21	Visual	Ragucci and Usai, 2004; Usai 2010
Serra de Castius	Chalc.	20	10	1	9	Visual; XRF	Tykot 1995, 2010
Stazione La Gumarense	LN-Chalc.	18	8	2	8	Visual; XRF	Tykot 2010
Su Casteddu Becciu	Chalc?	16	6	1	9	Visual; XRF	Tykot 1995, 2010
Su Coddu	LN-Chalc.	9	3	0	6	Visual	Tykot 1995
Terramaini	LN-Chalc.	10	2	0	8	Visual	Tykot 1995

Table 8.2 Results from previous sourcing studies on obsidian from Chalcolithic Sardinia (SA, SB and SC: sources; LN: Late Neolithic; Chalc: Chalcolithic).

range of socioeconomic processes and cultural traditions that underpin the archaeological record.

Using the data from Appendix H, a bi-variate plot of the elemental ratios of rubidium (Rb) and strontium (Sr) to niobium (Nb) was produced to discriminate the various Sardinian source products (see Freund and Tykot 2011), and to then to allocate each artifact to the source from which it originated (Figure 8.1). Of the 146 artifacts analyzed, 138 were shown to be made of obsidian that came from the SC subsource. Seven artifacts were made of SA obsidian, while only a single artifact’s raw material

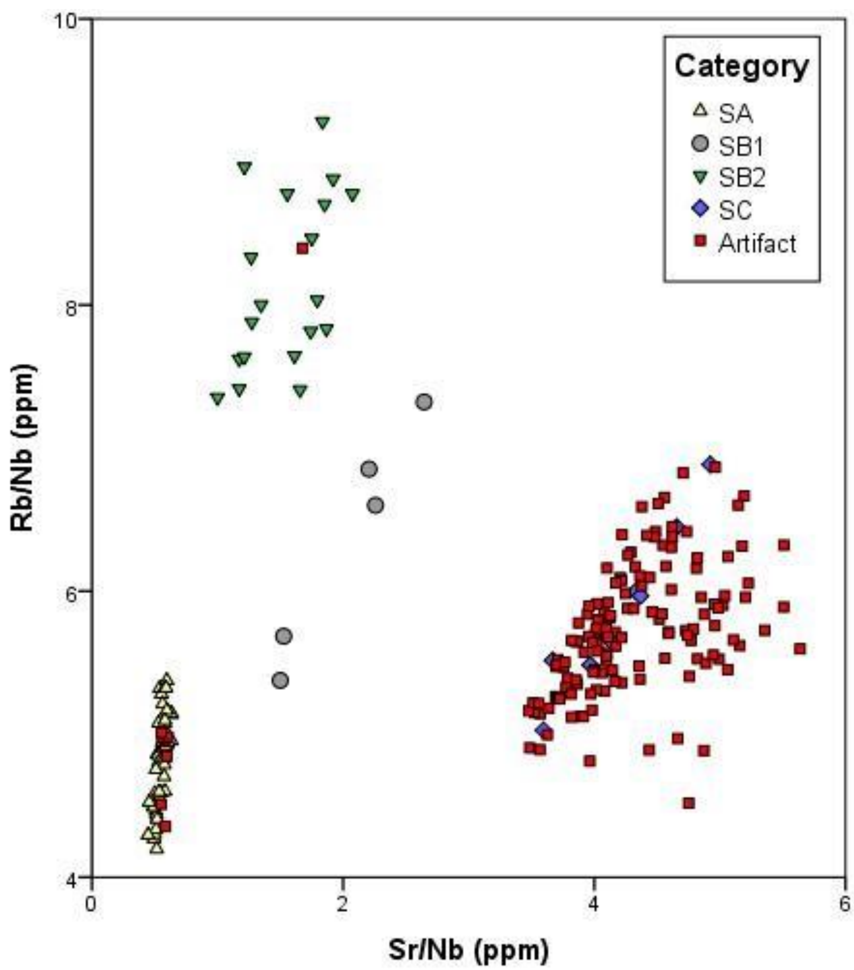

Figure 8.1 Bi-variate plot of the elemental ratios of rubidium (Rb) and strontium (Sr) to niobium (Nb) in parts per million (ppm).

matched the chemistry of geological samples from the SB2 subsource. No SB1 obsidian was present in the studied assemblage. The percentage of SC obsidian is especially high when compared to other Chalcolithic sites near the SC subsource, although the Bingia 'e Monti data is not radically different from the general trend of the predominance of SC obsidian in archaeological assemblages in southern Sardinia. The abundance of SC obsidian at the site is likely a reflection of Bingia 'e Monti’s proximity to the source, less than 15 kilometers distant, compared to 18 kilometers and 20 kilometers, from the SA and SB source regions respectively.

The analyzed artifacts comprise the full range of reduction debris related to the manufacture of flakes by direct percussion; in contrast to the Neolithic, blade technology was absent. The entire assemblage (n=154) weighed 0.9 kg. and contained one raw nodule, 20 cores, 118 flakes, and 15 pieces of angular waste. Fifty-five percent of artifacts had at least some cortex. When divided by source, the SC assemblage was composed of one nodule, 18 cores, 107 flakes, and 12 pieces of angular waste. Twenty SC artifacts displayed more than 80% cortex. Two of the seven artifacts made of SA obsidian were cores and the other five were either flakes or angular waste (see Figures 8.2c, 8.2d). Both cores contained cortex, one between 60% and 80% and the other between 1% and 20% cortex. The sole artifact of SB2 obsidian was in the form of a retouched flake and displayed no cortex. The range of blank types suggests that the SA and SC obsidian was worked on-site, with the high occurrence of cortical debris indicating that these raw materials were procured in the form of raw nodules, the raw material having likely been procured by the inhabitants of Bingia 'e Monti direct from the source, only some 18 kilometers and 15 kilometers away (SA and SC respectively).

Just under a third of the artifacts were modified (n=44), mainly in the form of simple marginal retouch. This included 29% (n=40) of the SC artifacts and 29% (n=2) of the SA artifacts. The sole SB2 artifact was a retouched perforator. While most of these artifacts can be considered the products of a low-skilled technology that were subsequently modified for the task at hand, there is one particular tool type in the

Figure 8.2 Examples of artifacts from Bingia 'e Monti including, A) cores; B) lunates; C) SA obsidian artifacts; D) closeup of two Kombewa lunates (D. Aubert).

assemblage that deserves further attention, the lunate (Figure 8.2b). Lunates are best defined as small elliptical flakes with a natural or artificially backed margin. All of the eight lunates present in the assemblage were made of SC obsidian. Four SC lunate flake cores were also present (bottom right of Figure 8.2a).

An important distinction must be made here with regard to reduction sequences surrounding lunate technology. While small elliptical backed pieces can be produced through an unspecialized manner of direct percussion, another method of production was also utilized. The Kombewa reduction strategy described and illustrated by Inizan et al.

(1999: 68-71) occurs when a generally convex, semi-circular flake is removed from a core and subsequently used as a flake-blank for the creation of regularly shaped thin flakes. Lunates of this type typically have an obtuse platform angle and are traditionally associated with the Nuragic phases of the Bronze Age (see Freund and Tykot 2011; Locci 2004), where functional analysis has shown that they were often used for plant processing (Hurcombe 1992). At Bingia 'e Monti, two Kombewa lunates were recovered (Figure 8.2d). As such, this study pushes back the initial appearance of Kombewa technology in Sardinian obsidian assemblages to at least the Monte Claro phase of the Chalcolithic, although more evidence from additional sites is needed to confirm this assessment.

Nuragic

Although the three Nuragic sites are not entirely contemporaneous, all of the results have been combined to allow for comparisons to be made across space. When combined with data from previous Nuragic obsidian studies, this scale of resolution allows for a broad discussion of Nuragic obsidian consumption that can be juxtaposed against previous time periods.

Table 8.3 presents the sourcing results from the three Nuragic sites. In general, SC obsidian is the predominant subsource utilized at these sites, which is in keeping with the general pattern from other Nuragic sites (see Freund and Tykot 2011; Michels et al. 1984). Nevertheless, SC obsidian comprises 97% of the assemblage from Bingia 'e Monti and only 81% and 79% from Nuraghe Pidighi and Mitza Pidighi respectively. These results can best be explained by the locations of the various sites in relation to the

Site	Dating	Total	SA (Sar)	SB1 (Sar)	SB2 (Sar)	SC (Sar)
Bingia 'e Monti	Nuragic	145	3	0	2	140
Nuraghe Pidighi	Nuragic	219	17	7	17	178
Mitza Pidighi	Nuragic	140	11	7	11	111

Table 8.3 Compiled list of Nuragic sites with counts of artifacts from each subsource. Sar: Sardinia.

sources. Bingia 'e Monti is located less than 15 kilometers from the SC source and even less than that to secondary SC deposits on the southwest edge of Monte Arci. Therefore, it is not unexpected that the residents of the site would collect the nearest available obsidians from the area. In contrast, Nuraghe Pidighi and Mitza Pidighi are located to the north of Monte Arci where SA and SB obsidians are more accessible. Of course this assumes that the residents of Nuraghe Pidighi traveled directly to the primary deposits to collect raw materials, which is impossible to assess based on the sourcing results alone.

Table 8.4 provides a breakdown of cortex percentages on the analyzed artifacts. What is immediately evident is that artifacts from Bingia 'e Monti contain more cortex than those from Nuraghe Pidighi and Mitza Pidighi. This suggests that the material from Bingia 'e Monti is in a comparatively earlier stage of reduction. Nevertheless, almost three-fourths of the artifacts from Bingia 'e Monti contain less than 20% cortex. and over 90% of artifacts from Nuraghe Pidighi and Mitza Pidighi contain less than 20% cortex.

Differences between Bingia 'e Monti and the other two sites also extend to the types of artifacts recovered. Figure 8.3 displays a typological breakdown of Nuragic artifacts by site. All three sites have roughly the same percentage of flakes and angular waste in their assemblages; however they differ in other categories. More cores are found

Site	0-20% Cortex	20-80% Cortex	80-100% Cortex	Total Artifacts
Bingia 'e Monti	106 (73%)	27 (18%)	13 (9%)	146
Nuraghe Pidighi	206 (94%)	11 (5%)	3 (1%)	220
Mitza Pidighi	131 (92%)	8 (6%)	3 (2%)	142

Table 8.4 Counts of Nuragic artifacts by site broken down by cortex percentages.

at Bingia 'e Monti than at the other sites, further demonstrating that the primary reduction of obsidian was occurring at the site. In contrast to the Chalcolithic, Nuragic cores from all three sites were smaller and less cortical (Figure 8.4). Bladelet cores were only found at Nuraghe Pidighi (n=1) and Mitza Pidighi (n=3). While material from multiple subsources was present at all three sites, relatively few non-SC cores were recovered. The non-SC cores include a single SB2 flake core from Nuraghe Pidighi with 40 to 60 percent cortex and two SA cores from Mitza Pidighi, one bladelet core with 1 to 20 percent cortex and one flake core with 20 to 40 percent cortex.

As at Bingia 'e Monti, there is clear evidence for the primary reduction of obsidian at both Nuraghe Pidighi and Mitza Pidighi, where the entire reduction sequence is represented by the presence of cores as well as flakes, bladelets, and angular waste. While this may be expected at a residential village like Nuraghe Pidighi, it is of particular interest at the sacred well of Mitza Pidighi. These results suggest that people were physically knapping obsidian near the well. Because of the broad similarities in both the

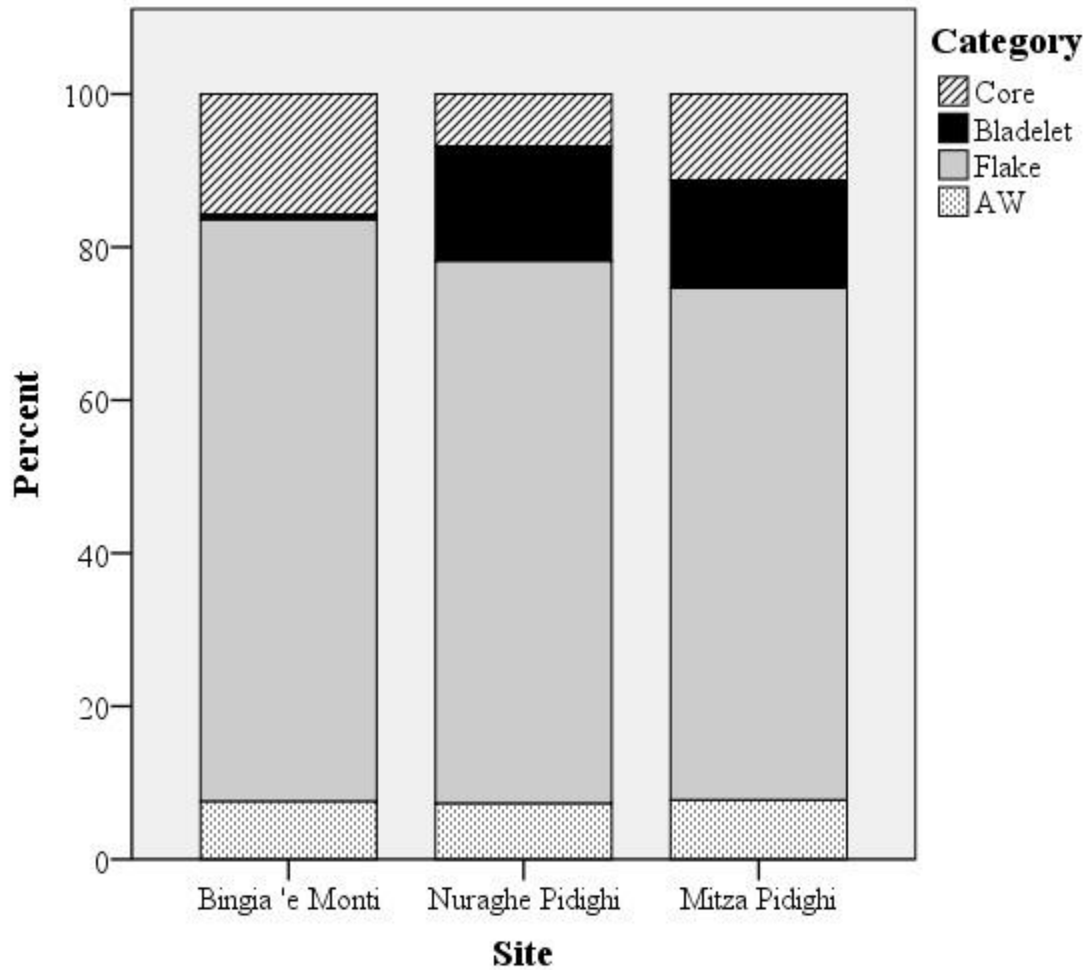

Figure 8.3 Typological breakdown of Nuragic artifacts by site.

sources represented and in the artifacts found, it is likely that the residents of Nuraghe Pidighi were the ones knapping these materials.

Bladelets comprise about 15% of the assemblages from Nuraghe Pidighi and Mitza Pidighi while they are virtually absent at Bingia 'e Monti. Indeed, Nuraghe Pidighi and Mitza Pidighi are the only Nuragic sites in which bladelets have ever been reported. Most of the bladelets are small and have parallel margins and a uniform thickness across their length (Figure 8.5). They are too small to be produced through direct percussion, as

Figure 8.4 Examples of cores from Bingia 'e Monti.

Figure 8.5 Examples of blades from Mitza Pidighi.

Figure 8.6 Examples of blade cores from Mitza Pidighi.

evidenced by corresponding blade cores (Figure 8.6). It is for these reasons that I argue that bladelets at Nuraghe Pidighi and Mitza Pidighi were produced using a mode of pressure flaking (see Andrefsky 2005: 118-119; Crabtree 1972: 44). While bladelets are mainly made from SC obsidian, they were also created from the other subsources, despite the lack of cores (Figure 8.7).

Thirty-three percent of artifacts from Bingia 'e Monti were retouched. This included two of the three SA artifacts, one of the two SB2 artifacts, and 45 of the 140 (32%) of the SC artifacts. In contrast, 43% of artifacts from Nuraghe Pidighi displayed intentional retouch, including 11 of the 17 (65%) SA artifacts, three of the seven SB1 artifacts, 11 of the 17 (65%) SB2 artifacts, and 70 of the 178 (39%) SC artifacts. At Mitza Pidighi, over half (55%) of the artifacts were intentionally modified, including nine of the 11 SA artifacts, 6 of the 7 SB1 artifacts, 6 of the 11 SB2 artifacts, and 50 of the 111

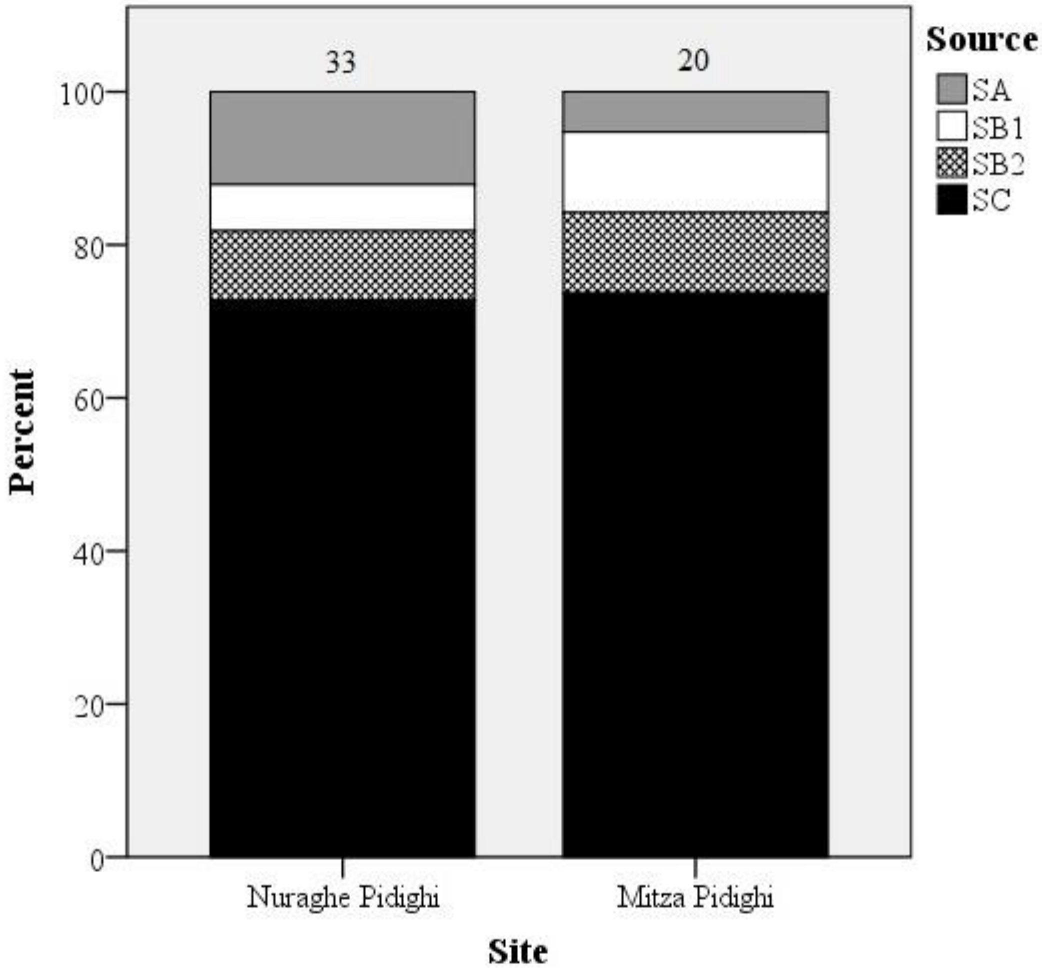

Figure 8.7 Sourcing results on bladelets from Nuraghe Pidighi and Mitza Pidighi.

(45%) SC artifacts. Despite the low numbers, non-SC materials at all three sites show a relatively high percentage of retouch.

Considering that over half of the artifacts from Mitza Pidighi were modified, there is clearly something going on at the site that is not happening elsewhere. A consideration of tool categories further highlights these distinctions (Table 8.5). Mitza Pidighi clearly differs from the residential sites in the lack of lunates and in the high number of *pièces esquillées*. However, both Nuraghe Pidighi and Mitza Pidighi differ from Bingia 'e Monti

Site	Lun.	End Scr.	Trans. Scr.	Dent.	Perf.	Notch	*P.E.*	Tot.
Bingia 'e Monti	6	1	0	1	2	2	0	12
Nuraghe Pidighi	8	2	1	4	1	15	4	35
Mitza Pidighi	0	3	0	2	0	15	9	29

Table 8.5 Counts of tool categories by site. Lun.: Lunate; End Scr.: End Scraper; Trans. Scr.: Tranverse Scraper; Dent: Denticulate; Perf: Perforator; *P.E.*: *Pièce esquillée*.

in the particularly high number of notched pieces. While lunates and lunate blanks are found at both Bingia 'e Monti (n=6) and Nuraghe Pidighi (n=8), lunate cores are only found at Bingia 'e Monti (Table 8.6). Lunate blanks are unretouched Kombewa flakes that are later formed into backed lunates (Figure 8.8). All lunate blanks were made from SC obsidian.

Summary of the Results

The results from the Monte Claro phase at Bingia 'e Monti suggest that the residents of the site obtained obsidian directly from the SA and SC source areas. These two raw materials were mainly reduced on site in exactly the same way using a relatively unskilled percussive technique for the manufacture of simple flake tools. In contrast, SC obsidian was the sole raw material used for the creation of lunates, which is similar to lunate production in the Bronze Age Nuragic period (Freund and Tykot 2011: 161).

The reduction strategies at Bingia 'e Monti contrast with the earlier Middle and Late Neolithic periods of Sardinia, where SC obsidian workshops produced core blanks that were circulated amongst populations on Sardinia and Corsica, while SA obsidian was specifically prepared as polyhedral blade cores for export to Corsica and further afield to

Site	Lunate Core	Lunate Blank	Finished Lunates
Bingia 'e Monti	5	1	5
Nuraghe Pidighi	0	3	5
Mitza Pidighi	0	0	0

Table 8.6 Counts of lunate artifact categories by site.

populations in southern France (Lugliè 2009; Lugliè et al. 2011; Vaquer 2007). While the dominance of SC obsidian at Bingia 'e Monti (95%) is in line with general trends in Sardinia that began in the Late Neolithic (Tykot et al. 2008) and subsequently continued into the Nuragic phases of the Bronze Age (Freund and Tykot 2011; Michels et al. 1984), the prevalence of SC obsidian in Chalcolithic assemblages is not universal. Indeed, previous analyses of obsidian at other Chalcolithic sites show that SA material was also commonly used. One must note, however, the problematic dating of many Chalcolithic sites.

To understand these differences, it is necessary to consider these sites' locations. Figure 8.9 shows a map of Chalcolithic sites where at least eight obsidian artifacts have been elementally or visually characterized, displaying the proportions of the subsources represented at each. Note that other studies do not make the distinction between the SB1 and SB2 subsources and have thus been lumped together as just 'SB'. The map makes it apparent that there is a spatial patterning to the consumption of SA and SC obsidian. In general, sites to the north of the Monte Arci obsidian sources have more SA obsidian while assemblages to the south are mainly composed of SC material.

Figure 8.8 Examples of lunate blanks from Nuraghe Pidighi.

The end of the dominance of SC obsidian in Sardinia from the Late Neolithic to the Chalcolithic could be related to the concomitant collapse of organized obsidian workshops near the source areas (Lugliè 2003b). Without these workshops in place - crafting areas conceivably organized by specialists who also structured the materials' subsequent distribution - the entire network of obsidian circulation could have been reconfigured to more local modes of procurement.

While broad similarities in both the composition of obsidian assemblages and in the reduction of the raw materials in the Late Neolithic have led scholars to posit that these objects were obtained through a model of down-the-line exchange (e.g. Tykot et al. 2008: 182), it is not known whether this is the case in the Chalcolithic. While we do know

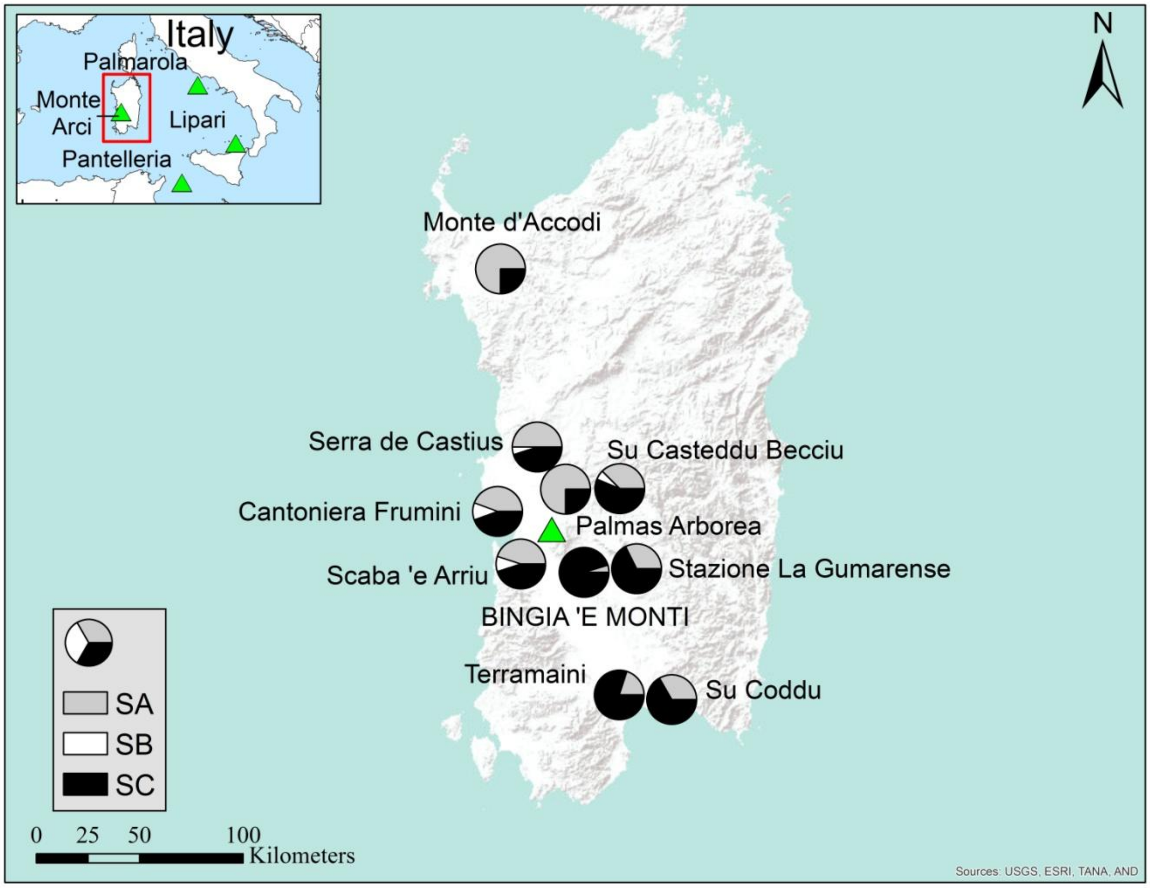

Figure 8.9 Map of the spatial distribution of the various subsources in Chalcolithic archaeological assemblages with eight or more analyzed artifacts.

that Sardinian raw materials are found during the Chalcolithic at sites on mainland Corsica and Italy (Bigazzi and Radi 1998; Hallam et al. 1976; Randle et al. 1993), it is difficult to say whether intra-island obsidian procurement at this time was the result of formalized exchange, especially with the lack of techno-typological data from this period.

This is an important question considering the role obsidian exchange likely played in creating and maintaining social relations across space (Renfrew 1993). A reconfiguration of obsidian circulation networks from the Late Neolithic to the Chalcolithic could signal a larger shift in the socio-political landscape, where

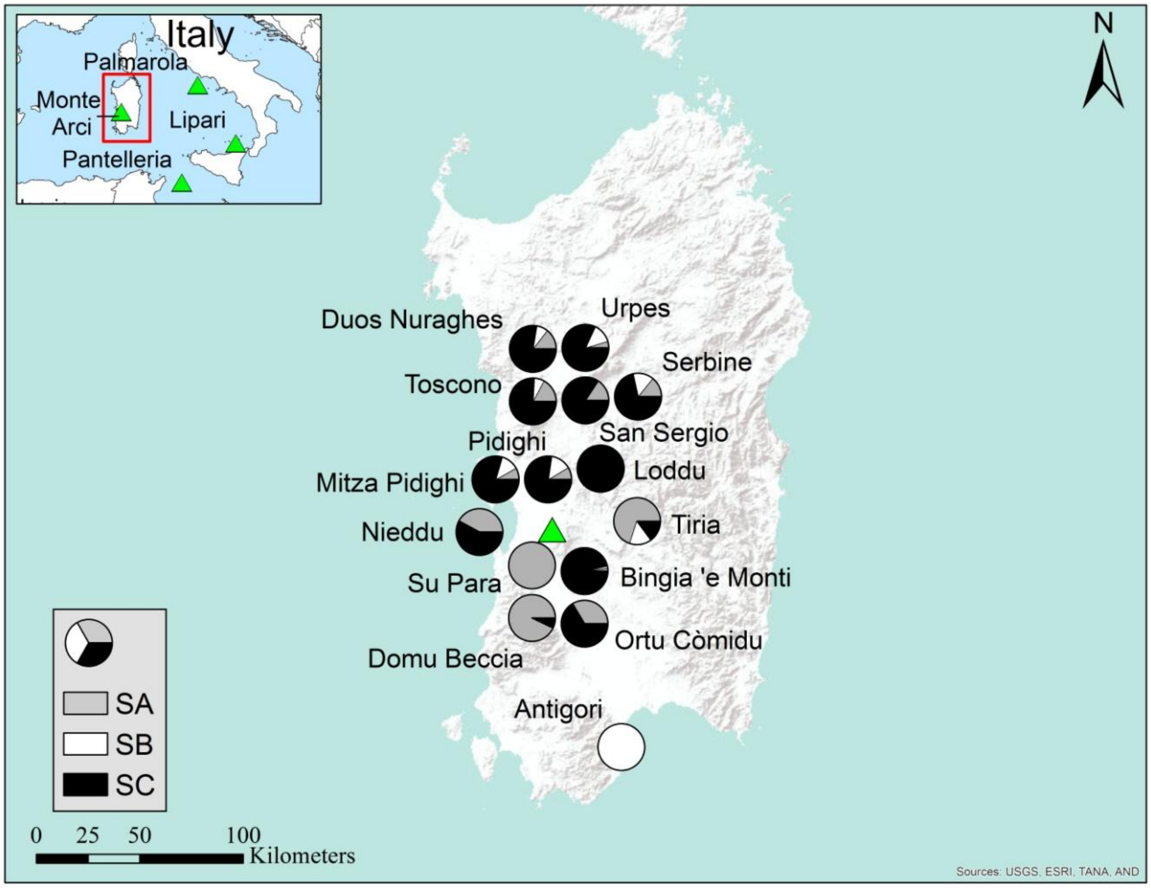

Figure 8.10 Map of the spatial distribution of the various subsources in Nuragic archaeological assemblages with eight or more analyzed artifacts.

communities became more isolated and/or individually empowered, and more local traditions emerged.

By the Nuragic period, SC obsidian becomes the predominant subsource utilized at sites throughout the island (Figure 8.10), although there is a certain degree of diversity. Based on the analysis of artifacts from the Nuragic phase at Bingia 'e Monti, it is clear that the residents of the site were obtaining obsidian directly from the source area and reducing the material on site for the creation of expedient flake tools and lunates. This technical tradition has its roots in the Monte Claro phases of the Chalcolithic and is mirrored in the reduction sequences at the other analyzed sites in this study as well as previous studies of Nuragic obsidian consumption (Freund and Tykot 2011).

Based on the dominance of SC obsidian and the similar reduction strategies oriented towards the production of expedient flake technology, I have previously argued that during the Nuragic period obsidian outside of the immediate source areas was distributed through a model of down-the-line exchange (Freund and Tykot 2011: 157). However, these analyses show that there are clear variations in the percentages of SC obsidian across space, suggesting that the picture is slightly more complicated.

Based on the fact that all lunate blanks from the analyzed sites were made from SC obsidian as well as the majority of Kombewa lunates themselves, it is possible that the lunates circulated as finished products through an island-wide network of connected sites. Nevertheless, not all communities were part of this network as indicated by the lack of lunates and the differential reduction strategies as seen at sites such as Nuraghe Pidighi and Mitza Pidighi. Further work on archaeological collections as well as further excavation at the source itself is sure to refine this scenario (Carlo Lugliè, personal communication).

Chapter 9: Discussion

This section summarizes the major conclusions of this dissertation and contextualizes the patterns of obsidian consumption outlined in Chapters 7, 8, and 9 within their broader long-term circumstances. This includes a discussion of the role of obsidian in Neolithic society and the implications behind the accumulation of these products at a select number of archaeological sites. Moreover, the collapse of long-distance exchange spheres at the end of the fourth millennia B.C. is addressed as well as the nature of post-Neolithic obsidian consumption on the islands of Sicily and Sardinia.

The 'Golden Age' of Obsidian Consumption

The exploitation of obsidian in the West Mediterranean corresponds with the adoption of a broader suite of socio-economic practices that spread from the East Mediterranean over the course of the sixth millennium B.C. (i.e. Neolithic package). Simply stated, obsidian consumption was a quintessentially Neolithic pheonomenon. The procurement of obsidian raw materials from the four island sources in the region was thus underpinned by those networks of maritime connectivity that had previously facilitated the spread of the Neolithic colonists. While there is some limited evidence for the occupation and visitation of Sardinia in the Late Pleistocene and Early Holocene (Costa 2004; Sondaar and Van der Geer 2000), it remains that the island's obsidian sources do not appear to have exploited until the arrival of farming communities. Over the course of sixth to fourth millennia B.C., raw materials from all four West Mediterranean sources were integrated into Neolithic life and eventually distributed to almost 500 sites extending over an area approximately 2,100 kilometers east to west and 1,800 kilometers north to south.

Obsidian as a Raw Material

Large amounts of obsidian are found at archaeological sites near the source areas and generally comprise a major percentage of the overall lithic assemblages. In Sardinia and Corsica specifically, the lack of alternative raw materials meant that obsidian was used to carry out the bulk of daily activities, often materializing as unspecialized flake-based industries (see Lugliè et al. 2007). By the Middle to Late phases of the Neolithic, however, obsidian exploitation expanded to Chasséen period sites across southern France, and residents near the source areas became increasingly involved in the systematic reduction of primary raw materials at specialized workshops, with SC obsidian generally being restricted to use on Sardinia and Corsica and SA obsidian being specifically prepared as polyhedral pressure blade cores for export to Corsica and mainland France (Lugliè 2009; Lugliè et al. 2011; Vaquer 2007).

While obsidian is extremely sharp and easy to work (Inizan et al. 1999: 22), it is not particularly durable in that it is extremely brittle and thus not ideal for carrying out many daily activities. Therefore, in regions outside of the obsidian source areas with readily available lithic alternatives, obsidian generally makes up a small percentage of the overall chipped stone assemblages. In these contexts, obsidian likely served other functions, perhaps related to body modification, including hair cutting, shaving, scarification, tattooing, and piercing. (Robb 2007: 203). This is supported by the presence of razor sharp obsidian blades throughout much of mainland Italy and France whose thin cutting edges would have been ideal for such activities.

Although blades were produced over a large area - likely for similar purposes - there do appear to be regional distinctions in how these materials were produced. Direct percussion blades are common in southwest Italy, bi-polar blades are found in northern Italy, and pressure-flaked blades are found in Sicily, southern France, and likely throughout much of mainland Italy. While the lack of data makes it impossible to determine whether these distinctions vary along axes of pottery design, domestic types of architecture, or other modes of social expression, these various traditions of consumption can be seen to represent distinct 'communities of practice' that may be able to be used to infer the existence of distinct social boundaries and spheres of interaction (see Gosselain 2000; Lave and Wenger 1991). Indeed, there is a long tradition of this type of scholarship in the West Mediterranean; however, previous studies concentrate on only one aspect of obsidian consumption (i.e. the raw material) to delineate such boundaries and thus fail to appreciate the full range of social processes that might have produced them.

The Nature of Power in Egalitarian Societies

Before elaborating further on obsidian it is necessary to discuss how archaeologists have contextualized power relations in egalitarian societies such as those of the West Mediterranean Neolithic. For purposes of this research, I adopt Ames' (2008: 490) terminology that relates power and inequality to differential access to positions of prestige and basic resources.

Studies of power are often connected with social organization and are heavily influenced by Service's (1962) mutually exclusive classification scheme that describes societies as either bands, tribes, chiefdoms, or states. Unfortunately, however, these terms often mask diversity and have become a catchall for a wide array of societies with different social hierarchies and power structures. Indeed, social inequalities based on age, sex, and gender are found in all societies and there is a large degree of variability in how power manifests itself in daily life, particularly in so-called egalitarian communities (Kent 1999: 36-37).

There are a number of social practices that can create and reify inequality in egalitarian societies, although archaeologists often focus on the role of public performance, accumulation, and gift-giving (Hartley et al. 2012; Godelier 1999; Price and Feinman 1995). For example, through an analysis of iconography at the Neolithic site of Çatalhöyük Hodder (2006) argues that participation in large-scale public events was an arena in which power was displayed and performed. These events, he argues, derive from a specific set of historical associations and meanings, a knowledge set that elders or leading kin groups would have manipulated to gain power and prestige.

Similarly, accumulation and conspicuous consumption in the form of competitive feasting has also been described as an important means through which individuals or local leaders established cooperative alliances and accrued social capital (Munro and Grosman 2010; Hayden 2001). At the Pre-Pottery Neolithic A (PPNA) ritual complex of Göbekli Tepe, for example, by combining analyses of communal architecture, faunal studies, and residue analysis Dietrich et al. (2012: 689) argue that feasting was a medium through which power relations were both constructed and maintained, where individuals "accumulated surplus in order to obtain powerful social positions through lavish feasts". Dietrich et al. (2012: 689) go on to argue that feasting may have also played a significant role in the larger process of Neolithization in southeastern Turkey (cf. Benz 2006).

In addition to public performance and accumulation, the gifting of valuable objects between and among egalitarian communities has also been shown to be a way in which individuals or groups could accumulate social capital (Godelier 1999; Malinowsi 1922: 95; Mauss 1967). In the case of Neolithic obsidian consumption, these practices are especially relevant and will be discussed in further detail in the following section. In general, the point to be made here is that there are degrees of equality and hierarchy (Chapman 2003: 73), and power relations can be a very real phenomena in egalitarian societies. This does not mean that such hierarchies were institutionalized or that powerful individuals would have exercised control over multiple aspects of daily life (Robb 1999). On the contrary, these relations were likely organized at the community or clan level and may have been quite ephemeral and context-specific.

Gift Exchange and Reciprocity

While obsidian was a medium for tool production and likely used as a raw material for grooming, tattooing, and scarification, I argue that the circulation, exchange, and gifting of these materials also served an important social function in Neolithic society. Through an examination of the relative quantities of obsidian across the landscape, I have argued that direct procurement and down-the-line exchange characterize the distribution of obsidian near the source areas on the islands of Sardinia, Corsica, and Sicily. However, at archaeological sites farther from the sources, a model of direct procurement and redistribution best fits the data. Under these conditions, individuals or groups from a select number of communities on mainland France and Italy organized the labor necessary to procure raw materials from distant sources, subsequently gifting a portion of these products to sites in the surrounding areas.

I use the term 'gifting' to describe the exchange relationships of the Neolithic because ethnographic evidence has shown that in small-scale societies with similar social organization, the gifting of valuable objects was an arena in which relationships were both formed and negotiated (Godelier 1999; Malinowsi 1922: 95; Mauss 1967). Godelier (1999: 11) further explains that "what creates the obligation to give is that giving creates obligations"; the power of the gift thus lies in the expectation of reciprocity. When a gift is given, a relationship is formed in which the receiver is indebted to the giver, and this dependency can only be relieved through reciprocity. While the objects being gifted are a materialization of these social contracts, a wide range of non-material goods such as brides, feasts, and dances would have also been exchanged, a system of 'total prestations' that Mauss (1967: 3) describes as an integral part of social life in traditional societies.

The Kula Ring

I have previously compared West Mediterranean obsidian exchange to Malinowski's (1922) ethnographic work on the Kula Ring of the Trobriand Islands east of Papua New Guinea. I bring up the Kula Ring for several reasons, a) it is a seminal work on exchange in traditional societies, b) it is a system of maritime exchange similar to the West Mediterranean, and c) it involves the gifting of objects that are just as important as the social relationships that are created and maintained through these endeavors.

The Kula is a system of exchange relationships linking together nearby island communities in which Kula participants undertake maritime expeditions to neighboring villages in order to exchange two types of traditional valuables, necklaces and armshells. The entire affair consists of the giving and receiving of these objects, and the men involved are typically local elites who compete with one another to form profitable partnerships. The Kula is not a surreptitious form of exchange, but rather a conspicuous and public ceremony that is rooted in myth and surrounded with magical rites (Malinowski 1922: 85).

While the Kula Ring is an excellent ethnographic parallel for how we might imagine obsidian exchange in the Neolithic West Mediterranean, it nonetheless differs in several important ways. The first relates to access to the objects themselves. Kula valuables are made locally and do not involve journeys of upwards of 2,000 kilometers to acquire. Indeed, the Trobriand Islands are rather small in scope (ca. 450 square kilometers) when compared to West Mediterranean. Considering that obsidian is found over such a large area, we can imagine multiple exchange spheres in existence that would have operated under different socio-economic conditions, underpinned by different religious and ritual practices.

The second difference between the Kula and the West Mediterranean concerns the nature of the objects themselves. *Mwali*, the finely cut and polished armshells, and *soulava*, the red spondylus shell necklaces, are both well made and require specialist skills to craft (Malinowski 1922: 81). The power of these prestige goods lies in their outward display or association with a particular individual at some stage in their life histories. Although obsidian blades are difficult to create, they would not have been able to be connected to particular individuals, clans, or groups after they were outside their possession. This could explain why obsidian artifacts were hoarded outside the source areas while Kula valuables were not (see Gell 1992: 62). The power of obsidian rested in the knowledge that a particular individual or group had more than anyone else, and the gifting of these objects was a reification of such knowledge. Instead of accumulating associations with particular artifacts as they circulated, people of the Neolithic physically accumulated artifacts that others could not.

The third difference between the Kula and the West Mediterranean relates to the individuals involved. The Kula Ring is organized by chiefs who use these exchange relationships to establish and reify their own social standing. In the Neolithic, however, there is little evidence for the presence of local elites or chiefs, and an examination of funerary evidence and settlement patterning data gives the impression of relatively egalitarian social groups divided according to gender and kin relations (Robb 2007: 40-43). Questions therefore arise as to who would have wanted to accumulate obsidian outside of the source areas and why. To answer these questions, it is necessary to explore how obsidian would have been procured at distance.

Obsidian Procurement at Distance

Ammerman (2010: 85) argues that "the study of obsidian provides no real support for the notion of long-distance voyaging at this time". However, if certain sites far from the sources contained large amount of obsidian when compared to neighboring communities, it is likely that the residents of these sites did in fact travel long distances to procure such materials. Since most sites with obsidian are located along the coast and all of the sources are island-based, then these were likely maritime expeditions organized by local leaders, clans, or even whole communities.

Considering that there is no evidence of sail technology until the second millennium B.C. (Ciabatti 1984), it is likely that log boats or bundled reed crafts were utilized to procure obsidian (Farr 2007: 214). Ethnographic evidence reveals that building these types of boats is a specialized endeavor, often organized at the clan or community level (Farr 2007: 216; McGrail 1987: 64). In the case of building a log boat, for example, the entire process can take several months to complete, and multiple people are needed to take down a tree and relocate it to the shore, not to mention the crew needed to operate it.

It is for these reasons that I argue that long-distance voyages to procure obsidian were organized by local clans or even whole communities as opposed to local elites vying for power. In this sense, obsidian procurement and accumulation can be seen as a form of competitive aggrandizement and a way in which groups at the intra-site and/or inter-site level could accrue social capital. Moreover, the gifting of a portion of these products to sites in the surrounding areas would have been a way in which communities or clans could establish themselves as powerful links within a larger network of connected sites.

This model therefore demonstrates the capacity for groups within unranked societies to compete with one another for political or social capital, although this does not imply that these groups would have been able to transfer this power to leadership roles over multiple aspects of daily life (cf. Robb 1999).

While I am not suggesting that the procurement and exchange of obsidian played an integral role in the emergence of social complexity through time, the consumption and exchange of prestige items such as metals, weaponry, and beakers - and the inequalities these materials embodied - was likely an important component in this process. Indeed, prestige competition in some capacity has long been seen to be an important driver of social evolution in the West Mediterranean, and the circulation of these objects through long-distance exchange spheres was a critical mean by which these social differences were reproduced (see Shennan 1987; Robb 1999; Vander Linden 2006). If we consider that this process was also occurring through the consumption and exchange of obsidian as early as the beginning phases of the Neolithic, then the transition to the Chalcolithic and the emergence of local elites or 'Big Men' (see Robb 1999) was not such a dramatic shift in the organization of society, but rather an intensification and elaboration of long-standing practices.

Gateway Communities

I have argued that the accumulation of obsidian at a small number of Neolithic settlements outside the source areas acted as a form of competitive aggrandizement and a means of accruing social capital both between and among prehistoric communities. While these sites are important in relation to the distribution of obsidian across the sea- and landscape, it must nevertheless be kept in mind that during the Neolithic there is little evidence for large regional centers or market places as discussed by Renfrew (1975). Therefore, in discussing these sites I adopt the term 'gateway community', which as originally conceptualized by Hirth (1978: 35) in the case of Formative period Mesoamerica represented a means of depicting "early interregional trade more efficiently than central place formulations". As summarized by Branigan (1991: 103), a gateway community is an archaeological site that possesses the following attributes:

a) it occurs particularly on the periphery of world systems.
b) it occurs at a passage point for a cultural or natural region.
c) it is located on a line of communication between areas with good mineral or agricultural resources, or high craft production.
d) it supports a limited elite hierarchy.
e) the elite manipulate the social system by control of exchange and of prestige products.
f) imported products are plentiful at the site, scarce elsewhere.
g) craft specialism/production increases at the site.
h) the site draws on a zone for its subsistence.

In their study of Final Neolithic Crete (ca. late fourth millennium B.C.), Papadatos and Tomkins (2013: 371-372) argue that certain sites acted as gateway communitites for trade due to their strategic location in relation to other islands with particular resources and their access to superior longboat technology. In contrast, gateway communities of the West Mediterranean Neolithic do not appear to be strategically located in relation to specific features and likely shared similar boat technology. Instead, these communities or groups can be seen as active participants in a much larger system of maritime exchange in which the journeys to procure obsidian were just as important as the social capital that was gained once they arrived home.

When the above attributes are applied to the West Mediterranean Neolithic, it is clear that the majority of these conditions are met. Conditions 'a' and 'f' are certainly met while conditions 'd' and 'e' concerning the presence of elites have already been discussed. Unfortunately, the lack of contextual data on subsistence practices and obsidian reduction strategies at many of the sites are limited, so it is difficult to address conditions 'g' and 'h', although the presence of craft specialization is unlikely. Obsidian blades are nevertheless difficult to create and would not likely have been able to be produced by everyone. This leaves 'b' and 'c' to be discussed in further detail, both of which concern the geographic location of particular sites in relation to one another and in relation to specific topographic features (e.g. confluence of waterways, mountain passes, etc.).

Figure 9.1 displays the 10 settlements that may have served as gateway communities over the course of the Neolithic in the West Mediterranean along with their frequencies of recovered artifacts. Based on an examination of the map, it is clear that eight of the ten sites are located within 25 kilometers of the coast, once again highlighting the maritime nature of obsidian exploitation. Another immediate pattern is that seven of the 10 sites are located east of the Apennine Mountains while the other three are located in southern France. There is no evidence for the presence of gateway communities outside the source areas in western Italy.

When considering the sources represented at sites in which 10 or more artifacts have been analyzed, it is clear that Sardinian SA obsidian comprises the bulk of archaeological assemblages at two of the three sites in southern France (Figure 9.2). This makes sense when considering that direct journeys from Corsica were likely taking place

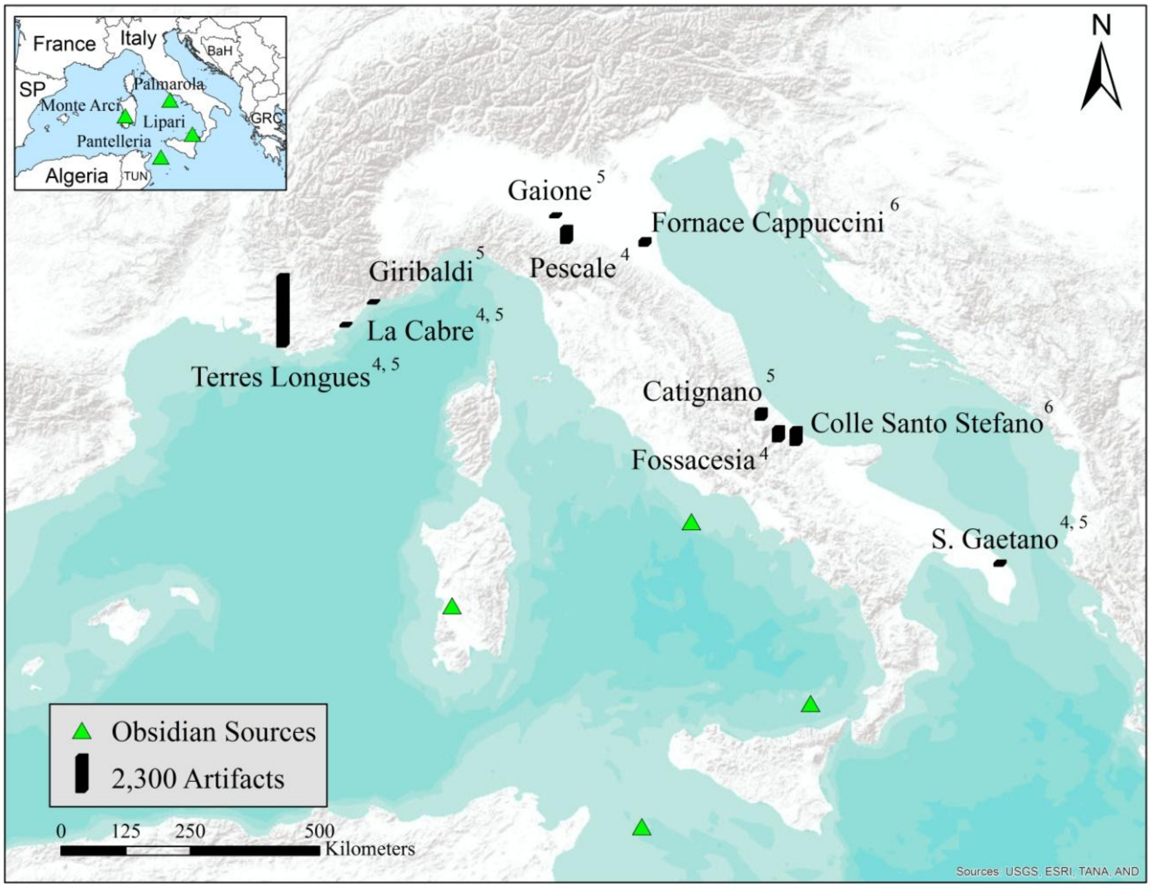

Figure 9.1 Map of Neolithic sites that may have served as gateway communities along with artifact frequencies. Bar size corresponds with artifact counts. Note: Counts do not necessarily correspond with the number of analyzed artifacts. Site dates are included at the end of the labels (in millennia B.C.).

over the course of the fifth to fourth millennia B.C. The French site of Giribaldi, however, only contains Lipari obsidian (based on 11 analyzed artifacts), thus suggesting that the residents of the site shared closer ties with VBQ communities in northern Italy as opposed to their Chasséen or Corsican contemporaries who only exploited Monte Arci obsidian. While the 57 total pieces of obsidian at the site is not enough to argue that its residents traveled the 1,400 or so kilometers to Lipari to procure obsidian, the fact that it is one of the largest collections of Lipari material west of the Apennine Mountains suggests that

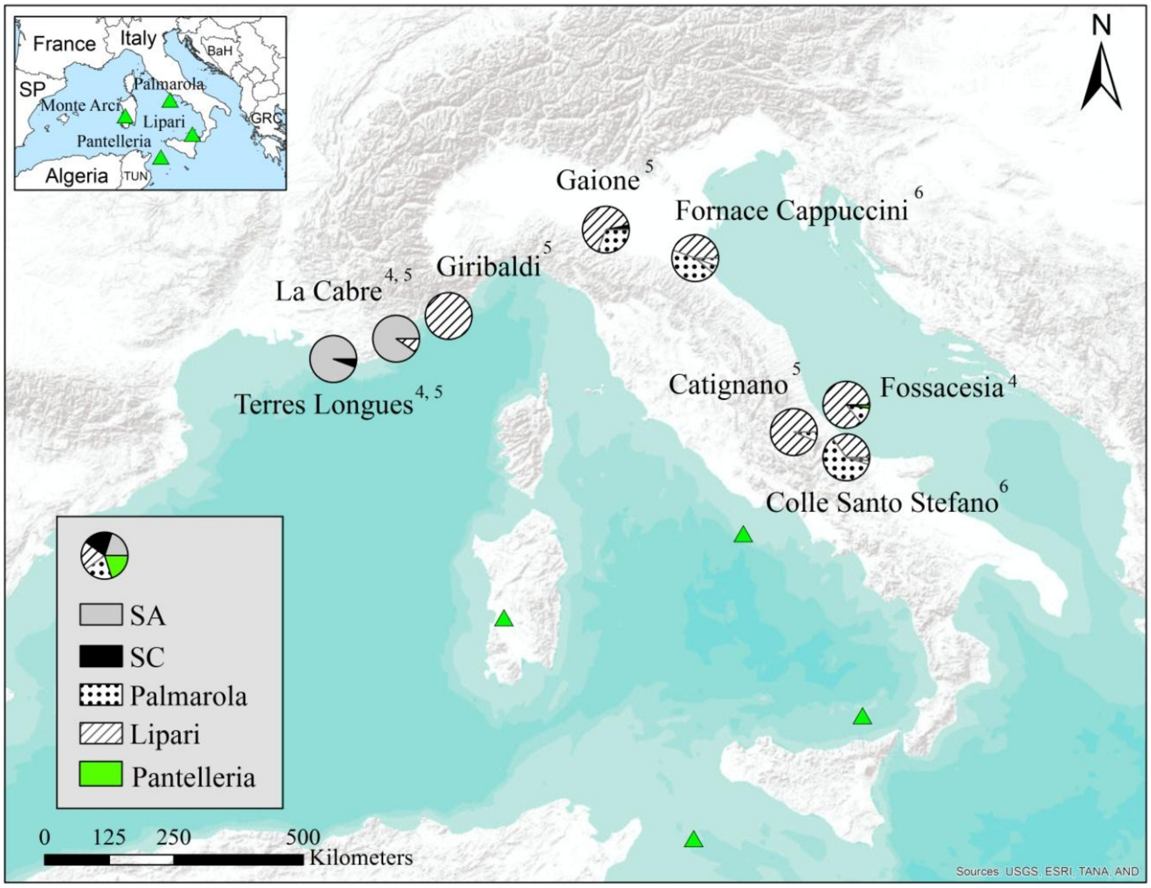

Figure 9.2 Pie charts showing the breakdown of obsidian sources represented at gateway communities in which 10 or more artifacts were analyzed.

these artifacts may have been acquired through exchange relations with multiple groups. Unfortunately though, without studies of the reduction strategies at the site it is impossible to tell just how much material these 57 pieces represent, i.e. whether a large number of artifacts came from a single core.

A further examination of Figure 9.2 reveals that Lipari obsidian is the predominant raw material at four of the five sites east of the Apennine Mountains, likely acquired from the source and transported around the tip of southern Italy to the Adriatic. Since Lipari obsidian is present along the entirety of the Adriatic coast, it is likely that groups traveling to and from the source established connections with these communities to exchange obsidian and other goods, and perhaps spend the night. Considering that few gateway communities contain excessive amounts of obsidian, it is likely that these journeys did not occur all of the time, but perhaps seasonally when the seas were calmest. Under these conditions, the journey to procure obsidian was where a large portion of exchange relationships were brokered as opposed to solely within the immediate vicinities of particular gateway communities.

Indeed, when the total number of sites with obsidian within the immediate vicinities of possible gateway communities is calculated (Table 9.1), there is a broad range of diversity. While sites such as S. Gaetano and Gaione are located in high traffic areas, many of the sites are not. At Fornace Cappuccini, for example, only one other Neolithic site is located within a 50 kilometer radius, once again highlighting how the journey to procure obsidian may have been an important arena in which social relations were both formed and negotiated. Once these groups arrived home, the raw materials they acquired may have become symbols of their power over the unknown and the distant (cf. Helms 1988: 77-78), in turn becoming a means of accruing social capital at the intra-site level.

While Lipari obsidian is prevalent at gateway communities east of the Apennines, Palmarola raw materials are still common and comprise over 25% of assemblages at three of the five sites, including both Early Neolithic settlements. The location of the Early Neolithic site of Colle Santo Stefano directly east of the Palmarola source is particularly noteworthy and may indicate that the site acted as a redistribution center for Palmarola

Site	Count
Catignano	7
Colle Santo Stefano	4
Fornace Cappuccini	1
Fossacesia	4
Gaione	11
Giribaldi	6
La Cabre	9
Pescale	10
S. Gaetano	14
Terres Longues	6
Neolithic Average	*6.9*

Table 9.1 Counts of the total number of sites with obsidian within 50 kilometers of the listed sites compared with the average for all 369 Neolithic sites with obsidian (excluding Sardinia and Corsica).

obsidian. Whether or not these products were acquired directly by the residents of Colle Santo Stefano is another matter, although the fact that no other contemporary communities contain such large amounts of Palmarola obsidian suggests that they did travel long distances to acquire these products, likely over land across the Apennine Mountains. It is unlikely, however, that they also made the journey to the isolated island of Palmarola itself, especially when considering that large quantities of Palmarola obsidian are present at contemporary sites in west-central Italy such as La Marmotta (Bigazzi and Radi 1998; De Francesco et al. 2012).

Reconfigured Modes of Consumption

I characterize the Neolithic as the 'Golden Age' of obsidian because it is a time when these raw materials both reflected and underpinned social structure. The exchange of these materials was a means through which communities defined their relationships with one another, and the accumulation of these products became a way for clans or sodalities to accrue social capital through control over the esoteric knowledge needed to acquire them. Moreover, obsidian was a raw material for tool production and likely served a distinct social role in ritualized body modification.

By the end of the Late Neolithic and into the Chalcolithic, the circulation of these raw materials was drastically reduced as large-scale obsidian exchange networks collapsed, a phenomenon that is best sees as one facet of a much larger cultural transformation characterized by new politics of value represented by metal artifacts and the emergence of local elites or 'Big Men' (Robb 2007: 324). In this world, obsidian and the social relations these materials embodied were no longer relevant; new symbols of gender and inter-personal violence became modes of expressing social difference.

Nevertheless, obsidian consumption does continue on Sicily and Sardinia, although under very different socio-economic circumstances. While the continued use of obsidian on Sardinia can in part be explained by the lack of lithic alternatives, the situation is more complex on Sicily.

Post-Neolithic Obsidian Use on Sicily

In Sicily, there is a remarkable continuity of pressure-flaked blade production from the Neolithic through Early Bronze Age. Although post-Neolithic blades are statistically thinner than those of the Neolithic, these distinctions do not represent a major change in lithic reduction sequences through time. Instead, what we see is a decrease in the amount of obsidian in circulation when compared with the Neolithic and not a collapse of the entire system as in mainland Italy and France.

Considering that high quality Monte Hyblaea flints continued to be a major raw material in chipped stone assemblages in the Chalcolithic (Robb 2007: 299), it is not possible to argue that the continued use of obsidian was a result of the lack of lithic alternatives. Indeed, this was never the case on Sicily, which in part explains why reduction strategies were oriented towards the production of specialized blades as opposed to a range of other functional tools that are present in areas in which obsidian is the only lithic material available (i.e. Sardinia). While a relative ease of access to obsidian on the nearby island of Lipari was almost certainly a factor in its continued use, it also appears to be related to the timing of the introduction of metal technology to the region.

I have previously argued that obsidian consumption in the West Mediterranean was gradually usurped by new modes of social distinction by the Late Neolithic/Chalcolithic, in part defined through an affiliation with a new set of practices and traditions that involved access to incipient metallurgy. Nevertheless, the adoption of metal technology did not occur at the time throughout the entire West Mediterranean. While northern Italy and Sardinia were early adopters of metal technology, Sicily in particular experienced a late appropriation of metallurgy, often described as having a Copper Age without copper (Cazzella 1994). Although a fragmentary crucible was found at the Late Neolithic site of Contrada Diana on Lipari, it is not until the Early Bronze Age that metals became prevalent in the region (Dolfini 2013: 477; Skeates 1993).

In the absence of metal artifacts representing new modes of social distinction and gendered ideologies, obsidian continued to serve as a raw material for expressing individual or collective identities through body modification and a means through which communities interacted with one another and negotiated inter-site power relations. However, when metals become more prevalent by the earliest phases of the Bronze Age, we see a shift in the contexts in which obsidian artifacts are found, becoming increasingly associated with human interments and burial practices. This trend only lasted several centuries.

Post-Neolithic Obsidian Use on Sardinia

The Late Neolithic of Sardinia is characterized by the presence of formal tools, blades, and the systematic production of cores at specialized workshops near the source areas (Lugliè 2003b; Tykot et al. 2006b). During this time, the exchange of SC obsidian within the island and SA obsidian at distance was a critical component of social life. However, by at least the middle to late phases of the Chalcolithic there are dramatic changes in obsidian reduction sequences as workshop areas are abandoned and communities shift to the production of expedient flake tools and to a lesser degree lunates, the latter being shown to be multi-purpose tools often associated with plant processing (Hurcombe 1992).

These changes over the course of the Late Neolithic to Chalcolithic can in part be explained by a corresponding shift in subsistence practices, including an increase in the contribution of plants to the Chalcolithic diet (Lai 2008). While this may be correlated with the adoption of lunate technology, it does not, however, explain why the production of more formal tools and blades all but disappears. In order to understand this phenomenon, one must situate it within the broader socio-economic circumstances of its occurrence.

Once again, I return to the effect that metal artifacts had on the collapse of obsidian exchange spheres. Indeed, metalworking begins on the island as early as the mid-to-late fourth millennium B.C., undoubtedly facilitated by the presence of ore deposits throughout the island (see Valera and Valera 2005). While metal does not replace obsidian in any functional sense, its introduction in the form of copper axes, weapons, and jewellery can be seen to represent a cognitive and symbolic shift in the relative importance of obsidian in the minds of the people who used it (cf. Freund and Tykot 2011: 162). In this sense, metals replace obsidian as a marker of social distinction and symbol of a community's place within a larger network of connected sites.

These changes would have resulted in the abandonment of specialized workshops near the source areas and a move towards the production of expedient tools that had little symbolic value. Such reconfigured modes of consumption during the Chalcolithic can therefore be seen to result from the lack of readily available lithic alternatives. If other high quality lithic materials were available on the island, the use of obsidian might have been drastically reduced or all but disappeared.

Nevertheless, by the Bronze Age Nuragic phases obsidian exploitation becomes more uniform as SC obsidian becomes the dominant subsource utilized throughout the island and we see a widespread adoption of lunate tools. Based on the fact that the vast majority of lunates are made from SC obsidian and reduced through a specialized Kombewa reduction strategy (see Inizan et al. 1999: 68-71), it is possible that these artifacts circulated as finished products through an island-wide network of connected sites. Nevertheless, more work in the region is needed before more concrete interpretations can be made. Current excavations at the source areas are likely to help in clarifying these issues (Carlo Lugliè, personal communication).

Chapter 10: Conclusions

In essence, this work can be located within the intellectual tradition of the French *Annales* school of history championed by Fernand Braudel, who emphasized the role of large-scale social and economic processes in the making of Mediterranean prehistory (see Braudel 1949, 1982). Central to this approach is the idea that in order to understand historical developments, one must tack back and forth between various scales of analysis. In this sense, the temporal and geographic scales of analysis affect, and indeed determine, the archaeological patterns with which archaeologists engage (Ames 1991: 935; Dobres and Robb 2000: 6). In this work, I combine macro-scale considerations with targeted case-studies from Sicily and Sardinia in order to engage with a broad range of archaeological questions about the dynamics of socio-economic change through time, including the role of exchange in structuring Neolithic society as well as the influence of incipient metallurgy on the stability of interaction spheres structured by the consumption of obsidian.

Obsidian's Social Relevance

I refer to the Neolithic as the 'Golden Age' of obsidian consumption because these products served as both raw materials for specialized and generalized tool production and as a media through which social relations both formed and negotiated. Due to their rarity and difficulty to access (cf. Gero 1989; Helms 1988), the accumulation these objects in mainland Italy and France was also an arena for the expression of social status and prestige, where groups could enhance their own social standing through control over the esoteric knowledge needed to acquire them. In this capacity, long-distance journeys to procure obsidian acted as a form competitive aggrandizement and a means of accruing social capital.

By the Late Neolithic/Chalcolithic, obsidian was usurped by new modes of social distinction in part defined through an affiliation with a new set of practices and traditions that involved access to incipient metallurgy. While I am not suggesting that the procurement and exchange of obsidian played an integral role in the emergence of social complexity through time, the transition to the Chalcolithic and the emergence of local elites or 'Big Men' (see Robb 1999) by the third millennium B.C. was not such a dramatic shift in the organization of society, but rather an intensification and elaboration of long-standing practices. As a result of the adoption of these new modes of consumption and expression we see the collapse of long-distance obsidian exchange networks, although obsidian continues to be exploited in regions where metals were absent or where obsidian was the only lithic material available for the creation of stone tools.

Interpretive Remit

In contrast to Robb's (2007: 326) claim that obsidian consumption in the West Mediterranean is a "low-profile genre of action", I argue that these materials played a number of important roles throughout prehistory. While obsidian artifacts were undoubtedly used as functional tools, much of their value rested in their capacity to facilitate social relations, where the circulation of these products through maritime networks of interaction both underpinned and reflected social structure.

In addition to becoming the first *longue durée* perspective on obsidian consumption in West Mediterranean prehistory, this study also makes an important contribution to the study of social inequality in small-scale societies, as conceptualized through comparisons with the Kula Ring of the Trobriand Islands. Since the gifting and exchange of obsidian artifacts during the Neolithic was a way for gateway communities to express their eminent status within a larger network of connected sites, the Kula Ring is an excellent ethnographic parallel.

Nevertheless, the Kula differs from the West Mediterranean Neolithic in that it is organized by central authority figures who exchange highly unique prestige goods to reify their own social standing. The power of these prestige goods rests in their outward display or association with a particular individual at some stage in their life histories. In contrast, there is little evidence for the presence of local elites in the Neolithic, which demonstrates the capacity for individuals or groups within unranked societies to compete with one another for political or social capital, although this does not imply that these groups would have been able to transfer this power to leadership roles over multiple aspects of daily life (cf. Robb 1999).

Future Directions

This dissertation represents the most thorough overview of prehistoric obsidian consumption in the West Mediterranean to date, in turn becoming one of the first in-depth discussions of post-Neolithic exploitation. Although this dissertation addresses a wide range of archaeological issues, a number of important questions still remain unanswered due to practical constraints on available data as well as the lack of integrated characterization programs with the potential to contribute to broader anthropological debates and discourse.

The interpretive potential of a large portion of current data on prehistoric sites in the West Mediterranean is limited because they come from unstratified contexts or are derived from excavations that pre-date modern collection methods. Therefore in the future, results from well-excavated and properly dated archaeological sites will be of critical importance in interpreting how obsidian was integrated into the lives of the people who used it. This includes recording where individual artifacts are recovered as well as implementing systematic screening programs that can collect smaller debitage to be used in reconstructing source-specific operational sequences.

While more-refined collection methods are an important first step in gathering relevant contextual information, such developments are only as effective as the methods used to interpret the data. With regard to obsidian, integrated characterization programs that combine data from multiple stages of artifact life histories have the capacity to answer a wide range of relevant archaeological questions. This includes combining sourcing studies with techno-typological analysis and usewear studies as well as recording basic measurements and counts of lithic artifacts, including total weights of products from each of the various sources and subsources. Archaeologists must also keep in mind that obsidian is often just one raw material in lithic assemblages. In the future, it will be necessary to bring together data on reduction sequences of other raw materials such as flint and quartz in order to compare and contrast how obsidian artifacts were reduced and consequently used.

Archaeologists have long understood that multiple distinct outcrops exist at each of the various sources, yet it is only on Sardinia that we have a real understanding of the unique exploitation histories of these outcrops and their corresponding socio-economic implications. Since each of the various subsources of Sardinia were being exploited differently through time, then it is possible that this was occurring at the other main island sources of the West Mediterranean. Future provenance studies of the region must therefore distinguish between all of the various outcrops at each of the four main sources in order to address central questions about how and where specific products were being distributed through time.

Central to this dissertation is the idea that obsidian 'characterization' studies represent a powerful means of engaging with major social science questions, where a particular regional dataset can be used to contribute to debates of global significance. Despite the diverse range of issues that have been addressed through obsidian characterization studies in the West Mediterranean, there is still potential for future growth. In many ways, we are only limited by the creative agency of the people behind the machines.

References Cited

Acquafredda, P., Lorenzoni, S., and E. Zanettin
1995 Discrimination of Milos, Lipari, Palmarola obsidians using XRF analysis. In *Proceedings of the Egyptian–Italian Seminar on Geosciences and Archaeology in the Mediterranean Countries,* edited by A.A.A. Hussein, M. Miele, and S. Riad, pp. 316-337. Geological Society of Egypt, Cairo.

Acquafredda, P., and I.M. Muntoni
2008 Obsidian from Pulo di Molfetta (Bari, Southern Italy): provenance from Lipari and first recognition of a Neolithic sample from Monte Arci (Sardinia). *Journal of Archaeological Science* 35: 947-955.

Agosti, F., Biagi, P., Casteletti, L., Cremaschi, M., and F. Germani
1980 La Grotta Rifugio di Oliena (Nuoro): Caverna Ossario Neolitico. *Rivista di Scienze Preistoriche* 35: 75-124.

Alba, L., and G. Canino
2005 L'Insediamento del neolitico antico "cardiale" de Perdaias Mannas (Gonnesa - CA) (nota preliminare). In *L'Ossidiana del Monte Arci nel Mediterraneo, Pau (Cagliari), 25–26 Settembre 2004*, pp. 73-80. PTM Editrice, Mogoro.

2010 Gli strumenti litici dell'insediamento neolitico di S'Arrocca Abruxiada di Arbus (breve nota). In *L'Ossidiana del Monte Arci nel Mediterraneo. Nuovi Apporti sulla Diffusio Sistemi di Produzioni e sulla loro Cronologia*, edited by C. Lugliè, pp. 135-146. NUR, Ales.

Ames, K.M.
1991 The archaeology of the *longue durée*: temporal and spatial scale in the evolution of social complexity on the southern Northwest coast. *Antiquity* 65: 935-945.

2008 The archaeology of rank. In *Handbook of Archaeological Theories*, edited by R.A. Bentley, H.D.G. Maschner, and C. Chippindale, pp. 487-513. AltaMira Press, Lanham, MD.

Ammerman, A.J.
1985 *The Acconia Survey: Neolithic Settlement and Obsidian Trade.* Institute of Archaeology Occasional Publication 10. University of London, London.

1987 L'habitation stentinellienne en Calabre. In *Premières Communautés Paysannes en Méditerranée Occidentale,* edited by J. Guilane, J. Courtin, J.-L. Roudil, and J.-L. Vernet, pp. 407-411. Colloque International du CNRS, Montpellier 1983. Éditions du CNRS, Paris.

2003 The circulation of obsidian in Italy during the Neolithic period. In *Atti XXXVI Riunione Scientifica Istituto Italiano Preistoria e Protostoria "Preistoria e Protostoria dell'Abruzzo", Settembre 2001*, pp. 547-557. Istituto Italiano Preistoria e Protostoria, Chieti-Celano.

2010 The first Argonauts: towards the study of the earliest seafaring in the Mediterranean. In *Global Origins of Seafaring*, edited by A. Anderson, J. Barrett and K. Boyle, pp. 81-92. McDonald Institute for Archaeological Research, Cambridge.

Ammerman, A.J., and W. Andrefsky, Jr.
1982 Reduction sequences and the exchange of obsidian in Neolithic Calabria. In *Contexts for Prehistoric Exchange*, edited by J.E. Ericson and T.K. Earle, pp. 149-172. Academic Press, New York.

Ammerman A.J., and L.L. Cavalli-Sforza
1971 Measuring the rate of spread of early farming in Europe. *Man* 6: 674-688.

1984 *The Neolithic Transition and the Genetics of Populations in Europe*. Princeton University Press, Princeton.

Ammerman, A.J., Cesana, A., Polglase, C., and M. Terrani
1990 Neutron activation analysis of obsidian from two Neolithic sites in Italy. *Journal of Archaeological Science* 17: 209-220.

Ammerman, A.J., Diamond, G.P., and D.D. Aldridge
1978a Un insediamento neolitico presso Curinga (Catanzaro). *Rivista di Scienze Preistoriche* 33: 161-185.

Ammerman, A.J., and C. Polglase
1993 New evidence on the exchange of obsidian in Italy. In *Trade and Exchange in European Prehistory*, edited by C. Scarre and F. Healy, pp. 101-107. Oxbow Monograph 33. Oxbow, Oxford.

Ammerman, A.J., Shaffer, G.D., and N. Hartmann
1988 A Neolithic household at Piana di Curinga, Italy. *Journal of Field Archaeology* 15: 121-140.

Andrefsky, W., Jr.
2005 *Lithics: Macroscopic Approaches to Analysis*. 2nd ed. Cambridge University Press, Cambridge.

2009 The analysis of stone tool procurement, production, and maintenance. *Journal of Archaeological Research* 17: 65-103.

Aranguren, B., and A. Revedin
1998 Il giacimento Mesolitico di Perriere Sottano. *Bullettino di Paletnologia Italiana* 89: 31-79.

Arias, P.E.
1937 La stazione preistorica di Serraferlicchio. *Monumenti Antichi del Lincei* 36: 693-838.

Arias, C., Bernardes, C., Bigazzi, G., Bonadonna, F.P., Cesar, M.F., Hadler, J.C., Lattes, C.M.G., Oliveira, J.X., Osorio Araya, A.M., and G. Radi
1986 Identificação da proveniência de manufaturados de obsidiana através da datação com o método do traço de fissão. *Ciencia e Cultura* 38(2): 285-308.

Arias, C., Bigazzi, G., Bonadonna, F.P., Cipolloni, M., Hadler, J.C., Lattes, C.M.G., and G. Radi 1984 Fission track dating in archeology: a useful application. In *Scientific Methodologies Applied to Works of Arts*, edited by P.L. Parrini, pp. 151-159. Montedison Progetto Cultura.

Arias-Radi, G., Bigazzi, G., and F. Bonadonna
1972 Le trace di fission: un metodo per lo studio delle vie di commercio dell'obsidiano. *Origini* 6: 155-171.

Atzeni, E.
1966 L'abri sous roche D du village préhistorique de Filitosa (Sollacaro-Corse). In *Congrès Préhistorique de France, 18e Session (Ajacco 1966)*, pp. 169-192.

1996 La sepoltura campaniforme di Bingia 'e Monti (Gonnostramatza, Oristano). In *L'Antica Età del Bronzo: Atti del Congresso di Viareggio, 9-12 Gennaio 1995*, edited by D. Cocchi Genick, pp. 609-611. Octavo F. Cantini, Firenze.

Badalian, R., Bigazzi, G., Cauvin, M.C., Chataigner, C., Jrbashyan, R., Karapetyan, S.G., Norelli, P., Oddone, M. and J. L. Poidevin
2002 Provenance studies of obsidian artefacts from Armenian archaeological sites using the fission-track analysis. *Geotemas* 4: 15-18.

Bagolini, B.
1972 Resultati della scavo 1969 a Chiozza di Scandiano e considerazioni sull insediamento della cultura di Fiorano documento a Chiozza. *Preistoria Alpina* 18: 31-71.

Bailey, G.
2007 Time perspectives, palimpsests and the archaeology of time. *Journal of Anthropological Archaeology* 26: 198-223.

Barfield, L.H., and A. Broglio (eds.)
1986 *L'insediamento Neolitico di Molino Casarotto nelle Valli di Fimon (Colli Berici, Vicenza). Parte I*. Accademia Olimpica, Vicenza.

Barca, D., De Francesco, A.M., and G.M. Crisci
2007 Application of Laser Ablation ICP-MS for characterization of obsidian fragments from peri-Tyrrhenian area. *Journal of Cultural Heritage* 8: 141-150.

Barca, D., De Francesco, A.M., Crisci, G.M., and C. Tozzi
2008 Provenance of obsidian artifacts from site of Colle Cera, Italy, by LA-ICP-MS method. *Periodico di Mineralogia* 77: 41-52.

Barfield, L.H.
1981 Patterns of North Italian trade 5000-2000 B.C.. In *Papers in Italian Archaeology II: Archaeology in Italian Society - Prehistory, Roman and Medieval Studies*, edited by G. Barker and R. Hodges, pp. 27-51. BAR International Series 102. BAR, Oxford.

Barge, O., and C. Chataigner
2003 The procurement of obsidian: factors influencing the choice of deposits. *Journal of Non-Crystalline Solids* 323: 172-179.

Barker, G.
1995 *Landscape Archaeology and Annales History in the Biferno Valley*. Leicester University Press, London.

2005 Agriculture, pastoralism, and Mediterranean landscapes in prehistory. In *The Archaeology of Mediterranean Prehistory*, edited by E. Blake and B. Knapp, pp. 46-76. Blackwell Publishing, Malden, Massachusetts.

2006 *The Agricultural Revolution in Prehistory*. Oxford University Press, Oxford.

Bass, B.
1998 Early Neolithic offshore accounts: remote, maritime exploitation, and the trans-Adriatic cultural network. *Journal of Mediterranean Archaeology* 11: 165-190.

Beeching, A.
1991 Sépultures, territoires et société dans le Chasséen méridional, l'exemple du bassin rhodanien. In *Identité du Chasséen*, edited by A. Beeching, D. Binder, and J.-C. Blanchet, pp. 327-341. Actes du Colloque de Nemours 1989. Mémoire du Musée de Préhistoire d'Île de France, Nemours.

Bellot-Gurlet, Bigazzi, G., Dorighel, O., Oddone, M., Poupeau, G., and Z. Yegingil
1999 The fission-track analysis: an alternative technique for provenance studies of prehistoric obsidian artefacts. *Radiation Measurements* 31: 639-644.

Bellwood, P.
2005 *First Farmers: The Origins of Agricultural Societies*. Blackwell Publishing, Malden, Massachusetts.

Benz, M.
2006 Zur Bedeutung von festen während der Neolithisierung im Vorderen Orient. *Ethnographisch-Archäologische Zeitschrift* 47(4): 439-462.

Bernabò Brea, L.
1956 *Gli scavi nella Caverna delle Arene Candide. Parte I, Gli Strati con Ceramiche*. Istituto di Studi Liguri, Bordighera.

Bernabò Brea, L., and M. Cavalier
1960 *Meligunìs Lipàra I. La Stazione Preistorica della Contrada Diana e la Necropoli Protostorica di Lipari*.S.F. Flaccovio, Palermo.

1995 *Meligunìs Lipàra VIII. Salina. Ricerche archeologiche (1989-1993)*. Palermo.

Best, S.
2002 *Lapita: A View from the East*. New Zealand Archaeological Association Monographs 24. New Zealand Archaeological Association, Auckland.

Biagi, P.
1980a La Grotta Rifugio di Oliena. Sardegna centro-orientale dal neolitico alla fine del mondo antico. In *Mostra in Occasione della XXII Reunione Scientifica dell'I.I.P.P., Sassari 1978,* pp. 11-16. Firenze.

2003 A review of the late Mesolithic in Italy and its implication for the Neolithic transition. In *The Widening Harvest*, edited by A. Ammerman and P. Biagi, pp. 133-156. Archaeological Institute of America, Boston.

Biagi, P., and M. Cremonesi
1980 Scavi nella Grotta Rifugio di Oliena (Nuoro), 1977-1978. Caverna sepolcrale della cultura di Bonu Ighinu - nota preliminare. In *Atti della XXII Reunione Scientifica dell'I.I.P.P., Sassari 1978,* pp. 95-114. Firenze.

Bietti, A., Boschian, G., Crici, G.M., Danese, E., De Francesco, A.M., Dini, M., Fontana, F., Giampietri, A., Grifoni, R., Guerreschi, A., Liagre, J., Negrino, F., Radi, G., Tozzi, C., and R. Tykot
2004 Inorganic Raw Materials Economy and Provenance of Chipped Industry in Some Stone Age Sites of Northern and Central Italy. *Collegium Antropologicum* 28(1): 41-54.

Bietti Sestieri, A.M.
1980 La Sicilia e le isole Eolie e i loro rapporti con le regione tirreniche dell'Italia continentale dal neolitico alla colonizzazione greca. *Kokalos* 26-27: 8-79.

Bigazzi, G., and F. Bonadonna
1973 Fission track dating of the obsidian of Lipari Island (Italy). *Nature* 242: 322-323.

Bigazzi, G., Meloni, S., Oddone, M., and G. Radi
1986 Provenance studies of obsidian artifacts: trace elements and data reduction. *Journal of Radioanalytical and Nuclear Chemistry* 98(2): 387-405.

1992 Nuovi dati sulla diffusione dell'obsidiana negli insediamenti preistorici italiani. In *Papers of the Fourth Conference of Italian Archaeology 1*, edited by E. Herring, R. Whitehouse, and J. Wilkins, pp. 9-18. Accordia Research Centre, London.

Bigazzi, G., Oddone, M., and G. Radi
2005 The Italian obsidian sources. *Archeometriai Műhely* 1: 1-13.

Bigazzi, G., and G. Radi
1981 Datazione con le trace di fissione per l'identificazione della provenienza dei manufatti di ossidiani. *Rivista di Scienze Preistoriche* 34(1-2): 234-249.

1998 Prehistoric exploitation of obsidian for tool making in the Italian peninsula: a picture from a rich fission-track data-set. In *Actes of the 8th International Congress of Prehistoric Sciences, Forli, Italy*, edited by C. Arias, A. Bietti, L. Castelleti, and C. Peretto., pp. 619-624. A.B.A.C.O., Forli.

2003 L'ossidiana in Abruzzo durante il neolitico. In *Atti XXXVI Riunione Scientifica Istituto Italiano Preistoria e Protostoria "Preistoria e Protostoria dell'Abruzzo", Settembre 2001*, pp. 619-624. Istituto Italiano Preistoria e Protostoria, Chieti-Celano.

Binder, D.
2000 Mesolithic and Neolithic interaction in southern France and northern Italy. In *Europe's First Farmers*, edited by T.D. Price, pp. 117-143. Cambridge University Press, Cambridge.

Binder, D., and J. Courtin
1994 Un point sur la circulation de l'obsidienne dans le domaine provençal. *Gallia Préhistoire* 36: 310-322.

Blake, E.
2002 Situating Sardinia's Giants' Tombs in their spatial, social, and temporal contexts. *Archeological Papers of the American Anthropological Association* 11(1): 119-127.

Blake, E., and A.B. Knapp
2005 *The Archaeology of Mediterranean Prehistory*. Blackwell Publishing, Malden, Massachusetts.

Bonzani, R.M.
1992 Territorial boundaries, buffer zones and sociopolitical complexity: a case study of the nuraghi on Sardinia. In *Sardinia in the Mediterranean: A Footprint in the Sea (Studies in Sardinian Archaeology presented to M.S. Balmuth),* edited by R.H. Tykot and T.K. Andrews, pp. 210-220. Monographs in Mediterranean Archaeology 3. Sheffield Academic Press, Sheffield.

Bosch, J., Gibaja, J.F., and B. Gratuze
2010 Studio di una lama di ossidiana proveniente dalla Sardegna trovata nelle miniere neolitiche di Gavá (Barcellona): contesto della scoperta, tipologia, analisi funzionale e caratterizzazione geochimiche. In *L'Ossidiana del Monte Arci nel Mediterraneo. Nuovi Apporti sulla Diffusio Sistemi di Produzioni e sulla loro Cronologia,* edited by C. Lugliè, pp. 147-156. NUR, Ales.

Bradley, R., and M. Edmonds
2005 *Interpreting the Axe Trade: Production and Exchange in Neolithic Britain*. Cambridge University Press, Cambridge.

Brandaglia, M.
1985 Il Neolitico a ceramica impressa dell'Isola del Giglio: l'industria litica. *Studi per l'Ecologia del Quaternario* 7: 53-76.

Branigan, K.
1991 Mochlos-an Early Aegean 'gateway community? In *Thalassa: L'Egée Préhistorique et la Mer. Actes de la 3e Rencontre Égéenne Internationale de l'Université de Liège, Station de Recherches Sous-marines et Océanographiques (StaReSO), Calvi, Corse, 23–25 Avril 1990*, edited by R. Laffineur and L. Basch, pp. 97-105. Université de Liège, Liège.

Braswell, G.E.
2003 Obsidian exchange spheres. In *The Postclassic Mesoamerican World*, edited by M.E. Smith and F.F. Berdan, pp. 131-158. University of Utah Press, Salt Lake City.

Braudel, F.
1972 *The Mediterranean and the Mediterranean World in the Age of Phillip II*. Vol. I, II, III. Harper Torchbooks, New York.

1982 *On History*. University of Chicago Press, Chicago.

Bressy, C.S., D'Anna, A., Poupeau, G., Le Bourdonnec, F.-X., Bellot-Gurlet, L., Leandri, F., Tramoni, P., and F. Demouche
2008 Chert and obsidian procurement of three Corsican sites during the 6th and 5th millenniums BC. *Comptes Rendus Palevol* 7: 237-248.

Brodie, N.
1997 New perspectives on the Bell-Beaker culture. *Oxford Journal of Archaeology* 16: 297-314.

Broodbank, C.
1989 The longboat and society in the Cyclades in the Keros-Syros Culture. *American Journal of Archaeology* 93(3): 319-37.

2006 The origins and early development of Mediterranean maritime activity. *Journal of Mediterranean Archaeology* 19(2): 199-230.

2013 *The Making of the Middle Sea*. Oxford University Press, Oxford.

Brumfield, E.M., and T.K. Earle (eds.)
1987 *Specialization, Exchange, and Complex Societies*. Cambridge University Press, Cambridge.

Buchner, G.
1949 Ricerche sui giacimenti e sulle industrie di ossidiana in Italia I. *Rivista di Scienze Preistoriche* 4: 162-186.

Camprubi, A., Melgarejo, J.-C., Proenza, J.A., Costa, F., Bosch, J., Estrada, A., Borell, F., Yushkin, N.P., and V.L. Andreichev
2003 Mining and geological knowledge during the Neolithic: a geological study on the variscite mines at Gavà, Catalonia. *Episodes* 26(4): 295-301.

Camps, G.
1964 Notes de protohistoire Nord-Africaine. *Libyca* 12: 293-297.

1974 *Les Civilisations Préhistoriques de l'Afrique du Nord et du Sahara*. Doin, Paris.

1976 La question de navigations préhistoriques dans le bassin occidental de la Méditerranée. In *Comptes Rendus du 20e Congrès Préhistorique de France*, pp. 53-65. Mémoire de la Société Préhistorique Française, Provence.

1986 The young sheep and the sea: early navigation in the Mediterranean. *Diogenes* 34(136): 19-45.

Cann, J.R., and C. Renfrew
1964 The characterization of obsidian and its application to the Mediterranean region. *Proceeding of the Prehistoric Society* 30: 111-133.

Cappai, R., Melis, M.G., and M. Mussi
2004 L'uso dell'ossidiana nell'insediamento preistorico di Craviole Paderi - Sestu (CA). In *L'Ossidiana del Monte Arci nel Mediterraneo: Recupero dei Valori di un Territorio. Atti del Convegno Internazionale, Oristano e Pau, 29 Novembre - 1 Dicembre 2002*, edited by P. Castelli, B. Cauli, F. Di Gregorio, C. Lugliè, G. Tanda, and C. Usai, pp. 223-234. Tipografia Ghilarzese, Ghilarza.

Carboni, A., and C. Lugliè
2010 Il debitage laminare in ossidiana a Coddu is Abionis (Sardegna centro-occidentale): incidenza quantitativa e analisi tecnologica. In *L'Ossidiana del Monte Arci nel Mediterraneo. Nuovi Apporti sulla Diffusio Sistemi di Produzioni e sulla loro Cronologia*, edited by C. Lugliè, pp. 215-233. NUR, Ales.

Carta, S.
2005 Il materiale litico in ossidiana rinvenuto nei pressi del nuraghe Inus - Siris (OR). In *L'Ossidiana del Monte Arci nel Mediterraneo, Pau (Cagliari), 25–26 Settembre 2004*, pp. 95-104. PTM Editrice, Mogoro.

Carter, T.
1997 Blood and tears: a Cycladic case study in microwear analysis. The use of obsidian blades as razors? In *Siliceous Rocks and Culture*, edited by M.A. Bustillo and A. Ramos-Millán, pp. 256-271. Consejo Superior de Investigaciones Científicas, Madrid.

2004 Mochlos and Melos: a special relationship? Creating identity and status in Minoan Crete. In *Crete Beyond the Palaces: Proceedings of the Crete 2000 Conference*, edited by L.P. Day, M.S. Mook, and J.D. Muhly, pp. 291-307. Prehistory Monographs 10. INSTAP Academic Press, Philadelphia.

2007 The theatrics of technology: consuming obsidian in the Early Cycladic burial arena. *Archaeological Papers of the American Anthropological Association* 17(1): 88-107.

2008 The consumption of obsidian in the Early Bronze Age Cyclades. In *Horizons: A Colloquium on the Prehistory of the Cyclades*, edited by N. Brodie, J. Doole, G. Gavalas, and C. Renfrew, pp. 225-235. McDonald Institute Monographs, Cambridge.

2014 The contribution of obsidian characterization studies to early prehistoric archaeology. In *Lithic Raw Material Exploitation and Circulation in Prehistory: A Comparative Perspective in Diverse Palaeoenvironments*, edited by M. Yamada and A. Ono, pp. 23-33. ERAUL, Liège.

Carter, T., Dubernet, S., King, R., Le Bourdonnec, F.-X., Milic, M., Poupeau, G., and M.S. Shackley
2008 Eastern Anatolian obsidians at Çatalhöyük and the reconfiguration of regional interaction in the Early Ceramic Neolithic. *Antiquity* 82: 900-909.

Carter, T., Grant, S., Kartal, M., Coşkun, A., and V. Özkaya
2013 Networks and Neolithisation: sourcing obsidian from Körtik Tepe (SE Anatolia). *Journal of Archaeological Science* 40: 556-569.

Carter, T. and V. Kilikoglou
2007 From reactor to royalty? Aegean and Anatolian obsidians from Quartier Mu, Malia (Crete) *Journal of Mediterranean Archaeology* 20(1): 115-143.

Cauvin, J.
1994 *Naissance des Divinités, Naissance de l'Agriculture: La Révolution des Symboles au Néolithique*. CNRS Éditions, Paris.

Cazzella, A
1994 Dating the "Copper Age" in the Italian Peninsula and adjacent islands. *European Journal of Archaeology* 21: 1-19.

Cazzella, A., and M. Moscoloni
1976 Un contributo allo studio del neolitico dell'Italia centrale: La Grotta del Vannaro (Corchiano). *Origini* 10: 135-174.

Ceccanti, M.
1980 Contatti culturali tra Puglia, Sicilia ed il Mediterraneo orientale in epoca premicenea (età del rame). In *Interaction and Acculturation in the Medietrranean, Proceedings of the 2nd International Congress of Mediterranean Pre- and Protohistory (Amsterdam 1980), Vol. I*, edited by J.G.P. Best, pp. 37-47. B.R. Grüner Publishing Co., Amsterdam.

Chapman, R.
2003 *Archaeologies of Complexity*. Routledge, London.

2005 Changing social relations in the Mediterranean Copper and Bronze Ages. In *The Archaeology of Mediterranean Prehistory*, edited by E. Blake and A.B. Knapp, pp. 77-101. Blackwell Publishing, Malden, Massachusetts.

Cherry, J.
1984 The initial colonization of the West Mediterranean islands in the light of island biogeography and palaeogeography. In *The Deya Conference of Prehistory: Early Settlement in the Western Mediterranean Islands and their Peripheral Areas, Vol. I*, edited by W.H. Waldren, R. Chapman, J. Lewthwaite, and R.-C. Kennard, pp. 7-27. BAR International Series 229. BAR, Oxford.

1990 The first colonization of the Mediterranean Islands: a review of recent research. *Journal of Mediterranean Archaeology* 3: 145-221.

Ciabatti, E. 1984. Lo scavo subaqueo della nave piu antica del Mediterraneo. Il relitto di Lipari. *Archeologia Viva* 3: 36-47.

Cicilloni, R., and E. Usai
2004 L'Insediamento neolitico di Puisteris - Mogoro (OR): nuovi dati dallo scavo di una "sacca" in località Serra Neula. In *L'Ossidiana del Monte Arci nel Mediterraneo: Recupero dei Valori di un Territorio. Atti del Convegno Internazionale, Oristano e Pau, 29 Novembre - 1 Dicembre 2002*, edited by P. Castelli, B. Cauli, F. Di Gregorio, C. Lugliè, G. Tanda, and C. Usai, pp. 216-222. Tipografia Ghilarzese, Ghilarza.

Civalero, M.T., and N.V. Franco
2003 Early human occupations in western Santa Cruz Province, southernmost South America. *Quaternary International*, 109-110: 77-86.

Contreras, D.A.
2011 How far to Conchucos?A GIS approach to assessing the implications of exotic materials at Chavın de Huantar. *World Archaeology* 43(3): 389-97.

Cornaggio Castiglioni, O., Fussi, F., and G. D'Agnola
1962-1963 Indagini sulla provenienza dell'ossidiana utilizzato nelle industrie del mediterraneo occidentale. *Atti della Società Italiana di Scienze Naturali e del Museo Civico di Storia Naturale* 52: 12-19.

Cortese, M., Frazzetta, G., and L. La Volpe
1986 Volcanic history of Lipari (Aeolian Islands, Italy) during the last 10,000 years. *Journal of Volcanology and Geothermal Research* 27: 117-133.

Costa, L.J.
2004 Nouvelles données sur le Mésolithique des îles Tyrrhéniennes (Corse et Sardaigne). *Gallia Préhistoire* 46: 211-230.

2006 Récents acquis sur la circulation préhistorique de l'obsidienne en Corse. *Bulletin de la Société Préhistorique Française* 103(1): 71-85.

2007 *L'obsidienne: Un Témoin d'échanges en Méditerranée Préhistorique.* Éditions Errance, Paris.

Costa, L.J., Paolini-Saez, H., Ottaviani-Spella, M.-M., Magdeleine, J., Ottaviani, J.-C., and A. Berlinghi
2002 Analyses de provenance des matériaux exploités à Strette (Barbaghju, Haute-Corse): approche du fonctionnement du site au Néolithique ancien. *Bulletin de la Société Préhistorique Française* 99(4): 765-774.

Costa, L.J., and J. Pélegrin
2004 Une production de grandes lames par pression à la fin du Néolithique, dans le nord de la Sardaigne (Contraguda, Perfugas). *Bulletin de la Société Préhistorique Française* 101(4): 867-873.

Costa, L.J., Vigne, J.-D., Bocherens, H., Desse-Berset, N., Heinz, C., de Lanfranchi, F., Magdeleine, J., Ruas, M.-P., Thiebault, S., and C. Tozzi
2003 Early settlement on Tyrrhenian Islands (8th millenia BC): Mesolithic adaptation to local resources in Corsica and Northern Sardinia. In *Mesolithic on the Move*, edited by H. Krindgen, K. Knutsson, L. Larsson, D. Loeffler, and A. Akerland, pp. 3-10. Colloque International UISPP: Meso2000, Stockholm 2000. Oxbow Monographs, Oxford.

Costantini, L.
1989 Plant exploitation at Grotta dell'Uzzo Sicily: new evidence for the transition from Mesolithic to Neolithic subsistence in Southern Europe. In *Foraging to Farming: The Evolution of Plant Domestication*, edited by D.H. Harris and G.C. Hillman, pp. 197-206. Unwin Hyman, London.

Coqueugniot, É.
1998 L'obsidienne en Méditerranée orientale auxépoques post-Néolithiques. In *L'Obsidienne au Proche et Moyen Orient: Du Volcan à l'Outil*, edited by M.-C. Cauvin, A. Gourgaud, B. Gratuze, N. Arnaud, G.Poupeau, J.L. Poidevin, and C. Chataigner, pp. 351-361. BAR International Series 738. Archaeopress, Oxford.

Courtin J.
1967 Le problème de l'obsidienne dan le néolithique du Midi de la France. *Rivista di Studi Liguri* 33: 93-109.

Crabtree, D.E.
1972 *An Introduction to Flintworking*. Occasional Papers 28. Idaho State Museum, Pocatello.

Cremonesi, G.
1965 Il villaggio di Ripoli alla luce dei recenti scavi. *Rivista di Scienze Preistoriche* 20: 85-155.

Crisci, G.M., De Rosa, R., Esperanca, S., Mazzuoli, R., and M. Sonnino
1991 Temporal evolution of a three component system: the island of Lipari (Aeolian Arc, southern Italy). *Bulletin of Volcanology* 53: 207-221.

Crisci, G.M., Ricq-de-Bouard, M., Lanzaframe, U., and A.M. De Francesco
1994 Nouvelle méthode d'analyse et provenance de l'ensemble des obsidiennes néolithiques du Midi de la France. *Gallia Préhistoire* 36: 289-309.

Crumley, C.L.
1979 Three locational models: an epistemological assessment for anthropology and archaeology. *Advances in Archaeological Method and Theory* 2: 141-173.

Crummett, J.G., and S.E. Warren
1985 Chemical analysis of Calabrian obsidian. In *The Acconia Survey: Neolithic Settlement and Obsidian Trade*, edited by A.J. Ammerman, pp. 107-114. Institute of Archaeology Occasional Publication 10. University of London, London.

Cruz-Uribe, K.
1990 The mammalian fauna. In *La Muculufa, The Early Bronze Age Sanctuary: The Early Bronze Age Village*, *Excavations of 1982 and 1983*, edited by R.R. Holloway, M.S. Joukowsky, and S.S. Lukesh, pp. 57-64. Brown University Center for Old World Archaeology and Art, Providence.

D'Anna, A., Marchesi, H., Tramoni, P., Gilabert, C., Demouche, F., and C. Gilabert
2001 Renaghju (Sartène, Corse-du-Sud), un habitat de plein-air néolithique ancien en Corse *Bulletin de la Société Préhistorique Française* 98(3): 431-444.

David, N.C.
1958-1959 Alcune osservazioni sull'ossidiana e sulla selce degli strati neolitici dei giacimenti preistorici di Lipari. *Bullettino di Paletnologia Italiana* 67-68: 205-211.

Davis, M.K., Jackson, T.L., Shackley, M.S., Teague, T., and J. Hampel
1998 Factors affecting the energy-dispersive X-ray fluorescence (EDXRF) analysis of archaeological obsidian. In: Archaeological Obsidian Studies: Method and Theory, edited by M.S. Shackley, pp. 159-180. Springer/Plenum Press, New York.

De Francesco, A.M., and M. Bocci
2007 Resultati delle analisi non distruttive in XRF sulle ossidiane dei siti archeologici di Cala Giovanna Piano (Arcipelago Toscano) e Torre Foghe (Sardegna). In *Preistoria e Protostoria dell'Area Tirrenica*, edited by C. Tozzi and M.C. Weiss, pp. 221. Felici Editore, Ghezzano.

De Francesco, A. M., Bocci, M., and G.M. Crisci
2010 Determinazione della provenienza dalle fonti del Monte Arci per le ossidiane di numerosi siti neolitici italiani e corsi con metodologia non distruttiva in fluorescenza X. In *L'Ossidiana del Monte Arci nel Mediterraneo. Nuovi Apporti sulla Diffusio Sistemi di Produzioni e sulla loro Cronologia*, edited by C. Lugliè, pp. 41-52. NUR, Ales.

2011 Non-destructive applications of wavelength XRF in obsidian studies. In *X-ray Fluoresence Spectrometry (XRF) in Geoarchaeology*, edited by M.S. Shackley, pp. 81-105. Springer, New York.

De Francesco, A. M., Bocci, M., Crisci, G.M., and V. Francaviglia
2012 Obsidian provenance at several Italian and Corsican archaeological sites using the non-destructive X-ray fluorescence method. In *Obsidian and Ancient Manufactured* Glass, edited by I. Liritzis and C.M. Stevenson, pp. 115-129. University of New Mexico Press, Albuquerque.

De Francesco, A.M., Bocci, M., Crisci, G.M., Martini, F., Tozzi, C., Radi, G., Sarti, L., and M.T. Cuda
2006a Applicazione della metodologia analitica non distruttiva in fluorescenza X per la determinazione della provenienza delle ossidiane archeologiche del progetto 'Materie Prime' dell'I.I.P.P. In *Atti della XXXIX Riunione Scientifica dell'Istituto di Storia e Protostoria (Firenze 2004)*, pp. 531-548. Istituto di Storia e Protostoria.

De Francesco, A.M., and G.M. Crisci
2000 Provenienza delle obsidiane dei siti archeologici di Pianosa (Arcipelago Toscano) E Lumaca (Corsica) con il metodo analitico non distruttivo in fluorescenza X. In *Il Primo Popolamento Olocenico dell'Area Corso-Toscano*, edited by C. Tozzi and M.-C. Weiss, pp. 253-255. Edizioni ETS, Pise.

2003 L'ossidiana. In *Gli Scavi nel Villaggio Neolitico di Catignano (1971–1980)*, edited by C. Tozzi and B. Zamagni, pp. 239-240. Istituto Italiano di Preistoria e Protostoria, Firenze.

De Francesco, A.M., Crisci, G.M., and M. Bocci
2008 Non-destructive analytic method using XRF for determination of provenance of archaeological obsidians from the Mediterranean area: a comparison with traditional XRF methods. *Archaeometry* 50(2): 337-350.

De Francesco, A.M., Crisci, G. M., Bocci, M., and U. Lanzafame
2002 Provenienza delle ossidiane archeologiche di alcuni siti neolitici italiani, in *PLINIUS, Supplemento Italiano all'European Journal of Mineralogy* 28: 137-138.

De Francesco, A.M., Crisci, G.M., Ducci, S., Guerrini, M., and P. Perazzi
2006b L'ossidiana dell'isolotto de La Scola (Isola di Pianosa - Livorno): i nuovi dati, l'analisi. In *Atti della XXXIX Riunione Scientifica dell'Istituto di Storia e Protostoria (Firenze 2004)*, pp. 575-578. Istituto di Storia e Protostoria.

De Francesco, A.M., Crisci, G.M., and U. Lanzafame
2000 Non-destructive analytical method by XRF for provenancing archaeological obsidians from Mediterranean Area. *Bollettino Accademia Gioenia Scienze Naturali* 357: 229-239.

Di Lernia, S.
1996 Tradizione mesolitica e caraterri autonomi dell'industria litica dell'insediamento di Terragne. In *Forme et Tempi della Neolitizzazione in Italia Meridionale e in Sicilia*, edited by V. Tiné, pp. 60-78. Rubbettino (IRACEB), Rossano.

1998 Local and mid-range exchange in the south-eastern neolithisation process in Italy: the problem of lithic raw material distribution. In *Man and Flint, VIIth International Flint Symposium*, edited by R. Schild and Z. Sulgostowska, pp. 217-223. Polish Academy of Sciences, Warsaw.

Diamond, G.P., and A.J. Ammerman
1985 Lithic material. In *The Acconia Survey: Neolithic Settlement and Obsidian Trade*, edited by A.J. Ammerman, pp. 60-82.. Institute of Archaeology Occasional Publication 10. University of London, London.

Dietler, M., and I. Herbich
1998 Habitus, techniques, style: an integrated approach to the social understanding of material culture and boundaries. In *The Archaeology of Social Boundaries*, edited by M.T. Stark, pp. 232-263. Smithsonian Institute Press, Washington and London.

Dietrich, O., Heun, M., Notroff, J., Schmidt, K., and M. Zarnkow
2012 The role of cult and feasting in the emergence of Neolithic communities. New evidence from Göbekli Tepe, south-eastern Turkey. *Antiquity* 86: 674-695.

Dini, M.
2007 L'industria in ossidiana dei siti neolitici di Santa Caterina di Pittinuri e Torre Foghe sulla costa occidentale della Sardegna. In *Preistoria e Protostoria dell'Area Tirrenica*, edited by C. Tozzi and M.C. Weiss, pp. 195-202. Felici Editore, Ghezzano.

Dini, M., Pala, R., and C. Tozzi
2004 Analisi tecnologica dell'ossidiana dell'insediamento neolitico di Torre Foghe (Tresnuraghes, Oristano). In *L'Ossidiana del Monte Arci nel Mediterraneo: Recupero dei Valori di un Territorio. Atti del Convegno Internazionale, Oristano e Pau, 29 Novembre - 1 Dicembre 2002*, edited by P. Castelli, B. Cauli, F. Di Gregorio, C. Lugliè, G. Tanda, and C. Usai, pp. 242-247. Tipografia Ghilarzese, Ghilarza.

Dixon, J.E., Cann, J.R., and C. Renfrew
1968 Obsidian and the origins of trade. *Scientific American* 218: 38-46.

Dobres, M.-A.
2000 *Technology and Social Agency*. Blackwell, Oxford.

Dobres, M.-A., and J.E. Robb
2000 Agency in archaeology: paradigm or platitude. In *Agency in Archaeology*, edited by M.-A. Dobres and J.E. Robb. Routledge, London and New York.

Dolfini, A.
2011 The function of Chalcolithic metalwork in Italy: an assessment based on use-wear analysis. *Journal of Archaeological Science* 38: 1037-1049.

2013 Early metallurgy in the central Mediterranean. In *Archaeometallurgy in Global Perspective*, edited by B.W. Roberts, C. P. Thornton, pp. 473-506. Springer, New York.

Duttine, M., Villeneuve, G., Poupeau, G., Rossi, A.M., and R.B. Scorzelli
2003 Electron spin resonance of Fe^{3+} ion in obsidians from Mediterranean islands. Application to provenance studies. *Journal of Non-Crystalline Solids* 323: 193-199.

Dyson, S.L., and R.J. Rowland, Jr.
2007 *Archaeology and History in Sardinia from the Stone Age to the Middle Ages: Shepherds, Sailors, and Conquerors*. University of Pennsylvania Museum of Archaeology and Anthropology, Philadelphia.

Elemental Analysis, Inc.
2014 X-ray Fluorescence (XRF). Electronic document, http://www.elementalanalysis.com/services/x-ray-fluorescence-xrf/, accessed April 16, 2014.

Ericson, J.E., and T.K. Earle (eds.)
1982 *Contexts for Prehistoric Exchange*. Academic Press, New York.

Ericson, J.E., and B.A. Purdy (eds.)
1984 *Prehistoric Quarries and Lithic Production*. Cambridge University Press, Cambridge.

Farr, R.H.
2007 *Navigating the Neolithic*. PhD Dissertation, Cambridge University, Cambridge.

Fedele, F.
1999 Circulation humaine près du Splugenpass au Preboreal-Boreal et contexte du peuplement Alpin. In *L'Europe des Derniers Chasseurs*, edited by A Thévenin, pp. 473-482. Actes du 5e Colloque International UISPP. Éditions du CTHS, Paris.

Forenbaher, S.
2009 Archaeological record of the Adriatic offshore islands as an indicator of long-distance interaction in prehistory. *European Journal of Archaeology* 11(2-3): 223-244.

Forenbaher, S., and P.T. Miracle
2005 The spread of farming in the eastern Adriatic. *Antiquity* 79: 514-528.

Francaviglia, V.
1984 Characterization of Mediterranean obsidian sources by classical petrochemical methods. *Preistoria Alpina* 20: 311-322.

1988 Ancient obsidian sources on Pantelleria. *Journal of Archaeological Science* 15: 109-122.

Francaviglia, V., and M. Piperno
1987 La répartition et la provenance de l'obsidienne archéologique de la Grotta dell'Uzzo et de Monte Cofano (Sicile). *Revue d'Archéométrie* 11: 31-39.

Frahm, E.
2014 Ten seconds in the field: rapid Armenian obsidian sourcing with portable XRF to inform excavations and surveys. *Journal of Archaeological Science* 41: 333-348.

Frangipane, M.
1975 Considerazione sugli aspetti culturali - neolitici a ceramica tricromica dell'Italia meridionale. *Origini* 9: 63-152.

Frasca, M., Messina, F., Palermo, D., and E. Procelli
1975 Ramacca (Catania). Saggi di scavo nel villaggio preistorico di contrada Torricella. *Notizie Scavi VIII* 29: 557-585.

Freund, K.P.
2013 An assessment of the current applications and future directions of obsidian sourcing in archaeological research. *Archaeometry* 55(5): 779-793.

2014 Obsidian exploitation in Chalcolithic Sardinia: a view from Bingia 'e Monti. *Journal of Archaeological Science* 41: 242-250.

Freund, K.P., and Z. Batist
2014 Sardinian obsidian circulation and early maritime navigation in the Neolithic as shown through social network analysis. *Journal of Island and Coastal Archaeology*, in press.

Freund, K.P., and R.H. Tykot
2011 Lithic technology and obsidian exchange networks in Bronze Age Nuragic Sardinia (Italy). *Journal of Archaeological and Anthropological Sciences* 3(2): 151-164.

Fugazzola Delpino, M.A., Pessina, A., and V. Tiné (eds.)
2004 *Il Neolitico in Italia. Ricognizione, Catalogazione e Pubblicazione dei Dati Bibliografici, Archivistici, Materiali e Monumentali.* Vol. I, II, III. *Origines: Studi e Materiali Pubblicati a Cura dell'Istituto Italiano di Preistoria e Protostoria*. Istituto Italiano di Preistoria e Protostoria, Firenze.

Gale, N.H.
1981 Mediterranean obsidian source characterisation by strontium isotope analysis. *Archaeometry* 23(1): 41-51.

Galiberti, A. (ed.)
2005 *Defensola: Una Miniera di Selce di 7000 Anni Fa.* Protagon Editori Toscani, Siena.
Gamble, C.

1986 Archaeology, geography and time. *Progress in Human Geography* 11: 227-246.

Gassin, B, Léa, V., Astruc, L., and J. Linton
2011 Lithic management in the Chassey culture Neolithic. *Human Evolution* 25: 125-142.

Gell, A.
1992 The technology of enchantment and the enchantment of technology. In *Anthropology, Art and Aesthetics*, edited by. J. Coote and A. Shelton, pp. 40-66. Clarendon, Oxford.

Gero, J.M.
1989 Assessing social information in material objects: how well do lithics add up? In *Time, Energy and Stone Tools*, edited by R. Torrence, pp. 92-105. Cambridge University Press, Cambridge.

Giddens, A.
1979 *Central Problems in Social Theory: Action, Structure, and Contradiction in Social Analysis*. University of California Press, Berkeley.

Gobert, E.G.
1962 La préhistoire dans la zone littorale de la Tunisie. *Quaternaria* 6: 271-307.

Godelier, M.
1999 *The Enigma of the Gift*. University of Chicago Press, Chicago.

Gosselain, O.
2000 Materializing identities: an African perspective. *Journal of Archaeological Method and Theory* 7: 187-217.

Gratuze, B., and S. Boucetta
2009 Provenance study of obsidian blades. *In Favella: Un Villaggio Neolitico nella Sibaritide*, edited by V. Tiné, 387-389. Istituto Poligrafico e Zecca dello Statto, Rome.

Grifoni Cremonesi, R.
1975-1976 Problemi relativi al neolitico della Toscano. *Giornale Storico della Lunigiana e del Territorio Lucenesi* 26-27: 83-88.

Guerreschi, G., Catalani, P., and N. Ceschin
1991 I nuovo scavi all'Isolino di Varese. *Sibrium* 21: 9-26.

Guilane, J., and J. Vaquer
1994 Les obsidiennes à l'ouest du Rhône. *Gallia Préhistoire* 36: 323-327.

Guzzardi, L.
1980 Un ipogeo preistorico a Calaforno e il suo contesto topografico. *Sicilia Archeologica Trapani* 13(42): 67-94.

Haggett, P.
1965 *Locational Analysis in Human Geography*. St. Martin's Press, New York.

Hallam, B.R., Warren, S.E., and C. Renfrew
1976 Obsidian in the western Mediterranean: characterisation by neutron activation analysis and optical emission spectroscopy. *Proceedings of the Prehistoric Society* 42: 85-110.

Hartley, C.W., Bike Yazicioğlu, G., and A.T. Smith
2012 *The Archaeology of Power and Politics in Eurasia: Regimes and Revolutions*. Cambridge University Press, Cambridge.

Hayden, B.
1995 Pathways to power: principles for creating socioeconomic inequalities. In *Foundations of Social Inequality*, edited by T.D. Price and G.M. Feinman, pp. 15-86. Plenum Press, New York and London.

2001 Fabulous feasts: a prolegomenon to the importance of feasting. In *Feasts: Archaeological and Ethnographic Pespectives on Food, Politics, and Power*, edited by M. Dietler and B. Hayden, pp. 23-64. Smithsonian Institution Press, Washington and London.

Helms, M.
1988 *Ulysses' Sail: An Ethnographic Odyssey of Power, Knowledge, and Geographical Distance*. Princeton: Princeton University Press, Princeton.

Hirth, K.G.
1978 Inter-regional trade and the formation of prehistoric gateway communities. *American Antiquity* 43: 25-45.

Hodder, I. (ed.)
1987 *Archaeology as Long-term History*. Cambridge University Press, Cambridge.

2004 Neo-thingness. In *Explaining Social Change: Studies in Honour of Colin Renfrew*, edited by J. Cherry, C. Scarre, and S. Shennan, pp. 45-52. MacDonald Institute of Archaeological Research, Cambridge.

2006 The spectale of daily performance at Çatalhöyük. In *Archaeology of Performance: Theaters of Power, Community, and Politics*, edited by T. Inomata and L.S. Coben, pp. 81-102. AltaMira Press, Lanham, MD.

Hodder, I., and C. Malone
1984 Intensive survey of prehistoric sites in the Stilo region, Calabria. *Proceedings of the Prehistoric Society* 50: 121-150.

Hodder, I.R., and C. Orton
1976 *Spatial Analysis in Archaeology*. Cambridge University Press, Cambridge.

Holdaway, S., and L. Wandsnider (eds.)
2008 *Time in Archaeology: Time Perspectivism Revisited.* The University of Utah Press, Salt Lake City.

Holden, T.G., Hather, J.G., and J.P.N. Watson
1995 Mesolithic plant exploitation at the Roc del Migdia, Catalonia. *Journal of Archaeological Science* 22(6): 769-778.

Holloway, R.S.
1991 *The Archaeology of Ancient Sicily*. Routledge, London.
Horden, P., and N. Purcell

2000 *The Corrupting Sea*. Blackwell Publishers, Oxford.

Hurcombe, L.
1992 New contributions to the study of the function of Sardinian obsidian artifacts. In *Sardinia in the Mediterranean: A Footprint in the Sea (Studies in Sardinian Archaeology presented to M.S. Balmuth),* edited by R.H. Tykot and T.K. Andrews, pp. 83-97. Monographs in Mediterranean Archaeology 3. Sheffield Academic Press, Sheffield.

Inizan, M.-L., Reduron-Ballinger, M., Roche, H., and J. Tixier
1999 *Technology and Terminology of Knapped Stone*. CREP, Nanterre.

Iovino, M.R., Maniscalco, L., Pappalardo, G., Pappalardo, L., Puglisi, D., Rizzo, F., and F.P. Romano
2008a Archaeological volcanic glass from the site of Rocchicella (Sicily, Italy). *Archaeometry* 50(3): 474-494.

Iovino, M.R., Martinelli, M.C., and N.N. Skakun
2008b Production and function(s) of obsidian tools at the Neolithic site of Contrada Diana (Aeolian Islands, Sicily). In *Prehistoric Technology 40 years later: Functional Studies and the Russian Legacy* edited by L. Longo, pp. 439-444. Archaeopress, Oxford.

Jochim, M.
2002 The Mesolithic. In *European Prehistory: A Survey*, edited by S. Milisauskas, pp. 115-141. Kluwer Academic/Plenum Publishers, New York.

Kaczanowska, M., and J.K. Kozłowski
2013 Mesolithic obsidian networks in the Aegean. In *Unconformist Archaeology: Papers in honour of Paolo Biagi*, edited by E. Starnini, pp. 17-26. BAR International Series 2528. Archaeopress, Oxford.

Kassianidou, V., and A.B. Knapp
2005 Archaeometallurgy in the Mediterranean: the social context of mining, technology, and trade. In *The Archaeology of Mediterranean Prehistory*, edited by E. Blake and A.B. Knapp, pp. 215-251. Blackwell Publishing, Malden, Massachusetts.

Kent, S.
1999 Egalitarianism, equality, and equitable power. In *Manifesting Power: Gender and the Interpretation of Power in Archaeology*, edited by T.L. Sweely, pp. 30-48. Routledge, London and New York.

Knapp B. (ed.)
1992 *Archaeology, Annales, and Ethnohistory*. Cambridge University Press, Cambridge.
Kononenko, N.A., and R. Torrence

2009 Tattooing in Melanesia: local invention or Lapita introduction? *Antiquity* 83(320): online.

La Rosa, V.
1994 Le nuove indagini nella media valle del Patani. In *La Preistoria del Basso Belice e della Sicilia Meridionale nel Quadro della Preistoria Siciliana e Mediterranea*, edited by S. Tusa, pp. 287-304. Palermo.

1997a Sopralluoghi e ricerche attorno a Milena nella media valle del Platani. In *Dalle Capanne alle Robbe: La Storia Lunga di Milocca-Milena*, pp. 141-164. Pro Loco, Milena.

1997b La media e tarda Eta del Bronzo nel territorio di Milena. In *Dalle Capanne alle Robbe: La Storia Lunga di Milocca-Milena*, pp. 193-196. Pro Loco, Milena.

La Rosa, V., Palio, O., Pappalardo, G., Pappalardo, L., and F.P. Romano
2006 Analisi delle provenienze di ossidiane del territorio di Milena (CL). In *Atti della XXXIX Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria: Materie Prime e Scambi nella Preistoria Italiana, Firenze, November 2004*, pp. 499-508. Instituto Italiano di Preistoria e Protostoria, Firenze.

Lacan, M., Keyser, C., Ricaut, F.-X., Brucato, N., Duranthon, F., Guilaine, J., Crubézy, E., and B. Ludes
2011 Ancient DNA reveals male diffusion through the Neolithic Mediterranean route. *Proceedings of the National Academy of Sciences* 108(45): 18255-18259.

Lai, L.
2008 *The Interplay of Economic, Climatic and Cultural Change Investigated Through Isotopic Analyses of Bone Tissue: The Case of Sardinia 4000-1900 B.C.* PhD Dissertation, University of South Florida, Tampa.

Lai, L., Tykot, R.H., and C. Tozzi
2006 Nuovi risultati sulla provenienza dell'ossidiana del sito neolitico recente di Contraguda (Sardegna). In *Atti del XXXIX Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria: Materie prime e scambi nella preistoria italiana, Firenze, November 2004*, pp. 598-602. Instituto Italiano di Preistoria e Protostoria, Firenze.

de Lanfranchi, F.
1987 Le Néolithique de Curacchiaghju. Position chronologie et culture matérielle. Son importance dans l'ensemble Corso-Sarde. In *Premières Communautés Paysannes en Mediterranée Occidentale,* edited by J. Guilane, J. Courtin, J.-L. Roudil, and J.-L. Vernet, pp. 433-442. Colloque International du CNRS, Montpellier 1983. Éditions du CNRS, Paris.

2010 Essai d'interprétation anthropologique de l'acquisition de l'obsidienne par les groupes néolithiques de Corse. In *L'Ossidiana del Monte Arci nel Mediterraneo. Nuovi Apporti sulla Diffusio Sistemi di Produzioni e sulla loro Cronologia,* edited by C. Lugliè, pp. 187-214. NUR, Ales.

de Lanfranchi, F., and M.-C. Weiss
1972 Le Néolithique ancien de l'abri d'Araguina-Sennola (Bonifacio, Corse). *Bulletin de la Société Préhistorique Française* 69: 376-388.

Laplace, G.
1968 Recherches de typologie analytique. *Origini* 2: 7-64.

1977 Il riparo Mocchi ai Balzi Rossi di Grimaldi (fouilles 1938-1948). Les industries leptolithiques. *Rivista di Scienze Preistoriche* 32(2): 3-131.

Lave, J., and E. Wenger
1991 *Situated Learning: Legitimate Peripheral Participation*. Cambridge University Press, Cambridge.

Le Bourdonnec, F.-X.
2007 *Aspects Archéométriques de la Circulation de l'Obsidienne Préhistorique: Développements Analytiques et Applications en Corse, Sardaigne et Éthiopie.* PhD Dissertation, Université Michel de Montaigne Bordeaux 3, Bordeaux.

Le Bourdonnec, F.-X., Bontempi, J.-M., Marini, N., Mazet, S., Neuville, P.F., Poupeau, G., and J. Sicurani
2010 SEM-EDS characterization of western Mediterranean obsidians and the Neolithic site of A Fuata (Corsica). *Journal of Archaeological Science* 37: 92-106.

Le Bourdonnec, F.-X., Delerue, S., Dubernet, S., Moretto, Ph., Calligaro, Ph., Dran, J.-C., and G. Poupeau
2005 PIXE characterization of western Mediterranean and Anatolian obsidians and Neolithic provenance studies. *Nuclear Instruments and Methods in Physics Research B* 240: 595-599.

Le Bourdonnec, F.-X., Poupeau, G., Lugliè, C., D'Anna, A., Bellot-Gurlet, L., Bressy-Leandri, C.S., Pasquet, A., and P. Tramoni
2011 New data and provenance of obsidian blocks from Middle Neolithic contexts on Corsica (western Mediterranean). *Comptes Rendus Palevol* 10: 259-269.

Léa, V.
2012 The diffusion of obsidian in the northwestern Mediterranean: toward a new model of the Chassey Culture? *Journal of Mediterranean Archaeology* 25: 147-173.

Léa, V., Pellissier, M., Gratuze, B., Boucetta, S., and C. Lepère
2010 Renouvellement des donées sur la diffusion de l'obsidienne sarde en contexte Chasséen (Midi de la France): la découverte du site Terres Longues (Trets, Bouche-du-Rhone). In *L'Ossidiana del Monte Arci nel Mediterraneo. Nuovi Apporti sulla Diffusio Sistemi di Produzioni e sulla loro Cronologia,* edited by C. Lugliè, pp. 157-185. NUR, Ales.

Leale Anfossi, M.
1972 Il giacimento dell'Arma dello Stefanin (Val Pennavaira e Albenga). Scavi 1952-1962. *Rivista di Scienze Preistoriche* 27: 249-322.

1974 L'Arma di Nasino (Savona). Gli strati con ceramica. In *Atti della XVI Riunione Scientifica dell'lstituto Italiano di Preistoria et Protostoria, Liguria, Novembre 1973*, pp. 131-140. Istituto Italiano di Preistoria et Protostoria, Firenze.

Leighton, R.
1999 *Sicily before History: An Archaeological Survey from the Palaeolithic to the Iron Age*. Cornell University Press, Ithaca.

Leroi-Gourhan, A.
1964 *Le Geste et la Parole*. Albin Michel, Paris.

Lewthwaite, J.
1985 From precocity to involution: the Neolithic of Corsica in its West Mediterranean and French contexts. O*xford Journal of Archaeology* 4(1): 47-68.

Lilliu, G.
1982 *La Civiltà Nuragica*. Delfino Carlo Editore, Sassari.

Locci, M.C.
2004 Osservazioni sui microliti a crescente di età Nuragica. In *L'ossidiana del Monte Arci nel Mediterraneo. La Ricerca Archeologica e la Salvaguardia del Paesaggio per lo Sviluppo delle Zone Interne della Sardegna*, pp. 281-290. Edizioni AV, Cagliari.

2005 Manufatti in ossidiana dal sito di Brunku s'Omu Villa Verde (OR). In *L'Ossidiana del Monte Arci nel Mediterraneo, Pau (Cagliari), 25–26 Settembre 2004*, pp. 105-114. PTM Editrice, Mogoro.

Loi, C., and V. Brizzi
2010 Ipotesi interpretative sull'industria litica del Monte S. Vittoria - Neoneli (OR). In *L'Ossidiana del Monte Arci nel Mediterraneo. Nuovi Apporti sulla Diffusio Sistemi di Produzioni e sulla loro Cronologia*, edited by C. Lugliè, pp. 235-254. NUR, Ales.

Lollini, D.G.
1965 Il neolitico nelle Marche alla luce delle recenti scoperte. In *Atti del VI Congresso Internazionale di Scienze Preistoriche e Protostoriche, Roma 1962, Vol. II, Sez. I-IV,* pp. 309-314.

Longworth, W., and S.E. Warren
1979 The application of Mössbauer spectroscopy to the characterisation of western Mediterranean obsidian. *Journal of Archaeological Science* 6: 179-193.

Lugliè, C.
1999 L'industria litica a ritocco erto di Coddu is Abionis - Terralba (OR): note tipologiche. Annali della Facoltà di Lettere e Filosofia dell'Università degli Studi di Cagliari 17: 6-74.

2003a La corrente a ceramiche impresse nel neolitico antico della Sardegna. Analisi di alcuni dati inediti dell'alto Campidano (Sardegna centro-occidentale). In *Atti della XXXV Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria. Le Comunità della Preistoria Italiana: Studi e ricerche sul neolitico e le Età dei Metalli in Memoria di Luigi Bernabò Brea, Lipari June 2000,* pp. 969-972. Istituto Italiano di Preistoria e Protostoria, Florence.

2003b First report on the study of obsidian prehistoric workshops in the eastern side of Monte Arci (Sardinia). In *Les Matières Premières Lithique en Préhistoire, Actes de la Table-Ronde d'Aurillac (Préhistoire du Sud-Ouest, Supplement 5),* pp. 207-209.

2004 Modalità di acquisizione dell'ossidiana del Monte Arci nel Neolitico. In *L'Ossidiana del Monte Arci nel Mediterraneo: Recupero dei Valori di un Territorio. Atti del Convegno Internazionale, Oristano e Pau, 29 Novembre - 1 Dicembre 2002*, edited by P. Castelli, B. Cauli, F. Di Gregorio, C. Lugliè, G. Tanda, and C. Usai, pp. 47-60. Tipografia Ghilarzese, Ghilarza.

2009 L'obsidienne néolithique en Méditerranée occidentale. In *L'Homme et le Précieux Matières Minérales Précieuses,* edited by M.-H. Moncel and F. Frohlich, pp. 199-211. BAR International Series 1934. BAR, Oxford.

Lugliè C., Congia, C., Le Bourdonnec F.-X., Poupeau G., Dubernet S., Calligaro, T., and I. Sanna
2009 Obsidian economy in the Rio Saboccu open-air Early Neolithic site (Sardinia, Italy). In *Non-flint Raw Material Use in Prehistory,* edited by F. Sternke, L. Eigeland, and L.-J. Costa, pp. 203-215. Papers presented at the 15th UISPP (Lisbon 2006). Oxbow Books, Oxford.

Lugliè C., Le Bourdonnec F.-X., and G. Poupeau
2011 Neolithic obsidian economy around the Monte Arci source (Sardinia, Italy): the Importance of integrated provenance/technology analyses. In *Proceedings of the 37th International Symposium on Archaeometry, 12th – 16th May 2008, Siena, Italy*, edited by I. Turbanti-Memmi, pp. 255-260. Springer, Berlin.

Lugliè C., Le Bourdonnec F.-X., Poupeau G., Atzeni, E., Dubernet S., Moretto, P., and L. Serani
2007 Early Neolithic obsidians in Sardinia (Western Mediterranean): the Su Carroppu case. *Journal of Archaeological Science* 34: 428-439.

Lugliè C., Le Bourdonnec F.-X., Poupeau G., Bohn M., Meloni S., Oddone M., and G. Tanda
2006 A map of the Monte Arci (Sardinia island, western Mediterranean) obsidian primary to secondary sources. Implications for Neolithic provenance studies. *Comptes Rendus Palevol* 5: 995-1003.

Lugliè, C., Le Bourdonnec, F.-X., Poupeau, G., Congia, C., Moretto, P., Calligaro, T., Sanna, I., and S. Dubernet
2008 Obsidians in the Rio Saboccu (Sardinia, Italy) campsite: provenance, reduction and relations with the wider Early Neolithic Tyrrhenian area. *Comptes Rendus Palevol* 7: 249-258.

Lugliè, C., and S. Sebis
2004 Un insieme di foliati in ossidiana dal villaggio di Cuccuru is Arrius (Cabras). In *L'Ossidiana del Monte Arci nel Mediterraneo: Recupero dei Valori di un Territorio. Atti del Convegno Internazionale, Oristano e Pau, 29 Novembre - 1 Dicembre 2002*, edited by P. Castelli, B. Cauli, F. Di Gregorio, C. Lugliè, G. Tanda, and C. Usai, pp. 235-241. Tipografia Ghilarzese, Ghilarza.

Mackey, M.P., and S.E. Warren
1983 Identification of obsidian sources in the Monte Arci region of Sardinia. In *Proceedings of the 22nd International Symposium on Archaeometry (Bradford 1982)*, edited by A. Aspinall and S.E. Warren, pp. 420-431. University of Bradford, Bradford.

Magdeleine, J.
1995 Préhistoire du Cap Corse: les abris de Torre d'Aquila, Pietracorbara (Haute-Corse). *Bulletin de la Société Préhistorique Française* 92(3): 363-367.

Maggi, R.
1999 Coasts and uplands in Liguria and northern Tuscany from the Mesolithic to the Bronze Age. In *Social Dynamics of the Prehistoric Central Mediterranean*, edited by R.H. Tykot, J. Morter, and J.E.Robb, pp. 47-65. Accordia Research Institute, University of London.

Maggi, R., and M. Pearce
2005 Mid-fourth millennium copper mining in Liguria, north-west Italy: the earliest known copper mines in Western Europe. *Antiquity* 79: 66-77.

Malavolti, F.
1948 Note sull'ossidiana usata dai palafitticoli del Lago di Varese. *Rassegna Storico del Seprio* 8: 25-27.

1949-1950 Manufatti preistorici di ossidiana levigata. *Emilia Preromana* 2: 139-141.

1953 L'ossidiana del Pescale. *Emilia Preromana* 3: 127-132.

Malinowski B.
1922 *Argonauts of the Western Pacific*. E.P. Dutton Inc., Illinois.

Malone, C.
2003 The Italian Neolithic: a synthesis of research. *Journal of World Prehistory* 17(3): 235-312.

Manfredini, A.
1972 Il villagio trincerato di Monte Aquilone nel quadro del neolitico dell'Italia meridionale. *Origini* 6: 29-154.

Mannino, M.A., Thomas, K.D., and M.J. Leng
2007 Marine resources in the Mesolithic and Neolithic at the Grotta dell'Uzzo (Sicily): evidence from isotope analyses of marine shells. *Archaeometry* 49(1): 117-133.

Marini, N., De Francesco, A.M., Bocci, M., Bressy, C., and B. Gratuze
2007 Costa di U Monte - du Néolithique à l'Âge du Fer sur la côte orientale corse: résultats de fouilles et provenance des vestiges. In *Preistoria e Protostoria dell'Area Tirrenica*, edited by C. Tozzi and M.C. Weiss, pp. 35-42. Felici Editore, Ghezzano.

Martin, L., Jacomet, S., and S. Thiebault
2008 Plant economy during the Neolithic in a mountain context: the case of ‘‘Le Chenet des Pierres’’ in the French Alps (Bozel-Savoie, France). *Vegetation History and Archaeobotany* 17: S113-S122.

Martinelli, M.C.
1990 Industrie litiche di alcuni siti neolitici della Dalmazia e loro raffronti con contemporanee industrie dell'Italia sud-Adriatica e delle Isole Eolie. *Rassegna di Archeologia* 9: 125-152.

Martini, F.
2002 L'Italia pre-Neolitica. In *Le Ceramiche Impresse nel Neolitico Antico. Italia e Mediterraneo*, edited by M.A. Fugazzola Delpino, A. Pessina, and V. Tine, pp. 73-89. Soprintendenza Speciale al Museo Nazionale Preistorico Etnografico, L. Pigorini, Roma.

Massanet, L.P.
2004 Noticia de algunos fragmentos de obsidiana hallados en Menorci. In *L'Ossidiana del Monte Arci nel Mediterraneo: Recupero dei Valori di un Territorio. Atti del Convegno Internazionale, Oristano e Pau, 29 Novembre - 1 Dicembre 2002,* edited by P. Castelli, B. Cauli, F. Di Gregorio, C. Lugliè, G. Tanda, and C. Usai, pp. 391-394. Tipografia Ghilarzese, Ghilarza.

Mauss, M.
1967 *The Gift: Forms and Functions of Exchange in Archaic Societies*. The Norton Library, New York.

McConnell, B.E.
1992 The Early Bronze Age village of La Muculufa and prehistoric hut architecture in Sicily. *American Journal of Archaeology* 96(1): 23-44.

McConnell, B.E., and B.W. Bevan
1999 Spatial analysis of a Castelluccian settlement in Early Bronze Age Sicily. In *Social Dynamics of the Prehistoric Central Mediterranean*, edited by R.H. Tykot, J. Morter, and J.E.Robb, pp. 195-204. Accordia Research Institute, University of London.

McDougall, J.M., Tarling, D.H., and S.E. Warren
1983 The magnetic sourcing of obsidian samples from Mediterranean and Near Eastern sources. *Journal of Archaeological Science* 10: 441-452.

McGrail, S.
1987 *Ancient Boats in North West Europe: The Archaeology of Water Transport to AD 1500*. Longman, London.

Melis, M.G.
2000 *L'Età del Rame in Sardegna: Origine ed Evoluzione Aspetti Autoctoni*. Soter Editrice, Sardinia.

Melis, P.
2003 *The Nuragic Civilization*. Carlo Delfino Editore, Sassari.

Meloni, S., Lugliè C., Oddone, M., and L. Giordani
2004 Characterization of obsidian samples from Monte Arci (Sardinia, Italy): implications for provenance investigations on obsidian artifacts. In *L'Ossidiana del Monte Arci nel Mediterraneo: Recupero dei Valori di un Territorio. Atti del Convegno Internazionale, Oristano e Pau, 29 Novembre - 1 Dicembre 2002*, edited by P. Castelli, B. Cauli, F. Di Gregorio, C. Lugliè, G. Tanda, and C. Usai, pp. 77-92. Tipografia Ghilarzese, Ghilarza.

Mello, E.
1983 Indagini scientifiche per l'individuazione della provenienza dei manufatti di ossidiana. In *Passo di Corvo e la Civiltà Neolitica del Tavoliere*, edited by S. Tiné, pp. 122-124. Sagep Editrice, Genova.

Meskell, L.M.
2004 *Object Worlds in Ancient Egypt: Material Biographies Past and Present*. Berg, London.

Michels, J.W., Atzeni E., Song I.S.T., and G.A. Smith
1984 Obsidian hydration dating in Sardinia. In *Studies in Sardinian Archaeology*, edited by M.S. Balmuth and R.J. Rowland Jr., pp. 83-114. The University of Michigan Press, Ann Arbor.

Milić, M.
2014 PXRF characterisation of obsidian from central Anatolia, the Aegean and central Europe. *Journal of Archaeological Science* 45: 285-296.

Milliken, S., and R. Skeates
1989 The Almini Survey: the Mesolithic-Neolithic transition in the Salerno peninsula (S.E. Italy). *Institute of Archaeology Bulletin, London* 26: 77-98.

Milisauskas, S.,
2002 Early Neolithic: the first farmers in Europe, 7000-5500/5000 BC. In *European Prehistory*, edited by S. Milisauskas, pp. 143-192. Springer, New York.

Milisauskas, S., and J. Kruk
2002 Middle Neolithic continuity, diversity, innovations, and greater complexity, 5500/5000–3500/3000 BC. In *European Prehistory*, edited by S. Milisauskas, pp. 193-246. Springer, New York.

Mizoguchi, K.
2009 Nodes and edges: a network approach to hierarchisation and state formation in Japan. *Journal of Anthropological Archaeology* 28: 14-26.

Montanari, G.B., Pasi, M.M., and D. Mengoli
1994 L'insediamento neolitico di Fornace Cappuccini di Faenza (Ravenna).*Preistoria Alpina* 27: 173-195.

Morel, J.
1969 La station préhistorique de la grande dune d'Aine Khiar dans la région de la Calle (Est Algérien). *Libyca* 17: 101-130.

Mulazzani, S., Le Bourdonnec, F.-X., Belhouchet, L., Poupeau, G., Zoughlami, J., Dubernet, S., Tufano, E., Lefrais, Y., and R. Khedhaier
2010 Obsidian from the Epipalaeolithic and Neolithic eastern Maghreb. A view from the Hergla context (Tunisia). *Journal of Archaeological Science* 37: 2529-2537.

Müller, H.
1914 La question de l'obsidienne. *Revue des Études Anciennes* 16: 91-94.

Muñoz Amilibia, A.M.
1965 *La Cultura Neolitica Catalana de los Sepulcros de Fosa.* Universidad de Barcelona Instituto de Arqueologia y Prehistoria, Barcelona.

Munro, N.D., and L. Grosman
2010 Early evidence (ca. 12,000 BP) for feasting at a burial cave in Israel. *Proceedings of the National Academy of Sciences* 107: 15362-66.

Nazaroff , A.J., Prufer , K.M., and B.L. Drake
2009 Assessing the applicability of portable x-ray fluorescence spectrometry for obsidian provenance research in the Maya Lowlands. *Journal of Archaeological Science* 30: 1-11.

Nicoletti, F.
1997 Il commercio preistorico dell'ossidiana nel Mediterraneo ed il ruolo di Lipari e Pantelleria nel più antico sistema di scambio. In *Prima Sicilia: Alle Origini della Società Siciliana*, edited by S. Tusa, pp. 258-69. Catalogo della Mostra, Palermo.

Ogburn, D., Connell, S., and C. Gifford, C.
2009 Provisioning of the Inka army in wartime: obsidian procurement in Pambamarca, Ecuador *Journal of Archaeological Science* 36: 740-751.

Orsi, P.
1890 Stazione Neolitica di Stentinello. *Bulletino di Paletnologia Italiana* 16: 177-200.

1893a Scarichi del villaggio siculo di Castelluccio (Sicilia). *Bulletino di Paletnologia Italiana* 19: 31-51.

1893b Necropoli sicula presso Siracusa con vasi e bronzi micenei (Cozzo del Pantano). *Monumenti Antichi del Lincei* 2: 5-36.

1903 Necropoli e stazioni sicule di transizione IV. *Bulletino di Paletnologia Italiana* 29: 136-149.

1907 La grotta di Calafarina presso Pachino, abitazione e sepolcro. *Bulletino di Paletnologia Italiana* 33: 7.

1911 Villagio Neolitica di Stentinello. *Bulletino di Paletnologia Italiana* 36: 66-67.

1921 Megara Hyblaea. *Monumenti Antichi del Lincei* 27: 109-150.

1924 Villaggio trincerato dell'età della pietra scoperto a Megara Hyblaea. *Bulletino di Paletnologia Italiana* 44: 214-220.

1928 Stazione e necropoli al Bersaglio di Caltagirone. *Bulletino di Paletnologia Italiana* 48: 82.

Ortega, D., Ibañez, J.J., Khalidi, L., Méndez, V., Campos, D., and L. Teira
2014 Towards a multi-agent-based modelling of obsidian exchange in the Neolithic Near East. *Journal of Archaeological Method and Theory* 21: 461-485.

Pabst, M.A., Letofsky-Pabst, I., Bock, E., Moser, M., Dorfer, L., Egarter-Vigl, E., and F. Hofer
2009 The tattoos of the Tyrolean Iceman: a light microscopical, ultrastructural and element analytical study. *Journal of Archaeological Science* 36(10): 2335-2341.

Panvini, R.
1999-2000 *Gela: Gli Insediamento nel Territorio dalla Preistoria all'Età Tardoantica.* Report published by the Regione Siciliana and the Museo Archeologico Regionale Gela.

Papadatos, Y., and P. Tomkins
2013 Trading, the longboat, and cultural interaction in the Aegean during the late fourth millennium B.C.E.: the view from Kephala Petras, East Crete. *American Journal of Archaeology* 117(3): 353-381.

Peet, T.E.
1909 *The Stone and Bronze Ages in Italy*. Clarendon Press, Oxford.

Pélegrin, J.
2012 New experimental observations for the characterization of pressure blade production techniques. In *The Emergence of Pressure Blade Making: From Origin to Modern Experimentation*, edited by P.M. Desrosiers, pp. 465-500. Springer, New York.

Peregrine, P.
1991 A graph-theoretic approach to the evolution of Cahokia. *American Antiquity* 56(1): 66-75.

Perlès, C. (ed.)
1990 *Les Industries Lithiques Taillees de Franchti (Argolide, Grece)*. Excavations at Franchti Cave, Fascicle 5. Indiana University Press, Bloomington and Indianapolis.

Perlès, C., Takaoglu, T., and B. Gratuze
2011 Melian obsidian in NW Turkey: evidence for early Neolithic trade. *Journal of Field Archaeology* 36(1): 42-49.

Pessina A., and G. Radi
2006 La diffusione dell'ossidiana nell'Italia centro-settentrionale. In *Atti del XXXIX Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria: Materie Prime e Scambi nella Preistoria Italiana, Firenze, November 2004,* pp. 435-460. Instituto Italiano di Preistoria e Protostoria, Firenze.

Pétrequin, P., Errera, M., Pétrequin, A.M., and P. Allard
2006 The Neolithic quarries of Mont Viso, Piedmont, Italy: initial radiocarbon dates *European Journal of Archaeology* 9(1): 7-30.

Phillips, P.
1992 Western Mediterranean Obsidian Distribution and the European Neolithic. In *Sardinia in the Mediterranean: A Footprint in the Sea (Studies in Sardinian Archaeology presented to M.S. Balmuth),* edited by R.H. Tykot and T.K. Andrews, pp. 71-82. Monographs in Mediterranean Archaeology 3. Sheffield Academic Press, Sheffield.

Phillips, P., Aspinall, A., and S. Feather
1977 Stages of 'Neolithisation' in southern France. *Proceeding of the Prehistoric Society* 43: 303-316.

Piperno, M., Collina, C., Gallotti, R., Raynal, J.P., Kieffer, G., Le Bourdonnec, F.-X., Poupeau, G., and D. Geraads
2009 Obsidian exploitation and utilization during the Oldowan at Melka Kunture (Ethiopia). In *Interdisciplinary Approaches to the Oldowan*, edited by E. Hovers and D.R. Braun, pp. 111-128. Springer, Dordrecht.

Pittau, P., Lugliè, C., Buosi, C., Sanna, I., and M. Del Rio
2009 Palynological interpretation of the Early Neolithic coastal open-air site at Sa Punta (central-western Sardinia, Italy). *Journal of Archaeological Science* 39: 1260-1270.

Polglase, C.
1990 Appendice 1, in M. Bernabo Brea, A. Ghiretti, C. Polglase, and V. Visconti, I siti neolitici lungo il torrente Cinghio (Parma). *Preistoria Alpina* 24: 140-155.

Pollard, M., and C. Heron
2008 *Archaeological Chemistry*. RSC Publishing, Cambridge.

Pollmann, H.O.
1993 *Obsidian in Nordwestmediterranen Raum*. *Seine Verbreitung und Nutzung im Neolithikum und Aneolithikum.* British Archaeological Reports, International Series 585. Tempus Reparatvm, Oxford.

Poupeau, G., Bellot-Gurlet, L., Brisotto, V., and O. Dorighel
2000 Nouvelles données sur la provenance de l'obsidienne des sites néolithiques du Sud-Est de la France. *Comptes Rendus de l'Académie des Sciences, Sciences de la Terre et des Planètes* 330: 297-303.

Poupeau, G., Lugliè, C., D'Anna, A., Carter, T., Le Bourdonnec, F.-X., Bellot-Gurlet, L., and C. Bressy
2010 Circulation et origine de l'obsidienne préhistorique en Méditerranée : un bilan de cinquante années de recherches. In *Archéologie des Rivages Méditerranéens: 50 Ans de Recherche, Actes du Colloque d'Arles (Bouches-du-Rhône), Octobre 2009*, edited by X. Delestre and H. Marchesi, pp. 183-191. Éditions Errance, Paris.

Powell, J.
2003 Fishing in the Mesolithic and Neolithic—the Cave of Cyclops, Youra. *British School at Athens Studies* 9: 75-84.

Price, T.D.
2000 Europe's first farmers: an introduction. In *Europe's First Farmers*, edited by T.D. Price, pp. 1-18. Cambridge University Press, Cambridge.

Price, T.D., and G.M. Feinman (eds.)
1995 *Foundations of Social Inequality.* Plenum Press, New York and London.

Privitera, F.
1991 La stazione di Mezzebbi nel contesto del Bronzo Antico del territorio di Milena. In *La Preistoria del Basso Belice e della Sicilia Meridionale nel Quadro della Preistoria Siciliana e Mediterranea*, edited by S. Tusa, pp. 339-353. Società Storia Patria Palermo, Palermo.

Procelli, E.
1996 Sicily between the Early and Middle Bronze Ages: a brief survey. In *Early Societies in Sicily: New Developments in Archaeological Research*, edited by R. Leighton, pp. 89-100. Accordia Specialist Studies on Italy 5. Accordia Research Centre, University of London.

Puxeddu, C.
1958 Giacimenti di ossidiana del Monte Arci in Sardegna e sua irradiazione. *Studi Sardi* 14-15(1): 10-66.

Quarta, G., Maruccio, L., and L. Calcagnile
2011 Provenance studies of obsidians from Neolithic contexts in Southern Italy by IBA (Ion Beam Analysis) methods. *Nuclear Instruments and Methods in Physics Research B* 269: 3102-3105.

Quero, T.
2012 Il sito Neolitico di San Martino-Spadafora (Me): analisi dei materiali e inquadramento culturale. In *Premio Decio de Lorentiis, per la Valorizzazione e la Diffusione degli Studi Preistorici e delle Scienze della Terra*, edited by M.A. Orlando. Editrice Salentina, Galatina.

Radi, G., and G. Bovenzi
2007 La circolazione dell'ossidiana nell'area alro tirrenica. In *Preistoria e Protostoria dell'Area Tirrenica*, edited by C. Tozzi and M.C. Weiss, pp. 209-216. Felici Editore, Ghezzano.

Radi, G., and E. Danese
2003 L'abitato di Colle Santo Stefano di Ortucchio (l'Aquila). In *Atti XXXVI Riunione Scientifica Istituto Italiano Preistoria e Protostoria "Preistoria e Protostoria dell'Abruzzo", Settembre 2001*, pp. 145-161. Istituto Italiano Preistoria e Protostoria, Chieti-Celano.

Radmilli, A.M.
1954 Le isole Pontine e il commercio dell'ossidiana nel Continente durante il neo-eneolitico. In *Origines: Raccolta in Onore di G. Baserga (Como 1954),* pp. 115-129. Tipografia Editrice Antonio Noseda, Como.

Radmilli, A.M., Mallegni, F., and G. Fornacciari
1978 Recenti scavi nella Grotta dei Piccioni di Bolognano (PS) e riesame dei scheletrici umani proenienti dai circoli. *Atti della Società Toscana di Scienze Naturali* 85: 175-198.

Ragucci, G., and E. Usai
2004 La tomba di Scaba 'e Arriu. In *L'Ossidiana del Monte Arci nel Mediterraneo: Recupero dei Valori di un Territorio. Atti del Convegno Internazionale, Oristano e Pau, 29 Novembre - 1 Dicembre 2002*, edited by P. Castelli, B. Cauli, F. Di Gregorio, C. Lugliè, G. Tanda, and C. Usai, pp. 255-261. Tipografia Ghilarzese, Ghilarza.

Randle, K., Brafield, L.H., and B. Bagolini
1993 Recent Italian obsidian analyses. *Journal of Archaeological Science* 20: 503-509.

Rathje, W.L.
1971 The origin and development of Lowland Classic Maya civilization *American Antiquity* 36: 275-285.

Reepmeyer, C., and G. Clark
2010 Post-colonization interaction between Vanuatu and Fiji reconsidered: the re-analysis of obsidian from Lakeba Island, Fiji. *Archaeometry* 52(1): 1-18.

Renfrew, C.
1969 Trade and culture process in European prehistory. *Current Anthropology* 10(2/3): 151-169.

1975 Trade as action at a distance. In *Ancient Civilization and Trade*, edited by J.A. Sabloff and C.C. Lamberg-Karlovsky, pp. 3-60. University of New Mexico Press, Albuquerque.

1993 Trade beyond the material. In *Trade and Exchange in European Prehistory*, edited by C. Scarre and F. Healy, pp. 5-16. Oxbow Monograph 33. Oxbow Books, Oxford.

Renfrew, C., Dixon, J.E., and J.R. Cann
1966 Obsidian and early cultural contact in the Near East. *Proceedings of the Prehistoric Society* 32: 30-72.

1968 Further analysis of Near Eastern obsidians. *Proceedings of the Prehistoric Society* 34: 319-331.

Ricq de Bouard, M.
1993 Trade in Neolithic jadeite axes from the Alps: new data. In *Trade and Exchange in Prehistoric Europe*, edited by C. Scarre and F. Healy, pp. 61-67. Oxbow Monograph 33. Oxbow Books, Oxford.

Robb, J.E.
1994 The Neolithic of peninsular Italy: anthropological synthesis and critique. *Bulletino di Paletnologia Italiana* 85: 189-214.

1999 Great persons and big men in the Italian Neolithic. In *Social Dynamics of the Prehistoric Central Mediterranean*, edited by R.H. Tykot, J. Morter, and J.E.Robb, pp. 111-122. Accordia Research Institute, University of London.

2007 *The Early Mediterranean Village*. Cambridge University Press, New York.

Robb, J.E., and R.H. Farr
2005 Substances in motion: Neolithic Mediterranean "trade". In *The Archaeology of Mediterranean Prehistory*, edited by E. Blake and A.B. Knapp, pp. 24-45. Blackwell Publishing, Malden, Massachusetts.

Robb, J.E., and T.R. Pauketat
2013 From moments to millennia: theorizing scale and change in human history. *Big Histories, Human Lives: Tackling Problems of Scale in Archaeology*, edited by J.E. Robb and T.R. Pauketat, pp. 3-33.School for Advanced Research Press, Santa Fe.

Rottoli, M., and E. Castiglioni
2009 Prehistory of plant growing and collecting in northern Italy, based on seed remains from the early Neolithic to the Chalcolithic (c. 5600–2100 cal B.C.). *Vegetation History and Archaeobotany* 18: 91-103.

Salanova, L.
Fabrication et circulation des céramiques Campaniformes. In *Matériaux, Productions, Circulations du Néolithique à l'Âge du Bronze*, edited by J. Guilane, pp. 151-166. Éditions Errance, Paris.

Salotti, M., Bellot-Gourlet, L., Courtois, J.Y., Dubois, J.N., Louchart, A., Mourer-Chauvire, C., Oberlin, C., Pereira, E., Poupeau, G., and P. Tramoni
2000 A fin du Pléistocène Supérieur et le début de l'Holocène en Corse: apports paléontologique et archéologique du site de Castiglione (Oletta, Haute-Corse). *Quaternaire* 11(3-4): 219-230.

Sammartino, F.
2007 Gli insediamenti neolitici di Castagneto Carducci (Livorno). In *Preistoria e Protostoria dell'Area Tirrenica*, edited by C. Tozzi and M.C. Weiss, pp. 203-207. Felici Editore, Ghezzano.

Sargent, A.
1985 The carbon-14 chronology of the Early and Middle Neolithic of southern Italy. *Proceedings of the Prehistoric Society* 51: 31-40.

Scarcella, S., Bouquillon, A., and A. Leclaire
2011 Neolithic facies of Stentinello culture: analysis and comparison of ceramics from Capo Alfiere (Calabria) and Perriere Sottano (Sicily). In *Proceedings of the 37th International Symposium on Archaeometry, 12th – 16th May 2008, Siena, Italy,* edited by I. Turbanti-Memmi, pp. 153-158. Springer, Berlin.

Scorzelli, R.B., Petrick, S., Rossi, A., Poupeau, G., and G. Bigazzi
2001 Obsidian archaeological artefacts provenance studies in the Western Mediterranean basin: an approach by Mössbauer spectroscopy and electron paramagnetic resonance. *Comptes Rendus de l'Académie des Sciences, Sciences de la Terre et des Planètes* 332: 769-776.

Seccaroni, C., Volante, N., Rosada, A., Ambrosone, L., Bufalo, G., and P. Avino
2008 Identification of provenance of obsidian samples analyzing elemental composition by INAA. *Journal of Radioanalytical and Nuclear Chemistry* 278(2): 277-282.

Serradimigni, M.
2007 L'industria litica scheggiata del sito di Cala Giovanna Piano sull'Isola di Pianosa (LI). In *Preistoria e Protostoria dell'Area Tirrenica,* edited by C. Tozzi and M.C. Weiss, pp. 115-125. Felici Editore, Ghezzano.

Service, E.
1962 *Primitive Social Organization: An Evolutionary Perspective*. Random House, New York.

Shackley, M.S.
2002 More than exchange: Pre-Ceramic though Ceramic period obsidian studies in the Greater North American Southwest. In *Geochemical Evidence for Long-distance Exchange*, edited by M.D. Glascock, pp. 53-87. Greenwood Publishing Group, Connecticut.

2005 *Obsidian: Geology and Archaeology in the North American Southwest*. University of Arizona Press, Tucson.

2011 An introduction to X-ray fluorescence (XRF) analysis in archaeology. In *X-ray Fluorescence Spectrometry in Archaeology*, edited by M.S. Shackley, pp. 7-44. Springer, New York.

Shennan, S.
1987 Trends in the study of later European prehistory. *Annual Review of Anthropology* 16: 365-382.

Sheppard, P.J., Irwin, G.J., Lin, S.C., and C.P. McCaffrey
2011 Characterization of New Zealand obsidian using PXRF. *Journal of Archaeological Science* 38: 45-56.

Sidrys, R.V.
1976 Classic Maya obsidian trade. *American Antiquity* 41(4): 449-464.

Skeates, R.
1993a Neolithic exchange in central and southern Italy. In *Trade and Exchange in European Prehistory*, edited by C. Scarre and F. Healy, pp. 109-115. Oxbow Monograph 33. Oxbow, Oxford.

1993b Early metal use in the central Mediterranean region. *Accordia Research Papers* 4: 5-48.

1994 A radiocarbon date-list for prehistoric Italy (ca. 46,400 BP-2450 BP/400 cal. BC. In *Radiocarbon Dating and Italian Prehistory*, edited by R. Skeates and R. Whitehouse, pp. 147-288. Accordia Research Centre, University of London.

1995 Animate objects: a biography of prehistoric 'axe-amulets'. In *Proceedings of the Prehistoric Society* 61: 279-301.

2003 Radiocarbon dating and interpretations of the Mesolithic-Neolithic transition in Italy. In *The Widening Harvest*, edited by A. Ammerman and P. Biagi, pp. 157-188. Archaeological Institute of America, Boston.

Sondaar, P.Y., and S.A. Van der Geer
2000 Mesolithic environment and animal exploitation on Cyprus and Sardinia/Corsica. In *Proceedings of the IVth ASWA Symposium, IVA*, edited by M. Mashkour, A. Choyke, and M. Buitenhuis, pp. 67-73. Paris.

Specht, J.
1981 Obsidian sources at Talasea, West New Britain, Papua New Guinea. *Journal of the Polynesian Society* 90: 337-356.

Strahm, C.
2007 L’introduction de la métallurgie en Europe. In *Le Chalcolithique et la Construction des Inégalités*, edited by J. Guilane, pp. 49-71. Errance, Paris.

Strasser, T.F., Panagopoulou, E., Runnels, C.N., Murray, P.M., Thompson, N., Karkanas, P., McCoy, F.W., and K.W. Wegmann
2010 Stone age seafaring in the Mediterranean: evidence from the Plakias Region for Lower Palaeolithic and Mesolithic habitation of Crete. *Hesperia* 79(2): 145-190.

Taramelli, A.
1918 L’officina fusoria di Ortu Commidu. *Monumenti Antichi dei Lincei* 25(2): 107-130.

Terradas, X., Gratuze, B., Bosch, J., Enrich, R., Esteve, X., Xavier Oms, F., and G. Ribé
2014 Neolithic diffusion of obsidian in the western Mediterranean: new data from Iberia. *Journal of Archaeological Science* 41: 69-78.

Tinè, S.
1961 Notize preliminari su recenti scavi nel villagio di Stentinello. *Archivo Storico Siracusano* 7: 113.

1965 Gli scavi nella Grotta della Chiusazza. *Bullettino di Paletnologia Italiana* 74: 123-287.

(ed.) 1983 *Passo di Corvo e la Civiltà Neolitica del Tavoliere*. Sagep Editrice, Genova.
1991 La valle del Lao, la Calabria e l'ossidiana nel Neolitico. *Bollettino di Archeologia* 11-12: 237-246.

Tomasi, P.
1904 L'obsidienne en Corse. *L'Homme Préhistorique* 2: 327-328.

Torrence, R. (ed.)
1989 *Time, Energy and Stone Tools*. Cambridge University Press, Cambridge.

Torrence, R., and P. Swadling
2008 Social networks and the spread of Lapita. *Antiquity* 82: 600-616.

Tozzi, C., and P. Notini
1999 L'Epigravettien Final et le Mésolithique de l'Apennin Tosco-Emilien et de la Vallee du Serchio (Toscane Septentrionale). In *L'Europe des Derniers Chasseurs*, edited by A Thévenin, pp. 483-488. Actes du 5e Colloque International UISPP. Éditions du CTHS, Paris.

Tozzi, C., and M.-C. Weiss
2001 Nouvelles données sur le Néolithique ancien de l'aire corso-toscane. *Bulletin de la Société Préhistorique Française* 98(3): 445-458.

Trump, D.H.
1966 *Central and Southern Italy Before Rome*. Thames and Hudson, London.

1982 La Grotta Filiestru, Bonu Ighinu, Mara (Sassari). In *Le Néolithique Ancien Méditerranéen, Actes du Colloque International de Préhistoire (Montpelier 1981): Archéologie en Languedoc*, pp. 327-331.

Tusa, S. (ed.)
1997 *Prima Sicilia*. Vols. 1, 2. Assessorato dei Beni Culturali, Palermo.

Tusa S., and I. Valente
1994 La ricerca archeologica in contrada Stretto-Partanna: il fossato/trincea neolitico. In *La Preistoria del Basso Belice e della Sicilia Meridionale nel Quadro della Preistoria Siciliana e Mediterranea*, edited by S. Tusa, pp. 177-195. Società Storia Patria Palermo, Palermo.

Tykot, R.H.
1992 The sources and distribution of Sardinian obsidian. In *Sardinia in the Mediterranean: A Footprint in the Sea (Studies in Sardinian Archaeology presented to M.S. Balmuth),* edited by R.H. Tykot and T.K. Andrews, pp. 57-70. Monographs in Mediterranean Archaeology 3. Sheffield Academic Press, Sheffield.

1994 Radiocarbon dating and absolute chronology in Sardinia and Corsica. In *Radiocarbon Dating and Italian Prehistory*, edited by R. Skeates and R. Whitehouse, pp. 115-145. Accordia Research Centre, University of London.

1995 *Prehistoric Trade in the Western Mediterranean: The Sources and Distribution of Sardinian Obsidian*. PhD Dissertation, Harvard University, Ann Arbor.

1996 Obsidian procurement and distribution in the central and western Mediterranean. *Journal of Mediterranean Archaeology* 9(1): 39-82.

1997 Characterization of the Monte Arci (Sardinia) obsidian sources. *Journal of Archaeological Science* 24: 467-479.

1999 Islands in the stream: stone age cultural dynamics in Sardinia and Corsica. In *Social Dynamics of the Prehistoric Central Mediterranean*, edited by R.H. Tykot, J. Morter, and J.E.Robb, pp. 67-82. Accordia Research Institute, University of London.

2002a Chemical fingerprinting and source tracing of obsidian: The Central Mediterranean trade in black gold. *Accounts of Chemical Research* 35: 618-627.

2002b New approaches to the characterization of obsidian from the Mediterranean island sources: interpreting chronological change in Neolithic Sardinia and Corsica. *Materials Research Society* 712(II 4.6): 1-15.

2003 Determining the source of lithic artifacts and reconstructing trade in the ancient world. In *Written in Stone: The Multiple Dimensions of Lithic Analysis*, edited by P.N. Kardulias & R.W. Yerkes, pp. 59-85. Lexington Books, Maryland.

2004 Neolithic exploitation and trade of obsidian in the central Mediterranean: new results and implications for cultural interaction. In *Acts of the XIVth UISPP Congress, University of Liège, Belgium, 2-8 September 2001*, pp. 25-35. BAR International Series 1303. Archaeopress, Oxford.

2007 Early Neolithic obsidian trade in Sardinia: the coastal site of Santa Caterina di Pittinuri (Cuglieri - OR). In *Preistoria e Protostoria dell'Area Tirrenica*, edited by C. Tozzi and M.C. Weiss, pp. 217-220. Felici Editore, Ghezzano.

2010 Sourcing of Sardinian obsidian collections in the Museo Preistorico-Etnografico "Luigi Pigorini" using non-destructive portable XRF. In *L'Ossidiana del Monte Arci nel Mediterraneo. Nuovi Apporti sulla Diffusio Sistemi di Produzioni e sulla loro Cronologia,* edited by C. Lugliè, pp. 85-97. NUR, Ales.

2011 Obsidian finds on fringes of the central Mediterranean: exotic or eccentric exchange. In *Exotica in the Prehistoric Mediterranean*, edited by A. Vianello, pp. 33-44. Oxbow Books, Oxford.

Tykot, R.H., Ammerman, A.J., Bernado Bréa, L., M.B., Glascock, M.D., and R.J. Speakman
2005a Source analysis and the socioeconomic role of obsidian trade in northern Italy: new data from the Middle Neolithic site of Gaione. *Geoarchaeological and Bioarchaeological Studies* 3: 103-106.

Tykot, R.H., Bass, B., and P. Della Casa
2001 *Obsidian as an indicator of prehistoric trade and interaction in the Adriatic Basin*. Paper presented at the 66th Annual Meeting of the Society for American Archaeology (SAA), April 18-22, New Orleans.

Tykot, R.H., Freund, K.P., and A. Vianello
2013 Source analysis of prehistoric obsidian artifacts in Sicily (Italy) using pXRF. In *Archaeological Chemistry VIII, ACS Symposium Series,* edited by R. Armitage, pp. 195-210. American Chemical Society, Washington, DC.

Tykot, R.H., Glascock, M.D., Speakman, R.J., and E. Atzeni
2008 Obsidian subsources utilized at sites in southern Sardinia (Italy). *Proceedings of the Materials Research Society Symposium* 1047: 175-183.

Tykot, R.H., Iovino, M.R., Martinelli, M.C., and L. Beyer
2006a Ossidiana da Lipari: le fonti, la distribuzione, la tipologia e le tracce d'usura. In *Atti del XXXIX Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria: Materie Prime e Scambi nella Preistoria Italiana*, pp. 592-597. Istituto Italiano di Preistoria e Protostoria, Firenze.

Tykot, R.H., Lai, L., and C. Tozzi
2011 Intra-site obsidian subsource patterns at Contraguda, Sardinia (Italy). In *Proceedings of the 37th International Symposium on Archaeometry*, edited by I. Turbanti-Memmi, pp. 321-327. Springer, Berlin.

Tykot, R.H., Lugliè, C., Setzer, T., Tanda, G., and R.W. Webb
2006b Surveying and excavating a prehistoric obsidian workshop in Sardinia (Italy): studying the chaîne opératoire. 71st Annual Meeting of the Society for American Archaeology, San Juan, Puerto Rico. Abstract published in *IAOS Bulletin* 35: 9.

Tykot, R.H., Setzer, T., Glascock, M.D., and R.J. Speakman
2005b Identification and characterization of the obsidian sources on the island of Palmarola, Italy. *Geoarchaeological and Bioarchaeological Studies* 3: 107-111.

Tykot, R.H., Vargo, B., Tozzi, C., and A. Ammerman
2003 Nuove analisi dei reperti di ossidiana rinvenuti nella provincia di Livorno. In *Atti del XXXV Riunione Scientifica, Le Comunità della Preistoria Italiana. Studi e Ricerche sul Neolitico e le Età dei Metalli*, pp. 1009-1112. Istituto Italiano di Preistoria e Protostoria, Firenze.

Usai, A.
1996 Gli insediamenti nuragici nelle località Muru Accas e Pidighi e la fonte nuragica "Mitza Pidighi" (Solarussa - Or). Campagne di scavo 1994-1995. *Quaderni della Soprintendenza Archeologico di Cagliari - Oristano* 13: 45-71.

2000 Nuove ricerche nell'insediamento di Nuraghe Pidighi e nella fonte nuragica "Mitza Pidighi" (Solarussa - Or). Campagne di scavo 1996-1999. *Quaderni della Soprintendenza Archeologica per le Province di Cagliari e Oristano* 17: 41-68.

2013 L'insediamento del Nuraghe Pidighi di Solarussa (OR). Scavi 1998-2008. *Quaderni* 24: 179-215.

Usai, E.
2010 Rivistazione del materiale litico dell'ipogeo di Scaba 'e Arriu di Siddi (VS): aspetti morfologici, tecnologici e considerazioni sull'utilizzo dello strumentario litico nei contesti funerari. In *L'Ossidiana del Monte Arci nel Mediterraneo. Nuovi Apporti sulla Diffusio Sistemi di Produzioni e sulla loro Cronologia,* edited by C. Lugliè, pp. 255-283. NUR, Ales.

Vacca, G.
2010 Ossidiane da Bricco del Canale, a Calasetta (CL). In *L'Ossidiana del Monte Arci nel Mediterraneo. Nuovi Apporti sulla Diffusio Sistemi di Produzioni e sulla loro Cronologia,* edited by C. Lugliè, pp. 121-134. NUR, Ales.

Valera, P.G., and R.G. Valera
2005 Outline of geology and mineral deposits of Sardinia. In *Archaeometallurgy in Sardinia from the origin to the Early Iron Age*, edited by F. Lo Schiavo, A. Giumlia-Mair, U. Sanna, and R. Valera, pp. 35-42. Monique Mergoil, Montagnac.

Vander Linden, M.
2006 For whom the bell tolls: social hierarchy vs social integration in the Bell Beaker Culture of southern France (third millennium BC). *Cambridge Archaeological Journal* 16:(3): 317-32.

Vaquer, J.
1999 Réseaux de distribution de l'obsidienne en Méditerranée centro-occidentale. In *La Pierre Taillée: Ressources, Technologie, Diffusion,* edited by F. Brois and V. Darras, pp. 29-34. Seminaire du Centre d'Anthropologie: Archives d'Écologie Préhistorique, Toulouse 1999. Archives d'Écologie Préhistorique, Toulouse.

2007 Le rôle de la zone nord-tyrrhénienne dans la diffusion de l'obsidienne en Méditerrannée nord-occidentale au Néolithique. In *Corse et Sardaigne Préhistoriques: Relations et Échanges dans le Contexte Méditerranéen, 128th Congrès National des Sociétés Historiques et Scientifiques, Bastia 2003,* edited by A. D'Anna, J. Cesari, L. Ogel, and J. Vaquer, pp. 99-119. Editions du CTHS: Documents Préhistoriques Number 22, Paris.

Vaquer, J., Geddes, D., Barbaza M., and J. Erroux
1986 Mesolithic plant exploitation at the Balma Abeurador (France). *Oxford Journal of Archaeology* 5: 1-18.

Vigliardi, A.
1980 Rapporti tra Sardegna e Toscana nell'eneolitico finale-primo bronzo: la Grotta Fontino nel Grossetano. In *Atti della XXII Riunione Scientifica dell'I.I.P.P. (1978),* pp. 247-288.

Villard, F.
1951 Megara Hyblaea: les fouilles de 1949. *Mélanges d'Archéologie et d'Histoire* 63(63): 7-52.

Vogel, N., Nomade, S., Negash, A., and P.R. Renne
2006 Forensic $^{40}Ar/^{39}Ar$ dating: a provenance study of Middle Stone Age obsidian artifacts from Ethiopia. *Journal of Archaeological Science* 33: 1749-1765.

Voza, G.
1975 Considerazioni su neolitico e sull'eneolitico in Campania. In *Atti della XVII Riunione Scientifica dell'I.I.P.P. (Firenze 1974),* pp. 51-84.

Wagner, G.A., Storzer, D., and J. Keller
1976 Spaltspurendatierung quartärer Gesteinsgläser aus dem Mittelmeerraum. *Neues Jahrbuch für Mineralogie* 2: 84-94.

Wallerstein, I.
2001 *Unthinking Social Science: The Limits of Nineteenth-century Paradigms*. Second Edition. Temple University Press, Philadelphia.

Webster, G.S.
1996 *A Prehistory of Sardinia 2300-500 B.C.* Sheffield Academic Press, Sheffield.

Weiss, M.C.
2004 Quelques réflexions à propos de l'obsidienne sarde du site corse du Néolithique ancien de A. Petra à l'Île Rousse. In *L'Ossidiana del Monte Arci nel Mediterraneo: Recupero dei Valori di un Territorio. Atti del Convegno Internazionale, Oristano e Pau, 29 Novembre - 1 Dicembre 2002*, edited by P. Castelli, B. Cauli, F. Di Gregorio, C. Lugliè, G. Tanda, and C. Usai, pp. 93-97. Tipografia Ghilarzese, Ghilarza.

Weninger, B., Alram-Stern, E., Bauer, E., Clare, L., Danzeglocke, U., Jöris, O., Kubatzki, C., Rollefson, G., Todorova, H., and T. van Andel
2006 Climate forcing due to the 8200 cal yr BP event observes at Early Neolithic sites in the eastern Mediterranean. *Quaternary Research* 66: 401-420.

White, N.M., and R.A. Weinstein
2008 The Mexican connection and the Far West of the U.S. Southeast. *American Antiquity* 73(2): 227-277.

Whitehouse, R.D.
1969 The Neolithic pottery sequence in southern Italy. *Proceedings of the Prehistoric Society* 35: 267-310.

1986 Siticulosa Apulia revisited. *Antiquity* 60(228): 36-44.

1990 Caves and cult in Neolithic southern Italy. *Accordia Research Papers* 1: 19-37.

Williams Thorpe, O., Warren, S.E., and L.H. Barfield
1979 The sources and distribution of archaeological obsidian in northern Italy. *Preistoria Alpina* 15: 73-92.

Williams Thorpe, O., Warren, S.E., and J. Courtin
1984a The distribution and sources of archaeological obsidian from southern France. *Journal of Archaeological Science* 11(2): 135-146.

Williams Thorpe, O., Warren, S.E., and J.G. Nandris
1984b The distribution and provenance of archaeological obsidian in central and eastern Europe. *Journal of Archaeological Science* 11(2): 183-212.

Zilhão, J.
2001 Radiocarbon evidence for maritime pioneer colonization at the origins of farming in West Mediterranean Europe. *Proceedings of the National Academy of Sciences* 98(24): 14180-14185.

Appendix A: Geological Overview of West Mediterranean Obsidian Sources

Lipari

While there are several obsidian subsources on the island of Lipari, only two are of archaeological importance, Gabellotto Gorge and Canneto Dentro (Figure A1; see Tykot et al. 2013). Previous studies refer to the Lipari source with specific reference to Gabellotto Gorge; however, more recent geochemical analysis has revealed the presence of two elementally distinct outcrops of archaeological importance (see Tykot et al. 2006a, 2013). Gabellotto Gorge is located on the eastern half of the island in a large gorge that cuts towards the interior of the island. Obsidian from the gorge is found as angular nodules of fist-size and larger, black or gray in color, often containing small spherulitic inclusions of quartz and feldspar. The Canneto Dentro subsource is located inland of Canneto Beach approximately 1.5 kilometers southeast of Gabellotto gorge. Obsidian from the subsource extends about 100-150 meters along a small ridge and is found intermittently as angular blocks of 10 centimeters in size and smaller.

Monte Arci

The obsidian source at Monte Arci in west-central Sardinia is often classified as a single ’source’, but researchers have identified at least nine chemically distinct outcrops (Tykot 1997), four of which are commonly reported in the literature as compositional groups, namely: SA, SB1, SB2, and SC (Figure A2).

SA and SB2 obsidians are black in color and typically transparent, although SB2 obsidian often contains phenocrysts. In contrast, SC obsidian tends to be quite opaque.

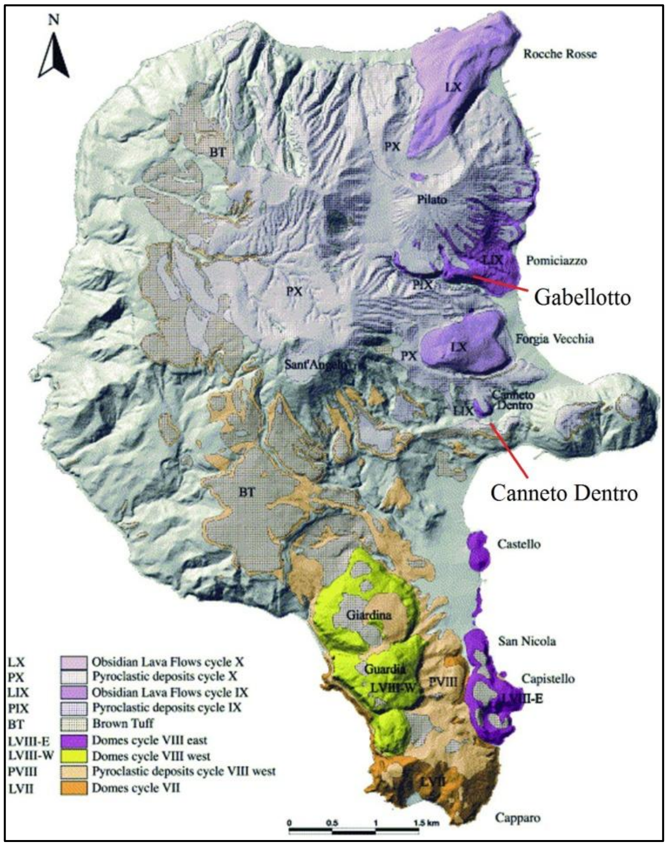

Figure A1 Geological map of the Lipari obsidian source (after Tykot et al. 2013: 198).

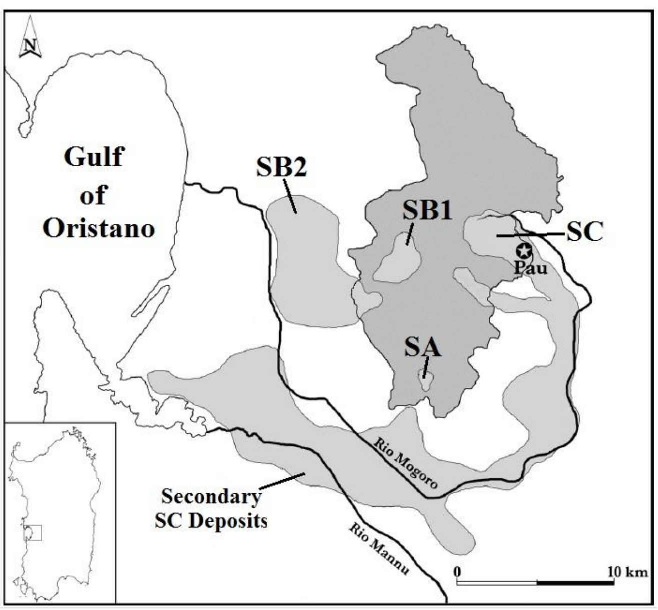

Figure A2 Geological map of the Monte Arci obsidian source on the island of Sardinia (after Lugliè et al. 2006: 1000).

SB1 obsidian usually contains a high number of phenocrystic inclusions and is the least used of the four subsources, likely due to its poor knapping quality. While geo-archaeological studies have documented the existence and exploitation of primary outcrops, secondary SC obsidian deposits have also been identified by Lugliè et al. (2006) south of the main SC conglomerate.

Palmarola

Obsidian flows are found on the northern end of Palmarola just south of Monte Tramontana and continue along the east coast south to Punta Vardella (Figure A3). While obsidians that transect the island on the northern end are spherultitic and of poor knapping quality, secondary outcrops near Punta Vardella produce fist-sized nodules of workable obsidian (Tykot et al. 2005b). These materials are black in color, vitreous, and often quite transparent (Costa 2007).

Pantelleria

While it has long been recognized that obsidian from Pantelleria was utilized by prehistoric populations in Sicily, Malta, and North Africa (see Cann and Renfrew 1964; Cornaggio-Castiglioni 1963; Hallam et al. 1976), it is only in the past 25 years that archaeologists have begun to appreciate that multiple subsources exist on the island, each with their own history of exploitation (see Francaviglia 1988; Mulazzani et al. 2010; Tykot et al. 2013). Despite the fact that Pantelleria obsidian has been recovered at 40 archaeological sites in the West Mediterranean, it is only at a few of these in which we

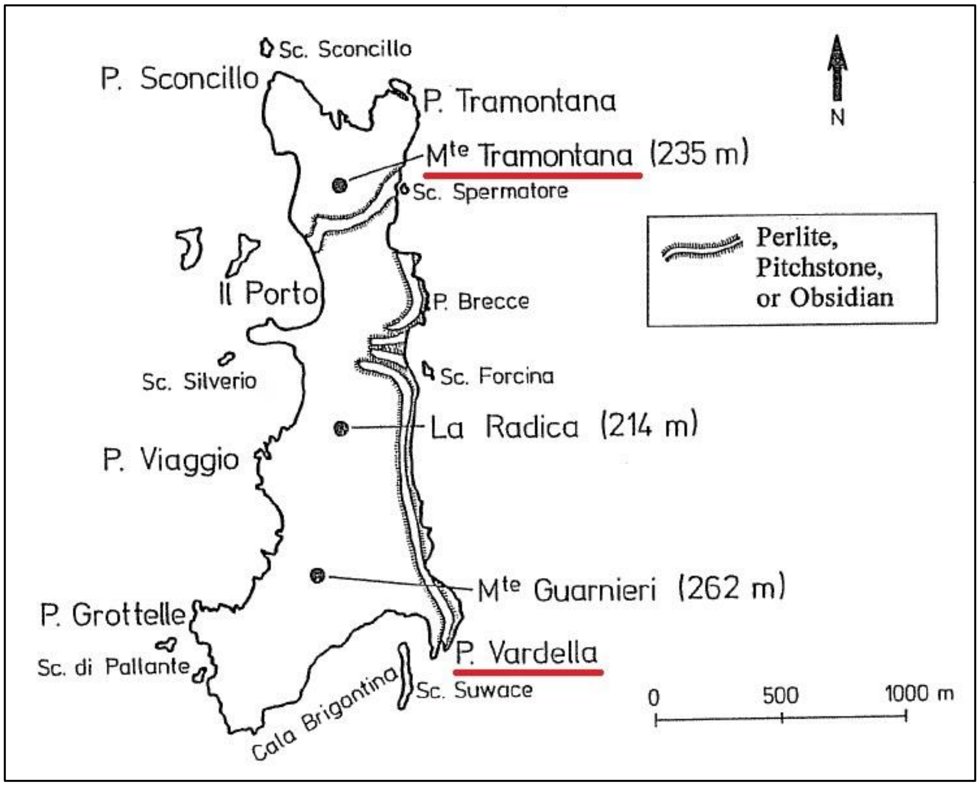

Figure A3 Geological map of the Palmarola obsidian source (after Tykot 1995: 72).

have an understanding of the exploitation of the various Pantelleria subsources. For purposes of this study, the three main subsources of Balata dei Turchi, Lago di Venere, and Gelkhamar are differentiated (Figure A4). Although raw materials from Gelkhamar can be distinguished elementally, the geological material is found in a secondary deposit that may be an extension of primary Lago di Venere products. Further geological work on the island is necessary.

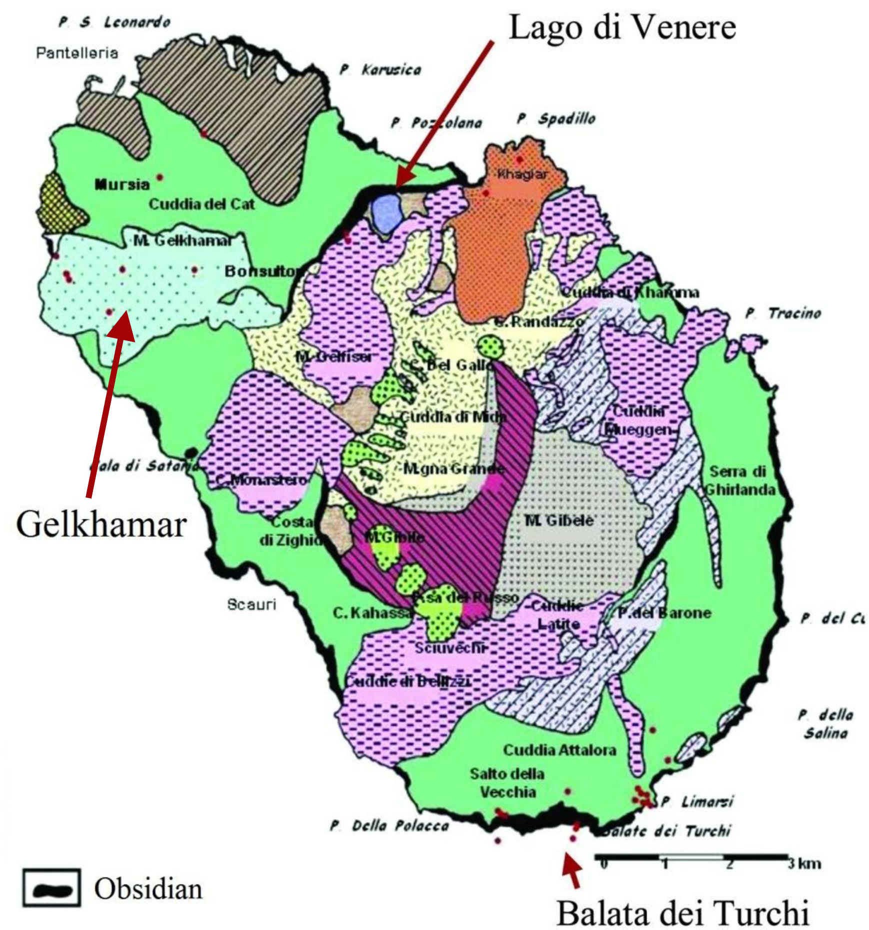

Figure A4 Geological map of the Pantelleria obsidian source (after Tykot et al. 2013: 199).

Appendix B: Obsidian Database Attributes

1. Site Name
2. Site Date by Culture (Early Neolithic, Middle Neolithic, etc.)
3. Site Date by Millennia
4. Site Type (Open Air, Burial, Cave, Unknown)
5. Culture Name
6. Number of Artifacts Analyzed
7. Technique (XRF, NAA, etc.)
8. Source Assignments
9. Artifact Types (Nodules , Cores, Core Trim, Flakes, Blades, Retouched Tools, Debris, *Piece Esquillées*)
10. Weight (g)
11. Percent Obsidian in Assemblage
12. Total Number of Pieces in Assemblage
13. Citations
14. Notes

Appendix C: Contextual Information on Sites Analyzed in Sicily

1. Butera is an Early Bronze Age site located in the territory of Butera in south-central Sicily (Panvini 1999-2000).
2. Calaforno is an open-air Stentinello period site located near the Comune di Giarratana to the west of the Irminio River (Fugazzola Delpino et al. 2004: 386; Guzzardi 1980).
3. Capo Soprano refers to an area in which unstratified obsidian artifacts were recovered along the coast, on a promontory near of the modern city of Gela.
4. Casalicchio-Agnone is an open-air Neolithic site excavated by F. Gnesotto in 1973 (Fugazzola Delpino et al. 2004: 370).
5. Castelluccio is a large Early Bronze Age settlement originally excavated by P. Orsi in the late 1800s (see Orsi 1893a). The analyzed artifact came from Tomb 9 of the associated burial complex.
6. Casteltermini is an unpublished Bronze Age site located in central Sicily approximately 20 kilometers northwest of the site of Malpasso. The analyzed material was collected from the surface.
7. Cava Canabarbara is an Early Bronze Age site located approximately 15 kilometers northwest of Megara Hyblaea along the east coast of Sicily (Tusa 1997: 636). The analyzed artifacts came from Tomb 4 of the associated burial complex.
8. Contrada Caduta is a Neolithic site located along the coast near the modern city of Licata (Tusa 1997: 630). The analyzed artifacts came from a surface collection.

9. Contrada Diana is a Late Neolithic open-air settlement on the island of Lipari, originally excavated by L. Bernabo Bréa and M. Cavalier in the 1950s (Bernabò Brea and Cavalier 1960; Fugazzola Delpino et al. 2004: 380).
10. Contrada Orto del Conte is an unpublished Early Chalcolithic site located south of Mount Etna in east-central Sicily.
11. Cozzo del Pantano is a Middle Bronze Age burial complex of about 60 tombs, originally excavated by P. Orsi in the late 1800s (Leighton 1999: 163; see Orsi 1893b). The analyzed artifact came from Tomb 16, which contained 68 skeletons.
12. Fontana di Pepe is a Stentinello period open-air settlement located in the hills of east-central Sicily to the southwest of Mount Etna (Fugazzola Delpino et al. 2004: 373).
13. Fontanazza Monte Grande Grotta 2 is a Neolithic cave sites located in the Province of Caltanissetta in central Sicily (Fugazzola Delpino et al. 2004: 370).
14. Fontanazza Monte Grande Grotta 4 is a Neolithic cave sites located in the Province of Caltanissetta in central Sicily (Fugazzola Delpino et al. 2004: 370).
15. Fontanazza Monte Grande Sommità is a Neolithic open-air site located in the Province of Caltanissetta in central Sicily (Fugazzola Delpino et al. 2004: 370).
16. Gela Manfria is an Early Bronze Age site located along the south coast of Sicily west of the modern city of Gela. The site is relatively small site when compared with contemporaneous sites such as La Muculufa and Castelluccio (Leighton 1999: 116). The analyzed blade came from the settlement while the piece of angular waste came from Tomb 2 of the associated burial complex.

17. Grotta Calafarina is a prehistoric cave site in the southeast corner of Sicily with a long history of occupation, from the Neolithic through Bronze Ages (Fugazzola Delpino et al. 2004: 389). The site was originally excavated by P. Orsi from 1897-1898 (see Orsi 1907) and later by L. Bernabò Brea from 1944-1945. The analyzed artifacts were from the Early Chalcolithic.
18. Grotta del Conzo is a prehistoric cave site excavated by S. Tinè in the 1950s. The site was occupied from the Late Neolithic through Chalcolithic (Fugazzola Delpino et al. 2004: 388), although the analyzed artifact dates to the Early Chalcolithic.
19. Grotta Corruggi is a Stentinello period cave site located in the southeastern Sicily. The site is one of the oldest cave sites in Sicily, along with Uzzo, and was also occupied during the Upper Palaeolithic and Mesolithic (Fugazzola Delpino et al. 2004: 389), although there is no evidence of pre-Neolithic obsidian exploitation.
20. Iannicu is an open-air Stentinello period site located in central Sicily (Fugazzola Delpino et al. 2004: 370).
21. Isola di Ognina refers to an unstratified collection of obsidian artifacts collected on the island of Ognina in eastern Sicily (Fugazzola Delpino et al. 2004: 388). An open-air Stentinello period site is located several hundred meters to the west on the mainland, possibly corresponding with the materials on the island.
22. La Muculufa is a large Early Bronze Age village located approximately 20 kilometers north of the mouth of the Salso River (McConnell 1992; McConnell and Bevan 1999). Based on a collection of radiocarbon dates, the site was occupied from around 2200-2100 B.C. (Holloway 1991: 24).

23. Malpasso is a Late Chalcolithic settlement located in central Sicily. Pottery from the site has become a diagnostic marker of the Late Chalcolithic (Leighton 1999: 91).
24. Matrensa is a Stentinello village located near the coast to the southwest of Grotta Corruggi (Orsi 1903).
25. Megara Hyblaea is a Stentinello village situated approximately 22 kilometers north of Syracuse to the northwest of the village of Stentinello (Orsi 1921, 1924; Villard 1951).
26. Menta is a Late Chalcolithic Malpasso facies circular tomb located near Milena in central Sicily (La Rosa 1994, 1997a: 153).
27. Mizzebbi is an open-air Neolithic site excavated by F. Privitera in 1980 and 1982 (see Privitera 1991).
28. Monte Sallia is an Early Bronze Age site located southwest of the Hyblaean Mountains in southeast Sicily (Tusa 1997: 636).
29. Palazzola Acreide refers to an area in which unstratified Neolithic obsidian artifacts were recovered approximately 100 kilometers to the east of the site of Calaforno in the vicinity of other Neolithic sites such as Grotta di Senebardo (Fugazzola Delpino et al. 2004: 389).
30. Palma di Montechiaro refers to an area in which unstratified obsidian artifacts were found on the surface near south coast of Sicily approximately 20 kilometers southeast of the modern city of Agrigento.

31. Poggio Rosso is an open-air Stentinello period site located in the Catania Plain to the southwest of Mount Etna (Fugazzola Delpino et al. 2004: 376). The site is close to the contemporaneous sites of Tre Fontane and Fontana di Pepe.
32. Ponte Olivo refers to an area in which unstratified obsidian artifacts were recovered from the surface approximately 15 kilometers northeast of the modern city of Gela (Panvini 1999-2000).
33. Rinicedda is one of the earliest Stentinello period sites in the Eolian islands, located on the island of Salina. The site was first excavated by M. Cavalier in 1989 (Bernabò Brea and Cavalier 1995) and later by M.C. Martinelli in the late 2000s.
34. Rocca Aquilia is an open-air Late Neolithic site characterized by the presence of Diana and Bellavista pottery (Fugazzola Delpino et al. 2004: 370)
35. San Martino is a prehistoric site located in northeast Sicily in the region of Spadafora. The site has two distinct phases of occupation during the Stentinello and Diana phases of the Neolithic (Quero 2012).
36. Sant'Ippolito is a Chalcolithic site located on a hill near the modern city of Catagirone. The site was originally excavated by P. Orsi in the early 1900s (see Orsi 1928).
37. Sant'Onofrio is an unpublished Chalcolithic site located along the coast of western Sicily near the modern city of Marsala. The analyzed artifacts were found on the surface.
38. Scintillia Capanna Alfa is an unpublished Early Bronze Age site located several kilometers northwest of the modern city of Agrigento.

39. Serra del Palco is an open-air Neolithic to Chalcolithic site excavated by V. La Rosa from 1981-1986 (La Rosa 1997b: 194**).**
40. Serraferlicchio is a Chalcolithic site in south-central Sicily excavated by P. Orsi and P.E. Arias in 1928 and 1937 (see Arias 1937). The painted pottery from the site has become a diagnostic marker of the Chalcolithic.
41. Stentinello is a Neolithic settlement with a long history of archaeological study (Orsi 1890, 1911; Tinè 1961) and gives its name to the period's distinctive pottery (see Scarcella et al. 2011). The site is located north of the modern-day city of Syracuse, in southeast Sicily.
42. Stretto Partanna is a prehistoric site in southwest Sicily with a long history of occupation. The artifacts from this study date to the Neolithic phases of habitation (see Tusa 1997: 630; Tusa and Valente 1994).
43. Tre Fontane is a Neolithic open-air settlement found in association with Stentinello, Serra d'Alto, and Diana ceramic wares. The site is located a few kilometers to the north of Poggio Rosso, southwest of Mount Etna (Fugazzola Delpino et al. 2004: 376).

Appendix D: List of Prehistoric West Mediterranean Sites with Obsidian

#	Site	6th	5th	4th	3rd	2nd	Tot. Ana.	LI	SA	PI	PA	Citation
1	"Eric" Survey Transect			y?			4	n	n	n	y	Tykot 1995
2	A Fuata		y				10	n	y	n	n	Le Bourdonnec et al. 2010
3	A Fuata			y	y		35	y	y	n	n	Le Bourdonnec et al. 2010; Tykot 1995
4	A Petra	y					0	n	n	n	n	Bressy et al. 2008; Weiss 2004
5	A Revellata	y					0	n	n	n	n	Costa 2006
6	A Teppa di U Lupinu		y				6	n	y	n	n	Le Bourdonnec et al. 2010
7	Abate in Baida						0	n	n	n	n	Pollmann 1993
8	Abri de Silogna						0	n	n	n	n	Pollmann 1993
9	Abri du Scorpion			y			19	n	n	n	y	Tykot 1995
10	Abri Pendimoun		y	y			0	n	n	n	n	Williams Thorpe et al. 1984a
11	Acconia 1						0	n	n	n	n	Ammerman 1985a
12	Acconia 3			y			0	n	n	n	n	Ammerman 1985a
13	Acconia 4						0	n	n	n	n	Ammerman 1985a
14	Acconia 6						0	n	n	n	n	Ammerman 1985a
15	Acconia 8			y			0	n	n	n	n	Ammerman 1985a
16	Acconia 9				y?	y?	0	n	n	n	n	Ammerman 1985a
17	Acconia 10	y	y	y			0	n	n	n	n	Ammerman 1985a
18	Acconia 11	y	y	y			0	n	n	n	n	Ammerman 1985a
19	Acconia 12	y	y				0	n	n	n	n	Ammerman 1985a
20	Acconia 13			y			0	n	n	n	n	Ammerman 1985a
21	Acconia 14			y			0	n	n	n	n	Ammerman 1985a
22	Acconia 15				y?	y?	0	n	n	n	n	Ammerman 1985a
23	Acconia 16				y?	y?	0	n	n	n	n	Ammerman 1985a
24	Acconia 17				y?	y?	0	n	n	n	n	Ammerman 1985a
25	Acconia 19						0	n	n	n	n	Ammerman 1985a
26	Acconia 20				y?	y?	0	n	n	n	n	Ammerman 1985a
27	Acconia 21				y?	y?	0	n	n	n	n	Ammerman 1985a
28	Acconia 22				y?	y?	0	n	n	n	n	Ammerman 1985a
29	Acconia 23						0	n	n	n	n	Ammerman 1985a
30	Acconia 24	y	y				0	n	n	n	n	Ammerman 1985a
31	Acconia 25	y	y	y			0	n	n	n	n	Ammerman 1985a
32	Acconia 26				y?	y?	0	n	n	n	n	Ammerman 1985a
33	Acconia 27				y?	y?	0	n	n	n	n	Ammerman 1985a
34	Acconia 28						0	n	n	n	n	Ammerman 1985a
35	Acconia 29						0	n	n	n	n	Ammerman 1985a
36	Acconia 30	y	y				0	n	n	n	n	Ammerman 1985a
37	Acconia 32						0	n	n	n	n	Ammerman 1985a
38	Acconia 37				y?	y?	0	n	n	n	n	Ammerman 1985a
39	Acconia 38						0	n	n	n	n	Ammerman 1985a
40	Acconia 39						0	n	n	n	n	Ammerman 1985a
41	Acconia 40	y	y				0	n	n	n	n	Ammerman 1985a
42	Acconia 41						0	n	n	n	n	Ammerman 1985a
43	Acconia 43						0	n	n	n	n	Ammerman 1985a
44	Acconia 46	y	y				0	n	n	n	n	Ammerman 1985a
45	Acconia 47	y	y				0	n	n	n	n	Ammerman 1985a
46	Acconia 48						0	n	n	n	n	Ammerman 1985a
47	Acconia 49						0	n	n	n	n	Ammerman 1985a
48	Acconia 50						0	n	n	n	n	Ammerman 1985a
49	Acconia 51						0	n	n	n	n	Ammerman 1985a
50	Acconia 52						0	n	n	n	n	Ammerman 1985a
51	Acconia 53						0	n	n	n	n	Ammerman 1985a

52	Acconia 54						0	n	n	n	n	Ammerman 1985a
53	Acconia 55						0	n	n	n	n	Ammerman 1985a
54	Acconia 56	y	y				0	n	n	n	n	Ammerman 1985a
55	Acconia 57	y	y	y			0	n	n	n	n	Ammerman 1985a
56	Acconia 59						0	n	n	n	n	Ammerman 1985a
57	Acconia 60				y?	y?	0	n	n	n	n	Ammerman 1985a
58	Acconia 61						0	n	n	n	n	Ammerman 1985a
59	Acconia 62						0	n	n	n	n	Ammerman 1985a
60	Acconia 63	y	y				0	n	n	n	n	Ammerman 1985a
61	Acconia 64	y	y				0	n	n	n	n	Ammerman 1985a
62	Acconia 65						0	n	n	n	n	Ammerman 1985a
63	Acconia 66						0	n	n	n	n	Ammerman 1985a
64	Acconia 67	y	y	y			0	n	n	n	n	Ammerman 1985a; Polglase 1990
65	Acconia 68	y	y	y			0	n	n	n	n	Ammerman 1985a
66	Acconia 69						0	n	n	n	n	Ammerman 1985a
67	Acconia 70						0	n	n	n	n	Ammerman 1985a
68	Acconia 71						0	n	n	n	n	Ammerman 1985a
69	Acconia 72						0	n	n	n	n	Ammerman 1985a
70	Acconia 74						0	n	n	n	n	Ammerman 1985a
71	Acconia 75						0	n	n	n	n	Ammerman 1985a
72	Acconia-Analysed	y	y				46	y	n	n	n	Ammerman 1985a; Crummett and Warren 1985; Tykot 1995
73	Acqua dei Corsari						0	n	n	n	n	Pollmann 1993
74	Agay		y	y			0	n	n	n	n	Williams Thorpe et al. 1984a
75	Agnetta-Reale						0	n	n	n	n	Pollmann 1993
76	Aïn Djantoura						0	n	n	n	n	Camps 1964; Mulazzani et al. 2010
77	Aïn Khiar						2	y	n	n	y	Camps 1974; Morel 1969; Mulazzani et al. 2010; Tykot 1995
78	Aix-en-Provence						0	n	n	n	n	Williams Thorpe et al. 1984a
79	Alba						0	n	n	n	n	Williams Thorpe et al. 1979
80	Albertini	y					0	n	n	n	n	Bressy et al. 2008; Weiss 2004
81	Alimini			y			1	y	n	n	n	Bigazzi and Radi 1998
82	Alimini B						0	n	n	n	n	Milliken and Skeates 1989
83	Alma Dannata	y					0	n	n	n	n	Mello 1983
84	Altamura						0	n	n	n	n	Pollmann 1993
85	Andria						0	n	n	n	n	Pollmann 1993
86	Apazzu						0	n	n	n	n	Pollmann 1993
87	Araguina-Sennola	y					0	n	n	n	n	Costa 2006; de Lanfranchi and Weiss 1972; Vaquer 2007
88	Araguina-Sennola			y			0	n	n	n	n	Costa 2006; Le Bourdonnec et al. 2010; Vaquer 2007
89	Arasu						0	n	n	n	n	Pollmann 1993
90	Arene Candide			y			3	y	y	n	n	Ammerman and Polglase 1993; Cornaggia Castiglioni et al. 1962-1963; Williams Thorpe et al. 1979; Vaquer 2007
91	Arene Candide		y				21	y	y	y	n	Ammerman and Polglase 1993; Cornaggia Castiglioni

												et al. 1962-1963; Williams Thorpe et al. 1979; Vaquer 2007
92	Arene Candide	y					29	n	y	y	n	Ammerman and Polglase 1993; Cornaggia Castiglioni et al. 1962-1963; Hallam et al. 1976; Williams Thorpe et al. 1979
93	Arenella	y	y				1	y	n	n	n	Hallam et al. 1976
94	Argentano		y				1	y	n	n	n	Longworth and Warren 1979
95	Arma dello Stefanin						0	n	n	n	n	Leale Anfossi 1972; Tinè 1991
96	Arma di Nasino						0	n	n	n	n	Binder and Courtin 1994; Leale Anfossi 1974
97	Arma di Nasino	y	y				0	n	n	n	n	Courtin 1967; Guilane and Vaquer 1994; Williams Thorpe et al. 1979
98	Arno						0	n	n	n	n	Pollmann 1993
99	Auriac		y	y			1	n	y	n	n	Crisci et al. 1994; Guilane and Vaquer 1994
100	Aussières		y	y			0	n	n	n	n	Guilane and Vaquer 1994; Williams Thorpe et al. 1984a
101	Avella			y			6	y	n	y	n	Bigazzi and Radi 1998
102	Bagaladi						0	n	n	n	n	Pollmann 1993
103	Balchidia						0	n	n	n	n	Pollmann 1993
104	Barbusi			y			11	n	y	n	n	Michels et al. 1984; Tykot 1992, 1995
105	Barbuzzi						0	n	n	n	n	Pollmann 1993
106	Bari						1	y	n	n	n	Reported by Hallam et al. 1976
107	Baselice	y	y	y			0	y	n	n	n	Farr 2007
108	Basi	y					72	n	y	n	n	Bressy et al. 2008; Costa 2006, 2007; Tykot 1995, 1996
109	Basi			y			267	n	y	n	n	Costa 2006; Crisci et al. 1994; Hallam et al. 1976; Le Bourdonnec et al. 2010; Tykot 1995, 1996
110	Batteria-Circeo		y				1	n	n	y	n	Hallam et al. 1976
111	Batteries-Basses		y	y			1	n	y	n	n	Poupeau et al. 2000
112	Bau Angius	y					0	n	y	n	n	Luglié 2003a, 2004
113	Bazzano						0	n	n	n	n	Williams Thorpe et al. 1979
114	Bazzarola		y				14	y	y	n	n	De Francesco et al. 2012
115	Beaulieu						0	n	n	n	n	Binder and Courtin 1994; Williams Thorpe et al. 1984a
116	Beaumajour		y	y			5	n	y	n	n	Crisci et al. 1994; Williams Thorpe et al. 1984a
117	Beauvallon		y	y			4	n	n	n	n	Crisci et al. 1994; Pollmann 1993; Williams Thorpe et al. 1984a
118	Bellavista						0	n	n	n	n	Pollmann 1993
119	Bellori						0	n	n	n	n	Tykot 1995; Williams Thorpe et al. 1979

120	Benedettu						0	n	n	n	n	Pollmann 1993
121	Benifizio			y			2	y	n	n	n	De Francesco et al. 2012
122	Bersaglio						0	n	n	n	n	Pollmann 1993
123	Bertarina di Vecchiazzano					y?	0	n	n	n	n	Malavolti 1948; Williams Thorpe et al. 1979
124	Betalova Spodmola						0	n	n	n	n	Pollmann 1993
125	Bevilacqua	y					6	y	n	n	n	Ammerman et al. 1990
126	Bigeni						0	n	n	n	n	Pollmann 1993
127	Bingia 'e Monti					y	136	n	y	n	n	This work
128	Bingia 'e Monti				y		146	n	y	n	n	This work; Freund 2014
129	Bisceglie						0	n	n	n	n	Pollmann 1993
130	Bizerte 1						2	y	n	n	y	Camps 1964; Crummett and Warren 1985; Tykot 1995
131	Bizerte 2						0	n	n	n	n	Pollmann 1993
132	Blayac						0	n	n	n	n	Guilane and Vaquer 1994
133	Bobila Madurell			y			2	n	y	n	n	Terradas et al. 2014
134	Bobila Padro						1	n	y	n	n	Muñoz 1965; Courtin 1967; Guilane and Vaquer 1994; Terradas et al. 2014; Tykot 2011; Williams Thorpe et al. 1984a
135	Bonifacio Sud						0	n	n	n	n	Dini 2007
136	Bonnefont		y	y			0	n	n	n	n	Binder and Courtin 1994; Courtin 1967; Williams Thorpe et al. 1984a
137	Borgo Sant'Angelo						0	n	n	n	n	Pollmann 1993
138	Boschetto						0	n	n	n	n	Pollmann 1993
139	Bosco Amatello						0	n	n	n	n	Pollmann 1993
140	Botro ai Marmi						0	n	n	n	n	Pollmann 1993
141	Botteghelle			y			5	y	n	y	n	De Francesco et al. 2012
142	Brellinga		y	y			0	n	n	n	n	Pollmann 1993
143	Bribir						0	n	n	n	n	Pollmann 1993
144	Bricco del Canale	y					0	n	y	n	n	Vacca 2010
145	Brunku s'Omu					y	0	n	y	n	n	Locci 2005
146	Buca delle Fate Sud				y?		0	n	n	n	n	Williams Thorpe et al. 1979
147	Buca di S. Antimo						0	n	n	n	n	Pollmann 1993
148	Buffa 2						0	n	n	n	n	Pollmann 1993
149	Bufua III			y			0	n	n	n	n	Bressy et al. 2008; Le Bourdonnec et al. 2010
150	Bulgaredo						0	n	n	n	n	Pollmann 1993
151	Buon Cammino		y				12	n	y	n	n	Michels et al. 1984; Tykot 1992, 1995
152	Butera					y	1	y	n	n	n	This work
153	Buthrotum						0	n	n	n	n	Pollmann 1993
154	Butte Nord du Stagnolu						0	n	n	n	n	Pollmann 1993
155	Caccamo						0	n	n	n	n	Pollmann 1993
156	Caccia al Piano						2	n	y	n	n	Tykot et al. 2003
157	Cala Barbarina						0	n	n	n	n	Pollmann 1993
158	Cala dei Inglesi						0	n	n	n	n	Pollmann 1993
159	Cala di Greco						0	n	n	n	n	Pollmann 1993
160	Cala di Lazarina						0	n	n	n	n	Pollmann 1993
161	Cala di Tramontana						0	n	n	n	n	Cornaggia Castiglioni

												et al. 1962-1963; Forenbaher 2009; Pollmann 1993
162	Cala Giovanna	y	y				213	y	y	y	n	Bigazzi et al. 2005; De Francesco and Bocci 2007; De Francesco et al. 2000; Radi and Bovenzi 2007; Serradimigni 2007
163	Cala Pisana	y	y				8	n	n	n	y	Arias-Radi et al. 1972; Pollmann 1993; Tykot 1995
164	Cala Villamarina		y				114	n	y	n	n	Tykot 1995
165	Calabro						0	n	n	n	n	Pollmann 1993
166	Calaforno	y	y				9	y	n	n	n	This work; Guzzardi 1980
167	Calarelli				y		0	n	n	n	n	Le Bourdonnec et al. 2010
168	Calcara						0	n	n	n	n	Buchner 1949
169	Calopinace						0	n	n	n	n	Pollmann 1993
170	Camerata						0	n	n	n	n	Pollmann 1993
171	Camp Puget						0	n	n	n	n	Pollmann 1993
172	Campi al Capoluogo						0	n	n	n	n	Pollmann 1993
173	Campi di Pietra all'Altare						0	n	n	n	n	Pollmann 1993
174	Campi Latini	y					4	y	n	n	n	Arias et al. 1984, 1986; Bigazzi et al. 1992; Bigazzi and Radi 1998
175	Camplan		y	y			1	n	y	n	n	Crisci et al. 1994; Williams Thorpe et al. 1984a
176	Campo a Poggio Polveriera						0	n	n	n	n	Pollmann 1993
177	Campo Balano		y				0	n	n	n	n	Vaquer 2007; Williams Thorpe et al. 1979
178	Campo Belmonte Cesario						0	n	n	n	n	Pollmann 1993
179	Campo Belmonte Domenico			y			0	n	n	n	n	Milliken and Skeates 1989
180	Campo Fave e Valle Melo						0	n	n	n	n	Pollmann 1993
181	Campo Mezzomonte						1	n	n	y	n	Hallam et al. 1976
182	Campo Pegoroni		y				0	n	n	n	n	Pollmann 1993; Vaquer 2007
183	Can Tintorer á Gavá		y	y			1	n	y	n	n	Bosch et al. 2010; Terradas et al. 2014; Vaquer 2007
184	Canale Reale						0	n	n	n	n	Pollmann 1993
185	Canale Samari	y					0	n	n	n	n	Pessina and Radi 2006
186	Cannatello						0	n	n	n	n	Pollmann 1993
187	Canosa						0	n	n	n	n	Pollmann 1993
188	Cantoniera Frumini				y		20	n	y	n	n	Tykot 1995, 2010
189	Cap Corse						0	n	n	n	n	Magdeleine 1995
190	Cap Gros						0	n	n	n	n	Pollmann 1993
191	Capdenac-le Haut			y			0	n	n	n	n	Williams Thorpe et al. 1984a
192	Capo Alfiere	y	y				0	n	n	n	n	Bietti Sestieri 1980; Farr 2007; Malone 2003; Vaquer 2007
193	Capo di Bove						0	n	n	n	n	Pollmann 1993
194	Capo d'Uomo						0	n	n	n	n	Pollmann 1993
195	Capo Graziano			y			0	n	n	n	n	Leighton 1999

196	Capo la Timpa						0	n	n	n	n	Pollmann 1993
197	Capo Pertusato						2	n	y	n	n	Crisci et al. 1994; Tykot 1995
198	Capo Soprano						1	y	n	n	n	This work
199	Capoliveri						0	n	n	n	n	Pollmann 1993
200	Capon B		y	y			0	n	n	n	n	Binder and Courtin 1994
201	Caporciano	y					0	n	n	n	n	Farr 2007
202	Carcassone						0	n	n	n	n	Guilane and Vaquer 1994
203	Carcù			y			1	n	y	n	n	Crisci et al. 1994; Le Bourdonnec et al. 2010
204	Cardiccioli						0	n	n	n	n	Pollmann 1993
205	Carini						0	n	n	n	n	Pollmann 1993
206	Carpignano Salentino		y				7	y	n	n	n	Quarta et al. 2011; Pessina and Radi 2006
207	Carruba						0	n	n	n	n	Pollmann 1993
208	Cas. Imperati						0	n	n	n	n	Pollmann 1993
209	Casa Bianca			y	y		1	n	y	n	n	Sammartino 2007; Tykot et al. 2003
210	Casa Carletti						0	n	n	n	n	Pollmann 1993
211	Casa dell'Isola	y	y				6	n	y	n	n	De Francesco et al. 2011
212	Casa Querciola	y					20	n	y	n	n	Bigazzi et al. 2005; Farr 2007; Tykot et al. 2003
213	Casa Rossa						0	n	n	n	n	Pollmann 1993
214	Casa Rossa di Torre Testa	y					3	y	n	n	n	Arias et al. 1984; Bigazzi and Radi 1998
215	Casa S. Paolo						0	n	n	n	n	Pollmann 1993
216	Casalaccio-Quota 77						0	n	n	n	n	Pollmann 1993
217	Casale De Luca 5						0	n	n	n	n	Pollmann 1993
218	Casale di Monte Salario						0	n	n	n	n	Pollmann 1993
219	Casale Torre Spaccata 18						0	n	n	n	n	Pollmann 1993
220	Casali						0	n	n	n	n	Pollmann 1993
221	Casalicchio-Agnone						77	y	n	n	y	This work
222	Casalorda						0	n	n	n	n	Pollmann 1993
223	Casatico di Marcaria		y				0	n	n	n	n	Williams Thorpe et al. 1979
224	Case S. Antonio						0	n	n	n	n	Pollmann 1993
225	Casella						0	n	n	n	n	Pollmann 1993
226	Casino S. Matteo						0	n	n	n	n	Pollmann 1993
227	Casone		y				2	n	n	y	n	Reported by Hallam et al. 1976; Pollmann 1993
228	Cassibile						0	n	n	n	n	Pollmann 1993
229	Castagna						0	n	n	n	n	Pollmann 1993
230	Castellaccio di Imola						0	n	n	n	n	Pessina and Radi 2006
231	Castell'Araldo						0	n	n	n	n	Pollmann 1993
232	Castellare						0	n	n	n	n	Pollmann 1993
233	Castellari						0	n	n	n	n	Pollmann 1993
234	Castellaro Vecchio	y	y				9	y	n	n	n	Cann and Renfrew 1964; David 1958-1959; Hallam et al. 1976; Longworth and Warren 1979
235	Castellet		y	y			0	n	n	n	n	Binder and Courtin 1994
236	Castelllazo						0	n	n	n	n	Pollmann 1993
237	Castello dei Bigini						0	n	n	n	n	Pollmann 1993

238	Castello del Balio						0	n	n	n	n	Pollmann 1993
239	Castellu de Capula						0	n	n	n	n	Pollmann 1993
240	Castellu de Marze						0	n	n	n	n	Pollmann 1993
241	Castelluccio					y	1	y	n	n	n	This work
242	Castelluccio di Sora						0	n	n	n	n	Pollmann 1993
243	Castellucio						0	n	n	n	n	Pollmann 1993
244	Castelluzzo						0	n	n	n	n	Pollmann 1993
245	Casteltermini					y	35	y	n	n	n	This work
246	Castetto					y	0	n	n	n	n	Pollmann 1993
247	Castidacciu						0	n	n	n	n	Pollmann 1993
248	Castiglione						2	n	y	y	n	Bigazzi et al. 2005; De Francesco et al. 2012; Salotti et al. 2000; Vaquer 2007
249	Catignano		y				97	y	n	y	n	Arias et al. 1984; Arias-Radi et al. 1972; Bigazzi and Radi 1981, 1998; De Francesco and Crisci 2003; De Francesco et al. 2006a
250	Caucade		y				2	y	y	n	n	Binder and Courtin 1994; Crisci et al. 1994; Tykot 1995; Williams Thorpe et al. 1984a
251	Cauria			y	y		0	n	n	n	n	Costa 2006; Le Bourdonnec et al. 2010
252	Cava Canabarbara					y	10	y	n	n	n	This work
253	Cava Cuoghi						0	n	n	n	n	Pollmann 1993
254	Cava Nuova		y?				3	y	n	n	n	Longworth and Warren 1979; Williams Thorpe et al. 1979, 1984b; Vaquer 2007
255	Cavaroz						0	n	n	n	n	Pollmann 1993
256	Cave di Casella						0	n	n	n	n	Pollmann 1993
257	Cave Mastrodon						0	n	n	n	n	Pollmann 1993
258	Caverna dell'Aqua o Anime						0	n	n	n	n	Pessina and Radi 2006
259	Caverna dell'Erba		y				0	n	n	n	n	Frangipane 1975; Whitehouse 1969
260	Caverna di Lazzaro						0	n	n	n	n	Pollmann 1993
261	Caverna di Montecelio					y?	0	n	n	n	n	Pollmann 1993
262	Cefalu						0	n	n	n	n	Pollmann 1993
263	Cellino S. Marco						0	n	n	n	n	Pollmann 1993
264	Cellitto		y				0	n	n	n	n	Pollmann 1993
265	Čepić		y	y			1	y	n	n	n	Farr 2007
266	Cetrangolo						0	n	n	n	n	Pollmann 1993
267	Chabert						1	y	n	n	n	Crisci et al. 1994; Guilane and Vaquer 1994
268	Chemin de Vallicone						0	n	n	n	n	Pollmann 1993
269	Chiarentana			y	y		29	y	y	y	n	Bigazzi and Radi 1998, 2003; De Francesco et al. 2006a; Vaquer 2007
270	Chidro 2						0	n	n	n	n	Pollmann 1993
271	Chiesa della Madonna Rosario						0	n	n	n	n	Pollmann 1993
272	Chiomonte la Maddalena			y			0	n	n	n	n	Vaquer 2007
273	Chiozza		y				2	y	n	n	n	Bagolini 1972; Costa 2007; Williams

												Thorpe et al. 1979
274	Chirospilia-Grotte						0	n	n	n	n	Pollmann 1993
275	Chiusa della Mammolessa						0	n	n	n	n	Pollmann 1993
276	Ciano d'Enza Luceria						0	n	n	n	n	Pollmann 1993
277	Cimino						0	n	n	n	n	Pollmann 1993
278	Cimitiero Nuovo						0	n	n	n	n	Pollmann 1993
279	Cirendinu 1		y	y			0	n	n	n	n	Pollmann 1993
280	Cirendinu 2		y	y			0	n	n	n	n	Pollmann 1993
281	Cirendinu 3						0	n	n	n	n	Pollmann 1993
282	Cisterna di Latina						0	n	n	n	n	Pollmann 1993
283	Citara						0	n	n	n	n	Pollmann 1993
284	Citta di Pantelleria						2	n	n	n	y	Hallam et al. 1976
285	Clariana				y		0	n	n	n	n	Massanet 2004
286	Codata delle Macine						0	n	n	n	n	Pollmann 1993
287	Coddu is Abbionis	y					4	n	y	n	n	Carboni and Lugliè 2010; Lugliè 1999; Lugliè et al. 2007; Meloni et al. 2004
288	Coffre de Poggiareale 1						0	n	n	n	n	Pollmann 1993
289	Coffres de Basi			y			1	n	y	n	n	Hallam et al. 1976
290	Coffres de Tivulaghju					y	2	n	y	n	n	Pollmann 1993
291	Coffres de Vasculacciu					y	0	n	n	n	n	Pollmann 1993
292	Coffres de Vasculacciu SW						0	n	n	n	n	Pollmann 1993
293	Col des Tourrettes						0	n	n	n	n	Pollmann 1993
294	Colle Cera	y	y				53	y	n	y	n	Barca et al. 2008
295	Colle del Macchione						0	n	n	n	n	Pollmann 1993
296	Colle del Telegrafo						0	n	n	n	n	Pollmann 1993
297	Colle S. Angeletto						0	n	n	n	n	Pollmann 1993
298	Colle Santo Stefano	y					28	y	n	y	n	Bietti et al. 2004; Bigazzi et al. 2005; Bigazzi and Radi 1998, 2003; Pessina and Radi 2006; Radi and Danese 2003
299	Collina di Moncisterno						0	n	n	n	n	Pollmann 1993
300	Coltano	y					3	y	n	y	n	Bigazzi and Radi 1998; Grifoni Cremonesi 1975-1976; Radi and Bovenzi 2007
301	Compolaggia						0	n	n	n	n	Pollmann 1993
302	Conca alla Favara Grande						0	n	n	n	n	Pollmann 1993
303	Conca Illonis			y			5	n	y	n	n	Hallam et al. 1976; Mackey and Warren 1983
304	Condom						0	n	n	n	n	Williams Thorpe et al. 1984a
305	Congliera						0	n	n	n	n	Pollmann 1993
306	Contrada Caduta						51	y	n	n	y	This work
307	Contrada Cimilla						0	n	n	n	n	Pollmann 1993
308	Contrada Diana			y			54	y	n	n	n	This work
309	Contrada Khaddiuggia						0	n	n	n	n	Pollmann 1993
310	Contrada Mursia					y	93	n	n	n	y	Arias et al. 1984, 1986; Arias-Radi et al. 1972; Bigazzi et al. 1986; Bigazzi and Radi 1998; Duttine et al. 2003; Francaviglia 1988; Hallam et al. 1976; Tykot 1995
311	Contrada Orto del Conte				y		70	y	n	n	n	This work

312	Contrada Roncone						0	n	n	n	n	Pollmann 1993
313	Contrada Suachi						0	n	n	n	n	Pollmann 1993
314	Contrada Zuebe						0	n	n	n	n	Pollmann 1993
315	Contraguda		y	y			412	n	y	n	n	Costa and Pélegrin 2004; Lai et al. 2006; Tykot et al. 2011
316	Coppa d'Ovidio						0	n	n	n	n	Pollmann 1993
317	Coppetella di Jesi			y			5	y	n	n	n	De Francesco et al. 2012; Pollmann 1993
318	Corte Auda			y			9	n	y	n	n	Tykot 1995
319	Costa delle Olive						0	n	n	n	n	Pollmann 1993
320	Costa di U Monte		y	y	y		50	n	y	n	n	Le Bourdonnec et al. 2010; Marini et al. 2007
321	Coste del Noce						0	n	n	n	n	Pollmann 1993
322	Cotura						0	n	n	n	n	Pollmann 1993
323	Cozza Torta						0	n	n	n	n	Pollmann 1993
324	Cozzo Busoné						0	n	n	n	n	Pollmann 1993
325	Cozzo del Pantano					y	1	y	n	n	n	This work
326	Cozzo di Quadararu						0	n	n	n	n	Pollmann 1993
327	Crabi						1	n	y	n	n	Cann and Renfrew 1964; Hallam et al. 1976
328	Craviole Paderi			y	y		0	n	n	n	n	Cappai et al. 2004
329	Crostoletto di Lamone						0	n	n	n	n	Pollmann 1993
330	Cuba-Muglia						0	n	n	n	n	Pollmann 1993
331	Cuccuru Craboni					y	13	n	y	n	n	Michels et al. 1984; Tykot 1992, 1995
332	Cuccuru Ibba			y			29	n	y	n	n	Tykot et al. 2008
333	Cucurru Nuraxi					y	3	n	y	n	n	Michels et al. 1984; Tykot 1995
334	Cucuruzzu						0	n	n	n	n	Pollmann 1993
335	Curacchiaghiu			y			7	n	y	n	n	Costa 2006; Hallam et al. 1976; de Lanfranchi 1987; Le Bourdonnec et al. 2010; Tykot 1995
336	Curacchiaghiu	y					5	n	y	n	n	Costa 2006; Hallam et al. 1976; de Lanfranchi 1987
337	Danilo Bitinj		y				0	n	n	n	n	Martinelli 1990; Tykot 2011
338	Debelo Brdo						0	n	n	n	n	Pollmann 1993
339	Di Nardo						0	n	n	n	n	Pollmann 1993
340	Djebel ed Dib 1						32	n	n	n	y	Camps 1964, 1974; Mulazzani et al. 2010
341	Djebel ed Dib 2						0	n	n	n	n	Pollmann 1993
342	Dolina Monrupino/Fernetta		y?				0	n	n	n	n	Farr 2007
343	Dolmen 2 de San Sebastien				y		2	n	n	n	y	Crisci et al. 1994; Williams Thorpe et al. 1984a
344	Dolmen de Cardiccia			y			68	n	y	n	n	Costa 2006; Le Bourdonnec et al. 2010; Tykot 1995, 1996
345	Dolmen de Silogna						0	n	n	n	n	Pollmann 1993
346	Domus de Janus Triarzu						20	n	y	n	n	Tykot 1995, 2010
347	Donatelli di Genga			y			2	y	n	n	n	De Francesco et al. 2012
348	Doukanet el Koutifa	y	y				2	n	n	n	y	Mulazzani et al. 2010
349	Duos Nuraghes					y	242	n	y	n	n	Freund and Tykot 2011
350	Eboulis Sud-Est						0	n	n	n	n	Pollmann 1993
351	Faraglioni						0	n	n	n	n	Pollmann 1993

352	Fattoria Terrarossa						0	n	n	n	n	Pollmann 1993
353	Favella della Corte	y					9	y	n	n	n	Gratuze and Boucetta 2009; Tinè 1991; Vaquer 2007
354	Feniki						0	n	n	n	n	Pollmann 1993
355	Ferraiulo						0	n	n	n	n	Pollmann 1993
356	Ferrari						0	n	n	n	n	Pollmann 1993
357	Fico						0	n	n	n	n	Pollmann 1993
358	Filitosa	y					5	n	y	n	n	Atzeni 1966; Cornaggia Castiglioni et al. 1962-1963; Tykot 1995
359	Filozingaro						0	n	n	n	n	Pollmann 1993
360	Fiuggi						0	n	n	n	n	Pollmann 1993
361	Foce 1			y			1	n	y	n	n	Le Bourdonnec et al. 2011; Pollmann 1993
362	Foce 2			y			0	n	n	n	n	Pollmann 1993
363	Foce del Torrente Romandato						0	n	n	n	n	Pollmann 1993
364	Fond de Cabane B						0	n	n	n	n	Pollmann 1993
365	Fondo Bragazza						0	n	n	n	n	Pollmann 1993
366	Fondo Santo e Corte Casotta						0	n	n	n	n	Pollmann 1993
367	Fontana Adogna 81						0	n	n	n	n	Pollmann 1993
368	Fontana di Pepe	y	y				4	y	n	n	n	This work
369	Fontana S. Paolo						0	n	n	n	n	Pollmann 1993
370	Fontanaccio						0	n	n	n	n	Pollmann 1993
371	Fontanarosa Ferrara						0	n	n	n	n	Pollmann 1993
372	Fontanazza Monte Grande Grotta 2						1	y	n	n	n	This work; La Rosa et al. 2006
373	Fontanazza Monte Grande Grotta 4						36	y	n	n	y	This work; La Rosa et al. 2006
374	Fontanazza Monte Grande Sommitá						14	n	n	n	n	This work; La Rosa et al. 2006
375	Fontanelle	y					4	y	n	n	n	Arias et al. 1986; Bigazzi et al. 1992; Bigazzi and Radi 1998
376	Fontbrégoua			y			0	n	n	n	n	Binder and Courtin 1994
377	Fonte di Lucullo						0	n	n	n	n	Pollmann 1993
378	Fontenoce di Recanati		y				1	y	n	n	n	De Francesco et al. 2012
379	Fonti Rossi	y					0	n	n	n	n	Radi and Bovenzi 2007
380	Font-Marthe		y	y			3	y	y	n	n	Hallam et al. 1976; Longworth and Warren 1979; Williams Thorpe et al. 1984a
381	Forcatella						0	n	n	n	n	Pollmann 1993
382	Foresta						0	n	n	n	n	Pollmann 1993
383	Forgia Vecchia						0	n	n	n	n	Pollmann 1993
384	Fornace Cappuccini	y					18	y	n	y	n	Bigazzi et al. 1992, 2005; Bigazzi and Radi 1998, 2003; Pessina and Radi 2006
385	Fornace Grandi á Bondeno			y			0	n	n	n	n	Pessina and Radi 2006; Vaquer 2007
386	Fossacesia			y			42	y	n	y	y	Arias-Radi et al. 1972; Bigazzi and Bonadonna 1973; Bigazzi et al. 2005; Bigazzi and Radi 1998, 2003; De

												Francesco et al. 2006a; Pessina and Radi 2006
387	Fosso del Pino						0	n	n	n	n	Pollmann 1993
388	Fosso della Torre 10						0	n	n	n	n	Pollmann 1993
389	Francavilla Fontana						0	n	n	n	n	Pollmann 1993
390	Funtana o Funacu						0	n	n	n	n	Pollmann 1993
391	Gabbra						0	n	n	n	n	Malavolti 1953
392	Gaione		y				94	y	y	y	n	Ammerman et al. 1990; Polglase 1990; Tykot 1995; Tykot et al. 2005a
393	Gallina						0	n	n	n	n	Pollmann 1993
394	Ganzirri						0	n	n	n	n	Pollmann 1993
395	Garrigues						0	n	n	n	n	Courtin 1967; Williams Thorpe et al. 1984a
396	Garrufo						0	n	n	n	n	Pollmann 1993
397	Gaudo				y		0	n	n	n	n	Voza 1975
398	Gela Manfria					y	2	y	n	n	n	This work
399	Giammarinaro						0	n	n	n	n	Pollmann 1993
400	Giardini di Renda						0	n	n	n	n	Pollmann 1993
401	Gioia del Colle						0	n	n	n	n	Pollmann 1993
402	Giribaldi		y				11	y	n	n	n	Binder and Courtin 1994; Costa 2007; Crisci et al. 1994; Phillips 1992; Tykot 1996
403	Gorgoglione						0	n	n	n	n	Mello 1983
404	Grapceva Špilja						0	n	n	n	n	Farr 2007
405	Gravina di Picciano						2	y	n	n	n	Arias et al. 1984
406	Gribaia			y			3	n	y	n	n	Mackey and Warren 1983; Tykot 1995
407	Grossa						0	n	n	n	n	Pollmann 1993
408	Grotta 1 di Latronico			y			2	y	n	n	n	Arias et al. 1984; Bigazzi and Radi 1981, 1998; Whitehouse 1990
409	Grotta 2 di Latronico						0	n	n	n	n	Pollmann 1993
410	Grotta 3 di Latronico						0	n	n	n	n	Vaquer 2007
411	Grotta all'Onda			y			37	n	y	n	n	Bigazzi and Radi 1998; Cornaggia Castiglioni et al. 1962-1963; De Francesco et al. 2002; Vaquer 2007
412	Grotta Bella	y					2	y	n	n	n	Hallam et al. 1976
413	Grotta Cala Giovanni						0	n	n	n	n	Pollmann 1993
414	Grotta Calafarina				y		9	y	n	n	n	This work
415	Grotta Campu du Consule						0	n	n	n	n	Pollmann 1993
416	Grotta Capitano						0	n	n	n	n	Pollmann 1993
417	Grotta Caprara						0	n	n	n	n	Pollmann 1993
418	Grotta Cipolliane						0	n	n	n	n	Pollmann 1993
419	Grotta Cola 2						0	n	n	n	n	Pollmann 1993
420	Grotta Corbeddu	y					0	n	n	n	n	Phillips 1992
421	Grotta Crollata						0	n	n	n	n	Pollmann 1993
422	Grotta degli Zingari						1	y	n	n	n	Williams Thorpe et al. 1979, 1984b
423	Grotta dei Chiusilla						0	n	n	n	n	Pollmann 1993
424	Grotta dei Diavoli						0	n	n	n	n	Pollmann 1993
425	Grotta dei Muracci						0	n	n	n	n	Pollmann 1993
426	Grotta dei Piccioni			y			2	y	n	n	n	Arias et al. 1984; Bigazzi and Radi

												1998; Cornaggia Castiglioni et al. 1962-1963; Pessina and Radi 2006; Whitehouse 1990
427	Grotta dei Pipistrelli						1	y	n	n	n	Arias et al. 1984; Bigazzi and Radi 1998; Hallam et al. 1976; Pollmann 1993
428	Grotta dei Puntali						0	n	n	n	n	Pollmann 1993
429	Grotta del Beato Benincasa						3	n	y	n	n	Arias et al. 1984; Bigazzi et al. 1986; Bigazzi and Radi 1981; Vaquer 2007
430	Grotta del Brigante						0	n	n	n	n	Pollmann 1993
431	Grotta del Conzo				y		1	y	n	n	n	This work
432	Grotta del Diavolo						0	n	n	n	n	Peet 1909
433	Grotta del Drago						0	n	n	n	n	Pollmann 1993
434	Grotta del Fico			y			0	n	n	n	n	Frangipane 1975; Pollmann 1993
435	Grotta del Fontino				y		1	n	y	n	n	Arias et al. 1984, 1986; Bigazzi and Radi 1981, 1998; Viggliardi 1980
436	Grotta del Leone			y	y		10	y	y	y	n	Arias et al. 1984; Bigazzi et al. 1986; Bigazzi and Radi 1981, 1998; Williams Thorpe et al. 1979; Vaquer 2007
437	Grotta del Noglio						0	n	n	n	n	Vaquer 1999, 2007
438	Grotta del Romito		y				1	y	n	n	n	Mello 1983; Tykot 1995
439	Grotta del Vannaro		y	y			0	n	n	n	n	Cazzella and Moscoloni 1976
440	Grotta del Vecchiuzza			y	y		0	n	n	n	n	Pollmann 1993
441	Grotta del Zachito						0	n	n	n	n	Pollmann 1993
442	Grotta della Cala						0	n	n	n	n	Pollmann 1993
443	Grotta della Chiusazza				y		0	n	n	n	n	Ceccanti 1980; Tinè 1965
444	Grotta della Madonna						0	n	n	n	n	Tinè 1991
445	Grotta della Madonna		y				0	n	n	n	n	Camps 1976; Cazzella and Moscoloni 1976; Courtin 1967; Tinè 1991
446	Grotta della Penna						0	n	n	n	n	Pollmann 1993
447	Grotta della Serratura		y				7	y	n	n	n	Barca et al. 2007; De Francesco et al. 2006a; Farr 2007
448	Grotta della Spinosa		y				6	n	y	n	n	De Francesco et al. 2010
449	Grotta della Tartaruga						2	y	n	n	n	Arias et al. 1984, 1986; Bigazzi et al. 1992; Bigazzi and Radi 1998; Pollmann 1993; Williams Thorpe et al. 1979, 1984b; Tykot 1995
450	Grotta della Trinità		y				2	y	n	n	n	Arias et al. 1984; Bigazzi and Radi 1981, 1998
451	Grotta dell'Ansa				y		1	y	n	n	n	Randle et al. 1993; Williams Thorpe et al. 1979
452	Grotta dell'Ausino						0	n	n	n	n	Pollmann 1993
453	Grotta delle Capre						0	n	n	n	n	Pollmann 1993

454	Grotta delle Felci		y				2	n	n	y	n	Hallam et al. 1976; Longworth and Warren 1979; Whitehouse 1990
455	Grotta delle Marmitte						0	n	n	n	n	Pollmann 1993
456	Grotta delle Mura	y					0	n	n	n	n	Cornaggia Castiglioni et al. 1962-1963; Frangipane 1975; Milliken and Skeates 1989; Pollmann 1993; Whitehouse 1971
457	Grotta delle Pecore						0	n	n	n	n	Pollmann 1993
458	Grotta delle Prazziche		y				0	n	n	n	n	Milliken and Skeates 1989; Pollmann 1993
459	Grotta dell'Edera		y				0	n	n	y	n	Vaquer 2007; Williams Thorpe et al. 1979
460	Grotta dello Scoglietto						0	n	n	n	n	Pollmann 1993
461	Grotta dell'Orso di Gabrovizza			y	y		0	n	n	n	n	Williams Thorpe et al. 1979
462	Grotta dell'Orso di Sarteano		y				1	y	n	n	n	Courtin 1967; Pollmann 1993; Hallam et al. 1976
463	Grotta dell'Uzzo	y	y	y			152	y	n	n	y	Francaviglia and Piperno 1987; Iovino et al. 2008a
464	Grotta di Cala Colombo			y			3	y	n	n	n	Bigazzi et al. 2005; Bigazzi and Radi 1998; Farr 2007; Whitehouse 1990
465	Grotta di Cala dei Santi						0	n	n	n	n	Pollmann 1993
466	Grotta di Cala Genovesi						0	n	n	n	n	Pollmann 1993
467	Grotta di Cala Scizzo			y			2	y	n	n	n	Bigazzi and Radi 1998; Whitehouse 1990
468	Grotta di Castelcivita						0	n	n	n	n	Pollmann 1993
469	Grotta di Corruggi	y	y				2	y	n	n	n	This work
470	Grotta di Levanzo						0	n	n	n	n	Whitehouse 1990
471	Grotta di Nardantuono						0	n	n	n	n	Pollmann 1993
472	Grotta di Pietrarossa						0	n	n	n	n	Pollmann 1993
473	Grotta di Porto Badisco	y	y				0	n	n	n	n	Whitehouse 1990
474	Grotta di S. Angelo di Ostuni						0	n	n	n	n	Whitehouse 1990
475	Grotta di S. Angelo di Statte						0	n	n	n	n	Pollmann 1993
476	Grotta di S. Angelo III		y				1	y	n	n	n	Frangipane 1975; Mello 1983; Whitehouse 1969
477	Grotta di S. Francesco						0	n	n	n	n	Pollmann 1993
478	Grotta di S. Francesco						0	n	n	n	n	Pollmann 1993
479	Grotta Due Paperi						0	n	n	n	n	Pollmann 1993
480	Grotta Farneto					y?	0	n	n	n	n	Malavolti 1948; Williams Thorpe et al. 1979
481	Grotta Filiestru			y			62	n	y	n	n	Mackey and Warren 1983; Tykot 1995
482	Grotta Filiestru		y				357	n	y	n	n	Tykot 1995
483	Grotta Filiestru	y	y				175	n	y	n	n	Tykot 1995
484	Grotta Filiestru	y					72	n	y	n	n	Lugliè et al. 2007; Trump 1982; Tykot 1995, 1996, 2002a, 2002b
485	Grotta Funeraria						4	y	n	n	y	Arias et al. 1984; Bigazzi and Radi 1998; Hallam et al. 1976; Pollmann 1993; Tykot 1995

486	Grotta G. Perrin			y	y		1	n	y	n	n	Costa 2007; Hallam et al. 1976
487	Grotta Geraci						0	n	n	n	n	Pollmann 1993
488	Grotta Giunta						0	n	n	n	n	Pollmann 1993
489	Grotta Infame Diavolo 1						0	n	n	n	n	Pollmann 1993
490	Grotta Infame Diavolo 2						0	n	n	n	n	Pollmann 1993
491	Grotta Inferno	y	y				0	n	n	n	n	de Lanfranchi 2010
492	Grotta La Punta		y				0	n	n	n	n	Pollmann 1993
493	Grotta La Scorosa						0	n	n	n	n	Pollmann 1993
494	Grotta La Sedia						0	n	n	n	n	Pollmann 1993
495	Grotta La Seggia						0	n	n	n	n	Pollmann 1993
496	Grotta Lattaia						0	n	n	n	n	Whitehouse 1990
497	Grotta Lioru						2	n	y	n	n	Tykot 1995
498	Grotta Lonza						1	y	n	n	n	Williams Thorpe et al. 1979, 1984b
499	Grotta Marina						0	n	n	n	n	Pollmann 1993
500	Grotta Marisa						0	n	n	n	n	Pollmann 1993
501	Grotta Maritza						0	n	n	n	n	Pollmann 1993
502	Grotta Misa						0	n	n	n	n	Pollmann 1993
503	Grotta Molinari						0	n	n	n	n	Pollmann 1993
504	Grotta Morelli	y					5	y	n	n	n	Arias et al. 1984, 1986; Bigazzi and Radi 1998
505	Grotta Nicolucci						0	n	n	n	n	Peet 1909
506	Grotta Officina Litica						0	n	n	n	n	Pollmann 1993
507	Grotta Oscuroza						0	n	n	n	n	Pollmann 1993
508	Grotta Pogrize						0	n	n	n	n	Pessina and Radi 2006
509	Grotta Polesina						0	n	n	n	n	Pollmann 1993
510	Grotta Pollera		y				1	n	y	n	n	Williams Thorpe et al. 1979
511	Grotta Pollera	y					2	y	y	n	n	Williams Thorpe et al. 1979
512	Grotta Porcospina						0	n	n	n	n	Pollmann 1993
513	Grotta Puleri						0	n	n	n	n	Pollmann 1993
514	Grotta Regina						0	n	n	n	n	Pollmann 1993
515	Grotta Rifugio		y				1	n	y	n	n	Agosti et al. 1980; Biagi 1980a; Biagi and Cremonesi 1980
516	Grotta Riparo Continenza	y					0	n	n	n	n	Farr 2007; Whitehouse 1990
517	Grotta Romanelli						0	n	n	n	n	Milliken and Skeates 1989
518	Grotta S. Croce						0	n	n	n	n	Pollmann 1993
519	Grotta S. Giorgio						0	n	n	n	n	Pessina and Radi 2006
520	Grotta S. Nicola						0	n	n	n	n	Pollmann 1993
521	Grotta Sacara		y				0	n	n	n	n	Milliken and Skeates 1989
522	Grotta San Bartolomeo			y			194	n	y	n	n	Tykot 1995, 2010
523	Grotta Sant'Angelo	y	y				2	y	n	y	n	Hallam et al. 1976; Mello 1983; Pessina and Radi 2006; Whitehouse 1990
524	Grotta Sant'Elia						31	n	y	n	n	Tykot 1995, 2010
525	Grotta Scaloria		y				1	y	n	n	n	Mello 1983; Whitehouse 1969, 1990
526	Grotta Skuzaria						0	n	n	n	n	Pollmann 1993
527	Grotta Zinzulusa						0	n	n	n	n	Whitehouse 1990
528	Grotte d'Antonnaire		y				2	n	y	n	n	Crisci et al. 1994; Poupeau et al. 2010
529	Grotte de la Ferrage		y	y			0	n	n	n	n	Binder and Courtin 1994; Williams

												Thorpe et al. 1984a
530	Grotte de Labeil			y	y		0	n	n	n	n	Guilane and Vaquer 1994; Williams Thorpe et al. 1984a
531	Grotte de l'Église Supérieure		y				1	y	n	n	n	Costa 2007; Williams Thorpe et al. 1984a
532	Grotte Marquis						0	n	n	n	n	Pollmann 1993
533	Grotte Nicolas		y?	y?			0	n	n	n	n	Guilane and Vaquer 1994; Williams Thorpe et al. 1984a
534	Grotte Southwell	y					0	n	n	n	n	Bressy et al. 2008
535	Grotticelle						0	n	n	n	n	Pollmann 1993
536	Guglimmorta						0	n	n	n	n	Pollmann 1993
537	Henchir Jel 2						0	n	n	n	n	Mulazzani et al. 2010
538	Hill 403						0	n	n	n	n	Pollmann 1993
539	I Calanchi			y			25	n	y	n	n	Costa 2006; Le Bourdonnec 2007
540	I Calanchi			y	y		126	n	y	n	n	Costa 2006; Le Bourdonnec 2007; Le Bourdonnec et al. 2010; Tykot 1995, 1996
541	I Cannona a Capo Fram						0	n	n	n	n	Pollmann 1993
542	I Caselli 1			y			2	n	y	n	n	Le Bourdonnec et al. 2011
543	I Caselli 2						0	n	n	n	n	Pollmann 1993
544	I Caselli 3						0	n	n	n	n	Pollmann 1993
545	I Caselli 4						0	n	n	n	n	Pollmann 1993
546	I Caselli 5						0	n	n	n	n	Pollmann 1993
547	Iannicu	y	y				3	y	n	n	n	This work; La Rosa et al. 2006
548	Il Ponticella						0	n	n	n	n	Pollmann 1993
549	Ile Monica						3	n	y	n	n	Gale 1981; Hallam et al. 1976
550	Is Solinas			y			24	n	y	n	n	Tykot et al. 2008
551	Ischio di Castro		y				0	n	y	n	n	Bigazzi et al. 2005
552	Isnello						0	n	n	n	n	Pollmann 1993
553	Isola Capraia						8	y	y	y	n	Arias et al. 1984; Bigazzi and Radi 1981, 1998; Bigazzi et al. 1986
554	Isola Caprara						0	n	n	n	n	Pollmann 1993
555	Isola del Cretaccio						0	n	n	n	n	Pollmann 1993
556	Isola d'Elba						2	n	y	n	n	Cornaggia Castiglioni et al. 1962-1963; Hallam et al. 1976
557	Isola di Basiluzzo						0	n	n	n	n	Pollmann 1993
558	Isola di Bientina						0	n	n	n	n	Pollmann 1993
559	Isola di Capri		y				3	n	n	y	n	Hallam et al. 1976; Pollmann 1993
560	Isola di Filicudi			y			9	y	n	n	n	Arias et al. 1984; Arias-Radi et al. 1972; Bigazzi and Bonadonna 1973; Duttine et al. 2003; Leighton 1999; Scorzelli et al. 2001
561	Isola di Linosa						0	n	n	n	n	Pollmann 1993
562	Isola di Lipari			y			7	y	n	n	n	Arias-Radi et al. 1972; Bigazzi and Bonadonna 1973; Duttine et al. 2003; Tykot 1995
563	Isola di Liri						0	n	n	n	n	Pollmann 1993
564	Isola di Ognina						129	y	n	n	y	This work

565	Isola di Panarea			y			0	n	n	n	n	Leighton 1999
566	Isola di Pantelleria						9	n	n	n	y	Arias et al. 1984, 1986; Cann and Renfrew 1964; Hallam et al. 1976; Longworth and Warren 1979
567	Isola di Pianosa						0	n	n	n	n	Bietti et al. 2004
568	Isola di Ponza						2	n	n	y	n	Buchner 1949; Cann and Renfrew 1964; Hallam et al. 1976; Longworth and Warren 1979; Pollmann 1993
569	Isola di S. Nicola						0	n	n	n	n	Pollmann 1993
570	Isola di Zannone						0	n	n	n	n	Buchner 1949; Radmilli 1954
571	Isola d'Ustica						14	y	n	n	y	Hallam et al. 1976; Iovino et al. 2008a; Tykot 1995
572	Isola San Domino		y				0	n	n	n	n	Cornaggia Castiglioni et al. 1962-1963; Whitehouse 1969
573	Isolino di Varese	y					0	n	n	n	n	Pollmann 1993; Williams Thorpe et al. 1979
574	Isolino di Varese			y			0	n	n	n	n	Vaquer 2007
575	Isolino di Varese				y		0	n	n	n	n	Pollmann 1993; Williams Thorpe et al. 1979
576	Isolino di Varese		y				14	y	y	n	n	Arias et al. 1984; Bigazzi and Radi 1998; Courtin 1967; Guerreschi et al. 1991; Hallam et al. 1976; Malavolti 1948; Williams Thorpe et al. 1979
577	Ja Hagret						0	n	n	n	n	Cornaggia Castiglioni et al. 1962-1963
578	Jama na Dolech Nabresina		y	y			0	n	n	n	n	Williams Thorpe et al. 1979
579	Karagadur	y		y			1	y	n	n	n	Farr 2007
580	Kef el Ahmar						0	n	n	n	n	Mulazzani et al. 2010
581	Kef Hamda	y					1	n	n	n	y	Mulazzani et al. 2010
582	Kerkennah						37	n	n	n	y	Mulazzani et al. 2010
583	Korba						1	n	n	n	y	Camps 1964; Gobert 1962; Mulazzani et al. 2010
584	Korcula						0	y	n	n	n	Bass 1998; Tykot et al. 2001
585	La Bertaude		y				1	y	n	n	n	Costa 2007; Hallam et al. 1976; WIlliams Thorpe et al. 1984a
586	La Botte						0	n	n	n	n	Pollmann 1993
587	La Cabre/Le Grenouiller		y	y			41	y	y	n	n	Binder and Courtin 1994; Crisci et al. 1994
588	La Citadelle			y			1	n	y	n	n	Binder and Courtin 1994; Crisci et al. 1994
589	La Condamine		y	y			0	n	n	n	n	Pollmann 1993; Williams Thorpe et al. 1984a
590	La Consuma			y			2	y	n	y	n	Bigazzi and Radi 1998
591	La Costa						0	n	n	n	n	Pollmann 1993
592	La Fiard-Les Morelles		y	y			1	n	y	n	n	Poupeau et al. 2000

593	La Figue		y				0	n	n	n	n	Bressy et al. 2008; Costa 2006
594	La Fortuneau			y			1	n	n	n	n	Poupeau et al. 2000
595	La Galinière						1	n	y	n	n	Tykot 1995; Williams Thorpe et al. 1984a
596	La Galite						1	n	n	n	y	Mulazzani et al. 2010
597	La Grande Baume	y					1	n	y	n	n	Binder and Courtin 1994; Courtin 1967; Crisci et al. 1994; Tykot 1995; Williams Thorpe et al. 1984a
598	La Hergla		y	y			1	n	n	n	y	Costa 2007; Tykot 1995
599	La Maison du Poète			y?			10	n	n	n	y	Tykot 1995
600	La Maravenna		y	y			1	n	y	n	n	Binder and Courtin 1994; Crisci et al. 1994
601	La Marmotta	y					393	y	n	y	n	Bigazzi and Radi 1998, 2003; De Francesco et al. 2012; Vaquer 2007
602	La Marsa						2	y	n	n	n	Camps 1974; Morel 1969; Mulazzani et al. 2010; Tykot 1995
603	La Martella						0	n	n	n	n	Pollmann 1993
604	La Muculufa					y	20	y	n	n	y	This work; La Rosa et al. 2006; McConnell 1992
605	La Padula				y		1	y	n	n	n	Bigazzi and Radi 1998
606	La Palmenta		y	y			0	n	n	n	n	Frangipane 1975
607	La Panetteria						1	y	n	n	n	Reported by Hallam et al. 1976
608	La Puzzolente				y	y	3	y	n	n	n	Bigazzi and Radi 1998; Tykot et al. 2003
609	La Roberte			y			1	n	y	n	n	Costa 2007; Crisci et al. 1994
610	La Romita di Asciano			y			0	n	n	n	n	Williams Thorpe et al. 1979
611	La Romola						0	n	n	n	n	Pollmann 1993
612	La Rouret		y	y			1	y	n	n	n	Binder and Courtin 1994; Crisci et al. 1994
613	La Scola	y					42	y	y	y	n	De Francesco et al. 2006b; Tykot 1995
614	La Secche	y					2	y	n	y	n	Bigazzi et al. 2005; Bigazzi and Radi 1998; Brandaglia 1985; Duttine et al. 2003; Radi and Bovenzi 2007; Vaquer 2007
615	La Selve						0	n	n	n	n	Pollmann 1993
616	La Serreta			y			1	n	y	n	n	Terradas et al. 2014
617	La Sirroque		y	y			0	n	n	n	n	Guilane and Vaquer 1994; Williams Thorpe et al. 1984a
618	La Stanza						0	n	n	n	n	Cornaggia Castiglioni et al. 1962-1963; Pollmann 1993
619	La Vela		y				1	y	n	n	n	Ammerman 2003; Pessina and Radi 2006
620	La Villata						0	n	n	n	n	Pollmann 1993
621	Lacona						0	n	n	n	n	Pollmann 1993
622	Laconella						0	n	n	n	n	Pollmann 1993

623	Lacumarense						9	n	y	n	n	Tykot 1995
624	Lagaccione						0	n	n	n	n	Pollmann 1993
625	Lagnano da Piedi I	y		y			0	n	n	n	n	Farr 2007
626	Lama Marángia						0	n	n	n	n	Pollmann 1993
627	Lamaforca						0	n	n	n	n	Pollmann 1993
628	Lamentano						0	n	n	n	n	Sammartino 2007
629	Lamia Vecchia						0	n	n	n	n	Pollmann 1993
630	Lampedusa Capanna	y					8	n	n	n	y	Arias et al. 1986; Arias-Radi et al. 1972; Bigazzi and Radi 1998; Duttine et al. 2003
631	Laterza						0	n	n	n	n	Pollmann 1993
632	Le Conche 1						0	n	n	n	n	Pollmann 1993
633	Le Conche 2						0	n	n	n	n	Pollmann 1993
634	Le Crès		y	y			0	n	n	n	n	Guilane and Vaquer 1994; Williams Thorpe et al. 1984a
635	Le Crestair						1	n	n	n	n	Crisci et al. 1994
636	Le Piane alla Casetta dei Frati						0	n	n	n	n	Pollmann 1993
637	Le Piane alla Teve						0	n	n	n	n	Pollmann 1993
638	Le Pighiole						0	n	n	n	n	Pollmann 1993
639	Le Pille						0	n	n	n	n	Pollmann 1993
640	Le Tane						0	n	n	n	n	Pollmann 1993
641	Le Veyssières						1	n	y	n	n	Crisci et al. 1994
642	Le Vieux Carniol						0	n	n	n	n	Williams Thorpe et al. 1984a
643	Le Volpelle						0	n	n	n	n	Pollmann 1993
644	Les Clapiers		y	y			5	n	y	n	n	Poupeau et al. 2000
645	Les Faysses		y	y			0	n	n	n	n	Pollmann 1993
646	Les Marres		y	y			3	n	y	n	n	Binder and Courtin 1994; Hallam et al. 1976; Longworth and Warren 1979; Williams Thorpe et al. 1984a
647	Les Moulins			y			1	n	y	n	n	Poupeau et al. 2000
648	Les Plos						1	n	y	n	n	Crisci et al. 1994; Guilane and Vaquer 1994
649	Les Ribassières			y			1	n	y	n	n	Crisci et al. 1994; Williams Thorpe et al. 1984a
650	Les Terres Blanches		y				15	n	y	n	n	Binder and Courtin 1994; Crisci et al. 1994; Poupeau et al. 2010
651	Li Muri			y			189	n	y	n	n	Tykot 1995, 1996
652	Liccia						0	n	n	n	n	Pollmann 1993
653	Licodia Eubea			y			0	n	n	n	n	Iovino et al. 2008a
654	Limatola						0	n	n	n	n	Pollmann 1993
655	Limina	y	y				0	n	n	n	n	Bietti Sestieri 1980
656	Lipari Castello			y			4	y	n	n	n	Arias-Radi et al. 1972; Bigazzi et al. 1986; Cann and Renfrew 1964; Hallam et al. 1976; Longworth and Warren 1979
657	Loc. Liscia Pilastru			y			10	n	y	n	n	Tykot 1995
658	Loc. Pirrotta						9	n	y	n	n	Tykot 1995
659	Loc. S. Pietro			y			81	n	y	n	n	Pessina and Radi 2006; Tykot 1995
660	Londe des Maures		y	y			0	n	n	n	n	Williams Thorpe et

												al. 1984a
661	Longone	y					0	n	n	n	n	Bressy et al. 2008; de Lanfranchi 2010
662	Lucera Castello						3	y	n	y	n	Dixon et al. 1968; Farr 2007
663	Ludosu			y			3	n	y	n	n	Mackey and Warren 1983; Tykot 1995
664	Lumaca	y					20	n	y	n	n	De Francesco and Crisci 2000; De Francesco et al. 2010; Tykot et al. 2008
665	Maddalena di Muccia	y					8	y	n	y	n	De Francesco et al. 2012; Farr 2007; Lollini 1965; Pessina and Radi 2006; Vaquer 2007
666	Madonelle						0	n	n	n	n	Pollmann 1993
667	Malcastel Supérieure		y	y			0	n	n	n	n	Pollmann 1993
668	Malfa						0	n	n	n	n	Pollmann 1993
669	Malpasso				y		4	y	n	n	n	This work; La Rosa et al. 2006
670	Maluserne						0	n	n	n	n	Guilane and Vaquer 1994
671	Marangone						0	n	n	n	n	Pollmann 1993
672	Marcianese	y					2	n	n	y	n	Bigazzi and Radi 1998; Farr 2007; Pessina and Radi 2006; Vaquer 2007
673	Margiazzo						0	n	n	n	n	Pollmann 1993
674	Marignani o Maraani						0	n	n	n	n	Pollmann 1993
675	Marina di Mancaversa						0	n	n	n	n	Pollmann 1993
676	Markova Špilja						0	n	n	n	n	Pollmann 1993
677	Marmo						0	n	n	n	n	Pollmann 1993
678	Marroneta della Porcareccia						0	n	n	n	n	Pollmann 1993
679	Martignano 5						0	n	n	n	n	Pollmann 1993
680	Mas Rouge		y	y			0	n	n	n	n	Williams Thorpe et al. 1984a
681	Masseria Belvedere 2						0	n	n	n	n	Pollmann 1993
682	Masseria Campanella						0	n	n	n	n	Pollmann 1993
683	Masseria Candelaro						0	n	n	n	n	Pessina and Radi 2006
684	Masseria Capo di Lupo						0	n	n	n	n	Pollmann 1993
685	Masseria Centonze						0	n	n	n	n	Pollmann 1993
686	Masseria Cotugno						0	n	n	n	n	Pollmann 1993
687	Masseria dell'Ischia						0	n	n	n	n	Pollmann 1993
688	Masseria Guidone	y					2	y	n	n	n	Arias et al. 1984; Bigazzi and Radi 1981, 1998
689	Masseria Leonessa		y				2	y	n	n	n	Arias et al. 1984; Bigazzi and Radi 1981, 1998
690	Masseria Mischitelli						0	n	n	n	n	Pollmann 1993
691	Masseria Pedone						0	n	n	n	n	Pollmann 1993
692	Masseria Posta D'Innanzi						0	n	n	n	n	Pollmann 1993
693	Masseria S. Chirico						0	n	n	n	n	Pollmann 1993
694	Masseria S. Gaetano		y	y			1	y	n	n	n	Arias et al. 1984; Bigazzi and Radi 1981, 1998; Pollmann 1993; Tykot 1995
695	Masseria Tecchia						0	n	n	n	n	Pollmann 1993
696	Masseria Valente						0	n	n	n	n	Pollmann 1993
697	Massolivieri						0	n	n	n	n	Pollmann 1993
698	Matera		y				0	n	n	n	n	Peet 1909

699	Matinelle 1						0	n	n	n	n	Pollmann 1993
700	Matinelle 2						0	n	n	n	n	Pollmann 1993
701	Matrensa	y	y				124	y	n	n	n	This work
702	Matrensa o Milocca 2						0	n	n	n	n	Pollmann 1993
703	Matteo-Chiantinello-Cesine Superiori						0	n	n	n	n	Pollmann 1993
704	Megara Hyblaea	y	y				123	y	n	n	n	This work; Frangipane 1975: 112-113
705	Menglon		y	y			3	n	y	n	n	Hallam et al. 1976; Longworth and Warren 1979; Müller 1914; Pollmann 1993; Williams Thorpe et al. 1984a
706	Menta				y		3	y	n	n	y	This work; La Rosa et al. 2006
707	Mes'e Arrius			y			69	n	y	n	n	Tykot 1995, 2010
708	Mezzavia						0	n	n	n	n	Pollmann 1993
709	Mezzouna	y	y				1	n	n	n	y	Mulazzani et al. 2010
710	Miaido						0	n	n	n	n	Pollmann 1993
711	Milazzese						0	n	n	n	n	Pollmann 1993
712	Mindoli						0	n	n	n	n	Pollmann 1993
713	Miouvin			y			1	n	y	n	n	Pollmann 1993; Tykot 1995; Williams Thorpe et al. 1984a
714	Misano Adriatico		y?				0	n	n	n	n	Williams Thorpe et al. 1979, 1984b; Tykot 1995
715	Misorofa						0	n	n	n	n	Pollmann 1993
716	Mitza Pidighi					y	128	n	y	n	n	This work
717	Mizzebbi						5	y	n	n	n	This work; La Rosa et al. 2006
718	Mola S. Maria						0	n	n	n	n	Pollmann 1993
719	Molia			y			83	n	y	n	n	Tykot 1995
720	Monasteri di Sopra						0	n	n	n	n	Pollmann 1993
721	Monêtier-Allemonte		y	y			1	n	y	n	n	Poupeau et al. 2000
722	Mont Piéry		y	y			0	n	n	n	n	Binder and Courtin 1994; Williams Thorpe et al. 1984a
723	Montagnola della Rocca						0	n	n	n	n	Pollmann 1993
724	Montagnola Senese						0	n	n	n	n	Pollmann 1993
725	Monte Alfeo	y					0	n	n	n	n	Pessina and Radi 2006; Vaquer 2007
726	Monte Aquilone	y					3	y	n	n	n	Arias-Radi et al. 1972; Bigazzi and Bonadonna 1973; Bigazzi and Radi 1998; Manfredini 1972; Pollmann 1993
727	Monte Arci						5	n	y	n	n	Hallam et al. 1976
728	Monte Argentario		y				0	n	n	n	n	Pollmann 1993
729	Monte Castello						0	n	n	n	n	Pollmann 1993
730	Monte Chiarastella						0	n	n	n	n	Pollmann 1993
731	Monte Cofano					y	0	n	n	n	y	Francaviglia and Piperno 1987; Tykot 1996
732	Monte Covolo			y	y		5	n	y	n	n	Hallam et al. 1976; Williams Thorpe et al. 1979
733	Monte Covolo						3	n	y	n	n	Barca et al. 2007
734	Monte d'Accodi						12	n	y	n	n	Hallam et al. 1976; Tykot 1995
735	Monte d'Accodi				Y		12	n	y	n	n	Tykot 1995
736	Monte di Procida		y				3	y	n	y	n	Bigazzi and Radi

												1998
737	Monte Faraglione						0	n	n	n	n	Pollmann 1993
738	Monte Grosso			y			28	n	y	n	n	Costa 2006; Le Bourdonnec et al. 2010; Radi and Bovenzi 2007; Tykot 1995, 1996
739	Monte Lazzu			y?			1	n	y	n	n	Costa 2006; Crisci et al. 1994
740	Monte Leone		y				0	n	n	n	n	Le Bourdonnec et al. 2010
741	Monte Mastacchio 38						0	n	n	n	n	Pollmann 1993
742	Monte Narcao			y?			1	n	y	n	n	Tykot 1995
743	Monte Revincu		y				19	n	y	n	n	Bressy et al. 2008; Costa 2006; Le Bourdonnec et al. 2010
744	Monte Rossano						0	n	n	n	n	Pollmann 1993
745	Monte Rozzi 1						0	n	n	n	n	Pollmann 1993
746	Monte Rozzi 2						0	n	n	n	n	Pollmann 1993
747	Monte Rozzi 4						0	n	n	n	n	Pollmann 1993
748	Monte Sallia					y	1	y	n	n	n	This work
749	Monte Tinello di Acquaviva Picena			y			1	y	n	n	n	De Francesco et al. 2012
750	Montelungo						0	n	n	n	n	Pollmann 1993
751	Monterotondo						0	n	n	n	n	Pollmann 1993
752	Montesarchio						0	n	n	n	n	Pollmann 1993
753	Montetinello						0	n	n	n	n	Pollmann 1993
754	Monteverde						0	n	n	n	n	Pollmann 1993
755	Monti della Caccia 16						0	n	n	n	n	Pollmann 1993
756	Monticello di Martina Franca	y?					0	n	n	n	n	Milliken and Skeates 1989
757	Monticello di Ostuni						0	n	n	n	n	Pollmann 1993
758	Monument de Foce						0	n	n	n	n	Pollmann 1993
759	Morelli A	y					1	y	n	n	n	Bigazzi and Radi 1998
760	Morelli B		y				1	y	n	n	n	Bigazzi and Radi 1998
761	Motta della Regina	y					0	n	n	n	n	Farr 2007
762	Motya						0	n	n	n	n	Pollmann 1993
763	Mozia						0	n	n	n	n	Pollmann 1993
764	Murgecchia						3	y	n	n	n	Arias et al. 1984
765	Murgia Timone 1		y				3	y	n	n	n	Arias et al. 1984; Bigazzi and Radi 1998; Hallam et al. 1976; Longworth and Warren 1979
766	Murgia Timone 2						0	n	n	n	n	Pollmann 1993
767	Mursia					y	0	n	n	n	n	Pollmann 1993
768	Nakovana	y	y				0	n	n	n	n	Farr 2007
769	Neto di Bolasse			y			2	y	y	n	n	Bigazzi and Radi 1998; Farr 2007; Vaquer 2007
770	Noce/Fedele						0	n	n	n	n	Pollmann 1993
771	Nulachiu						0	n	n	n	n	Pollmann 1993
772	Nuraghe Albucciu						0	n	n	n	n	de Lanfranchi 2010
773	Nuraghe Aunes					y	0	n	n	n	n	Tykot 2010
774	Nuraghe Cuao					y	0	n	n	n	n	Tykot 2010
775	Nuraghe Domu Beccia					y	10	n	y	n	n	Michels et al. 1984; Tykot 1992, 1995
776	Nuraghe Inus						0	n	n	n	n	Carta 2005
777	Nuraghe Loddu					y	17	n	y	n	n	Tykot 1995, 2010
778	Nuraghe Losa					y?	4	n	y	n	n	Francaviglia 1984; Tykot 1995

779	Nuraghe Nieddu					y	19	n	y	n	n	Tykot 1995, 2010
780	Nuraghe Pidighi					y	196	n	y	n	n	This work
781	Nuraghe San Sergio					y	19	n	y	n	n	Freund and Tykot 2011
782	Nuraghe Serbine					y	35	n	y	n	n	Freund and Tykot 2011
783	Nuraghe Su Para					y	14	n	y	n	n	Tykot 1995
784	Nuraghe Tiria					y	20	n	y	n	n	Tykot 1995, 2010
785	Nuraghe Toscono					y	29	n	y	n	n	Freund and Tykot 2011
786	Nuraghe Truberi					y	0	n	n	n	n	Tykot 2010
787	Nuraghe Urpes					y	22	n	y	n	n	Freund and Tykot 2011
788	Nuraghe Zendero					y	0	n	n	n	n	Tykot 2010
789	Nuraghi Antigori					y	13	n	y	n	n	Michels et al. 1984; Tykot 1992
790	Nuraghi Ortu Còmidu					y	144	n	y	n	n	Freund and Tykot 2011; Mackey and Warren 1983; Tykot 1992, 1995
791	Obre 1						0	n	n	n	n	Pollmann 1993
792	Obre 2						0	n	n	n	n	Pollmann 1993
793	Ogliastra						1	n	y	n	n	Hallam et al. 1976
794	Olivento	y					2	y	n	y	n	Bigazzi and Radi 1998; Vaquer 2007
795	Oliveto Masselli						0	n	n	n	n	Pollmann 1993
796	Olmo						0	n	n	n	n	Pollmann 1993
797	Oppidum des Roches		y	y			2	n	y	n	n	Binder and Courtin 1994; Crisci et al. 1994
798	Oppidum Lattes		y	y			0	n	n	n	n	Guilane and Vaquer 1994; Williams Thorpe et al. 1984a
799	Oria Sant'Anna			y			37	y	n	y	n	De Francesco et al. 2012
800	Orri	y					0	n	n	n	n	Lugliè et al. 2008
801	Ortale						0	n	n	n	n	Pollmann 1993
802	Orti						0	n	n	n	n	Pollmann 1993
803	Ortucchio				y?		0	n	n	n	n	Pollmann 1993
804	Ortygia						0	n	n	n	n	Pollmann 1993
805	Ouveillan			y			0	n	n	n	n	Williams Thorpe et al. 1984a
806	Paceo						0	n	n	n	n	Pollmann 1993
807	Paduletto di Castagneto						12	y	y	y	n	Sammartino 2007; Tykot et al. 2003
808	Paestum						0	n	n	n	n	Pollmann 1993
809	Palagruža						0	y	n	n	n	Bass 1998; Farr 2007; Tykot 2011; Tykot et al. 2001
810	Palas de Casteddu			y			20	n	y	n	n	Tykot 1995, 2010
811	Palavese						0	n	n	n	n	Pollmann 1993
812	Palazzolo Acreide						4	y	n	n	n	This work
813	Palidora	y					1	n	n	y	n	Hallam et al. 1976
814	Palma di Montechiaro						4	y	n	n	y	This work
815	Palmas Arborea				y		8	n	y	n	n	Tykot 1995, 2010
816	Pantano						0	n	n	n	n	Pollmann 1993
817	Pantano in Sizilien						0	n	n	n	n	Pollmann 1993
818	Papalucio						0	n	n	n	n	Pollmann 1993
819	Pappada						0	n	n	n	n	Pollmann 1993
820	Parate						0	n	n	n	n	Pollmann 1993
821	Parco Trumpagno						0	n	n	n	n	Pollmann 1993
822	Passo del Rignano						0	n	n	n	n	Pollmann 1993
823	Passo di Corvo		y				10	y	n	n	n	Bigazzi et al. 2005; Farr 2007; Mello

												1983
824	Paterno		y				2	y	n	n	n	Arias et al. 1984; Bigazzi and Radi 1981; Pessina and Radi 2006
825	Pauli Annuas	y					0	n	n	n	n	Luglìè 2004
826	Pauli Putzu	y					0	n	n	n	n	Luglìè 2003a
827	Pedagne						0	n	n	n	n	Pollmann 1993
828	Peiro Signado	y					1	y	n	n	n	Crisci et al. 1994; Guilane and Vaquer 1994; Williams Thorpe et al. 1984a; Vaquer 2007
829	Pelagone Aldi						0	n	n	n	n	Pollmann 1993
830	Penitenzaria		y	y			0	n	n	n	n	Farr 2007; Robb 2007
831	Perda Lada			y			3	n	y	n	n	Mackey and Warren 1983; Tykot 1995
832	Perdaias Mannas	y					0	n	n	n	n	Alba and Canino 2005
833	Perriere Sottano						1	y	n	n	n	Aranguren and Revedin 1998; Bigazzi et al. 2005; Bigazzi and Radi 1981, 1998
834	Pescale			y			6	n	y	n	n	Barfield 1981; Cornaggia Castiglioni et al. 1962-1963; Costa 2007; Hallam et al. 1976; Malavolti 1949-1950, 1953; Malone 2003; Williams Thorpe et al. 1979, 1984b
835	Petescia						0	n	n	n	n	Pollmann 1993
836	Petra Robbia 1			y			0	n	n	n	n	Pollmann 1993
837	Petra Robbia 2			y			0	n	n	n	n	Pollmann 1993
838	Petraro	y	y				0	n	n	n	n	Leighton 1999
839	Petrolo di Chianti						0	n	n	n	n	Pollmann 1993
840	Pezza Cardu						0	n	n	n	n	Pollmann 1993
841	Pezza della Fontana						0	n	n	n	n	Pollmann 1993
842	Pian Devoto						0	n	n	n	n	Pollmann 1993
843	Piana di Curinga	y	y				0	n	n	n	n	Ammerman 1985a; Ammerman et al. 1978a, 1988
844	Piana di Drauto						0	n	n	n	n	Pollmann 1993
845	Piana Grossa						0	n	n	n	n	Pollmann 1993
846	Pianaccio		y				0	n	n	n	n	Pollmann 1993
847	Piani della Melia						0	n	n	n	n	Pollmann 1993
848	Pianicelli						0	n	n	n	n	Pollmann 1993
849	Piannaccia di Suvero	y					12	y	y	n	n	Bigazzi and Radi 1998; Pessina and Radi 2006; Tykot 1995; Vaquer 2007
850	Piano Conte			y	y		0	n	n	n	n	Voza 1975
851	Piano del Pirazetto 1						0	n	n	n	n	Pollmann 1993
852	Piano del Pirazetto 2						0	n	n	n	n	Pollmann 1993
853	Piano della Torre di Chiachi						0	n	n	n	n	Pollmann 1993
854	Piano di S. Paolo						0	n	n	n	n	Pollmann 1993
855	Piano d'Orte						0	n	n	n	n	Pollmann 1993
856	Piano Ilaria						0	n	n	n	n	Pollmann 1993
857	Piano Quartara						0	n	n	n	n	Buchner 1949
858	Piano Vento	y					0	n	n	n	n	La Rosa et al. 2006; Skeates 2003
859	Pianu di U Grecu	y					0	n	n	n	n	Bressy et al. 2008

860	Pianu di U Grecu				y		0	n	n	n	n	Le Bourdonnec et al. 2010
861	Pic de la Vierge						0	n	n	n	n	Camps 1964
862	Picciano-Malvezzi						0	n	n	n	n	Pollmann 1993
863	Piedimonte Massicano						0	n	n	n	n	Pollmann 1993
864	Piedivesco 1						0	n	n	n	n	Pollmann 1993
865	Piedivesco 2						0	n	n	n	n	Pollmann 1993
866	Pienza						2	y	n	y	n	Arias et al. 1986; Hallam et al. 1976
867	Pietra all'Altare						0	n	n	n	n	Pollmann 1993
868	Pietra Major						0	n	n	n	n	Pollmann 1993
869	Pietrabutera						0	n	n	n	n	Pollmann 1993
870	Pietracorbara		y				7	n	y	n	n	Tykot 1995
871	Pietracorbara	y					10	n	y	n	n	Tykot 1995
872	Pietre Chatel						0	n	n	n	n	Müller 1914
873	Pietrineri						0	n	n	n	n	Pollmann 1993
874	Pietro Pallio	y	y				0	n	n	n	n	Bietti Sestieri 1980
875	Piolenc		y	y			0	n	n	n	n	Pollmann 1993; Williams Thorpe et al. 1984a
876	Pioulier		y	y			0	n	n	n	n	Binder and Courtin 1994; Williams Thorpe et al. 1984a
877	Piscina degli Olmi						0	n	n	n	n	Pollmann 1993
878	Piscina del Lepre						0	n	n	n	n	Pollmann 1993
879	Piscina di Torresspaccata						0	n	n	n	n	Pollmann 1993
880	Pizzica Pantanello	y					1	y	n	n	n	Bigazzi and Radi 1998
881	Pizzo Caduto						0	n	n	n	n	Pollmann 1993
882	Plemmirio						0	n	n	n	n	Pollmann 1993
883	Podere Casanuova			y			5	y	y	n	n	Bigazzi and Radi 1998; De Francesco et al. 2012; Farr 2007; Radi and Bovenzi 2007
884	Podere Pellegrino						0	n	n	n	n	Pollmann 1993
885	Podere Uliveto						5	n	y	y	n	Arias et al. 1984, 1986; Bigazzi and Radi 1981, 1998
886	Pogghiaredda	y					0	n	n	n	n	Bressy et al. 2008; Vaquer 2007
887	Poggio Caselle						0	n	n	n	n	Pollmann 1993
888	Poggio della Capriola						1	y	n	n	n	Bigazzi and Radi 1998
889	Poggio delle Piane						0	n	n	n	n	Pollmann 1993
890	Poggio di Mezzo						0	n	n	n	n	Pollmann 1993
891	Poggio Gian Filippo						0	n	n	n	n	Pollmann 1993
892	Poggio Martelloni						0	n	n	n	n	Pollmann 1993
893	Poggio Olivastro		y	y			206	y	y	n	n	Tykot 1995
894	Poggio Rosso	y	y				22	y	n	n	n	This work
895	Poghjaredda			y			0	n	n	n	n	Bressy et al. 2008; Costa 2006; Le Bourdonnec et al. 2010
896	Pokrivenik						0	n	n	n	n	Pollmann 1993
897	Polada					y?	0	n	n	n	n	Williams Thorpe et al. 1979
898	Pont de Roque-Haute	y					2	n	n	y	n	Costa 2007; Vaquer 2007
899	Ponte Ciccalento						0	n	n	n	n	Pollmann 1993
900	Ponte Olivo						1	y	n	n	n	This work
901	Pontesecco						0	n	n	n	n	Pollmann 1993
902	Portata Casone						0	n	n	n	n	Pollmann 1993

903	Porto Fetente						0	n	n	n	n	Pollmann 1993
904	Porto Perone						0	n	n	n	n	Pollmann 1993
905	Pozzu Neru						0	n	n	n	n	Pollmann 1993
906	Prato San Michele	y					0	n	n	n	n	Vaquer 1999
907	Prato Sant'Irene						0	n	n	n	n	Pollmann 1993
908	Predjama						0	n	n	n	n	Pollmann 1993
909	Presia-Tusiu 3		y				0	n	n	n	n	Bressy et al. 2008; Le Bourdonnec et al. 2010
910	Prestarona	y	y				3	y	n	n	n	Arias et al. 1984; Bigazzi and Radi 1981, 1998
911	Procchio						0	n	n	n	n	Pollmann 1993
912	Puech de la Fontaine		y	y			3	y	y	n	n	Crisci et al. 1994; Guilane and Vaquer 1994
913	Puisteris			y			12	n	y	n	n	Cann and Renfrew 1964; Cicilloni and Usai 2004; Gale 1981; Hallam et al. 1976
914	Puisteris					y	2	n	y	n	n	Francaviglia 1984; Tykot 1995
915	Pulo di Altamura Grotta 1					y	2	y	n	n	n	Acquafredda et al. 1995
916	Pulo e Campo di Molfetta		y	y			24	y	y	n	n	Acquafredda and Muntoni 2008
917	Punta Capicciola						0	n	n	n	n	Pollmann 1993
918	Punta Castellare						0	n	n	n	n	Pollmann 1993
919	Punta d'Alca						0	n	n	n	n	Pollmann 1993
920	Punta del Fieno						0	n	n	n	n	Pollmann 1993
921	Punta del Pane						0	n	n	n	n	Pollmann 1993
922	Punta del Pianone						0	n	n	n	n	Pollmann 1993
923	Punta di Carpalone						0	n	n	n	n	Pollmann 1993
924	Punta di Mezzogiorno						0	n	n	n	n	Pollmann 1993
925	Punta di Peppa Maria						0	n	n	n	n	Pollmann 1993
926	Punta Tonno						0	n	n	n	n	Pollmann 1993
927	Pupićina		y				1	y	n	n	n	Farr 2007
928	Quartier du Guire						0	n	n	n	n	Pollmann 1993
929	Quarto						0	n	n	n	n	Pollmann 1993
930	Quarto Grande						0	n	n	n	n	Pollmann 1993
931	Quattrofinaite di M. Pito						0	n	n	n	n	Pollmann 1993
932	Radosic						0	n	n	n	n	Pollmann 1993
933	Rakkale						0	n	n	n	n	Pollmann 1993
934	Ranc d'Aven, Dolmen 1				y		0	n	n	n	n	Costa 2007: 75; Williams Thorpe et al. 1984a
935	Ras ed Drek						0	n	n	n	n	Mulazzani et al. 2010
936	Ras el Koran						0	n	n	n	n	Pollmann 1993
937	Ravagnese						0	n	n	n	n	Pollmann 1993
938	Razza di Campegine		y				3	y	n	n	n	Williams Thorpe et al. 1979
939	Recattivo						0	n	n	n	n	Pollmann 1993
940	Reggio di Calabria						0	n	n	n	n	Pollmann 1993
941	Reinella						0	n	n	n	n	Pollmann 1993
942	Remel						1	y	n	n	n	Camps 1964; Mulazzani et al. 2010
943	Renaghju		y				0	n	n	n	n	Bressy et al. 2008
944	Renaghju	y					40	n	y	n	n	Bressy et al. 2008; D'Anna et al. 2001; Vaquer 2007
945	Rendina	y					1	y	n	n	n	Bigazzi and Radi 1998
946	Rialbo	y					1	y	n	n	n	Bigazzi and Radi

												1998
947	Ricovero						0	n	n	n	n	Pollmann 1993
948	Rinaiu-Scagliu						0	n	n	n	n	Pollmann 1993
949	Rinicedda	y	y				204	y	n	n	n	This work
950	Rio Saboccu	y					1047	n	y	n	n	Lugliè et al. 2008, 2009
951	Ripa Maiale						0	n	n	n	n	Pollmann 1993
952	Ripa Tetta	y					0	n	n	n	n	Farr 2007
953	Ripabianca di Monterado		y				5	y	n	n	n	De Francesco et al. 2012; Lollini 1965; Pollmann 1993
954	Riparo Blanc						0	n	n	n	n	Pollmann 1993
955	Riparo della Sperlinga			y	y		0	n	n	n	n	Bietti Sestieri 1980; Pollmann 1993
956	Riparo di Monrupino		y				2	y	n	n	n	Williams Thorpe et al. 1979
957	Riparo Mocchi						0	n	n	n	n	Binder and Courtin 1994; Laplace 1977; Martini 2002
958	Riparo Valtenesi				y		4	n	y	n	n	Randle et al. 1993
959	Ripoli		y				2	y	n	n	n	Arias et al. 1984; Bigazzi and Radi 1981, 1998; Cornaggia Castiglioni et al. 1962-1963; Courtin 1967; Cremonesi 1965; Hallam et al. 1976
960	Riserva Capanna Murata 3						0	n	n	n	n	Pollmann 1993
961	Riserva dell'Ara 43						0	n	n	n	n	Pollmann 1993
962	Rissieddi						0	n	n	n	n	Pollmann 1993
963	Rmel Khellada						0	n	n	n	n	Mulazzani et al. 2010
964	Rocca Aquilia			y			3	y	n	n	n	This work; La Rosa et al. 2006
965	Rocca Corneta						0	n	n	n	n	Williams Thorpe et al. 1979
966	Rocca Daparo						0	n	n	n	n	Pollmann 1993
967	Rocca di Manerba			y?			1	n	y	n	n	Hallam et al. 1976; Williams Thorpe et al. 1979
968	Rocca S. Marco						0	n	n	n	n	Vaquer 2007
969	Roccagorga						0	n	n	n	n	Pollmann 1993
970	Rocchicella						2	y	n	n	n	Iovino et al. 2008a
971	Rocchicella	y	y				9	y	n	n	n	Iovino et al. 2008a
972	Rocchicella			y	y		25	y	n	n	n	Iovino et al. 2008a
973	Rocchicella						12	y	n	n	n	Iovino et al. 2008a
974	Roccia Canalozzo						0	n	n	n	n	Pollmann 1993
975	Roccia Minguddu						0	n	n	n	n	Pollmann 1993
976	Roja Cannas						2	n	y	n	n	Cann and Renfrew 1964; Hallam et al. 1976
977	Rosignano					y	1	n	y	n	n	Bigazzi and Radi 1998
978	Rue du Portone						0	n	n	n	n	Pollmann 1993
979	Ruinacchesos			y			6	n	y	n	n	Mackey and Warren 1983; Tykot 1995
980	Ruvo						0	n	n	n	n	Pollmann 1993
981	S. Agnese		y				0	n	n	n	n	Pollmann 1993
982	S. Alessandro						0	n	n	n	n	Pollmann 1993
983	S. Anastasia						0	n	n	n	n	Guilane and Vaquer 1994
984	S. Anna di Oria			y			2	y	n	n	n	Bigazzi et al. 2005; Bigazzi and Radi 1998; Pessina and

												Radi 2006
985	S. Callisto		y				1	y	n	n	n	Bigazzi and Radi 1998
986	S. Cesario sul Panaro 3						0	n	n	n	n	Pollmann 1993
987	S. Cesario sul Panaro 5						0	n	n	n	n	Pollmann 1993
988	S. Ciprianu			y			0	n	n	n	n	Pollmann 1993
989	S. Cono 1						0	n	n	n	n	Pollmann 1993
990	S. Cono 2						0	n	n	n	n	Pollmann 1993
991	S. Cosimato						0	n	n	n	n	Pollmann 1993
992	S. Elio						0	n	n	n	n	Pollmann 1993
993	S. Evrasa						0	n	n	n	n	Pollmann 1993
994	S. Foca						0	n	n	n	n	Pollmann 1993
995	S. Foca di Castelbuono						0	n	n	n	n	Pollmann 1993
996	S. Giovanni	y					0	n	n	n	n	Lugliè 2003a
997	S. Giovanni La Parete						0	n	n	n	n	Pollmann 1993
998	S. Giuseppe						0	n	n	n	n	Pollmann 1993
999	S. Isidoro						0	n	n	n	n	Pollmann 1993
1000	S. Marco						0	n	n	n	n	Pollmann 1993
1001	S. Maria 7						0	n	n	n	n	Pollmann 1993
1002	S. Maria a Marciola						0	n	n	n	n	Pollmann 1993
1003	S. Maria dei Bossi						0	n	n	n	n	Pollmann 1993
1004	S. Martino 1						0	n	n	n	n	Pollmann 1993
1005	S. Martino 2						0	n	n	n	n	Pollmann 1993
1006	S. Panagia	y	y				0	n	n	n	n	Pollmann 1993
1007	S. Pietro						0	n	n	n	n	Pollmann 1993
1008	S. Restituta						0	n	n	n	n	Pollmann 1993
1009	Sa Corona di Monte Maiore Cave		y				11	n	y	n	n	Lugliè et al. 2007; Tykot 1995, 1996, 2002a
1010	Sa Corona di Monte Maiore Cave	y					26	n	y	n	n	Lugliè et al. 2007; Tykot 1995, 1996, 2002a
1011	Sa Punta	y					0	n	n	n	n	Lugliè et al. 2008
1012	Sa Ucca de Su Tintirriolu			y			17	n	y	n	n	Tykot 1995, 1996
1013	Saint Florent						0	n	n	n	n	Pollmann 1993
1014	Saint Jean		y	y			0	n	n	n	n	Williams Thorpe et al. 1984a
1015	Saint-Michel-du-Touche		y	y			0	n	n	n	n	Williams Thorpe et al. 1984a
1016	Saint Pancrase-Tiggianese		y	y			10	n	y	n	n	Costa 2006; Tykot 1995, 1996
1017	Saint-André-de-Roquelongue						2	n	y	n	n	Crisci et al. 1994
1018	Sainte Catherine			y			22	n	y	n	n	Crisci et al. 1994; Hallam et al. 1976; Williams Thorpe et al. 1984a
1019	Sainte Luce		y				4	n	y	n	n	Müller 1914; Poupeau et al. 2000; Williams Thorpe et al. 1984a
1020	Saint-Loup						1	y	n	n	n	Crisci et al. 1994; Guilane and Vaquer 1994
1021	Saint-Pierre de Vacquière		y				1	n	y	n	n	Binder and Courtin 1994; Crisci et al. 1994; Guilane and Vaquer 1994; Williams Thorpe et al. 1984a
1022	Saladino						0	n	n	n	n	Pollmann 1993
1023	Salavona						0	n	n	n	n	Pollmann 1993
1024	Saldone		y				0	n	n	n	n	Pollmann 1993

1025	Saléon						0	n	n	n	n	Courtin 1967; Williams Thorpe et al. 1984a
1026	Saline di Senigallia			y			2	y	n	n	n	De Francesco et al. 2012
1027	Salinettes		y	y			2	n	y	n	n	Binder and Courtin 1994; Courtin 1967; Hallam et al. 1976; Williams Thorpe et al. 1984a
1028	Salto di Vecchia						0	n	n	n	n	Pollmann 1993
1029	Sammardenchia di Pozzuola	y	y				3	y	n	n	n	Pessina and Radi 2006; Randle et al. 1993; Vaquer 1999
1030	San Benedetto			y			5	n	y	n	n	Michels et al. 1984; Tykot 1992
1031	San Gemiliano			y			199	n	y	n	n	Tykot 1995; Tykot et al. 2008
1032	San Giovanni						0	n	y	n	n	Lugliè 2004
1033	San Giovanni in Misileo						0	n	n	n	n	Williams Thorpe et al. 1979
1034	San Martino	y	y				92	y	n	n	n	This work
1035	San Martino			y			40	y	n	n	n	This work
1036	San Polo d'Enza		y				11	y	y	n	n	Hallam et al. 1976; Williams Thorpe et al. 1979; Tykot 1995
1037	San Quirino						1	y	n	n	n	Williams Thorpe et al. 1979, 1984b
1038	Santa Caterina di Pittinuri	y					35	n	y	n	n	Dini 2007; Tykot 2007
1039	Santa Gilla			y			17	n	y	n	n	Mackey and Warren 1983; Tykot 1995
1040	Santa Maria in Selva			y			32	y	n	n	n	Courtin 1967; De Francesco et al. 2006a; Lollini 1965; Hallam et al. 1976
1041	Santa Panegia	y	y				1	y	n	n	n	Hallam et al. 1976
1042	Santa Vittoria			y			3	n	y	n	n	Loi and Brizzi 2010; Mackey and Warren 1983; Tykot 1995
1043	Sant'Ippolito				y		7	y	n	n	n	This work
1044	Sant'Onofrio				y		6	y	n	n	y	This work
1045	Sapara Alta			y			0	n	n	n	n	Le Bourdonnec et al. 2010
1046	Sapara d'Acquedda		y	y			0	n	n	n	n	Le Bourdonnec et al. 2010
1047	Sarpellizza						0	n	n	n	n	Pollmann 1993
1048	S'Arriedu			y			3	n	y	n	n	Mackey and Warren 1983; Tykot 1995
1049	S'Arrocca Abruxiada di Arbus		y				0	n	n	n	n	Alba and Canino 2010
1050	Sarténe						0	n	n	n	n	Pollmann 1993
1051	Sasso di Manerba						0	n	n	n	n	Williams Thorpe et al. 1979
1052	Savignano sul Panaro	y					0	n	n	n	n	Farr 2007; Pessina and Radi 2006; Vaquer 2007
1053	Scaba 'e Arriu			y	y		31	n	y	n	n	Ragucci and Usai 2004; Usai 2010
1054	Scaffa Piana		y				0	n	n	n	n	Bressy et al. 2008; Costa 2006; Le Bourdonnec 2007
1055	Scaramella S. Vito			y			0	n	n	n	n	Farr 2007; Mello 1983; Pessina and Radi 2006; Sargent 1985
1056	Scarceta						0	n	n	n	n	Pollmann 1993

1057	Scintillia Capanna Alfa					y	1	y	n	n	n	This work
1058	Scirarone						0	n	n	n	n	Pollmann 1993
1059	Scogli del Bagno Santo						0	n	n	n	n	Pollmann 1993
1060	Sebkha el Melah						1	n	n	n	y	Mulazzani et al. 2010
1061	Sebkhat et Menzel						0	n	n	n	n	Pollmann 1993
1062	Sebkhet Halk el Mennzel-1	y					19	n	n	n	y	Camps 1974; Mulazzani et al. 2010
1063	Sebkhet Halk el Mennzel-12						2	n	n	n	y	Mulazzani et al. 2010
1064	Secteur A						0	n	n	n	n	Pollmann 1993
1065	Sellettes		y				0	n	n	n	n	Williams Thorpe et al. 1984a
1066	Selva dei Muli						0	n	n	n	n	Pollmann 1993
1067	Serra Cannigas					y	12	n	y	n	n	Michels et al. 1984; Tykot 1992
1068	Serra Cicora		y				4	y	n	n	n	Quarta et al. 2011
1069	Serra d'Alta dell'Lido						0	n	n	n	n	Pollmann 1993
1070	Serra d'Alto	y					2	y	n	n	n	Arias et al. 1984; Bigazzi and Radi 1998; Duttine et al. 2003; Hallam et al. 1976
1071	Serra d'Alto		y	y			1	y	n	n	n	Arias et al. 1984; Bigazzi and Radi 1998; Hallam et al. 1976
1072	Serra de Castius				y		20	n	y	n	n	Tykot 1995, 2010
1073	Serra del Palco						42	y	n	n	y	This work; La Rosa et al. 2006
1074	Serraferlicchio				y		6	y	n	n	n	This work
1075	Serre Pointu		y	y			0	n	n	n	n	Guilane and Vaquer 1994
1076	Serre-Muret						0	n	n	n	n	Courtin 1967; Williams Thorpe et al. 1984a
1077	Servirola		y				2	n	y	n	n	Hallam et al. 1976; Pollmann 1993
1078	Sesi						0	n	n	n	n	Pollmann 1993
1079	Sette Tarine						0	n	n	n	n	Pollmann 1993
1080	Settefonti			y			10	y	n	y	n	Bigazzi and Radi 1998; De Francesco et al. 2006a; Pessina and Radi 2006; Vaquer 2007
1081	Setteville						7	y	n	y	n	Arias et al. 1984; Bigazzi et al. 1986; Tykot 1995
1082	Sferro 2						0	n	n	n	n	Pollmann 1993
1083	Sidi Abdel Aroua						0	n	y	n	n	Mulazzani et al. 2010
1084	Simaxis						20	n	y	n	n	Tykot 1995, 2010
1085	Sinopoli						0	n	n	n	n	Pollmann 1993
1086	Siroque		y	y			0	n	n	n	n	Courtin 1967
1087	Skorba			y			87	y	n	n	y	Cann and Renfrew 1964; Cornaggia Castiglioni et al. 1962-1963; Francaviglia 1988; Hallam et al. 1976
1088	Skorba	y	y				121	y	n	n	y	Cann and Renfrew 1964; Cornaggia Castiglioni et al. 1962-1963
1089	Skorba		y				111	y	n	n	y	Cann and Renfrew 1964; Cornaggia Castiglioni et al. 1962-1963; Hallam et

												al. 1976
1090	Skorba				y		15	y	n	n	y	Cann and Renfrew 1964; Cornaggia Castiglioni et al. 1962-1963; Hallam et al. 1976
1091	Smilčić		y				0	n	n	n	n	Martinelli 1990
1092	Sobunar						0	n	n	n	n	Pollmann 1993
1093	Solfarate						0	n	n	n	n	Pollmann 1993
1094	Son Muleta				y		0	n	n	n	n	Tykot 2011
1095	Sora						0	n	n	n	n	Pollmann 1993
1096	Sorgenti della Nova						0	n	n	n	n	Pollmann 1993
1097	Sotta-Figari						0	n	n	n	n	Pollmann 1993
1098	Spazzavento		y				26	y	y	n	n	Barca et al. 2007; De Francesco et al. 2006a; Vaquer 2007
1099	Spilamberto			y	y		3	y	n	n	n	Randle et al. 1993; Vaquer 1999
1100	Špilja sv Nedilja						0	n	n	n	n	Pollmann 1993
1101	Spineda		y				0	n	n	n	n	Williams Thorpe et al. 1979
1102	Station de Villecroze		y	y			2	y	y	n	n	Binder and Courtin 1994; Hallam et al. 1976; Tykot 1995
1103	Station des Combes						10	n	y	n	n	Binder and Courtin 1994; Crisci et al. 1994
1104	Stazione La Gumarense			y	y		18	n	y	n	n	Tykot 2010
1105	Ste. Victoire				y?		0	n	n	n	n	Williams Thorpe et al. 1984a
1106	Stentinello	y	y				133	y	n	n	n	This work
1107	Stilo Region	y					21	y	n	n	n	Hodder and Malone 1984
1108	Stilo Region			y			30	y	n	n	n	Hodder and Malone 1984
1109	Stilo Region				y		3	y	n	n	n	Hodder and Malone 1984
1110	Stilo Region					y	3	y	n	n	n	Hodder and Malone 1984
1111	Strappazzola		y	y			0	n	n	n	n	Pollmann 1993
1112	Strette		y				0	n	n	n	n	Costa 2006; Crisci et al. 1994; Le Bourdonnec et al. 2010; Tykot 1996
1113	Strette			y			12	n	y	n	n	Crisci et al. 1994; Le Bourdonnec et al. 2010; Tykot 1995, 2002b
1114	Strette	y					10	n	y	n	n	Bressy et al. 2008; Costa 2006; Costa et al. 2002; Crisci et al. 1994; Tykot 1995, 1996
1115	Stretto Partanna		y	y			1	y	n	n	n	This work
1116	Stretto Partanna						3	y	n	n	n	This work
1117	Stretto Partanna			y			4	y	n	n	n	This work
1118	Stretto Partanna		y				10	y	n	n	y	This work
1119	Su Carroppu	y					136	n	y	n	n	Lugliè et al. 2007; Michels et al. 1984; Tykot 1995; Tykot et al. 2008
1120	Su Casteddu Becciu				y?	y?	16	n	y	n	n	Tykot 1995, 2010
1121	Su Coddu			y	y		9	n	y	n	n	Tykot 1995
1122	Su Coddu			y			10	n	y	n	n	Tykot 1995
1123	Su Cucurru S'Arrius			y			4	n	y	n	n	Lugliè and Sebis 2004; Mackey and

												Warren 1983
1124	Su Cucurru S'Arrius		y				154	n	y	n	n	Tykot 1995, 2010
1125	Su Cucurru S'Arrius Tomb 387		y				6	n	y	n	n	Tykot 1995
1126	Su Forru de Sinzurreddus						0	n	n	n	n	Lugliè 2004
1127	Su Paris de Sa Turre	y					2	n	y	n	n	Lugliè et al. 2007; Meloni et al. 2004
1128	Su Pranu			y			3	n	y	n	n	Mackey and Warren 1983; Tykot 1995
1129	Suese				y		1	n	y	n	n	Bigazzi and Radi 1998
1130	Supersano		y				4	y	n	n	n	Quarta et al. 2011
1131	Sušac	y					0	y	n	n	n	Bass 1998; Farr 2007; Tykot 2011; Tykot et al. 2001
1132	Tabarano						0	n	n	n	n	Pollmann 1993
1133	Tana delle Fate		y				1	y	n	n	n	Bigazzi and Radi 1998; Pessina and Radi 2006; Vaquer 2007
1134	Tane del Diavolo						0	n	n	n	n	Pollmann 1993
1135	Tarxien-Tempel						0	n	n	n	n	Cornaggia Castiglioni et al. 1962-1963
1136	Tébessa						1	y	n	n	n	Camps 1964; Crummett and Warren 1985; Mulazzani et al. 2010; Tykot 1995
1137	Teghja di Donna			y			1	y	n	n	n	Le Bourdonnec et al. 2011
1138	Tenuta della Perna 10						0	n	n	n	n	Pollmann 1993
1139	Tenuta di Torre Nuova 22						0	n	n	n	n	Pollmann 1993
1140	Termizzi						0	n	n	n	n	Pollmann 1993
1141	Terragne						0	n	n	n	n	Di Lernia 1996; Vaquer 2007
1142	Terragne	y					0	n	n	n	n	Di Lernia 1996; Vaquer 2007
1143	Terramaini			y	y		10	n	y	n	n	Tykot 1995
1144	Terrarossa						0	n	n	n	n	Pollmann 1993
1145	Terrasse sous Menhir						0	n	n	n	n	Pollmann 1993
1146	Terrasse Sud-Ouest						0	n	n	n	n	Pollmann 1993
1147	Terres Longues		y	y			35	n	y	n	n	Léa et al. 2010
1148	Terrina 1			y			0	n	n	n	n	Le Bourdonnec et al. 2010
1149	Terrina 3						0	n	n	n	n	Pollmann 1993
1150	Terrina 4			y	y		0	n	n	n	n	Costa 2006
1151	Tesoru			y			0	n	n	n	n	Le Bourdonnec et al. 2010
1152	Thapsos						0	n	n	n	n	Pollmann 1993
1153	Timpa Casone						0	n	n	n	n	Pollmann 1993
1154	Tirlecchia			y			0	n	n	n	n	Farr 2007
1155	Tivulaghju		y	y			10	n	y	n	n	Bressy et al. 2008; Hallam et al. 1976; Le Bourdonnec et al. 2010, 2011; Tykot 1995
1156	Tomba di Masone Perdu						2	n	y	n	n	Tykot 1995
1157	Torellò				y		0	n	n	n	n	Massanet 2004
1158	Torraccia della Peschiera						0	n	n	n	n	Pollmann 1993
1159	Torre Bianca	y					2	y	n	n	n	Hallam et al. 1976; Milliken and Skeates 1989; Pollmann 1993
1160	Torre Borraco						0	n	n	n	n	Pollmann 1993

1161	Torre Canne	y					1	y	n	n	n	Arias et al. 1986; Bigazzi and Radi 1998; Hallam et al. 1976; Pollmann 1993; Tykot 1995
1162	Torre Crognola 2						0	n	n	n	n	Pollmann 1993
1163	Torre Crognola 3						0	n	n	n	n	Pollmann 1993
1164	Torre d'Aquila		y				7	n	y	n	n	Bressy et al. 2008; Costa 2006; Le Bourdonnec et al. 2010; Tykot 1996
1165	Torre d'Aquila	y					10	n	y	n	n	Costa 2006; Tykot 1996; Vaquer 2007
1166	Torre delle Cannelle						0	n	n	n	n	Pollmann 1993
1167	Torre di Cala Piatti						0	n	n	n	n	Pollmann 1993
1168	Torre Foghe		y	y			49	n	y	n	n	De Francesco and Bocci 2007; Dini 2007; Dini et al. 2004
1169	Torre S. Sabina						0	n	n	n	n	Pollmann 1993
1170	Torre Sabea	y					2	y	n	n	n	Arias et al. 1986; Bigazzi et al. 1992; Bigazzi and Radi 1998; Farr 2007; Grifoni Cremonesi 2003
1171	Torre Spaccata			y			0	y	n	y	n	Vaquer 2007
1172	Torricella						0	n	n	n	n	Frasca et al. 1975
1173	Tortoli						2	n	y	n	n	Hallam et al. 1976; Tykot 1995
1174	Tourtour		y	y			1	n	y	n	n	Hallam et al. 1976; Williams Thorpe et al. 1984a
1175	Tozze Bianche						0	n	n	n	n	Pollmann 1993
1176	Tracasi			y			10	n	y	n	n	Michels et al. 1984; Tykot 1992, 1995
1177	Trasanello	y					1	y	n	n	n	Bigazzi and Radi 1998
1178	Trasano	y					2	y	n	n	n	Bigazzi and Radi 1998
1179	Travo		y				5	y	y	n	n	De Francesco et al. 2012; Pessina and Radi 2006; Pollmann 1993; Vaquer 2007
1180	Tre Fontane						62	y	n	n	n	This work
1181	Tre Pini						0	n	n	n	n	Pollmann 1993
1182	Tre Ponti-Trasano						0	n	n	n	n	Pollmann 1993
1183	Tripi						0	n	n	n	n	Pollmann 1993
1184	Tufariello						0	n	n	n	n	Pollmann 1993
1185	Tusèle			y			1	n	y	n	n	Binder and Courtin 1994; Crisci et al. 1994; Williams Thorpe et al. 1984a
1186	Ugento						0	n	n	n	n	Pollmann 1993
1187	Ulina						0	n	n	n	n	Pollmann 1993
1188	Umbro						14	y	n	n	n	Farr 2007
1189	Unita Anagnina 28						0	n	n	n	n	Pollmann 1993
1190	Uscio						1	n	y	n	n	Bigazzi and Radi 1998; Pessina and Radi 2006
1191	Uzes						0	n	n	n	n	Guilane and Vaquer 1994; Williams Thorpe et al. 1984a
1192	Vaccarizzo						0	n	n	n	n	Pollmann 1993
1193	Vacil Vecchio						0	n	n	n	n	Pollmann 1993
1194	Val Berretta						0	n	n	n	n	Pollmann 1993
1195	Valdesi						0	n	n	n	n	Pollmann 1993

1196	Valle Cancella 18						0	n	n	n	n	Pollmann 1993
1197	Valle degli Acquastrini						0	n	n	n	n	Pollmann 1993
1198	Valle Maggio						0	n	n	n	n	Pollmann 1993
1199	Valle Ottara			y			2	y	n	n	n	Bigazzi and Radi 1998; Hallam et al. 1976; Longworth and Warren 1979
1200	Valli del Merse e Farma						0	n	n	n	n	Pollmann 1993
1201	Vallieu 5		y	y			1	n	y	n	n	Poupeau et al. 2000
1202	Vallon de la Fey		y	y			0	n	n	n	n	Binder and Courtin 1994; Williams Thorpe et al. 1984a
1203	Valsavoia						0	n	n	n	n	Pollmann 1993
1204	Vascasio						0	n	n	n	n	Pollmann 1993
1205	Vasculacciu		y				46	n	y	n	n	Bressy et al. 2008; Costa 2006; Hallam et al. 1976; Le Bourdonnec et al. 2010, 2011; Tykot 1995
1206	Vela Jama						0	n	n	n	n	Pollmann 1993
1207	Vela Špilja		y				1	y	n	n	n	Bass 1998; Farr 2007
1208	Veli Munat	y		y			1	y	n	n	n	Farr 2007
1209	Venera						0	n	n	n	n	Pollmann 1993
1210	Venere						0	n	n	n	n	Pollmann 1993
1211	Vercoiran						0	n	n	n	n	Beeching 1991
1212	Versentino 1			y			0	n	n	n	n	Mello 1983; Pollmann 1993
1213	Via Ardeatina km 9						0	n	n	n	n	Pollmann 1993
1214	Via Valeria km 118						0	n	n	n	n	Pollmann 1993
1215	Via Verga			y			25	y	y	n	n	De Francesco et al. 2006a; Seccaroni et al. 2008
1216	Vigna Vecchia						0	n	n	n	n	Pollmann 1993
1217	Vignali degli Olivi						0	n	n	n	n	Pollmann 1993
1218	Vignazza						0	n	n	n	n	Pollmann 1993
1219	Vigne de Montrouge						1	n	y	n	n	Crisci et al. 1994
1220	Villa Agazzotti						2	y	y	n	n	Williams Thorpe et al. 1979, 1984b; Vaquer 2007
1221	Villa Badessa		y				8	y	n	y	y	Arias et al. 1984, 1986; Bigazzi et al. 1992; Bigazzi and Radi 1981; Tykot 1995
1222	Villa Comunale						0	n	n	n	n	Pollmann 1993
1223	Villa Comunale						0	n	n	n	n	Pollmann 1993
1224	Villa del Barone						0	n	n	n	n	Pollmann 1993
1225	Villa Panezia di Ascoli		y				1	n	n	y	n	De Francesco et al. 2012
1226	Villa Persolini				y?		0	n	n	n	n	Malavolti 1948; Williams Thorpe et al. 1979
1227	Villa S. Antonio			y			1	n	y	n	n	Tykot 1995
1228	Villa Sanminiatelli						0	n	n	n	n	Pollmann 1993
1229	Villeneuve-sur-Lot						0	n	n	n	n	Williams Thorpe et al. 1984a
1230	Vizzavona						0	n	n	n	n	Pollmann 1993
1231	Vlašca Jama		y				3	y	n	y	n	Hallam et al. 1976; Williams Thorpe et al. 1979, 1984b; Tykot 1995
1232	Vorganska Pec						0	n	n	n	n	Pollmann 1993
1233	Zembra						34	n	n	n	y	Mulazzani et al. 2010; Tykot 1996

1234	Zinghilino						0	n	n	n	n	Pollmann 1993
1235	Zolforata						0	n	n	n	n	Pollmann 1993
1236	Zuccaro						0	n	n	n	n	Pollmann 1993
1237	Zupello						0	n	n	n	n	Pollmann 1993

*Note that each row represents an archaeological site of a specific periods. Sites where obsidian was analyzed in multiple contexts are listed twice. Columns 2-6 refer to the occupation date while rows 8-11 refer to the presence of absence of obsidian from a particular source. Rows with no source specific designations refer to sites in which obsidian has been reported, but not analyzed. LI: Lipari; MA: Monte Arci; PI: Palmarola; PA: Pantelleria.

Appendix E: Compiled Results from Sites Analyzed in Sicily

Site	Dating	Total	GG (Li)	CD (Li)	BdeiT (Pa)	Gelk (Pa)
Butera	Early Bronze Age	1	1	0	0	0
Calaforno	Stentinello	9	9	0	0	0
Capo Soprano	Unstratified	1	0	1	0	0
Casalicchio-Agnone	Neolithic	77	31	1	45	0
Castelluccio	Early Bronze Age	1	1	0	0	0
Casteltermini	Bronze Age	35	34	1	0	0
Cava Canabarbara	Early Bronze Age	10	10	0	0	0
Contrada Caduta	Neolithic	52	39	7	6	0
Contrada Diana	Diana	54	54	0	0	0
Contrada Orto del Conte	Early Chalcolithic	70	70	0	0	0
Cozzo del Pantano	Middle Bronze Age	1	1	0	0	0
Fontana di Pepe	Stentinello	4	3	1	0	0
Fontanazza Monte Grande Grotta 2	Neolithic	1	1	0	0	0
Fontanazza Monte Grande Grotta 4	Neolithic	36	28	2	2	4
Fontanazza Monte Grande Sommità	Neolithic	14	12	0	2	0
Gela Manfria	Early Bronze Age	2	2	0	0	0
Grotta Calafarina	Early Chalcolithic	9	9	0	0	0
Grotta Corruggi	Stentinello	2	2	0	0	0

Grotta del Conzo	Early Chalcolithic	1	1	0	0	0
Iannicu	Stentinello	3	3	0	0	0
Isola di Ognina	Unstratified	129	126	1	2	0
La Muculufu	Early Bronze Age	20	13	5	2	0
Malpasso	Late Chalcolithic	4	4	0	0	0
Matrensa	Stentinello	124	124	0	0	0
Megara Hyblaea	Stentinello	125	125	0	0	0
Menta	Late Chalcolithic	3	1	0	2	0
Mizzebbi	Neolithic	5	5	0	0	0
Monte Sallia	Early Bronze Age	1	1	0	0	0
Palazzola Acreide	Neolithic	4	4	0	0	0
Palma di Montechiaro	Unstratified	4	2	0	1	1
Poggio Rosso	Stentinello	22	22	0	0	0
Ponte Olivo	Unstratified	1	1	0	0	0
Rinicedda	Stentinello	206	205	1	0	0
Rocca Aquilia	Diana	3	3	0	0	0
San Martino	Stentinello	92	92	0	0	0
San Martino	Diana	40	40	0	0	0
Sant'Ippolito	Chalcolithic	7	7	0	0	0
Sant'Onofrio	Chalcolithic	6	2	0	3	1
Scintillia Capanna Alfa	Early Bronze Age	1	1	0	0	0
Serra del Palco	Neolithic to Chalcolithic	42	32	0	8	2
Serraferlicchio	Chalcolithic	6	4	2	0	0
Stentinello	Stentinello	133	131	2	0	0
Stretto Partanna	Middle Neolithic	10	9	0	0	1

Stretto Partanna	Middle to Late Neolithic	1	1	0	0	0
Stretto Partanna	Late Neolithic	4	4	0	0	0
Stretto Partanna	Neolithic	3	3	0	0	0
Tre Fontane	Neolithic	62	62	0	0	0

*List of analyzed sites with counts of artifacts from each subsource. Li: Lipari; Pa: Pantelleria; GG: Gabellotto Gorge; CD: Canneto Dentro; BdeiT: Balata dei Turchi; Gelk: Gelkhamar

Site	**Nodules**	**Cores**	**Blades**	**Flakes**	**Angular Waste**	**Total**
Butera	0	0	1 *(1)*	0	0	1 *(1)*
Calaforno	0	1 *(1)*	3 *(3)*	5 *(5)*	0	9 *(9)*
Capo Soprano	0	0	1 *(1)*	0	0	1 *(1)*
Casalicchio-Agnone	0	28 *(21)*	95 *(38)*	328 *(11)*	561 *(7)*	1012 *(77)*
Castelluccio	0	0	0	1 *(1)*	0	1 *(1)*
Casteltermini	1 *(1)*	5 *(5)*	16 *(16)*	8 *(8)*	5 *(5)*	35 *(35)*
Cava Canabarbara	0	0	8 *(8)*	0	2 (2)	10 *(10)*
Contrada Caduta	0	10 (5)	240 (20)	89 (23)	26 (4)	365 (52)
Contrada Diana	NA	NA	NA	NA	NA	NA
Contrada Orto del Conte	0	0	67 *(67)*	3 *(3)*	0	70 *(70)*
Cozzo del Pantano	0	0	1 *(1)*	0	0	1 *(1)*
Fontana di Pepe	0	0	2 *(2)*	2 *(2)*	0	4 *(4)*
Fontanazza Monte Grande Grotta 2	0	1 *(1)*	0	0	0	1 *(1)*
Fontanazza Monte Grande Grotta 4	0	0	19 *(19)*	17 *(17)*	0	36 *(36)*

Fontanazza Monte Grande Sommità	0	1 *(1)*	11 *(11)*	2 *(2)*	0	14 *(14)*
Gela Manfria	0	0	1 *(1)*	0	1 *(1)*	2 *(2)*
Grotta Calafarina	0	0	9 *(9)*	0	0	9 *(9)*
Grotta Corruggi	0	0	2 *(2)*	0	0	2 *(2)*
Grotta del Conzo	0	0	1 *(1)*	0	0	1 *(1)*
Iannicu	0	0	3 *(3)*	0	0	3 *(3)*
Isola di Ognina	0	8 *(8)*	48 *(48)*	62 *(62)*	11 *(11)*	129 *(129)*
La Muculufu	0	0	13 *(13)*	4 *(4)*	3 *(3)*	20 *(20)*
Malpasso	0	0	4 *(4)*	0	0	4 *(4)*
Matrensa	0	2 *(2)*	107 *(71)*	217 *(46)*	27 *(5)*	353 *(124)*
Megara Hyblaea	0	18 *(11)*	508 *(62)*	563 *(44)*	9 *(8)*	1098 *(125)*
Menta	0	0	1 *(1)*	2 *(2)*	0	3 *(3)*
Mizzebbi	0	0	3 *(3)*	2 *(2)*	0	5 *(5)*
Monte Sallia	0	0	0	1 *(1)*	0	1 *(1)*
Palazzola Acreide	0	0	4 *(4)*	0	0	4 *(4)*
Palma di Montechiaro	0	0	14 (4)	24	5	43 (4)
Poggio Rosso	0	0	22 *(22)*	0	0	22 *(22)*
Ponte Olivo	0	0	1 *(1)*	0	0	1 *(1)*
Rinicedda	0	39 *(39)*	233 *(69)*	441 *(51)*	260 *(47)*	974 *(206)*
Rocca Aquilia	0	0	3 *(3)*	0	0	3 *(3)*
San Martino (Stentinello)	0	5 (5)	42 (42)	33 (33)	12 (12)	92 (92)
San Martino (Diana)	0 (NA)	89 (NA)	517 (NA)	435 (NA)	196 (NA)	1237 (40)
Sant'Ippolito	0	2 *(2)*	5 *(5)*	0	0	7 *(7)*
Sant'Onofrio	0	0	0	2 *(2)*	4 *(4)*	6 *(6)*

Scintillia Capanna Alfa	0	0	0	1 *(1)*	0	1 *(1)*
Serra del Palco	0	0	23 *(23)*	19 *(19)*	0	42 *(42)*
Serraferlicchio	0	0	5 *(5)*	1 *(1)*	0	6 *(6)*
Stentinello	0	3 *(3)*	139 *(55)*	339 *(67)*	44 *(8)*	525 *(133)*
Stretto Partanna (MN)	0	0	10 *(10)*	0	0	10 *(10)*
Stretto Partanna (MN-LN)	0	0	1 *(1)*	0	0	1 *(1)*
Stretto Partanna (LN)	0	0	3 *(3)*	1 *(1)*	0	4 *(4)*
Stretto Partanna (Neolithic)	0	0	3 *(3)*	0	0	3 *(3)*
Tre Fontane	0	1 *(1)*	54 *(54)*	7 *(7)*	0	62 *(62)*

*Basic typological counts of obsidian artifacts at the analyzed sites. Numbers in italics denote the number of artifacts that underwent more extensive analysis (length, width, etc.) as well as elemental characterization. MN: Middle Neolithic; LN: Late Neolithic

Appendix F: Raw Data from Analyzed Sicilian Obsidians

Site	Dating	Source	Category	State	Cortex	L	W	T	Ret.
Butera	EBA	Gab	Blade	p	0 to 20	12	15	3	n
Calaforno	Stent.	Gab	Blade	m	0 to 20	19	19	2	y
Calaforno	Stent.	Gab	Blade	p	0 to 20	18	17	3	y
Calaforno	Stent.	Gab	Blade	d	0 to 20	33	22	3	y
Calaforno	Stent.	Gab	Flake	w	0 to 20	14	27	11	n
Calaforno	Stent.	Gab	Flake	w	0 to 20	21	30	11	y
Calaforno	Stent.	Gab	Flake	w	0 to 20	26	19	6	y
Calaforno	Stent.	Gab	Flake	w	0 to 20	23	22	7	y
Calaforno	Stent.	Gab	Flake	Unk	0 to 20	20	11	5	y
Calaforno	Stent.	Gab	Flake Core	w	0 to 20	38	25	16	-
Capo Soprano	Unstratified	CD	Blade	w	0 to 20	26	15	5	y
Casalicchio	Neo.	Gab	Blade Core	w	0 to 20	84	62	55	-
Casalicchio	Neo.	Gab	Blade Core	w	0 to 20	82	60	37	-
Casalicchio	Neo.	Gab	Flake Core	w	0 to 20	20	71	46	-
Casalicchio	Neo.	BT	Flake Core	w	20 to 80	30	41	28	-
Casalicchio	Neo.	BT	Blade Core	w	0 to 20	32	32	25	-
Casalicchio	Neo.	BT	Flake Core	w	0 to 20	45	46	19	-
Casalicchio	Neo.	BT	Flake Core	w	0 to 20	27	33	19	-
Casalicchio	Neo.	Gab	Flake Core	w	0 to 20	36	29	12	-
Casalicchio	Neo.	BT	Flake Core	w	0 to 20	32	25	17	-
Casalicchio	Neo.	Gab	Flake Core	w	0 to 20	22	29	29	-
Casalicchio	Neo.	BT	Flake Core	w	0 to 20	24	31	20	-
Casalicchio	Neo.	BT	Blade Core	w	0 to 20	24	21	21	-
Casalicchio	Neo.	BT	Blade Core	w	0 to 20	22	26	16	-
Casalicchio	Neo.	Gab	Blade Core	w	0 to 20	18	24	14	-
Casalicchio	Neo.	Gab	Flake Core	w	0 to 20	16	23	18	-
Casalicchio	Neo.	BT	Flake Core	w	0 to 20	23	20	9	-
Casalicchio	Neo.	BT	Flake Core	w	0 to 20	14	22	9	-
Casalicchio	Neo.	Gab	Flake Core	w	0 to 20	12	21	9	-
Casalicchio	Neo.	BT	Flake Core	w	0 to 20	24	17	8	-
Casalicchio	Neo.	Gab	Flake Core	w	0 to 20	25	26	12	-
Casalicchio	Neo.	Gab	Flake Core	w	0 to 20	13	19	12	-
Casalicchio	Neo.	BT	Blade	m	0 to 20	14	11	2	y
Casalicchio	Neo.	BT	Blade	m	0 to 20	9	12	2	n
Casalicchio	Neo.	BT	Blade	d	0 to 20	28	18	7	y
Casalicchio	Neo.	BT	Blade	w	0 to 20	18	10	3	n
Casalicchio	Neo.	BT	Blade	w	0 to 20	39	16	4	y
Casalicchio	Neo.	BT	Blade	w	0 to 20	43	13	3	y
Casalicchio	Neo.	BT	Blade	w	0 to 20	34	12	4	n
Casalicchio	Neo.	Gab	Blade	w	20 to 80	31	15	5	n
Casalicchio	Neo.	BT	Blade	d	0 to 20	37	18	4	n
Casalicchio	Neo.	BT	Blade	d	0 to 20	23	15	3	n
Casalicchio	Neo.	BT	Blade	m	0 to 20	11	22	3	n
Casalicchio	Neo.	BT	Blade	p	0 to 20	22	15	3	n
Casalicchio	Neo.	BT	Blade	m	0 to 20	29	12	2	y
Casalicchio	Neo.	BT	Blade	m	0 to 20	22	15	2	y
Casalicchio	Neo.	BT	Blade	w	0 to 20	20	9	2	y
Casalicchio	Neo.	BT	Blade	w	0 to 20	30	9	3	n
Casalicchio	Neo.	BT	Blade	m	0 to 20	20	16	4	n
Casalicchio	Neo.	BT	Blade	p	0 to 20	20	14	2	n
Casalicchio	Neo.	BT	Blade	m	0 to 20	16	15	2	y
Casalicchio	Neo.	Gab	Blade	w	0 to 20	25	10	2	n
Casalicchio	Neo.	Gab	Blade	d	0 to 20	18	8	2	n
Casalicchio	Neo.	Gab	Blade	w	0 to 20	21	17	2	n
Casalicchio	Neo.	Gab	Blade	w	0 to 20	23	14	3	n
Casalicchio	Neo.	BT	Blade	m	0 to 20	19	9	2	n
Casalicchio	Neo.	BT	Blade	m	0 to 20	20	9	2	n
Casalicchio	Neo.	Gab	Blade	w	0 to 20	27	9	1	n
Casalicchio	Neo.	BT	Blade	w	0 to 20	22	14	3	n
Casalicchio	Neo.	Gab	Blade	w	0 to 20	26	15	5	n
Casalicchio	Neo.	BT	Blade	d	0 to 20	23	9	3	n

Casalicchio	Neo.	Gab	Blade	d	0 to 20	22	15	3	y
Casalicchio	Neo.	Gab	Blade	d	0 to 20	17	11	4	n
Casalicchio	Neo.	BT	Blade	w	0 to 20	18	14	2	n
Casalicchio	Neo.	BT	Blade	w	0 to 20	23	9	3	y
Casalicchio	Neo.	BT	Blade	m	0 to 20	16	17	3	n
Casalicchio	Neo.	Gab	Blade	d	0 to 20	18	11	2	n
Casalicchio	Neo.	Gab	Blade	d	0 to 20	14	8	3	n
Casalicchio	Neo.	BT	Blade	p	0 to 20	28	23	5	n
Casalicchio	Neo.	BT	Blade	w	0 to 20	28	13	7	n
Casalicchio	Neo.	BT	Flake	w	0 to 20	34	22	5	n
Casalicchio	Neo.	Gab	Flake	w	0 to 20	10	22	3	n
Casalicchio	Neo.	Gab	Flake	w	0 to 20	19	15	4	n
Casalicchio	Neo.	BT	Flake	w	0 to 20	51	29	7	y
Casalicchio	Neo.	Gab	Flake	w	0 to 20	40	26	7	y
Casalicchio	Neo.	BT	Flake	d	0 to 20	34	24	5	n
Casalicchio	Neo.	Gab	Flake	w	0 to 20	30	21	7	y
Casalicchio	Neo.	BT	Flake	w	0 to 20	28	15	10	n
Casalicchio	Neo.	BT	Flake	m	0 to 20	25	40	7	n
Casalicchio	Neo.	BT	Flake	w	0 to 20	23	17	4	n
Casalicchio	Neo.	Gab	Flake	d	80 to 100	18	18	6	n
Casalicchio	Neo.	Gab	Ang. Waste	-	0 to 20	-	-	-	n
Casalicchio	Neo.	Gab	Ang. Waste	-	0 to 20	-	-	-	n
Casalicchio	Neo.	Gab	Ang. Waste	-	0 to 20	-	-	-	n
Casalicchio	Neo.	Gab	Ang. Waste	-	0 to 20	-	-	-	n
Casalicchio	Neo.	Gab	Ang. Waste	-	0 to 20	-	-	-	n
Casalicchio	Neo.	BT	Ang. Waste	-	0 to 20	-	-	-	n
Casalicchio	Neo.	CD	Ang. Waste	-	0 to 20	-	-	-	n
Castelluccio	EBA	Gab	Flake	w	0 to 20	40	27	18	n
Casteltermini	BA	Gab	Nodule	w	80 to 100	-	-	-	-
Casteltermini	BA	Gab	Blade Core	w	0 to 20	56	48	48	-
Casteltermini	BA	Gab	Flake Core	w	0 to 20	22	23	15	-
Casteltermini	BA	Gab	Blade Core	w	0 to 20	26	14	9	-
Casteltermini	BA	Gab	Flake Core	w	0 to 20	16	21	8	-
Casteltermini	BA	Gab	Flake Core	w	0 to 20	13	26	7	-
Casteltermini	BA	Gab	Blade	m	0 to 20	9	13	4	n
Casteltermini	BA	Gab	Blade	m	0 to 20	10	9	2	n
Casteltermini	BA	Gab	Blade	p	0 to 20	6	12	3	y
Casteltermini	BA	Gab	Blade	d	0 to 20	13	12	3	y
Casteltermini	BA	Gab	Blade	w	0 to 20	18	11	5	y
Casteltermini	BA	Gab	Blade	m	0 to 20	10	13	2	n
Casteltermini	BA	Gab	Blade	w	0 to 20	15	11	3	n
Casteltermini	BA	Gab	Blade	w	0 to 20	20	13	4	n
Casteltermini	BA	Gab	Blade	p	0 to 20	12	13	3	n
Casteltermini	BA	Gab	Blade	m	0 to 20	17	16	4	n
Casteltermini	BA	Gab	Blade	d	0 to 20	18	10	5	n
Casteltermini	BA	Gab	Blade	Unk	0 to 20	18	10	4	n
Casteltermini	BA	Gab	Blade	w	0 to 20	15	8	1	n
Casteltermini	BA	Gab	Blade	m	0 to 20	15	12	3	n
Casteltermini	BA	Gab	Blade	Unk	0 to 20	17	16	5	y
Casteltermini	BA	Gab	Blade	m	0 to 20	27	22	5	n
Casteltermini	BA	Gab	Flake	m	0 to 20	9	14	2	y
Casteltermini	BA	Gab	Flake	d	0 to 20	11	18	1	n
Casteltermini	BA	Gab	Flake	w	0 to 20	20	14	7	y
Casteltermini	BA	Gab	Flake	Unk	0 to 20	19	14	4	y
Casteltermini	BA	Gab	Flake	w	20 to 80	14	18	7	y
Casteltermini	BA	Gab	Flake	w	0 to 20	18	21	4	n
Casteltermini	BA	Gab	Flake	d	0 to 20	16	9	4	n
Casteltermini	BA	CD	Flake	w	0 to 20	20	20	5	n
Casteltermini	BA	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Casteltermini	BA	Gab	Ang. Waste	w	0 to 20	-	-	-	y
Casteltermini	BA	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Casteltermini	BA	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Casteltermini	BA	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Cava Canabarbara	EBA	Gab	Blade	w	0 to 20	77	21	5	n
Cava Canabarbara	EBA	Gab	Blade	p	0 to 20	56	22	4	y

Cava Canabarbara	EBA	Gab	Blade	w	0 to 20	54	12	4	n
Cava Canabarbara	EBA	Gab	Blade	p	0 to 20	31	12	3	n
Cava Canabarbara	EBA	Gab	Blade	m	0 to 20	15	10	3	n
Cava Canabarbara	EBA	Gab	Blade	m	0 to 20	15	9	2	n
Cava Canabarbara	EBA	Gab	Blade	p	0 to 20	10	9	2	n
Cava Canabarbara	EBA	Gab	Blade	m	0 to 20	9	7	2	n
Cava Canabarbara	EBA	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Cava Canabarbara	EBA	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Contrada Caduta	Neo.	Gab	Flake Core	w	0 to 20	60	112	84	-
Contrada Caduta	Neo.	CD	Blade Core	w	0 to 20	37	23	27	-
Contrada Caduta	Neo.	BT	Flake Core	w	0 to 20	32	24	11	-
Contrada Caduta	Neo.	BT	Flake Core	w	0 to 20	34	22	13	-
Contrada Caduta	Neo.	Gab	Flake Core	w	20 to 80	87	81	68	-
Contrada Caduta	Neo.	Gab	Blade	w	0 to 20	23	17	3	n
Contrada Caduta	Neo.	BT	Blade	w	0 to 20	19	7	3	n
Contrada Caduta	Neo.	Gab	Blade	w	0 to 20	19	15	3	n
Contrada Caduta	Neo.	Gab	Blade	w	0 to 20	20	13	5	y
Contrada Caduta	Neo.	Gab	Blade	w	0 to 20	27	13	5	n
Contrada Caduta	Neo.	Gab	Blade	w	0 to 20	39	15	3	y
Contrada Caduta	Neo.	Gab	Blade	w	0 to 20	24	13	4	y
Contrada Caduta	Neo.	Gab	Blade	p	0 to 20	23	11	2	n
Contrada Caduta	Neo.	Gab	Blade	w	0 to 20	26	12	3	y
Contrada Caduta	Neo.	Gab	Blade	p	0 to 20	19	14	3	n
Contrada Caduta	Neo.	Gab	Blade	w	0 to 20	15	9	2	n
Contrada Caduta	Neo.	Gab	Blade	w	0 to 20	46	18	3	n
Contrada Caduta	Neo.	Gab	Blade	w	0 to 20	20	13	3	n
Contrada Caduta	Neo.	Gab	Blade	w	0 to 20	28	13	3	n
Contrada Caduta	Neo.	Gab	Blade	w	0 to 20	22	14	3	n
Contrada Caduta	Neo.	CD	Blade	Unk	0 to 20	25	10	3	y
Contrada Caduta	Neo.	BT	Blade	w	0 to 20	18	12	3	n
Contrada Caduta	Neo.	Gab	Blade	w	0 to 20	20	14	2	n
Contrada Caduta	Neo.	CD	Blade	w	0 to 20	25	14	5	n
Contrada Caduta	Neo.	Gab	Blade	w	0 to 20	22	11	3	n
Contrada Caduta	Neo.	Gab	Flake	w	0 to 20	26	24	6	n
Contrada Caduta	Neo.	Gab	Flake	w	0 to 20	24	30	5	y
Contrada Caduta	Neo.	Gab	Flake	w	0 to 20	34	23	5	y
Contrada Caduta	Neo.	CD	Flake	w	0 to 20	31	28	7	n
Contrada Caduta	Neo.	Gab	Flake	w	0 to 20	22	21	4	y
Contrada Caduta	Neo.	Gab	Flake	Unk	0 to 20	29	24	8	y
Contrada Caduta	Neo.	Gab	Flake	w	0 to 20	21	14	5	n
Contrada Caduta	Neo.	CD	Flake	d	0 to 20	18	14	5	n
Contrada Caduta	Neo.	Gab	Flake	p	0 to 20	16	20	4	y
Contrada Caduta	Neo.	Gab	Flake	w	0 to 20	32	36	9	y
Contrada Caduta	Neo.	Gab	Flake	w	0 to 20	20	22	7	y
Contrada Caduta	Neo.	Gab	Flake	w	0 to 20	23	10	4	n
Contrada Caduta	Neo.	Gab	Flake	w	0 to 20	31	20	7	y
Contrada Caduta	Neo.	Gab	Flake	w	0 to 20	21	15	6	y
Contrada Caduta	Neo.	Gab	Flake	w	0 to 20	18	15	7	y
Contrada Caduta	Neo.	Gab	Flake	w	0 to 20	21	17	3	n
Contrada Caduta	Neo.	Gab	Flake	w	0 to 20	24	16	5	y
Contrada Caduta	Neo.	Gab	Flake	w	0 to 20	17	14	6	n
Contrada Caduta	Neo.	Gab	Flake	d	0 to 20	20	25	6	n
Contrada Caduta	Neo.	BT	Flake	w	0 to 20	22	21	6	n
Contrada Caduta	Neo.	Gab	Flake	w	0 to 20	15	19	2	n
Contrada Caduta	Neo.	Gab	Flake	w	0 to 20	19	22	3	n
Contrada Caduta	Neo.	Gab	Flake	w	0 to 20	17	15	4	n
Contrada Caduta	Neo.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Contrada Caduta	Neo.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Contrada Caduta	Neo.	BT	Ang. Waste	w	0 to 20	-	-	-	n
Contrada Caduta	Neo.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Contrada Orto del Conte	EChal.	Gab	Blade	w	0 to 20	34	14	4	y
Contrada Orto del Conte	EChal.	Gab	Blade	w	0 to 20	34	7	2	n
Contrada Orto del Conte	EChal.	Gab	Blade	w	0 to 20	30	10	2	n
Contrada Orto del Conte	EChal.	Gab	Blade	w	0 to 20	34	10	5	n
Contrada Orto del Conte	EChal.	Gab	Blade	p	0 to 20	32	6	2	n

Contrada Orto del Conte	EChal.	Gab	Blade	w	0 to 20	29	12	2	n
Contrada Orto del Conte	EChal.	Gab	Blade	w	0 to 20	31	12	3	n
Contrada Orto del Conte	EChal.	Gab	Blade	w	0 to 20	51	11	3	n
Contrada Orto del Conte	EChal.	Gab	Blade	w	0 to 20	62	15	2	n
Contrada Orto del Conte	EChal.	Gab	Blade	m	0 to 20	52	12	3	n
Contrada Orto del Conte	EChal.	Gab	Blade	w	0 to 20	55	15	3	n
Contrada Orto del Conte	EChal.	Gab	Blade	w	0 to 20	53	12	2	n
Contrada Orto del Conte	EChal.	Gab	Blade	d	0 to 20	46	11	2	n
Contrada Orto del Conte	EChal.	Gab	Blade	m	0 to 20	45	9	4	n
Contrada Orto del Conte	EChal.	Gab	Blade	w	0 to 20	43	9	2	n
Contrada Orto del Conte	EChal.	Gab	Blade	w	0 to 20	40	10	2	n
Contrada Orto del Conte	EChal.	Gab	Blade	d	0 to 20	39	11	5	y
Contrada Orto del Conte	EChal.	Gab	Blade	w	0 to 20	39	11	3	n
Contrada Orto del Conte	EChal.	Gab	Blade	p	0 to 20	17	12	3	y
Contrada Orto del Conte	EChal.	Gab	Blade	w	0 to 20	24	7	1	n
Contrada Orto del Conte	EChal.	Gab	Blade	p	0 to 20	22	12	2	n
Contrada Orto del Conte	EChal.	Gab	Blade	p	0 to 20	21	9	2	n
Contrada Orto del Conte	EChal.	Gab	Blade	m	0 to 20	20	9	3	n
Contrada Orto del Conte	EChal.	Gab	Blade	p	0 to 20	29	10	6	y
Contrada Orto del Conte	EChal.	Gab	Blade	w	0 to 20	26	10	3	n
Contrada Orto del Conte	EChal.	Gab	Blade	m	0 to 20	29	8	3	n
Contrada Orto del Conte	EChal.	Gab	Blade	p	0 to 20	34	17	5	n
Contrada Orto del Conte	EChal.	Gab	Blade	w	0 to 20	39	11	2	n
Contrada Orto del Conte	EChal.	Gab	Blade	p	0 to 20	25	12	3	y
Contrada Orto del Conte	EChal.	Gab	Blade	m	0 to 20	24	11	4	n
Contrada Orto del Conte	EChal.	Gab	Blade	m	0 to 20	34	11	3	n
Contrada Orto del Conte	EChal.	Gab	Blade	d	0 to 20	18	10	3	n
Contrada Orto del Conte	EChal.	Gab	Blade	d	0 to 20	26	11	2	y
Contrada Orto del Conte	EChal.	Gab	Blade	w	0 to 20	23	10	2	n
Contrada Orto del Conte	EChal.	Gab	Blade	w	0 to 20	25	10	2	n
Contrada Orto del Conte	EChal.	Gab	Blade	w	0 to 20	25	9	2	n
Contrada Orto del Conte	EChal.	Gab	Blade	p	0 to 20	24	12	3	n
Contrada Orto del Conte	EChal.	Gab	Blade	d	0 to 20	25	10	3	n
Contrada Orto del Conte	EChal.	Gab	Blade	w	0 to 20	27	12	2	n
Contrada Orto del Conte	EChal.	Gab	Blade	m	0 to 20	20	13	4	n
Contrada Orto del Conte	EChal.	Gab	Blade	m	0 to 20	20	12	5	n
Contrada Orto del Conte	EChal.	Gab	Blade	d	0 to 20	17	8	1	n
Contrada Orto del Conte	EChal.	Gab	Blade	d	0 to 20	28	13	3	n
Contrada Orto del Conte	EChal.	Gab	Blade	p	0 to 20	23	11	3	n
Contrada Orto del Conte	EChal.	Gab	Blade	m	0 to 20	17	10	1	n
Contrada Orto del Conte	EChal.	Gab	Blade	m	0 to 20	25	13	2	n
Contrada Orto del Conte	EChal.	Gab	Blade	w	0 to 20	30	15	6	n
Contrada Orto del Conte	EChal.	Gab	Blade	w	0 to 20	35	10	1	n
Contrada Orto del Conte	EChal.	Gab	Blade	p	0 to 20	24	7	4	n
Contrada Orto del Conte	EChal.	Gab	Blade	w	0 to 20	23	10	2	y
Contrada Orto del Conte	EChal.	Gab	Blade	w	0 to 20	28	8	4	n
Contrada Orto del Conte	EChal.	Gab	Blade	w	0 to 20	28	17	4	y
Contrada Orto del Conte	EChal.	Gab	Blade	m	0 to 20	20	10	2	n
Contrada Orto del Conte	EChal.	Gab	Blade	w	0 to 20	27	9	2	n
Contrada Orto del Conte	EChal.	Gab	Blade	w	0 to 20	36	13	2	n
Contrada Orto del Conte	EChal.	Gab	Blade	d	0 to 20	27	12	4	y
Contrada Orto del Conte	EChal.	Gab	Blade	w	0 to 20	28	10	3	y
Contrada Orto del Conte	EChal.	Gab	Blade	w	0 to 20	33	16	5	n
Contrada Orto del Conte	EChal.	Gab	Blade	w	0 to 20	23	9	2	n
Contrada Orto del Conte	EChal.	Gab	Blade	p	0 to 20	26	13	3	n
Contrada Orto del Conte	EChal.	Gab	Blade	d	0 to 20	27	9	2	n
Contrada Orto del Conte	EChal.	Gab	Blade	m	0 to 20	18	12	1	n
Contrada Orto del Conte	EChal.	Gab	Blade	w	0 to 20	29	11	2	n
Contrada Orto del Conte	EChal.	Gab	Blade	p	0 to 20	25	10	1	n
Contrada Orto del Conte	EChal.	Gab	Blade	d	0 to 20	21	12	2	n
Contrada Orto del Conte	EChal.	Gab	Blade	p	0 to 20	16	12	3	n
Contrada Orto del Conte	EChal.	Gab	Blade	d	0 to 20	16	10	2	n
Contrada Orto del Conte	EChal.	Gab	Flake	w	0 to 20	11	11	2	n
Contrada Orto del Conte	EChal.	Gab	Flake	w	0 to 20	13	28	2	n
Contrada Orto del Conte	EChal.	Gab	Flake	d	0 to 20	18	22	2	n

Cozzo del Pantano	MBA	Gab	Blade	w	0 to 20	35	14	6	n
Fontana di Pepe	Stent.	Gab	Blade	d	0 to 20	26	13	2	n
Fontana di Pepe	Stent.	Gab	Blade	p	0 to 20	34	19	6	y
Fontana di Pepe	Stent.	Gab	Flake	w	0 to 20	29	34	9	n
Fontana di Pepe	Stent.	CD	Flake	w	0 to 20	33	32	3	n
FMG Grotta 2	Neo.	Gab	Flake Core	w	0 to 20	35	84	69	-
FMG Grotta 4	Neo.	Gab	Blade	w	0 to 20	54	12	4	n
FMG Grotta 4	Neo.	Gab	Blade	w	0 to 20	38	12	2	n
FMG Grotta 4	Neo.	Gab	Blade	w	0 to 20	37	11	2	n
FMG Grotta 4	Neo.	CD	Blade	m	0 to 20	11	13	3	n
FMG Grotta 4	Neo.	LV	Blade	p	0 to 20	34	13	3	n
FMG Grotta 4	Neo.	Gab	Blade	p	0 to 20	25	15	3	n
FMG Grotta 4	Neo.	Gab	Blade	w	0 to 20	33	10	4	n
FMG Grotta 5	Neo.	Gab	Blade	d	0 to 20	34	11	3	n
FMG Grotta 6	Neo.	Gab	Blade	w	0 to 20	29	10	8	n
FMG Grotta 7	Neo.	BT	Blade	m	0 to 20	52	10	3	n
FMG Grotta 4	Neo.	Gab	Blade	w	0 to 20	34	16	5	n
FMG Grotta 4	Neo.	Gab	Blade	p	0 to 20	30	17	3	n
FMG Grotta 4	Neo.	Gab	Blade	p	0 to 20	56	10	3	n
FMG Grotta 4	Neo.	Gab	Blade	w	0 to 20	40	14	3	n
FMG Grotta 4	Neo.	LV	Blade	p	0 to 20	40	18	3	y
FMG Grotta 4	Neo.	LV	Blade	d	0 to 20	31	11	2	n
FMG Grotta 4	Neo.	LV	Blade	w	0 to 20	40	8	2	n
FMG Grotta 4	Neo.	Gab	Blade	w	0 to 20	33	13	3	n
FMG Grotta 4	Neo.	Gab	Blade	d	0 to 20	51	9	3	n
FMG Grotta 4	Neo.	Gab	Flake	p	1 to 20	22	29	5	y
FMG Grotta 4	Neo.	Gab	Flake	d	2 to 20	18	23	3	n
FMG Grotta 4	Neo.	Gab	Flake	m	3 to 20	27	12	2	n
FMG Grotta 4	Neo.	Gab	Flake	w	4 to 20	38	11	3	n
FMG Grotta 4	Neo.	Gab	Flake	d	5 to 20	15	29	12	n
FMG Grotta 4	Neo.	Gab	Flake	w	6 to 20	37	24	9	n
FMG Grotta 4	Neo.	Gab	Flake	w	7 to 20	19	24	4	n
FMG Grotta 4	Neo.	BT	Flake	m	8 to 20	37	31	19	y
FMG Grotta 4	Neo.	Gab	Flake	w	9 to 20	32	40	5	n
FMG Grotta 4	Neo.	Gab	Flake	w	10 to 20	15	11	1	n
FMG Grotta 4	Neo.	Gab	Flake	w	11 to 20	14	20	15	y
FMG Grotta 4	Neo.	CD	Flake	d	12 to 20	23	23	8	n
FMG Grotta 4	Neo.	Gab	Flake	d	13 to 20	21	29	7	n
FMG Grotta 4	Neo.	Gab	Flake	w	20 to 80	30	59	13	n
FMG Grotta 4	Neo.	Gab	Flake	w	0 to 20	15	25	6	n
FMG Grotta 4	Neo.	Gab	Flake	w	0 to 20	18	9	2	n
FMG Grotta 4	Neo.	Gab	Flake	p	0 to 20	35	30	11	n
FMG Sommità	Neo.	Gab	Blade Core	w	0 to 20	23	18	14	-
FMG Sommità	Neo.	Gab	Blade	w	0 to 20	43	9	2	n
FMG Sommità	Neo.	BT	Blade	w	0 to 20	14	11	4	n
FMG Sommità	Neo.	Gab	Blade	m	0 to 20	15	13	3	y
FMG Sommità	Neo.	Gab	Blade	m	0 to 20	15	13	2	n
FMG Sommità	Neo.	Gab	Blade	d	0 to 20	17	12	2	n
FMG Sommità	Neo.	Gab	Blade	m	0 to 20	25	19	4	y
FMG Sommità	Neo.	Gab	Blade	m	0 to 20	21	13	2	n
FMG Sommità	Neo.	Gab	Blade	p	0 to 20	38	13	4	n
FMG Sommità	Neo.	Gab	Blade	p	0 to 20	15	14	3	n
FMG Sommità	Neo.	Gab	Blade	p	0 to 20	31	18	4	n
FMG Sommità	Neo.	BT	Blade	p	0 to 20	17	19	2	n
FMG Sommità	Neo.	Gab	Flake	w	0 to 20	12	15	3	n
FMG Sommità	Neo.	Gab	Flake	p	0 to 20	23	18	4	n
Gela Manfria	EBA	Gab	Blade	Unk	0 to 20	22	17	4	n
Gela Manfria	EBA	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Grotta Calafarina	EChal.	Gab	Blade	d	0 to 20	31	12	2	n
Grotta Calafarina	EChal.	Gab	Blade	w	0 to 20	31	10	2	y
Grotta Calafarina	EChal.	Gab	Blade	w	0 to 20	37	12	8	n
Grotta Calafarina	EChal.	Gab	Blade	w	0 to 20	36	11	3	n
Grotta Calafarina	EChal.	Gab	Blade	p	0 to 20	23	10	2	n
Grotta Calafarina	EChal.	Gab	Blade	w	0 to 20	27	9	2	n
Grotta Calafarina	EChal.	Gab	Blade	w	0 to 20	22	12	3	n

Grotta Calafarina	EChal.	Gab	Blade	p	0 to 20	22	8	2	n
Grotta Calafarina	EChal.	Gab	Blade	m	0 to 20	25	9	2	n
Grotta Corruggi	Stent.	Gab	Blade	w	0 to 20	33	14	2	n
Grotta Corruggi	Stent.	Gab	Blade	m	0 to 20	23	15	3	y
Grotta del Conzo	EChal.	Gab	Blade	p	0 to 20	45	20	5	y
Iannicu	Stent.	Gab	Blade	p	0 to 20	18	8	4	n
Iannicu	Stent.	Gab	Blade	m	0 to 20	25	14	3	n
Iannicu	Stent.	Gab	Blade	d	0 to 20	32	14	4	y
Isola di Ognina	Unstratified	Gab	Flake Core	w	0 to 20	16	14	4	-
Isola di Ognina	Unstratified	Gab	Flake Core	w	0 to 20	26	20	7	-
Isola di Ognina	Unstratified	Gab	Blade Core	w	0 to 20	20	11	3	-
Isola di Ognina	Unstratified	Gab	Flake Core	w	0 to 20	17	13	4	-
Isola di Ognina	Unstratified	Gab	Flake Core	w	0 to 20	16	20	15	-
Isola di Ognina	Unstratified	Gab	Flake Core	w	0 to 20	19	20	13	-
Isola di Ognina	Unstratified	Gab	Flake Core	w	0 to 20	18	28	17	-
Isola di Ognina	Unstratified	Gab	Flake Core	w	0 to 20	24	20	5	-
Isola di Ognina	Unstratified	Gab	Blade	w	0 to 20	46	18	3	n
Isola di Ognina	Unstratified	Gab	Blade	w	0 to 20	15	15	3	n
Isola di Ognina	Unstratified	Gab	Blade	w	0 to 20	14	14	3	n
Isola di Ognina	Unstratified	Gab	Blade	d	0 to 20	22	10	2	n
Isola di Ognina	Unstratified	Gab	Blade	w	0 to 20	11	9	2	y
Isola di Ognina	Unstratified	Gab	Blade	d	0 to 20	21	11	2	n
Isola di Ognina	Unstratified	Gab	Blade	y	0 to 20	18	10	2	n
Isola di Ognina	Unstratified	Gab	Blade	d	0 to 20	8	6	1	n
Isola di Ognina	Unstratified	Gab	Blade	w	0 to 20	10	3	3	n
Isola di Ognina	Unstratified	Gab	Blade	w	0 to 20	30	15	5	n
Isola di Ognina	Unstratified	Gab	Blade	w	0 to 20	20	12	6	y
Isola di Ognina	Unstratified	Gab	Blade	w	0 to 20	23	13	4	y
Isola di Ognina	Unstratified	Gab	Blade	w	0 to 20	10	7	2	n
Isola di Ognina	Unstratified	Gab	Blade	p	0 to 20	7	5	2	n
Isola di Ognina	Unstratified	Gab	Blade	w	0 to 20	16	11	2	n
Isola di Ognina	Unstratified	Gab	Blade	w	0 to 20	30	10	2	n
Isola di Ognina	Unstratified	Gab	Blade	m	0 to 20	19	13	1	y
Isola di Ognina	Unstratified	Gab	Blade	w	0 to 20	20	19	3	n
Isola di Ognina	Unstratified	Gab	Blade	w	0 to 20	18	10	5	n
Isola di Ognina	Unstratified	Gab	Blade	w	0 to 20	36	13	4	n
Isola di Ognina	Unstratified	Gab	Blade	w	0 to 20	25	11	3	n
Isola di Ognina	Unstratified	Gab	Blade	p	0 to 20	24	21	4	n
Isola di Ognina	Unstratified	Gab	Blade	m	0 to 20	13	14	5	n
Isola di Ognina	Unstratified	Gab	Blade	w	0 to 20	18	13	5	n
Isola di Ognina	Unstratified	Gab	Blade	m	0 to 20	22	11	1	n
Isola di Ognina	Unstratified	Gab	Blade	w	0 to 20	41	22	5	y
Isola di Ognina	Unstratified	Gab	Blade	w	0 to 20	34	15	6	n
Isola di Ognina	Unstratified	Gab	Blade	p	0 to 20	18	20	5	y
Isola di Ognina	Unstratified	Gab	Blade	p	0 to 20	24	12	5	n
Isola di Ognina	Unstratified	Gab	Blade	d	0 to 20	33	11	5	y
Isola di Ognina	Unstratified	Gab	Blade	w	0 to 20	18	11	3	n
Isola di Ognina	Unstratified	Gab	Blade	m	0 to 20	17	16	5	n
Isola di Ognina	Unstratified	Gab	Blade	w	0 to 20	22	10	3	y
Isola di Ognina	Unstratified	Gab	Blade	w	0 to 20	18	11	2	n
Isola di Ognina	Unstratified	Gab	Blade	w	0 to 20	22	12	4	y
Isola di Ognina	Unstratified	BT	Blade	w	0 to 20	25	14	5	y
Isola di Ognina	Unstratified	Gab	Blade	p	0 to 20	11	12	5	n
Isola di Ognina	Unstratified	Gab	Blade	w	0 to 20	15	7	1	n
Isola di Ognina	Unstratified	Gab	Blade	m	0 to 20	9	11	2	n
Isola di Ognina	Unstratified	Gab	Blade	d	0 to 20	17	12	3	n
Isola di Ognina	Unstratified	Gab	Blade	m	0 to 20	10	9	1	n
Isola di Ognina	Unstratified	Gab	Blade	m	0 to 20	19	13	1	y
Isola di Ognina	Unstratified	Gab	Blade	w	0 to 20	20	11	2	n
Isola di Ognina	Unstratified	Gab	Blade	w	0 to 20	19	18	5	y
Isola di Ognina	Unstratified	Gab	Blade	w	0 to 20	16	14	3	n
Isola di Ognina	Unstratified	Gab	Blade	w	0 to 20	20	14	2	n
Isola di Ognina	Unstratified	Gab	Blade	w	0 to 20	27	10	2	n
Isola di Ognina	Unstratified	Gab	Blade	w	0 to 20	25	18	3	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	12	16	2	n

Isola di Ognina	Unstratified	Gab	Flake	m	0 to 20	20	20	4	y
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	18	10	5	y
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	19	25	10	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	19	14	3	n
Isola di Ognina	Unstratified	Gab	Flake	d	0 to 20	8	21	2	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	15	15	2	y
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	25	20	8	y
Isola di Ognina	Unstratified	Gab	Flake	m	0 to 20	8	11	1	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	25	28	4	y
Isola di Ognina	Unstratified	Gab	Flake	d	0 to 20	10	16	2	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	16	14	2	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	21	20	4	y
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	19	10	3	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	19	9	3	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	9	11	3	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	14	12	2	y
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	12	13	2	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	10	10	1	n
Isola di Ognina	Unstratified	CD	Flake	w	0 to 20	21	20	5	y
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	17	23	5	n
Isola di Ognina	Unstratified	Gab	Flake	d	0 to 20	10	25	6	y
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	12	7	1	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	19	13	3	n
Isola di Ognina	Unstratified	Gab	Flake	d	0 to 20	7	13	3	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	9	10	1	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	12	12	6	y
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	21	11	2	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	17	20	4	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	15	16	4	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	23	15	8	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	31	21	6	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	20	14	4	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	20	21	4	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	23	15	2	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	15	11	5	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	16	11	5	n
Isola di Ognina	Unstratified	Gab	Flake	d	0 to 20	13	19	3	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	15	16	5	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	15	18	6	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	24	16	5	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	26	14	10	n
Isola di Ognina	Unstratified	Gab	Flake	p	0 to 20	17	19	4	y
Isola di Ognina	Unstratified	Gab	Flake	p	0 to 20	22	10	5	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	23	11	5	y
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	15	17	6	y
Isola di Ognina	Unstratified	Gab	Flake	p	0 to 20	23	22	5	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	24	23	6	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	27	26	6	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	26	25	3	y
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	20	18	5	y
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	13	20	4	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	11	10	3	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	20	23	10	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	19	17	7	n
Isola di Ognina	Unstratified	Gab	Flake	d	0 to 20	21	14	3	y
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	18	23	8	y
Isola di Ognina	Unstratified	Gab	Flake	p	0 to 20	18	26	7	n
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	18	12	6	y
Isola di Ognina	Unstratified	Gab	Flake	w	0 to 20	12	22	2	n
Isola di Ognina	Unstratified	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Isola di Ognina	Unstratified	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Isola di Ognina	Unstratified	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Isola di Ognina	Unstratified	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Isola di Ognina	Unstratified	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Isola di Ognina	Unstratified	Gab	Ang. Waste	w	0 to 20	-	-	-	n

Isola di Ognina	Unstratified	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Isola di Ognina	Unstratified	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Isola di Ognina	Unstratified	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Isola di Ognina	Unstratified	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Isola di Ognina	Unstratified	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Isola di Ognina	Unstratified	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Isola di Ognina	Unstratified	Gab	Ang. Waste	w	0 to 20	-	-	-	n
La Muculufu	EBA	Gab	Blade	w	0 to 20	22	10	4	n
La Muculufu	EBA	Gab	Blade	w	0 to 20	29	12	3	n
La Muculufu	EBA	CD	Blade	w	0 to 20	29	18	5	y
La Muculufu	EBA	CD	Blade	w	0 to 20	30	15	3	n
La Muculufu	EBA	BT	Blade	w	0 to 20	16	15	2	n
La Muculufu	EBA	Gab	Blade	w	0 to 20	17	11	2	n
La Muculufu	EBA	Gab	Blade	w	0 to 20	15	10	3	n
La Muculufu	EBA	Gab	Blade	w	0 to 20	17	11	2	n
La Muculufu	EBA	Gab	Blade	m	0 to 20	15	9	4	n
La Muculufu	EBA	Gab	Blade	m	0 to 20	7	11	2	n
La Muculufu	EBA	BT	Blade	w	0 to 20	10	6	2	n
La Muculufu	EBA	Gab	Blade	m	0 to 20	9	7	1	n
La Muculufu	EBA	Gab	Blade	p	0 to 20	11	13	4	y
La Muculufu	EBA	Gab	Flake	w	0 to 20	22	32	10	n
La Muculufu	EBA	CD	Flake	d	0 to 20	27	18	3	n
La Muculufu	EBA	Gab	Flake	d	0 to 20	9	15	1	n
La Muculufu	EBA	CD	Flake	p	0 to 20	12	10	3	n
La Muculufu	EBA	Gab	Ang. Waste	w	0 to 20	-	-	-	y
La Muculufu	EBA	CD	Ang. Waste	w	0 to 20	-	-	-	n
La Muculufu	EBA	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Malpasso	LChal.	Gab	Blade	w	0 to 20	81	21	8	n
Malpasso	LChal.	Gab	Blade	p	0 to 20	48	15	3	n
Malpasso	LChal.	Gab	Blade	w	0 to 20	35	12	2	n
Malpasso	LChal.	Gab	Blade	d	0 to 20	31	10	2	n
Matrensa	Stent.	Gab	Blade Core	w	20 to 80	44	36	22	-
Matrensa	Stent.	Gab	Flake Core	w	0 to 20	21	16	11	-
Matrensa	Stent.	Gab	Blade	p	0 to 20	28	12	3	y
Matrensa	Stent.	Gab	Blade	p	0 to 20	30	12	5	n
Matrensa	Stent.	Gab	Blade	p	0 to 20	23	10	4	y
Matrensa	Stent.	Gab	Blade	p	0 to 20	30	14	2	n
Matrensa	Stent.	Gab	Blade	w	0 to 20	77	24	7	n
Matrensa	Stent.	Gab	Blade	w	0 to 20	55	21	5	y
Matrensa	Stent.	Gab	Blade	d	0 to 20	55	23	5	n
Matrensa	Stent.	Gab	Blade	w	0 to 20	55	12	4	n
Matrensa	Stent.	Gab	Blade	p	0 to 20	53	14	2	n
Matrensa	Stent.	Gab	Blade	p	0 to 20	48	12	4	n
Matrensa	Stent.	Gab	Blade	p	0 to 20	40	15	3	n
Matrensa	Stent.	Gab	Blade	p	0 to 20	35	10	2	n
Matrensa	Stent.	Gab	Blade	p	0 to 20	14	14	3	n
Matrensa	Stent.	Gab	Blade	p	0 to 20	14	16	5	n
Matrensa	Stent.	Gab	Blade	p	0 to 20	23	11	3	n
Matrensa	Stent.	Gab	Blade	d	0 to 20	20	15	2	n
Matrensa	Stent.	Gab	Blade	w	0 to 20	30	10	6	n
Matrensa	Stent.	Gab	Blade	m	0 to 20	16	15	2	y
Matrensa	Stent.	Gab	Blade	w	0 to 20	19	9	2	n
Matrensa	Stent.	Gab	Blade	w	0 to 20	21	5	1	n
Matrensa	Stent.	Gab	Blade	d	0 to 20	18	12	3	n
Matrensa	Stent.	Gab	Blade	p	0 to 20	26	17	3	y
Matrensa	Stent.	Gab	Blade	w	0 to 20	22	11	3	n
Matrensa	Stent.	Gab	Blade	p	0 to 20	18	10	2	n
Matrensa	Stent.	Gab	Blade	w	0 to 20	35	17	5	n
Matrensa	Stent.	Gab	Blade	w	0 to 20	28	12	8	n
Matrensa	Stent.	Gab	Blade	m	0 to 20	20	15	2	n
Matrensa	Stent.	Gab	Blade	p	0 to 20	21	15	4	n
Matrensa	Stent.	Gab	Blade	d	0 to 20	22	15	2	n
Matrensa	Stent.	Gab	Blade	d	0 to 20	21	14	2	n
Matrensa	Stent.	Gab	Blade	w	0 to 20	23	13	4	n
Matrensa	Stent.	Gab	Blade	p	0 to 20	23	10	3	n

Matrensa	Stent.	Gab	Blade	d	0 to 20	21	10	3	n
Matrensa	Stent.	Gab	Blade	p	0 to 20	15	17	3	n
Matrensa	Stent.	Gab	Blade	p	0 to 20	16	12	3	n
Matrensa	Stent.	Gab	Blade	w	0 to 20	32	15	3	n
Matrensa	Stent.	Gab	Blade	p	0 to 20	30	16	3	n
Matrensa	Stent.	Gab	Blade	p	0 to 20	24	12	3	n
Matrensa	Stent.	Gab	Blade	m	0 to 20	37	14	3	n
Matrensa	Stent.	Gab	Blade	p	0 to 20	47	14	3	n
Matrensa	Stent.	Gab	Blade	w	0 to 20	37	10	3	n
Matrensa	Stent.	Gab	Blade	p	0 to 20	30	12	3	n
Matrensa	Stent.	Gab	Blade	w	0 to 20	27	12	2	n
Matrensa	Stent.	Gab	Blade	p	0 to 20	32	17	4	n
Matrensa	Stent.	Gab	Blade	d	0 to 20	24	11	3	n
Matrensa	Stent.	Gab	Blade	p	0 to 20	34	12	3	n
Matrensa	Stent.	Gab	Blade	w	0 to 20	36	12	3	n
Matrensa	Stent.	Gab	Blade	p	0 to 20	20	11	2	n
Matrensa	Stent.	Gab	Blade	d	0 to 20	31	15	5	n
Matrensa	Stent.	Gab	Blade	w	0 to 20	31	13	5	n
Matrensa	Stent.	Gab	Blade	p	0 to 20	36	21	5	n
Matrensa	Stent.	Gab	Blade	w	0 to 20	26	15	7	n
Matrensa	Stent.	Gab	Blade	p	0 to 20	23	19	4	n
Matrensa	Stent.	Gab	Blade	p	0 to 20	18	11	3	n
Matrensa	Stent.	Gab	Blade	p	0 to 20	33	12	3	n
Matrensa	Stent.	Gab	Blade	p	0 to 20	25	26	4	y
Matrensa	Stent.	Gab	Blade	p	0 to 20	25	12	3	n
Matrensa	Stent.	Gab	Blade	w	0 to 20	44	15	3	y
Matrensa	Stent.	Gab	Blade	w	0 to 20	41	9	3	n
Matrensa	Stent.	Gab	Blade	w	0 to 20	36	15	5	n
Matrensa	Stent.	Gab	Blade	m	0 to 20	23	10	1	n
Matrensa	Stent.	Gab	Blade	w	0 to 20	27	11	3	y
Matrensa	Stent.	Gab	Blade	p	0 to 20	30	10	3	n
Matrensa	Stent.	Gab	Blade	p	0 to 20	27	20	5	y
Matrensa	Stent.	Gab	Blade	w	0 to 20	27	9	2	n
Matrensa	Stent.	Gab	Blade	w	0 to 20	36	15	4	n
Matrensa	Stent.	Gab	Blade	m	0 to 20	20	8	2	n
Matrensa	Stent.	Gab	Blade	w	0 to 20	31	10	4	n
Matrensa	Stent.	Gab	Blade	p	0 to 20	24	13	4	n
Matrensa	Stent.	Gab	Blade	w	0 to 20	20	8	3	n
Matrensa	Stent.	Gab	Blade	w	0 to 20	29	12	3	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	24	20	4	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	19	34	7	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	20	30	5	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	23	21	8	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	23	20	5	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	19	25	4	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	21	20	5	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	30	15	4	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	23	17	3	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	29	10	11	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	22	19	6	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	14	20	5	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	11	19	4	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	21	19	8	n
Matrensa	Stent.	Gab	Flake	m	0 to 20	17	15	2	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	17	20	7	y
Matrensa	Stent.	Gab	Flake	w	0 to 20	16	28	6	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	30	17	5	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	18	9	7	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	22	12	1	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	23	16	3	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	29	15	3	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	20	19	8	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	21	20	2	n
Matrensa	Stent.	Gab	Flake	p	0 to 20	24	25	3	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	26	27	4	n

Matrensa	Stent.	Gab	Flake	w	0 to 20	23	28	5	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	26	30	6	n
Matrensa	Stent.	Gab	Flake	d	0 to 20	17	15	5	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	23	10	7	n
Matrensa	Stent.	Gab	Flake	d	0 to 20	21	22	6	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	30	21	6	y
Matrensa	Stent.	Gab	Flake	p	0 to 20	20	30	6	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	21	15	3	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	21	22	3	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	25	17	5	n
Matrensa	Stent.	Gab	Flake	m	0 to 20	15	12	2	y
Matrensa	Stent.	Gab	Flake	d	0 to 20	19	13	4	n
Matrensa	Stent.	Gab	Flake	p	0 to 20	14	31	8	n
Matrensa	Stent.	Gab	Flake	p	0 to 20	24	13	5	n
Matrensa	Stent.	Gab	Flake	p	0 to 20	18	25	4	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	22	13	4	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	18	38	4	n
Matrensa	Stent.	Gab	Flake	w	0 to 20	18	27	6	y
Matrensa	Stent.	Gab	Flake	w	0 to 20	31	16	5	n
Matrensa	Stent.	Gab	Flake	p	0 to 20	25	41	10	y
Matrensa	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	y
Matrensa	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Matrensa	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	y
Matrensa	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	y
Matrensa	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Megara Hyblaea	Stent.	Gab	Blade Core	w	0 to 20	51	33	33	-
Megara Hyblaea	Stent.	Gab	Blade Core	w	0 to 20	23	23	20	-
Megara Hyblaea	Stent.	Gab	Flake Core	w	20 to 80	98	108	66	-
Megara Hyblaea	Stent.	Gab	Blade Core	w	0 to 20	39	40	33	-
Megara Hyblaea	Stent.	Gab	Flake Core	w	0 to 20	25	28	21	-
Megara Hyblaea	Stent.	Gab	Flake Core	w	20 to 80	46	39	36	-
Megara Hyblaea	Stent.	Gab	Flake Core	w	0 to 20	33	37	18	-
Megara Hyblaea	Stent.	Gab	Flake Core	w	0 to 20	25	32	17	-
Megara Hyblaea	Stent.	Gab	Flake Core	w	0 to 20	26	19	20	-
Megara Hyblaea	Stent.	Gab	Flake Core	w	0 to 20	20	23	19	-
Megara Hyblaea	Stent.	Gab	Flake Core	w	0 to 20	29	44	31	-
Megara Hyblaea	Stent.	Gab	Blade	d	0 to 20	11	9	2	n
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	21	13	3	n
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	38	10	2	n
Megara Hyblaea	Stent.	Gab	Blade	p	0 to 20	23	11	5	n
Megara Hyblaea	Stent.	Gab	Blade	d	0 to 20	20	10	2	n
Megara Hyblaea	Stent.	Gab	Blade	w	20 to 80	31	13	3	n
Megara Hyblaea	Stent.	Gab	Blade	p	0 to 20	21	10	2	n
Megara Hyblaea	Stent.	Gab	Blade	m	0 to 20	28	9	2	n
Megara Hyblaea	Stent.	Gab	Blade	p	0 to 20	20	33	6	y
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	36	26	7	n
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	32	15	1	n
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	36	10	3	n
Megara Hyblaea	Stent.	Gab	Blade	d	0 to 20	37	17	3	n
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	39	10	3	n
Megara Hyblaea	Stent.	Gab	Blade	p	0 to 20	40	13	3	n
Megara Hyblaea	Stent.	Gab	Blade	m	0 to 20	36	15	3	n
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	39	12	6	n
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	26	14	7	y
Megara Hyblaea	Stent.	Gab	Blade	d	0 to 20	32	8	2	n
Megara Hyblaea	Stent.	Gab	Blade	p	0 to 20	23	13	3	n
Megara Hyblaea	Stent.	Gab	Blade	p	0 to 20	24	11	2	n
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	31	9	7	y
Megara Hyblaea	Stent.	Gab	Blade	d	0 to 20	37	18	4	n
Megara Hyblaea	Stent.	Gab	Blade	m	0 to 20	14	18	5	n
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	20	10	3	n
Megara Hyblaea	Stent.	Gab	Blade	d	0 to 20	19	12	2	n
Megara Hyblaea	Stent.	Gab	Blade	d	0 to 20	39	22	11	y
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	28	10	3	n
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	30	13	6	n

Megara Hyblaea	Stent.	Gab	Blade	d	0 to 20	28	10	3	n
Megara Hyblaea	Stent.	Gab	Blade	d	0 to 20	30	13	3	n
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	44	12	3	n
Megara Hyblaea	Stent.	Gab	Blade	m	0 to 20	15	13	2	n
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	48	12	4	n
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	37	12	2	y
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	44	23	6	n
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	42	11	3	n
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	21	14	2	n
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	43	17	4	n
Megara Hyblaea	Stent.	Gab	Blade	p	0 to 20	17	11	3	n
Megara Hyblaea	Stent.	Gab	Blade	p	0 to 20	18	9	2	n
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	27	10	2	n
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	23	14	3	n
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	33	14	3	n
Megara Hyblaea	Stent.	Gab	Blade	p	0 to 20	28	18	5	n
Megara Hyblaea	Stent.	Gab	Blade	m	0 to 20	19	13	2	n
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	22	14	3	y
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	18	16	3	n
Megara Hyblaea	Stent.	Gab	Blade	m	0 to 20	36	11	2	y
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	35	21	7	n
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	33	16	4	n
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	31	19	4	n
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	20	12	4	n
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	31	10	2	n
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	34	8	3	n
Megara Hyblaea	Stent.	Gab	Blade	m	0 to 20	32	12	3	n
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	32	9	2	n
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	38	10	2	n
Megara Hyblaea	Stent.	Gab	Blade	d	0 to 20	43	15	9	y
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	62	14	4	n
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	53	13	5	n
Megara Hyblaea	Stent.	Gab	Blade	w	0 to 20	64	13	3	y
Megara Hyblaea	Stent.	Gab	Flake	w	0 to 20	21	12	6	n
Megara Hyblaea	Stent.	Gab	Flake	p	0 to 20	21	23	5	n
Megara Hyblaea	Stent.	Gab	Flake	w	0 to 20	52	30	7	n
Megara Hyblaea	Stent.	Gab	Flake	w	0 to 20	30	15	7	y
Megara Hyblaea	Stent.	Gab	Flake	w	20 to 40	23	22	4	y
Megara Hyblaea	Stent.	Gab	Flake	w	0 to 20	18	18	3	n
Megara Hyblaea	Stent.	Gab	Flake	w	0 to 20	20	23	6	n
Megara Hyblaea	Stent.	Gab	Flake	w	0 to 20	28	20	10	n
Megara Hyblaea	Stent.	Gab	Flake	w	20 to 80	59	48	12	y
Megara Hyblaea	Stent.	Gab	Flake	w	0 to 20	33	48	12	n
Megara Hyblaea	Stent.	Gab	Flake	na	0 to 20	35	20	11	y
Megara Hyblaea	Stent.	Gab	Flake	w	20 to 80	26	31	7	n
Megara Hyblaea	Stent.	Gab	Flake	w	0 to 20	17	12	3	y
Megara Hyblaea	Stent.	Gab	Flake	d	0 to 20	18	28	5	n
Megara Hyblaea	Stent.	Gab	Flake	w	0 to 20	21	14	5	n
Megara Hyblaea	Stent.	Gab	Flake	d	0 to 20	20	21	5	y
Megara Hyblaea	Stent.	Gab	Flake	w	0 to 20	18	27	5	n
Megara Hyblaea	Stent.	Gab	Flake	w	0 to 20	31	12	5	n
Megara Hyblaea	Stent.	Gab	Flake	d	0 to 20	16	32	5	n
Megara Hyblaea	Stent.	Gab	Flake	w	0 to 20	25	26	5	n
Megara Hyblaea	Stent.	Gab	Flake	w	0 to 20	17	21	3	n
Megara Hyblaea	Stent.	Gab	Flake	w	0 to 20	20	15	3	n
Megara Hyblaea	Stent.	Gab	Flake	w	0 to 20	20	22	5	n
Megara Hyblaea	Stent.	Gab	Flake	w	0 to 20	34	27	4	n
Megara Hyblaea	Stent.	Gab	Flake	w	0 to 20	40	30	7	n
Megara Hyblaea	Stent.	Gab	Flake	w	0 to 20	17	17	3	n
Megara Hyblaea	Stent.	Gab	Flake	w	0 to 20	23	12	7	n
Megara Hyblaea	Stent.	Gab	Flake	d	0 to 20	25	23	7	n
Megara Hyblaea	Stent.	Gab	Flake	w	0 to 20	24	44	6	n
Megara Hyblaea	Stent.	Gab	Flake	d	0 to 20	29	22	11	n
Megara Hyblaea	Stent.	Gab	Flake	p	0 to 20	7	16	3	n
Megara Hyblaea	Stent.	Gab	Flake	w	0 to 20	23	18	5	y

Megara Hyblaea	Stent.	Gab	Flake	w	0 to 20	32	22	4	n
Megara Hyblaea	Stent.	Gab	Flake	w	0 to 20	31	22	8	n
Megara Hyblaea	Stent.	Gab	Flake	w	0 to 20	15	29	4	n
Megara Hyblaea	Stent.	Gab	Flake	w	0 to 20	22	28	7	n
Megara Hyblaea	Stent.	Gab	Flake	p	0 to 20	24	31	5	n
Megara Hyblaea	Stent.	Gab	Flake	w	0 to 20	21	28	9	n
Megara Hyblaea	Stent.	Gab	Flake	w	0 to 20	43	13	4	n
Megara Hyblaea	Stent.	Gab	Flake	d	0 to 20	16	18	5	n
Megara Hyblaea	Stent.	Gab	Flake	w	0 to 20	16	14	4	n
Megara Hyblaea	Stent.	Gab	Flake	w	0 to 20	25	24	6	y
Megara Hyblaea	Stent.	Gab	Flake	m	0 to 20	30	13	8	n
Megara Hyblaea	Stent.	Gab	Flake	w	0 to 20	24	21	5	n
Megara Hyblaea	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	y
Megara Hyblaea	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Megara Hyblaea	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	y
Megara Hyblaea	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Megara Hyblaea	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Megara Hyblaea	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Megara Hyblaea	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	y
Megara Hyblaea	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Menta	LC	BT	Blade	p	0 to 20	13	6	2	y
Menta	LC	Gab	Flake	p	0 to 20	14	14	6	n
Menta	LC	BT	Flake	w	0 to 20	20	19	3	n
Mizzebbi	Neo.	Gab	Blade	p	0 to 20	29	12	4	y
Mizzebbi	Neo.	Gab	Blade	d	0 to 20	19	15	5	n
Mizzebbi	Neo.	Gab	Blade	m	0 to 20	19	18	4	n
Mizzebbi	Neo.	Gab	Flake	w	0 to 20	21	16	5	n
Mizzebbi	Neo.	Gab	Flake	w	0 to 20	13	19	3	n
Monte Sallia	EBA	Gab	Flake	w	0 to 20	19	25	7	n
Palazzola Acreide	Neo.	Gab	Blade	w	0 to 20	83	30	7	n
Palazzola Acreide	Neo.	Gab	Blade	w	0 to 20	90	15	3	n
Palazzola Acreide	Neo.	Gab	Blade	p	0 to 20	90	20	4	n
Palazzola Acreide	Neo.	Gab	Blade	p	0 to 20	20	21	5	n
Palma di Montechiaro	Unstratified	Gab	Blade	d	0 to 20	11	13	3	n
Palma di Montechiaro	Unstratified	BT	Blade	w	0 to 20	12	9	2	n
Palma di Montechiaro	Unstratified	LV	Blade	Unk	0 to 20	20	12	3	y
Palma di Montechiaro	Unstratified	Gab	Blade	m	0 to 20	15	10	2	n
Poggio Rosso	Stent.	Gab	Blade	w	0 to 20	24	15	3	n
Poggio Rosso	Stent.	Gab	Blade	d	0 to 20	22	8	3	n
Poggio Rosso	Stent.	Gab	Blade	p	0 to 20	22	10	2	n
Poggio Rosso	Stent.	Gab	Blade	p	0 to 20	24	14	3	y
Poggio Rosso	Stent.	Gab	Blade	p	0 to 20	16	9	2	n
Poggio Rosso	Stent.	Gab	Blade	p	0 to 20	20	14	4	n
Poggio Rosso	Stent.	Gab	Blade	d	0 to 20	12	7	2	n
Poggio Rosso	Stent.	Gab	Blade	p	0 to 20	25	15	3	n
Poggio Rosso	Stent.	Gab	Blade	d	0 to 20	18	12	3	y
Poggio Rosso	Stent.	Gab	Blade	w	0 to 20	25	10	3	y
Poggio Rosso	Stent.	Gab	Blade	p	0 to 20	28	16	6	y
Poggio Rosso	Stent.	Gab	Blade	p	0 to 20	30	20	8	y
Poggio Rosso	Stent.	Gab	Blade	p	0 to 20	22	15	4	n
Poggio Rosso	Stent.	Gab	Blade	p	0 to 20	27	15	3	y
Poggio Rosso	Stent.	Gab	Blade	w	0 to 20	41	8	4	n
Poggio Rosso	Stent.	Gab	Blade	w	0 to 20	32	15	4	y
Poggio Rosso	Stent.	Gab	Blade	w	0 to 20	32	18	3	n
Poggio Rosso	Stent.	Gab	Blade	d	0 to 20	57	10	3	y
Poggio Rosso	Stent.	Gab	Blade	w	0 to 20	53	13	3	y
Poggio Rosso	Stent.	Gab	Blade	w	0 to 20	26	11	4	n
Poggio Rosso	Stent.	Gab	Blade	w	0 to 20	22	10	3	n
Poggio Rosso	Stent.	Gab	Blade	w	0 to 20	22	10	2	n
Ponte Olivo	Unstratified	Gab	Blade	w	0 to 20	67	14	4	n
Rinicedda	Stent.	Gab	Flake Core	w	20 to 80	53	58	56	-
Rinicedda	Stent.	Gab	Blade Core	w	0 to 20	57	49	28	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	83	53	68	-
Rinicedda	Stent.	Gab	Blade Core	w	0 to 20	35	39	36	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	25	58	18	-

Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	85	71	38	-
Rinicedda	Stent.	Gab	Flake Core	w	20 to 80	53	60	54	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	25	37	20	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	43	25	23	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	37	49	37	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	65	52	32	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	37	24	15	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	38	22	19	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	20	40	17	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	65	75	48	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	46	54	29	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	52	49	33	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	30	16	15	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	27	62	62	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	23	21	18	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	16	20	31	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	36	69	17	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	38	37	15	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	45	41	28	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	28	27	14	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	37	42	20	-
Rinicedda	Stent.	CD	Flake Core	w	0 to 20	28	34	15	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	42	69	39	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	43	27	26	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	20	38	18	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	33	30	21	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	27	57	34	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	18	35	26	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	70	55	24	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	48	62	28	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	35	37	20	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	19	23	16	-
Rinicedda	Stent.	Gab	Flake Core	w	0 to 20	57	34	16	-
Rinicedda	Stent.	Gab	Flake Core	w	20 to 80	47	38	23	-
Rinicedda	Stent.	Gab	Blade	p	0 to 20	23	13	3	n
Rinicedda	Stent.	Gab	Blade	w	0 to 20	17	13	4	n
Rinicedda	Stent.	Gab	Blade	d	0 to 20	23	12	2	n
Rinicedda	Stent.	Gab	Blade	w	0 to 20	13	6	2	n
Rinicedda	Stent.	Gab	Blade	d	0 to 20	62	35	14	n
Rinicedda	Stent.	Gab	Blade	w	0 to 20	55	19	5	y
Rinicedda	Stent.	Gab	Blade	d	0 to 20	51	22	8	y
Rinicedda	Stent.	Gab	Blade	w	20 to 80	66	17	7	y
Rinicedda	Stent.	Gab	Blade	d	0 to 20	47	18	7	n
Rinicedda	Stent.	Gab	Blade	p	0 to 20	36	12	8	n
Rinicedda	Stent.	Gab	Blade	w	0 to 20	31	20	4	n
Rinicedda	Stent.	Gab	Blade	w	0 to 20	32	16	4	n
Rinicedda	Stent.	Gab	Blade	w	0 to 20	49	16	8	y
Rinicedda	Stent.	Gab	Blade	m	0 to 20	13	15	3	n
Rinicedda	Stent.	Gab	Blade	w	0 to 20	37	21	5	n
Rinicedda	Stent.	Gab	Blade	w	0 to 20	30	24	10	n
Rinicedda	Stent.	Gab	Blade	p	0 to 20	21	27	11	n
Rinicedda	Stent.	Gab	Blade	w	0 to 20	18	23	6	y
Rinicedda	Stent.	Gab	Blade	m	0 to 20	19	13	3	n
Rinicedda	Stent.	Gab	Blade	d	0 to 20	46	17	5	y
Rinicedda	Stent.	Gab	Blade	d	0 to 20	19	15	5	n
Rinicedda	Stent.	Gab	Blade	w	0 to 20	45	31	10	n
Rinicedda	Stent.	Gab	Blade	w	0 to 20	70	15	13	n
Rinicedda	Stent.	Gab	Blade	d	0 to 20	53	15	14	n
Rinicedda	Stent.	Gab	Blade	m	0 to 20	17	15	2	n
Rinicedda	Stent.	Gab	Blade	m	0 to 20	22	22	4	n
Rinicedda	Stent.	Gab	Blade	w	0 to 20	72	29	10	y
Rinicedda	Stent.	Gab	Blade	w	0 to 20	25	13	3	n
Rinicedda	Stent.	Gab	Blade	w	0 to 20	35	33	10	n
Rinicedda	Stent.	Gab	Blade	m	0 to 20	22	22	7	n
Rinicedda	Stent.	Gab	Blade	d	0 to 20	14	12	2	n

Rinicedda	Stent.	Gab	Blade	p	0 to 20	26	15	5	n
Rinicedda	Stent.	Gab	Blade	w	0 to 20	39	19	6	n
Rinicedda	Stent.	Gab	Blade	w	0 to 20	42	15	5	n
Rinicedda	Stent.	Gab	Blade	m	0 to 20	18	14	1	n
Rinicedda	Stent.	Gab	Blade	d	0 to 20	13	11	3	n
Rinicedda	Stent.	Gab	Blade	w	0 to 20	22	10	3	n
Rinicedda	Stent.	Gab	Blade	w	0 to 20	46	20	4	n
Rinicedda	Stent.	Gab	Blade	w	0 to 20	62	32	18	n
Rinicedda	Stent.	Gab	Blade	d	0 to 20	58	27	9	y
Rinicedda	Stent.	Gab	Blade	w	0 to 20	69	21	6	n
Rinicedda	Stent.	Gab	Blade	w	0 to 20	48	16	9	n
Rinicedda	Stent.	Gab	Blade	w	0 to 20	38	9	6	n
Rinicedda	Stent.	Gab	Blade	d	0 to 20	23	17	5	n
Rinicedda	Stent.	Gab	Blade	w	0 to 20	15	5	3	n
Rinicedda	Stent.	Gab	Blade	w	0 to 20	26	28	4	y
Rinicedda	Stent.	Gab	Blade	m	0 to 20	9	16	3	n
Rinicedda	Stent.	Gab	Blade	m	0 to 20	25	19	3	n
Rinicedda	Stent.	Gab	Blade	w	20 to 80	30	24	8	n
Rinicedda	Stent.	Gab	Blade	p	0 to 20	19	24	7	n
Rinicedda	Stent.	Gab	Blade	w	20 to 80	80	37	11	y
Rinicedda	Stent.	Gab	Blade	w	0 to 20	43	20	9	y
Rinicedda	Stent.	Gab	Blade	p	0 to 20	23	20	6	n
Rinicedda	Stent.	Gab	Blade	w	0 to 20	45	27	5	n
Rinicedda	Stent.	Gab	Blade	w	0 to 20	25	13	3	n
Rinicedda	Stent.	Gab	Blade	w	0 to 20	31	13	4	n
Rinicedda	Stent.	Gab	Blade	m	0 to 20	29	10	4	n
Rinicedda	Stent.	Gab	Blade	w	0 to 20	24	13	4	n
Rinicedda	Stent.	Gab	Blade	w	0 to 20	45	25	7	n
Rinicedda	Stent.	Gab	Blade	d	0 to 20	49	23	8	y
Rinicedda	Stent.	Gab	Blade	d	0 to 20	30	16	2	n
Rinicedda	Stent.	Gab	Blade	w	0 to 20	31	18	8	n
Rinicedda	Stent.	Gab	Blade	m	0 to 20	27	14	6	n
Rinicedda	Stent.	Gab	Blade	p	0 to 20	27	39	10	n
Rinicedda	Stent.	Gab	Blade	w	0 to 20	45	15	2	n
Rinicedda	Stent.	Gab	Blade	w	0 to 20	29	18	5	n
Rinicedda	Stent.	Gab	Blade	d	0 to 20	45	20	7	n
Rinicedda	Stent.	Gab	Blade	d	0 to 20	43	23	9	y
Rinicedda	Stent.	Gab	Blade	w	0 to 20	34	14	4	n
Rinicedda	Stent.	Gab	Flake	w	0 to 20	37	53	19	y
Rinicedda	Stent.	Gab	Flake	w	0 to 20	57	40	17	y
Rinicedda	Stent.	Gab	Flake	w	0 to 20	33	37	10	n
Rinicedda	Stent.	Gab	Flake	w	0 to 20	23	14	4	n
Rinicedda	Stent.	Gab	Flake	w	0 to 20	11	6	3	n
Rinicedda	Stent.	Gab	Flake	w	0 to 20	14	13	2	n
Rinicedda	Stent.	Gab	Flake	w	0 to 20	73	64	15	n
Rinicedda	Stent.	Gab	Flake	d	0 to 20	57	59	18	n
Rinicedda	Stent.	Gab	Flake	w	0 to 20	31	44	10	n
Rinicedda	Stent.	Gab	Flake	w	0 to 20	18	20	5	n
Rinicedda	Stent.	Gab	Flake	w	80 to 100	18	27	5	n
Rinicedda	Stent.	Gab	Flake	d	0 to 20	18	15	7	n
Rinicedda	Stent.	Gab	Flake	m	0 to 20	23	35	11	n
Rinicedda	Stent.	Gab	Flake	w	0 to 20	61	38	14	n
Rinicedda	Stent.	Gab	Flake	d	0 to 20	23	57	11	n
Rinicedda	Stent.	Gab	Flake	w	0 to 20	19	13	4	n
Rinicedda	Stent.	Gab	Flake	w	0 to 20	77	88	20	y
Rinicedda	Stent.	Gab	Flake	w	0 to 20	40	26	5	n
Rinicedda	Stent.	Gab	Flake	w	0 to 20	20	21	4	n
Rinicedda	Stent.	Gab	Flake	w	0 to 20	73	71	21	y
Rinicedda	Stent.	Gab	Flake	w	0 to 20	54	41	10	y
Rinicedda	Stent.	Gab	Flake	w	0 to 20	29	17	15	n
Rinicedda	Stent.	Gab	Flake	w	0 to 20	25	25	10	y
Rinicedda	Stent.	Gab	Flake	w	0 to 20	20	17	3	n
Rinicedda	Stent.	Gab	Flake	d	0 to 20	34	33	9	n
Rinicedda	Stent.	Gab	Flake	w	0 to 20	26	18	4	n
Rinicedda	Stent.	Gab	Flake	w	0 to 20	17	19	2	n

Rinicedda	Stent.	Gab	Flake	p	0 to 20	38	47	10	n
Rinicedda	Stent.	Gab	Flake	d	0 to 20	35	22	11	n
Rinicedda	Stent.	Gab	Flake	w	0 to 20	16	11	2	n
Rinicedda	Stent.	Gab	Flake	d	0 to 20	21	19	8	n
Rinicedda	Stent.	Gab	Flake	w	0 to 20	23	15	4	n
Rinicedda	Stent.	Gab	Flake	d	0 to 20	20	18	3	n
Rinicedda	Stent.	Gab	Flake	w	0 to 20	22	23	3	n
Rinicedda	Stent.	Gab	Flake	w	0 to 20	20	14	5	n
Rinicedda	Stent.	Gab	Flake	w	0 to 20	38	26	7	n
Rinicedda	Stent.	Gab	Flake	w	0 to 20	16	14	10	n
Rinicedda	Stent.	Gab	Flake	w	0 to 20	45	39	9	n
Rinicedda	Stent.	Gab	Flake	w	20 to 80	62	39	10	n
Rinicedda	Stent.	Gab	Flake	w	0 to 20	13	20	10	n
Rinicedda	Stent.	Gab	Flake	w	0 to 20	9	15	3	n
Rinicedda	Stent.	Gab	Flake	w	0 to 20	18	14	2	n
Rinicedda	Stent.	Gab	Flake	w	0 to 20	59	37	17	n
Rinicedda	Stent.	Gab	Flake	d	0 to 20	42	29	9	y
Rinicedda	Stent.	Gab	Flake	d	0 to 20	32	23	9	n
Rinicedda	Stent.	Gab	Flake	d	0 to 20	20	17	6	n
Rinicedda	Stent.	Gab	Flake	w	0 to 20	25	23	5	n
Rinicedda	Stent.	Gab	Flake	w	0 to 20	37	34	11	n
Rinicedda	Stent.	Gab	Flake	d	0 to 20	14	23	5	n
Rinicedda	Stent.	Gab	Flake	w	0 to 20	45	50	10	y
Rinicedda	Stent.	Gab	Flake	w	0 to 20	77	55	14	y
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	y
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	y
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	y
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	y
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n

Rinicedda	Stent.	Gab	Ang. Waste	w	20 to 80	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rinicedda	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Rocca Aquilia	Diana	Gab	Blade	p	0 to 20	14	7	4	n
Rocca Aquilia	Diana	Gab	Blade	p	0 to 20	18	14	4	n
Rocca Aquilia	Diana	Gab	Blade	p	0 to 20	17	11	5	n
San Martino	Stent.	Gab	Flake Core	w	0 to 20	32	23	13	-
San Martino	Stent.	Gab	Flake Core	w	0 to 20	12	21	9	-
San Martino	Stent.	Gab	Flake Core	w	0 to 20	36	26	12	-
San Martino	Stent.	Gab	Flake Core	w	0 to 20	25	21	8	-
San Martino	Stent.	Gab	Flake Core	w	0 to 20	39	25	11	-
San Martino	Stent.	Gab	Blade	d	0 to 20	22	12	4	n
San Martino	Stent.	Gab	Blade	w	0 to 20	40	16	7	n
San Martino	Stent.	Gab	Blade	w	0 to 20	18	13	2	n
San Martino	Stent.	Gab	Blade	d	0 to 20	25	14	4	n
San Martino	Stent.	Gab	Blade	w	0 to 20	26	9	5	n
San Martino	Stent.	Gab	Blade	p	0 to 20	20	22	3	n
San Martino	Stent.	Gab	Blade	p	0 to 20	14	22	4	y
San Martino	Stent.	Gab	Blade	m	0 to 20	8	13	4	n
San Martino	Stent.	Gab	Blade	p	0 to 20	25	15	5	n
San Martino	Stent.	Gab	Blade	w	0 to 20	24	13	3	y
San Martino	Stent.	Gab	Blade	w	20 to 80	56	13	5	n
San Martino	Stent.	Gab	Blade	w	0 to 20	40	11	1	n
San Martino	Stent.	Gab	Blade	w	0 to 20	35	12	3	n
San Martino	Stent.	Gab	Blade	m	0 to 20	17	11	2	n
San Martino	Stent.	Gab	Blade	m	0 to 20	30	10	3	n
San Martino	Stent.	Gab	Blade	d	20 to 80	26	25	5	y
San Martino	Stent.	Gab	Blade	w	0 to 20	27	13	3	y
San Martino	Stent.	Gab	Blade	w	0 to 20	29	18	7	n
San Martino	Stent.	Gab	Blade	w	0 to 20	26	12	4	n
San Martino	Stent.	Gab	Blade	w	0 to 20	23	11	3	n
San Martino	Stent.	Gab	Blade	d	0 to 20	27	18	3	n
San Martino	Stent.	Gab	Blade	d	0 to 20	27	12	4	y
San Martino	Stent.	Gab	Blade	m	0 to 20	13	11	4	n
San Martino	Stent.	Gab	Blade	d	0 to 20	15	17	5	n
San Martino	Stent.	Gab	Blade	m	0 to 20	15	13	4	y
San Martino	Stent.	Gab	Blade	w	0 to 20	20	15	2	n
San Martino	Stent.	Gab	Blade	p	0 to 20	17	9	3	n
San Martino	Stent.	Gab	Blade	w	0 to 20	17	9	2	n
San Martino	Stent.	Gab	Blade	p	0 to 20	13	12	3	n
San Martino	Stent.	Gab	Blade	w	0 to 20	14	14	4	y
San Martino	Stent.	Gab	Blade	w	0 to 20	33	19	7	n
San Martino	Stent.	Gab	Blade	w	0 to 20	47	25	5	n
San Martino	Stent.	Gab	Blade	m	0 to 20	10	15	2	n
San Martino	Stent.	Gab	Blade	m	0 to 20	9	13	4	n
San Martino	Stent.	Gab	Blade	m	0 to 20	19	8	3	n
San Martino	Stent.	Gab	Blade	d	0 to 20	38	12	2	n
San Martino	Stent.	Gab	Blade	w	0 to 20	24	9	3	n
San Martino	Stent.	Gab	Blade	w	0 to 20	16	6	4	n
San Martino	Stent.	Gab	Blade	p	0 to 20	9	7	1	n
San Martino	Stent.	Gab	Blade	w	0 to 20	18	9	2	n
San Martino	Stent.	Gab	Blade	m	0 to 20	11	10	2	n
San Martino	Stent.	Gab	Blade	d	0 to 20	21	9	2	n
San Martino	Stent.	Gab	Flake	w	0 to 20	25	13	2	n
San Martino	Stent.	Gab	Flake	w	0 to 20	25	25	5	y
San Martino	Stent.	Gab	Flake	w	0 to 20	40	27	5	y
San Martino	Stent.	Gab	Flake	w	0 to 20	18	19	3	n
San Martino	Stent.	Gab	Flake	w	0 to 20	17	18	3	n
San Martino	Stent.	Gab	Flake	w	0 to 20	30	16	10	n
San Martino	Stent.	Gab	Flake	w	0 to 20	20	30	4	n
San Martino	Stent.	Gab	Flake	w	0 to 20	20	21	5	n
San Martino	Stent.	Gab	Flake	w	0 to 20	27	25	7	y

San Martino	Stent.	Gab	Flake	w	0 to 20	25	24	8	n
San Martino	Stent.	Gab	Flake	w	0 to 20	32	28	7	n
San Martino	Stent.	Gab	Flake	w	0 to 20	31	23	6	n
San Martino	Stent.	Gab	Flake	w	0 to 20	22	43	8	n
San Martino	Stent.	Gab	Flake	w	0 to 20	19	18	5	y
San Martino	Stent.	Gab	Flake	w	0 to 20	28	23	7	y
San Martino	Stent.	Gab	Flake	w	0 to 20	27	24	6	y
San Martino	Stent.	Gab	Flake	w	0 to 20	31	25	5	n
San Martino	Stent.	Gab	Flake	w	0 to 20	32	22	5	n
San Martino	Stent.	Gab	Flake	w	0 to 20	33	29	11	n
San Martino	Stent.	Gab	Flake	w	0 to 20	31	18	5	n
San Martino	Stent.	Gab	Flake	d	0 to 20	22	14	4	n
San Martino	Stent.	Gab	Flake	w	0 to 20	13	8	1	n
San Martino	Stent.	Gab	Flake	w	0 to 20	13	8	1	n
San Martino	Stent.	Gab	Flake	d	0 to 20	13	11	1	n
San Martino	Stent.	Gab	Flake	w	0 to 20	33	40	9	y
San Martino	Stent.	Gab	Flake	w	0 to 20	15	14	3	n
San Martino	Stent.	Gab	Flake	w	0 to 20	10	15	3	n
San Martino	Stent.	Gab	Flake	w	0 to 20	33	21	11	n
San Martino	Stent.	Gab	Flake	w	0 to 20	8	14	4	n
San Martino	Stent.	Gab	Flake	w	0 to 20	17	22	3	y
San Martino	Stent.	Gab	Flake	w	0 to 20	18	29	5	n
San Martino	Stent.	Gab	Flake	d	0 to 20	17	12	3	n
San Martino	Stent.	Gab	Flake	d	0 to 20	13	10	1	n
San Martino	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
San Martino	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	y
San Martino	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
San Martino	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	y
San Martino	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	y
San Martino	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
San Martino	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
San Martino	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
San Martino	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	y
San Martino	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
San Martino	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
San Martino	Stent.	Gab	Ang. Waste	w	20 to 80	-	-	-	n
Sant'Ippolito	Chal.	Gab	Blade Core	p	0 to 20	30	52	54	-
Sant'Ippolito	Chal.	Gab	Blade Core	w	0 to 20	44	30	20	-
Sant'Ippolito	Chal.	Gab	Blade	w	0 to 20	55	18	5	y
Sant'Ippolito	Chal.	Gab	Blade	w	0 to 20	42	14	2	n
Sant'Ippolito	Chal.	Gab	Blade	w	0 to 20	33	7	3	y
Sant'Ippolito	Chal.	Gab	Blade	p	0 to 20	40	12	3	y
Sant'Ippolito	Chal.	Gab	Blade	p	0 to 20	42	9	3	n
Sant'Onofrio	Chal.	BT	Flake	w	0 to 20	29	23	8	y
Sant'Onofrio	Chal.	LV	Flake	w	0 to 20	12	14	3	y
Sant'Onofrio	Chal.	BT	Ang. Waste	w	0 to 20	-	-	-	n
Sant'Onofrio	Chal.	BT	Ang. Waste	w	0 to 20	-	-	-	n
Sant'Onofrio	Chal.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Sant'Onofrio	Chal.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Scintillia Capanna Alfa	EBA	Gab	Flake	w	0 to 20	23	14	4	n
Serra del Palco	Neo. to Chal.	Gab	Blade	w	0 to 20	30	17	5	n
Serra del Palco	Neo. to Chal.	Gab	Blade	m	0 to 20	19	8	2	n
Serra del Palco	Neo. to Chal.	Gab	Blade	w	0 to 20	29	14	4	n
Serra del Palco	Neo. to Chal.	Gab	Blade	m	0 to 20	22	13	2	n
Serra del Palco	Neo. to Chal.	BT	Blade	p	0 to 20	13	13	3	n
Serra del Palco	Neo. to Chal.	Gab	Blade	p	0 to 20	18	15	5	y
Serra del Palco	Neo. to Chal.	Gab	Blade	m	0 to 20	13	15	3	y
Serra del Palco	Neo. to Chal.	Gab	Blade	p	0 to 20	12	12	2	y
Serra del Palco	Neo. to Chal.	LV	Blade	d	0 to 20	14	12	2	y
Serra del Palco	Neo. to Chal.	Gab	Blade	p	0 to 20	18	20	4	n
Serra del Palco	Neo. to Chal.	Gab	Blade	d	0 to 20	14	12	4	y
Serra del Palco	Neo. to Chal.	BT	Blade	m	0 to 20	25	12	2	y
Serra del Palco	Neo. to Chal.	BT	Blade	m	0 to 20	27	14	3	n
Serra del Palco	Neo. to Chal.	BT	Blade	w	0 to 20	33	12	3	n
Serra del Palco	Neo. to Chal.	Gab	Blade	d	0 to 20	27	10	1	n

Serra del Palco	Neo. to Chal.	Gab	Blade	p	0 to 20	27	15	6	n
Serra del Palco	Neo. to Chal.	Gab	Blade	d	0 to 20	26	9	4	n
Serra del Palco	Neo. to Chal.	Gab	Blade	w	0 to 20	28	13	3	y
Serra del Palco	Neo. to Chal.	Gab	Blade	w	0 to 20	30	14	4	n
Serra del Palco	Neo. to Chal.	Gab	Blade	p	0 to 20	25	13	5	n
Serra del Palco	Neo. to Chal.	Gab	Blade	p	0 to 20	45	14	8	n
Serra del Palco	Neo. to Chal.	Gab	Blade	p	0 to 20	25	17	3	n
Serra del Palco	Neo. to Chal.	Gab	Blade	m	0 to 20	29	18	4	n
Serra del Palco	Neo. to Chal.	BT	Flake	w	0 to 20	24	16	4	n
Serra del Palco	Neo. to Chal.	Gab	Flake	d	0 to 20	15	23	2	n
Serra del Palco	Neo. to Chal.	Gab	Flake	w	0 to 20	33	34	5	y
Serra del Palco	Neo. to Chal.	Gab	Flake	w	0 to 20	23	13	3	n
Serra del Palco	Neo. to Chal.	Gab	Flake	w	0 to 20	16	16	3	n
Serra del Palco	Neo. to Chal.	Gab	Flake	w	20 to 80	39	26	7	y
Serra del Palco	Neo. to Chal.	Gab	Flake	w	20 to 80	28	41	7	y
Serra del Palco	Neo. to Chal.	BT	Flake	w	0 to 20	23	5	3	n
Serra del Palco	Neo. to Chal.	LV	Flake	w	0 to 20	22	13	2	n
Serra del Palco	Neo. to Chal.	Gab	Flake	w	0 to 20	27	25	4	n
Serra del Palco	Neo. to Chal.	BT	Flake	w	0 to 20	22	14	4	n
Serra del Palco	Neo. to Chal.	BT	Flake	w	0 to 20	16	28	7	n
Serra del Palco	Neo. to Chal.	Gab	Flake	w	0 to 20	28	17	4	n
Serra del Palco	Neo. to Chal.	Gab	Flake	w	0 to 20	14	39	34	n
Serra del Palco	Neo. to Chal.	Gab	Flake	w	0 to 20	33	37	3	n
Serra del Palco	Neo. to Chal.	Gab	Flake	w	0 to 20	39	26	5	n
Serra del Palco	Neo. to Chal.	Gab	Flake	w	0 to 20	36	26	6	n
Serra del Palco	Neo. to Chal.	Gab	Flake	d	0 to 20	17	25	5	n
Serra del Palco	Neo. to Chal.	Gab	Flake	w	0 to 20	42	30	7	y
Serraferlicchio	Chal.	Gab	Blade	p	0 to 20	26	10	3	y
Serraferlicchio	Chal.	CD	Blade	p	0 to 20	30	17	4	n
Serraferlicchio	Chal.	CD	Blade	d	0 to 20	38	12	3	y
Serraferlicchio	Chal.	Gab	Blade	w	0 to 20	53	18	4	n
Serraferlicchio	Chal.	Gab	Blade	w	0 to 20	60	17	6	n
Serraferlicchio	Chal.	Gab	Flake	w	20 to 80	42	19	5	n
Stentinello	Stent.	Gab	Blade Core	w	0 to 20	47	26	28	-
Stentinello	Stent.	Gab	Flake Core	w	0 to 20	26	34	34	-
Stentinello	Stent.	Gab	Flake Core	w	0 to 20	31	30	28	-
Stentinello	Stent.	CD	Blade	m	0 to 20	20	15	3	n
Stentinello	Stent.	Gab	Blade	w	0 to 20	62	14	3	n
Stentinello	Stent.	Gab	Blade	w	0 to 20	31	8	2	n
Stentinello	Stent.	Gab	Blade	w	0 to 20	55	11	7	n
Stentinello	Stent.	Gab	Blade	p	0 to 20	22	10	2	n
Stentinello	Stent.	Gab	Blade	d	0 to 20	54	14	4	n
Stentinello	Stent.	Gab	Blade	w	0 to 20	33	9	2	n
Stentinello	Stent.	Gab	Blade	m	0 to 20	23	10	4	n
Stentinello	Stent.	Gab	Blade	p	0 to 20	53	16	5	n
Stentinello	Stent.	Gab	Blade	m	0 to 20	23	12	2	n
Stentinello	Stent.	Gab	Blade	w	0 to 20	32	11	4	n
Stentinello	Stent.	Gab	Blade	w	0 to 20	27	13	3	n
Stentinello	Stent.	Gab	Blade	d	0 to 20	28	11	2	n
Stentinello	Stent.	Gab	Blade	w	0 to 20	28	12	3	y
Stentinello	Stent.	Gab	Blade	w	0 to 20	20	9	1	n
Stentinello	Stent.	Gab	Blade	w	0 to 20	23	7	2	n
Stentinello	Stent.	Gab	Blade	p	0 to 20	20	8	2	n
Stentinello	Stent.	Gab	Blade	p	0 to 20	17	5	2	n
Stentinello	Stent.	Gab	Blade	d	0 to 20	19	6	2	n
Stentinello	Stent.	Gab	Blade	p	0 to 20	18	9	2	y
Stentinello	Stent.	Gab	Blade	p	0 to 20	18	10	2	n
Stentinello	Stent.	Gab	Blade	w	0 to 20	18	10	3	y
Stentinello	Stent.	Gab	Blade	w	0 to 20	21	6	3	n
Stentinello	Stent.	Gab	Blade	p	0 to 20	15	8	2	y
Stentinello	Stent.	Gab	Blade	d	0 to 20	17	6	3	n
Stentinello	Stent.	Gab	Blade	w	0 to 20	14	8	2	y
Stentinello	Stent.	Gab	Blade	w	0 to 20	16	7	2	y
Stentinello	Stent.	Gab	Blade	m	20 to 80	16	9	3	n
Stentinello	Stent.	Gab	Blade	w	0 to 20	40	16	2	n

Stentinello	Stent.	Gab	Blade	m	0 to 20	33	15	5	n
Stentinello	Stent.	Gab	Blade	p	0 to 20	27	17	3	n
Stentinello	Stent.	Gab	Blade	d	0 to 20	43	15	2	n
Stentinello	Stent.	Gab	Blade	p	0 to 20	24	14	4	n
Stentinello	Stent.	Gab	Blade	w	0 to 20	32	16	4	n
Stentinello	Stent.	Gab	Blade	d	0 to 20	12	15	5	y
Stentinello	Stent.	Gab	Blade	d	0 to 20	25	13	4	n
Stentinello	Stent.	Gab	Blade	p	0 to 20	26	14	2	n
Stentinello	Stent.	Gab	Blade	w	0 to 20	30	9	2	n
Stentinello	Stent.	Gab	Blade	d	0 to 20	25	14	3	n
Stentinello	Stent.	Gab	Blade	w	0 to 20	28	10	1	n
Stentinello	Stent.	Gab	Blade	d	0 to 20	21	11	1	n
Stentinello	Stent.	Gab	Blade	d	0 to 20	17	7	2	n
Stentinello	Stent.	Gab	Blade	m	0 to 20	13	13	1	n
Stentinello	Stent.	Gab	Blade	p	0 to 20	20	15	3	n
Stentinello	Stent.	Gab	Blade	p	0 to 20	20	11	2	n
Stentinello	Stent.	Gab	Blade	p	0 to 20	18	12	3	n
Stentinello	Stent.	Gab	Blade	d	0 to 20	15	14	2	n
Stentinello	Stent.	Gab	Blade	w	0 to 20	23	11	3	y
Stentinello	Stent.	Gab	Blade	p	0 to 20	18	10	2	n
Stentinello	Stent.	Gab	Blade	p	0 to 20	18	11	3	y
Stentinello	Stent.	Gab	Blade	m	0 to 20	13	16	1	n
Stentinello	Stent.	Gab	Blade	p	0 to 20	25	15	2	y
Stentinello	Stent.	Gab	Blade	p	0 to 20	17	15	2	n
Stentinello	Stent.	Gab	Blade	p	0 to 20	23	12	1	n
Stentinello	Stent.	Gab	Blade	d	0 to 20	38	35	13	y
Stentinello	Stent.	Gab	Flake	w	0 to 20	18	12	4	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	21	14	4	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	24	15	5	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	26	20	4	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	18	18	8	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	20	19	5	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	21	21	8	n
Stentinello	Stent.	Gab	Flake	d	0 to 20	34	27	5	n
Stentinello	Stent.	Gab	Flake	p	0 to 20	22	15	6	n
Stentinello	Stent.	CD	Flake	d	0 to 20	18	30	5	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	12	14	4	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	18	29	2	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	11	20	2	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	20	16	5	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	14	10	4	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	27	35	4	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	15	8	4	n
Stentinello	Stent.	Gab	Flake	d	0 to 20	16	16	2	n
Stentinello	Stent.	Gab	Flake	p	0 to 20	13	26	4	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	26	27	8	n
Stentinello	Stent.	Gab	Flake	d	0 to 20	32	31	5	y
Stentinello	Stent.	Gab	Flake	w	0 to 20	20	18	5	n
Stentinello	Stent.	Gab	Flake	d	0 to 20	16	22	3	n
Stentinello	Stent.	Gab	Flake	d	0 to 20	37	40	9	y
Stentinello	Stent.	Gab	Flake	w	0 to 20	18	26	4	n
Stentinello	Stent.	Gab	Flake	d	0 to 20	19	14	7	n
Stentinello	Stent.	Gab	Flake	d	0 to 20	17	30	5	y
Stentinello	Stent.	Gab	Flake	w	0 to 20	17	15	6	y
Stentinello	Stent.	Gab	Flake	w	0 to 20	20	15	2	y
Stentinello	Stent.	Gab	Flake	w	0 to 20	21	17	4	y
Stentinello	Stent.	Gab	Flake	w	0 to 20	32	23	4	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	28	33	5	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	23	23	5	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	33	17	9	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	20	28	4	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	16	7	3	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	17	20	6	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	20	25	3	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	38	24	3	n

Stentinello	Stent.	Gab	Flake	w	0 to 20	26	15	3	n
Stentinello	Stent.	Gab	Flake	p	0 to 20	23	25	4	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	17	11	3	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	12	11	2	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	32	19	3	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	28	24	6	n
Stentinello	Stent.	Gab	Flake	d	0 to 20	23	16	5	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	17	21	3	n
Stentinello	Stent.	Gab	Flake	d	0 to 20	11	26	5	n
Stentinello	Stent.	Gab	Flake	p	20 to 80	20	17	2	y
Stentinello	Stent.	Gab	Flake	p	0 to 20	15	23	7	n
Stentinello	Stent.	Gab	Flake	p	0 to 20	13	16	2	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	15	33	9	y
Stentinello	Stent.	Gab	Flake	w	0 to 20	30	30	5	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	23	15	4	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	23	39	3	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	38	30	7	n
Stentinello	Stent.	Gab	Flake	d	0 to 20	19	25	6	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	22	18	6	y
Stentinello	Stent.	Gab	Flake	w	0 to 20	19	15	4	y
Stentinello	Stent.	Gab	Flake	w	0 to 20	25	25	7	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	29	15	3	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	27	33	4	n
Stentinello	Stent.	Gab	Flake	d	0 to 20	19	33	5	n
Stentinello	Stent.	Gab	Flake	d	0 to 20	19	15	5	n
Stentinello	Stent.	Gab	Flake	w	0 to 20	15	16	3	n
Stentinello	Stent.	Gab	Flake	m	0 to 20	18	23	2	n
Stentinello	Stent.	Gab	Flake	m	0 to 20	15	21	5	y
Stentinello	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Stentinello	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Stentinello	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Stentinello	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Stentinello	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Stentinello	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Stentinello	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Stentinello	Stent.	Gab	Ang. Waste	w	0 to 20	-	-	-	n
Stretto Partanna	MN	LV	Blade	w	0 to 20	88	15	4	n
Stretto Partanna	MN	Gab	Blade	m	0 to 20	45	9	3	n
Stretto Partanna	MN	Gab	Blade	w	0 to 20	48	7	2	n
Stretto Partanna	MN	Gab	Blade	w	0 to 20	37	8	1	n
Stretto Partanna	MN	Gab	Blade	d	0 to 20	53	15	3	n
Stretto Partanna	MN	Gab	Blade	w	0 to 20	54	32	6	n
Stretto Partanna	MN	Gab	Blade	d	0 to 20	38	10	3	n
Stretto Partanna	MN	Gab	Blade	w	0 to 20	37	12	2	n
Stretto Partanna	MN	Gab	Blade	w	0 to 20	35	10	3	n
Stretto Partanna	MN	Gab	Blade	w	0 to 20	38	8	2	n
Stretto Partanna	MN	Gab	Blade	w	0 to 20	75	11	3	n
Stretto Partanna	LN	Gab	Blade	p	0 to 20	30	15	3	n
Stretto Partanna	LN	Gab	Blade	m	0 to 20	33	14	3	n
Stretto Partanna	LN	Gab	Blade	m	0 to 20	34	11	3	n
Stretto Partanna	LN	Gab	Flake	w	0 to 20	54	23	6	y
Stretto Partanna	Neo.	Gab	Blade	m	0 to 20	18	13	2	n
Stretto Partanna	Neo.	Gab	Blade	m	0 to 20	35	18	4	n
Stretto Partanna	Neo.	Gab	Blade	m	0 to 20	26	11	3	n
Tre Fontane	Neo.	Gab	Flake Core	w	20 to 80	25	49	47	-
Tre Fontane	Neo.	Gab	Blade	w	0 to 20	27	15	3	y
Tre Fontane	Neo.	Gab	Blade	p	0 to 20	28	8	2	n
Tre Fontane	Neo.	Gab	Blade	m	0 to 20	23	8	2	y
Tre Fontane	Neo.	Gab	Blade	w	0 to 20	24	7	2	n
Tre Fontane	Neo.	Gab	Blade	w	0 to 20	20	7	2	n
Tre Fontane	Neo.	Gab	Blade	w	0 to 20	14	5	1	n
Tre Fontane	Neo.	Gab	Blade	m	0 to 20	28	14	4	n
Tre Fontane	Neo.	Gab	Blade	w	0 to 20	35	10	2	n
Tre Fontane	Neo.	Gab	Blade	p	0 to 20	32	11	2	n
Tre Fontane	Neo.	Gab	Blade	w	0 to 20	24	11	2	n

Tre Fontane	Neo.	Gab	Blade	w	0 to 20	22	9	3	n
Tre Fontane	Neo.	Gab	Blade	p	0 to 20	34	20	7	y
Tre Fontane	Neo.	Gab	Blade	p	0 to 20	22	13	3	n
Tre Fontane	Neo.	Gab	Blade	p	0 to 20	33	17	5	y
Tre Fontane	Neo.	Gab	Blade	p	0 to 20	26	15	3	n
Tre Fontane	Neo.	Gab	Blade	w	0 to 20	20	8	3	n
Tre Fontane	Neo.	Gab	Blade	p	0 to 20	27	15	2	n
Tre Fontane	Neo.	Gab	Blade	m	0 to 20	30	11	3	y
Tre Fontane	Neo.	Gab	Blade	p	0 to 20	25	10	1	n
Tre Fontane	Neo.	Gab	Blade	p	0 to 20	18	15	4	y
Tre Fontane	Neo.	Gab	Blade	w	0 to 20	27	10	4	y
Tre Fontane	Neo.	Gab	Blade	w	0 to 20	26	14	2	n
Tre Fontane	Neo.	Gab	Blade	p	0 to 20	21	13	6	n
Tre Fontane	Neo.	Gab	Blade	w	0 to 20	17	8	2	n
Tre Fontane	Neo.	Gab	Blade	w	0 to 20	36	13	3	n
Tre Fontane	Neo.	Gab	Blade	p	0 to 20	13	16	5	n
Tre Fontane	Neo.	Gab	Blade	m	0 to 20	25	12	3	y
Tre Fontane	Neo.	Gab	Blade	w	0 to 20	45	11	2	n
Tre Fontane	Neo.	Gab	Blade	m	0 to 20	39	13	4	n
Tre Fontane	Neo.	Gab	Blade	w	0 to 20	54	7	2	n
Tre Fontane	Neo.	Gab	Blade	p	0 to 20	19	8	1	n
Tre Fontane	Neo.	Gab	Blade	d	0 to 20	24	10	3	n
Tre Fontane	Neo.	Gab	Blade	p	0 to 20	23	18	4	n
Tre Fontane	Neo.	Gab	Blade	d	0 to 20	21	18	5	n
Tre Fontane	Neo.	Gab	Blade	m	0 to 20	33	10	1	n
Tre Fontane	Neo.	Gab	Blade	p	0 to 20	17	12	3	n
Tre Fontane	Neo.	Gab	Blade	w	0 to 20	22	10	4	n
Tre Fontane	Neo.	Gab	Blade	p	0 to 20	26	18	3	n
Tre Fontane	Neo.	Gab	Blade	w	0 to 20	32	12	3	n
Tre Fontane	Neo.	Gab	Blade	m	0 to 20	33	14	3	y
Tre Fontane	Neo.	Gab	Blade	p	0 to 20	20	13	3	n
Tre Fontane	Neo.	Gab	Blade	p	0 to 20	22	13	3	y
Tre Fontane	Neo.	Gab	Blade	w	0 to 20	30	10	3	y
Tre Fontane	Neo.	Gab	Blade	d	0 to 20	23	8	2	n
Tre Fontane	Neo.	Gab	Blade	p	0 to 20	24	9	2	n
Tre Fontane	Neo.	Gab	Blade	p	0 to 20	46	10	4	n
Tre Fontane	Neo.	Gab	Blade	w	0 to 20	25	10	4	n
Tre Fontane	Neo.	Gab	Blade	d	0 to 20	20	11	3	n
Tre Fontane	Neo.	Gab	Blade	d	0 to 20	52	18	4	n
Tre Fontane	Neo.	Gab	Blade	p	0 to 20	15	26	7	n
Tre Fontane	Neo.	Gab	Blade	w	0 to 20	48	19	6	y
Tre Fontane	Neo.	Gab	Blade	p	0 to 20	35	18	5	y
Tre Fontane	Neo.	Gab	Blade	m	0 to 20	30	10	3	n
Tre Fontane	Neo.	Gab	Blade	w	0 to 20	19	7	2	n
Tre Fontane	Neo.	Gab	Flake	p	0 to 20	11	12	3	y
Tre Fontane	Neo.	Gab	Flake	d	0 to 20	17	34	11	n
Tre Fontane	Neo.	Gab	Flake	d	0 to 20	38	26	10	n
Tre Fontane	Neo.	Gab	Flake	w	0 to 20	30	20	5	n
Tre Fontane	Neo.	Gab	Flake	w	0 to 20	21	38	8	n
Tre Fontane	Neo.	Gab	Flake	w	0 to 20	25	13	7	n
Tre Fontane	Neo.	Gab	Flake	w	0 to 20	21	18	5	n

* Typological data and sourcing results of the analyzed obsidians from Sicily. L: Maximum Length; W: Maximum width; T: Maximum thickness; Ret: Retouched; Neo: Neolithic; Stent: Stentinello; MN: Middle Neolithic; LN: Late Neoltihic; EChal: Early Chalcolithic; EBA: Early Bronze Age; Gab: Gabellotto Gorge; CD: Canneto Dentro; LV: Gelkhamar; BT: Balata dei Turchi; w: whole; p: proximal; d: distal.

Appendix G: Compiled Results from Sites Analyzed in Sardinia

Site	Dating	Total	SA (Sar)	SB1 (Sar)	SB2 (Sar)	SC (Sar)
Bingia 'e Monti	Chalcolithic	146	7	0	1	138
Bingia 'e Monti	Nuragic	145	3	0	2	140
Nuraghe Pidighi	Nuragic	219	17	7	17	178
Mitza Pidighi	Nuragic	140	11	7	11	111

*List of analyzed sites with counts of artifacts from each subsource. Sar: Sardinia.

Site	Nodules	Cores	Blades	Flakes	Angular Waste	Total
Bingia 'e Monti (Chalcolithic)	1	20	0	118	15	154
Bingia 'e Monti (Nuragic)	0	23	1	111	11	146
Nuraghe Pidighi	0	15	33	156	16	220
Mitza Pidighi	0	16	20	95	11	142

*Basic typological counts of obsidian artifacts at the analyzed sites. Note that the totals do not match those from the table of sourcing results due to the fact that several artifacts were too small for XRF analysis, but were nonetheless included in the typological results.

Appendix H: Elemental Data of Sardinian Obsidians as Determined by EDXRF

Site	Sample	Fe	Zn	Rb	Sr	Y	Zr	Nb	Ba	Type	Category
-	SAPrim.001	12104	92	254	29	41	100	57	161	SA	Geological
-	SAPrim.002	11809	84	242	26	36	90	50	134	SA	Geological
-	SAPrim.003	13492	100	267	27	41	97	50	158	SA	Geological
-	SAPrim.004	14825	121	290	32	45	106	54	139	SA	Geological
-	SAPrim.005	12486	93	262	29	37	99	49	162	SA	Geological
-	SAPrim.006	11988	84	252	29	37	101	50	168	SA	Geological
-	SAPrim.007	12904	94	275	31	38	99	54	171	SA	Geological
-	SAPrim.008	13124	131	246	27	33	95	51	154	SA	Geological
-	SAPrim.009	11853	86	254	29	36	96	53	179	SA	Geological
-	SAPrim.010	13289	94	267	28	40	102	51	132	SA	Geological
-	SAPrim.011	12424	86	260	30	35	91	57	125	SA	Geological
-	SAPrim.012	12094	86	254	31	36	98	50	180	SA	Geological
-	SAPrim.013	12826	93	265	31	37	94	60	162	SA	Geological
-	SAPrim.014	11396	73	244	29	33	92	47	143	SA	Geological
-	SAPrim.015	11934	84	256	30	37	99	60	163	SA	Geological
-	SB1Prim.002	13516	72	231	79	28	169	35	564	SB1	Geological
-	SB1Prim.003	11666	53	216	58	30	128	38	412	SB1	Geological
-	SB1Prim.004	14317	58	227	82	23	191	31	676	SB1	Geological
-	SB1Prim.005	13530	67	233	75	26	172	34	563	SB1	Geological
-	SB1Prim.006	15563	83	258	72	34	143	48	360	SB1	Geological
-	SB2Prim.001	12275	61	237	49	25	138	28	352	SB2	Geological
-	SB2Prim.002	13531	69	271	54	22	134	29	279	SB2	Geological
-	SB2Prim.003	11611	55	250	38	24	121	30	219	SB2	Geological
-	SB2Prim.005	11800	56	237	50	24	139	31	346	SB2	Geological
-	SB2Prim.007	10904	42	215	34	24	113	29	214	SB2	Geological
-	SB2Prim.008	12184	52	251	34	23	118	28	193	SB2	Geological
-	SB2Prim.009	11710	48	237	42	25	122	27	251	SB2	Geological
-	SB2Prim.010	10718	48	221	34	24	114	29	222	SB2	Geological
-	SB2Prim.011	12209	50	235	56	22	144	30	420	SB2	Geological
-	SB2Prim.012	12089	55	250	34	28	125	34	216	SB2	Geological
-	SB2Prim.013	11850	54	222	48	25	132	25	334	SB2	Geological
-	SB2Prim.014	10839	54	208	35	26	110	26	234	SB2	Geological
-	SB2Prim.015	11407	48	235	50	25	137	27	435	SB2	Geological
-	SB2Prim.016	11681	56	252	40	21	124	33	233	SB2	Geological
-	SB2Prim.017	12149	53	237	56	25	145	27	398	SB2	Geological
-	SCPrim.001	15818	79	186	133	27	259	37	1216	SC	Geological
-	SCPrim.002	15000	70	180	130	26	257	30	1233	SC	Geological
-	SCPrim.003	15095	71	182	121	26	253	33	1060	SC	Geological
-	SCPrim.004	14513	65	179	128	27	256	26	1214	SC	Geological
-	SCPrim.005	14558	66	176	124	24	254	31	1228	SC	Geological
-	SCPrim.006	15546	75	179	131	29	254	30	1164	SC	Geological
-	SCPrim.007	15952	63	187	135	25	271	29	1386	SC	Geological
-	SCPrim.008	14196	61	170	123	24	245	31	1172	SC	Geological
-	SCPrim.010	15321	73	181	132	27	258	32	1142	SC	Geological
BMChal	Mac001	14336	60	160	132	24	240	28	1080	SC	Flake
BMChal	Mac002	16771	70	182	152	24	255	32	1144	SC	Flake
BMChal	Mac003	14382	76	175	122	23	255	34	1168	SC	Flake
BMChal	Mac004	15696	71	190	132	28	264	32	1185	SC	Flake
BMChal	Mac005	13750	68	167	114	26	241	32	1130	SC	Flake
BMChal	Mac006	16980	77	189	148	23	261	28	1083	SC	Flake
BMChal	Mac007	15988	61	168	152	25	255	30	1059	SC	Flake
BMChal	Mac008	15446	87	181	134	25	256	32	1269	SC	Flake
BMChal	Mac009	14799	67	168	137	25	243	28	1081	SC	Flake
BMChal	Mac010	12013	84	254	30	38	97	51	156	SA	Flake
BMChal	Mac011	17958	70	191	153	28	269	33	1262	SC	Flake
BMChal	Mac013	16407	72	170	156	24	262	30	1259	SC	Flake
BMChal	Mac014	15069	67	172	135	26	253	32	1187	SC	Flake
BMChal	Mac017	16658	71	177	154	26	260	32	1206	SC	Flake
BMChal	Mac018	13530	76	167	119	28	241	29	1101	SC	Flake
BMChal	Mac019	14880	73	165	142	26	243	27	1189	SC	Flake
BMChal	Mac020	15194	104	178	130	28	255	31	1190	SC	Flake

BMChal	Mac022	14095	60	149	148	27	244	30	1223	SC	Flake
BMChal	Mac023	12463	78	255	29	36	102	51	154	SA	Flake
BMChal	Mac024	15206	71	173	132	25	246	30	1153	SC	Flake
BMChal	Mac025	15760	76	184	128	24	255	32	1194	SC	Flake
BMChal	Mac026	15348	77	175	139	27	252	32	1218	SC	Ang. Waste
BMChal	Mac027	15162	68	177	128	23	237	29	1008	SC	Flake
BMChal	Mac028	17625	84	197	134	26	258	33	1113	SC	Flake
BMChal	Mac029	14373	70	170	126	25	246	31	1113	SC	Flake
BMChal	Mac030	16564	73	179	159	30	269	33	1222	SC	Flake
BMChal	Mac031	13086	70	151	106	28	227	27	1125	SC	Ang. Waste
BMChal	Mac032	15235	64	179	126	26	254	31	1046	SC	Core
BMChal	Mac033	14304	71	168	118	24	242	32	1086	SC	Flake
BMChal	Mac034	12767	60	143	122	23	216	24	1026	SC	Flake
BMChal	Mac035	14961	69	185	125	26	260	32	1279	SC	Flake
BMChal	Mac036	14481	69	169	139	25	254	31	1221	SC	Flake
BMChal	Mac037	14131	64	155	140	27	238	32	1178	SC	Core
BMChal	Mac038	13689	61	174	117	29	249	29	1197	SC	Flake
BMChal	Mac039	16584	80	193	132	27	265	29	1158	SC	Flake
BMChal	Mac040	14254	70	172	122	27	244	35	1106	SC	Ang. Waste
BMChal	Mac041	14506	65	169	130	23	238	32	1074	SC	Flake
BMChal	Mac042	17329	79	181	168	23	261	33	1232	SC	Core
BMChal	Mac043	13893	74	146	132	24	225	26	1309	SC	Ang. Waste
BMChal	Mac044	15840	73	181	134	26	254	28	1120	SC	Core
BMChal	Mac045	13977	79	159	121	22	231	31	1093	SC	Flake
BMChal	Mac046	14804	69	180	121	28	249	35	1093	SC	Flake
BMChal	Mac047	14260	69	176	125	26	248	31	1128	SC	Flake
BMChal	Mac048	15495	82	170	131	31	248	27	1142	SC	Flake
BMChal	Mac049	15356	76	185	128	28	255	32	1117	SC	Flake
BMChal	Mac050	15502	77	184	126	27	257	28	1145	SC	Flake
BMChal	Mac051	13821	73	172	118	30	243	31	1127	SC	Flake
BMChal	Mac052	16076	82	168	147	23	254	28	1136	SC	Flake
BMChal	Mac053	14739	65	171	124	27	250	34	1145	SC	Flake
BMChal	Mac055	18302	92	191	139	26	263	33	1191	SC	Flake
BMChal	Mac056	13402	73	159	121	26	248	31	1246	SC	Flake
BMChal	Mac057	13348	67	154	113	21	227	26	1101	SC	Flake
BMChal	Mac058	13994	71	172	124	26	251	32	1148	SC	Flake
BMChal	Mac059	11017	84	218	29	35	94	50	151	SA	Ang. Waste
BMChal	Mac060	13720	74	164	116	26	238	31	1098	SC	Flake
BMChal	Mac061	13639	62	149	140	26	234	26	1160	SC	Flake
BMChal	Mac062	14218	78	172	120	25	249	27	1113	SC	Flake
BMChal	Mac063	14264	66	166	136	27	244	34	1302	SC	Ang. Waste
BMChal	Mac064	14719	82	163	132	26	248	26	1127	SC	Flake
BMChal	Mac065	13825	65	163	117	24	240	26	1137	SC	Flake
BMChal	Mac066	10522	68	215	26	32	84	44	155	SA	Core
BMChal	Mac067	13460	66	165	118	23	246	29	1198	SC	Ang. Waste
BMChal	Mac068	14457	64	145	146	21	224	26	1130	SC	Flake
BMChal	Mac072	15949	78	172	145	28	261	30	1109	SC	Flake
BMChal	Mac075	13237	115	153	106	23	210	22	874	SC	Flake
BMChal	Mac076	14750	62	166	139	26	254	28	1171	SC	Flake
BMChal	Mac078	13820	67	168	120	23	234	29	1115	SC	Flake
BMChal	Mac079	14248	94	155	127	26	232	25	1136	SC	Flake
BMChal	Mac080	15697	87	181	141	23	255	27	1154	SC	Flake
BMChal	Mac081	11359	87	229	28	31	88	46	141	SA	Flake
BMChal	Mac084	15405	83	191	142	27	255	34	1127	SC	Flake
BMChal	Mac086	13768	66	163	131	27	238	29	1145	SC	Core
BMChal	Mac087	14815	73	181	125	24	249	30	1177	SC	Flake
BMChal	Mac088	14269	80	167	112	27	230	32	1037	SC	Flake
BMChal	Mac089	13428	73	158	108	25	231	25	1102	SC	Flake
BMChal	Mac091	14173	63	173	121	25	256	30	1172	SC	Flake
BMChal	Mac092	13655	61	166	116	25	240	27	1263	SC	Flake
BMChal	Mac093	13062	60	161	110	25	237	31	1168	SC	Core
BMChal	Mac094	17251	75	197	132	30	268	36	1251	SC	Core
BMChal	Mac095	13529	63	167	120	25	232	26	1137	SC	Flake
BMChal	Mac096	16272	83	173	135	23	246	28	1101	SC	Flake
BMChal	Mac097	14313	68	165	119	23	237	31	1114	SC	Flake

BMChal	Mac098	14065	69	162	121	24	245	32	1208	SC	Core
BMChal	Mac099	13656	70	155	118	23	232	29	1074	SC	Flake
BMChal	Mac101	16252	80	187	135	24	268	27	1194	SC	Flake
BMChal	Mac102	17153	81	173	162	23	254	29	1115	SC	Flake
BMChal	Mac103	15590	64	157	165	28	252	35	1199	SC	Ang. Waste
BMChal	Mac104	13081	85	156	110	27	225	24	1143	SC	Flake
BMChal	Mac105	13696	61	165	116	26	236	31	989	SC	Core
BMChal	Mac106	13017	72	158	108	28	221	28	1080	SC	Ang. Waste
BMChal	Mac107	14441	60	173	127	24	249	27	1139	SC	Core
BMChal	Mac108	15101	72	181	119	29	243	28	994	SC	Core
BMChal	Mac109	13868	69	171	118	28	249	27	1081	SC	Flake
BMChal	Mac110	16029	76	183	142	27	261	31	1142	SC	Core
BMChal	Mac111	11257	100	216	24	31	98	43	111	SA	Flake
BMChal	Mac112	13808	77	167	116	26	237	29	1104	SC	Flake
BMChal	Mac113	14417	66	173	118	28	245	31	1112	SC	Flake
BMChal	Mac114	11395	53	221	44	22	130	26	342	SB2	Flake
BMChal	Mac115	14199	67	172	122	24	244	33	1173	SC	Flake
BMChal	Mac116	12391	83	252	31	35	96	56	130	SA	Core
BMChal	Mac117	12873	51	154	117	28	233	28	1181	SC	Flake
BMChal	Mac118	15208	80	170	142	22	257	30	1175	SC	Flake
BMChal	Mac119	14638	62	176	122	25	252	29	1218	SC	Flake
BMChal	Mac120	12577	62	157	118	22	232	30	1141	SC	Flake
BMChal	Mac121	12809	55	148	111	21	224	27	1142	SC	Ang. Waste
BMChal	Mac122	14021	69	171	120	28	246	32	1189	SC	Flake
BMChal	Mac123	13896	72	176	118	24	250	30	1227	SC	Flake
BMChal	Mac124	14764	64	174	116	23	244	26	997	SC	Core
BMChal	Mac125	13696	64	165	117	23	234	29	1156	SC	Flake
BMChal	Mac126	14018	74	169	115	27	247	27	1154	SC	Ang. Waste
BMChal	Mac127	16321	67	175	148	29	261	29	1134	SC	Flake
BMChal	Mac128	14573	63	170	126	22	257	28	1194	SC	Flake
BMChal	Mac129	15502	64	170	143	25	261	29	1345	SC	Flake
BMChal	Mac130	14517	61	172	122	27	247	29	1081	SC	Flake
BMChal	Mac131	14786	99	175	118	29	247	31	1134	SC	Flake
BMChal	Mac132	13511	58	157	138	26	250	29	1380	SC	Flake
BMChal	Mac133	14408	70	158	122	22	235	26	1087	SC	Flake
BMChal	Mac135	12946	62	152	117	22	221	29	1110	SC	Flake
BMChal	Mac137	14416	71	170	130	20	252	29	1169	SC	Flake
BMChal	Mac138	16350	78	184	135	25	259	33	964	SC	Flake
BMChal	Mac139	15473	69	179	133	24	260	32	1157	SC	Flake
BMChal	Mac140	14733	72	178	130	25	253	29	1151	SC	Flake
BMChal	Mac141	14229	70	148	139	24	229	30	1248	SC	Flake
BMChal	Mac142	13863	61	158	122	26	234	29	1157	SC	Core
BMChal	Mac145	15422	71	179	130	28	261	32	1181	SC	Core
BMChal	Mac146	13980	72	164	120	26	242	30	1206	SC	Flake
BMChal	Mac147	14987	69	166	141	25	252	28	1150	SC	Flake
BMChal	Mac148	13906	60	172	122	25	250	30	1192	SC	Ang. Waste
BMChal	Mac150	15598	64	170	151	26	260	31	1328	SC	Flake
BMChal	Mac151	14747	61	164	141	24	244	29	1130	SC	Flake
BMChal	Mac152	15485	73	177	124	28	248	34	1051	SC	Flake
BMChal	Mac153	14656	66	179	121	26	251	33	1232	SC	Flake
BMChal	Mac154	16572	80	195	130	33	267	32	1197	SC	Flake
BMChal	Mac155	15869	63	172	134	23	246	29	1004	SC	Core
BMChal	Mac156	15076	73	179	128	26	244	29	1191	SC	Flake
BMChal	Mac157	13916	56	160	118	27	243	29	1137	SC	Ang. Waste
BMChal	Mac158	14213	70	169	121	27	250	31	1241	SC	Flake
BMChal	Mac159	14390	59	173	117	26	250	32	1163	SC	Flake
BMChal	Mac160	13267	63	159	116	28	242	33	1254	SC	Flake
BMChal	Mac161	14617	64	172	125	25	243	27	1101	SC	Core
BMChal	Mac162	14621	68	162	111	26	239	27	1098	SC	Flake
BMChal	Mac164	15221	68	178	123	26	250	30	1126	SC	Flake
BMChal	Mac166	15027	65	170	123	28	243	31	1031	SC	Nodule
BMChal	Mac167	12509	58	152	104	23	222	28	1084	SC	Flake
BMChal	Mac168	15759	69	179	156	28	260	28	1166	SC	Flake
BMChal	Mac170	14804	64	163	132	25	239	30	1126	SC	Core
-	RGM-2	13970	34	142	101	25	226	7	797	-	Standard

-	RGM-2	13988	33	146	103	25	227	9	794	-	Standard
-	RGM-2	13958	41	143	101	26	230	9	763	-	Standard
-	RGM-2	13974	44	147	103	23	226	10	773	-	Standard
-	RGM-2	13927	38	142	102	23	224	9	780	-	Standard
-	RGM-2	13967	35	145	102	25	232	7	777	-	Standard
-	RGM-2	13925	36	144	103	26	228	14	812	-	Standard
-	RGM-2	13982	40	142	105	23	228	10	825	-	Standard
-	RGM-2	13990	33	144	103	25	229	11	830	-	Standard
-	RGM-2	13977	41	144	104	25	225	11	829	-	Standard
-	RGM-2	14004	37	146	100	20	231	12	795	-	Standard
BMNur	Mac171	14330	68	174	122	27	248	32	1169	SC	Flake
BMNur	Mac172	14218	68	166	125	25	253	27	1277	SC	Ang. Waste
BMNur	Mac173	15167	70	165	116	24	237	36	1317	SC	Core
BMNur	Mac174	13514	69	166	115	25	239	31	1198	SC	Flake
BMNur	Mac175	16047	87	174	134	27	256	34	1147	SC	Flake
BMNur	Mac176	11500	74	234	29	34	90	45	144	SA	Blade
BMNur	Mac177	14759	75	182	121	30	251	27	1216	SC	Flake
BMNur	Mac178	14285	73	172	119	25	251	30	1200	SC	Flake
BMNur	Mac179	13544	79	150	109	23	232	31	1238	SC	Flake
BMNur	Mac180	13151	76	150	117	20	216	30	1273	SC	Flake
BMNur	Mac181	15093	69	177	131	25	251	28	1197	SC	Flake
BMNur	Mac182	13630	69	162	115	24	244	28	1270	SC	Flake
BMNur	Mac183	14003	62	166	116	24	237	30	1122	SC	Flake
BMNur	Mac184	15122	71	179	121	27	253	27	1157	SC	Flake
BMNur	Mac185	15574	60	165	162	28	257	30	1278	SC	Flake
BMNur	Mac186	13270	69	160	117	27	227	28	1087	SC	Flake
BMNur	Mac187	14450	66	171	125	24	254	28	1238	SC	Flake
BMNur	Mac188	15373	71	185	131	22	270	31	1300	SC	Flake
BMNur	Mac189	14633	70	167	139	25	245	29	1217	SC	Flake
BMNur	Mac190	15884	77	150	152	20	239	26	1122	SC	Flake
BMNur	Mac191	14382	68	171	115	26	247	23	1109	SC	Flake
BMNur	Mac192	14409	61	168	122	29	244	36	1188	SC	Flake
BMNur	Mac193	13576	64	168	117	24	241	30	1209	SC	Ang. Waste
BMNur	Mac194	14075	63	166	124	27	250	34	1224	SC	Flake
BMNur	Mac195	14816	75	174	132	28	254	27	1238	SC	Flake
BMNur	Mac196	14820	72	168	136	26	247	29	1198	SC	Flake
BMNur	Mac197	15138	78	180	130	27	253	28	1300	SC	Flake
BMNur	Mac198	14987	64	164	130	24	247	29	1354	SC	Core
BMNur	Mac199	14146	66	168	117	31	242	27	1150	SC	Flake
BMNur	Mac200	14687	65	172	123	26	248	32	1163	SC	Flake
BMNur	Mac201	13186	86	152	112	24	230	27	1207	SC	Flake
BMNur	Mac203	15446	68	182	131	26	262	30	1218	SC	Flake
BMNur	Mac204	14013	63	170	123	22	256	28	1328	SC	Core
BMNur	Mac205	14170	59	155	132	28	249	27	1212	SC	Flake
BMNur	Mac206	14210	68	174	114	26	248	29	1212	SC	Ang. Waste
BMNur	Mac208	13466	69	155	116	24	232	32	1164	SC	Flake
BMNur	Mac209	14819	65	181	128	26	253	28	1082	SC	Core
BMNur	Mac210	15243	67	178	131	24	258	29	1101	SC	Core
BMNur	Mac211	14515	71	167	116	25	241	29	1169	SC	Core
BMNur	Mac212	12381	59	138	99	24	212	26	1013	SC	Core
BMNur	Mac213	13512	62	159	117	26	234	28	1122	SC	Ang. Waste
BMNur	Mac214	14976	70	177	126	29	255	32	1230	SC	Core
BMNur	Mac215	14552	71	175	123	25	248	33	1217	SC	Flake
BMNur	Mac216	15773	68	179	129	24	248	33	1106	SC	Core
BMNur	Mac217	14742	65	173	126	22	251	31	1144	SC	Flake
BMNur	Mac218	15654	65	174	144	25	266	30	1231	SC	Flake
BMNur	Mac219	14602	64	177	121	28	251	32	1120	SC	Flake
BMNur	Mac221	14251	66	176	120	25	244	30	1174	SC	Flake
BMNur	Mac222	13552	53	166	116	24	237	25	1091	SC	Core
BMNur	Mac223	12837	62	151	107	21	223	32	1208	SC	Flake
BMNur	Mac224	13966	66	155	122	27	237	28	1200	SC	Core
BMNur	Mac225	14922	66	171	128	22	252	31	1212	SC	Flake
BMNur	Mac226	14187	66	167	116	25	235	32	1101	SC	Flake
BMNur	Mac227	15243	71	170	138	24	244	34	1165	SC	Flake
BMNur	Mac228	14766	71	180	119	27	255	29	1172	SC	Flake

BMNur	Mac229	16032	73	175	138	30	258	35	1163	SC	Flake
BMNur	Mac230	15945	70	173	151	27	259	33	1194	SC	Flake
BMNur	Mac231	14884	67	186	121	26	256	27	1228	SC	Flake
BMNur	Mac232	13787	73	169	115	24	241	26	1119	SC	Flake
BMNur	Mac233	9337	195	85	62	14	132	16	772	SC	Flake
BMNur	Mac234	10578	171	111	86	16	173	23	920	SC	Flake
BMNur	Mac235	14379	131	154	130	25	233	25	1032	SC	Flake
BMNur	Mac237	12719	80	147	108	22	216	27	1117	SC	Flake
BMNur	Mac238	12258	73	147	101	22	214	27	1191	SC	Flake
BMNur	Mac239	11988	119	107	107	20	171	23	932	SC	Flake
BMNur	Mac240	13566	81	154	115	28	232	30	1214	SC	Flake
BMNur	Mac241	13801	68	171	122	24	244	27	1246	SC	Flake
BMNur	Mac242	13611	74	151	123	24	224	25	1214	SC	Flake
BMNur	Mac243	12826	75	147	106	25	223	22	1158	SC	Flake
BMNur	Mac244	15315	71	180	127	28	250	31	1164	SC	Flake
BMNur	Mac245	12815	128	132	98	20	198	22	1107	SC	Flake
BMNur	Mac246	12868	72	148	106	24	218	28	1177	SC	Ang. Waste
BMNur	Mac248	13735	65	172	116	23	245	33	1192	SC	Flake
BMNur	Mac249	14390	69	166	120	27	238	29	1099	SC	Flake
BMNur	Mac250	17196	76	178	164	28	255	30	1172	SC	Flake
BMNur	Mac251	14489	62	172	118	28	240	32	1130	SC	Flake
BMNur	Mac252	14457	75	182	112	25	243	28	1097	SC	Flake
BMNur	Mac253	10807	73	216	28	33	87	50	164	SA	Ang. Waste
BMNur	Mac254	15471	59	156	170	25	248	28	1154	SC	Flake
BMNur	Mac256	12404	67	150	102	24	220	23	1141	SC	Flake
BMNur	Mac257	14946	62	178	134	27	255	30	1181	SC	Flake
BMNur	Mac258	13487	56	163	122	26	250	33	1266	SC	Flake
BMNur	Mac259	13988	65	166	123	26	242	25	1111	SC	Flake
BMNur	Mac260	15238	72	179	129	25	243	29	1065	SC	Flake
BMNur	Mac261	14799	68	179	126	27	253	33	1198	SC	Flake
BMNur	Mac262	14279	60	172	127	25	254	28	1218	SC	Flake
BMNur	Mac263	12347	63	148	108	25	225	25	1184	SC	Flake
BMNur	Mac264	11672	56	246	33	27	118	30	162	SB2	Flake
BMNur	Mac265	13585	61	161	117	24	235	28	1118	SC	Flake
BMNur	Mac267	13446	69	162	109	22	233	28	1139	SC	Flake
BMNur	Mac268	13338	58	162	111	26	235	27	1151	SC	Flake
BMNur	Mac269	14949	67	174	140	24	259	30	1238	SC	Flake
BMNur	Mac270	15324	73	170	145	27	261	28	1178	SC	Flake
BMNur	Mac271	13917	63	168	119	27	251	35	1273	SC	Ang. Waste
BMNur	Mac272	14343	67	176	125	26	257	30	1339	SC	Flake
BMNur	Mac273	15026	68	174	129	29	255	30	1202	SC	Ang. Waste
BMNur	Mac274	12409	64	145	103	22	210	27	1082	SC	Flake
BMNur	Mac275	5553	297	8	4	2	14	2	-14	SC	Ang. Waste
BMNur	Mac276	9425	119	94	75	14	155	21	1017	SC	Flake
BMNur	Mac277	11560	87	237	28	36	94	52	156	SA	Flake
BMNur	Mac278	13855	62	177	115	24	246	33	1201	SC	Flake
BMNur	Mac279	14886	71	179	128	24	255	32	1132	SC	Flake
BMNur	Mac280	16238	104	168	142	24	230	24	897	SC	Flake
BMNur	Mac281	13629	63	156	123	25	239	25	1220	SC	Core
BMNur	Mac282	13129	71	159	122	24	228	30	1091	SC	Flake
BMNur	Mac283	13307	76	153	124	27	236	25	1234	SC	Flake
BMNur	Mac284	13149	66	165	107	27	229	26	1033	SC	Flake
BMNur	Mac285	14081	56	167	115	24	231	32	1001	SC	Flake
BMNur	Mac286	14710	71	169	123	23	246	29	1131	SC	Core
BMNur	Mac287	14610	56	174	116	24	236	29	1015	SC	Flake
BMNur	Mac288	13926	59	154	126	23	234	30	1121	SC	Core
BMNur	Mac289	12834	65	151	107	23	228	25	1161	SC	Flake
BMNur	Mac290	15914	77	182	130	29	255	31	1128	SC	Core
BMNur	Mac291	13848	68	169	117	28	244	29	1199	SC	Flake
BMNur	Mac292	14881	67	176	121	28	248	30	1100	SC	Flake
BMNur	Mac293	13943	79	162	114	25	234	28	1116	SC	Flake
BMNur	Mac294	14655	67	171	125	26	253	31	1285	SC	Flake
BMNur	Mac295	14390	67	176	119	26	247	30	1180	SC	Flake
BMNur	Mac296	14583	63	172	123	28	252	30	1249	SC	Core
BMNur	Mac297	13181	66	146	108	24	216	30	1106	SC	Flake

BMNur	Mac298	14252	58	172	122	25	240	25	1141	SC	Flake
BMNur	Mac299	13265	64	160	112	26	232	27	1154	SC	Flake
BMNur	Mac300	15779	75	188	130	28	258	33	1182	SC	Core
BMNur	Mac301	13951	62	157	135	24	233	32	1140	SC	Flake
BMNur	Mac302	14445	63	174	116	26	250	34	1164	SC	Flake
BMNur	Mac303	14789	67	176	122	29	237	29	1111	SC	Flake
BMNur	Mac304	15065	71	177	124	24	240	34	1061	SC	Core
BMNur	Mac305	14708	64	168	122	28	239	29	945	SC	Flake
BMNur	Mac306	14652	78	169	124	27	241	32	1056	SC	Flake
BMNur	Mac307	13904	61	172	120	26	244	28	1141	SC	Flake
BMNur	Mac308	14950	66	165	148	21	239	30	1192	SC	Ang. Waste
BMNur	Mac309	15373	63	183	127	27	260	30	1202	SC	Core
BMNur	Mac310	14115	64	163	128	25	244	32	1106	SC	Core
BMNur	Mac311	13809	60	165	127	24	253	32	1278	SC	Core
BMNur	Mac312	12986	63	153	105	22	210	28	936	SC	Flake
BMNur	Mac313	15514	76	169	156	24	258	31	1280	SC	Flake
BMNur	Mac314	11071	90	172	24	20	88	21	107	SB2	Flake
BMNur	Mac315	12933	76	157	108	28	223	33	1056	SC	Flake
BMNur	Mac316	14654	90	165	114	23	224	22	912	SC	Flake
BMNur	Mac317	15233	89	175	126	27	239	26	1117	SC	Flake
BMNur	Mac318	10557	81	120	85	21	184	24	1088	SC	Flake
BMNur	Mac319	15320	69	182	124	25	253	32	1059	SC	Flake
BMNur	Mac320	14711	70	171	123	31	241	29	1065	SC	Flake
BMNur	Mac321	15074	72	179	125	26	262	31	1251	SC	Core
BMNur	Mac322	15334	69	178	117	25	247	33	1012	SC	Core
-	RGM-2	13944	38	144	102	27	230	8	784	-	Standard
-	RGM-2	13934	39	141	106	21	230	12	803	-	Standard
-	RGM-2	13862	40	145	103	24	224	11	792	-	Standard
-	RGM-2	13976	37	143	107	24	228	11	792	-	Standard
-	RGM-2	13986	37	144	104	25	224	10	802	-	Standard
-	RGM-2	14010	32	146	107	23	226	8	817	-	Standard
-	RGM-2	13899	35	143	99	23	228	12	818	-	Standard
-	RGM-2	13912	39	141	102	26	222	10	780	-	Standard
-	RGM-2	13915	43	142	103	22	220	12	776	-	Standard
-	RGM-2	13942	41	143	105	23	231	6	785	-	Standard
NurPid	Mac324	14328	70	175	117	29	248	29	1164	SC	Flake
NurPid	Mac325	13727	69	176	124	26	247	28	1195	SC	Core
NurPid	Mac326	12997	57	161	113	21	229	25	1113	SC	Core
NurPid	Mac327	13962	67	179	119	27	253	30	1194	SC	Flake
NurPid	Mac329	12123	80	262	30	36	95	50	162	SA	Blade
NurPid	Mac330	14172	76	172	116	24	245	31	1142	SC	Flake
NurPid	Mac331	13221	72	158	116	23	232	28	1111	SC	Flake
NurPid	Mac332	11969	86	149	98	21	211	27	1112	SC	Flake
NurPid	Mac334	5611	247	9	5	2	14	2	169	SC	Flake
NurPid	Mac335	11846	124	123	95	16	181	23	1029	SC	Flake
NurPid	Mac336	13625	82	171	120	25	248	27	1146	SC	Flake
NurPid	Mac337	9625	170	106	87	19	181	23	1029	SC	Flake
NurPid	Mac338	14598	71	180	123	26	247	31	1124	SC	Blade
NurPid	Mac339	15067	61	179	133	24	252	34	1277	SC	Flake
NurPid	Mac340	14012	71	165	132	27	248	29	1225	SC	Flake
NurPid	Mac341	12846	59	162	109	23	226	29	1162	SC	Blade
NurPid	Mac342	13090	64	153	101	24	222	30	1082	SC	Flake
NurPid	Mac343	14630	74	175	121	26	241	34	1160	SC	Flake
NurPid	Mac344	12350	59	247	34	23	120	27	170	SB2	Flake
NurPid	Mac345	14470	58	170	121	25	249	27	1224	SC	Flake
NurPid	Mac347	14370	62	175	121	26	250	33	1215	SC	Flake
NurPid	Mac348	12513	53	237	34	25	126	27	195	SB2	Flake
NurPid	Mac350	13631	72	139	143	22	226	24	1069	SC	Flake
NurPid	Mac351	14627	72	173	128	21	243	28	1119	SC	Flake
NurPid	Mac352	13710	71	167	121	26	245	33	1173	SC	Flake
NurPid	Mac353	14121	60	168	126	23	248	27	1144	SC	Flake
NurPid	Mac354	15816	74	169	125	27	252	30	1295	SC	Ang. Waste
NurPid	Mac355	14776	65	175	120	28	250	29	1170	SC	Flake
NurPid	Mac358	12855	79	151	106	25	223	29	1198	SC	Flake
NurPid	Mac359	13381	78	162	117	24	236	28	1202	SC	Ang. Waste

NurPid	Mac360	13132	85	164	113	24	232	28	1062	SC	Flake
NurPid	Mac361	9248	70	98	69	16	155	21	990	SC	Flake
NurPid	Mac362	13332	65	172	121	27	254	30	1181	SC	Ang. Waste
NurPid	Mac365	12904	75	153	108	24	222	23	1071	SC	Flake
NurPid	Mac366	11967	101	257	31	36	95	55	162	SA	Flake
NurPid	Mac367	14232	69	172	125	26	250	36	1163	SC	Flake
NurPid	Mac368	12313	75	145	103	22	215	27	1073	SC	Flake
NurPid	Mac369	14024	66	173	125	25	245	30	1195	SC	Core
NurPid	Mac370	14833	81	172	124	25	246	30	1152	SC	Flake
NurPid	Mac371	9052	126	148	21	23	66	31	140	SA	Flake
NurPid	Mac372	12468	110	141	99	19	197	25	974	SC	Flake
NurPid	Mac374	12916	167	143	98	20	192	23	899	SC	Flake
NurPid	Mac375	12533	99	154	122	23	224	27	1156	SC	Flake
NurPid	Mac376	12478	109	145	103	25	212	28	963	SC	Flake
NurPid	Mac377	11265	98	125	84	18	185	24	1134	SC	Flake
NurPid	Mac378	14698	70	178	119	21	253	28	1226	SC	Ang. Waste
NurPid	Mac379	13694	72	170	126	30	250	30	1173	SC	Flake
NurPid	Mac380	11397	57	237	33	23	116	32	167	SB2	Flake
NurPid	Mac381	12023	99	199	62	22	155	30	523	SB1	Flake
NurPid	Mac382	10732	78	125	83	19	187	23	1031	SC	Flake
NurPid	Mac383	12316	75	137	98	21	199	22	1024	SC	Ang. Waste
NurPid	Mac384	13281	76	170	121	26	244	31	1181	SC	Flake
NurPid	Mac385	12621	60	158	107	23	227	30	1095	SC	Flake
NurPid	Mac386	12769	103	149	104	17	213	26	1019	SC	Blade
NurPid	Mac387	12042	90	154	116	24	234	24	1133	SC	Flake
NurPid	Mac388	14234	66	169	117	26	251	31	1236	SC	Flake
NurPid	Mac390	15175	74	179	119	26	250	31	1154	SC	Flake
NurPid	Mac392	13023	72	156	114	24	231	30	1039	SC	Flake
NurPid	Mac393	16863	69	185	132	29	259	30	1163	SC	Blade
NurPid	Mac394	14422	64	174	132	23	255	29	1342	SC	Blade
NurPid	Mac395	12918	64	160	110	25	228	29	1116	SC	Flake
NurPid	Mac396	11737	107	133	93	20	188	23	1032	SC	Flake
NurPid	Mac397	14544	64	174	127	25	254	27	1201	SC	Flake
NurPid	Mac398	14051	69	169	127	23	256	26	1302	SC	Flake
NurPid	Mac399	13797	90	168	111	26	238	33	1161	SC	Flake
NurPid	Mac400	15505	74	184	132	26	263	31	1270	SC	Flake
NurPid	Mac402	14742	70	182	125	27	254	34	1231	SC	Flake
NurPid	Mac403	16008	75	181	129	25	256	29	1184	SC	Blade
NurPid	Mac404	11952	81	251	31	37	99	51	181	SA	Flake
NurPid	Mac405	13381	72	166	112	24	232	27	1109	SC	Blade
NurPid	Mac406	13833	68	175	119	25	253	32	1189	SC	Flake
NurPid	Mac407	14551	73	183	126	26	253	29	1172	SC	Flake
NurPid	Mac408	12876	62	264	36	26	123	30	183	SB2	Flake
NurPid	Mac409	11592	76	249	27	35	95	49	163	SA	Flake
NurPid	Mac410	14394	77	179	126	27	256	30	1211	SC	Flake
NurPid	Mac411	12311	57	156	123	25	231	30	1183	SC	Flake
NurPid	Mac412	13686	71	169	115	27	240	31	1172	SC	Blade
NurPid	Mac413	11380	54	238	32	26	116	30	188	SB2	Ang. Waste
NurPid	Mac414	14022	65	170	123	25	245	25	1159	SC	Blade
NurPid	Mac415	14051	85	175	120	27	247	27	1190	SC	Flake
NurPid	Mac417	14034	71	165	123	26	251	29	1288	SC	Flake
NurPid	Mac418	13589	61	169	128	27	250	27	1271	SC	Flake
NurPid	Mac419	11716	55	244	31	26	115	29	173	SB2	Flake
NurPid	Mac422	13700	78	177	124	27	244	31	1191	SC	Blade
NurPid	Mac423	13976	66	180	123	23	255	33	1201	SC	Ang. Waste
NurPid	Mac424	13711	65	173	123	26	254	31	1284	SC	Blade
NurPid	Mac425	12619	60	158	120	24	228	22	1111	SC	Flake
NurPid	Mac426	13423	62	167	128	23	249	31	1243	SC	Flake
NurPid	Mac427	14650	79	171	132	24	247	30	1202	SC	Core
NurPid	Mac428	12449	63	156	110	29	233	32	1127	SC	Flake
NurPid	Mac429	13034	60	154	112	27	231	28	1127	SC	Flake
NurPid	Mac431	12674	57	157	109	24	232	28	1132	SC	Blade
NurPid	Mac432	12877	61	154	109	24	224	27	1092	SC	Core
NurPid	Mac433	13847	72	163	120	26	241	29	1221	SC	Core
NurPid	Mac434	11391	47	216	54	21	125	28	384	SB2	Blade

NurPid	Mac435	12481	83	147	106	27	226	25	1214	SC	Core
NurPid	Mac436	13348	68	171	119	24	244	36	1231	SC	Flake
NurPid	Mac437	11603	125	242	28	34	115	47	149	SA	Flake
NurPid	Mac441	15382	60	182	134	27	249	31	1140	SC	Flake
NurPid	Mac442	15124	76	187	130	26	260	32	1260	SC	Flake
NurPid	Mac443	12408	93	149	99	21	203	25	1044	SC	Ang. Waste
NurPid	Mac445	11164	143	123	91	20	186	22	1051	SC	Flake
NurPid	Mac446	11603	94	135	93	18	201	27	1138	SC	Ang. Waste
NurPid	Mac447	13388	73	174	124	25	256	32	1219	SC	Ang. Waste
NurPid	Mac449	12636	70	146	105	26	220	26	1224	SC	Flake
NurPid	Mac450	12256	60	217	73	27	169	33	556	SB1	Flake
NurPid	Mac451	14500	73	171	121	26	244	29	1137	SC	Blade
NurPid	Mac452	13517	61	165	112	25	236	28	1108	SC	Flake
NurPid	Mac455	13147	69	225	82	27	171	39	624	SB1	Core
NurPid	Mac456	11159	79	232	28	36	93	49	144	SA	Flake
NurPid	Mac457	13081	60	225	89	26	207	34	774	SB1	Flake
NurPid	Mac458	13470	63	163	115	27	238	30	1129	SC	Flake
NurPid	Mac459	14226	97	165	114	25	223	28	1123	SC	Blade
NurPid	Mac460	12542	77	151	107	24	220	28	1096	SC	Flake
NurPid	Mac462	9166	129	151	21	19	80	21	141	SB2	Flake
NurPid	Mac463	13692	63	173	120	25	246	30	1144	SC	Flake
NurPid	Mac464	15795	79	194	139	30	267	29	1289	SC	Blade
NurPid	Mac465	13505	71	166	117	23	233	30	1134	SC	Flake
NurPid	Mac466	12353	65	150	100	23	215	31	1050	SC	Blade
NurPid	Mac467	13820	60	174	124	27	249	36	1292	SC	Core
NurPid	Mac468	11328	78	231	25	31	92	48	124	SA	Flake
NurPid	Mac469	13366	67	160	124	26	244	26	1238	SC	Flake
NurPid	Mac470	14022	69	172	129	24	257	29	1331	SC	Flake
NurPid	Mac474	14695	76	166	120	23	243	32	1186	SC	Flake
NurPid	Mac475	11222	55	225	33	25	108	27	143	SB2	Ang. Waste
NurPid	Mac476	14857	65	184	124	26	263	33	1282	SC	Blade
NurPid	Mac477	12867	63	162	114	27	245	29	1196	SC	Core
NurPid	Mac478	13230	71	157	104	23	230	30	1185	SC	Flake
NurPid	Mac479	13761	68	169	114	28	245	33	1208	SC	Flake
NurPid	Mac481	13433	67	167	114	25	250	35	1209	SC	Flake
NurPid	Mac482	13823	64	170	117	26	251	25	1137	SC	Flake
NurPid	Mac484	12559	67	156	105	26	217	27	1079	SC	Flake
NurPid	Mac485	13992	59	172	125	25	249	29	1258	SC	Flake
NurPid	Mac486	14023	68	177	125	23	255	26	1222	SC	Blade
NurPid	Mac488	11026	77	126	95	21	197	28	1130	SC	Flake
NurPid	Mac489	12049	54	237	52	25	144	31	386	SB2	Flake
NurPid	Mac490	12035	60	244	33	25	121	32	179	SB2	Flake
NurPid	Mac491	12716	63	155	110	23	229	26	1116	SC	Flake
NurPid	Mac492	15374	65	172	144	27	261	28	1247	SC	Flake
NurPid	Mac493	12633	56	149	116	23	228	25	1144	SC	Blade
NurPid	Mac494	13975	59	164	120	25	239	27	1246	SC	Ang. Waste
NurPid	Mac495	11932	79	245	28	34	99	49	174	SA	Flake
NurPid	Mac496	12767	88	259	29	37	92	49	148	SA	Blade
NurPid	Mac498	13766	61	164	114	26	234	23	1066	SC	Blade
NurPid	Mac500	12855	62	158	113	20	231	29	1113	SC	Flake
NurPid	Mac501	15491	67	180	135	27	262	32	1285	SC	Blade
NurPid	Mac502	12771	61	153	107	24	223	23	1100	SC	Flake
NurPid	Mac504	13196	65	170	120	27	246	33	1228	SC	Flake
NurPid	Mac505	13771	67	170	117	27	238	29	1108	SC	Flake
NurPid	Mac506	14206	75	173	126	24	253	32	1295	SC	Blade
NurPid	Mac507	13065	68	158	106	23	227	31	1172	SC	Blade
NurPid	Mac508	14652	65	173	126	27	248	29	1292	SC	Flake
NurPid	Mac509	14233	62	181	130	25	256	31	1198	SC	Flake
NurPid	Mac510	10402	137	160	38	24	83	30	215	SB1	Flake
NurPid	Mac511	14401	63	175	119	26	256	30	1290	SC	Flake
NurPid	Mac512	9895	88	169	33	15	108	21	280	SB2	Flake
NurPid	Mac513	11761	49	227	43	23	129	31	293	SB2	Flake
NurPid	Mac519	12962	76	148	101	21	211	24	1089	SC	Flake
NurPid	Mac528	12227	153	131	83	19	167	20	686	SC	Flake
NurPid	Mac529	12383	54	247	33	20	118	27	172	SB2	Flake

NurPid	Mac530	10986	137	117	79	13	168	25	987	SC	Flake
NurPid	Mac532	10756	64	213	30	23	110	29	165	SB2	Flake
NurPid	Mac533	13071	74	157	112	24	228	29	1170	SC	Flake
NurPid	Mac534	11884	80	255	30	37	94	50	147	SA	Flake
NurPid	Mac535	13084	80	161	112	27	228	25	1151	SC	Flake
NurPid	Mac536	12514	64	160	111	25	231	24	1103	SC	Flake
NurPid	Mac537	11676	65	141	101	21	214	27	1250	SC	Blade
NurPid	Mac538	13819	78	173	114	26	246	32	1198	SC	Flake
NurPid	Mac540	12568	61	245	50	21	134	32	307	SB2	Flake
NurPid	Mac542	13999	74	165	121	27	245	28	1240	SC	Flake
NurPid	Mac543	12777	60	159	108	26	229	32	1151	SC	Flake
NurPid	Mac544	14470	81	166	114	26	238	29	1219	SC	Flake
NurPid	Mac545	11766	83	244	28	35	93	54	153	SA	Flake
NurPid	Mac546	14058	61	174	124	29	252	27	1152	SC	Flake
NurPid	Mac547	14400	69	162	129	26	253	24	1274	SC	Blade
NurPid	Mac548	14577	65	170	119	22	247	28	1103	SC	Flake
NurPid	Mac549	12899	63	149	112	26	221	26	1086	SC	Flake
NurPid	Mac550	14993	70	179	126	26	258	28	1283	SC	Core
NurPid	Mac551	13502	60	161	120	24	242	29	1262	SC	Core
NurPid	Mac552	13271	65	168	127	23	251	30	1287	SC	Flake
NurPid	Mac553	13751	66	172	116	25	245	29	1179	SC	Flake
NurPid	Mac554	16177	117	172	118	26	236	28	1009	SC	Flake
NurPid	Mac555	12527	65	149	103	23	219	27	1004	SC	Flake
NurPid	Mac556	14480	77	179	121	26	253	29	1195	SC	Flake
NurPid	Mac557	12913	62	160	112	23	224	29	1123	SC	Flake
NurPid	Mac557	13306	65	162	104	22	229	29	1037	SC	Blade
NurPid	Mac558	11715	89	239	29	39	101	51	123	SA	Flake
NurPid	Mac559	14577	79	180	132	24	254	32	1133	SC	Flake
NurPid	Mac560	11262	87	240	28	32	87	49	168	SA	Flake
NurPid	Mac561	13638	61	162	121	28	244	27	1256	SC	Flake
NurPid	Mac562	13251	79	230	74	24	159	35	504	SB1	Flake
NurPid	Mac563	13564	53	166	120	25	253	29	1321	SC	Flake
NurPid	Mac565	14729	65	184	129	25	260	33	1248	SC	Flake
NurPid	Mac566	12830	65	158	111	27	232	29	1248	SC	Flake
NurPid	Mac567	13365	80	233	71	30	155	37	497	SB1	Blade
NurPid	Mac568	12236	71	144	100	24	217	31	1202	SC	Ang. Waste
NurPid	Mac569	13307	84	158	108	21	227	31	1169	SC	Flake
NurPid	Mac570	12351	56	175	92	18	196	29	826	SC	Blade
NurPid	Mac571	11725	134	123	89	17	183	19	1011	SC	Ang. Waste
NurPid	Mac573	12994	56	165	116	26	231	33	1104	SC	Core
NurPid	Mac576	15607	75	175	125	29	253	28	1127	SC	Flake
NurPid	Mac577	13151	89	159	113	22	224	26	1107	SC	Ang. Waste
NurPid	Mac578	13646	68	170	117	24	247	31	1149	SC	Core
NurPid	Mac579	12109	85	260	32	36	95	50	179	SA	Flake
NurPid	Mac580	13028	60	169	120	26	250	30	1206	SC	Blade
NurPid	Mac581	13269	60	161	121	25	246	29	1255	SC	Ang. Waste
NurPid	Mac582	14400	71	179	128	25	261	32	1253	SC	Flake
NurPid	Mac583	13882	71	172	121	25	248	34	1194	SC	Flake
NurPid	Mac584	10919	62	137	92	20	206	26	1137	SC	Flake
NurPid	Mac585	11994	84	257	29	38	103	54	165	SA	Flake
NurPid	Mac586	12916	62	249	50	20	137	30	276	SB2	Flake
NurPid	Mac587	13823	69	172	123	28	255	27	1297	SC	Flake
NurPid	Mac588	7936	108	122	15	21	55	28	103	SA	Flake
NurPid	Mac589	12680	76	159	111	23	223	27	1129	SC	Flake
NurPid	Mac590	13168	81	154	111	23	226	27	1275	SC	Flake
NurPid	Mac591	14696	64	159	146	25	244	28	1161	SC	Core
NurPid	Mac592	13104	59	161	110	22	233	26	1091	SC	Blade
NurPid	Mac593	13442	59	163	113	23	238	26	1132	SC	Flake
NurPid	Mac594	12946	79	160	122	26	235	28	1236	SC	Flake
-	RGM-2	13960	37	142	104	21	228	10	829	-	Standard
-	RGM-2	13929	42	142	104	22	232	11	786	-	Standard
-	RGM-2	13931	37	148	104	22	223	9	796	-	Standard
-	RGM-2	13885	36	143	103	23	226	11	801	-	Standard
-	RGM-2	13915	33	146	103	24	224	14	815	-	Standard
-	RGM-2	13951	39	142	104	25	232	13	786	-	Standard

-	RGM-2	13967	43	143	104	25	232	12	811	-	Standard
-	RGM-2	13962	41	145	102	23	225	16	814	-	Standard
-	RGM-2	14077	34	144	104	23	232	13	771	-	Standard
-	RGM-2	13960	44	142	104	22	230	8	815	-	Standard
-	RGM-2	13993	39	145	104	27	229	8	806	-	Standard
-	RGM-2	13934	43	143	103	21	228	15	790	-	Standard
-	RGM-2	13949	37	142	105	26	224	8	795	-	Standard
-	RGM-2	13935	31	141	104	22	227	8	792	-	Standard
-	RGM-2	14042	44	145	104	25	231	10	814	-	Standard
-	RGM-2	13884	37	145	103	21	232	8	803	-	Standard
MitPid	Mac598	8245	157	82	58	17	128	18	864	SC	Flake
MitPid	Mac600	11297	105	121	84	21	184	25	1172	SC	Flake
MitPid	Mac601	13912	63	147	102	24	216	25	1120	SC	Core
MitPid	Mac603	15416	79	190	131	29	254	32	1180	SC	Flake
MitPid	Mac605	13973	65	173	117	23	243	32	1203	SC	Flake
MitPid	Mac606	14406	74	175	120	27	241	29	1154	SC	Ang. Waste
MitPid	Mac607	14663	68	182	123	27	259	33	1269	SC	Core
MitPid	Mac608	14232	57	160	144	34	236	28	1144	SC	Core
MitPid	Mac609	11480	59	243	31	22	116	31	185	SB2	Blade
MitPid	Mac610	12177	97	231	28	31	88	44	139	SA	Flake
MitPid	Mac611	10564	58	214	29	24	99	25	132	SB2	Flake
MitPid	Mac612	15112	68	175	142	26	261	31	1221	SC	Flake
MitPid	Mac613	14395	79	176	123	24	251	30	1231	SC	Blade
MitPid	Mac614	14690	70	183	128	27	255	31	1210	SC	Blade
MitPid	Mac615	14038	64	171	122	27	248	28	1221	SC	Core
MitPid	Mac618	15064	73	179	123	26	246	32	1062	SC	Flake
MitPid	Mac619	14008	73	233	84	27	165	34	606	SB1	Ang. Waste
MitPid	Mac620	18083	67	170	120	24	244	27	1173	SC	Flake
MitPid	Mac621	13831	69	171	116	25	250	28	1205	SC	Flake
MitPid	Mac622	13421	85	164	111	22	231	31	1149	SC	Flake
MitPid	Mac624	14247	72	176	124	27	255	34	1285	SC	Flake
MitPid	Mac628	14299	69	185	123	24	259	31	1218	SC	Blade
MitPid	Mac629	13735	61	168	114	23	236	28	1124	SC	Flake
MitPid	Mac634	13067	68	161	123	28	244	31	1267	SC	Flake
MitPid	Mac635	14461	65	159	110	25	231	26	1144	SC	Flake
MitPid	Mac636	14628	67	180	121	24	256	28	1199	SC	Flake
MitPid	Mac637	13970	59	173	122	26	245	32	1131	SC	Flake
MitPid	Mac638	12837	75	153	102	22	215	30	1026	SC	Core
MitPid	Mac639	14159	58	159	111	25	228	26	1129	SC	Blade
MitPid	Mac640	12766	70	154	110	31	230	22	1087	SC	Core
MitPid	Mac641	13118	83	220	70	26	148	38	495	SB1	Blade
MitPid	Mac642	15523	65	156	113	24	239	28	1264	SC	Core
MitPid	Mac644	12075	81	143	98	20	202	27	1112	SC	Flake
MitPid	Mac645	14180	73	166	115	21	240	27	1185	SC	Core
MitPid	Mac646	15302	88	178	125	24	249	28	1140	SC	Flake
MitPid	Mac647	13551	66	169	118	26	249	33	1268	SC	Flake
MitPid	Mac648	14049	91	165	114	22	227	28	1042	SC	Flake
MitPid	Mac649	7305	199	60	44	11	98	14	823	SC	Flake
MitPid	Mac652	9042	170	82	62	12	115	14	768	SC	Flake
MitPid	Mac653	10280	220	107	72	16	149	22	810	SC	Flake
MitPid	Mac655	14837	71	178	123	24	256	34	1233	SC	Flake
MitPid	Mac656	13453	73	157	112	26	239	29	1195	SC	Ang. Waste
MitPid	Mac657	13480	59	162	113	27	234	33	1054	SC	Flake
MitPid	Mac659	12323	60	251	32	27	125	29	175	SB2	Blade
MitPid	Mac660	11911	87	246	29	38	97	52	146	SA	Flake
MitPid	Mac662	14294	65	164	114	21	234	25	1089	SC	Blade
MitPid	Mac663	14464	66	175	119	28	244	30	1154	SC	Flake
MitPid	Mac664	10831	50	216	30	22	104	27	156	SB2	Flake
MitPid	Mac665	14038	62	165	117	23	236	27	1088	SC	Flake
MitPid	Mac666	14112	66	174	125	24	255	30	1244	SC	Flake
MitPid	Mac667	14931	71	183	122	26	257	32	1178	SC	Blade
MitPid	Mac668	15272	73	174	133	23	258	31	1246	SC	Flake
MitPid	Mac670	12287	58	152	106	22	225	27	1149	SC	Flake
MitPid	Mac671	12673	66	159	116	21	234	30	1270	SC	Flake
MitPid	Mac672	9265	153	98	70	16	148	20	905	SC	Flake

MitPid	Mac677	13546	60	171	119	28	250	33	1202	SC	Flake
MitPid	Mac678	12432	63	145	101	24	218	24	1195	SC	Ang. Waste
MitPid	Mac679	14590	66	163	155	27	259	28	1279	SC	Flake
MitPid	Mac680	13896	78	174	121	23	250	30	1185	SC	Flake
MitPid	Mac682	12483	67	220	87	26	155	36	570	SB1	Flake
MitPid	Mac683	13098	64	162	119	27	239	31	1172	SC	Flake
MitPid	Mac684	13385	60	160	113	22	233	25	1256	SC	Core
MitPid	Mac685	15069	71	184	132	26	257	25	1195	SC	Flake
MitPid	Mac693	13562	101	154	108	23	220	24	1030	SC	Flake
MitPid	Mac694	12375	82	155	105	26	227	29	1170	SC	Flake
MitPid	Mac695	13387	67	166	116	29	239	31	1094	SC	Core
MitPid	Mac697	11281	81	236	27	37	95	51	143	SA	Flake
MitPid	Mac698	13214	112	236	30	32	93	48	141	SA	Flake
MitPid	Mac699	11633	76	245	27	36	91	51	148	SA	Flake
MitPid	Mac700	12488	72	145	100	21	214	26	1135	SC	Flake
MitPid	Mac701	15635	76	176	133	23	255	37	1177	SC	Core
MitPid	Mac702	9855	162	104	74	19	162	20	964	SC	Ang. Waste
MitPid	Mac703	13147	81	150	111	23	226	28	1201	SC	Ang. Waste
MitPid	Mac704	10373	64	188	23	19	89	20	132	SB2	Flake
MitPid	Mac705	13208	73	152	109	26	220	27	1168	SC	Flake
MitPid	Mac706	14108	90	162	120	19	228	31	1157	SC	Flake
MitPid	Mac707	12389	92	130	98	22	200	26	1099	SC	Ang. Waste
MitPid	Mac708	14018	84	169	118	25	241	27	1061	SC	Flake
MitPid	Mac709	9975	152	97	67	15	142	18	922	SC	Flake
MitPid	Mac710	14044	72	173	116	27	241	27	1169	SC	Blade
MitPid	Mac711	12193	101	148	107	20	215	23	1086	SC	Flake
MitPid	Mac712	13091	49	215	90	21	204	32	754	SB1	Flake
MitPid	Mac713	14460	72	174	128	27	252	30	1217	SC	Flake
MitPid	Mac714	13147	100	153	110	23	225	29	1176	SC	Flake
MitPid	Mac715	10940	48	237	31	25	112	29	148	SB2	Flake
MitPid	Mac716	13773	72	170	119	22	246	25	1196	SC	Blade
MitPid	Mac717	14493	76	168	116	24	237	29	1160	SC	Flake
MitPid	Mac718	11342	124	125	91	22	182	23	965	SC	Flake
MitPid	Mac719	16803	68	182	128	29	253	32	1177	SC	Blade
MitPid	Mac720	11432	49	236	39	26	117	31	231	SB2	Flake
MitPid	Mac722	11823	51	219	32	23	108	27	170	SB2	Flake
MitPid	Mac723	14312	66	177	124	24	255	29	1264	SC	Flake
MitPid	Mac724	13176	60	158	114	23	233	30	1113	SC	Flake
MitPid	Mac725	13379	115	152	103	23	207	25	1081	SC	Flake
MitPid	Mac726	15172	64	185	127	27	257	31	1233	SC	Flake
MitPid	Mac727	11589	81	243	26	36	96	50	135	SA	Core
MitPid	Mac728	14059	55	170	119	26	241	29	1145	SC	Flake
MitPid	Mac729	11467	74	235	28	36	97	55	141	SA	Flake
MitPid	Mac730	14308	61	179	128	28	248	30	1203	SC	Flake
MitPid	Mac731	12998	70	224	74	25	167	35	578	SB1	Blade
MitPid	Mac732	14048	68	178	118	22	255	32	1254	SC	Flake
MitPid	Mac733	11545	64	249	37	22	117	30	177	SB2	Flake
MitPid	Mac734	13102	55	155	116	27	241	27	1246	SC	Blade
MitPid	Mac735	13523	65	166	107	25	227	28	989	SC	Flake
MitPid	Mac736	14073	64	172	122	23	249	32	1175	SC	Flake
MitPid	Mac738	14490	65	169	124	27	244	30	1208	SC	Flake
MitPid	Mac741	10445	46	217	26	22	102	25	122	SB2	Flake
MitPid	Mac742	11256	77	233	29	31	95	51	135	SA	Blade
MitPid	Mac743	12841	59	156	105	25	225	28	1159	SC	Ang. Waste
MitPid	Mac744	15144	68	178	130	23	262	35	1268	SC	Flake
MitPid	Mac745	15352	69	176	125	24	247	25	1044	SC	Flake
MitPid	Mac747	13004	64	158	111	25	240	33	1202	SC	Core
MitPid	Mac748	11932	68	203	64	23	140	32	482	SB1	Flake
MitPid	Mac750	14389	65	175	127	24	251	30	1170	SC	Blade
MitPid	Mac751	14465	66	178	131	26	257	30	1292	SC	Flake
MitPid	Mac752	12626	88	259	30	38	95	57	147	SA	Core
MitPid	Mac753	12725	65	225	78	27	164	35	562	SB1	Ang. Waste
MitPid	Mac754	14003	61	169	118	29	240	27	1090	SC	Flake
MitPid	Mac755	13269	59	172	114	26	243	34	1159	SC	Ang. Waste
MitPid	Mac756	13750	74	177	118	25	250	34	1167	SC	Flake

MitPid	Mac757	13859	60	177	124	26	252	32	1232	SC	Blade
MitPid	Mac758	12665	58	153	111	24	227	23	1124	SC	Flake
MitPid	Mac759	13863	58	171	115	25	237	32	1140	SC	Flake
MitPid	Mac760	14369	68	176	123	28	249	31	1214	SC	Core
MitPid	Mac761	15309	69	161	118	22	228	27	1175	SC	Flake
MitPid	Mac762	15345	62	166	118	21	243	31	1142	SC	Flake
MitPid	Mac763	15589	63	175	128	24	247	31	1109	SC	Flake
MitPid	Mac765	14615	70	177	120	25	247	29	1191	SC	Flake
MitPid	Mac766	13167	90	275	11	47	203	71	10	SA	Flake
MitPid	Mac767	12733	56	155	127	29	225	30	1155	SC	Flake
MitPid	Mac769	15768	76	181	127	26	262	34	1189	SC	Core
MitPid	Mac770	13223	71	166	119	23	239	29	1055	SC	Blade
MitPid	Mac771	11387	47	224	40	21	116	28	247	SB2	Flake
MitPid	Mac772	15047	66	171	128	23	256	28	1207	SC	Blade
MitPid	Mac773	14610	61	177	132	24	258	31	1251	SC	Flake
MitPid	Mac774	12088	51	148	103	24	219	28	1210	SC	Flake
MitPid	Mac775	13854	62	169	117	23	244	25	1171	SC	Flake
MitPid	Mac776	12444	88	261	26	36	98	53	159	SA	Flake
MitPid	Mac777	13328	65	166	116	27	230	29	1050	SC	Flake
MitPid	Mac778	12796	67	150	104	20	224	30	1219	SC	Ang. Waste
-	RGM-2	13935	36	147	103	23	229	13	822	-	Standard
-	RGM-2	13928	43	142	104	24	234	11	829	-	Standard
-	RGM-2	13981	37	143	106	24	229	10	795	-	Standard
-	RGM-2	13937	29	145	103	24	231	9	794	-	Standard
-	RGM-2	13944	41	145	101	25	227	11	815	-	Standard
-	RGM-2	14002	39	147	106	25	227	13	790	-	Standard
-	RGM-2	14001	37	148	106	22	229	15	815	-	Standard
-	RGM-2	14013	42	146	104	21	226	11	817	-	Standard
-	RGM-2	13996	37	144	105	24	231	11	770	-	Standard
-	RGM-2	14047	37	147	105	24	225	8	806	-	Standard
-	RGM-2	13932	38	144	101	22	228	11	820	-	Standard

*Elemental data of Sardinian obsidians and in situ geological specimens as determined by EDXRF in parts per million (ppm). RGM-2 standard data is also included. Note that ‘Mac’ numbers are not consecutive because several pieces turned out not to be obsidian, but rather the rhyolites mentioned in the text, often similar to opaque SC obsidians. BMChal: Bingia 'e Monti Chalcolithic; BMNur: Bingia 'e Monti Nuragic; NurPid: Nuraghe Pidighi; MitPid: Mitza Pidighi.