Original Study

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The Neolithic Site of San Martino – Sicily: Working and Circulation of Obsidian from Lipari

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Abstract: The settlement of San Martino was found in 2008 on the Northern coast of Sicily (near the city of Spadafora – Messina). It is located on a hill slope about 4 km from the coast of the Tyrrhenian Sea, near an ancient river which is no longer present today. The stratigraphy included two Neolithic levels: the oldest one belonged to the Stentinello culture (middle Neolithic – 6th–5th millennium BC cal) and the later one belonged to the Diana culture (Late Neolithic – 4th millennium BC cal). The San Martino lithic assemblage consists of a very significant amount of obsidian knapping products that have allowed us to examine the procurement, exploitation and circulation of this raw material, from the source on the island off the coast of Sicily, during the Neolithic period. Considering its strategic location and some analogies with other settlements nearby, the site of San Martino was probably part of the Lipari obsidian networks of exchange.

Keywords: Neolithic period, obsidian exploitation, circulation, Lipari island, Northern coast of Sicily

1 Introduction. The Site of San Martino and the Archaeological Excavation

The site of San Martino (Spadafora City – Messina) was found in 2007–2008 during some operations of rescue archaeology carried out by the Superintendence of Cultural Heritage of Messina (PK 237). San Martino is located in the municipality of Spadafora village, about 23 km south-west of Messina and 18 km north of Milazzo. It is positioned on little plateau at 250 m a.s.l. and 4 km far from the sea (Figure 1). The geomorphology of the territory is characterized by sedimentary rock formations and alluvial deposits (gravels and clays) of the Holocene age (Maccarrone et al., 2000).

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Figure 1. S. Martino site position (IGM map of Spadafora) compared to Lipari island.

The Neolithic settlement (Martinelli & Quero, 2013) situated on an alluvial deposit made of sand and gravel, where a few streams used to flow, was probably connected with a seasonal stream which was active in winter, at the eastern side of the site. The excavation carried out on an area of 160 square meters has highlighted the presence of a settlement near these streams, during two phases of the Neolithic period: the early one in the Middle Neolithic period (Stentinello culture) and the latest one in the Late Neolithic (Diana culture). There were some hearths, fragmented and whole pottery and a large amount of burned daub fragments that attest the wattle and daub technique used for the construction of huts. The stratigraphic sequence of the phase of occupation and abandonment of the site started underneath the layer 1 sloping to the north (Figures 2, 3; Table 1).

Figure 2. S. Martino excavation plant: A. Diana culture layer 12 in pink color and Stentinello culture layer 20 in blue color; B. Stentinello culture layers 20-25-24 and the bowl SU 22, in blue color; in the lower part there are the paleo-channels filled by the layer 12.

Figure 3. S. Martino. Stratigraphic section B'-B.

Table 1. Archaeological layers and stratigraphic sequence from the site of S. Martino.

Number	Layers	Relationships	Facies
1	Remodeled layer	above SU 12	Modern age
3	Fine yellow sand	under SU 12	Natural ground
12	Brown clay	in SU 3	- cuts XV–XXVII Diana - cuts XXVII–XXVIII Diana and Stentinello - cuts XXIX–XL Stentinello
14	Group of stones	in SU 12	Diana
15	Lans of gray fine sand	in SU 12	Diana
19	Group of stones	in SU 12	Diana
20	Dark brown clay	above SU 21	Stentinello and Diana
21	gravel	Under SU 20	Natural ground
22	Whole jar	in SU 20 above SU 25	Stentinello
23	Hearth	in SU 20	Stentinello
24	Group of stones	in SU 20	Stentinello
25	Clay and gravel with group of stones	in SU 20	Stentinello

The archaeological layer of the Late Neolithic period (layer 12, cuts XV–XXVII) constituted the filling of some channels that cut the natural sand and gravel level (layers 3, 21). It was an alluvial brown clay deposit, with groups of pebbles (layers 14 and 19) and very fine-grained gray sand (layer 15) (Figure 2.A). On square D4 (layer 12, cut XX), there was whole bowl in pieces. The archaeological layer of the Middle Neolithic period was the alluvial clay layer 20 situated at the bottom of the same channels, in the northern area. Inside this deposit, a hearth (layer 23) and two groups of pebbles (layers 24–25) were found. On square F8, from layer 25 (clay and gravel with groups of stones) a whole bowl in fragments was discovered (layer 22) (Figure 2.B and 3).

The layers of alluvial formation suggest an occupation of the site linked to the presence of seasonal water sources. The consistency of the archaeological deposit could indicate that the beginning of the inhabitation dates back to the Middle Neolithic period and became more stable during the Late Neolithic period.

The radiocarbon dates (Table 2) obtained from charcoal fragments confirm the site occupation during the 5th millennium BC, corresponding to two cultural phases (Pessina & Tinè, 2012, pp. 40–42): the Stentinello II culture (4800–4500 BC cal) and the Diana culture (4200–3900 BC cal).

Table 2. Radiocarbon dating by CEDAD laboratory (Salento University).

CEDAD University of Salento	Archaeological layer	Radiocarbon Age (BP)	$\delta^{13}\text{C}$ (‰)	Calibrated date BC 1σ	Probably
LTL3520A	04/PK237-layer 12 cut XXVI square D9	5274 $\pm$ 50	-24.6 $\pm$ 0.2	4240–3970	95.4%
LTL3521A	05/PK237-layer 20	5757 $\pm$ 50	-28.3 $\pm$ 0.1	4720–4480	95.4%
LTL3519A	03/PK237-layer 23	5853 $\pm$ 60	-26.9 $\pm$ 0.3	4850–4540	95.4%

2 The Neolithic Pottery Complex of the Two Phases of the Settlement: Diana and Stentinello Cultures

The pottery of **Diana culture** consists of 4218 fragments, 4168 of which came from layer 12, 47 from layer 19, 3 from layer 14 (Table 1). Cut XVII returned the greatest amount of pottery (458 fragments). The main shapes are deep bowls with indistinct rim and curved, truncated-cone or carinated body; ollas with cylindrical or globular body with indistinct rim; bowls with truncated-cone, straight or curved body (Figure 4). Bowls are commonest shapes with 59 artifacts (Figure 5), while there are 10 necked vessels. The peculiar “rocchetto” handles amount to 54. Most of the handles show pronounced apices; some of them are characterized by a central hole. Alongside bigger shaped handles, there are also some small samples consisting in a thin string under the rim (Figures 4, 5). These elements indicate a late phase of production of the Diana pottery, as known in the eponymous site of “Contrada Diana” on Lipari island (Bernabò Brea, 1987; Bernabò Brea & Cavalier, 1960, 1980). Surfaces and pastes are brown, purple and bright red colored. Generally, the surfaces are devoid of decorations, but 11 fragments of middle/big sized vessels present inner asyntactic pinching impressions (Figure 4.7). Specific comparisons come from the site of Contrada Diana (Bernabò Brea & Cavalier, 1960, p. XVI, 3 d–f). Other comparisons have been known in Sicily at S. Marco di Salinelle (Maniscalco, 2000), Riparo della Sperlinga di San Basilio (Cavalier, 1971) and in Calabria at Grotta San Michele di Saracena (Tinè & Natali, 2014), Madonna di Praia a Mare (Bernabò Brea et al., 2000), Capo Alfiere — phase IIc e Curinga (Pessina & Tinè, 2008, p. 48).

The **Stentinello culture** pottery consists of 1588 fragments (563 catalogued fragments). The larger part comes from layer 20 and layer 12 (cuts XXIX–XL; channel n. 3) (Table 1). Small amounts come from layers 23–24 and from layer 12 (cuts XXVII–XXVIII, mixed with Diana pottery).

This ware production is a recent and advanced variety of the wide group of Neolithic Impressed Ware Pottery, widespread in Sicily and Calabria (so-called Stentinello-style pottery).

In the Coarse Impressed Ware class, the ovoid *olla* with an indistinct rim prevails (33 fragments). External surfaces are decorated with finger or nail impressions, incisions, pinching and rocker motifs, without specific patterns (Figure 6.2). Another form is the large jar (2 fragments), with a curved body, little neck and rim (Figure 6.3). The necked vessels have a straight or curved body and an indistinct rim (3 fragments). The bowls (10 fragments) have a truncated-cone body; the surfaces seem to be devoid of decoration. A whole bowl in fragments comes from layer 25, with an indistinct rim, truncated-cone body and shaped base (Figure 6.1). In the Fine Impressed Ware class, the bowls prevail (36 fragments). There are two types: one type presents a truncated-cone body (Figure 7.2); the other has a hemispheric body, with an indistinct rim (Figure 7.1). The cups (31 fragments) have a hemispheric body, with a narrow (Figure 7.3) or closed (Figure 7.4) mouth.

These shapes are often characterized by complex decorations, also obtained with stamps. Chevrons motifs, lozenge figures, grids and zigzag can be found in two or three rows on the pottery and filled with red ochre paste (Figure 7.1). The decoration patterns of the Fine Impressed Ware class have specific comparisons with the Aeolian area and the Tyrrhenian coast of Calabria, in particular with the sites of: Castellaro Vecchio and Contrada Diana (Cavalier, 1979, pp. 45–70, fig. 5; Bernabò Brea & Cavalier, 1956, pp. 19–21; Bernabò Brea & Cavalier, 1957, pp. 97–110; Bernabò Brea & Cavalier, 1980, pp. 656–671; Bernabò Brea & Cavalier, 1960, pp. XXIII, 31–32, tab. VII, 1–2, 6–7), Rinicedda (Bernabò Brea & Cavalier, 1995, pp. 44–74, fig. 9 a–c, 17 i–j,

18 c, tab. X; Martinelli, 2004, pp. 3–14, tab. II, 9, 13–16), Curinga and Acconia (Ammerman et al., 1978, pp. 168–172, fig. 6–9; Ammerman et al., 1980, pp. 121–123, tab. 1, 6, fig. 4; Ammerman & Bonardi, 1985–1986, pp. 209–220, tab. 3–4, fig. 6–11; Aldridge, 1985, pp. 39–59, fig. 4.4–4.9), Sovereto di Nicotera (Cuda & Murgano, 2004, pp. 163–174, fig. 2–3).

In all of classes there are flat or ring handles and conical knobs. 4,44% of the pottery is represented by *figulina* ware, a very purified clay production decorated with red painted motifs (Figure 7.5). The preferred shapes are small *ollas*, cups and bowls, as known also at the sites of Castellaro and Rinicedda. The presence of *figulina* production, associated with the Stentinello-style decorated pottery, confirms the late phase of Stentinello culture (Stentinello II).

Figure 4. S. Martino. Diana pottery. Bowls and cups with typical handles.

Figure 5. S. Martino. Diana pottery. Bowls with typical handles.

Figure 6. S. Martino. Stentinello pottery. Coarse Impressed Ware class (bowls and large jar).

Figure 7. S. Martino. Stentinello pottery. 1–4. Fine Impressed Ware class (bowls and cups). 5. Figulina pottery class (depurated clay) with traces of red painting.

3 The Lithic Industry: The Exploitation of Obsidian from Lipari During the Middle and the Late Neolithic Periods

The lithic industry of San Martino (obsidian, flint, pebble, schist and pumice) consists of 1254 artifacts. The Late Neolithic industry (374 artifacts), from layer 12 (cuts XXVI–XV), is mostly concentrated in squares C3/4/5/6, D3/4/5/6/7/8 and E3 (Figure 2.A; Table 1).

The Middle Neolithic industry (505 artifacts), from layers 12 (cuts XXIX–XL), is mostly concentrated in the squares E4/5/6, F3/4/5/6/7 (Figure 2.B; Table 1). Just one hundred pieces come from layers 20, 22, 24. The conservation is good: there are few post-depositional signs on the surfaces (patina).

In both phases the prevalent raw material is obsidian (>98%) which comes from Lipari island. XRF analyses have been performed by professor C. Vaccaro (University of Ferrara) on 12 samples selected from Late and Middle Neolithic levels.

3.1 Technology

In the first occupation levels, cores account for 1% of the whole industry (Figure 8). There are 4 polyhedral cores, used for the production of blades, with opposite platforms and different *débitage* surfaces (average dimensions 35 mm) (Figure 9.1–2). The supports could have been small or medium-sized nodules. A core from layer 20 is prismatic shaped and only used for blade production (its morphology is similar to the cores which come from the later occupation levels). There is one main inclined platform on the *débitage* surface and a secondary platform functional to create a rear crest. There are three shapeless core fragments. The bladelets amount to 21% of the assemblage, of which 95% represent the *plein débitage*, the 5% represent crests and rejuvenation flakes (Figure 9). The butts are mostly faceted, a smaller number are punctiform and plain. The overhang is often abraded. The bulbs can be prominent or flat. The profile is straight or curved, the edges are aligned; the sections are trapezoidal. The technique employed can be either the pressure or indirect percussion with a soft hammer. The artifacts are very fragmented; average dimensions are 36 mm length, 16 width mm, 5 mm thickness. The flakes account for 77,9%, of which 8% is represented by shaping flakes, cortex removal, crests; they have been obtained with direct percussion. The butts are faceted and flat. The products are microlithic and very flat.

Figure 8. S. Martino. Distribution of the obsidian knapping products from Stentinello occupation levels.

Figure 9. S. Martino. *Chaîne opératoire* of the obsidian assemblage from Stentinello levels. In the lower part there are two polyhedral cores.

In the later occupation levels, the cores account for 3,5% of the whole industry (Figure 10). Three pyramidal cores (average dimensions 44 mm) and two prismatic cores (average dimensions 50 mm), exploited for the production of blades and bladelets, have been recognized. Two polyhedral cores (average dimensions 21 mm) have been exploited for the production of flakes. The supports could have been small or medium-sized nodules and core flakes. The peculiar characteristic of the assemblage in this period is the standardization in shapes and sizes of the cores: in the pyramidal types, the negatives of removals are 26–43 mm long and 8–13 mm wide; in the prismatic types, the negatives of removals are 24–40 mm long and 8–15 mm wide. The cores are characterized by one main inclined platform on the *débitage* surface and a secondary platform functional to create a rear crest which was never removed. The *débitage* surface is wide, but in case of overexploitation this surface is quite narrow (Figure 11). The polyhedral types have the same characteristics of those documented in the early phase. In the Late Neolithic levels, a raw material nodule (from the level 12, Square E7) with a thin cortical coating is present (Figure 11).

Bladelets account for 44,3%, of which the 93% represent the *plein débitage*, 7% represent crests and rejuvenation flakes. The butts are mostly plain or lacking (in retouched blades) and punctiform (in raw blades). The overhang is abraded: it is rather preferred to smooth the overhangs with abrasions and/or small chipping removal upon the *débitage* surface than to facet the platform. The bulbs may be prominent or flat. The profile is mostly straight, the edges are always aligned; the sections are trapezoidal. The artifacts are very fragmented. In this period, an interesting datum concerns the *débitage* product sizes. Blades are narrower and thinner than the products which come from the early phase levels (it is not possible to deduce their length, because they are highly fragmented): the average dimensions are 36 mm length, 13 mm width, 4,1 mm thickness. The width frequently reaches 14–15 mm and rarely exceeds 20 mm (Figure 11). In this case, the pressure technique is certainly confirmed (Binder et al., 2012; Morgado & Pélegrin, 2012). The flakes reach 51,5%, of which 7% is represented by shaping flakes, platform and surface rejuvenations; cortex removal and crests are lacking. They have been obtained by means of the direct percussion technique. They are microlithic and very flat. The butts are mostly faceted, a smaller number are plain.

Figure 10. S. Martino. Distribution of the obsidian knapping products from Diana occupation levels.

Figure 11. S. Martino. *Chane opratoire* of the obsidian assemblage from Diana levels. In the middle part there are pyramidal and prismatic shaped cores; in the lower part there is the obsidian raw block.

3.2 Tools

In both periods, flakes are preferred as retouch tools.

In the Stentinello levels, tools upon blades reach 36%, while in the Diana levels, they reach 43%. In the first phase, side-scrapers (Laplace, 1968), with marginal retouch, upon flakes and blades, account for 63,9% (Figure 12.1–2). Denticulated account for 7,3%, points for 5,1%.

Truncations (1,5%), backed points (1,5%) and backed blade (0,7%) are present. End-scrapers (2,2%) are on flake, with a rounded working edge. A burin with a lateral facet (B6 *sensu* Laplace; 0,7%; Figure 12.5) and a *foliacé* scraper (F10 *sensu* Laplace; 0,7%; Figure 12.4) are present. The presence of a *foliacé* in the Stentinello levels reveals the later date of the site.

In the Diana levels, the scrapers group accounts for 73,3%. The big blade (89x25x9 mm; Figure 13.3), with a plain butt and lateral retouch is remarkable. Denticulated account for 5,6%, points for 3,7%. Truncations (3,7%) (Figure 13.1–2), backed points (1,8%) (Figure 13.6) and backed blades (0,9%) are present. The end-scrapers are absent.

A burin on fracture (B5 *sensu* Laplace; 0,9%) and a *foliacé* tool (F4 *sensu* Laplace; 0,9%) (Figure 13.5) are present. The Stentinello levels return a larger amount of *Pièces esquillées* (14,8%; Figure 13.3) compared to the Diana phase (8,4%; Figure 13.4).

Figure 12. S. Martino. Tools from Stentinello occupation levels and percentage.

Figure 13. S. Martino. Tools from Diana occupation levels and percentage.

In the later occupation levels, the cores account for 3,5% of the whole industry (Figure 10). Three pyramidal cores (average dimensions 44 mm) and two prismatic cores (average dimensions 50 mm), exploited for the production of blades and bladelets, have been recognized. Two polyhedral cores (average dimensions 21 mm) have been exploited for the production of flakes. The supports could have been small or medium-sized nodules and core flakes. The peculiar characteristic of the assemblage in this period is the standardization in shapes and sizes of the cores: in the pyramidal types, the negatives of removals are 26–43 mm long and 8–13 mm wide; in the prismatic types, the negatives of removals are 24–40 mm long and 8–15 mm wide. The cores are characterized by one main inclined platform on the *débitage* surface and a secondary platform functional to create a rear crest which was never removed. The *débitage* surface is wide, but in case of overexploitation this surface is quite narrow (Figure 11). The polyhedral types have the same characteristics of those documented in the early phase. In the Late Neolithic levels, a raw material nodule (from the level 12, Square E7) with a thin cortical coating is present (Figure 11).

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4 Discussion

The set of archaeological data (geographic position, lithic, pottery, chronology) deduced from the study of the S. Martino settlement are compared with the Lipari obsidian distribution and long-distance exchange networks in Southern Italy.

4.1 A Few Considerations about the Obsidian Exploitation at the Site of San Martino

Despite the fact that it is important to take account of the nature of the archaeological deposit, post-depositional processes and the restricted excavation area, the data acquired from the San Martino obsidian industry lead to a few considerations.

The distribution analysis of obsidian knapping products from San Martino suggests that, in both phases of occupation, the *débitage* was carried out in the settlement. The presence of a gray obsidian raw block (Diana levels) and the significant percentage of cortex removal flakes (Stentinello levels) confirm this. In any case, it is likely that pre-formed cores were brought to San Martino, as noted for a few other coastal sites in Calabria (Diamond & Ammerman, 1985; Farr, 2004). The main *débitage* is laminar and unipolar. Flakes (obtained by means of the percussion technique) are by-products of the laminar *débitage*.

An important difference can be noted in the typometric and morphologic aspects of the products, confirming that some changes in exploitation strategies during the Neolithic period are recognizable in technological strategies, not in the production of tools (Martinelli, 2016).

In the earliest levels, a scarce number of blades and bladelets is present; they are slightly thicker and larger than those that come from the Diana levels. The faceted butts are peculiar to the San Martino site, because normally in settlements with Stentinello pottery butts are small with abraded overhangs (Negrino & Radi, 2006; Freund et al., 2015).

On the contrary, in the last phase of occupation, the blade butts and overhangs are smoothed; they are thinner and narrower. These technical choices (different preparation of the blades platform and sizes) could be associated with the use of different techniques: arguably, the indirect percussion technique, in the early phase, as said by Diamond & Ammerman (1985; in particular, see the average sizes of blades/bladelets from Stentinello period sites in Calabria); handheld pressure in the late phase. In both phases of occupation, blades and flakes are the most important categories represented in the obsidian production. However, there are few tools. Moreover, the presence of cores and other products attesting a quite complete obsidian reduction sequence, is a consequence of an easier access to raw materials due to the proximity of the site on the Northern Sicilian coast to Lipari (Freund et al., 2015). Among the tools, the presence of *pièces esquillées* (Cremillieux & Livache, 1976) or other artifacts of difficult functional interpretation, some of them included in the category of cores or parts of them, attests an intense raw material processing in the settlement.

4.2 San Martino Obsidian Industry in the Context of the Lipari Obsidian Distribution and Long-Distance Exchange Networks in Southern Italy

Radiocarbon dates support the cultural chronology of two Neolithic phases attested by different pottery production. The first phase has been identified with the latest aspects of the Stentinello culture (first half of 5th millennium BC cal), characterized by Impressed Ware (decorated with stamps) and painted *figulina* pottery (Martinelli & Quero, 2013). The earliest occupation of the Aeolian islands dates back to the Stentinello culture, as settlements of Castellaro and Rinicedda demonstrate, probably since the middle of the 6th millennium BC cal (5470–5440 BC 2σ cal) (Martinelli, 2016).

The second phase of occupation of the site coincides with the Diana culture, dated between the end of the 5th millennium BC cal and the beginning of the 4th millennium BC cal.

In both phases the pottery of San Martino has some precise stylistic comparisons with the Aeolian islands.

During the Middle Neolithic period, Stentinello-style decoration (fine impressions patterns with colored paste) realized on the hemispheric cups is known at Rinicedda and Castellaro, but also at Curinga, Acconia and Sovereto di Nicotera, in Calabria. The *figulina* fragments is associated with the Stentinello-style decorated pottery also at the Aeolian sites.

During the Late Neolithic period the particular inner impressions on medium/large sized vessels are just attested in Lipari. This link could suggest the presence of Neolithic communities, settled on the Sicilian Tyrrhenian coast and interested in the obsidian outcrops exploitation, maintaining a close contact with the Lipari populations. For the residents of San Martino, the choice of the area was determined by the seasonal presence of a stream. Stentinello inhabitants settled on the alluvial levels probably in the periods of the year when the stream was flowing. The greater consistency of archaeological deposits suggests that the settlement became stable in the late Neolithic period along with the Diana phase. Therefore, San Martino seems to have been an important site of processing and sorting of obsidian during the periods of greater use of the volcanic rock.

Below we present a short review of the distribution of the obsidian artifacts from the edited sites in Sicily and in southern Italy, during the Early/Middle and Late Neolithic period.

During the Early Neolithic period, Lipari obsidian spread across the Adriatic Sea and the area of Central-Southern Italy. Before the middle of the 6th millennium BC, Neolithic people used the source of Lipari but there is no evidence of permanent settlements in the Aeolian archipelago (Acquafredda et al., 2017).

During the Middle Neolithic period, when the Aeolian islands were inhabited, Lipari obsidian arrived in Northern Italy and in Southern France, circulating through the region of Liguria and the coast, along with Sardinian obsidian. In the Late Neolithic period, Lipari obsidian was the most exchanged (Tykot, 1996, 2002, 2017).

During the spread of the Stentinello culture, the settlements of Castellaro on Lipari (Cavalier, 1979) and Rinicedda on Salina (Bernabò Brea & Cavalier, 1995) had a very significant amount of obsidian artifacts and a low percentage of flint artifacts (Martinelli, 2016, 1995).

At Castellaro there are many cores (42 and 26 from a sort of hole-storage) used for laminar *débitage* (Cavalier, 1979). Tools are represented by flake and blade side-scrappers, points and denticulated, marginally by end-scrappers and burins (Martinelli, 2016).

The cores are regular-shaped and characterized by a smoothed and rounded striking platform, inclined on a *débitage* surface and a secondary raw platform functional to create a rear crest. This morphology has been noted at the site of San Martino, especially in the latest levels.

At Rinicedda (Martinelli, 1995, 2004, 2016) the lithic industry includes obsidian (89,3%) and flint (10,7%). The production was certainly carried out in the settlement, considering the plentiful quantity of by-products, raw material blocks and pyramidal and prismatic shaped cores (9,9%) and their fragments (0,3%). Laminar production is remarkable and blades are preferred for tools. This is a specific exploitation strategy of raw material, different from the site of San Martino. However, the distribution of tools is similar. Despite its isolated location, the settlement of Rinicedda was included “into the larger Stentinello world as attested by the presence of distinctive Stentinello pottery and pressure flaked blades” (Freund et al., 2015, p. 215).

On the Tyrrhenian coast of Sicily, the Neolithic settlements are still little known.

In the area of Contrada Limina — Barcellona Pozzo di Gotto (Genovese, 1978), a surface collection has returned 250 obsidian artifacts (flakes, blades, tools and cores) with a low percentage of flint.

At Riparo di San Basilio — Novara di Sicilia (Cavalier, 1971) 23 artifacts come from the Stentinello levels. In these two sites the obsidian knapping is not comparable with the lithic production of S. Martino. In the Platani valley, the settlements of Serra del Palco, (Nicoletti, 1997; Boscaino et al., 2012), show the co-existence of Lipari and Pantelleria sources. During the Neolithic period until the Copper Age, there were considerable amounts of Lipari obsidian and its presence was in finished artifacts. In Eastern Sicily (Freund et al., 2015), the industries from a few sites (Stentinello, Calaforno, Grotta Corruggi, Matrensa, Megara Hyblaea, on the south-eastern coast; Poggio Rosso and Fontana di Pepe, in the province of Etna) reveal that obsidian was transported from Lipari in the form of pre-formed cores (first stages of reduction occurred at the source area) and exploited to extract blades using the pressure technique. There is no evidence that these sites played any roles in the obsidian redistribution. In Calabria, the settlements of Curinga and those in the Acconia district (Ammerman, 1985) have returned a very high percentage of Lipari obsidian. In a few sites, all stages of the *chaîne opératoire* are present, but cortex removal and brief initial shaping are lacking; blades are 10,2–12,6 mm wide and 2,7–3,2 mm thick. Other sites can have high percentages of by-products and a low number of blades. On the Ionian coast of Calabria, the sites of Umbro and Penitenzeria (Farr, 2004) are characterized by complete obsidian *chaînes opératoires*.

In the Salento region (Apulia), the settlement of Sant'Anna (Oria — Brindisi) has a copious quantity of Lipari obsidian artifacts, distributed in two phases of frequentation (Middle and Late Neolithic periods) (Ingravallo, 1995). In the impressed and engraved pottery levels (radiocarbon dating: 5730–5560 BC cal; 5470–5220 BC cal), obsidian reaches 54,4% of the whole industry. All stages of the *chaîne opératoire* are attested, with a low number of cores. The pressure technique is used for the *plein débitage*. The distribution of products is similar to the one attested at San Martino (the butts are mostly smooth and punctiform). The site of Sant'Anna is possibly a redistribution station of raw material, included in the trade network of Lipari obsidian (Negrino & Radi, 2006).

During the Late Neolithic period, obsidian reaches the maximum spread, circulating in shaped cores or finished artifacts as bladelets (Martinelli, Tykot, & Vianello, 2019).

In Contrada Diana (XXXVI and XVII trenches) (Martinelli, 1994), the lithic artifacts are small and medium sized, blades are very regular shaped and thick (1–3 mm). Product and by-product distribution is comparable to the San Martino industry. Pyramidal, prismatic and polyhedral cores show a careful platform preparation. The butts are mostly plain and scaled. The tools are blade and flake side-scrapers, but a sort of specialization in the production of end-scrapers has been recognized (Martinelli, Tykot, & Vianello, 2019). that totally lack in the Late Neolithic levels at the San Martino site. No information is available about obsidian exploitation and reduction sequences on the Tyrrhenian coast of Sicily.

Central-Eastern Sicily has very high-quality flint and quartzite, that could have prevented the access of a significant amount of obsidian. Nevertheless, in the settlement of San Marco (Nicoletti, 1997; Maniscalco, 2000) a certain quantity of Lipari obsidian arrived through the Simeto river.

In Calabria, settlement n. 3 of Acconia (Ammerman, 1985) has the following Lipari obsidian distribution: cores (11%), blades (6%), flakes (16%), by-products (69%).

In Apulia, Sant'Anna is still a working station for Lipari obsidian, but the absolute amounts are dramatically lower than those of the earlier phase. It is possible that in this period the site did not play the previous redistribution role (Ingravallo, 1995). As previously noted, the main similarities of the San Martino obsidian exploitation strategies have been recognized, such as pottery production, in the area of the Aeolian islands and the sites situated along the Tyrrhenian coast of Calabria.

Considering that several sites between Calabria and the Aeolian islands have supposedly obtained obsidian at the source and played a role in its distribution (Ammerman, 1979; Freund et al., 2015), it is conceivable that also the site of San Martino may have been involved in that specific trade network at the moment of maximum exploitation, starting in the 5th millennium BC, because of its position which connects Lipari with the Tyrrhenian coast of Sicily.

5 Conclusions

In light of “stylistic” similarities among Stentinello and Diana pottery and data about obsidian *chaînes opératoires* from San Martino, the Aeolian islands and some sites in Calabria, the idea of San Martino being involved in the exchange of Lipari obsidian seems plausible (Martinelli & Quero, 2013).

In this sense, the analysis of the procurement, exploitation and circulation of Lipari obsidian still needs more detailed data (techno-typological and scientific characterization of obsidian artifacts and sourcing) from all of the known sites, in order to understand the different position and role of the sites within the exchange networks.

Moreover, it would be interesting to analyze other aspects involving cultural, geographical and socio-economic conditions, such as the settlements or seasonal sites located near rivers and transport routes, the presence of further raw materials traveling together with obsidian or other knapping raw materials that could have restricted the access to a significant quantity of obsidian.

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