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Obsidian at Neolithic sites in Northern Italy

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ABSTRACT - The article presents the results of the chemical analyses undertaken on the obsidian recovered in the course of excavations conducted by Bernardo Bagolini at the site of Fornace Cappuccini (an Impressed Ware Neolithic settlement near Faenza) and La Vela (a VBQ site near Trent). The blade from La Vela is of particular interest since it represents at the present time the most northern point in the distribution of obsidian in Italy. Analysis by means of electron microprobe (EMP) indicates that the obsidian comes from Lipari. The islands of Palmarola and Lipari constitute the two sources of obsidian at the site of Fornace Cappuccini, where the characterization was done by means of neutron activation analysis (INAA). In the discussion on the distribution and the exchange of obsidian in Northern Italy, these results are considered in the context of our previous studies at Arene Candide and Gaione.

Key words: Neolithic, Obsidian, Northern Italy
Parole chiave: Neolitico, Ossidiana, Italia settentrionale

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1. INTRODUCTION

When it comes to the study of exchange systems and the circulation of materials between Neolithic sites in Italy, obsidian constitutes the most developed line of investigation at the present time. This line of research has witnessed significant steps in its development over the last twenty years (Ammerman, 1985b; Williams-Thorpe, 1995; Tykot & Ammerman, 1997). The aim of this report is twofold: (1) to the present the new results from the sites of Fornace Cappuccini and La Vela and (2) to review briefly the current evidence on the distribution of obsidian at Neolithic sites in Northern Italy.

It has been known for some time (Buchner, 1949) that there are four main island sources of obsidian in the Central Mediterranean: Pantelleria, Lipari, Palmarola and Sardinia. No important outcrop of obsidian of workable quality has been identified so far in the Italian peninsula. In addition, the current evidence shows that, with very few exceptions involving sites near the Triest border (Randle *et al.*, 1993), all of the obsidian analyzed from Neolithic sites in Italy comes from the four islands mentioned above. In the case of Sardinia, where obsidian comes from several different sources in the vicinity of Monte Arci (which each present minor chemical differences), the situation has only recently been clarified by Tykot (1996, 1997). While many different methods have been applied to the sourcing of obsidian at Neolithic sites in Italy over the years (for example, optical emission spectroscopy, fission track dating and X-ray fluorescence spectrometry), the two that would appear to offer the best results at the present time are neutron activation analysis (INAA) and electron microprobe (EMP).

The approach that we have recommended for the characterization of obsidian is based upon "comprehensive sourcing" (Ammerman & Polglase, 1997; Tykot & Ammerman, 1997), which means the ample sampling of the material from a given site. This is in contrast with earlier studies where it was common practice to analyze only a few selected pieces of obsidian from any one site (Bigazzi & Radi, 1981; Williams-Thorpe *et al.*, 1979, 1984). One of the limitations of "selective sourcing," as it should now be called, is that it did not always lead to the recognition of all of the obsidian sources represented at a site. Moreover, it was not possible in this way to obtain a clear picture of the relative abundance of the obsidian from different sources at a site. What we have also tried to do is to integrate the characterization of obsidian with the analysis of the lithic assemblage in terms of its reduction technology and the study of use wear (AMMERMAN & ANDREFSKY, 1982; AMMERMAN, 1985a; BERNABÒ BREA *et al.*, 1990; AMMERMAN & POLGLASE, 1997). In short, it is not enough just to perform a chemical analysis on a set of material. The first time that we tried to use comprehensive sourcing was at Gaione, a settlement with Square Mouth Pottery near Parma (AMMERMAN *et al.*, 1990). This study revealed a clear association between the source of an obsidian artefact and its classification on the basis of reduction technology. Obsidian from Lipari is present at Gaione principally in the form of blades or a finished product, while that from Sardinia includes cores and core trim, which indicate the local working of material from this source at the site.

The same approach was subsequently applied to the study of the obsidian at Arene Candide, the cavern in Liguria which has a well known stratigraphic sequence (AMMERMAN & POLGLASE, 1993, 1997). Here chemical analysis was done at the CESNEF Laboratory in Milan on a total of 54 pieces of obsidian: that is, three times the size of the sample for any other Neolithic site in Italy up to this time. In early work at Arene Candide (WILLIAMS-THORPE *et al.*., 1979), only two obsidian artefacts recovered from the Early Neolithic levels were examined. Both of them turned out to come from Sardinia. In contrast, our sourcing of 26 artefacts from the same early levels now yielded a quite different picture: 58% of the obsidian was from Sardinia and 42% from the island of Palmarola. Obsidian from Lipari made its first appearance at the site in the Middle Neolithic period. At this time, obsidian from three different sources - Sardinia, Palmarola and Lipari - was equally represented at the site. By the Late Neolithic period, Lipari, notwithstanding its greater distance from Arene Candide, contributed 87.5% of the obsidian at site and all of the material now took the form of blades. Thus, we were able to document major patterns of change in the obsidian reaching Arene Candide from different island sources over the course of the Neolithic.

2. ANALYSIS

Among the Neolithic sites in Northern Italy with Impressed Ware pottery, the one that has produced the most obsidian is the settlement called Fornace Cappuccini which is located near Faenza (ANTONIAZZI *et al.*, 1987; BERMOND MONTANARI *et al.*, 1994). Polglase carried out a study of 334 pieces of obsidian from the site in terms of their reduction technology. As shown in Table 1, blades represent more than half of the obsidian recovered. At the same time, the low percentages observed for both trim and core trim (essentially waste by-products of reduction) imply that obsidian was not actively worked at the site. Much of the obsidian apparently reached Fornace Cappuccini already in the form of a final product. In addition, it is worth noting the occurrence of obsidian blades of fairly large size, which tends to be more typical of the material found at sites in Southern Italy.

In order to establish the source of the material, neutron activation analysis (INNA) was carried out on a sample of 14 obsidian artefacts from Fornace Cappuccini. The work was done by Cesana and Terrani at the CESNEF Laboratory in the Polytechnical University of Milan (for a summary of previous attempts at the characterization of obsidian from the site, see the appendix at the end). The three trace elements that are known to be most useful in identifying the source of a piece of obsidian recovered at a Neolithic site in Italy are Lanthanum, Scandium and Cesium. The values for these trace elements are given in Table 2. In Fig. 2, ten of the obsidian artefacts can be seen to have Palmarola for their source, while the other four come from Lipari. It is worth noting that no material from Sardinia is represented among the 14 artefacts that were analyzed. These results would seem to indicate that the part of the Emilia-Romagna region near the Adriatic coast had, from the start of the Neolithic period, links with the islands of the south coast of the Tyrrenhian Sea through long-distance exchange networks.

La Vela at Trent is the most northern place in Italy where obsidian has been recovered so far. A single arteface was found in a Middle Neolithic context with Square Mouth Pottery (specifically, from stratum 108 which belongs to a dwelling at the site). It is part of the base of a blade made from high quality obsidian that is transparent and has a greyish black colour. The blade is very narrow but well made. In this case, the chemical analysis was conducted by Tykot at Harvard University using an electron microprobe (EMP). The results are given in Table 3 and show clearly that the obsidian is from the island of Lipari. It is of interest to note that Polglase had already attributed the blade fragment to Lipari on the basis of its visual properties. This was now confirmed by the chemical analysis. It is perhaps worth adding here that obsidian from its source on Lipari had to travel a distance of some 900 km, as the crow flies, in order to reach La Vela and other sites such as Pozzuolo near Udine.

3. DISCUSSION

In this last section, we would like to review briefly some of the main trends in the distribution of obsidian at Neolithic sites in Northern Italy without attempting a systematic survey of the literature. Counter to the view once taken by some, obsidian from the small island of Palmarola is now quite commonly observed at sites in the Northern part of the peninsula. It is well documented, for example, at the sites of Gaione, Arene Candide and Fornace Cappuccini.

During the Early Neolithic, there appears to be a clear difference between what is found on the Tyrrhenian and Adriatic coasts. The obsidian recovered at Arene Candide on the West coast is from Sardinia and Palmarola but not from Lipari. On the east coast as seen at Fornace Cappuccini, one finds obsidian from Palmarola and Lipari but not from the sources on Sardinia. In the latter case, the suggestion would be that the obsidian moved across the width of the peninsula by means of exchange networks operating in South-Central Italy and then moved up along the Adriatic coast. Obsidian from Sardinia did not enter this exchange network but travelled predominantly to the West and North.

Over time, Lipari - notwithstanding its greater distance in comparison with the two other island sources - came to play an ever increasing role in the exchange of obsidian in Northern Italy. The quality of the obsidian from Lipari may have given it a prestige value, thus making it a commodity that was in greater demand by Late Neolithic times. In the upper Neolithic levels at Arene Candide, as mentioned before, almost all of the obsidian comes from Lipari.

Finally, it is worth noting that in terms of reduction technology - in particular, the relationship between finished products (blades) and waste by-products (trim and core trim) - none of the sites examined so far in Northern Italy seems to show the kind of evidence for local production that is observed, for example, at the Neolithic site of Piana di Curinga in Calabria (AMMERMAN & ANDREFSKY, 1982; AMMERMAN, 1985b). The suggestion is that at least part of the obsidian is making its way to the Northern sites in finished or final form.

APPENDIX

This appendix gives a summary of previous attempts to characterize the obsidian found at the site of Fornace Cappuccini. In an early report by Francaviglia at Rome, it was thought that the obsidian did not come from the four island sources (mentioned in our introduction) and that the question of sourcing the material was still an open one (ANTONIAZZI *et al.*, 1987). In a subsequent report (BIGAZZI *et al.*, 1992), it was possible to say - without specifying exactly how many pieces were analyzed - that the obsidian came from Palmarola and Lipari. This is in agreement with our own work. More recently, during the course of the meeting in commemoration of Bernardo Bagolini at Trento (1997), Bermond Montanari commented that Bigazzi had examined 19 artefacts from the site so far - with all of the obsidian coming from either Palmarola or Lipari. We hope that this data will soon be published. Thus, at the time of the Trent meeting, it would appear that a total of 33 pieces have been characterized and that none of them derived from the obsidian sources on the island of Sardinia. On the other hand, it is important to keep in mind that this would represent a sample of less than 10% of the obsidian recovered from Fornace Cappuccini.

SUMMARY - The article presents the results of the chemical analyses undertaken on the obsidian recovered in the course of excavations conducted by Bernardo Bagolini at the site of Fornace Cappuccini (an Impressed Ware Neolithic settlement near Faenza) and La Vela (a VBQ site near Trent). The blade from La Vela is of particular interest since it represents at the present time the most northern point in the distribution of obsidian in Italy. Analysis by means of electron microprobe (EMP) indicates that the obsidian comes from Lipari. The islands of Palmarola and Lipari constitute the two sources of obsidian at the site of Fornace Cappuccini, where the characterization was done by means of neutron activation analysis (INAA). In the discussion on the distribution and the exchange of obsidian in Northern Italy, these results are considered in the context of our previous studies at Arene Candide and Gaione.

RIASSUNTO - L'articolo presenta i risultati delle analisi svolte sull'ossidiana raccolta nel corso degli scavi di Bernardo Bagolini nei siti di Fornace Cappuccini (un sito neolitico a ceramica impressa vicino a Faenza) e La Vela (un sito neolitico a VBQ presso Trento). La lame da la Vela e di particolare interesse poiche attualmente rappresenta il punto piu settentrionale della distribuzione dell'ossidiana in Italia. L'analisi tramite microsonda all'elettrone (EMP) indica che l'ossidiana proviene da Lipari. Le isole di Palmarola e Lipari costituiscono le due fonti di ossidian al sito di Fornace Cappuccini, dove e stata utilizzata l'analisi dell'attivazione neutronica (INAA). Nella discussione sulla distribuzione e sullo scambio dell'ossidiana in Italia settentrionale, i risultati sono contestualizzati negli studi precedenti di Arene Candide e Gaione.

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Blade	179	53.6%
Trim	76	22.8
Core Trim	78	23.4
Core	1	0.3
Totale	334	100.1

Table 1 - Fornace Cappuccini: the reduction technology of the obsidian examined

Sample	La ppm	Sc ppm	Cs ppm	INAA Attrib.	Weight gm	Class
G-26	72.7	1.13	48.0	Pal	4.3	Core Trim
G-27	49.6	0.97	16.4	Lip	2.7	Blade
G-28	79.0	1.56	49.6	Pal	0.7	Blade
G-29	58.4	0.95	16.0	Lip	0.7	Blade
G-30	78.2	1.40	47.1	Pal	6.8	Core Trim
G-31	80.8	1.45	48.2	Pal	0.3	Blade
G-32	80.3	1.33	48.4	Pal	0.2	Blade
G-33	82.0	1.41	47.5	Pal	0.6	Core Trim
G-34	46.7	1.75	15.1	Lip	1.3	Blade
G-35	81.9	1.46	47.2	Pal	0.7	Blade
G-36	83.7	1.42	48.9	Pal	0.1	Blade
G-37	85.7	1.50	51.0	Pal	0.3	Blade
G-38	94.8	1.26	49.9	Pal	1.4	Blade
G-39	58.0	0.97	15.8	Lip	0.4	Blade

Table 2 - Fornace Cappuccini: the trace element values (parts per million) for the 14 obsidian artefacts analyzed (INAA)

	SiO_2	Al_2O_3	TiO_2	Fe_2O_3	MgO	CaO	Na_2O	K_2O	P_2O_5	MnO	BaO	Total
La Vela												
point 1	74.71	12.74	0.03	1.54	0.04	0.68	4.13	5.07	0.00	0.05	0.00	99.00
point 2	74.68	12.79	0.03	1.40	0.03	0.67	4.16	5.18	0.00	0.05	0.00	99.00
point 3	74.57	12.89	0.08	1.45	0.03	0.70	4.08	5.12	0.02	0.06	0.00	99.00
ave.	74.65	12.81	0.05	1.47	0.03	0.68	4.12	5.12	0.01	0.05	0.00	99.00
Lipari												
ave.	74.51	12.75	0.08	1.63	0.03	0.72	4.03	5.13	0.06	0.05	0.01	99.00
std dev	0.22	0.14	0.01	0.08	0.01	0.04	0.10	0.09	0.01	0.05	0.01	

Table 3 - La Vela: the electron microprobe analysis of the blade. The results of three separate test points on the same obsidian artefact and the values for Lipari obsidian (by percentage for the respective minerals)

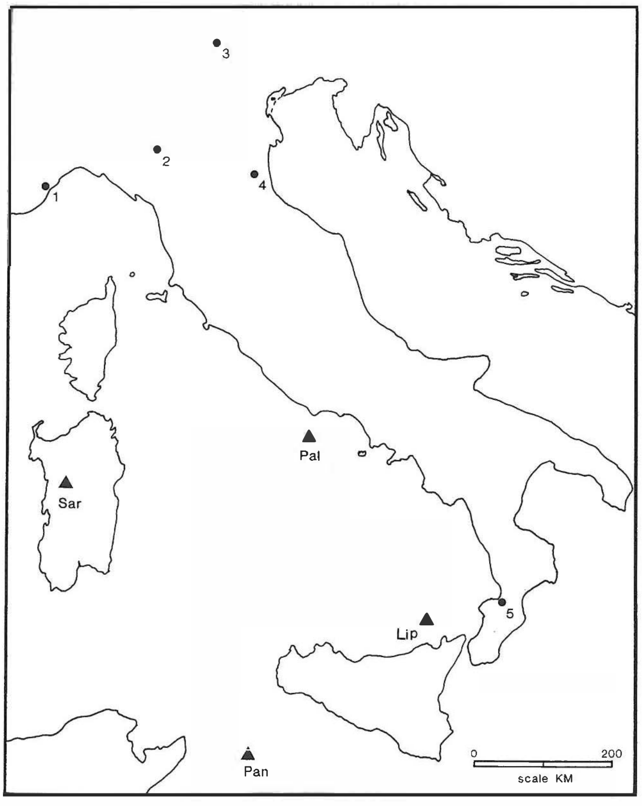

Fig. 1 - Map of Italy. The four island sources of obsidian are: Sardinia, Palmarola, Lipari and Pantelleria. The five Neolithic sites: 1) Arene Candide, 2) Gaione, 3) La Vela, 4) Fornace Cappuccini and 5) Piana di Curinga

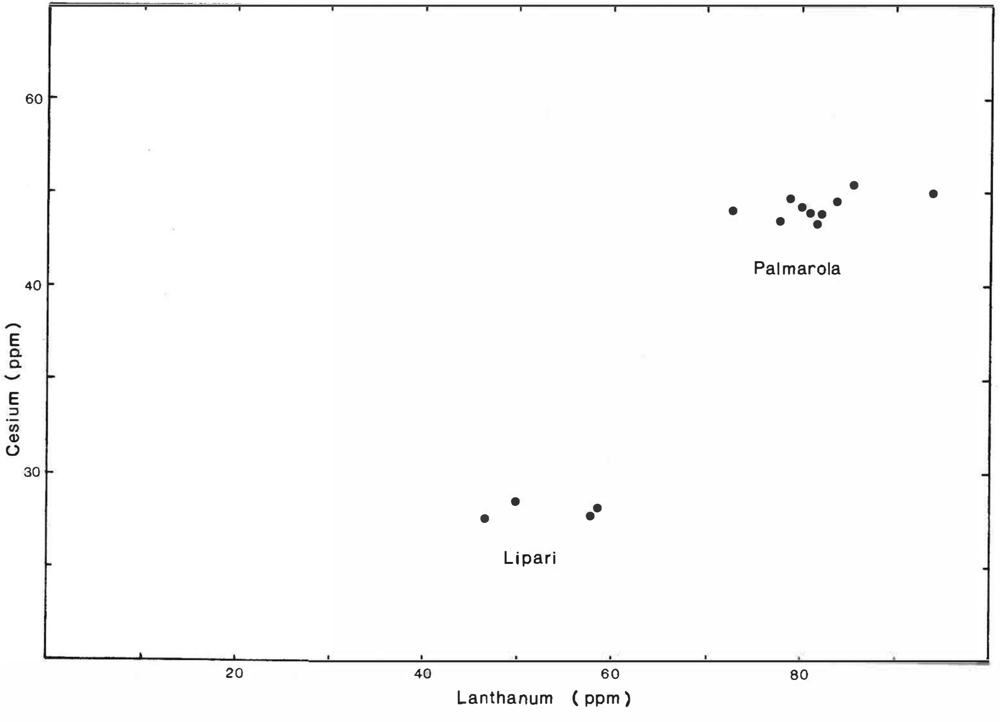

Fig. 2 - Fornace Cappuccini: the results of neutron activation analysis (INAA) for 14 obsidian artefacts (see Table 2)