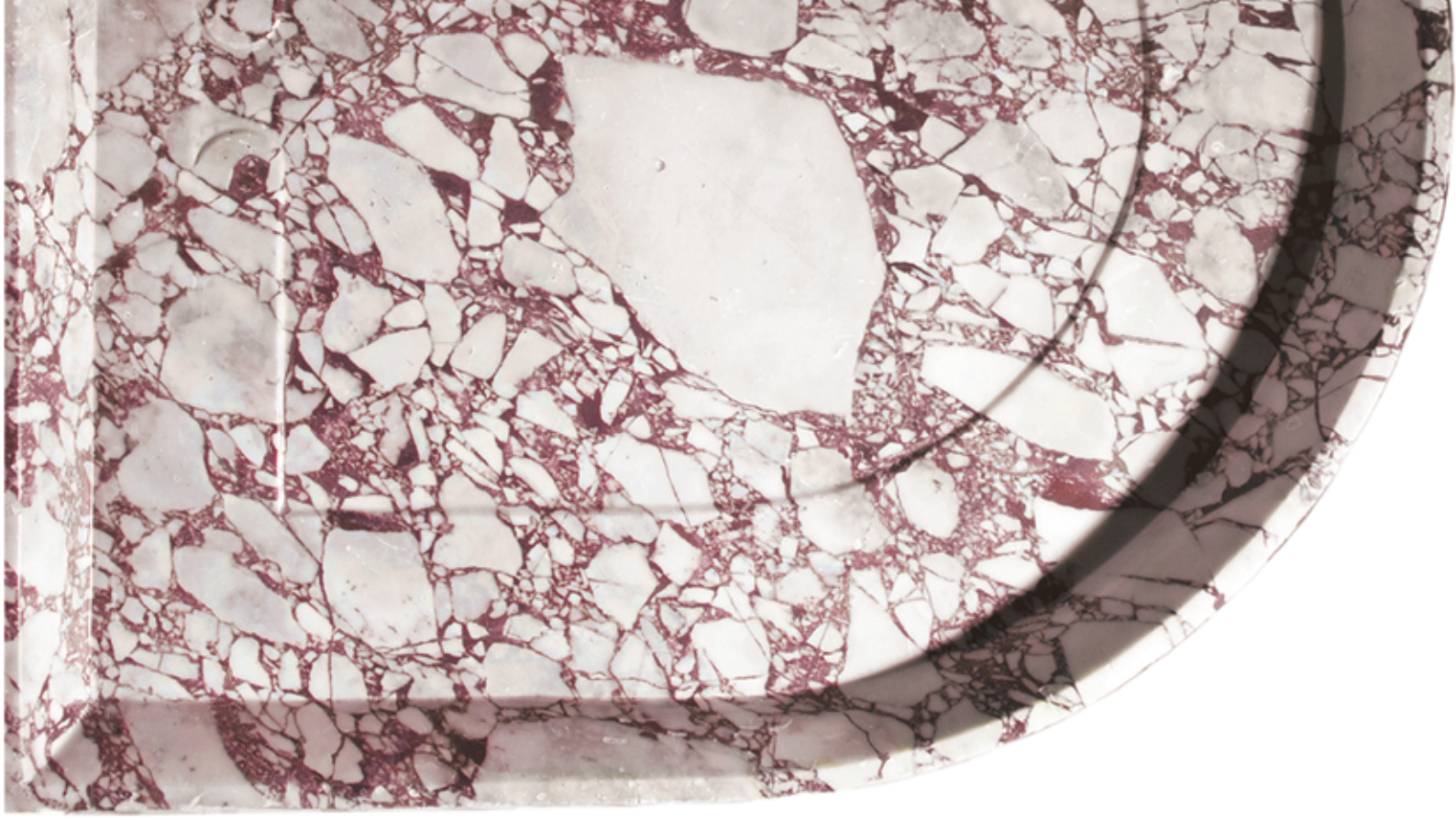
Aurisina Limestone in the Roman Age: from Karst Quarries to the Cities of the Adriatic Basin

Previato, Caterina



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CONTENT

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AURISINA LIMESTONE IN THE ROMAN AGE: FROM KARST QUARRIES TO THE CITIES OF THE ADRIATIC BASIN

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Abstract

Aurisina limestone is a type of stone extracted in the Karst region, just a few kilometers away from Trieste (north-eastern Italy), which was much used in the Roman Age. The Aurisina quarries belonged to the territory of Aquileia and were exploited at least from the 2nd century BC. In ancient times they provided huge quantities of stone, that was used to realize buildings and infrastructure as well as artifacts (e.g. statues, inscriptions, weights, etc.), and was exported to the north of Italy, along the Adriatic coasts and their inland regions.
This paper aims at reconstructing the different steps of the production process of Aurisina limestone, analyzing different topics: the quarrying, transportation, diffusion and use of this stone in the Roman Age.

Keywords
Aurisina, quarries, Roman Age

Aurisina limestone is a stone extracted in the north-eastern part of Italy, in the Karst region. This stone was much used in the Roman Age because of its aesthetic and physical qualities. The quarries, still active, are situated in Aurisina, a small town in the Karst, 20 km from Trieste (Italy). They are located not far from the coast (less than 1 km), but they are separated from it by a difference in altitude of about 150 m (Fig. 1).

In this area different kinds of pure, compact and homogeneous limestone, which are commonly known with their commercial names, such as "Aurisina Chiara", "Aurisina Granitello", "Roman Stone" and "Aurisina Fiorita", crop out. They all have a gray or light gray ground color, but they differ in the dimension and orientation of the organic fraction[1] (Fig. 2). All these limestones have excellent petrographic, chemical, mineralogical, physical and mechanical properties. They are compact, durable and wear-resistant, and they are suitable for use both indoors and outdoors, as well as for carving.

Recently the Aurisina extraction basin has been involved in a research project of the University of Padua focused on the quarrying, the circulation and the use of the stones extracted in the *Regio X* (*Venetia et Histria*) during the Roman Age. Within the project, particular attention was paid to the use of the stone in Aquileia, a city in the north-east of Italy that was a very important urban centre in the Roman Age. Aiming at identifying the lithotypes used in the buildings of Aquileia as well as their provenience, the extraction basins surrounding the city have been studied and surveyed, trying to identify the quarries exploited in ancient times[2]. Therefore, the research focused on the Aurisina quarries, which are just 30 km away from Aquileia and were in the Roman Age part of its territory.

The survey was interested in both active and inactive quarries, located by means of satellite images (Fig. 3). During the survey in each quarry, stone samples were taken to be compared with stone samples taken from Aquileia's structures. Moreover, all the data collected regarding quarries and stone samples were entered in a database specifically created for this research project, which is linked to a geographical information system (*Ancient Quarries Database*)[3]. As a result, at present we can dispose of a sort of catalogue of the extraction sites and stone sources of this area.

By means of the available data, we can assume that the exploitation of the Aurisina extraction district started in the Roman Age, as suggested by different clues. Indeed, in one of the active quarries, significantly called "Cava Romana", two unfinished boundary stones were found (Fig. 4). In another quarry, called "Caharjia

1 See CARULLI, ONOFRI 1960; *I marmi del Carso triestino* 1985, 88-90. In the Aurisina basin there are also outcrops of a polygenic conglomerate, "Breccia di Slivia", and two kinds of alabaster, "Stalattite Gialla" and "Stalattite Rossa".

2 BONETTO, PREVIATO 2013; PREVIATO *et al.* 2014; PREVIATO 2015a, 411-457; PREVIATO, VENTURA [in press].

3 About the database, see the paper of C. Previato e A. Zara in these proceedings.

Fig. 1. Map showing the position of the Aurisina quarries (north-eastern Italy), which in the Roman Age were situated in territory belonging to the city of Aquileia

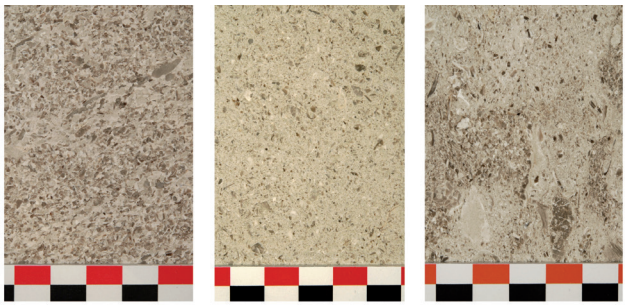

Fig. 2. Macroscopic aspect of different kinds of limestone extracted in the Aurisina quarries. From left to right: "Aurisina granitello", "Aurisina roman stone", "Aurisina fiorita"

quarry", other unfinished artifacts were unearthed. This is why one of the limestones extracted in the area is called "Roman stone"[4].

The exploitation of this extraction basin in the Roman Age is proved also by numerous artifacts and structural elements made of Aurisina limestone found in the cities of Northern Italy.

At present we do not know exactly when the exploitation began, but we can suppose that it started in the 2nd century BC. In fact, the most ancient artifact made of Aurisina limestone known so far is the milestone of Spurio Postumio Albino, dated to 148 BC[5].

We do not know which of the quarries was exploited in the Roman Age, but probably some of the active quarries do correspond to the ancient ones. Indeed, a recent survey in the Aurisina quarries showed that in some of them pick extraction signs are visible on the upper part of the quarry walls.

In addition, in the territory surrounding the quarries many Roman structures and artifacts were found or identified. The most interesting site is that of a Roman *villa* dating back to the 1st century BC and located right in front of a quarry, along the road between Sistiana and Aurisina[6]. At this site some blocks and unfinished drums made of Aurisina limestone, as well as some iron slag, were found. These findings have been considered as proof of the connection between the *villa* and the extraction activity.

4 PREVIATO 2015a, 417-418. About the "Cava Romana", D'AMBROSI, SONZOGNO 1962.

5 GROSSI 2003, 198.

6 MASELLI SCOTTI 1976; MASELLI SCOTTI 1979, 358-361; MASELLI SCOTTI 1982.

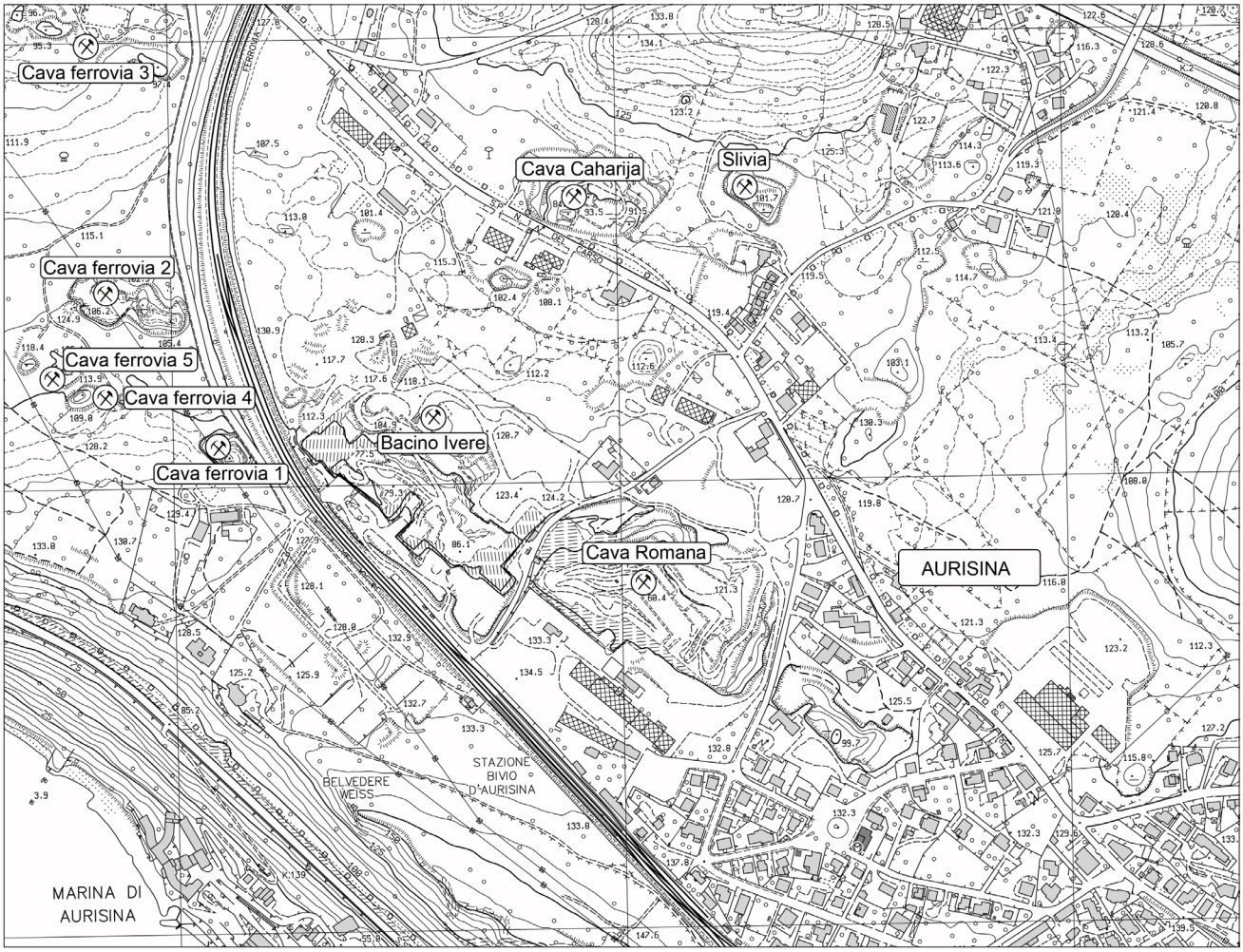

Fig. 3. Map of the quarries situated in the Aurisina extraction basin which have been identified and surveyed (base map CTR 1:5000 n. 109042, Sistiana)

The Aurisina quarries were exploited for a long period, at least until the beginning of the 6th century, when the great monolith covering the Mausoleum of Teodorico in Ravenna, which is made of Aurisina limestone, was extracted[7].

Regarding the Middle Ages, there are fewer elements proving the exploitation of this extraction basin, but some architectural elements and well-curbs made of Aurisina limestone found in the city of Venice lead to the hypothesis that the quarries remained active until the 13th century[8]. Later, the exploitation of this basin seems to cease.

Only in the 18th and 19th centuries were the quarries exploited again by the Habsburg Empire, for the extraction of stone materials to be employed in the Südbahn, the railway between Trieste and Vienna, and in the buildings of Vienna, Budapest and other cities of the Empire[9].

In the Roman Age, the Aurisina extraction basin was situated in Aquileia's territory, and we can hypothesize that the quarries were controlled directly by the colony, which was situated at a distance of just 30 km. The city and the quarries were connected by the road between Aquileia and Trieste. This road was certainly used to carry the stones to Aquileia and Trieste, and then, by means of other roads, to further sites. Despite this, most of the stone trade probably conducted by sea, as usually happened in ancient times.

But how was the stone extracted transported from the quarries to the sea? As mentioned above, between the quarries and the sea there is a difference in altitude of about 150 m (Fig. 5).

According to Ireneo della Croce, an historian of the 17th century, the difference in altitude was overcome through slides excavated in the rock and covered with lead[10]. These slides are not visible anymore, but the plausibility of this story is proven by the fact that a similar

7 POZZETTO 1985; BEVILACQUA *et al.* 2003.

8 FABIANI PADOVINI 1985, 37; LAZZARINI 1986, 93.

9 CARULLI, ONOFRI 1960, 17-19.

10 See PREVIATO 2015a, 419 (footnote n. 20).

Fig. 4.
Aurisina (Trieste, Italy). The Cava Romana quarry. On the right, the tunnel exploited in ancient times. On the left, the active quarry

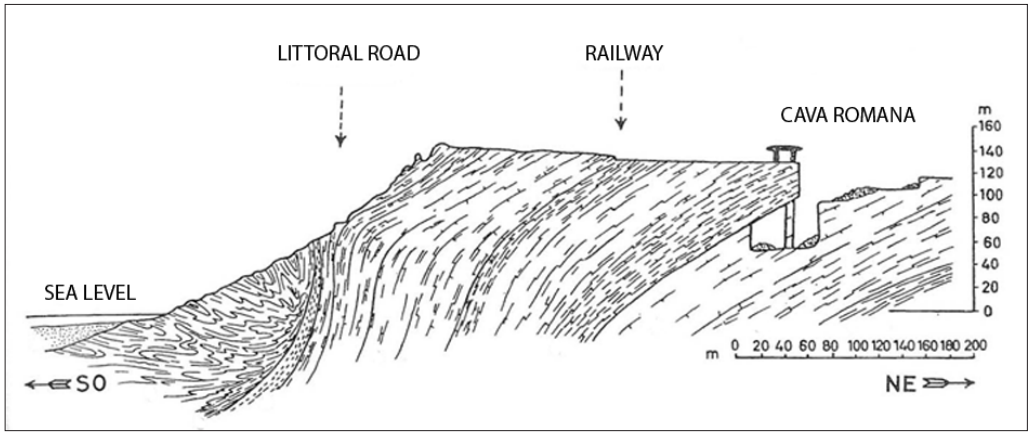

Fig. 5.
Aurisina (Trieste, Italy). Section showing the difference in height between the Cava Romana quarry and the sea (reworked image from ZEZZA 1982)

Fig. 6.
A slide used at the beginning of the 20th century to move stone chips and blocks from the quarries to the sea (from: FLEGO, RUPEL, ZUPANČIČ 2001)

Fig. 7. Map showing the cities where Roman structures or artifacts made of Aurisina limestone have been found

solution was adopted at the end of the 19th century by a modern company to move stone chippings and blocks from the quarries to the sea (Fig. 6). Other scholars believed that the tunnel of the Cava Romana was not only an extraction site, but also a gallery that linked the quarry to the sea, used in ancient times for the transfer of stones, but there is no evidence to support this hypothesis.

After reaching the seaside, the stones were loaded onto ships. The port of shipment has not been identified. Some scholars believe that it was in Canovella de' Zoppoli, a site located along the coast, near Aurisina, where, according to P. Kandler, there are the remains of a Roman harbor[11]. Other scholars believe that the quarries' port was that of Sistiana, because a dock and other maritime structures have been recognized in the bay[12]. Although we cannot identify exactly the starting point of the route, we can suppose that the stone extracted in the quarries was transported by sea to the Roman cities situated along the coast of the Adriatic Sea (Aquileia, Adria, Altino, Rimini, Ravenna), from which it was transported in the hinterland by means of rivers and roads.

In the Roman Age, the Aurisina quarries provided huge quantities of stone, which was used for the construction of buildings and infrastructure in the form of masonry blocks, slabs and columns, but also for the production of decorative elements and artifacts, such as capitals, statues, inscriptions, weights and milestones. Based only on published data, it is difficult to determine the diffusion of Aurisina limestone, because the identification of this stone is not always reliable and petrographical analyses have been carried out only in a few cases. Indeed, there is also a terminological problem, because in the 20th century, when the city of Aurisina was not part of Italy, the stone was sometimes called "pietra d'Istria".

Based on the available data, it seems clear that Aurisina limestone was widespread in the Roman Age, in the north of Italy as well as along the Adriatic coasts and in their inland regions[13] (Fig. 7).

This stone was largely exported to cities located near the quarries, like Aquileia and Trieste, but also further away. By land, the stone was transported northward and reached some inland sites like Emona and Nauportos, where some Aurisina limestone artifacts were found[14].

Structures and artifacts made of Aurisina limestone have also been found in many cities of *Regio X*, such as Concordia Sagittaria, Oderzo, Altino, Padua, Verona, Brescia, Cremona, Piacenza and Mantua. In this case, the stone was probably first transported by sea to the cities situated along the Adriatic coast, and then circulated in the hinterland by means of rivers, primarily

11 FLEGO, RUPEL, ZUPANČIČ 2001, 166-168. The presence of a harbor at this site is not certain (see the results of recent underwater research: AURIEMMA *et al.* 2008, 17).

12 DEGRASSI 1957, 29; BERTACCHI 1995, 118; AURIEMMA *et al.* 2008, 108-110.

13 See LAZZARINI, VAN MOLLE 2015, 700; PREVIATO 2015b, 36-37.

14 SASEL-KOS 1997.

Fig. 8. Aquileia (Udine, Italy). The forum of the colony, entirely constructed in Aurisina limestone. For the square's paving 1500 m^3 of limestone was used

Fig. 9. Aquileia (Udine, Italy). Plinth in Aurisina limestone decorated with the head of Medusa from the forum

the Po and its tributaries. Thus, it could reach some cities of *Regio XI* situated at a distance of about 400 km from the quarries, like Milano and Pavia. Probably in the same way, the stone reached also some cities of *Regio VIII*, like Modena and Reggio Emilia. By sea, Aurisina limestone also reached some more distant cities situated along the Adriatic coasts, like Ravenna, Rimini and Fano.

In the cities located near the quarries, Aurisina limestone was employed a great deal. In Aquileia, for example, this stone was used in both public and private buildings to produce masonry blocks, columns and slabs. Huge quantities of Aurisina limestone were employed for example in the *forum* (Fig. 8). In the city Aurisina limestone was used also for paving some streets[15]. In Aquileia, indeed, many kinds of architectural elements like capitals and lintels, as well as artifacts, like statues, inscriptions, reliefs, weights and urns, were made of this kind of limestone (Fig. 9). The same situation occurs in Trieste, where Aurisina limestone was employed in numerous buildings, like for example the *Capitolium*, the Basilica and the Arco di Riccardo, and was also used for the production of architectonic and decorative elements[16].

In inland sites further away from the quarries, Aurisina limestone was less used as a building material, and more frequently imported in the shape of architectural elements, such as columns, capitals and cornices, or artifacts, like statue bases, urns, altars and funerary monuments or sacred inscriptions. On the other hand, in the cities situated along the coast or not far from it, this stone was employed in buildings and infrastructures as well. In Rimini for example, Aurisina limestone was used to build the bridge of Augustus.

All things considered, we can notice that the wide spread of the Aurisina stone in the Roman age is really remarkable, and the dynamics of extraction and trade of this material can somehow be compared to that of the precious and famous Mediterranean marbles. Although more studies and archaeometric analyses are necessary to have a complete picture of the distribution of this stone in ancient times and to define the chronology of the phenomenon, in light of the available data, we can assert that the Aurisina quarries were heavily exploited in the Roman age, and must have constituted a huge source of profit.

15 About the use of Aurisina limestone in Aquileia, see PREVIATO 2015, 424-425.

16 See MASELLI SCOTTI 1985.

BIBLIOGRAPHY

AURIEMMA *et al.* 2008 = AURIEMMA R., DEGRASSI V., DONAT P., GADDI D., MAURO S., ORIOLO F., RICCOBONO D. 2008: "Terre di mare. Paesaggi costieri dal Timavo alla penisola muggesana", in R. AURIEMMA, S. KARINJA (eds.): Terre di mare. L'archeologia dei paesaggi costieri e le variazioni climatiche, Atti del Convegno Internazionale di Studi (Trieste, 8-10 novembre 2007), 75-211.

BERTACCHI L. 1995: "I porti romani dell'Istria e la loro economia", Aquileia Nostra, LXVI, 113-132.

BEVILACQUA *et al.* 2003 = BEVILACQUA F., FABBRI R., GRILLINI G.C., IANNUCCI A.M. 2003: "Il mausoleo di Teodorico: la pietra di Aurisina. Tecniche e strumenti di lavorazione", in F. LENZI (ed.): L'archeologia dell'Adriatico dalla Preistoria al Medioevo, Atti del Convegno (Ravenna 7-8-9 giugno 2001), 572-580.

BONETTO J., PREVIATO C. 2013: "Trasformazioni del paesaggio e trasformazioni della città: le cave di pietra per Aquileia", in G. CUSCITO (ed.): Le modificazioni del paesaggio nell'altoadriatico tra pre-protostoria e medioevo, Antichità Altoadriatiche LXXVI, Trieste, 141-162.

CARULLI G.B., ONOFRI R. 1960: I marmi del Carso, Udine.

D'AMBROSI C., SONZOGNO G. 1962: La cava romana: marmi e pietre del Carso e dell'Istria, Trieste.

DEGRASSI A. 1957: "I porti romani dell'Istria", Atti e memorie della società istriana di archeologia e storia patria V, 24-81.

FABIANI PADOVINI R. 1985: "L'impiego a Venezia e a Trieste fino alla metà del XIX secolo", in I marmi del Carso triestino 1985, 37-41.

FLEGO S., RUPEL L., ZUPANČIČ M. 2001: "Contributo alla conoscenza dei siti archeologici sul declivio tra Sistiana e Grignano", Annales. Series Historia et Sociologia 11, 1, 157-180.

GROSSI P. 2003: "Miliari romani nel Nord Italia: materiali, provenienza, lavorazione. L' esempio dell'area Veneta e Friulana", Quaderni di Archeologia del Veneto XIX, 192-202.

I marmi del Carso triestino 1985 = F. CUCCHI, S. GERDOL (eds.): I marmi del Carso triestino, Trieste 1985.

LAZZARINI L. 1986: "I materiali lapidei dell'edilizia storica veneziana", Restauro e città II, 3-4, 84-100.

LAZZARINI L., VAN MOLLE M. 2015: "Local and imported lithotypes in Roman times in the Southern part of the *X Regio Augustea Venetia et Histria*", in ASMOSIA X, 699-711.

MASELLI SCOTTI F. 1976: "Lo scavo di un edificio romano ad Aurisina", Atti e memorie della società istriana di archeologia e storia patria LXXVI, 63-80.

MASELLI SCOTTI F. 1979: "Il territorio sudorientale di Aquileia", in Il territorio di Aquileia nell'antichità, Antichità Altoadriatiche XV/I, Udine, 345-381.

MASELLI SCOTTI F. 1982: "Villa rustica (scavo 1976) - Aurisina, Duino Aurisina (Trieste)", in Ritrovamenti archeologici recenti e recentissimi nel Friuli Venezia Giulia, Trieste, 75-80.

MASELLI SCOTTI F. 1985, "L'impiego a Trieste e nel suo territorio", in I marmi del Carso triestino 1985, 29-33.

POZZETTO M. 1985: "Un significativo impiego in età postromana: il Mausoleo di Teodorico", in I marmi del Carso triestino 1985, 34-36.

PREVIATO C. 2015a: Aquileia. Materiali, forme e sistemi costruttivi dall'età repubblicana alla tarda età imperiale, Antenor Quaderni 32, Padova.

PREVIATO C. 2015b: "Tra monti, fiumi e mare: l'estrazione e il commercio della pietra nella *Regio X - Venetia et Histria*", in F. CAMBI, G. DE VENUTO, R. GOFFREDO (eds.): I pascoli, i campi, il mare. Paesaggi d'altura e di pianura in Italia dall'Età del Bronzo al Medioevo, Storia e Archeologia Globale 2, Bari, 31-49.

PREVIATO *et al.* 2014 = PREVIATO C., BONETTO J., MAZZOLI C., MARITAN L. 2014: "Aquileia e le cave delle regioni alto-adriatiche: il caso della trachite euganea", in J. BONETTO, S. CAMPOREALE, A. PIZZO (eds.): Arqueología de la Construcción IV – Le cave nel mondo antico: sistemi di sfruttamento e processi produttivi, Anejos de archivo español de Arquelogia LXIX, Merida, 149-166.

PREVIATO C., VENTURA P. [in press]: "Archeologia dell'edilizia ad Aquileia. L'approvvigionamento del materiale lapideo e il suo impiego all'interno della città", in Atti del II Forum sulla ricerca archeologica in Friuli Venezia Giulia (Udine, 30-31 gennaio 2014).

SASEL-KOS M. 1997: "Roman Inscriptions in the National Museum of Slovenia. The provenance of the stone", Histria Antiqua 3, 57-68.

ZEZZA M. G. 1982: "I materiali lapidei locali impiegati in età romana nell'area compresa tra il Ticino e il Mincio", Atti della Società Italiana di Scienze Naturali e del Museo Civico di Storia Naturale di Milano 123, 1, 3-188.