

Calcitic Marble from Thasos in the North Adriatic Basin: Ravenna, Aquileia, and Milan

Herrmann, John J.; Tykot, Robert H.; van den Hoek, Annewies

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CALCITIC MARBLE FROM THASOS IN THE NORTH ADRIATIC BASIN: RAVENNA, AQUILEIA, AND MILAN

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Abstract

Macroscopic examination is used as a guide for selecting candidates for testing in a search for Thasian marble artifacts in the north Adriatic region. Five Roman and Early Byzantine artifacts could be sampled in Ravenna, Aquileia, and Milan: three sarcophagi, a pulpit, and a column shaft. Grain size was measured in some cases. Four of the five candidates clearly proved to be marble from Thasos, and the other seemed more likely to be Thasian than Proconnesian.

Keywords

Late Antique, stable isotopes, X-ray fluorescence, Early Byzantine, sarcophagi, ambo

Macroscopic evidence for Proconnesian and Thasian marble in the North Adriatic/Po Valley region and sampling

On a macroscopic basis, it has long been evident that the quarries of Proconnesus near Constantinople had a dominant position in the Adriatic region, as they did throughout the Eastern Mediterranean.¹ Grayish marble with long, dark gray bands typical of Proconnesus is widespread throughout the region.² Fernando Rebecchi has pointed out the dominance of Proconnesian marble in sarcophagi produced at Ravenna during the second and third centuries, although a few products from Attica, Ephesus, and Assos also reached the region.³ Proconnesian dominance of the market for marble in the North Aegean continued during the Early Christian period. Stylistically,



Fig. 1. Schematic (semifinished) Ionic capital from Thasos, untested, 380-410, Aquileia Museum

most architectural decoration in Ravenna, the most important city of the region in Early Byzantine times, has close parallels in Constantinople, and F. W. Deichmann has affirmed that most of the marble used in Ravenna was Proconnesian.⁴ Yuri Marano has collected literary sources that speak of or allude to the importation of Proconnesian marble products to Ravenna in the sixth century.⁵

Traditional art-historical methods, however, have shown that marble products from the Aegean island of Thasos also managed on rare occasions to reach the northern Adriatic. Semi-finished Ionic capitals of a kind produced during the fourth century in the quarries of calcitic marble at Aliko on Thasos have appeared at Aquileia. One is in the Archaeological Museum (Fig. 1),⁶ and another, which was redecorated in the Middle Ages, is in Aquileia Cathedral.⁷ Macroscopic examination of the marble reinforces these identifications. Archaeometric study has shown that the maximum grain size (MGS) of calcitic marble from Thasos is usually substantially

1 REBECCHI 1978; MARANO 2008A; MARANO 2008B; LAZZARINI 2015.

2 For the properties of Proconnesian marble, see LAZZARINI 2015.

3 REBECCHI 1978, 251, 255, 257, fig. 5.

4 DEICHMANN 1969, 64.

5 MARANO 2008A, 59-60, 190-191; MARANO 2008B, 164.

6 HERRMANN, SODINI 1977, 490, fig. 32; HERRMANN 1988, 84, 92; MARANO 2008A, 199.

7 CUSCITO 2008, 382-383, fig. 5, ascribed to the project of Bishop Cromazio (388-408).



Fig. 2. Column shaft, calcitic marble from Aliko, Thasos, fourth century, perhaps 380-410, Aquileia, Museum. USF 19901

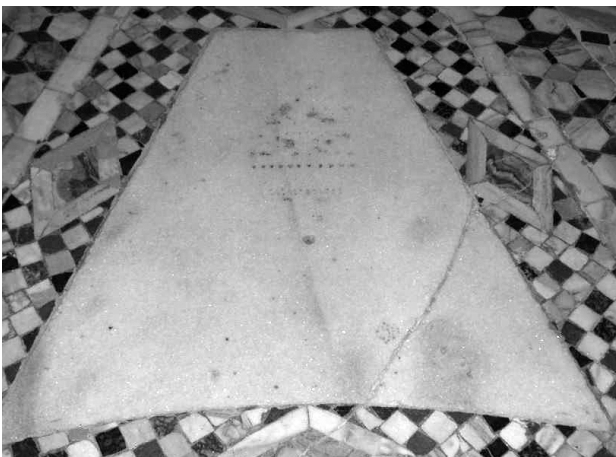


Fig. 3. Pavement of central octagon of S. Vitale, Ravenna, marble slab probably from Thasos, untested, 6th century, reused in medieval pavement



Fig. 4. Quarries of Aliko, Thasos

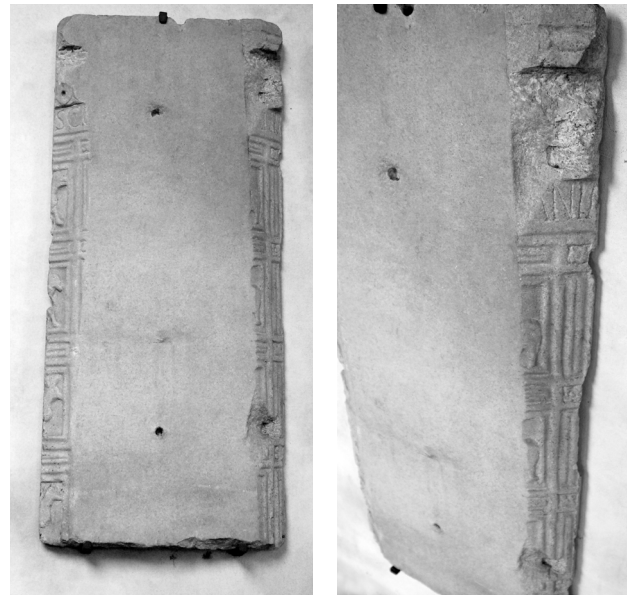


Fig. 5. Part of an ambo recut as a slab, inscribed SCO...NI/, marble from Aliko, Thasos. Ravenna, Museo Nazionale, inv. 620. USF19898, late 6th/early 7th century

greater than that from Proconnesus,⁸ and Thasian calcite tends to have softer or more rounded markings than typical Proconnesian marble. On an optical basis, Patrizio Pensabene has also identified a large column shaft (Fig. 2) and four fragmentary shafts at Aquileia as Thasian.⁹ Marble from Thasos also appears to be present in Ravenna as well as Aquileia. The most striking Thasian-looking pieces there are several coarse-grained, spotted slabs in the pavement of the mid-sixth century church of San Vitale (Fig. 3); their markings can be closely matched in the quarries at Aliko on Thasos (Fig. 4).

The pavement of S. Vitale could not be sampled to check the macroscopic evidence, but a few other Thasian-looking objects in Ravenna could be. Small chips were taken from a fragmentary ambo (pulpit) (Fig. 5) and two sarcophagi (Figs. 6-7). At Aquileia, a tiny chip could be taken from the large Thasian-looking column shaft (Fig. 2). A sarcophagus at Milan also appeared to be Thasian, and a tiny chip was taken there too (Fig. 8). The Sarcophagus of the Wine Merchant in the Archaeological Museum in Ancona also appears to be Thasian calcite, but permission for a sample has not been granted (Fig. 10).¹⁰

8 ATTANASIO 2003, 110, fig. 5.3.

9 PENSABENE 2015, 613, fig. 6.

10 PROFUMO 2005.

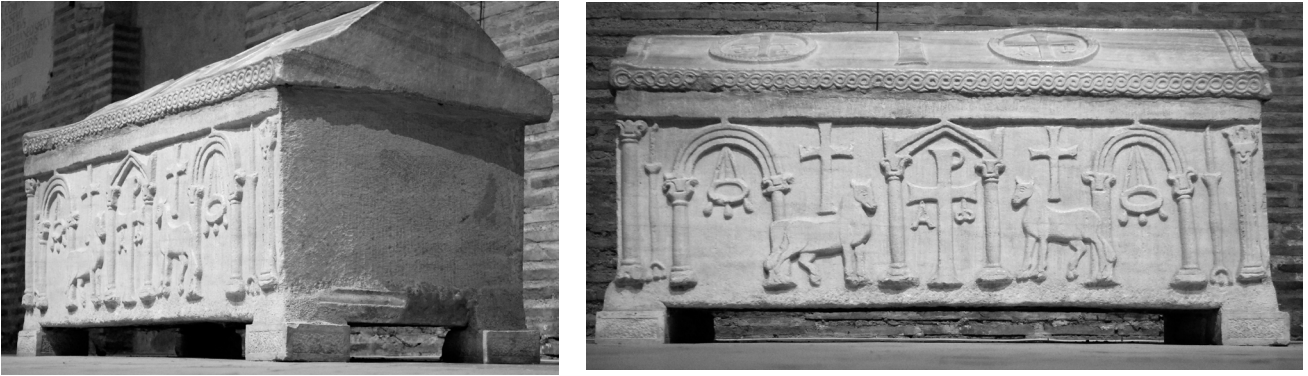


Fig. 6. Sarcophagus of Archbishop Felix (†725), marble from Alikí, Thasos, ca. 3rd century, reused 8th century. S. Apollinare in Classe. USF 19899.



Fig. 7. Crucifer Lamb Sarcophagus, marble probably from the acropolis quarry, Thasos, possibly quarried in the 5th century and decorated in the 7th century. S. Apollinare in Classe. USF 19900



Fig. 8. Christian Sarcophagus, excavated in Milan, marble from Alikí, Thasos, early fourth century. Castello Sforzesco, Milan. USF 8455

Methodology and analysis

The samples were analyzed at the University of South Florida (USF). The ratios of stable isotopes of carbon and oxygen were measured, and three of the five samples were large enough to permit measurement of the maximum grain size (MGS). A portable X-ray fluorescence spectrometer (pXRF) was used to measure levels of the trace elements manganese (Mn) and strontium (Sr). Differences in Mn can also be determined with cathodoluminescence (CL) and, above all, with paramagnetic resonance spectrography (EPR), for which there are extensive quantitative results.¹¹ With CL and EPR, the intensity of the response corresponds to the level of Mn⁺⁺. In pXRF the Mn response reflects the differences in both Mn⁺⁺ in the crystal lattice and Mn in trace elements. The Mn levels of Thasian calcitic marble tend to be high, and those of Proconnesian are low.¹²

Results of testing

The isotopic ratios of four of the five samples found their only match in the calcitic marble quarries at Aliko, Thasos (USF19898-9, 19901, 8455) (Table 1, Fig. 9). Three of these four samples could also be studied with pXRF, and all had relatively high levels of Mn, confirming their origin from Aliko, Thasos (USF 19898-9, 19901). Proconnesian marble, on the contrary, tends to have low levels of Mn.¹³

One sample (USF 19900) had isotopic ratios that fell in another part of the field for Aliko and in the fields of many quarries of Asia Minor and Greece (Fig. 9).¹⁴ Most of the non-Thasian quarries can be eliminated for historical reasons; the quarries of Paros probably did not produce fresh marble during Late Antiquity,¹⁵ the fine-grained marble of Mt. Hymettus is unlike the marble used in Ravenna, and no gray-white marble from Asiatic sites other than Proconnesus is known in the North Adriatic. Proconnesus, however, is a good possibility isotopically, as are other quarries on Thasos: those on Cape Fanari and on the Acropolis. The very coarse grain of USF19900 (mgs = 4mm), however, tends to exclude Proconnesus (Table II). Since USF19900, on the other hand, has low Mn, it probably does not stem from Aliko or Cape Fanari,

marble from which characteristically has high levels of Mn⁺⁺ (that is, high intensity of EPR response) (Table II). The Acropolis Quarry on Thasos, however, often has very low intensity/low Mn comparable to the median value of Proconnesus 1 (Table 2). Since USF 19900 lacks the long, sharp dark veins typical of Proconnesian marble and has very large MGS, it is likely to be a product of this small Thasian quarry of calcitic marble.

In different ways, all three of the analyzed sarcophagi are typical of the North Adriatic basin and have been ascribed to Ravenna, where the imported chests and lids were decorated. Two have the familiar local scheme of three niches framed by a lintel and corner pilasters. The example in Milan dates from around 300 (USF8455, Fig. 8). The sarcophagus of Archbishop Felix (709-725) was given its three-niche scheme in the eighth century, but the chest was quarried much earlier; a fragment of an S-curve molding (*cyma*) along the right end survives from its first phase (USF19899, Fig. 6a). Moldings along the end are features of Ravennate sarcophagi of the second and third centuries.¹⁶ The Crucifer Lamb Sarcophagus (USF19900) (Fig. 7), whose figures probably date from the eighth century, is also a recut older piece. Its unusual projecting molding above recalls a sarcophagus of the fifth century at Ravenna.¹⁷ One of the capitals in Aquileia has plausibly been ascribed to the rebuilding of the cathedral between 388 and 408, and the other capital and the column shaft there could well date from that time as well (Figs. 1-2, USF19901). The slabs in the S. Vitale pavement are reused in the Medieval pavement, but they probably stem from the original pavement of around 540 (Fig. 3). The ambo fragment (Fig. 5, USF19898) belongs to the late sixth or early seventh century.

The untested sarcophagus-front with three niches found in Ancona also appears to be Thasian calcite; the "sarcophagus of the wine merchant" (il Sarcophago del vinaio) in the Museo Archeologico of Ancona has the coarse grain, grayish color, and short, soft dark-gray streaks typical of Aliko or Fanari (Fig. 10). The sarcophagus has been dated to the mid-third century and has also been attributed to a workshop of Ravenna.¹⁸ On the basis of this group of tests, it seems likely that the third century was the main period of importation of quarry-rough Thasian sarcophagi to the north Aegean.

11 ATTANASIO *et al.* in this volume.

12 VAN KEUREN *et al.* 2012, 349-351, table 1, lines 7-9.

13 ATTANASIO 2003, database diskette; ATTANASIO *et al.* 2006, 139, figs. 2.11a.

14 ATTANASIO *et al.* 2006, 140, table 2.11a; MANIATIS *et al.* 2009, 268, fig. 5; MANIATIS *et al.* 2010, 53, fig. 7.

15 HERRMANN *et al.* 2009, 732.

16 GABELMANN 1973.

17 VALENTI ZUCCHINI, BUCCI 1968, cat. no. 25 (2nd half 5th century); KOLLWITZ, HERDEJURGEN 1979, cat. no. B 11, pl. 60-63 (late 5th century).

18 PROFUMO 2005. The stone is called limestone.

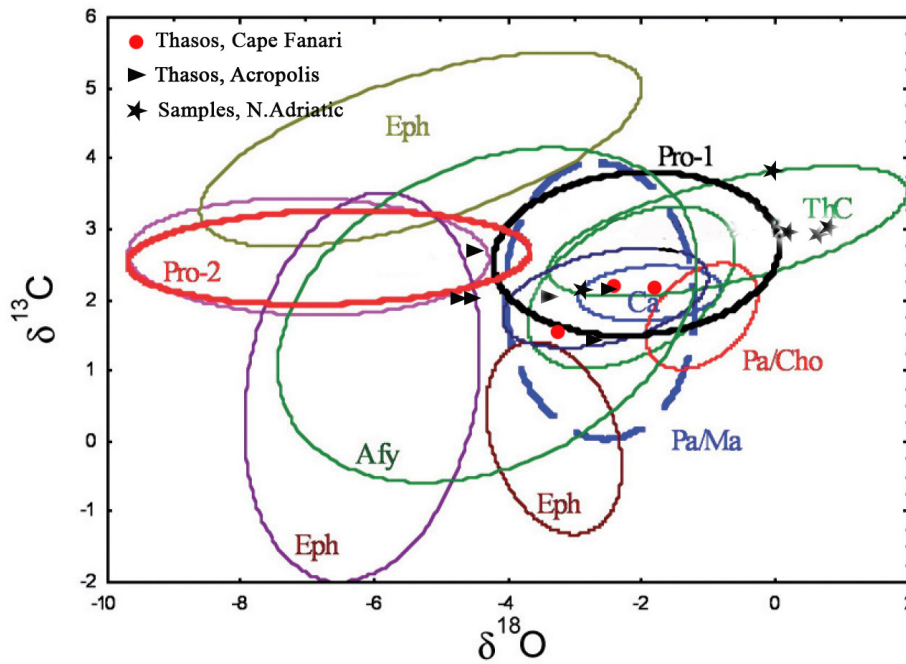


Fig. 9. Isotopic ratios of North Adriatic samples (diagram from VAN KEUREN *et al.* 2012) Table 1. Afy = Afyon; Ca = Carrara; Eph = Ephesus; Pa/Cho = Paros, Marathi; Pro = Proconnesus; ThC = Thasos, calcitic quarries (Alik)

USF #	Site	description	Mn	Sr	δ13C	δ18O	MGS	Quarry: preferred <u>underlined</u>
19898	Ravenna, Museo Nazionale, inv.620	Slab from ambo inscribed SCO...NI ¹⁹	High	low	3.2	0.6	3-4 mm	<u>Th-Al</u> , Proc
19899	S. Apollinare in Classe (Ravenna)	Sarcophagus of Archbishop Felix ²⁰	High	low	3.3	0.0	3-4 mm	<u>Th-Al</u> , Proc
19900	S. Apollinare in Classe (Ravenna)	Crucifer Lamb Sarcophagus ²¹	Low	low	2.4	-2.9	4 mm	Af; Aphro; Hym; Paros; Proc; Th-F; <u>Th-Acr</u>
19901	Aquileia, Museo Archeologico	Tall column shaft in front of old facade ²²	High	low	3.4	0.7	-	<u>Th-Al</u> , Proc
8455	Milan, Castello Sforzesco, inv. 203	Tetrarchic sarcophagus ²³	--	--	3.9	0.1	-	<u>Th-Al</u> , Proc

Af = Afyon; Aphro = Aphrodisias; Hym = Hymettos; Paros = Paros, Marathi, Lychnites; Proc = Proconnesus; Th-Al = Thasos, Alik; Th-Ph = Thasos, Phanari; Th-Acr = Thasos, Acropolis

Table 1. Analysis of Thasian-looking objects in Ravenna, Aquileia, and Milan

- 19 ANGIOLINI MARTINELLI 1968, cat. no. 20 (2nd half 6th century); DEICHMANN 1969, 73, 280, fig. 101. Compare ambo of Marinianus (595-606): DEICHMANN 1969, 73, fig. 98, 102-102.
- 20 Felix died in 724: LAWRENCE 1945, 3, 40-41, 48-49, fig. 73; VALENTI ZUCCHINI, BUCCI 1968, cat. no. 58; DEICHMANN 1969, 86, fig. 175; KOLLWITZ, HERDEJURGEN 1979, 169-170, pl. 85.2, 86.3, 89.8.
- 21 LAWRENCE 1945, 37, 39, 41, 44, fig. 69 (7th century); VALENTI ZUCCHINI, BUCCI 1968, cat. no. 59 (8th century); DEICHMANN 1969, 86; KOLLWITZ, HERDEJURGEN 1979, 170-171, pl. 85.4 (early 8th century).
- 22 PENSABENE 2015, fig. 5.
- 23 GABELMANN 1973, 98, 102, 110, 116-117, 119, 158-162, 168, 175, 190, 218, cat. 74, pl. 40; REBECCHI 1978, 269, fig. 14.

Figure-decorated sarcophagi of dolomitic (rather than calcitic) marble from Thasos, notable for its whiteness, are well known from Rome. Shipwrecked cargoes of unfinished sarcophagi of both white dolomitic and grayish calcitic marble from Thasos have been recovered off the southern coast of Italy,²⁴ but Thasian calcitic sarcophagi were previously unknown from *terra firma*. As shown elsewhere in this volume, it is now also possible to document the presence of sarcophagi of Thasian calcitic marble on the western shores of Italy, in Ostia and Siracusa.²⁵ The third century may have been the main period for importation of Thasian calcitic sarcophagi to

24 CALIA *et al.* 2009; GABELLONE *et al.* 2009.

25 HERRMANN *et al.* in this volume.



Fig. 10. Sarcophagus of the Wine Dealer, probably marble from Aliko, excavated in Ancona, mid-third century

sample	Quarry	D13 C	D18O	Intens (Mn++)	MGS
Th_AT1	Acropolis	2.66	-4.52	0.053	3.5
Th_AT2	Acropolis	2.08	-4.56	1.057	3.4
Th_AC1	Acropolis	1.89	-2.96	0.072	3.8
Th_AC2	Acropolis	2.07	-4.74	0.274	3.3
Th_AC3	Acropolis	2.25	-2.46	0.110	3.7
Th_AC4	Acropolis	2.10	-3.20	0.612	4.0
Th_P1	Cape Fanari	1.50	-3.30	0.244	6.0
Th_P2	Cape Fanari	2.31	-2.36	0.508	6.5
Th_P3	Cape Fanari	2.26	-1.91	0.428	7.5
Several hundred	Proconnesus 1	2.65	-2.07	0.06	1.71

Table 2.
Quarry data for
Acropolis and
Cape Fanari,
Thasos (Attanasio
2006, Table 2.11a);
compared with
averages for
Proconnesus 1
(VAN KEUREN
et al. 2012 Table 1)

the northern Adriatic and to Ostia, but importation continued or was resumed at the end of the sixth century, as demonstrated by the sarcophagus of around 600 in Siracusa. The ambo of Aliko marble in Ravenna was both quarried and sculpted around 600 and forms a chronological parallel to the late sarcophagus in Siracusa.

Conclusions

Macroscopic examination of marble objects at several sites in the North Adriatic made it possible to distinguish the calcitic marble of Thasos from that of Proconnesus with considerable success; five Thasian-looking sculptures at Aquileia, Ravenna, and Milan could be sampled, and isotopic analysis, measurements of MGS, and analysis with pXRF confirmed that at least four of the five pieces were certainly from the Aliko quarries on

Thasos. The fifth piece seems to be marble from Acropolis quarry on Thasos (Fig. 7).

On the basis of these analyses, it appears that calcitic marble from Thasos made sporadic appearances in the Central and North Adriatic region from the third through the sixth century. The marble appears to have arrived in the region roughly shaped and been finished locally. Columns and Thasian-type Ionic capitals were imported to Aquileia (as they were to Rome) from Thasos in the late fourth century. Pavement slabs seem to have been imported in the time of Justinian. An ambo was imported in post-Justinianic times. For the first time, sarcophagi of Thasian marble can be identified in the Adriatic region; three of the five artifacts sampled were sarcophagi, and two of them came to Italy in the third or early fourth centuries.

The apparent rarity of Thasian marble artifacts found so far in the North Adriatic indicates that Thasos

was a very junior partner to Proconnesus in supplying grayish, coarse-grained calcitic marble to the region. In this respect, the situation is similar to what is seen in the Early Byzantine Eastern Mediterranean, where Thasian marble had a marginal presence in the architectural market alongside Proconnesian.²⁶ In fourth- and early-fifth century Rome, on the other hand, Thasian calcite was a fairly consistent presence.²⁷ Future larger-scale studies at Ravenna and elsewhere in the North Aegean are needed to provide a fuller picture of the Thasian share of the market there, but this pilot project demonstrates that, at least, it did have a presence.

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BIBLIOGRAPHY

- AL-NADDAF M., AL-BASHAIREH K., AL-WAKED F. 2010: "Characterization and provenance of marble chancel screens, northern Jordan", *Mediterranean Archaeology and Archaeometry* 10.2, 75-83.
- ANGIOLINI MARTINELLI P. 1968: *Corpus della scultura paleocristiana bizantina ed altomedioevale di Ravenna*, 1: Altari, amboni, cibori, cornici, plutei con figure di animali e con intrecci, transenne e frammenti vari, Roma.
- ATTANASIO D. 2003: *Ancient White Marbles: Analysis and Identification by Paramagnetic Resonance Spectroscopy*, Rome.
- ATTANASIO D., BRILLI M., OGLE N. 2006: *The Isotopic Signature of Classical Marbles*, Rome.
- ATTANASIO D., BRILLI M., ROCCHI P. 2008: "The marbles of two early Christian churches at Latrun (Cyrenaica, Libya)", *Journal of Archaeological Science* 35, 1040-1048.
- ATTANASIO D., HERRMANN J., TYKOT R., VAN DEN HOEK A. in this volume: "Roman and Early Byzantine sarcophagi of calcitic marble from Thasos in Italy", in *ASMOSIA XI*.
- CALIA A., GIANNOTTA M. T., LAZZARINI L., QUARTA G. 2009: "The Torre Sgarrata Wreck (South-Italy): Characterization and provenance of marbles", in *ASMOSIA VII*, 319-331.
- CUSCITO G. 2008: "Il gruppo episcopale di Aquileia", in PIUSSI S. (ed.): *Cromazio di Aquileia 388-409*, Milano, 380-385.
- DEICHMANN F. W. 1969: *Ravenna, Hauptstadt des spätantiken Abendlandes, I: Geschichte und Monumente*, Wiesbaden.
- DRESKEN-WEILAND J. 1998: „Überlegungen zur weströmischen Plastik des späten 5. und 6. Jh.“, in N. CAMBI, E. MARIN (eds.): *Acta XIII Congressus Internationalis Archaeologiae Christianae*, Split-Poreč, 283-301.
- GABELLONE F., GIANNOTTA M. T., ALESSIO A. 2009: "The Torre Sgarrata Wreck (South-Italy): Marble Artefacts in the Cargo", in *ASMOSIA VII*, 319-331.
- GABELMANN H. 1973: *Die Werkstattgruppen der oberitalischen Sarkophage*, Bonn.
- HERRMANN J., SODINI J.-P. 1977: "Exportations de marbre thasien à l'époque paléochrétienne : le cas des chapiteaux ioniques", *Bulletin de correspondance hellénique* 101, 471-511.
- HERRMANN J. 1988: *The Ionic Capital in Late Antique Rome*, Rome.
- HERRMANN J., TYKOT R., VAN DEN HOEK A. 2009: "Parian marble in Early Christian times", in *ASMOSIA VIII*, 723-737.

26 ATTANASIO, *et al.* 2008, 10048; AL-NADDAF *et al.* 2010, 81.

27 HERRMANN 1988, 79-92, 179-181.

- KOCH G. 1982: *Römische Sarkophage*, Munich.
- KOLLWITZ J., HERDEJURGEN H. 1979: *Die Sarkophage der westlichen Gebiete des Imperium Romanum*, 2: *Die ravennatischen Sarkophage*, Berlin.
- LAWRENCE M. 1945: *The Sarcophagi of Ravenna*, New York.
- LAZZARINI L. 2015: "Il reimpiego del marmo proconnesio a Venezia", in M. CENTANNI, L. SPERTI (eds.), *Pietre di Venezia: Spolia in se spolia in re*, Roma, 134-157.
- MANIATIS Y., TAMBAKOPOULOS D., DOTSIKA E., WESCOAT B., MATSAS D. 2012: "The Sanctuary of the Great Gods on Samothrace, Greece: An extended marble provenance study", in *ASMOSIA IX*, 263-278.
- MANIATIS Y., TAMBAKOPOULOS D., DOTSIKA E., STEFANIDOU-TIVERIOU T. 2010: "Marble provenance investigation of Roman sarcophagi from Thessaloniki", *Archaeometry* 52.1, 45-58.
- MARANO Y. 2008A: *Il commercio del marmo nell'Adriatico tardoantico (IV – VI secolo d.C.). Scambi, maestranze, committenze*, thesis, Università di Padova.
- MARANO Y. 2008B: "Il commercio del marmo nell'Adriatico tardoantico (IV – VI secolo d.C.)", in S. COLLODO, G. L. FONTANA (eds.): *Eredità culturali dell'Adriatico. Archeologia, storia, lingua e letteratura*, Roma, 159-174.
- PENSABENE P. 2015: "Blocks and quarry marks in the Museum of Aquileia", in *ASMOSIA X*, 611-614.
- PROFUMO M. C. 2005: "Fronte di sarcofago detta 'sarcofago del vinaio'", in G. DE MARINIS (ed.): *Arte romana nei musei delle Marche*, Ancona, 266, cat. no. 143.
- REBECCHI F. 1978. "Cronologia e fasi di fabbricazione dei sarcophagi pagani dell'officina di Ravenna," *Studi romagnoli* 29, 247-275.
- SODINI J-P., BARSANTI C., GUIGLIA GUIDOBALDI A. 1998: "La sculpture architecturale en marbre au VI^e siècle à Constantinople et dans les régions sous influence constantinopolitaine", in N. CAMBI, E. MARIN (eds.): *Acta XIII Congressus Internationalis Archaeologiae Christianae*, Split-Poreč, 301-376.
- VALENTI ZUCCHINI G., BUCCI M. 1968: *Corpus della scultura paleocristiana bizantina ed altomedioevale di Ravenna*, 2: *I sarcophagi a figure e a carattere simbolico*, Roma.
- VAN KEUREN F., ATTANASIO D., HERRMANN J., HIPOL S., COX J., GROMET L. P., ABRAMITIS D. 2012: "Three Fragments of a Marsyas Sarcophagus: Multimethod Marble Analyses", in *ASMOSIA IX*, 344-354.