

MDPI

Article

# On the Use of White Marbles in Roman Forum Sempronii (Fossombrone, Marche, Italy): An Overview of the Archaeometric Data on Architectural Elements

Devi Taelman <sup>1,\*</sup>, Oscar Mei <sup>2</sup> and Fabrizio Antonelli <sup>3,\*</sup>

- Department of History, Archaeology, Arts, Philosophy and Ethics, Vrije Universiteit Brussel, 1050 Brussels, Belgium
- Department of Communication Sciences, Humanities and International Studies (DISCUI), University of Urbino Carlo Bo, 61029 Urbino, Italy
- 3 Laboratory for the Analysis of Ancient Materials (LAMA), University IUAV of Venice, 30125 Venice, Italy
- \* Correspondence: devi.taelman@vub.be (D.T.); fabrizio.antonelli@iuav.it (F.A.)

Abstract: This paper presents the results of the characterisation, identification, provenance determination, and quantification of the white, *greco scritto*-like and polychrome marbles used for architectural purposes at *Forum Sempronii*, a Roman town in the Marche region of Italy. Samples of five fragments of white marble and one fragment of a *greco scritto*-like marble have been studied using mineralogical and petrographic observations and stable isotope ratio analysis (SIRA) of carbon and oxygen. Polychrome marbles were macroscopically identified by comparison with reference samples and available image databases. Analytical results of the white and *greco scritto*-like marbles identified the material as coming from the quarries of Carrara (Luni, Italy) and Proconnesos (Marmara, Saraylar, Turkey) for white marble, and of Ephesos-Hasançavuslar for *greco scritto*-like marble. Further, at least eleven imported polychrome stone varieties were distinguished. The study clearly illustrates that *Forum Sempronii* had access to the main marble trade networks of the Roman Mediterranean. The early attestation of Proconnesian marble at the town's augusteum (i.e., Augustan date) is unique for central Adriatic Italy.

Keywords: archaeometry; marble provenance; white marble; polychrome marble; Roman; Italy



Citation: Taelman, D.; Mei, O.; Antonelli, F. On the Use of White Marbles in Roman Forum Sempronii (Fossombrone, Marche, Italy): An Overview of the Archaeometric Data on Architectural Elements. Heritage 2023, 6, 2942–2955. https://doi.org/ 10.3390/heritage6030156

Academic Editor: Kerstin Elert

Received: 20 February 2023 Revised: 7 March 2023 Accepted: 7 March 2023 Published: 10 March 2023



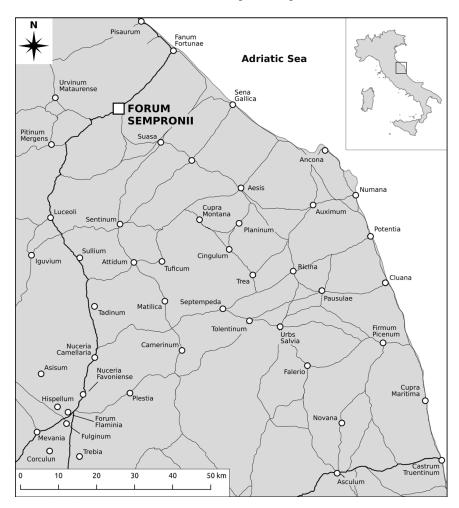
Copyright: © 2023 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https://creativecommons.org/licenses/by/4.0/).

### 1. Introduction

This paper presents the results of the characterisation, identification, provenance determination, and quantification of the white, *greco scritto*-like and polychrome marbles used at *Forum Sempronii*, a medium-sized Roman town located along the Metauro river, about 2 km east of the modern town Fossombrone (Marche region, Italy) (Figure 1). The study is part of a project that examines the import and use of decorative stones in the wider region of central Adriatic Italy in Roman times (published marble provenance studies for central Adriatic Italy are [1–12]). Because very few stone resources of sufficient quality for decorative purposes are geologically present in the region, almost all high-quality decorative stones had to be imported. Sourcing the geological origins of marble artefacts used in the region can therefore contribute to the knowledge of ancient trade connections and the integration of central Adriatic Italy in the wider Roman economy.

The town of *Forum Sempronii* was established in the late 2nd century CE, probably between 132 BCE and 126 BCE, along the course of the *via Flaminia*, the consular road that connected Rome with the Adriatic coast and later with Northern Italy and the Danubian provinces (Figure 1) [13]. In consequence of the reorganisation of the *ager Picenus* and *ager Gallicus* by the Romans, the town received the status of municipium at the latest in 49 BCE [14]. Extensive building activity has been documented between the 1st and early 3rd century CE, followed by reduced infrastructural investments because of regional unrest

caused by Alemannic, Juthungic, and Visigothic invasions in the later 3rd and 4th century CE [13]. In Late Antiquity, the town became a bishop seat with an important Christian community [14,15]. The site was finally abandoned in favour of the nearby medieval town of Fossombrone during the 5th–6th century CE probably as a consequence of the Greek-Gothic invasions of 535–553 CE [13,14,16].



**Figure 1.** Location of *Forum Sempronii* in relation to the road network and other urban centres in central Adriatic Italy in the Roman Imperial period.

In its heydays, *Forum Sempronii* occupied an urban area of c. 25 ha that was organised along a regular orthogonal street grid with the *via Flaminia* as its main axis [17,18]. Excavations in the 16th to 19th century CE and systematic research (including excavations, aerial photography, and geophysical survey) carried out since 1974 by the *Università degli Studi di Urbino Carlo Bo* have revealed large sections of the town layout. Apart from the town's street grid, identified structures include the forum square with three temples, an augusteum, two bath complexes, several richly decorated elite houses, commercial buildings, an amphitheatre, and parts of the town's circuit wall [15,16,19–21].

For this study, the white, *greco scritto*-like and polychrome marbles of the augusteum, the Small Baths (*terme piccole*), and a small marble depot were examined. The results of this study are discussed together with those of a previous provenance study of the town's marble relief and statuary collection [3,4]. The sumptuously decorated augusteum, which probably functioned as an administrative building as well as a temple for the imperial cult, is located in the town centre on the eastern side of the forum square, along the *via Flaminia*. The building occupies an area of  $216 \text{ m}^2$  (c.  $12 \times 18 \text{ m}$ ) and consists of three aisles, with an apsis on the western end of the central aisle, and a porch with columns and pilasters [22]. The masonry technique applied and recovered relief fragments and inscriptions place the

construction of the temple and (at least part of) its marble decoration in the Augustan period [21]. The Small Baths occupied a town block in the southern part of the town. The total area of the building is estimated at  $1200 \, \text{m}^2$  (c.  $43 \times 30 \, \text{m}$ ). Based on the masonry techniques applied and the recovered materials, the complex's construction is dated to the first half of the 1st century CE. The complex was extensively modified and reorganised between the 2nd and 3rd century CE, when it was transformed into an elite residence, but maintained part of its bathing function. Minor interventions were carried out in the 3rd and 4th centuries CE, and the building was finally abandoned in the 5th century CE [23]. The third structure is a rectangular room that operated as a storage depot for marble veneer panels. The depot was part of a series of simple commercial units (shops and storage rooms) connected to the so-called House of Aesclepius, an elite house decorated with mosaics that opened onto the first *decumanus* south of the *via Flaminia*. The house and connected commercial units date to the 3rd century CE [24].

#### 2. Materials and Methods

In this study, the typological and lithological characteristics of all marble elements from the augusteum, the Small Baths, and a small marble depot were analyzed. Six marble fragments of architectural elements have been analysed in terms of composition and provenance, including five fragments of white marble and one fragment of a *greco scritto*-like marble (Table 1). The samples were selected to encompass the full range of white marble varieties found at the site based on macro- and mesoscopic properties, i.e., structure, average crystal size, colour patterning, and translucency.

**Table 1.** White and *greco scritto*-like marble architectural elements sampled and analysed from *Forum Sempronii*.

ID	Origin	Marble Type	Description	Chronology
FOS001	marble depot	greco scritto-like	veneer	not earlier than 3rd century CE
FOS003	augusteum	white	veneer	1st century CE (Augustan)
FOS004	augusteum	white	veneer	1st century CE (Augustan)
FOS005	marble depot	white	veneer	not earlier than 3rd century CE
FOS006	marble depot	white	veneer	not earlier than 3rd century CE
FOS007	marble depot	white	cornice	not earlier than 3rd century CE

A multi-technique approach, including mineralogical and petrographic observation in thin sections, powder X-ray diffraction (PXRD), and stable isotope ratio analysis (SIRA) of carbon and oxygen, was used to examine the samples. The main petrographic features, including fabric, microstructure, maximum grain size of carbonate crystals [25], calcite/dolomite boundary shapes, and the presence and relative abundance of accessory minerals, were determined using a Leitz DM RXP polarizing microscope. The presence and relative abundance of dolomite were evaluated through powder X-ray diffraction using a PANalytical Empyrean X-ray powder diffractometer–Cu-Kα radiation operating at 40 kV and 40 mA. Carbon and oxygen isotopic ratios were determined via a Gasbench II preparation line connected online to a ThermoFinnigan Five Plus mass spectrometer in a continuous flow mode according to the procedure outlined by [26]. Carbonate powder was reacted with 100% phosphoric acid at 70 °C. The isotopic values are expressed as delta notation ( $\delta^{13}$ C and  $\delta^{18}$ O) per mille relative to Vienna Pee Dee Belemnite (VPDB) [27]. The reproducibility of the measures was verified through replicate analyses of laboratory standards calibrated to NBS19 [28] and LSVEC [29] and was found to be better than  $\pm 0.07\%$ for  $\delta^{13}$ C and  $\pm 0.04\%$  for  $\delta^{18}$ O.

Mineralogical, petrographic, and isotopic data were compared with those of the latest databases compiled for the principal Mediterranean white and *greco scritto*-like marbles to determine the most likely provenance. [30–40].

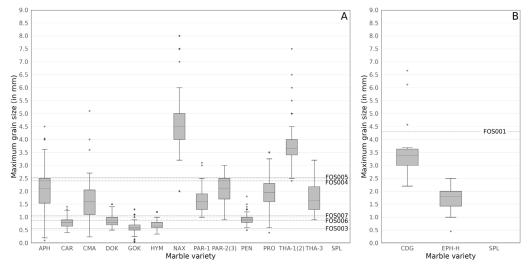
Polychrome marbles were macroscopically identified by comparison with reference samples and available image databases [41–43]. The term 'polychrome marble' is used

in this study to refer to any rock that can be polished and used for decorative purposes, i.e., in a similar meaning as the Latin term 'marmor'. As such, the term also includes limestones, porphyries, granites, breccias, and alabasters. The names for the polychrome marbles are based on the Italian names given to the stones in the 18th century CE by Italian stonecutters [42].

#### 3. Results and Discussion

#### 3.1. Archaeometric Data

Detailed descriptions of the mineralogical-petrographic characterisation, stable isotopic results, and provenance results of the white and *greco scritto*-like architectural marble samples are reported in Table 2. A comparison of the analytical data of the *Forum Sempronii* samples with those of the principal Mediterranean marbles is given in Figures 2 and 3. Based on the archaeometric observations, two varieties can be distinguished among the architectural white marbles: group 1 with FOS003, FOS006, and FOS007, and group 2 with FOS004 and FOS005, respectively, with a suggested provenance of Carrara (Luni, Italy) and Proconnesos (Marmara, Saraylar, Turkey). The samples provenanced to Carrara show a homeoblastic to homeoblastic/heteroblastic microstructure, mosaic or polygonal fabric with triple junctions, and mainly straight to curved calcite crystal boundary shapes. The samples have a maximum grain size between 0.56 and 1.05 mm (Figure 4). Calcite is the main carbonate phase; no traces of dolomite were detected by PXRD analysis. Accessory phases are limited to traces of graphite, pyrite, and hematite for FOS006. Stable isotope values range from -1.53% to -1.80% for  $\delta^{18}$ O and from 2.03% to 2.21% for  $\delta^{13}$ C.



**Figure 2.** Box plots of maximum grain size (in mm) for the main Mediterranean marble quarries and architectural white marble samples from *Forum Sempronii*. (**A**). White marbles (APH: Aphrodisias, CAR: Carrara, DOK: Dokimeion, GOK: Göktepe, HYM: Hymettos, NAX: Naxos, PAR-1: Paros-1, PAR-2(3): Paros-2(3), PEN: Pentelikon, PRO: Proconnesos, THA-1(2): Thasos-1(2), THA-3: Thasos-3, SPL: archaeological samples); (**B**). *Greco scritto*-like marbles (CDG: Cap de Garde, EPH-H: Ephesos—Hasançavuslar, SPL: archaeological sample). Quarry data from [30–32,34,37–39].

The two Proconnesos samples show a heteroblastic microstructure, mortar fabric with strained calcite crystals, showing mainly embayed to sutured boundary shapes. The maximum grain size is 2.40 and 2.52 mm (Figures 2 and 4). No dolomite was detected, and accessory minerals are traces of graphite, haematite, and potassic mica. Stable isotope values are -1.29% and 2.67% (FOS004) and -2.02% and 2.99% (FOS005) for  $\delta^{18}O$  and  $\delta^{13}C$ , respectively.

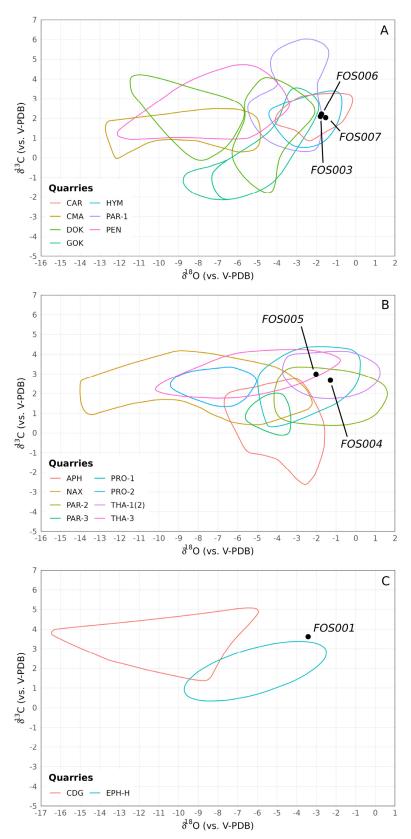
**Table 2.** Mineralogical-petrographic features, isotopic values, and suggested provenance of the white and *greco scritto*-like marble artefacts analysed from *Forum Sempronii*. CBS = crystal boundary shape. MGS = maximum grain size. AGS = average grain size. Mineral abbreviations follow the recommendations of the International Mineralogical Association (IMA) Commission on New Minerals, Nomenclature and Classification (CNMNC) [44] (Dol: dolomite, Qz: quarts, Gr: graphite, Op: opaque minerals, Pmca: potassic mica, Ap: apatite, Pl: plagioclase, Ep: epidote). Ho: homeoblastic, He: heteroblastic. +++: very abundant, ++: abundant, +: present, ±: traces, nd: not detected.

ID	Texture	Microstructure	CBS	MGS	Dol	Qz	Gr	Op	Pmca	Ap	Pl	Ep	δ <sup>13</sup> C	$\delta^{18}O$	Suggested Provenance
FOS001	He	mosaic, with strained crystals, weakly foliated	$\begin{array}{c} \text{embayed} \ \pm \\ \text{sutured} \end{array}$	4.30 (AGS < 1 mm)	±/+		+++	±/+ (Py)				±	3.62	-3.42	Hasançavuslar- Ephesos
FOS003	Но	polygonal, with triple junctions	straight	0.56	nd		±						2.09	-1.80	Carrara (Luni)
FOS004	He	mortar, with strained crystals	$\begin{array}{c} \text{embayed} \ \pm \\ \text{sutured} \end{array}$	2.40	nd		±/+	± (Hem)					2.67	-1.29	Proconnesos, Marmara (Saraylar)
FOS005	He	mortar, with crystals slightly strained	$\begin{array}{c} \text{embayed} \ \pm \\ \text{sutured} \end{array}$	2.52	nd		±		±				2.99	-2.02	Proconnesos, Marmara (Saraylar)
FOS006	Ho/He	mosaic	curved	0.88	nd	$\pm$	+	$\pm$ (Py, Hem)					2.21	-1.74	Carrara (Luni)
FOS007	Не	mosaic	curved	1.05	nd	±	±						2.03	-1.53	Carrara (Luni)

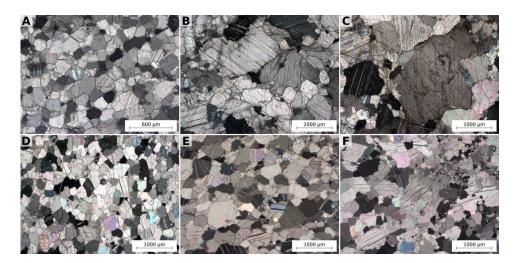
The greco scritto-like marble sample (FOS001) displays an MGS of 4.30 mm, with an average grain size smaller than 1.00 mm. Fabric is heteroblastic, and calcite crystals have embayed to curved boundaries and form a mosaic microstructure with strained crystals (Figure 4). PXRD analysis shows calcite as the main carbonate phase, but with traces of dolomite. Accessory minerals include abundant graphite and traces of epidote and opaque minerals (pyrite). SIRA analysis recorded 3.62% and -3.42% for  $\delta^{13}C$  and  $\delta^{18}O$ , respectively. Oxygen and carbon isotopic ratios for FOS001 fit well with those reported for the Hasançavuslar quarries exploited in the Ephesos region. Likewise, the mineralogicalpetrographic data recorded are compatible with these observed for some specimens from the Hasançavuslar quarries. While the high MGS (4.30 mm) of the archaeological sample does not conform to the MGS range for the Hasançavuslar quarries, the average grain size of the sample seems not to contradict this origin. To date, detailed mineralogical and petrographic descriptions of a sufficiently large set of samples of the Hasançavuslar marble are still unpublished, limiting comparative studies (a paper on this topic is currently in progress by Fabrizio Antonelli and co-workers involved in the Marmora Asiatica project directed by Dr. D. Wielgosz-Rondolino; http://marmoraasiatica.uw.edu.pl/, accessed on 14 January 2023). Based on these properties, a provenance from Epheosos for FOS001 can be suggested. However, a different origin for the Forum Sempronii sample cannot be completely ruled out.

## 3.2. Quantification and Contextualisation

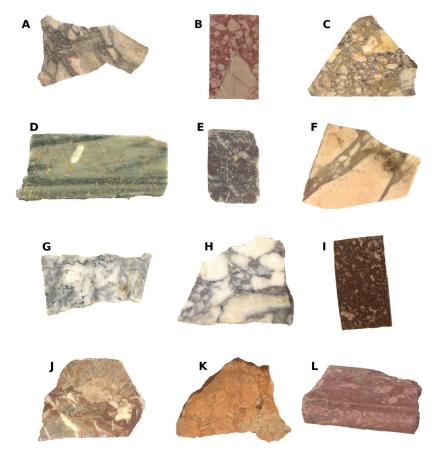
A total of 1943 marble pieces have been lithologically and typologically documented, of which 1913 fragments are part of veneer and 30 of cornices. Lithotypes for veneer application are grey(ish) (31%), white (25%) and *greco scritto*-like (18%) marbles, and limestone (8%) (percentages for veneer are expressed relative to the total weight of all veneer fragments (538.63 kg)). The remaining 18% are carved from polychrome stones. Amongst the grey marbles, a grey-white medium-to-coarse-grained variety, probably from Proconnesos, and a grey fine-grained variety, called *bardiglio* from the quarries at Carrara, could be distinguished. By far the most attested polychrome variety is *breccia di sciro*, followed by smaller quantities of *africano*, *breccia corallina*, *cipollino verde*, *or di pesco*, *giallo antico*, *pavonazzetto*, *porfido rosso*, *portasanta*, *rosso ammonitico*, and *rosso antico* (Figure 5). Cornices are in white marble (21), *rosso antico* (4), *greco scritto*-like marble (2), *breccia di sciro* (2), and grey(ish) marble (1).



**Figure 3.** Stable isotope diagrams of the marble samples from *Forum Sempronii*: (**A**). White fine-grained marbles (MGS ≤ 2 mm) (CAR: Carrara, DOK: Dokimeion, GOK: Göktepe, HYM: Hymettos, PAR-1: Paros-1, PEN: Pentelikon); (**B**). White medium- to coarse-grained marbles (MGS > 2 mm) (APH: Aphrodisias, NAX: Naxos, PAR-2: Paros-2, PAR-3: Paros-3, PRO-1: Proconnesos-1, PRO-2: Proconnesos-2, THA-1(2): Thasos−1(2), THA-3: Thasos-3); (**C**). *Greco-scritto*-like marbles (CDG: Cap de Garde, EPH-H: Ephesos-Hasançavuslar). Isotopic fields from [30,31,35].

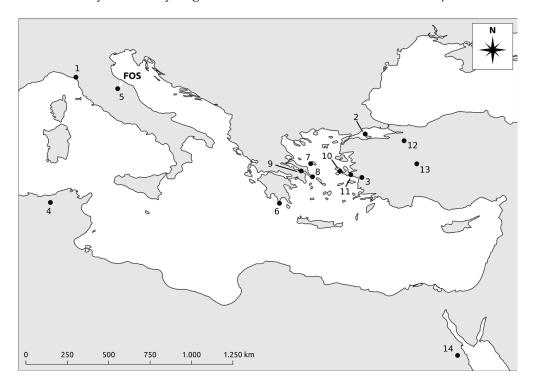


**Figure 4.** Photomicrographs under crossed polars of thin sections of the marbles samples analysed: (**A**). FOS003, homeoblastic, polygonal microstructure characterized by triple junctions made of calcite crystals having straight boundary shape (Carrara marble); (**B**). FOS004 and (**C**). FOS005, heteroblastic, mortar fabric with calcite crystals showing (mainly) embayed boundary shapes (Proconnesian marble); (**D**). FOS006, homeoblastic microstructure made of a mosaic of calcite crystals with curved and straight boundary shapes (Carrara marble); (**E**). FOS007, heteroblastic mosaic fabric displaying calcite crystals with curved boundaries and some plagioclase individuals (Carrara marble); (**F**). FOS001, heteroblastic mosaic microstructure, weakly foliated, made of strained calcite crystals with embayed  $\pm$  sutured boundary shapes (*greco scritto*-like marble from Hasançavuslar).



**Figure 5.** Overview of the polychrome marbles from Forum Sempronii: (A) Africano; (B) Breccia corallina; (C) Breccia di sciro; (D) Cipollino verde; (E) Fior di pesco; (F) Giallo antico; (G) Greco scritto; (H) Pavonazzetto; (I) Porfido rosso; (J) Portasanta; (K) Rosso ammonitico; (L) Rosso antico.

The origin of the polychrome marbles can be traced back to the coast and inland region of *Asia Minor*, Greece (mainland and Aegean islands), *Numidia* (Tunisia), and Egypt (Figure 6). The only lithotype of regional origin is *rosso ammonitico*, a red-to-pink nodular limestone with abundant ammonites and other fossils of Jurassic age that can be traced back to various deposits in the southern Alps, near Verona [43,45,46], and in the central Adriatic Apennines, within the Ammonitico Rosso geological formation of the Umbro-Marchigiana Sedimentary Succession [47,48]. Overall, none of the attested polychrome marbles can be considered atypical for central Adriatic Italy in the Roman Imperial period. Remarkable absences are prestigious varieties of granites. For the latter, we should note the presence of several columns in Troad and Aswan granite currently on display outside the site's archaeological museum [4]. Even though the exact archaeological provenance of these is unknown, they most likely originate from the Roman town of *Forum Sempronii*.



**Figure 6.** Map showing the provenance of the marbles found at *Forum Sempronii*: 1. Carrara white marble and *bardiglio*; 2. Proconnesian marble; 3. *Greco scritto*-like marble; 4. *Giallo antico*; 5. *Rosso ammonitico*; 6. *Rosso antico*; 7. *Breccia di sciro*; 8. *Cipollino verde*; 9. *Fior di pesco*; 10. *Portasanta*; 11. *Africano*; 12. *Pavonazzetto*; 13. *Breccia corallina*; 14. *Porfido rosso*.

# 3.2.1. The Augusteum

By far the most abundant lithotypes from the augusteum are white and grey(ish) marbles (Figure 7). The results of the archaeometric analysis (samples FOS003 and FOS004) suggest a provenance of the white marble from Carrara (Luni) and Proconnesos (Marmara, Saraylar). Polychrome marbles include typical and widespread varieties in the Roman world and are foremost *breccia di sciro* and *greco scritto*. Minor quantities of *africano*, *breccia corallina*, *cipollino verde*, *fior di pesco*, *giallo antico*, *pavonazzetto*, *porfido rosso*, *portasanta*, and *rosso antico* were documented as well.

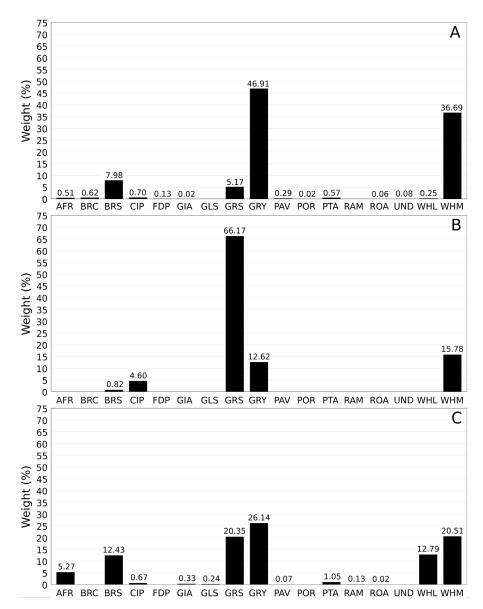


Figure 7. Bar graph of the marbles used for veneer, expressed as percentage of the total weight: (A). Augusteum; (B). Small Baths; (C). Marble depot. Marble abbreviations: AFR: africano; BRC: breccia corallina; BRS: breccia di sciro; CIP: cipollino verde; FDP: fior di pesco; GIA: giallo antico; GLS: greenish limestone; GRS: greco scritto; GRY: grey marble; PAV: pavonazzetto; POR: porfido rosso; PTA: portasanta; RAM: rosso ammonitico; ROA: rosso antico; UND: undefined polychrome marble; WHL: white limestone; WHM: white marble.

These observations are in line with recent excavation reports and seventeenth-century references that mention the use of a local white limestone pavement for the entrance of the structure and a pavement consisting of large grey and white marble slabs (c.  $60 \times 90$  cm) for the main hall [21,49]. These references further mention a polychrome marble floor for the apsis and polychrome marble plinth (50 cm high) for the walls topped with wall paintings [21]. While the white and grey marble pavement was found largely intact during recent excavations, the polychrome marbles were already stripped in the 17th century. These were partly sold and partly reused in the San Filippo Neri chapel of the *Chiesa di San Filippo* in nearby Fossombrone [49]. The marble varieties observed here are *africano*, *bardiglio*, *breccia di sciro*, *giallo antico*, *pavonazzetto*, *portasanta*, and *rosso ammonitico*. These are used at the chapel in combination with presumably post-Roman polychrome marbles, including *rosso e verde di Levanto*, *breccia medicea*, and probably *giallo mori* and *cipollino apuano* (Figure 8).



**Figure 8.** Reused polychrome marble panels in the San Filippo Neri chapel of the *Chiesa di San Filippo* in nearby Fossombrone.

Two marble reliefs, one depicting a *probatio equitum* and one of a dancing girl, are believed to have decorated the base which was placed in the apsis of the building on top of which the famous bronze statuette, the so-called Victoria of Kassel was displayed. Both are dated to the Augustan period based on their stylistic and iconographic characteristics. Archaeometric analysis identified both reliefs as being carved from material from Carrara [3]. The masonry technique applied, the recovered relief fragments, and two inscriptions place the construction of the augusteum in the Augustan period [21].

While an Augustan date for the marble application is not impossible, some remarks must be made here. First, the use of Proconnesian marble in an early imperial context is quite exceptional for central Adriatic Italy, but also for the wider Italian Peninsula. While the importance of Proconnesos as a marble supplier for the region has already been demonstrated elsewhere [12], the example here would be the earliest attested evidence of its use in central Adriatic Italy but also Italy as a whole. Second, the range of polychrome marbles in such an early context is extraordinary. This is particularly true for the use of *porfido rosso*, even though only present in a single fragment, which becomes widespread only in the 2nd century CE. It can therefore not be excluded that (part of) the marble decoration for the augusteum was installed later, perhaps as part of a later renovation of the building.

# 3.2.2. The Small Baths

The so-called Small Baths or *terme piccole* are a monumental complex that was constructed in the first half of the 1st century CE and renovated in the 2nd and 3rd centuries CE when part of the building was converted into an elite residence. As part of the renovation, marble decoration was applied in several rooms of the complex. A reused inscription in the marble pavement of one of the rooms provides a *terminus post quem* for the marble

decoration of the 2nd century CE [23]. Apart from the addition of marble decoration, several rooms were adorned in this period with wall paintings and mosaics.

Overall, for the Small Baths, *greco scritto* was the most used marble, followed at a large distance by grey and white marble (Figure 7). Further, the relative importance of *cipollino verde* is to be noted, especially in reference to its overall occurrence at *Forum Sempronii*. A similar observation of the relative importance of *cipollino verde* in bath complexes is, for example, also made at the *terme di Santa Lucia* in the nearby Roman town Sentinum [11].

# 3.2.3. The Marble Depot

For the marble depot, there is no marble variety that particularly stands out in terms of volume. Grey, white, and *greco scritto*-like marbles, as well as white limestone and *breccia di sciro* have been documented in similar volumes (Figure 7). Further, we can note a relatively high quantity of *africano*, as well as small amounts of polychrome marbles such as *cipollino verde*, *giallo antico*, *pavonazzetto*, *portasanta*, *rosso ammonitico*, and *rosso antico*. Remarkably, *greco scritto* is encountered here mainly in the form of larger, thin panels with simple moulding decoration along the edges that are part of wall decoration, while white marble and white limestone are part of thicker panels for flooring (Figure 9).



**Figure 9.** *Greco scritto* veneer panels with simple moulding decoration from the marble depot.

The archaeometric analysis of the samples from the depot suggests an origin from Carrara (Luni) (FOS006, FOS007) and Proconnesos (Marmara, Saraylar) (FOS005) for the white marbles, and Ephesos-Hasançavuslar (FOS001) for the *greco scritto*-like marble.

The nature of the structure in which these panels were found suggests an identification as a depot or storage room where marble and limestone panels were stacked after the dismantlement of another building, probably the nearby Large Baths, the unexcavated building north of the House of Aesclepius or the House of Aesclepius itself, and before being sold, reused or recycled.

#### 4. Conclusions

The mineralogical-petrographic and stable isotopic analyses carried out on six samples of architectural marble from the Roman town of *Forum Sempronii* (Marche region, Italy)

identified the material as coming from the quarries of Carrara (Luni, Italy) and Proconnesos (Marmara, Saraylar, Turkey) for white marble, and of Ephesos-Hasançavuslar for *greco scritto*-like marble. In contrast with the apparent exclusive use of Carrara and Proconnesian white marble for architectural use, the marbles identified for statuary and relief applications are more diverse and include Carrara (Luni, Italy), Pentelikon (Greece), and Thasos-1 (Cape Vathy, Thasos) [3].

The study of the polychrome marbles further identified an additional eleven lithotypes (fourteen if one includes the black/white marble from the San Filippo Neri chapel and the two granites from the columns outside the site's archaeological museum). Even though most of these stones have been documented only in small volumes, they clearly illustrate that *Forum Sempronii* had access to the main marble trade networks of the Roman Mediterranean, with imports coming from Asia Minor, Greece (mainland and Aegean islands), North Africa, and Egypt. The only polychrome stone discovered of regional origin is the so-called *rosso ammonitico* from the central Adriatic Apennine region or from the Southern Alps, near Verona, a stone which figures also among the polychrome marbles used at nearby Roman sites such as *Sentinum*, *Suasa*, *Urbs Salvia* and *Urvinum Mataurense* [1,3,10,11]

Overall, these observations are in line with those for the wider central Adriatic Italy and the rest of the Italian Peninsula [12,50]. As for chronology, the results obtained for architectural, sculptural, and relief materials indicate that imports arrived at *Forum Sempronii* already as early as the Augustan period, in particular for the decoration of the augusteum. It should be noted here that the early (i.e., Augustan) use of Proconnesian marble for architectural purposes and polychrome marbles in the augusteum are unique for the region.

**Author Contributions:** Conceptualization, D.T. and F.A.; methodology, D.T. and F.A.; investigation, D.T., F.A. and O.M.; writing—original draft preparation, D.T. and F.A.; writing—review and editing, D.T., F.A. and O.M. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research was funded by the Research Foundation—Flanders (FWO) through a post-doctoral fellowship of D.T., grant number 12N8219N.

Data Availability Statement: Not applicable.

**Conflicts of Interest:** The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

# References

- 1. Antonelli, F.; Lazzarini, L. White and Coloured Marbles of the Roman Town of Urbs Salvia (Urbisaglia, Macerata, Marche, Italy). *Oxf. J. Archaeol.* **2013**, 32, 293–317. [CrossRef]
- 2. Capedri, S.; Venturelli, G.; De Maria, S.; Uguzzoni, M.P.M.; Pancotti, G. Characterisation and Provenance of Stones Used in the Mosaics of the Domus Dei Coiedii at Roman Suasa (Ancona, Italy). *J. Cult. Herit.* **2001**, *2*, 7–22. [CrossRef]
- 3. Antonelli, F.; Columbu, S.; Lezzerini, M.; Miriello, D. Petrographic Characterization and Provenance Determination of the White Marbles Used in the Roman Sculptures of Forum Sempronii (Fossombrone, Marche, Italy). *Appl. Phys. A Mater. Sci. Process.* **2014**, 115, 1033–1040. [CrossRef]
- 4. Antonelli, F. Note sull'origine dei marmi colorati rinvenuti a Forum Sempronii. In *Domus di Forum Sempronii: Decorazione e Arredo;* Luni, M., Ed.; L'Erma di Bretschneider: Rome, Italy, 2007; pp. 107–115.
- 5. Antonelli, F.; Lazzarini, L. The Use of White Marble in the Central and Upper Adriatic between Greece and Rome: Hellenistic Stelae from the Necropolis of Ancona (Italy). *Camb. Archaeol. J.* **2013**, *23*, 149–162. [CrossRef]
- 6. Attanasio, D.; De Marinis, G.; Pallecchi, P.; Platania, R.; Rocchi, P. An EPR and Isotopic Study of the Marbles of the Trajan's Arch at Ancona: An Example of Alleged Hymettian Provenance. *Archaeometry* **2003**, *45*, 553–568. [CrossRef]
- 7. Amadori, M.L.; Gorgoni, C.; Pallante, P. Studio di provenienza dei marmi dei manufatti dalla colonia romana di potentia. In *Amore per L'Antico. Dal Tirreno all'Adriatico, dalla Preistoria al Medioevo e Oltre. Studi di Antichità in Ricordo di Giuliano de Marinis*; Baldelli, G., Lo Schiavo, F., Eds.; Scienze e Lettere: Rome, Italy, 2014; Volume 2, pp. 769–777.
- 8. Amadori, M.L.; Gorgoni, C.; Pallante, P.; Raffaelli, G.; Rinaldi Tufi, S. Identificazione e provenienza dei marmi: La statuaria romana nel museo civico malatestiano di Fano. In *Murum Dedit. Bimillenario delle Mura Augustee di Fanum Fortunae. Atti del Convegno*; Mignani, P., Pozzi, R., Eds.; Comune di Fano—Assessorato alla Cultura—Museo Civico: Fano, Italy, 2012; pp. 130–137.

9. Taelman, D. The Changing Material Culture of a Valley. Marbles and Other Stones Used as Luxury Material. In *The Potenza Valley Survey (Marche, Italy)*. Settlement Dynamics and Changing Material Culture in an Adriatic Valley between Iron Age and Late Antiquity; Vermeulen, F., Van Limbergen, D., Monsieur, P., Taelman, D., Eds.; Dià Cultura: Rome, Italy, 2017; pp. 194–198.

- Taelman, D.; Delpino, C.; Antonelli, F. Marble Decoration of the Roman Theatre of Urvinum Mataurense (Urbino, Marche Region, Italy): An Archaeological and Archaeometric Multi-Method Provenance Study. J. Cult. Herit. 2019, 39, 238–250. [CrossRef]
- 11. Taelman, D.; Antonelli, F. Provenance of the White and Polychrome Marbles Used for the Architecture and Sculpture of Roman Sentinum (Sassoferrato, Marche, Italy). *Archaeometry* **2022**, *64*, 1–24. [CrossRef]
- Taelman, D.; Van Limbergen, D.; Antonelli, F. Architectural and Sculptural Decoration of Roman Central Adriatic Italy: An Archeological and Archaeometric Approach to Region-Wide Marble Trade. Archeol. Calc. 2021, 32, 249–260.
- 13. Montanari, M. Forum Sempronii: Note storiche. In *Domus di Forum Sempronii: Decorazione e Arredo*; Luni, M., Ed.; L'Erma di Bretschneider: Rome, Italy, 2007; pp. 37–51.
- 14. Luni, M. La scoperta della città di Forum Sempronii. In *Domus di Forum Sempronii: Decorazione e Arredo*; Luni, M., Ed.; L'Erma di Bretschneider: Rome, Italy, 2007; pp. 17–36.
- 15. Gori, G.; Luni, M. Note di archeologia e topografia forosemproniense. *Picus. Studi e Ricerche Sulle Marche nell'Antichita* 1983, 3, 87–113.
- 16. Luni, M.; Mei, O. Forum Sempronii: Origini, sviluppo e abbandono della città. In *Forum Sempronii*, *I. Scavi e ricerche* 1974–2012; Luni, M., Mei, O., Eds.; QuattroVenti: Urbino, Italy, 2012; pp. 25–79.
- 17. Savelli, D.; Luni, M.; Mei, O. La città di Forum Sempronii e i suoi rapporti con il paesaggio attuale: Una discussione basata su evidenze geologico-geomorfologiche e archeologiche. *Il Quat. Ital. J. Quart. Sci.* **2004**, *17*, 185–193.
- 18. Luni, M.; Mei, O.; Nesci, O.; Savelli, D.; Troiani, F. Geomorphology and Archaeology: An Integrated Heritage along the Roman via Flaminia in the Mid Metauro River Valley (Central Italy). *Mem. Descr. Carta Geol. d'Italia* **2009**, *87*, 99–108.
- 19. Luni, M. Per il parco archeologico di Forum Sempronii. In *Domus di Forum Sempronii: Decorazione e Arredo*; Luni, M., Ed.; L'Erma di Bretschneider: Rome, Italy, 2007; pp. 15–16.
- 20. Luni, M. Forum Sempronii e i bronzi nell'area medioadriatica. In *La Vittoria «di Kassel» e l'«Augusteum» di Forum Sempronii. Un Ritorno nel Bimillenario di Augusto*; Luni, M., Ed.; L'Erma di Bretschneider: Rome, Italy, 2014; pp. 25–60.
- 21. Mei, O.; Cariddi, L.; Gasparini, M. L'area forense di Forum Sempronii: Nuovi dati architettonici e urbanistici alla luce degli scavi 2013–2017. REUDAR Eur. J. Rom. Archit. 2017, 1, 75. [CrossRef]
- 22. Luni, M. L'augusteum' et la Victoria di Forum Sempronii. In *La Vittoria «di Kassel» e l'«Augusteum» di Forum Sempronii. Un Ritorno nel Bimillenario di Augusto*; Luni, M., Ed.; L'Erma di Bretschneider: Rome, Italy, 2014; pp. 61–67.
- 23. Gori, G.; Luni, M. Edificio termale a 'Forum Semproni'. Nota preliminare. *Picus Studi Ric. Sulle Marche nell'Antichità* **1982**, 2, 119–129.
- 24. Mei, O. Forum Sempronii. Guida alla Scoperta del Parco Archeologico; Comune di Fossombrone: Fossombrone, Italy, 2020.
- 25. Moens, L.; Roos, P.; De Rudder, J.; De Paepe, P.; Van Hende, J.; Waelkens, M. A Multi-Method Approach to the Identification of White Marbles Used in Antique Artifacts. In *Classical Marble: Geochemistry, Technology, Trade*; NATO ASI Series E, Applied Sciences; Herz, N., Waelkens, M., Eds.; Kluwer Academic Publishers: Dordrecht, The Netherlands, 1988; Volume 153, pp. 243–250.
- 26. McCrea, J. On the Isotopic Chemistry of Carbonates and a Paleotemperature Scale. J. Chem. Phys. 1950, 18, 849-857. [CrossRef]
- 27. Craig, H. Isotopic Standards for Carbon and Oxygen and Correction Factor for MassSpectrometric Analyses of Carbon Dioxide. *Geochim. Cosmochim. Acta* 1957, 12, 133–149. [CrossRef]
- 28. Friedman, I.; O'Neil, J.R.; Cebula, G. Two New Carbonate Stable Isotope Standards. Geostand. Newsl. 1982, 6, 11–12. [CrossRef]
- 29. Flesch, G.D.; Anderson, A.R.; Svec, H.J. A Secondary Isotopic Standard for 6Li/7Li Determination. *Int. J. Mass Spectrom. Ion Phys.* 1973, 12, 265–272. [CrossRef]
- 30. Antonelli, F.; Lazzarini, L.; Cancelliere, S.; Dessandier, D. Minero-Petrographic and Geochemical Characterization of 'Greco Scritto' Marble from Cap de Garde, near Hippo Regius (Annaba, Algeria). *Archaeometry* **2009**, *51*, 351–365. [CrossRef]
- 31. Yavuz, A.B.; Bruno, M.; Attanasio, D. An Updated, Multi-Method Database of Ephesos Marbles, Including White, Greco Scritto and Bigio Varieties. *Archaeometry* **2011**, *53*, 215–240. [CrossRef]
- 32. Attanasio, D.; Brilli, M.; Ogle, N. The Isotopic Signature of Classical Marbles; L'Erma di Bretschneider: Rome, Italy, 2006.
- 33. Attanasio, D.; Yavuz, A.B.; Bruno, M.; Herrmann, J.J., Jr.; Tykot, R.H.; Van Den Hoek, A. On the Ephesian Origin of Greco Scritto Marble. In *Interdisplinary Studies on Ancient Stone. Proceedings of the IX Association for the Study of Marbles and Other Stones in Antiquity (ASMOSIA) Conference (Tarragona 2009)*; Gutiérrez Garcia-Moreno, A., Lapuente, P., Rodà de Llanza, I., Eds.; Institut Català d'Arqueologia Clàssica: Tarragona, Spain, 2012; pp. 245–254.
- 34. Attanasio, D.; Bruno, M.; Prochaska, W.; Yavuz, A.B. A Multi-Method Database of the Black and White Marbles of Göktepe (Aphrodisias), Including Isotopic, EPR, Trace and Petrographic Data. *Archaeometry* **2015**, *57*, 217–245. [CrossRef]
- 35. Antonelli, F.; Lazzarini, L. An Updated Petrographic and Isotopic Reference Database for White Marbles Used in Antiquity. *Rend. Lincei. Sci. Fis. Nat.* **2015**, *26*, 399–413. [CrossRef]
- 36. Lazzarini, L.; Antonelli, F. Petrographic and Isotopic Characterization of the Marble of the Island of Tinos (Greece). *Archaeometry* **2003**, *45*, 541–552. [CrossRef]

37. Lazzarini, L.; Ponti, G.; Preite Martinez, M.; Rockwell, P.; Turi, B. Historical, Technical, Petrographic, and Isotopic Features of Aphrodisian Marble. In *ASMOSIA 5. Interdisciplinary Studies on Ancient Stone. Proceedings of the Fifth International Conference of the Association for the Study of Marble and Other Stones in Antiquity, Museum of Fine Arts, Boston, 1998*; Herrmann, J.J., Jr., Herz, N., Newman, R., Eds.; Archetype Publications Ltd.: London, UK, 2002; pp. 163–168.

- 38. Attanasio, D.; Bruno, M.; Yavuz, A.B. Quarries in the Region of Aphrodisias: The Black and White Marbles of Göktepe (Mügla). *J. Rom. Archaeol.* **2009**, 22, 312–348. [CrossRef]
- 39. Brilli, M.; Lapuente, P.; Giustini, F.; Royo Plumed, H. Petrography and Mineralogy of the White Marble and Black Stone of Göktepe (Mugla, Turkey) Used in Antiquity: New Data for Provenance Determination. *J. Archaeol. Sci. Rep.* **2018**, *19*, 625–642. [CrossRef]
- 40. Wielgosz-Rondolino, D.; Antonelli, F.; Bojanowski, M.J.; Gładki, M.; Göncüoglu, M.C.; Lazzarini, L. Improved Methodology for Identification of Göktepe White Marble and the Understanding of Its Use: A Comparison with Carrara Marble. *J. Archaeol. Sci.* **2020**, *113*, 105059. [CrossRef]
- 41. Borghini, G. (Ed.) Marmi Antichi, 5th ed.; De Luca Editori d'Arte: Rome, Italy, 2004.
- 42. Gnoli, R. Marmora Romana; L'Elefante: Rome, Italy, 1988.
- 43. Price, M.T. Decorative Stone: The Complete Sourcebook; Thames and Hudson: London, UK, 2007.
- 44. Warr, L.N. IMA-CNMNC approved mineral symbols. Mineral. Mag. 2021, 85, 291-320. [CrossRef]
- 45. Préat, A.; Morano, S.; Loreau, J.-P.; Durlet, C.; Mamet, B. Petrography and Biosedimentology of the Rosso Ammonitico Veronese (Middle-Upper Jurassic, North-Eastern Italy). *Facies* **2006**, *52*, 265–278. [CrossRef]
- 46. Albertini, G. Geologia dei marmi veronesi. In *I Marmi a Verona*; Rossini, F., Ed.; Associazione Marmisti Veronesi: Verona, Italy, 1991; pp. 28–43.
- 47. Centamore, E.; Deiana, G.; Micarelli, A.; Potetti, M. Il trias-paleogene delle marche. In *La Geologia delle Marche*; Centamore, E., Deiana, G., Eds.; Università di Camerino, Dipartimento di Scienze della Terra: Rome, Italy, 1986; pp. 9–27.
- 48. Farinacci, A.; Elmi, S. (Eds.) Rosso Ammonitico Symposium Proceedings; Edizione Tecnoscienza: Rome, Italy, 1981.
- 49. Vernarecci, A. Fossombrone dai Tempi Antichissimi ai Giorni Nostri; Forni: Fossombrone, Italy, 1903.
- Taelman, D. Marble Trade in the Roman Mediterranean: A Quantitative and Diachronic Study. J. Rom. Archaeol. 2022, 35, 848–875.
  [CrossRef]

**Disclaimer/Publisher's Note:** The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.