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ORIGINAL ARTICLE

Provenance of the white and polychrome marbles used for the architecture and sculpture of roman Sentinum (Sassoferrato, Marche, Italy)

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Abstract
Samples from 22 white crystalline and one *greco scritto*-like marble artefacts (first–third centuries CE) from Roman Sentinum (Sassoferrato, Italy) were analysed to determine their provenance by thin-section microscopy, X-ray diffraction and stable isotope ratio analysis ($\delta^{18}O$ and $\delta^{13}C$). Polychrome marbles were provenanced through macroscopic examination. Results show that relief sculpture and statuary were carved in white marble from Carrara, Paros, Thasos and Naxos. Architectural white marbles were identified as Proconnesian for veneer, and Proconnesian, Parian, Dokimeion and Thasian for capitals and pediments. Polychrome lithotypes include foremost *africano*, *breccia di Sciro*, *cipollino verde*, *giallo antico*, *bardiglio* and *greco scritto* (from Ephesos-Hasançavuslar).

KEYWORDS
architecture, central Adriatic Italy, marble, Roman, sculpture, Sentinum, stable isotopic analysis, thin-section microscopy

INTRODUCTION

For the Roman elite, monumental architecture and sculpture were powerful material means to display, maintain and increase their social status. As a luxury product and a symbol of propaganda for the Roman elite, the use of marble in ever-increasing quantities was emblematic of the architectural and sculptural programmes undertaken in antiquity. Unlike building stones that were acquired generally locally, marbles and other decorative coloured stones were considered expensive luxury goods that were traded over long distance, especially from the Augustan–Tiberian period onwards (Russell, 2013; Ward-Perkins & Dodge, 1992). Particularly in regions where marbles and decorative stones are geologically absent, provenance

studies can greatly increase our knowledge on ancient trade connections (e.g., Antonelli et al., 2009a, 2010, 2015).

This paper reports the results of the characterization, identification and provenance determination of the white and polychrome marbles used at Roman Sentinum, a small inland town in central Adriatic Italy. The monumentality of the town's sculptural and architectural remains, together with the good state of conservation of its monuments, and recent excavations make Sentinum an excellent case study to enhance our understanding of the process of marmorization of central Adriatic Italy. The study offers insights into how and to what extent remote, small inland sites in the Italic Peninsula participated in the Roman marble trade, and how marble was used to embellish both public and private buildings in the typical setting of central Adriatic Italy. The results of the marble study will also contribute to the valorization of the archaeological heritage of the Roman site as part of the development of site's archaeological park and museum.

HISTORICAL AND ARCHAEOLOGICAL BACKGROUND

The site of Sentinum is located just south of the modern town of Sassoferrato (Marche region, Italy), in the foothills of the Apennine Mountains. The town was built on a fluvial terrace between the River Sentino and the Marena stream in a synclinal depression of the Apennines known as the Inner Marche Basin (Coltorti et al., 1996, 34). In Roman times, the town belonged to *Umbria et ager Gallicus*, the sixth district of Augustus' *Provincia Italia*, and was located at the intersection of an important regional road that followed the Inner Marche Basin and a side road of the Via Flaminia[1] linking the town with Sena Gallica on the Adriatic coast (Figure 1a).

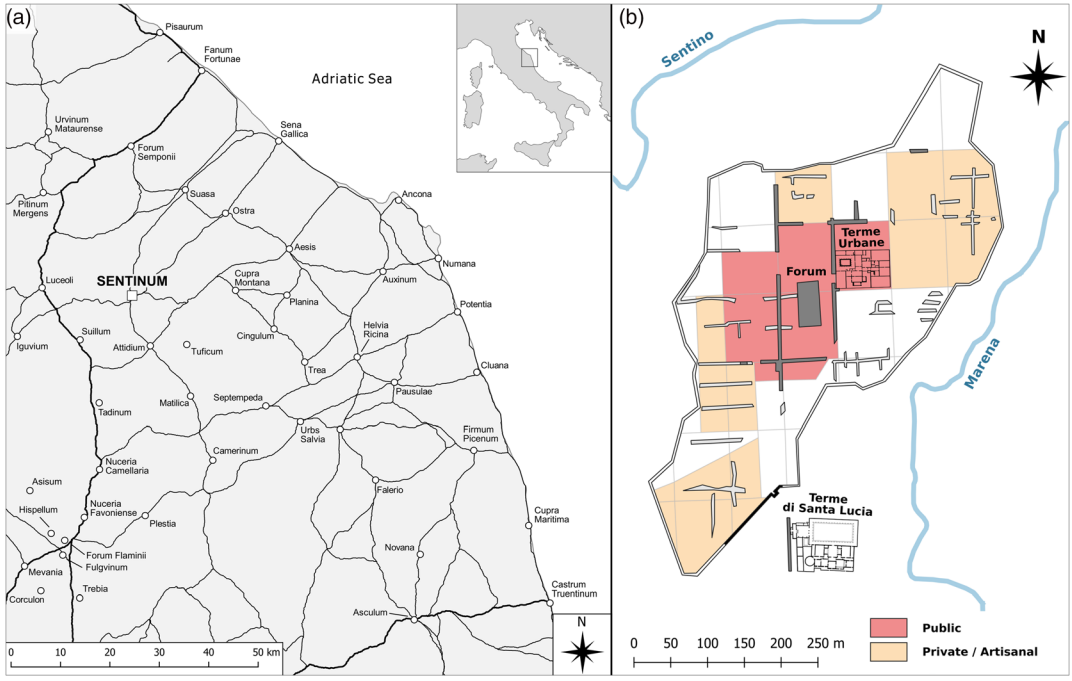

FIGURE 1 (a) Location of Sentinum in relation to the road network and other town centres in central Adriatic Italy in the Roman Imperial period; and (b) simplified town plan of Sentinum with the studied thermal complexes and the identified public zones of the Roman town (after Medri, 2008b, 214)

The site is best known from the final battle of the Third Samnite War (295 BCE) in which the Romans defeated a coalition of Samnites, Etruscans, Umbrians and Senones, and which paved the way for Roman control over Central Italy. The earliest archaeological evidence, however, dates the foundation of the settlement only in the third or early second century BCE, perhaps as a *praefectura* following the institution of the *Lex Flaminia de agro Gallico et Piceno viritim dividendo* in 232 BCE (Van Limbergen, 2015, 196). It probably received the municipal status in the first half of the first century BCE. Considerable building activity took place in Augustan times, followed by a phase of monumentalization in the late first century CE and extending throughout the second century CE (Medri, 2008a, 315). Town abandonment started in the late fourth or fifth century CE as a result of the Gothic Wars and resulted in a transfer of the settlement to the nearby strategically positioned hilltop site of Sassoferrato (Medri, 2008a, 52;, 2008b, 216–217).

Excavations and geophysical surveys revealed an irregular urban centre centred on a monumental public centre consisting of a forum complex, and commercial, administrative and religious buildings, including a tetrastyle temple, a *macellum*, a monumental fountain, a public bath building and a *compitum* (Conventi, 2008, 378; Hay & Bottacchi, 2008; Medri, 2008b, 209–212) (Figure 1b). The entire central area of the town (covering > 28,600 m^2, or about 19% of the total town area) seems to have been reserved for public space (Van Limbergen, 2015, 196–199, 541, 544). With an estimated town surface of 15 ha and an estimated maximum population of 2000 (Van Limbergen, 2015, 196–199, 541, 544), Sentinum is an exemplary case of a small town with an apparent oversizing of monumental public spaces aimed impressing the urban inhabitants, as well as travellers or visitors from the nearby countryside or neighbouring towns, typical of the urbanism in central Adriatic Italy (Vermeulen, 2017).

As for the marble application, the town's two excavated bath complexes and statuary collection stand out particularly. The Terme di Santa Lucia (extra-urban baths) is a monumental bathing complex in the town's immediate southern suburban area. The building is believed to be constructed as part of an extension of the town outside the walled area in response to population growth and a related shortage of urban space (De Marinis et al., 2008, 206). The large complex with an estimated surface area of about 7000 m^2, of which about 3000 m^2 were reserved for bathing facilities, consisted of a *vestibulum*, *atrium*, large *palaestra* with a monumental peristyle, several *apodyteria*, *frigidaria* with pools, *tepidaria*, *caldaria* and service rooms (Medri, 2014, 795) (Figure 2a). Its construction dates to the second half of the first century CE (Neronian–Flavian) according to De Marinis et al. (2008, 209–210) or the mid- to late second century CE (Hadrianic–Antoninian) according to Medri (2014, 796). The complex was modified, restored and reorganized several times before the fourth century CE, resulting in the presently preserved layout with lavish architectural decoration in the form of mosaic pavements and the extensive use of marble (De Marinis et al., 2008, 210; Medri, 2014, 793). Heavy spoliation took place after the abandonment of the building in the late fourth and early fifth centuries CE (De Marinis et al., 2008, 210).

Located in the town centre, just north-east of the forum, are the so-called Terme urbane or urban baths. Excavated sections include a large *natatio* and at least three rooms with a hypocaust (Figure 2b). The total area of the complex is estimated at about 3810 m^2 (about 67 × 57 m) (Cavallo, 2008, 367–368). The baths date initially to the Late Republic, but were enlarged and modified extensively in the Julio-Claudian period and in the late second century CE/early third centuries CE, resulting in an irregular layout of the building and its individual rooms (Cavallo, 2008, 368; Medri, 2008c, 48). The complex was abandoned probably in the fourth century CE (Medri, 2008c, 47).

SAMPLING AND ANALYTICAL PROCEDURE

Samples from 22 white crystalline and one *greco scritto*-like marble artefacts from Sentinum were analysed, including statuary, relief sculpture, funerary monuments, inscriptions and

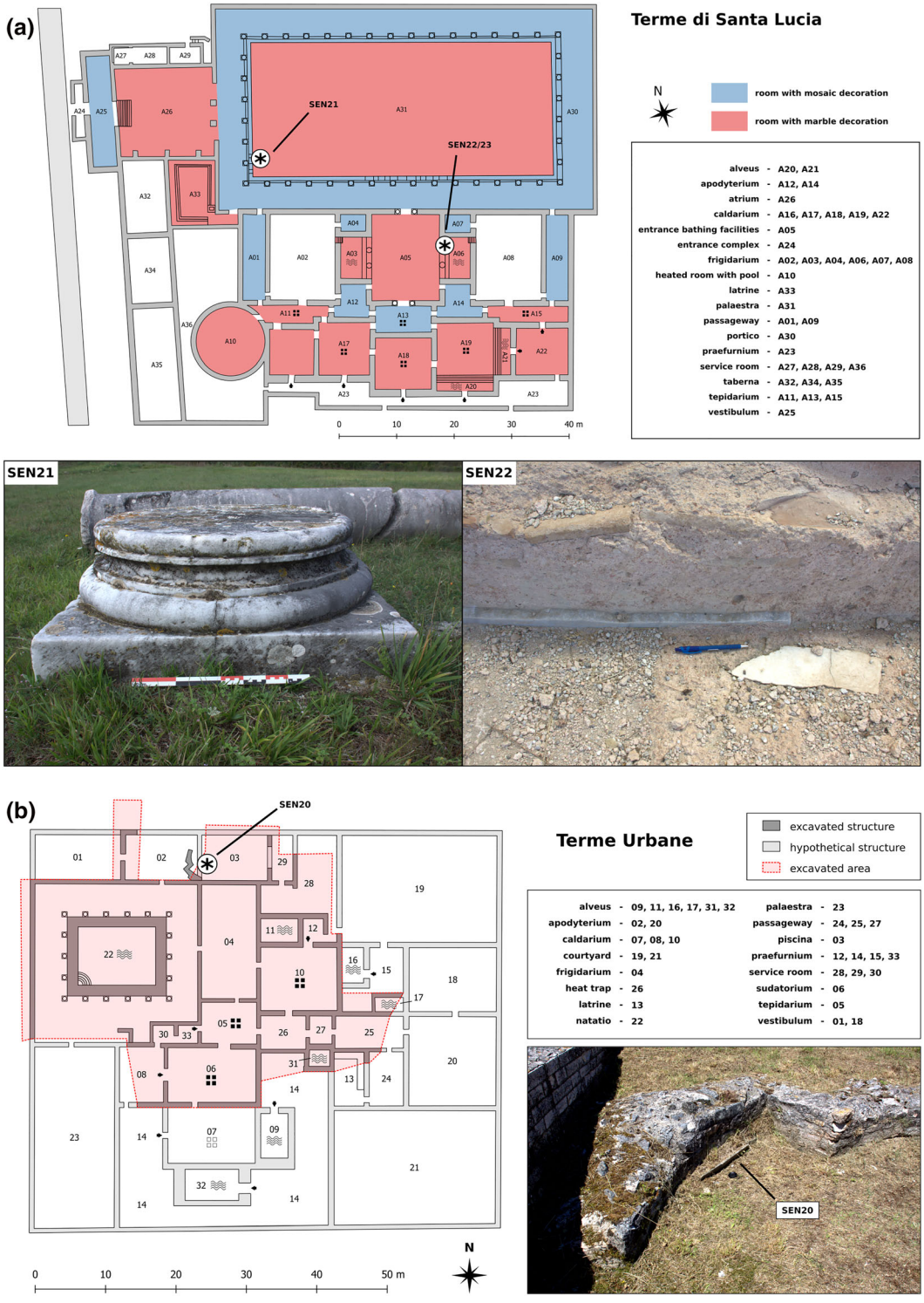

FIGURE 2 (a) Plan of the Terme di Santa Lucia (extra-urban baths), with indication of the sampling locations: SEN21 (attic column base), SEN22 (seating veneer) and SEN23 (floor veneer) (after De Marinis et al., 2008, 207–208; Medri, 2014, fig. 4); and (b) plan of the Terme urbane (urban baths), with indication of the sampling location of SEN20 (after Cavallo, 2008, tabs CVI, CVII, CVIII)

TABLE 1 Marble artefacts sampled and analysed

Sample	Location	Marble	Type	Description	Chronology
SEN01	Museum	WHM	Capital	Corinthian capital	Roman Imperial
SEN02	Museum	WHM	Capital	Corinthian capital	Roman Imperial
SEN03	Museum	WHM	*Oscillum*	*Oscillum* with centaur	1st–mid–2nd century CE
SEN04	Museum	WHM	Pediment	*Tympane* of a pediment with a *genius* and acanthus leaves	Late 2nd–early 3rd century CE
SEN05	Museum	WHM	Statue	Lion's head	Late 1st–early 2nd century CE
SEN06	Museum	WHM	Well-head	Doric well-head	Roman
SEN08	Museum	WHM	Pediment	Cornice of a pediment	Roman
SEN09	Museum	WHM	Funerary urn	*Aedes*-shaped urn	1st–early 2nd century CE
SEN10	Museum	WHM	Statue	Heroic, semi-nude male	Julio-Claudian
SEN11	Museum	WHM	Statue	Cuirass statue	1st–2nd century CE
SEN12	Museum	WHM	Statue	Cuirass statue	1st–early 2nd century CE
SEN13	Museum	WHM	Statue	Portrait of a man	First half of 1st century CE (Julio-Claudian)
SEN14	Museum	WHM	Statue	Portrait of a man	Trajanic (98–117 CE)
SEN15	Museum	WHM	Statue	Portrait of a man	Hadrianic–Antonine (117–192 CE)
SEN16	Museum	WHM	Statue	Head of a bearded god	Early 2nd century CE
SEN17	Museum	WHM	Statue	Cuirass statue (Aeneas-group?)	Early 1st century CE
SEN18	Museum	WHM	Inscription	CIL IX 5754	Late 1st–early 2nd century CE
SEN19	Museum	WHM	Inscription	CIL XI 5744	Flavian–Trajanic (69–117 CE)
SEN20	*Terme urbane*	WHM	Veneer	Wall veneer	Before late 2nd–early 3rd century CE
SEN21	Terme di Santa Lucia, Room A30/A31	WHM	Column base	Attic column base	Hadrianic–Antonine (117–192 CE)
SEN22	Terme di Santa Lucia, Room A06	WHM	Veneer	Seating veneer	Hadrianic–Antonine (117–192 CE)
SEN23	Terme di Santa Lucia, Room A06	WHM	Veneer	Floor veneer	Hadrianic–Antonine (117–192 CE)
SEN24	Terme di Santa Lucia, depot	GRS	Veneer	Veneer	Hadrianic–Antonine (117–192 CE)

Note: WHM, white marble; and GRS, *greco scritto*-like marble.

architectural elements from the Museo Archeologico Sentinate e Sala Perottiana, from *in situ* preserved architectural decoration of the town's two bath complexes (Terme di Santa Lucia and Terme urbane) as wells as from the site's excavation depot. The sampled artefacts are a

representative selection for the marble sculpture and architecture of the site, with samples chosen to maximize the chronological variation of the artefacts (mainly between the first and third centuries CE) and to possibly represent the full range of white marble varieties found at the site thus far as based on macro- and mesoscopic properties (i.e., structure, average crystal size, colour and translucency) (Table 1 and see Appendix 1).

Each sample was examined using a multi-technique approach combining mineralogical–petrographic and stable isotopic analyses of C and O. Thin sections were studied under a polarizing microscope to define the main petrographic features—fabric, microstructure, maximum grain size of carbonate crystals (MGS) (Moens et al., 1988), calcite/dolomite boundary shapes—as well as the presence and relative abundance of accessory minerals. The possible presence of dolomite was evaluated using X-ray diffraction. C and O isotopic ratios were determined according to the procedure outlined by McCrea (1950), through a Gasbench II preparation line connected online to a ThermoFinnigan Five Plus mass spectrometer in a continuous flow mode. Carbonate powders were reacted with 100% phosphoric acid at 70°C. Isotopic results are expressed as delta values (δ^{13}C‰ and δ^{18}O‰) relative to Vienna-Pee Dee Belemnite (V-PDB) (Craig, 1957). Reproducibility was verified by replicate analyses of laboratory standards calibrated to NBS19 (Friedman et al., 1982) and LSVEC (Flesch et al., 1973) and is better than ±0.04‰ for δ^{18}O and ±0.07‰ for δ^{13}C. Results of the analyses were compared with data reported in the literature to determine the most likely provenance (Antonelli & Lazzarini, 2015; Antonelli et al., 2009b; Attanasio et al., 2012; Lazzarini & Antonelli, 2003; Wielgosz-Rondolino et al., 2020; Yavuz et al., 2011).

The identification of polychrome lithotypes (including coloured marbles, limestones, breccias, granitoids and porphyries) was carried out by using a standard accepted procedure in marble studies, which is based both on the specific experience of the authors and comparative macro- and mesoscopic analysis of rock type: colour, veining, macrofossil presence mineral or clasts distribution and general texture in hand specimens. Conclusive identification and provenance determination were also obtained by comparison with reference collections and available image databases (Borghini, 2004; Gnoli, 1988; Price, 2007). The nomenclature adopted for the polychrome lithotypes refers to that used standardly in studies on Roman marble trade (Borghini, 2004; Gnoli, 1988). The catalogue of coloured stones and marbles identified is presented in Appendix 2 (after Antonelli et al., 2020).

RESULTS

Results of the mineralogical–petrographic and isotopic analyses of the 22 white crystalline and one *greco scritto*-like studied marble artefacts are given in Table 2 and Figures 3–5.

Terme di Santa Lucia

The original marble decoration of the Terme di Santa Lucia is only preserved in the *palaestra*, the large central entrance room to the bathing area, the entrance *atrium* and the *frigidarium* pools. The *palaestra* (rooms A30–A31) was lined with columns in *portasanta* marble from Chios (Greece) (diameter 65–75 cm) which were placed on top of Attic column bases in white marble and crowned with Corinthian–Asiatic capitals, the origin of which could not be verified as no capitals are preserved. The column shafts in *granito violetto* (Troad granite), which are now on display, do not come from the site, but were brought here from a nearby Roman rural sanctuary. The marble for the bases (SEN21) is purely calcitic and displays abundant graphite in thin section. Opaque minerals and traces of quartz, potassic mica, plagioclase and apatite can be observed as accessory phases. The marble has a heteroblastic fabric and a mortar

TABLE 2 Mineralogical–petrographic features, isotopic values and suggested provenance of the white and greco scritto-like marble artefacts analysed from Sentinum

	Petrography				Mineralogy							Stable isotopes		
Sample	Texture	Microstructure	CBS	MGS (mm)	Dol	Qtz	Gr	op	Kmca	Pl	Ap	$\delta^{13}C$	$\delta^{18}O$	Suggested provenance
SEN01	He	Mosaic	Curved, embayed	0.92								1.96	−3.40	Paros-1
SEN02	He	Mosaic, weakly foliated	Embayed	1.15			+		±			1.78	−3.60	Dokimeion (Afyon)
SEN03	Ho/he	Mosaic, partially heteroblastic	Curved ± straight	0.65		±	±		±			2.16	−1.72	Carrara (Luni)
SEN04	He	Mortar, strained crystals	Embayed ± sutured	2.30			+		±		±	3.31	−2.55	Proconnesos-1 (Marmara)
SEN05	Ho	Mosaic, some triple points	Straight, curved	0.52		±		+ (Py)	±		±	2.23	−1.81	Carrara (Luni)
SEN06	He	Mosaic, strained crystals	Embayed, curved	2.80		+	±	±	+			2.12	−1.06	Paros-2(3)
SEN08	He/ho	Mosaic, weakly foliated	Sutured, curved ± embayed	1.72	+++	+	±	++ (Py)	+		±	3.42	−1.12	Thasos-3
SEN09	Ho	Polygonal/mosaic	Straight	0.48			+					1.27	−2.28	Carrara (Luni)
SEN10	Ho/He	Mosaic, partially heteroblastic	Curved ± straight	0.67		±				±	±	2.33	−1.58	Carrara (Luni)
SEN11	Ho/He	Mosaic, weakly foliated	Curved, straight	0.65	±				+			1.80	−1.37	Carrara (Luni)
SEN12	Ho	Mosaic, some triple points	Straight ± curved	0.57	±	±				±		1.99	−2.21	Carrara (Luni)
SEN13	He	Mosaic	Sutured ± embayed	3.10		+	++	±	+		±	0.65	−6.50	Naxos
SEN14	He	Mosaic	Curved, embayed	2.50			±					2.20	−3.60	Paros-2(3)
SEN15	He	Mosaic	Curved ± embayed	1.60			±				±	4.24	−3.03	Paros-1

(Continues)

TABLE 2 (Continued)

	Petrography				Mineralogy							Stable isotopes		
Sample	Texture	Microstructure	CBS	MGS (mm)	Dol	Qtz	Gr	op	Kmca	Pl	Ap	$\delta^{13}C$	$\delta^{18}O$	Suggested provenance
SEN16	He	Mosaic	Curved	1.20								5.05	−2.94	Paros-1
SEN17	Ho/he	Mosaic, weakly foliated	Straight, curved	0.85		++	±	++	+++	±		1.75	−1.60	Carrara (Luni)
SEN18	He	Mosaic	Curved ± embayed	2.88			++					3.33	−1.45	Paros-2(3)
SEN19	He	Mortar	Sutured ± embayed	2.60			++	+			±	3.25	−2.38	Proconnesos-1 (Marmara)
SEN20	He	Mortar	Embayed ± sutured	1.90			++	±	±			3.40	−2.28	Proconnesos-1 (Marmara)
SEN21	He	Mortar	Sutured ± embayed	2.84		±	+++	+	±	±	±	2.53	−0.83	Proconnesos-1 (Marmara)
SEN22	He	Mortar	Sutured, embayed	2.82			++				±	2.54	−0.51	Proconnesos-1 (Marmara)
SEN23	He	Mortar	Embayed	2.80			+++	+	±		±	2.88	−0.98	Proconnesos-1 (Marmara)
SEN24	He	Mosaic, weakly foliated	Embayed ± sutured	1.75		+	+++	± (hem)	+	±	+	2.96	−2.87	Hasançavuslar

Note: Mineral abbreviations follow the recommendations of the International Union of Geological Sciences (IUGS) subcommission on the systematics of metamorphic rocks: Ho, homeoblastic; He, heteroblastic; +++, very abundant; ++, abundant; +, present; and ±, traces.

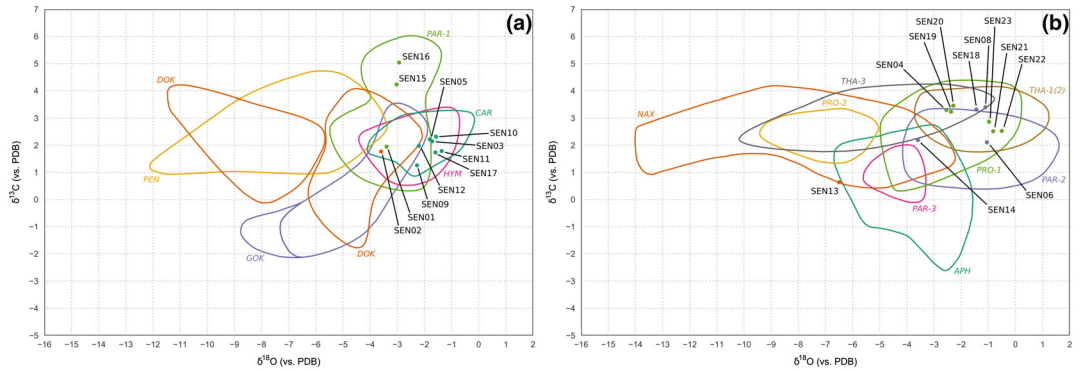

FIGURE 3 Stable isotope diagrams of the white marble samples from Sentinum: (a) white fine-grained marbles (MGS ≤ 2 mm) (CAR, Carrara; DOK, Dokimeion; GOK, Göktepe; HYM, Hymettos; PAR-1, Paros-1; PEN, Pentelikon); and (b) white medium- to coarse-grained marbles (MGS > 2 mm) (APH, Aphrodisias; NAX, Naxos; 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). Isotopic fields are from Antonelli and Lazzarini (2015)

microstructure. Calcite crystals show sutured and embayed boundaries. The MGS of calcite is 2.84 mm. Stable isotope values are −0.83‰ and 2.53‰, respectively, for $\delta^{18}O$ and $\delta^{13}C$. Mineralogical–petrographic and isotopic data point to an origin for the specimen from Proconnesos (variety 1: Marmara, Saraylar, Turkey) (Figure 3b, and Table 2).

The two *frigidarium* pools (rooms A03 and A06) were dressed with medium- to coarse-grained white marble revetment (SEN22 and SEN23) with MGSs of 2.82 and 2.80 mm, respectively. The samples are purely calcitic with abundant graphite, traces of opaque minerals, apatite and potassic mica as accessory phases. Both samples have a heteroblastic fabric and a mortar microstructure (Figure 4h). Calcite boundary shapes are embayed to sutured. $\delta^{13}C$ and $\delta^{18}O$ values are, respectively, 2.54‰ and −0.51‰ for SEN22 and 2.88‰ and −0.98‰ for SEN23. For both samples, a provenance from Proconnesos (variety 1: Marmara) is suggested (Figures 3b, 4g, and Table 2).

The most lavishly decorated room of the complex is without doubt the large central entrance room to the bathing area (room A05), which was entirely paved with rectangular marble slabs of *cipollino verde* from Euboea (Greece), the largest of which measure up to 185 × 85 and 88 × 88 cm. Irregular inserts of *giallo antico*, grey Proconnesian marble and *bardiglio*[2] suggest that the floor was restored. The exact date of restoration, however, remains unclear, but it took place probably before the gradual abandonment of the building in the fourth century CE. Small leftover pieces and reused fragments of *breccia corallina*, *breccia di Sciro*, *cipollino verde*, *giallo antico*, *portasanta*, *rosso antico*, as well as grey Proconnesian and white marble were used in the mortar bed as support for the overlaying veneer slabs.

Excavation reports also further mention marble decoration in the *atrium* of the entrance, the latrines and different rooms destined for bathing (De Marinis et al., 2008, 207–208). An impression of the marble decoration of these rooms could be obtained from the marble fragments currently stored in the site depot (364 fragments totalling 114.22 kg). In addition to white marble veneer that forms the bulk of the material, *africano*, *giallo antico*, *cipollino verde* and grey marbles (*bardiglio* from the Carrara quarries and a variety of unknown provenance) seem to have been the main marble types used for decorating the bath complex. Other observed lithotypes are a *greco scritto*-like marble, *pavonazzetto*, *breccia di Sciro* and few fragments of *breccia corallina*, white alabaster, *verde antico* and *rosso ammonitico* (Figure 6).

The latter is the only variety of decorative stone that was obtained in the wider region of the site. It concerns a red-to-pink nodular limestone with abundant ammonites and other fossils of

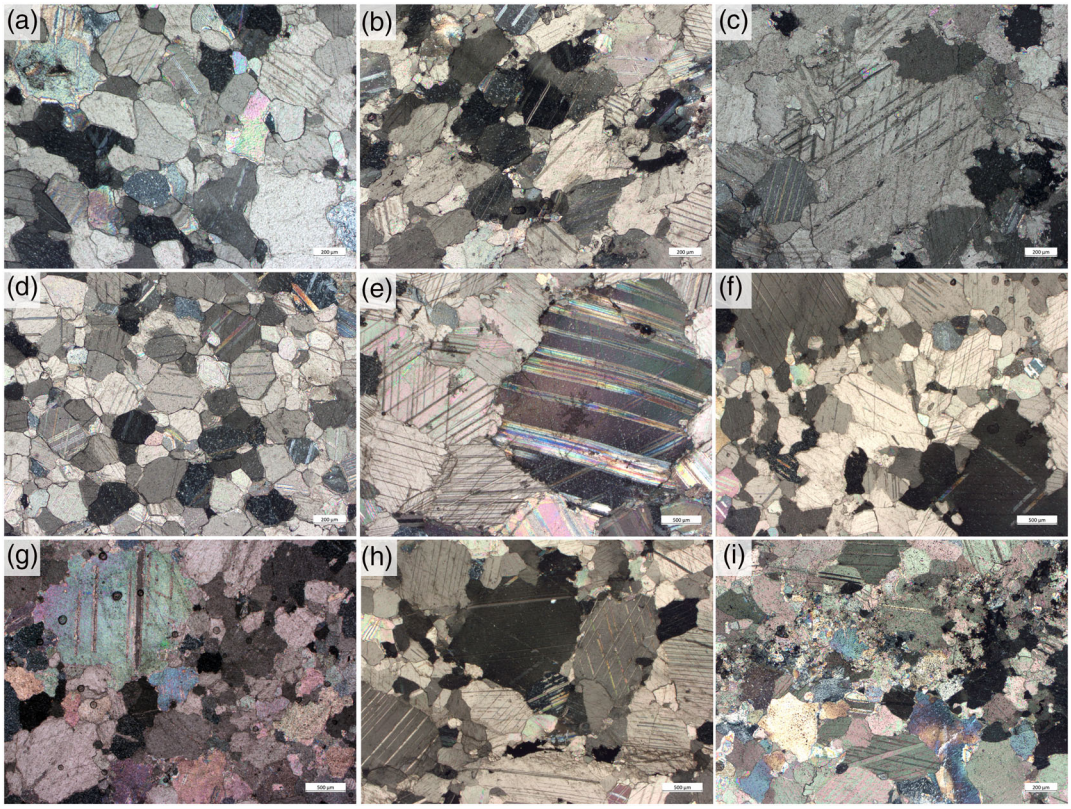

FIGURE 4 Photomicrographs under crossed polars of the representative fabrics of the marbles analysed: (a) SEN001: heteroblastic, mosaic microstructure, embayed boundary shapes of calcite crystals—Paros-1 (Stephani, Paros, Greece); (b) SEN002: heteroblastic, mosaic, weakly foliated microstructure, embayed boundary shapes of calcite crystals—Dokimeion (Afyon, Turkey); (c) SEN008: heteroblastic–homeoblastic, mosaic, weakly foliated microstructure, sutured and curved to embayed boundary shapes of calcite crystals—Thasos-3 (cape Vathy, Thasos, Greece); (d) SEN009: homeoblastic, polygonal/mosaic microstructure, straight boundary shapes of dolomite crystals—Carrara (Italy); (e) SEN013: heteroblastic, mosaic microstructure, sutured to embayed boundary shapes of calcite crystals—probable provenance: Naxos (Aegean, Greece); (f) SEN018: heteroblastic, mosaic microstructure, curved to embayed boundary shapes of calcite crystals—Paros-2(3) (Lakkoi, Paros, Greece); (g) SEN19 and (h) SEN022: heteroblastic, mortared microstructure with sutured to embayed boundary shapes of calcite crystals—Proconnesos-1 (Marmara, Turkey); and (i) SEN24: greco scritto-like marble, heteroblastic, mosaic microstructure and embayed to sutured boundary shapes of calcite crystals—Hasançavuslar (Ephesos, Turkey)

Jurassic age that can be traced back to various deposits in the southern Alps, near Verona (Albertini, 1991; Price, 2007, 115), and in the central Adriatic Apennines, within the Rosso Ammonitico Formation of the Umbro-Marchigiana Sedimentary Succession (Farinacci & Elmi, 1981). Thus far, its use in Roman times has been attested mainly in north-eastern Italy (Verona, Reggio Emilia and Aosta) (Bortolaso & Appolonia, 1992; Price, 2007, 115; Reghizzi et al., 2014) and in central Adriatic Italy (*Urbs Salvia*, *Suasa* and *Urvinum Mataurense*) (Antonelli & Lazzarini, 2013a; Capedri et al., 2001; Taelman et al., 2019).

The *greco scritto*-like marble sample (SEN24) studied under the optical microscope displays an MGS of 1.75 mm and a heteroblastic fabric. Calcite crystals have embayed to sutured boundaries and form a weakly foliated mosaic microstructure. Accessory minerals include abundant graphite, some quartz, potassic mica and apatite. Traces of opaque minerals (hematite) and plagioclase have been observed as well. Stable isotope values are −2.87‰ and 2.96‰ for $\delta^{18}O$ and $\delta^{13}C$, respectively. The mineralogical–petrographic data recorded clearly

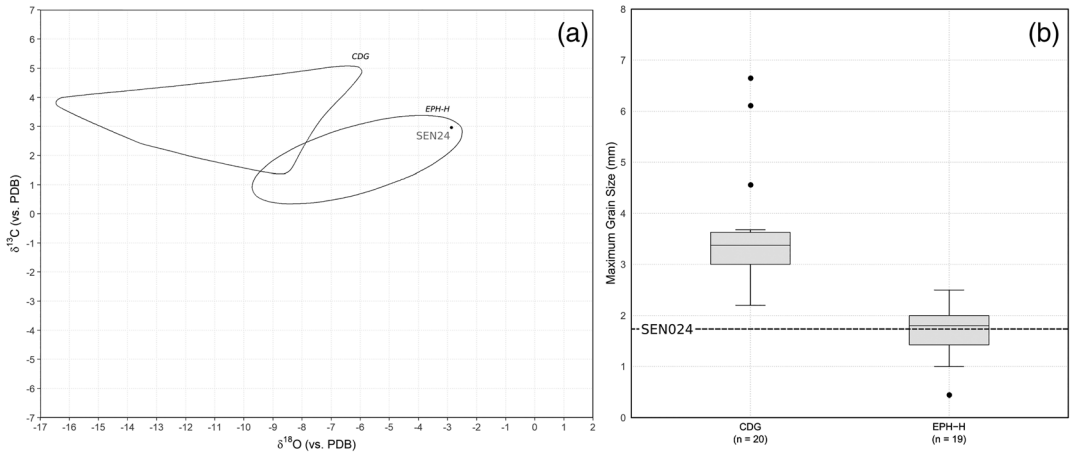

FIGURE 5 Greco scritto-like marble sample (SEN24) from Sentinum: (a) stable isotope diagram; and (b) box plot for maximum grain size. Quarry abbreviations: CDG, cap de Garde; and EPH-H, Ephesos-Hasançavuslar. Quarry data are from Antonelli et al. (2009b) and Yavuz et al. (2011)

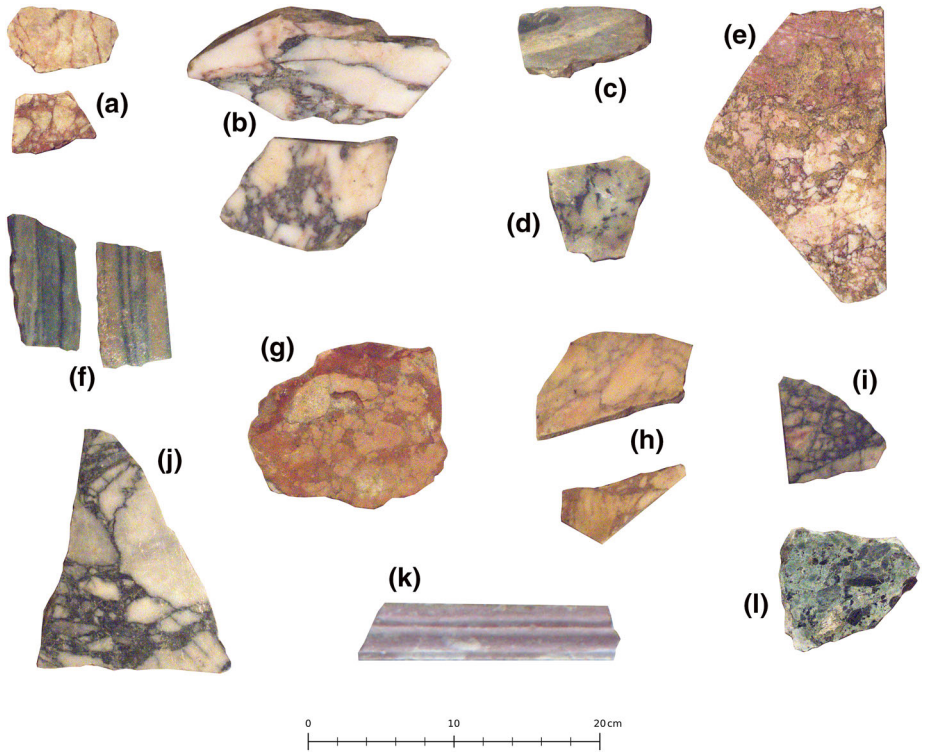

FIGURE 6 Overview of the polychrome marbles from the Terme di Santa Lucia: (a) breccia corallina; (b) breccia di Sciro; (c) bardiglio; (d) greco scritto; (e) portasanta; (f) cipollino verde; (g) rosso ammonitico; (h) giallo antico; (i) africano; (j) pavonazzetto; (k) rosso antico; and (l) verde antico

exclude an Algerian origin from Cap de Garde for this marble (Antonelli et al., 2009b), whereas they are compatible with these observed for some specimen from Hasançavuslar quarry sampled by one of the authors (unpublished data); furthermore, the O and C isotopic ratios fit well in terms of the Hasançavuslar quarries exploited in the Ephesus region, so the latter is here suggested as the most likely source area (Figures 4i, 5, and Table 2). The lack of published detailed mineralogical and petrographic descriptions of a sufficiently large set of samples of the Hasançavuslar marble, however, makes this identification not entirely secure.

Terme urbane

Remains of marble decoration for the Terme urbane are fragments of white marble wall veneer (SEN20) in an apsidal room that dates before the final phase of the complex. The sample concerns a fine- to medium-grained, purely calcitic white marble. Accessory minerals are mainly graphite, together with traces of potassic mica and opaque minerals. The specimen shows a heteroblastic fabric and a mortar microstructure with embayed to sutured calcite boundaries. The MGS is 1.90 mm. Isotopic $\delta^{18}O$ and $\delta^{13}C$ ratios are $-2.28‰$ and $3.40‰$, respectively. Mineralogical–petrographic observations and the isotopic signature point to an origin of the marble from Proconnesos (variety 1: Marmara) (Figure 3b, and Table 2).

Museum collection

A total of 16 of the 18 white marble samples are purely calcitic, two samples (SEN11 and SEN12) show traces of dolomite and one sample (SEN08) has dolomite as its main carbonate phase. Accessory minerals are mainly quartz, graphite, potassic mica, apatite and opaques. Plagioclase was detected in some samples (Table 2). The MGS ranges from 0.48 to 3.10 mm. Based on grain size, a distinction can be made between fine-grained and medium- to coarse-grained marbles, respectively, with an MGS ≤ 2.00 mm (12 samples) and an MGS > 2.00 mm (six samples). Medium- to coarse-grained marbles show heteroblastic fabrics and have curved to sutured calcite boundaries forming mosaic or mortar microstructures. Fabrics for the fine-grained white marbles range from homeo–heteroblastic to completely heteroblastic. Only SEN05, SEN09 and SEN12 are purely homeoblastic, with occasional triple points. Some samples show weak foliation and crystal straining. Crystal boundaries vary from straight to sutured. Stable isotope values range from $-3.60‰$ to $-1.06‰$ for $\delta^{18}O$ and from $1.27‰$ to $5.05‰$ for $\delta^{13}C$. With values of $-6.50‰$ for $\delta^{18}O$ and $0.65‰$ for $\delta^{13}C$, sample SEN13 is the only one outside this range. SEN13 is also the sample with the largest MGS (3.10 mm).

These results suggest a provenance for the Sentinum white marble museum objects principally from the quarries of Carrara (Apuan Alps, Italy) (seven samples), Proconnesos-1 (two samples) and Paros (Cyclades, Greece) (six samples). For the latter, three samples have been identified as the Paros-1 (lychnites) variety and three samples as Paros-2(3) from Lakkoi. The remaining samples can be attributed to the quarries at Dokimeion (Afyon, Ischehisar, Turkey) (one sample), Naxos (Cyclades, Greece) (one sample) and Thasos (Northern Aegean, Greece) (one sample), in particular the dolomitic variety from Cape Vathy/Saliara (Thasos-3).

Statuary fragments of torsos and bodies, that is, a heroic, semi-nude male (SEN10) and three cuirass statues (SEN11, SEN12, SEN17), were exclusively carved in white marble from Carrara. The chronology of the objects spans from the early first to the second centuries CE. The possible risk of confusing the Göktepe marble for the Carrara one was avoided (without recurring to the evaluation of the Sr content) because samples fall outside the isotopic field of the Microasiatic lithotype (Figure 3b) or contain traces of dolomite and/or presence of quartz

and plagioclase, that is, accessory phases not recorded for the Göktepe marble which is purely calcitic (Attanasio et al., 2013; Wielgosz-Rondolino et al., 2020).

Three portrait heads, dated from the early first to the mid-second centuries CE, were carved in marble from Paros, that is, Paros-1 (lychnites) variety (SEN15, SEN16) and in Paros-2 (3) (Lakkoi) variety (SEN14). A portrait of an unknown man dating to the Julio-Claudian period (SEN13) was hypothesized to be carved in Naxian marble based mainly on the high MGS and isotopic values (Table 2). A final statuary fragment was a lion's head that was probably part of a funerary monument (SEN05) which was carved in marble from the Carrara quarries (Figure 7).

Corinthian capitals were made of Paros-1 (SEN1) and Dokimeion (SEN02) marble. Pediments of funerary monuments were made from marble obtained in Proconnesos-1 (SEN04) and the dolomitic marble variety from Thasos (Thasos-3) (SEN08). The pediments date to the second or early third centuries CE. A Doric well-head was made in Paros-2(3) marble (SEN06) (Figure 7).

An inscription (SEN18) that was dedicated to C. Fullonius Verecundus and C. Fullonius Priscus, both municipal magistrates (*aediles*) in Sentinum, and which was erected by their father C. Fullonius Honoratus, municipal priest of the imperial cult, was carved in Paros-2(3) marble. A second inscription (SEN19) is an honorific inscription, part of a statue base, describing the career of unknown equestrian of the Flavian period. It was carved in Proconnesian-1 marble (Figure 7).

Two final analysed objects were a small *aedes*-shaped funerary urn (SEN09), dated between the first and early second centuries CE, and an *oscillum* depicting a bearded and long-haired centaur (SEN03), dated to the Early Imperial period (first to mid-second centuries CE). Both samples were identified as made of Carrara marble (Figure 7).

DISCUSSION

The Mediterranean basin has abundant attractive white marbles, many of which were exploited in the Roman period. Correct characterization of these white marbles is generally a difficult task as the variations in the colour, texture and structure of these rocks tend to occur within single outcrops or quarries. Moreover, inter-quarry similarities are very frequent, and many white marbles can display very similar macroscopic and petrographic features. It is therefore a prerequisite for marble studies to be based on more advanced characterization techniques. Since the mid-1960s, when scientific marble provenancing in archaeology started (Antonelli & Lazzarini, 2015, *passim*), advances in archaeometric methodologies in combination with extensive quarry sampling have significantly improved the reliability of provenance determinations of archaeological marble artefacts. Specifically for white marbles, a multimethod approach is applied here that principally relies on a combination of mineralogical–petrographic observations (mineralogy, fabric, texture, maximum grain size and grain boundary shape) and stable isotopic analysis of C and O.

Even though Sentinum can be categorized as a small inland Roman town, it was characterized by impressive public monumental architecture with elaborate marble decoration. The earliest marble imports arrived at the site in the form of white marble statuary in the early first century CE. Provenance data suggest a distinction in marble use between statuary bodies and portrait heads, with Carrara being preferred for the former and more prestigious imports from the Aegean (Paros and Naxos) for the latter. The use of Naxian marble is particularly noteworthy as it represents a rare example of portrait sculpture in Roman Central Italy in this lithotype.

Marble imports for architecture started in the second century CE when public building such as the town's bathing complexes were renovated. The results of the analyses of the

FIGURE 7 Selection of the museum objects analysed from Sentinum

architectural marbles show a clear preference for Proconnesos, especially for veneer applications. On the basis of their isotopic signature, samples SEN21, SEN22 and SEN23 could share a common quarrying district, but seem to be from a different extractive site at Proconessos with respect to that of samples SEN04, SEN19 and SEN20 (Figure 3b). The importance of Proconnesos is not surprising and has been observed at other nearby sites (e.g., *Urvinum Mataurense*, Ancona and *Suasa*) (Attanasio et al., 2003; Capedri et al., 2001; Taelman et al., 2019). The significance of Proconnesos as a marble source for central Adriatic Italy is further illustrated by an honorific inscription of the Flavian/Trajanic chronology for an unknown equestrian, representing an early import of this marble not only in

the region but also in the wider Italian Peninsula. More elaborate architectural elements, such as capitals and pediments, used a wider range of marble varieties from Paros-1, Paros-2 (3), Dokimeion and Thasos-3. The identification of Paros-1 and Thasos-3, two marble varieties generally used for sculpture only, and Dokimeion marble, which was imported from inland Asia Minor, is surprising and unusual in Roman Italy.

Overall, the spectrum of white marbles, in combination with imported polychrome marbles from Italy, mainland Greece, the Aegean islands, Asia Minor and North Africa, suggests that Sentinum, like other Roman towns in the region (such as Fanum Fortunae, Forum Sempronii, Ostra, Potentia, Septempeda, Suasa, Trea, Urbs Salvia and Urvinum Mataurense) (Amadori et al., 2012; Antonelli & Lazzarini 2013b; Antonelli et al., 2014; Capedri et al., 2001; Lugli & Pallante, 2015; Taelman, 2017; Taelman et al., 2019), had good access to the Roman marble market, notwithstanding its remote inland location and the related overland transport difficulties to reach the town (Figure 1a).

This study illustrated that that Sentinum was a flourishing town with important investments in marble statuary and marble architecture between the first and third centuries CE. This is particularly visible in the Terme di Santa Lucia that were constructed not only for the town's inhabitants but also for visitors and those from the nearby countryside. While there is no direct information on the identity of these elite investors at Sentinum, epigraphic evidence can give some insights into the town's prominent families. Of particular importance are several attestations of members of Rome's upper societal classes (up to senatorial rank). An unknown equestrian officer starting as centurion and later becoming governor of Baetica, Mauretania Tingitana, Mauretania Caesariensis, Germania Superior, Germania Inferior and Belgica was honoured by an inscription in Flavian/Trajanic times (CIL XI 5744) (Le Bohec, 2008, 33–34). In the same period, a funerary inscription was erected in honour of Gaius Aetrius Naso, an equestrian who had served as a *praefectus* of the *cohors Germanorum* and as a *tribunus militum* of *legio I Italica*. The inscription mentions specific acts of munificence including the instruction to erect a monument, probably an equestrian statue, for him after his death but also a bequest of 120,000 *sesterces* to the citizens of Sentinum (CIL XI 5745) (Le Bohec, 2008, 34–35; Wen, 2018, 46). Another elite inscription mentions a dedication by Caius Memmius Caecilianus Placidus, a consul of African origin, to *Minerva Matusia* in the third century CE (Paci, 2008; Petraccia, 2010, 57). Finally, several inscriptions from Sentinum refer to the Satria family (e.g., CIL XI 5761). According to Petraccia (2010, 58), it is very probably that the Satrii of Sentinum were affiliated to Marcus Satrius, a *praefectus equitum* who became praetor in 45 BCE and was involved in the assassination of Julius Caesar in 44 BCE. The connection of Marcus Satrius with Sentinum is also suggested by Coarelli (1998), who identifies the famous equestrian group of the Cartoceto bronzes from Pergola (near Sentinum) as representing Marcus Satrius and his family.

Despite the opulence of the town and its elite inhabitants, as illustrated by the monumental architecture of the town, its lavish marble sculptural and architectural decoration and epigraphic record, the marble panorama of Sentinum shows some significant absences, for both white and polychrome marbles. Among the analysed sculptures, no Pentelic or Thasian imports have been identified. Likewise, no portrait sculpture and even architectural elements in Carrara marble have been attested thus far. As for polychrome marbles, imports from the imperial quarries such as porphyries and granites are completely lacking. In general, we can say that the opulence of the town was not as much reflected in the application of a wide variety of polychrome marble, but more through the extensive application of the material. It needs to be noted, however, that only a part of the town's monumental buildings have been unearthed, and that the views on the marble imports of the town possibly need to be updated in future as more research is carried out on-site.

CONCLUSIONS

From the Imperial period onwards, the urban development of Sentinum was strongly focused on the monumentalization of the town through the construction and renovation of monumental public buildings and the application of marble architecture and sculpture. Initially, the Sentinum local patronage relied on marble sculpture to impress the inhabitants of and visitors to the town. Marble provenance data defined the origin of the sculptural marble from the quarries at Carrara (for statuary bodies) and at Paros and Naxos (for portrait heads). Throughout the late first and second centuries CE, large-scale investments were made to import architectural marble. Key examples are the town's two bathing complexes. Architectural marble imports included foremost Proconnesian marble for veneer, as well several types of polychrome marbles from some of the main marble quarries in the Mediterranean (foremost *africano*, *giallo antico* and *cipollino verde*). More elaborated architectural elements were carved in more prestigious white marbles such as Paros-1, Paros-2(3), Dokimeion and Thasos-3.

Despite being a small town located in inland central Adriatic Italy, at the foothills of the Apennines, Sentinum shows a remarkably rich marble provision that is without doubt connected to the presence of several members of the higher Roman elite in the town as illustrated by the epigraphic record.

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ENDNOTES

[1] The Via Flaminia was a consular road constructed in 223–220 BCE that connected Rome with the Adriatic Sea and later with Northern Italy and the Danubian provinces (Laurence, 1999, 22; Renzulli et al., 1999).

[2] *Bardiglio* is the name of the dark grey variety (the colour is due to finely dispersed carbonaceous matter/graphite) of *marmor lunense*, a true marble which was (and still is) quarried in the Apuan Alps (along the Torano, Miseglia and Colonnata valleys) near the present town of Carrara. All facies of *marmor lunense* were locally used from the fifth century BCE by the Etruscans, then in the Hellenistic period (mid-first century BCE), also outside Tuscany and Latium (Antonelli & Lazzarini 2013b; Antonelli et al., 2017).

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APPENDIX 1: EXAMINED MUSEUM OBJECTS

Architectural elements

Corinthian capital (SEN01): Corinthian capital with two tiers of eight alternating acanthus leaves. Adjacent helices and corner volutes stem from a single, broad and pronounced *cauliculus*. The central flowers on the abacus are not preserved. Apart from its relative squat proportions, the characteristics of the capital are typical for the 'normal' Corinthian capital. Dimensions: H: 0.32 m. Findspot: Unknown. Date: Imperial.

Corinthian capital (SEN02): Corinthian-Asiatic capital with two tiers of eight acanthus leaves with relatively shallow lines defining the foliage. The leaf ranges occupy well over the half of the capital height. The *cauliculi* from which the helices and corner volutes sprout are not sculpted. Helices and corner volutes are carved only superficially and flattened against the abacus. The helices touch at the centre. The capital has squat proportions. Dimensions: H: 0.29 m. Findspot: Unknown. Date: Late Imperial (4th century CE) (Brecciaroli Taborelli 1978).

Pediment of funerary monument (SEN04): Tympane of a pediment with an erote ending in acanthus leaves. Possibly part of a funerary monument. Dimensions: H: c.1.25 m; W: c. 2.20

m. Findspot: Reused in the Santa Maria church in Borgo a Sassoferrato. Date: late 2nd / early 3rd century CE (Brecciaroli Taborelli 1978; Lo Blundo 2017, pp. 122, 192–193).

Marble well-head or puteal (SEN06): Cylindrical well-head or puteal in marble with simple decoration in Doric style. The well-head is composed of a central fluted part, topped by an architrave, a Doric frieze with triglyphs and metopes, dentils and an Ionic egg-and-dart motif. Traces of vertical grooves are preserved on the inside of the rim as a result of extensive use over time (Catani 2018, pp. 43–44). Dimensions: H: 0.57 m; D: 0.52 m. Findspot: *Insula del Pozzo*. Date: 1st century CE.

Pediment of funerary monument (SEN08): Ionic-style cornice of a pediment probably of a funerary monument. The moulded cornice is made up of a lesbian cymatium, row of dentils, egg-and-dart motif, and a capping lesbian cymatium. Dimensions: H: min. 0.90 m; W: min. 2.40 m. Findspot: Unknown. Date: Roman.

Sculpture

Oscillum (SEN03): *Oscillum* with representation in low-relief of a bearded and long-haired centaur. Marble *oscilla* were particularly popular in the Western Mediterranean from the 1st century CE to the middle of the 2nd century (Taylor 2005: 83). Dimensions: H: 0.28 m. Findspot: Unknown. Date: Early Imperial (1st century CE – middle 2nd century CE) (Brecciaroli Taborelli 1978).

Lion head (SEN05): Fragment of the head of a lion possibly part of a funerary monument, in bad state of conservation. Dimensions: 0.20 m. Findspot: Reused in Sassoferrato, original context is unknown. Date: late 1st / early 2nd century CE (Lo Blundo 2017, p. 193).

Heroic, semi-nude male (SEN10): Headless torso of a heroic semi-nude male, slightly under life-size. The figure represents an idealised torso, with a *chlamys* around the hips, over the left arm and bunched over the left shoulder. The type can be labelled as the so-called Schulterbausch-typus (Fejfer 2008, p. 200) or the standing hip-mantle type (Hallett 2011: 160–166). The head was inserted separately. The right arm is broken at the shoulder, the left arm at the elbow. The lower legs are missing. The back of the figure was sculpted only roughly, suggesting it was originally placed in a niche. The objects carried in the hands are lost. The absence of the head and of attributes make it impossible to identify the figure as an emperor, a member of the imperial family or a private citizen. Statues of this type were primarily in use during the Late Republic and Early Imperial period and assimilated the honorand to a hero or deity. The absence of fringes on the cloak suggest an Early Imperial (Julio-Claudian) rather than a Late Republican date. Dimensions: Slightly under life-sized (H: 0.99 m). Findspot: Unknown, most likely displayed in a public monument (forum, compitum, theatre…). Date: Early Imperial (1st century CE), possibly Julio-Claudian (Brecciaroli Taborelli 1978; Lo Blundo 2017, p. 121).

Fragment of a cuirassed statue (SEN11): Fragment of an over life-size cuirassed statue with a *gorgoneion* centrally on the breast plate. Dimensions: Over-life-sized. Findspot: Unknown, most likely displayed in a public monument (forum, *compitum*, theatre…). Date: probably 1st–2nd century CE (Early Imperial).

Torso of a cuirassed statue with plant and animal decoration (SEN12): Torso of a slightly under life-size cuirassed statue with elaborated breastplate (muscle cuirass). Preserved until the waist. The head was inserted separately. The breastplate shows a candelabrum flanked by two leaping rams in a medallion. The top is decorated by two crows. The bottom decoration shows a palmette flanked by two rosettes. Short fringed leather straps emerge from underneath the cuirass at the waist and at the left shoulder. The absence of *pteryges*, typical for the so-called 'Hellenistic type 'cuirass statues (Fejfer, 2008 p. 208), could point to an Early Imperial date. The ram's heads remind of the capitals of the Temple of Concord at the *Forum Romanum* in Rome (Rebert and Marceau 1925, p. 74). Dimensions: Slightly under life-sized (H: 0.54 m). Findspot: Unknown, most likely displayed in a public monument (forum, *compitum*, theatre…).

Date: early 1st century CE (early Julio-Claudian) or late 1st / early 2nd century CE (Brecciaroli Taborelli 1978; Lo Blundo 2017, p. 122).

Portrait of a man of the Julio-Claudian period (SEN13, inv.no. 77804): The portrait is of high-quality carving but preserved in fragmentary state. It depicts a middle-aged man. The hairstyle is characteristic of Augustan and Julio-Claudian portraiture, with forked locks combed forward until forming a typical short fringe on the forehead. The hair is carved slightly simplified (Rinaldi Tufi 2008, p. 319–320). Dimensions: Life-sized (H: 0.27 m). Findspot: 2004 excavations in a 4th/5th century CE dump context of the so-called Portico Building of the monumental public town centre. Original display context is unknown (Damiani 2018, p. 85). Date: just before the middle of the 1st century CE.

Portrait of a man from the Trajanic period (SEN14, inv.no. 21): Portrait of an adult man with shaved beard and pronounced eye brows. The hair is combed forward with clearly differentiated locks of hair, covering also the ears, and rendered in long, thick and wavy locks. Dimensions: Life-sized (H: 0.22 m). Findspot: Unknown. Date: Trajanic (Brecciaroli Taborelli 1978; Catania, 2018, pp. 41–42).

Portrait of a young man of the Antonine period (SEN15): Portrait of a young, with curly hair, a short beard and a moustache. The nose is missing. The coiffure is characterised by full and wavy curls combed forward, made by the subtle use of the drill. The portrait reminds of the youthful portraits of Marcus Aurelius. Dimensions: Life-sized (H: 0.28 m). Findspot: Unknown. Date: Hadrian–Antonine (early / middle of the 2nd century CE).

Head of bearded god (SEN16): Under life-size head of male deity, possibly of a herm. The deity has a long beard and shows long hair in thick, wavy locks bound by a fillet and with bunches of grapes behind the ears. The eyelids are thickened and the pupils are not carved. The fillet and grapes suggest an association of the figure with Bacchus. Dimensions: Under life-sized (H: 0.15 m). Findspot: *Insula del Pozzo* (Catani 2018, pp. 43–44). Date: Middle Imperial (possibly early 2nd century CE).

Fragment of cuirassed statue, part of a group possibly representing Aeneas, Anchises and Ascanius (SEN17): Fragment of an over life-size cuirassed statue of the so-called 'Classical type' (Fejfer 2008, p. 208), preserving only the lower part of the leather straps of the vest and the upper legs. According to Rinaldi Tufi (2008, pp. 321–322), it could belong to a group representing Aeneas, Anchises and Ascanius and relate to the cult of Augustus. Dimensions: Over-life-sized. Findspot: Excavations along the railway, in the SW part of the town. Most likely displayed in a public monument (forum, *compitum*, theatre…). Date: early 1st century CE.

Inscriptions

Honorific inscription (SEN18, CIL XI 5754): Monumental honorific inscription dedicated to C. Fullonius Verecundus and C. Fullonius Priscus, both municipal magistrates (*aediles*) in *Sentinum*, and erected by their father C. Fullonius Honoratus, municipal priest of the imperial cult. Dimensions: H: 0.75 m; W: 1.30 m. Findspot: Unknown, probably displayed in a public monument (forum, compitum…). Date: late 1st / early 2nd century CE (Lo Blundo 2017, pp. 118–119).

C(aio) Fullonio, / C(ai) fil(io), Lem(onia), / Verecundo, aedil(i), // C(aio) Fullonio, / C(ai) fil(io), Lem(onia), / Prisco, aedil(i). // C(aius) Fullonius Honoratus, augustalis, / fili(i)s piissimis. / L(ocus) d(atus) d(ecreto) d(ecurionum).

To C. Fullonius Verecundus and C. Fullonius Priscus of the Lemonia tribe, *aediles*, by their father C. Fullonius Honoratus, municipal priest of the imperial cult, by decree of the town councillors.

Honorific inscription (SEN19, CIL XI 5744): Honorific inscription, part of a statue base, describing the career of unknown equestrian officer starting as centurion and later becoming governor of *Baetica*, *Mauretania Tingitana*, *Mauretania Caesariensis*, *Germania Superior*,

Germania Inferior and *Belgica*. Dimensions: H: 0.33 m; W: 0.26 m. Findspot: Reused as part of a wall near the ancient site, probably displayed in a public monument (forum, *compitum*, theatre…). Date: Flavian–Trajanic (Le Bohec 2008, pp. 33–34).

------] / [--- proc(uratori)] / [p]rov[inc(iae) Belgic(ae) et duar(um)] / [G]erma[niar(um) proc(uratori) pro leg(ato)] / provin[c(iae) Mauret(aniae) Caesar(iensis)] / item Maur[etan(iae) Tingitan(ae)] / proc(uratori) prov[inc(iae) Hispaniae] / ulterio[r(is) Baeticae] / p(rimo) p(ilo) [bis] / praef(ecto) ala[e ---] / item or[ae maritumae] / in Mauret[an(ia) Caesariens(i)] / [------

…procurator of the provinces of *Belgica* and both *Germaniae*, *procurator pro legato* of the provinces of *Mauretania Caesariensis* and *Mauretania Tingitanae*, procurator of the province *Hispania Ulterior Baeticae*, senior centurion for the second time, commander of a cavalry unit in *Mauretania Caesariensis*…

Other

Cinerary urn (SEN09): Uninscribed cinerary urn of unknown person. The urn is of the most common type with a rectangular chest and a roof-shaped lid and gable, in the form of a miniature house or temple for the dead. The corners of the roof are decorated with *pulvini*. Both *pulvini* and pediments are decorated with rosettes. The chest is left undecorated. The tabula is enclosed within a moulded frame but was left blank. Dimensions: H: 0.31 cm. Findspot: unknown. Date: 1st century CE or early 2nd century CE (Brecciaroli Taborelli 1978).

APPENDIX 2: CATALOGUE OF POLYCHROME DECORATIVE STONES IDENTIFIED

Africano, also known under the Latin name of *marmor lucullaeum,* after consul L. Licinio Lucullo, who was the first to introduce the marble to Rome in the first half of the 1st century BCE, is a polygenic calcareous metabreccia with clasts that are generally whitish with pink spots, but may also be greyish, black, pinkish or blood-red, set in a brownish matrix, which may also be a more or less intense green colour depending on the presence of chlorite. Its source quarries were situated near the ancient city of Teos, in the vicinity of the present-day village of Sigacik, in the province of Izmir. The quarries also yielded a variety of *bigio antico* (Brilli et al., 2010; Raneri et al., 2021), with production probably forming the focus once supplies of the finer breccia were depleted.

Breccia corallina is a breccia with whitish or pinkish clasts, mainly a centimetre in size, and a typical coral pink colour of the matrix. In petrographic terms, it is an oligomictic sedimentary (slope) breccia of the Cretaceous; there are many varieties with differing colours and textures, including *broccatellone* and *breccia nuvolata*. It was quarried from the very earliest imperial age in Bitinia, in the present-day Turkish province of Bilecik. The most important quarries were found near the village of Vezirhan, along a tributary of the River Sakarya, which is recalled in the ancient name of the marble (*marmor sagarium*). Other quarries can be found in several parts of the Karaburn peninsula, north of Izmir, in the province of Manisa.

Breccia di Sciro or breccia di Settebasi is a calcareous, sometimes dolomitic breccia, consisting of sharp-edged clasts of various colours (but generally white-pink), often striate and arranged in isoparallel fashion in one direction, set in a brownish matrix, often spotted with yellow and scored with red/brown/grey veinlets. Varieties with minute grains are known as *semesanto* and *semesantone*. In petrographic terms it is classified as a low temperature metamorphosed breccia but subject to strong directed pressure. It was quarried in various places on the Island of Skyros (Aghios Panteleimon, Treis Boukes, Kourisies) and on some small, nearby islands (Valaxa, Renia, Koulouris).

Cipollino verde is an impure chlorite-muscovite marble of the Permo-Triassic with a distinctive white-green layered appearance that it is easily identifiable with the naked eye. It was also known in ancient times as *marmor carystium* or *marmor styrium*, depending on which of the

two main quarrying areas it came from: Karystos or Styra on the Island of Euboea. There is also a rarer, grey variety known as *cipollino Bigio* that seems only to have been quarried at Karystos, in the vicinity of Mili.

Giallo Antico, also known as *marmor numidicum* by the Romans, is a compact microcrystalline limestone which may occur with a uniformly intense yellow or light yellow base colour, sometimes with veins of red or brown; it may also occur with a breccia texture composed of white or yellow clasts immersed in a variably coloured base with shades of yellow to red. The source quarries are situated in the hills near the ancient town of Simitthus (now Chemtou, in Tunisia).

Granito violetto or marmor troadense from Troas, is a granitoid with a violet hue that petrographically can be classified as a quartz-monzonite with violet k-feldspar porphyroblasts (diam. 2–3 cm), white oligoclasic plagioclase, black hornblende, biotite and grey quartz (Lazzarini 2010). The quarries are located near Çigri Dâg (near the ancient sites of Alexandria Troas and Neandria), in Turkey.

Greco Scritto is a crystalline marble, white in colour and stippled with grey veins. Quarries have been identified in Asia Minor, at Hasançavuslar near Ephesus (which yielded a fine-grained variety), on the Marmara island (i.e. a medium-grained variety, with a vertical cross-section cut), in Greece (at ancient Neapolis, present-day Kavala), and in Algeria (near ancient Hippo Regius, Ippona, now Annaba).

Pavonazzetto, that is also known under the names of *marmor phrygium, marmor docimium* and *marmor synnadicum,* was quarried near the ancient city of Docimium (now Iscehisar in the province of Afyon, Turkey), near Synnada, in Phrygia. It concerns a breccia with elongated white marble clasts (of varying dimensions) with diffuse boundaries in een dark purple to dark red hematite-rich matrix. The quarries also produced a fine-grained white marble.

Portasanta or *marmor chium* was quarried at Latomi, in the NW outskirts of the city of Chios on the island of Chios. It is a tectonic limestone breccia of the Triassic, with centimetre- to metre-long red, pink and/or grey clasts in a matrix coloured red or yellow by hematite/limonite, or grey from very fine carbonaceous particles. Several varieties of this stone, with different textural and chromatic characteristics, have been identified.

Rosso Ammonitico is a nodular limestone frequently characterized by the presence of large fossils (especially ammonites, but also belemnites and brachiopods) almost always recognizable with the naked eye. The classic facies shows centimetre-sized calcareous nodules, red, reddish or dark pink in colour, immersed in a marly, dark red to brick red cement. Geologically, Rosso Ammonitico is a limestone that can be classified as a biomicrite (or wackestone) whose origin is related to a peculiar sedimentation environment (a continental shelf tectonically unstable and subject to temporary marine regression) occurred with the opening of the Tethys in the Mediterranean area during the Jurassic period. The geological formation of Rosso Ammonitico crops out in the Tuscan-Umbrian-Marche Apennines, in the southern Apennines as far as Sicily, in the Venetian Pre-Alps (Lessini Mountains and Asiago Plateau) – the so-called Rosso di Verona – and in the Lombardy-Brianza Alps. To date, there are no specific petrographic and geochemical databanks for the safe recognition of any of the regional varieties mentioned.

Rosso Antico, also known under the Latin term of *marmor taenarium*, generally occurs with a uniform base colour of bright or dark red or purple, sometimes with traces of fine blackish veinlets or white strips/bands running in isoparallel or, more rarely, undulating fashion. In petrographic terms, it is an impure hematite marble of the Eocene. It was quarried at Cape Taenarum (now Cape Matapan) and elsewhere on the Mani peninsula: Paganea, Profitis Elias, Laghia and Kokkinoghia.

Verde antico (also *marmor thessalicum* or *marmor atracium*) generally appears as a breccia with an emerald green background with angular white, dark green and blackish clasts (centimetre to decimetre in size). Other varieties show a very dark green colour and, generally, a lower content of white marble clasts. Geologically, verde antico belongs to a rather vast

Pelagonian ophiolitic series, probably from the Upper Cretaceous, and can be petrographically classified as an ophicarbonatic metabreccia consisting of dark green-serpentine and white marble elements immersed in a light-green matrix mainly composed of a mixture of antigorite and calcite, to which are added, as accessory phases, magnetite and tremolite. Numerous ancient quarries have been identified on Mount Mopsion (village of Chasabali), near the city of Larisa (ancient Larissa), the capital of Thessaly.