The Marbles of the Sculptures of Felix Romuliana in Serbia

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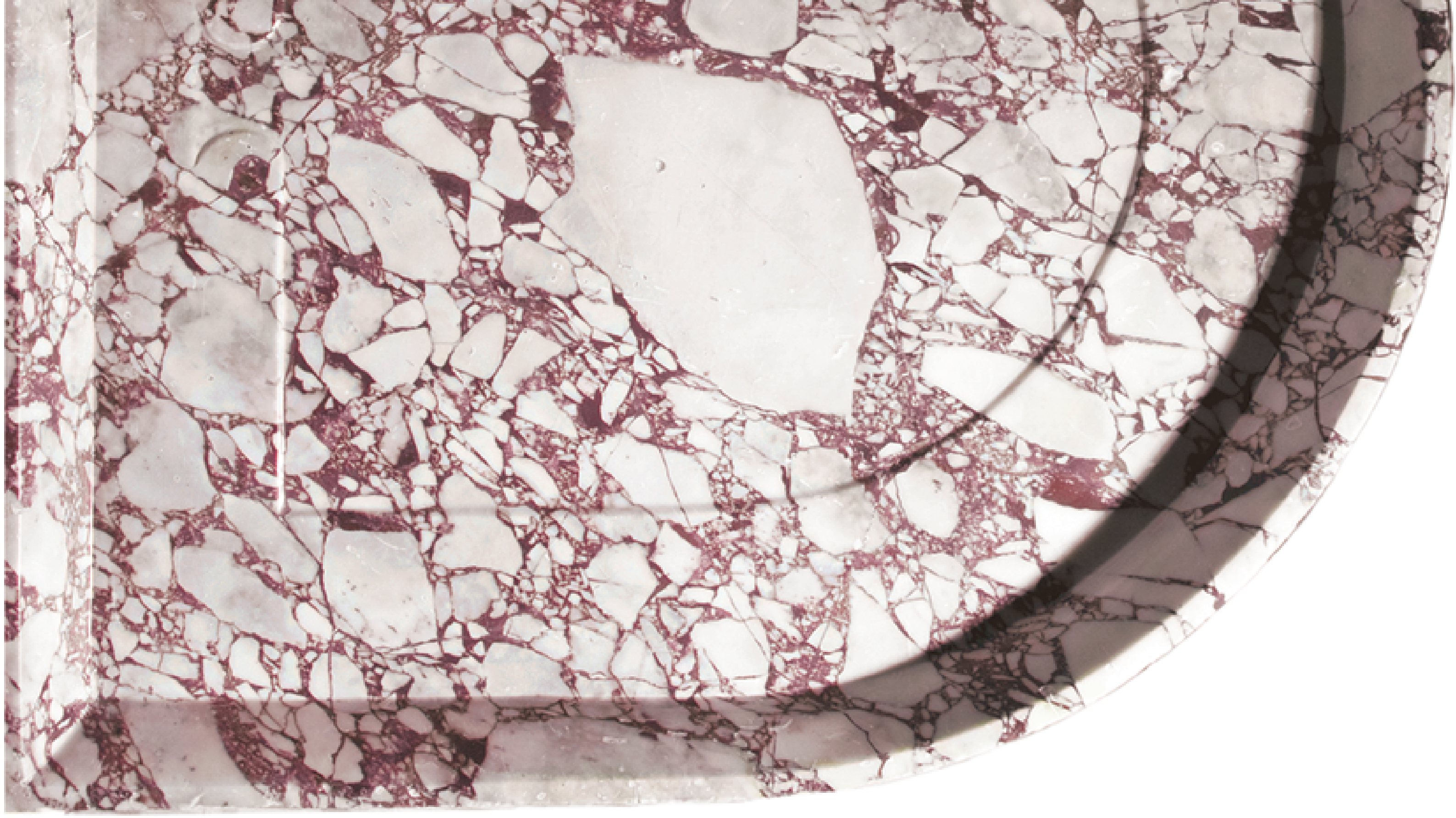

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CONTENT

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THE MARBLES OF THE SCULPTURES OF FELIX ROMULIANA IN SERBIA

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Abstract

Twenty four statues and other sculptures from the sculptural decoration of the palace of emperor Galerius in Felix Romuliana/Serbia were investigated. Provenance analyses revealed that the fine-grained marbles originate from the Pentelic quarries near Athens, and a second group clearly comes from the imperial quarries of Afyon/Docimium in Asia Minor. The very narrow spread in their composition suggests that the sculptures were made for a single commission.

Two sculptures investigated within the course of this work are exhibited in the museum in Zaječar. The "Boar-hunt" shows a match with marbles from the area of Berkovitsa in the NW-Balkan Mountains, where the pink plates and veneers from Felix Romuliana also come from. No precise provenance of the "Ariadne" can be presented so far. One possibility is an origin from medium-grained varieties of Alpine marbles.

Two fragments of a gigantic statue are composed of a coarse-grained marble that probably comes from the Bachern-Pohorje mountains in Slovenia.

Keywords
Felix Romuliana, sculptural inventory, marble provenance analysis

1. Introduction

Located south of the River Danube (Fig. 1) near the city of Zaječar, in the vicinity of the village Gamzigrad, the palace of Emperor Galerius is one of the most important Late Roman imperial sites in SE Europe. C. Galerius Valerius Maximianus was Caesar from 293 to 305 and Augustus and successor of Diocletian from 305 to 311. The location is considered to be the birthplace of the emperor, who built the palace as retirement residence at the end of the 3rd/beginning of 4th century during his reign as Augustus. The operating life of the palace was relatively short thus giving good information on the chronology of the usage of the investigated marble artefacts. Starting in 2004 the palace was investigated in different campaigns within the course of a German/Serbian project[1].

Within the course of a campaign in 2012 a series of marble sculptures was sampled in order to determine the provenance of the marbles, and to elucidate the marble production centres and trading relations of this period. This work focuses on the sculptural decoration of the palace. The general use of stones in the architecture of Felix Romuliana was recently investigated by DJURIĆ *et al.* in this volume[2].

Among the fragments of sculptures we selected for analysis, several are of particular interest and will be described in detail below. These fragments belong to one or two giant figures of a monumental sculpture representing the armoured emperor Galerius or maybe two emperors – Galerius and Diocletian (Fig. 2). According to the dimensions of the fragments of the foot (feet) as well as fragments of legs, arms and torsos, the sculptures were over 4 m high. Knowing the architectural complex of Galerius' Palace in Gamzigrad, we could assume that such colossal statues could have been placed only in the temple of Jupiter or in the forum in front of the temple.

A fragmented sculptural group depicting the hunting of a wild boar was found in 2011 during the Serbian-German excavation campaign in the area north of the northern ramparts of the earlier fortification of Romuliana (Fig. 3). The sculpture was reused as spolia in the wall of one Late Roman building. It probably came from the civil settlement that preceded the construction of the Galerius Palace, which probably was the birthplace of Galerius. Most probably this settlement can be dated to the time of the rule of emperor Aurelian. The horseman is missing, and only in the lower part are the hind legs of the horse preserved. The figures of a dog and the wild boar are completely preserved. The sculptural group depicting the hunting of a wild boar was very carefully modelled, with attention to every individual detail. On the basis of stylistic features, we dated the sculpture to

1 VON BÜLOW *et al.*, 2009.

2 DJURIĆ, JOVANOVIĆ, LAZIĆ, PROCHASKA this volume.

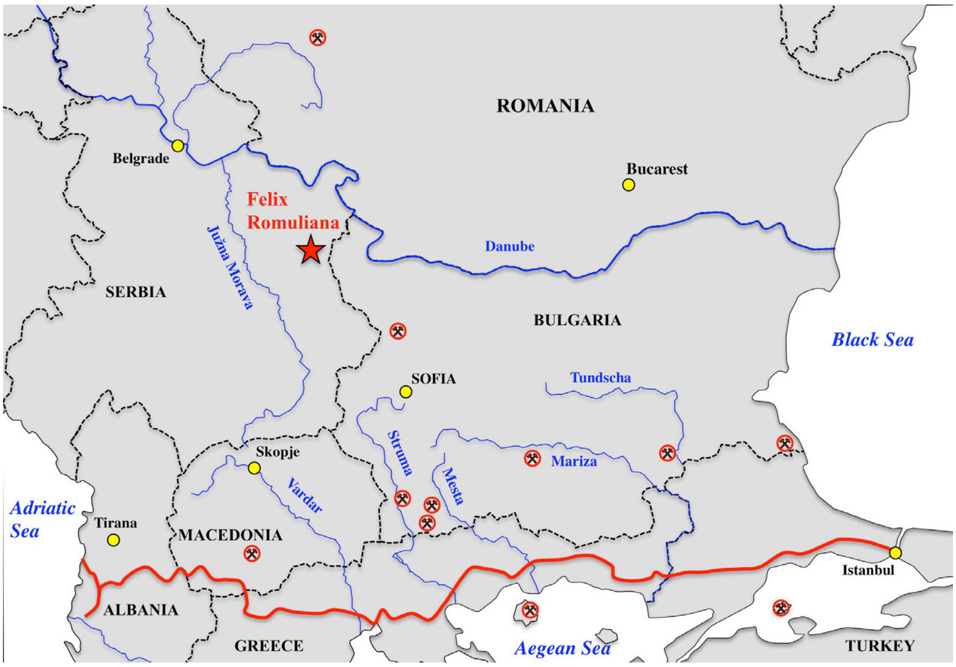

Fig. 1.
The geographic position of Felix Romuliana

Fig. 2. Fragment (pedestal with toes) of a gigantic figure made of coarse-grained marble (sample FRM/12/18)

Fig. 3. Imperial (?) boar-hunt found in 2011 and now displayed in the museum of Zaječar

the second half of the 3rd century. Representations of the hunt were genre scenes, popular in various branches of Roman art. The essence of the symbolism of these scenes is the aspiration for visualization of the power and virtue (virtus) of the emperor, in which hunting is a paradigm for spiritual hunting, which is a manifestation of the emperor's divine nature.

A wall relief depicting the sleeping Ariadne (Fig. 4) is also made of the same marble of medium grain-size as the sculptural group depicting the hunting of the wild boar. This monument was for the most part modelled as a deep relief while only a small part of the composition was designed as a free-standing sculpture. The reverse side of the relief was rounded and carelessly worked. Accordingly we can assume that the relief was originally made to stand in a niche. During the excavations three fragments of the relief were found in the area southeast of baths in the south-eastern tract of Romuliana. Evidently it was in a secondary position, in ruins of agricultural buildings from the 6th century, where the fragments were used as building materials (*spolia*). For this reason, there is no indication whatsoever in which building of Romuliana this monument was originally located. Possible locations for the original display of the relief are the nearby baths but also a room in the palace. The sleeping Ariadne was made after the model of the Hellenistic sculpture, but compared to the Hellenic model, certain deviations can be noticed (the face is rounded and much softer modelled, the head of the young woman is resting on a pillow, unlike the model where it is resting on her left hand). Based on the way of modelling of the head as well as the hairstyle, this monument can be dated to the last decade of the 3rd or the early 4th century. The dating is supported by the representation of one piece of a necklace with a lunated pendant.

Fig. 4. "Ariadne" – a restored relief displayed in the museum of Zaječar

2. Sampling and methods applied

The marbles investigated in this study include most of the sculptures and decorative artefacts available on the excavation site of Felix Romuliana and in the Museum of Zaječar. No preselecting or grouping was performed. All the samples are listed in Table 1.

For the provenance analysis of white marbles, in most cases no single method, such as stable isotope investigation, is sufficient, and a combination of different methods has to be applied. We refer here to previously published papers where this problem is discussed[3]. The obvious consequence from the complexity of the characteristics of marbles and their overlap is to apply a combination of analytical methods followed by a statistical evaluation of the results. Below only a summary of the methodology is presented.

Sampling: Microsamples were taken from broken, non-worked surfaces of bottom parts of the sculptural fragments and analyzed for their petrographic and chemical characteristics. Beside the standard petrographic analysis with the petrographic microscope, stable isotopes, trace element, and the chemical composition of microinclusions were performed. The samples taken were small chips of some mm in size. Before grinding or polishing, as required to carry out the experimental measurements, external traces of weathering, black crusts and patinas were carefully removed mechanically. The samples were then reduced to fine powders and used for isotopic, trace element, and inclusion fluid analyses following procedures reported in detail e.g. in PROCHASKA, ATTANASIO, 2012 or in PROCHASKA, GRILLO, 2010[4].

Powder samples cannot be used for the crush-leach method because the inclusions are already opened and the metal drill bits usually chemically contaminate the powder. It cannot be cleaned any more as can samples obtained with diamond tipped drills or simply with solid chips.

Petrographic methods: In general a sound investigation of the microfabric of the investigated marbles is desirable. While these investigations can easily be done on quarry samples, the tininess of many samples available from artefacts prevents a sound petrographic investigation. According to petrographic standards for grain-size measurement, a few hundred mineral grains should be counted. A widely used parameter is maximum grain size (MGS), which is either determined by petrographic microscopy or by a hand magnifier on polished surfaces.

Isotope analysis: This method is the state of the art and the most widely used approach in marble provenance analysis. A considerable advantage of this method is the very small amount of sample required. It has to be kept in mind, however, that extremely small samples in the order of some mg taken from weathered or partly weathered surfaces of ancient artefacts involve the risk of wrong results. Furthermore, only in rare cases will the exclusive use of the stable isotope analysis without

3 PROCHASKA, GRILLO 2010; PROCHASKA, ATTANASIO 2012.

4 PROCHASKA, GRILLO 2010; PROCHASKA, ATTANASIO 2012.

sample	DS	$MgCO_3$	Fe ppm	Mn ppm	Sr ppm	Li/Na	Cl/Na	K/Na	Br/Na	I/Na	SO_4/Na	^{18}O ‰$_{(PDB)}$	^{13}C ‰$_{(PDB)}$
fine-grained (Afyon/Docimium)													
FRM/12/3	1490	0,45	117	35	65	0,209	1558	497	14,9	5,0	171,1	-4,30	1,12
FRM/12/10	3123	0,30	113	33	48	0,170	2179	949	5,9	2,2	90,8	-4,54	1,38
FRM/12/12	5498	0,96	448	110	155	8,888	944	1169	3,4	2,9	190,0	-3,67	2,58
FRM/12/13	2919	0,50	147	37	60	0,528	2040	529	22,1	6,7	231,4	-3,88	1,45
FRM/12/15	2644	1,60	128	37	67	0,162	353	958	18,5	0,8	35,8	-4,18	0,70
FRM/12/16	1999	0,34	155	35	62	0,323	1591	539	13,6	5,7	143,7	-3,80	1,51
FRM/12/19	2032	0,33	85	28	60	0,263	957	736	9,9	2,8	86,0	-4,10	1,46
FRM/12/20	2169	0,42	207	45	57	0,291	1583	586	22,3	14,9	157,4	-3,91	2,05
FRM/12/21	1562	0,46	77	32	65	0,366	1556	504	20,5	5,8	581,6	-3,90	1,57
FRM/12/22	2287	0,45	74	25	64	0,452	1957	701	13,6	5,7	132,8	-3,99	1,27
fine-grained (Pentelikon)													
FRM/12/4	5134	1,20	265	95	180	0,878	2105	199	10,4	4,1	176,7	-3,74	2,77
FRM/12/5	10809	1,01	198	135	158	0,746	1978	317	7,2	2,1	46,0	-7,74	2,52
FRM/12/6	7421	1,14	203	95	163	0,732	2093	106	7,3	3,1	69,7	-7,66	2,59
FRM/12/7	12450	1,15	198	113	158	0,850	2075	132	8,0	2,6	41,0	-7,78	2,57
FRM/12/8	4692	1,23	172	72	162	0,814	1927	238	12,4	4,8	344,6	-7,69	2,75
FRM/12/9	11866	1,34	281	141	156	1,323	2283	123	9,3	3,6	103,1	-7,88	2,77
FRM/12/11	21258	1,50	571	149	171	1,068	2352	170	7,3	2,4	74,3	-4,56	2,64
FRM/12/14	9825	1,53	314	130	150	0,853	2118	181	9,2	2,9	147,2	-7,69	2,91
Torso Emperor	8995	1,13	168	80	153	0,824	1926	216	8,2	6,5	69,4	-7,79	2,78
Herkules Statue	8821	2,03	359	123	136	0,739	1564	524	9,4	6,6	834,1	-8,01	2,76
medium-grained (Berkovitsa and Alpine marble?)													
Museum Boarhunt	2662	0,37	833	79	117	0,090	916	907	9,1	2,0	58,6	-10,85	1,27
Museum Ariadne	5809	0,58	588	40	151	1,105	2741	532	16,8	2,1	183,3	-10,82	0,48
coarse-grained (unknown origin, possibly Alpine)													
FRM/12/17	4829	1,24	467	40	150	7,191	1978	352	20,4	0,9	156,1	-6,57	1,18
FRM/12/18	5375	2,28	1740	115	241	2,850	1311	463	24,2	0,9	88,9	-13,59	0,69

Table 1. The analytical data of the investigated sculptures

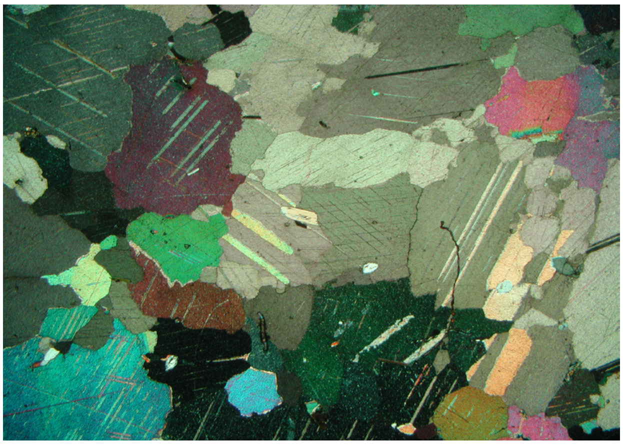

Fig. 5. Microphoto of sample FRM/12/18 showing the very coarse-grained texture of the rock with small inclusions of silicate minerals in the calcite crystals (polarized light, length of image is 6 mm)

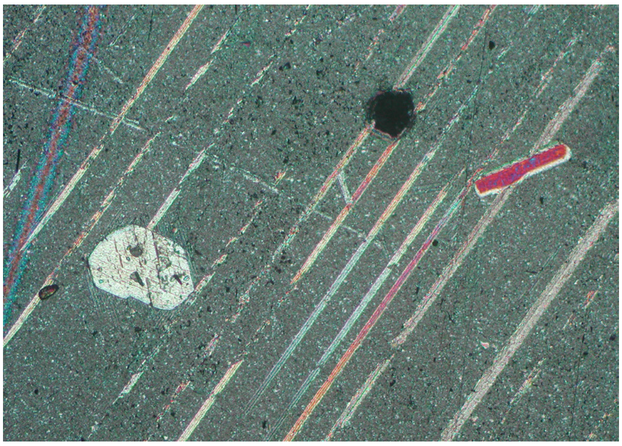

Fig. 6. Microphoto of sample FRM/12/18 with a poikilitic inclusion of amphibole in the calcite (polarized light, length of image is 1,4 mm)

combination with other methodological approaches account for satisfactory results.

Trace element chemistry: Additional variables can be obtained by chemical analysis of the marbles.

In this context it is important to mention that those elements that are incorporated into the carbonate lattice (Mg, Fe, Mn, Sr, and Zn) exhibit a fairly homogeneous and consistent distribution and can advantageously be used to discriminate different types of white marbles.

Analysis of the fluid inclusions: This technique for characterizing marbles was developed to acquire further variables to distinguish between different marble quarries when the usually applied methods like isotope analysis fail to provide a satisfying discrimination. These data can be used in concert with the established methods when applying statistical evaluation. The results from fluid inclusion investigations of carbonate rocks show that the fluid phase is usually relatively uniform with respect to its chemical composition. A series of chemical parameters (cations as well as anions) can be detected simultaneously by means of ion chromatography[5]. To eliminate the effects of the possible irregular distribution of the amount of inclusions, and also because of possible scattering of the efficiency of the crushing and extraction of the fluids, the results are normalized to Na x 1000.

Evaluation of the data: The large number of data obtained by the different analytical methods applied requires multivariate discrimination analysis for data evaluation. The compositional fields of the marbles from a quarry or a given marble-producing site are usually presented as statistical ellipses (90 % ellipses, that means that 90 % of the samples of this population is within the ellipse). The resulting big number of variables requires a multivariate statistical analysis in combination with our databank of ancient marble quarries in the Roman Empire.

3. The analytical results

3.1. The petrographic features

The *medium- to coarse-grained marbles* exhibit different textural features. The samples FRM/12/17 and FRM/12/18 were taken from two fragments originally belonging to one or two gigantic sculptures. The white to slightly greyish marble is of exceptionally large grain-size (MGS up to 5 mm) and is characterized by silicatic impurities. Figs. 5 and 6 display the microimages of these marbles. The calcite crystals exhibit uneven and intermeshing grain-boundaries and poikilitic inclusions of quartz, mica, and amphibole minerals (Fig. 6) testifying to the amphibolite facies metamorphism of this rock.

For the petrographic investigation of the medium-grained marbles one sample suitable for preparing a thin section was available ("Boar-hunt"). The marble is of homoeoblastic texture without noteworthy impurities. The twin lamellae of the calcites are deformed and toothed grain boundaries are ubiquitous. As can be seen in Fig. 7, the textural features of this marble exactly match those of the marbles found in the NW Balkan Mountains near the village of Berkovitsa.

Most of the analyzed *fine-grained marbles* are of high quality. The petrographic investigations clearly show the occurrence of Pentelic marbles as well as of marbles from the imperial quarries of Docimium in Asia Minor (Fig. 8). The photo on the right hand side in Fig. 8 shows Pentelic marble with slight schistosity and silicate impurities. The microphoto on the left hand side is from Docimean marble with a typical heteroblastic texture, sutured grain boundaries and slight post crystalline tectonic deformation.

5 PROCHASKA, GRILLO 2010; PROCHASKA 2013.

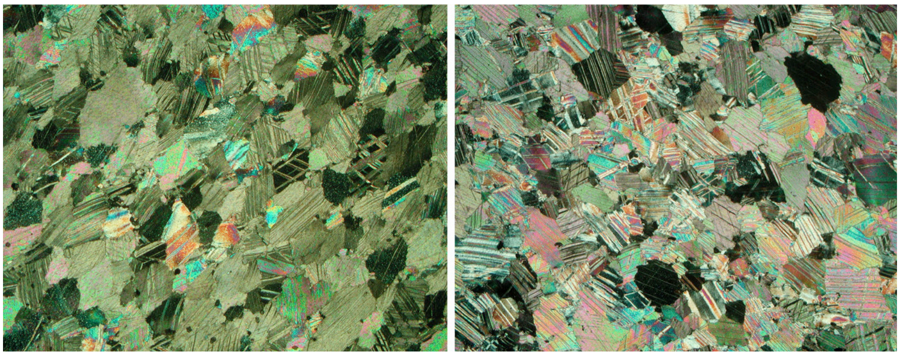

Fig. 7.
Microphoto of the marble of the "Boar-hunt" with the characteristic tectonically deformed texture and slight schistosity on the left hand side, which very much resembles the white marble from Berkovitsa on the right hand side (polarized light, length of images is 6 mm)

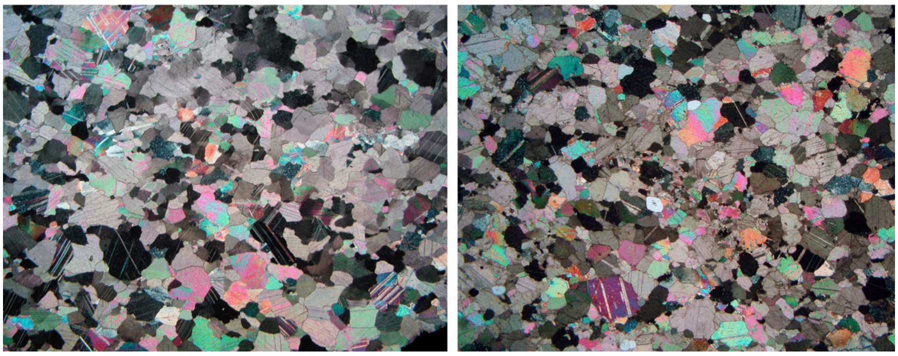

Fig. 8.
The fine-grained marbles of the sculptures of Felix Romuliana. Pentelic marble on the right hand side exhibits minor deformation and traces of quartz. Docimian marble on the left hand side is very pure and characterized by a heteroblastic texture and sutured grain boundaries (polarized light, length of images is in both cases 6 mm)

3.2. The isotopic composition

The analytical data of the stable isotope investigation and the chemical analyses are displayed in Table 1.

Fine-grained marbles: In Fig. 9 the results of the isotope analyses of the fine-grained marbles are graphically shown. Reference data for a comparison of the isotope analyses were taken from our databank. These are the compositional fields for the isotopic composition of the quarries of Pentelikon near Athens, Carrara and for the imperial quarries of Afyon/Docimium. They are displayed as 90 % probability ellipses. For reasons of their macroscopic characteristics and of their general isotopic composition the fine-grained marbles from Göktepe and the Lychnites from the island of Paros were excluded a priori from further considerations. In the isotope diagram the projection points of the samples cluster clearly in two distinct groups. One sample cluster is located in a very central position of the ellipse of the Pentelic marbles with a very narrow scattering. The second sample cluster is situated within the rather large ellipse of the marbles from Afyon/Docimium. For the sake of clarity the total databank sample set for the Docimian marbles was used and no sub-site ellipses were displayed.

Medium- and coarse-grained marbles: From the investigated samples, only four exhibit a grain-size > 1.5 mm and are treated separately ("medium- to coarse-grained marbles"). The isotope results for this group are displayed in Fig. 10. Because of their special importance and popularity, two samples exhibited in the museum of Zaječar are highlighted in the diagram ("Boarhunt" and "Ariadne"). The other two samples are fragments (foot and toe) of one or two gigantic sculptures. Because of their isotopic and petrographic features, the medium- to coarse-grained marbles from Proconnesos, Thasos, Ephesos and Paros II were not taken into further consideration and are not shown in the diagram. To compare the measured isotopic results with corresponding marbles from our databank we looked for coarse-grained marbles with very light O-isotope composition especially in Dacia and Thracia. Consequently, reference data were chosen (displayed as statistical 90 % ellipses) from the following locations: Asenovgrad near today´s Plovdiv, Bulgaria, from two locations north of the River Danube in Romania where Roman quarries are known in Bucova and Rușchița, from white and pink marbles in the NW-Balkans near Berkovitsa in Bulgaria and from Alpine marbles in Gummern and Pohorje/Bachern. The marbles of the architecture of Sarmizegetusa (the Roman Ulpia Traiana Augusta Dacica Sarmizegetusa) originate from the Roman quarries of Bucova and are displayed for comparison in Figs. 10 and 12.

The C-isotope composition of the four samples is in the range of 1 to 2 ‰, while the O-isotopes scatter appreciably but generally exhibit very light O-isotope values. They correspond roughly with the very large data-field from Asenovgrad, but do not match at all the isotopic composition of the Romanian marbles from Bucova and Rușchița.

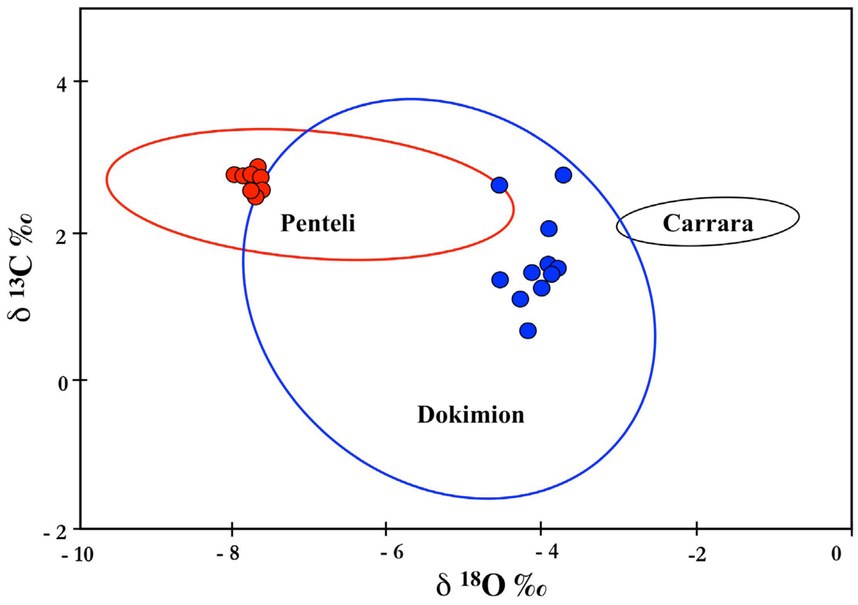

Fig. 9.
Isotope diagram of the fine-grained marbles clearly showing that two distinct groups of marbles were used

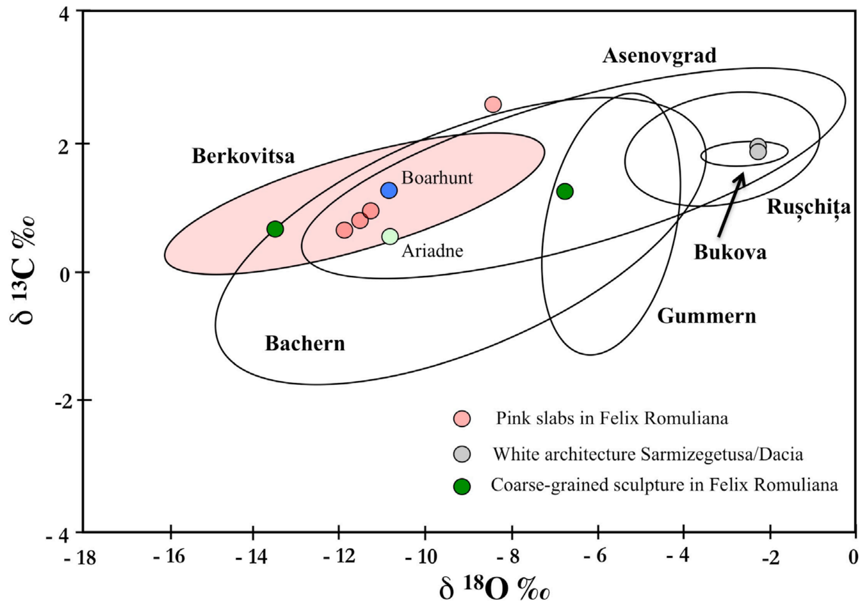

Fig. 10.
Isotope diagram for the medium- and coarse-grained marbles and the compositional fields of marble quarries used for the statistical evaluation

3.3. Trace element and fluid inclusion composition

Fine-grained marbles: In accordance with the isotope data the two groups of fine-grained marbles are also attested in their trace element composition. With one exemption the marbles from Afyon/Docimium show a remarkable uniformity in their chemical composition. The low Mg-concentration shows that all marbles of this group are pure calcitic marbles without any dolomitic contribution. Medium to low Mn- and Fe-contents (2-110 and 74-478 ppm) are typical for Docimian marbles.

Similarly, the group of the Pentelic marbles exhibits its typical trace element content pattern with high Mn-concentrations and correspondingly high Fe-numbers.

Medium to coarse-grained marbles: These marbles are characterized by generally high Fe-contents and moderate to medium Mn-numbers. The very coarse-grained marbles from the gigantic sculpture differ from the medium-grained marbles ("Boar-hunt" and "Ariadne") in the characteristically high Li-content of the inclusion fluids and slightly higher Mg-contents.

4. Statistical evaluation of the analytical data

To assign the analyzed samples to their corresponding quarry or quarrying area multivariate statistical calculation was applied. The variables used for these statistical operations are indicated in the corresponding figures of the fine-grained and coarse-grained marbles (Figs. 11 and 12). As in the case of the isotope diagrams, the data-fields of the considered reference quarry samples are displayed as 90 % ellipses.

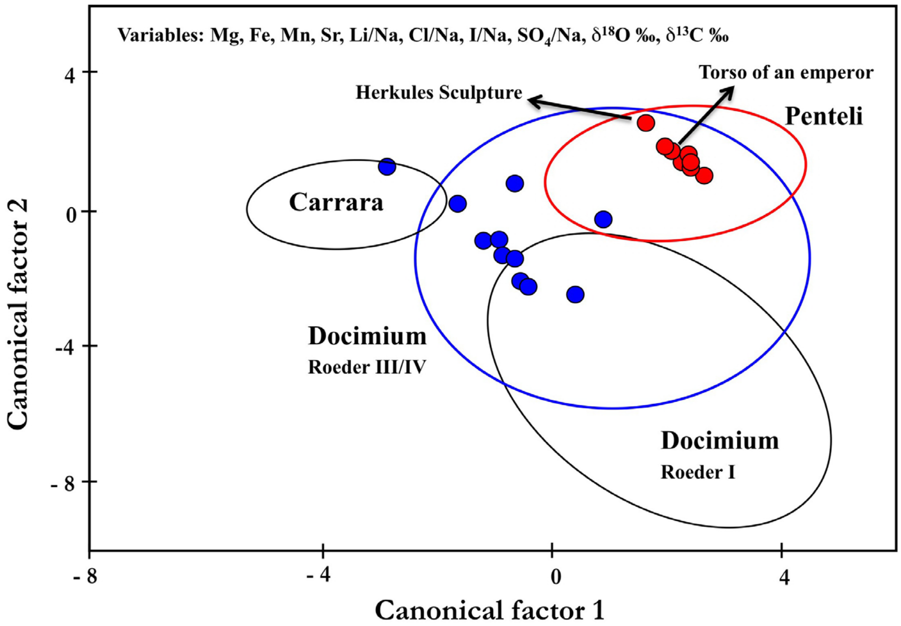

Fig. 11.
Bivariate diagram for the fine-grained marbles showing the two most important canonical coordinates obtained by the multivariate analyses

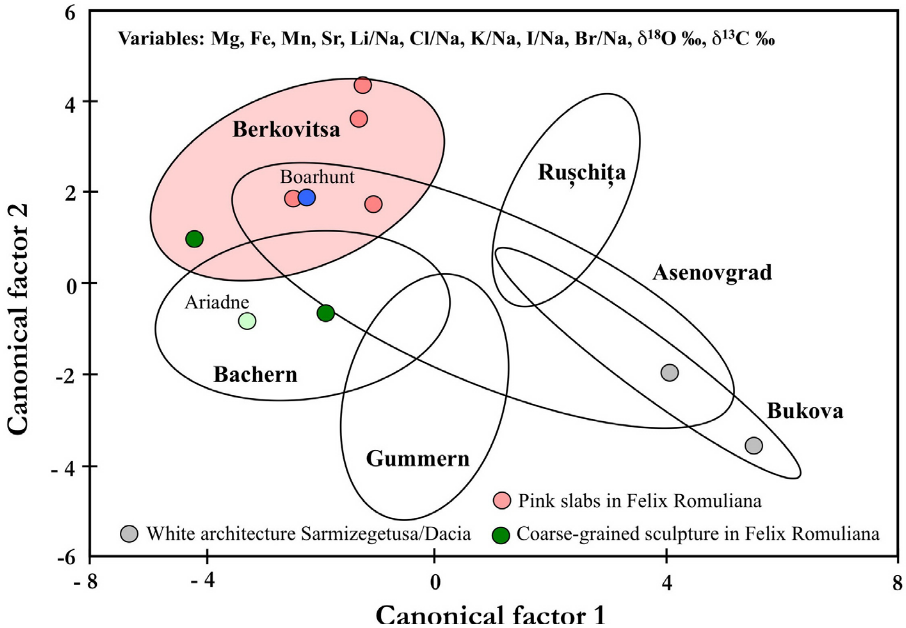

Fig. 12.
Bivariate diagram for the medium- to coarse-grained marbles graphically showing the result of the multivariate analyses

Fine-grained marbles: In the multivariate diagram (Fig. 11) the results of the discriminant analysis are displayed by means of the two most powerful canonical coordinates (factor 1 and 2) using the variables Mg, Fe, Mn, Sr, Li/Na, Cl/Na, I/Na, SO_4/Na, ^{18}O ‰, and ^{13}C ‰. In accordance with the isotope composition (Fig. 9) two groups of fine-grained marble samples can be distinguished by the statistical analysis. One group is consistently located in the very centre of the Penteli ellipse, and the second group best fits with the Docimium marbles of quarries III/IV according to the nomenclature of Roeder[6].

Medium- to coarse-grained marbles: For this group of marbles the variables Mg, Fe, Mn, Sr, DS, Li/Na, Cl/Na, K/Na, Br/Na, I/Na, SO_4/Na, ^{18}O ‰, and ^{13}C ‰ were used for the multivariate statistical calculation, and the results are displayed in Fig. 12. Clearly the “Boar-hunt” plots close to the centre of the compositional field of the marbles from Berkovitsa in the NW Balkan Mountains and coincide with the pink samples from slabs and veneers of Felix Romuliana. The “Ariadne” and the coarse-grained samples from the giant sculpture differ significantly and cannot yet be assigned to a distinct origin with sufficient clarity.

6 ROEDER, 1971.

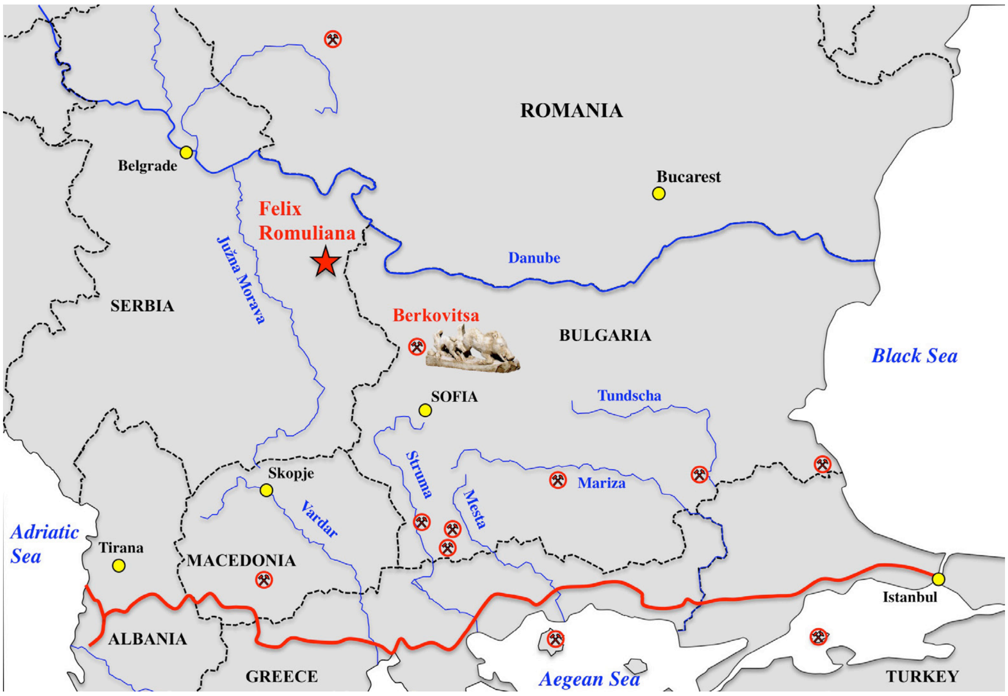

Fig. 13
The location of the marble occurrences of Berkovitsa where the pink marbles of Felix Romuliana and also the white marble of the "Boar-hunt" come from

5. Discussion and conclusions

All marbles investigated are white and of very good quality. Grain-size in most cases is below 1 mm, and only a few sculptures of medium- to coarse-grained marbles were found. The majority of the investigated sculptures are made of fine-grained marbles both from the imperial quarries of Pentelikon and from those of Afyon/Docimium in Asia Minor. The logistic efforts required to haul the marble and also premium building materials for decorative architecture in general to this site are respectable, considering the remote location of Felix Romuliana away from important overland roads[7]. It seems that within the course of an imperial project like Felix Romuliana costs did not play any role and cumbersome and costly efforts were accepted. The River Danube, a very potent waterway some 50 km away, was most probably the essential supply route for Felix Romuliana with respect to long distance trade. However, land transport over long distances and across rugged terrain is also verified by the provenance of the pink marbles and the white marble of the "Boar-hunt" from the NW Balkans. On modern routes the closest road-connection between Felix Romuliana and Berkovitsa in Bulgaria is approx. 150 km (Fig. 13).

The very uniform and homogenous composition of the Afyon/Docimium samples especially in their Sr- and Mn-contents (see Table 1) and, also importantly, the nearly identical composition of the Pentelic samples suggest that these sculptures were not collected incidentally but were part of one special program executed in the course of one single commission.

The medium-grained marble of the "Boar-hunt" does not match any classical marble composition thus defying assignment to given special source when scanning the usual databanks. White marbles occur in the area of Asenovgrad near Plovdiv in Bulgaria and were widely used in Roman Plovdiv (Trimontium). As shown below, there is no match with the marbles of Felix Romuliana. The fact that the marble of the "Boar-hunt" is practically identical to the compositional features of pink marble plates and veneers in Felix Romuliana led us to look for occurrences of pink marbles, which are not very common all and can be used as a "pathfinder" for the white marble in question. This led us to investigate the Dacian marbles north of the River Danube in the region of Bucova, where some pink varieties also occur near Rușchița. However, no resemblance to the pinkish marbles of Felix Romuliana was found. Intensive search for this pink type resulted in the discovery of that marble (pink and white varieties) in the region of Berkovitsa in the NW-Balkan Mountains in Montana province of today's Bulgaria. These marbles match exactly the composition of the pink veneers of Felix Romuliana and of the white marble of the "Boar-hunt".

This provenance of the marble of the "Boar-hunt" from Thracian or Moesian sources spurs us to contextualize this sculpture with the general motif of the "Thracian Horseman". However, these considerations are rather speculative in the moment and have to be entrusted to future art historical investigations.

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The marbles of one or perhaps two giant sculptures are very coarse-grained, and so far we could not work out a convincing suggestion for the provenance of the marble, which is characterized by very light O-isotope composition of around -10 ‰. The occurrence of amphibole minerals (Fig. 6) in the marbles of the giant statue testifies to an origin from a high-grade amphibolite facies terrain. This indicates that the coarse-grained marbles are from a different source than the marble from the "Boar-hunt", which is of lower metamorphic grade. The chemical characteristics of the two very coarse-grained samples differ considerably, thus indicating that they originate not from one but from two different sculptures. Amphibole-bearing marbles of that grain-size can be found in some locations in the Eastern Alps already mined in Roman times, such as the marbles of the Pohorje/Bachern mountains or those of southern Austria.

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