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ANCIENT HISTORY

QUARRYING ACTIVITY IN THE SANCTUARY OF DODONA

Abstract: The aim of this paper is to present unpublished data of quarrying activity linked to the development of the sanctuary of Dodona, in Epirus. The study analyzes new information about quarry-marks found in the area of this sacred center, obtained by prospecting the territory. After the identification of the area where there is evidence of quarrying works, the paper deals with the main features of this sort of activity and material remains of other cases in the Greek world. Finally, the data is put into context with the development of the sanctuary of Dodona and the historical processes of the region.
Keywords: *Dodona, quarry, economy, Epirus, sanctuary.*

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Quarries are usually forgotten on studies of archaeological sites. It is more common to focus the analysis on the space where the buildings were constructed. However, quarries can provide useful information concerning the economic activity of the site and the kind of technology that was employed to extract the materials. Furthermore, it is also important to consider the network that transportation of this material generated.

There has been no official excavation, neither prospection, of the quarries of the sanctuary of Dodona. Located in Epirus, this site has been studied for more than one century, especially the sacred area, where temples and other buildings stand.[1] The origins of the materials required to build these structures have remained a minor topic.

This article aims to present a new light on this aspect, by publishing a first preliminary study on the new data concerning the places where building materials of Dodona where extracted. In order to do so, the analysis is divided in three parts. First, a summary of modern references about the possible location of those quarries. Second, the findings and their characteristics. Third, the role played by quarrying activities in the development of the sanctuary of Dodona.

MODERN REFERENCES ABOUT THE QUARRIES

In his *Archaeological Guide to Dodona*, Dakaris mentioned three possible locations nearby the sanctuary. The first one was situated 2km north from the sanctuary, near the modern-day village of Dodonoupoli. There, it was possible to see "the shelves made by the quarrying of the stone, huge blocks roughly hewn and ready for transport, a roughly hewn column drum, and wedge holes in the compact rock face for prizing free the material".[2] In the southern part of the valley, he identified traces of extraction of conglomerate

[1] The main works are CARAPANOS 1878; DAKARIS 1971; DIETERLE 2007; EMMERLING 2012; PICCININI 2017 and CHAPINAL-HERAS 2021.
[2] DAKARIS 1971, 77.

stone. Finally, a better-quality limestone may have been brought from a zone located between the current villages of Marmara and Grammenochoria, four or five hours from Dodona (i.e. *ca*. 18km). Unfortunately, the description of these sites was not more detailed; the Greek archaeologist limited himself to citing the quarries, but without further information concerning the kind of quarry marks or the sort of blocks he saw.

The most employed material for construction, in general but also in particular in Dodona, was limestone. Sandstone, tuff and conglomerate were used in this sanctuary, too.[3] Different works mention the presence of limestone in the temple of Zeus,[4] in the five so-called temples (or more probably treasuries in some cases[5]), in the bouleuterion,[6] in Building O-O1-O2,[7] and in the theater,[8] the biggest structure of the sanctuary. As Higgins and Higgins highlight, the limestone of this valley contains veins of chert, which can be seen in the upper surfaces of the seats of the theater.[9] For the walls of the Acropolis, limestone was the main source as well.[10] Another element made of this material is the series of pedestals from the sanctuary. Human-scale bronze statues stood over them.[11] According to Dakaris, the better-quality limestone was used for these pedestals and for the propyla of the theater.[12]

More recently, Prof Theoulakis has pointed out the geological composition of this valley, and two different kinds of limestone can be clearly discerned. He has also published some pictures from the first area that Dakaris mentioned, providing more information about this material and suggesting that stones from the sanctuary were quarried here.[13] Moreover, the map of Zachos shows how limestone and other sedimentary stones prevail in the valley.[14]

THE FINDINGS

After considering these data, we did three short fieldworks in order to locate and identify the quarries mentioned by Dakaris and Theoulakis. A significant setback is the current state of this area, due to the way this landscape has evolved during the last decades. Owing to the economic transformation of the country and the rural exodus in recent times, a great amount of farming and pasture lands that were used for centuries are nowadays abandoned. This has entailed the spreading of weeds there. For this reason, many areas that could be visited in the epoch of Dakaris are currently covered by trees and bushes.

Fortunately, the search was successful and a limestone zone with traces of quarrying was found (**Figs. 1-9**). The place was visited thrice.[15] It is worth pointing out that this is not a quarry where the work area is concentrated in a specific site, but a vast area full of different big rocks that feature marks of this kind of activity and spread all along the ground. This can be easily explained if we consider the geological characteristics of the valley of Tcharacovitsa, where the sanctuary is located.

Epirus and the Pindus range have several areas of limestone,[16] as we can see in the region of Ioannina and the valley of Dodona, where limestone dates from Late Jurassic to the Eocene.[17] In fact, limestone is one of the most abundant materials in the world, representing 10% of the surface of the planet.[18] In Egypt, for example, about 65% of the course of the Nile is flanked by a terrain of limestone and engineers in Pharaonic times took advantage of it to extract the material they needed.[19]

The slopes of the valley of Tcharacovitsa are formed by this kind of rock, which is distributed in beds of *ca*. 40-60 cm thick, with a slight inclination (**Fig. 10**). These bands are overlapped among them, and their separation is due to the bedding planes of limestone, which are frequently easily recognizable.[20] This sort of geological distribution in beds makes easier to split the blocks along the plane of cleavage than in other directions.[21] For this reason, some scholars call them "step quarries",[22] since the pit is stepped

[3] DAKARIS 1960, 8; EMMERLING 2012, 194. The use of conglomerate, just in specific cases, usually dates to the Late Hellenistic period of Epirus, between 232 and 167 (EMMERLING 2012, 133-139 and 157-162).

[4] DAKARIS 1960, 11; DIETERLE 2007, 109-115 and 155, with some Ionic columns of sandstone and, after the Aetolian attack of the 232 BC, limestone Ionic columns in the propylon.

[5] Building Γ: EVANGELIDIS 1958, 103; DIETERLE 2007, 117; EMMERLING 2012, 183. Building Λ: DAKARIS 1967, 33; EMMERLING 2012, 122-123, with the capitals of the inner columns of sandstone. Building A: EVANGELIDIS 1929, 107-108; EMMERLING 2012, 127. Building Θ: DAKARIS 1971, 51-52; EMMERLING 2012, 157; the conglomerate columns were covered by a slight layer of limestone or marble. Building Z: EMMERLING 2012, 194; also, some parts of sandstone and tuff. For the function of these structures, traditionally seen as temples, but more likely treasuries – or archives, or dining-halls – see EMMERLING 2012, PICCININI 2016 and CHAPINAL-HERAS 2021. They provide strong arguments to support their hypothesis – shape of the buildings, no specific material evidence of cult – although building Z does seem to have been a temple, mainly due to the presence of an altar in front of the entrance and the kind of votive offerings that were found there.

[6] DAKARIS *et alii* 1999, 152; DIETERLE 2007, 135 and 159. The stoa of this building has elements of limestone, sandstone and conglomerate.

[7] DAKARIS *et alii* 1999, 152. The capitals of the Doric columns of the peristyle were made with sandstone. Probably the prytaneion, although EMMERLING 2012, 211-228, suggests that maybe this was a cult building.

[8] DAKARIS 1971, 65; DIETERLE 2007, 142 and 164; PLIAKOU and SMIRIS 2012, 76. The size of limestone blocks are 1.20m x 0.50m x 0.40m. The theatre is currently being restored by a team directed by Prof G. Smiris.

[9] HIGGINS/HIGGINS 1996, 99. Prof. THEOULAKIS 2005 presented the most complete research concerning the stone utilized for the construction of the theater.

[10] DIETERLE 2007, 151. The width of blocks of the isodomic wall is *ca*. 3.60m.

[11] The most complete work focused on these pedestals and the remaining parts of their statues is KATSIKOUDIS 2005, although nine new pedestals appeared during the last archaeological seasons; for them, see GRAVANI 2007 numbers 3 and 5-12.

[12] DAKARIS 1971, 77.

[13] THEOULAKIS 2005.

[14] ZACHOS 1954. Marked as *Te*, this section includes limestones, sandstones, hornstones, and conglomerates.

[15] The first one, performed by Diego Chapinal-Heras and Vega Zamora (10-02-2015). The second by Diego Chapinal-Heras, Panagiotis Kaplanis, Andreana Antoniou, and Andreu Bonavía (11-30-2015). The third one by Panagiotis Kaplanis and Aris Papagiannis. We would like to thank Petros Katsoudas, member of the restoration team of the theatre of Dodona, for his advice regarding the possible location of the quarries.

[16] JACOBSHAGEN 1986, 52.

[17] HIGGINS/HIGGINS 1996, 98-99; THEOULAKIS 2005. Far north from here, in the Illyrian mountains, this is also attested, as for instance in Byllis: KOZELJ/WURCH-KOZELJ 2012, 619.

[18] OATES 1998, 16. The main component of this stone is calcite and it might also contain dolomite: MACKENZIE/ADAMS 1994, 62

[19] KLEMM/KLEMM 1993, 23.

[20] ROCKWELL 1993, 156. At the same time there are fault vertical lines, although they are less visible. They can be used in quarries to define the boundaries of the potential block (156-157).

[21] DWORAKOWSKA 1975, 147; OATES 1998, 12.

[22] ROCKWELL 1993, 162.

down following the hillside. Such examples are to be found at Aphrodisias in Turkey,[23] the area of the sanctuary of Dydima,[24] Naxos,[25] or Los Bañales, in ancient Hispania.[26] It is possible to see this bedding structure in different parts of the valley of Tcharacovitsa. This explains why there is not a unique pit, but a large area where quarry-marks can be easily discerned.

The studied area lies in the slope known as Agios Nikolaos, between the village of Dodonoupoli and the highway tunnel. Although wild plants cover most of this land, it is possible to reach it through a narrow path naturally made by a watercourse, today dry. Near the area where many rocks with quarry-marks stand, there is a path delimited by two thin modern walls (**Figs. 11-12**).[27]

The shape of these blocks tends to be regular. The thickness is usually similar, *ca*. 40cm., due to the homogeneity of the limestone beds of the slope. We can see a similar pattern in the Asomata quarries, near the Macedonian center of Beroea, where the characteristics of the rock favored the detachment of the block practically in its final form.[28] There is a remarkable variety of marks, as the pictures show, according to the techniques and tools that were employed to obtain the material and to work the stone. Greeks had different tools for these tasks, mainly wedges – both metal and wooden –, hammers, picks, chisels, axes, adzes, crowbars, and punches.[29] Moreover, they had several techniques for splitting off the stones, depending on the kind of material and how it was structured.[30]

The most common marks in Dodonaean quarries are triangular and semi-circular holes in the sides of the blocks. In other quarries it is more frequent to see rectangular trenches about 40-80 cm wide along a straight line.[31] Workers made small trenches or channels to delimit the blocks, as well as vertical marks.[32] The metal wedges were especially useful to detach the blocks from underneath.[33] Some of the blocks in this area appear isolated. They have those marks, which means that they are the discarded parts of those blocks detached from the parent rock that were brought to the shrine.

It was necessary to shift these materials from this location to the sanctuary. In other Hellenic cases, a road was prepared to make this process easier, as we see in a pit located near the mount Himettos.[34] In Dodona, workers would have moved the blocks following the gradient of the slope and, once in the deepest part of the valley, they would have carried them to the sanctuary. The area of the slope, although apparently easier for hauling the stone, actually demanded more effort to control the effect of the weight.[35] One of the goals of the fieldtrips was to find a sort of path that could have remained with the common traces of this activity, as for example grooves or tracks along the ground of stone produced by the wheels of the wagons.[36] Another possibility, when the blocks were too heavy,[37] and this can be the case, was to use two timbers as sledge, so the stone rolled over them.[38] The search was unsuccessful, but it does not imply that the transportation technique was different, since the development and erosion of the territory over millennia could have removed the evidence of grooves or tracks. It is not possible to know the method or methods employed for haulage. A simple one was pack animals, but it worked only with small loads,[39] and the blocks in Dodona were heavier. The absence of evidence entails to surmise that wagons or some kind of tackle system was used, but it remains uncertain.

Plausible evidence of this itinerary is the path delimited by two modern walls mentioned above. This kind of routes is frequently very old. This path could represent the remains of an ancient route used to carry the rocks obtained in this zone, although this theory remains hypothetical. Another finding can reinforce this hypothesis: a few meters higher in the slope another wall, made with bigger stones, appeared. As it was completely covered by bushes, it was not possible to take pictures, neither to examine it accurately; but its presence in this location is quite suggesting. By cutting the wild vegetation, not possible in this preliminary study, a systematic prospection of the area would provide more useful information concerning the quarrying activity and its development.

QUARRYING ACTIVITY AND DODONA

Quarries in Greece

Quarries in Greece are well attested,[40] although scholars have focused more on the Roman ones.[41] Whereas Rome developed a remarkable technique to obtain resources for construction,[42] most of the Greek cases were relatively small, connected to specific construction projects.[43] This

[23] ROCKWELL 1993, 162.
[24] BORG/BORG 2003, 430-432.
[25] DWORAKOWSKA 1975, 147.
[26] GUTIÉRREZ GARCÍA-MORENO, ROYO/ANDREU PINTADO 2012, 653-655.
[27] This path also appears in the study of Prof. THEOULAKIS, who explains that in this area limestone was quarried.
[28] KOUKOUVOU 2012, 266-267.
[29] WARD-PERKINS 1971, 138; DWORAKOWSKA 1975, 99-102; WAELKENS/PAEPE/MOENS 1990, 55; FANT 2008, 122-123; ZARZALEJOS/GUIRAL 2010, 117-119. The tools and techniques did not vary in Greek culture since the Archaic period onwards: WAELKENS/PAEPE/MOENS 1990, 62; although the late antique period saw the introduction of a new one, the pendular saw: WAELKENS/PAEPE/MOENS 1988, 16-17.
[30] WAELKENS/PAEPE/MOENS 1988, 18.
[31] FANT 2008, 122.
[32] GUTIÉRREZ GARCÍA-MORENO 2009, 261.
[33] DWORAKOWSKA 1975, 145.
[34] GOETTE 2002, 96-98.
[35] RUSSELL 2013, 101.
[36] Although the appearance of this kind of archaeological record could be dated not in Antiquity, but in Mediaeval or Modern times. Usually, it is necessary to compile more data linked to these traces to date them properly.
[37] Regular wagons could have carried no more than 1 or 2 tones: RUSSELL 2013, 98.
[38] WARD-PERKINS 1971, 142.
[39] RUSSELL 2013, 97.
[40] The most updated work is the *corpus* of KOKKOROU-ALEVRAS *et alii* 2014, that compiles information on 1026 quarries identified in ancient Greece.
[41] In his PhD, Russell catalogued the Roman quarries. This study entailed the creation of the website "Stone Quarries Database" (http://oxrep.classics.ox.ac.uk/databases/stone_quarries_database/, accessed on 20-02-22), that is continuously updated.
[42] The imperial building projects required the highest densities of high-quality stones (RUSSELL 2013, 18), and the main kind of raw material was marble (LONG 2017, 52).
[43] FANT 2008, 124. RUSSELL 2013, 63: Some of the biggest quarries in Antiquity are from Roman times, especially Prokonnesos (30km^2, more than 1,000,000m^3 extracted), Aswan (ca. 20km^2, 220,000m^3), and Dokimeion

does not imply that this activity is completely unknown.[44] For example, archaeologists have discovered many quarries in Laconia,[45] as well as in Delos,[46] Euboea,[47] Lesbos,[48] Kos,[49] and four in the island of Kythera, active from the prehistoric period to modern times.[50] The enormous complex of quarries near Aphrodisias began its activity in Hellenistic times onwards and was especially important during the Imperial period.[51] Delphi, where the main construction material was limestone, provides interesting data, too. In the region of this shrine there are many small quarries, although the main ones are in the area of Prophitis Elias, which lies on the lower southwestern side of Mount Parnassus, 5km southwest from the center.[52] There are also places where the stone originated from the same location where the edifice was eventually built, as we see with the temples of Apollo and Athena in the ancient city of Karthaia, in the island of Kea.[53] One might seek for places where the elites obtained prestigious stones and used them in order to show their wealth and power, but actually raw material for construction and utilitarian products were more demanded as most quarries attest.[54]

With regard to Epirus, the *Corpus* of Kokkorou-Alevras *et alii* mentions five quarries.[55] Nos. 243 and 244 are the ones from the area of Dodona that Dakaris mentioned. In the Nomos of Thesprotia, No. 245 is located near ancient Phanote, in Agios Donatos,[56] whereas No. 246 is linked to the so-called Nekyomanteion.[57] Finally, in the Nomos of Preveza there is at least one in Koinotita Stephanis, No. 247; the odeion of Kassope was built with limestone plaques obtained here.[58] Apart from these, there is another known quarry, although not cited by Kokkorou-Alevras *et alii*: in the neighborhood of Ioannina called Klimatia, there are some stones with similar characteristics, but further research about them has yet to be made.[59]

Quarries and Dodona

In the case of Dodona, it would be a mistake to think that quarrying was a continuous activity. The place functioned as a sanctuary since at least the eighth century BC, maybe even before,[60] until Late Antiquity, when it was abandoned. However, the building process began quite late, at the end of fifth-century or the beginning of the fourth.[61] Most of the structures are dated to the Hellenistic period, indeed. For this reason, the chronology of most of these quarry-marks may cover these centuries and, more specifically, the 3rd century, when it seems that the main edifices were built.[62] A few more structures were erected during the Roman period onwards, as for example the Christian basilica,[63] but most of the materials required for this were just re-used, taken from previous edifices already abandoned.[64]

It is not possible to interpret the quarry-marks for dating, since the technology and tools changed very little between the Archaic period and modern era.[65] Therefore, there are not conclusive data to assure the Hellenistic chronology of the pits. Could these quarry-marks date to an earlier or later period?[66] During the fieldwork it was not possible to find more archaeological traces that could shed light on this issue, as we can see for example in Thera, where some quarry-marks seem to be actually masonry marks;[67] or in Lesbos, where pottery shards help to confirm a Roman chronology.[68] Nevertheless, we might find the answer if we pay attention to the development of the valley of Tcharacovitsa: from Antiquity to modern times, the main site was Dodona. The sanctuary was active over one and a half millennia, but the period of major development was the Hellenistic one. The basilica, the main structure of later times, was partially erected with materials of previous buildings. The only part of Dodona still unexcavated is the acropolis, where one can assume there were houses, i.e. stone was required. The chronology of the settlement is therefore uncertain. There was no other remarkable site in the valley, where small villages have been always the common trend, and it is not likely to have exported this limestone to further places, since other settlements in the region would have easily obtained the material for construction in their own surroundings. However, even small modern settlements, such as modern Dodonoupoli or Dramesioi, needed stone for the buildings, and the techniques to obtain it maybe did not vary until recently. Thus, it cannot be completely confirmed

(ca. 8km^2, 500,000m^3).

44 One of the most complete works that talks about different quarries in ancient Greece is WAELKENS/PAEPE/MOENS 1990, where authors examine the origins of the techniques that were employed.

45 KOKKOROU-ALEVRAS *et alii* 2009b.

46 At least 19 have been identified; also, a certain amount of the stone was obtained from the nearest islands of Rheneia and Mykonos: CHADJIDAKIS/MATARANGAS/VARTI-MATARANGAS 2009, 276-284.

47 CHIDIROGLOU 2015. The activity increases during the Roman period.

48 ZACHOS/LEKA 2012, 592-596.

49 POUPAKI 2004, 28; CHATZICONSTANTINOU/POUPAKI 2009, 63. In this case, most of the exportations during the Hellenistic period went to Egypt.

50 KOKKOROU-ALEVRAS *et alii* 2009, 183.

51 LONG 2012, 57-62.

52 PAPAGEORGAKIS/KOLAITI 1992, 37. Here the method used to extract the blocks seems to have been almost similar: they started cutting down trenches on all sides of the block, which were turned into holes. Quarry workers inserted wedges in those holes, so the rock was cut slowly (38).

53 KOLAITI/MENDONI 1992, 29-31.

54 ABU-JABER *et alii* 2009, 1.

55 KOKKOROU-ALEVRAS *et alii* 2014, 74, nos. 243-247.

56 SUHA 2007, 61.

57 In the last decades, the interpretation of this site as the Nekyomanteion has been challenged. For this issue, see FRIESE 2010, with previous bibliography.

58 In the reference, not Kassopi, but Dodona, is mentioned. However, the sentence is surely wrong.

59 I thank Professors K. Soueref and Ch. Klitsas, from the Ephorate of Antiquities of Ioannina, for their information concerning this place. This Hellenistic site has not been excavated yet, just a few data are provided by HAMMOND 1967, 191-193.

60 For the debate about Dodona as a religious center during the Mycenaean times, see SOUEREF 1999, 31-32 (supports), KLEITSAS 2021 (supports) and TARTARON 2004, 21 (denies).

61 Although there are remains of older buildings, mainly an ellipsoidal edifice, they did not last much time and it is not sure if stone was employed: PICCININI 2012, 101-102. Apparently, the first one seems to have been the temple of Zeus: EMMERLING 2012, 28-30.

62 The specific chronology of the buildings is still debated, although there is no doubt that most of them belong to the Hellenistic period. For this question, see EMMERLING 2012.

63 BOWDEN 2003, 121-126 and 145-147.

64 DAKARIS 1971, 64-65.

65 RUSSELL 2013, 81.

66 This issue is quite common in studies about quarries: BURKE 2013, 44. We can see this for example in northeast Hispania: GUTIÉRREZ GARCÍA-MORENO 2009, 263. It is usually necessary to collect extra data that gives enough credit to determine the chronology of the site.

67 TZILIGKAKI 2015-2016, 139-140.

68 ZACHOS/LEKA 2012, 600.

if all these quarry-marks are directly linked to Hellenistic Dodona, but both the historical context and the evolution of this region point to it.

DISCUSSION – QUARRIES, ECONOMY, AND SETTLEMENT NETWORK

The economic perspective of this process is complex. The sanctuary would have needed a good and strong framework to organize all the steps. First, the strategy of exploitation, that is to say, the workforce in quarrying zones to extract the stone and prepare it; second, the transportation of this material; third, the reception at the sacred site, where it was finally utilized for the construction of a building. This means a heavy resource investment. It is not sure whether quarry workers received a salary or whether the activity was carried out by slaves. Waelkens, Paepe and Moens reject this theory: it required remarkable skills to work in quarries, so the activity is likely to have been performed by families, passing on their experience from one generation to another.[69] On the other hand, even if this hypothesis is wrong, at least accommodation and support were necessary. As a logical consequence the commerce probably increased here.

With regard to transportation, the decision to use materials from the valley of Tcharacovitsa is logic. In Antiquity the easiest way to carry heavy products was by sea or rivers.[70] By land, the further the place, the more difficult and expensive it was. The main raw material for construction was always timber and stone, both with multiple varieties and, therefore, origins.[71] There are a few Greek buildings from the fifth and fourth centuries that bear epigraphs with information concerning quarrying costs and the contracts to carry it out,[72] and there are many more cases in the Roman world.[73] Sometimes these materials are obtained from the same area, but in other cases the itinerary is longer; this shows the existence of imports and exports.[74] As Burford points out, probably local stone did not have any cost *per se*, since it was located in the territory owned by those who ruled in the region.[75] Conversely, we know some cases of importations, as for instance the sanctuary of Asklepios in Epidauros, where stone from the area of Corinth was employed.[76] There are even accounts of costs of importing construction materials, as in Delphi. Here, each block bought to rebuild the temple of Apollo cost 61 drachmas at the quarry, plus 600 for the transfer from the harbor of Kirrha to the shrine.[77] Since Dodona is situated inland, in the territory of Molossia, 80km far from the Ambrakian Gulf, it is more reasonable to obtain materials that were near, especially if the entire valley offered limestone.

Transportation of the raw material from the pit to the site is the most obvious connection between both places, but not the only one. The appearance of new sites is a common consequence. For example, in the region near Emerita Augusta, in modern Spain, a few villages were founded as a way to provide accommodation and nourishment to the quarry workers.[78] The most remarkable case in Greece is surely Thorikos, in Attica, whose origin and development was narrowly linked to the mines of Laurion.[79] Would it be possible to see a similar phenomenon – although at a lower scale – in Dodona? Probably not because the area of stones with quarry-marks is near enough to Dodona as to consider that accommodation was actually in the asty of the sanctuary, the acropolis.[80]

From the above explained, an important thesis can be posited: we should not understand or study quarries as an isolated element. They were part of a bigger network that connected, in this case, the places where the stone was obtained and also Dodona, where it was used.[81] With this scope it is possible to proceed to a more accurate analysis that covers the entire area where both quarry and sanctuary are located, as well as the context of this process. In this sense, we need to focus on the motivations to accomplish this building project. In order to examine it, a brief summary about the political context of Epirus is necessary.

The zone where Dodona and the quarries are situated is Molossia. Its history during the Archaic period and previously is scarcely known. Both the literary and epigraphic sources that provide information on it date mostly to the fifth century onwards, referring to the Molossian kingdom in the Classical age.[82] The political development of this area until Rome conquered it 167 BC is not completely known but it is confirmed that the Hellenistic period was a very active epoch. The kingdom turned into the Molossian Koinon, preserving the Aeacids as rulers. Once this royal family disappeared in 232, a more extensive federal state was formed in almost the entire territory of Epirus, the Epirote Koinon. Before, it is possible that there was a previous step in the process of federalization, with a period of an alliance, a *symmachia*.[83]

[69] WAELKENS/PAEPE/MOENS 1990, 62. More scholars support this opinion, such as ABU-JABER *et alii* 2009, 1.

[70] SNODGRASS 1983; RUSSELL 2013, 96-97; PREVIATO/ZARA 2017. In an interesting article concerning wrecks that brought stone, RUSSELL 2012, 536, highlights that this was not the typical composition of cargoes, but most probably there were specific buyers, and they were the result of direct commissions. The same author 2013, 104-110 points out that overland transport was actually more reliable, since river or sea shift was too conditioned to other factors, such as the weather.

[71] Marble is quite common in many sanctuaries (SNODGRASS 1980, 140), although in the case of Dodona it is scarce, even in sculpture, where bronze was more frequent: DAKARIS 1971, 95.

[72] As in Epidauros: BURFORD 1961, 89; 1969, 88-118.

[73] RUSSELL 2013, 37-62.

[74] HOPPER 1979, 142 -146.

[75] BURFORD 1969, 173. Although this scholar considered likely that quarries were located in private property.

[76] BURFORD 1960, 7.

[77] RUSSELL 2013, 103.

[78] PIZZO and CORDERO RUIZ 2014, 330-339.

[79] MUSSCHE 1998, 2-29.

[80] Although there has not been an exhaustive study of the valley of Tcharacovitsa, it can be assumed that there were many komai and farming sites surrounding Dodona. This would not have been linked to quarrying activity, but just to the development of the region. On the other hand, when stone was obtained some km further, the foundation of small settlements for workers is likely; they would have been abandoned once the work was completed.

[81] BURKE 2013. This is called by BLOXAM 2011, 153, "associated historical landscapes", and is attested even in the Neolithic period, as in the Swabian Alb, in southern Germany: FISHER *et alii* 2013, 13-16.

[82] The first mentioned is Admetus, who protected Themistokles: Plut. *Them*. 24.2; Aristodem., *FGrHis* 104 F10.1).

[83] These lines are a short summary of the main hypothesis concerning the ancient history of Epirus. Several scholars, mainly HAMMOND 1967, CABANES 1976 and DAVIES 2000, have supported it. Recently, MEYER (2013 and 2015) has revised the epigraphic sources and her conclusions

Dodona was the main cult center of Epirus and, according to Herodotus, it was the oldest oracle of Greece.[84] It might not be a coincidence that its construction process occurred during the development of the kingdom of Molossia, which became the most powerful state in Epirus. All the data suggest that the sanctuary was controlled by the kings and this situation is likely to have endured during the period of the Epirote Koinon, when more structures were constructed. A great plethora of events took place here, as for example the agonistic competition of the Naia,[85] manumissions, concessions of citizenship and other privileges, and the erection of human-scale statues to commemorate different achievements.[86] During this time the oracle activity was not interrupted, neither the votive offerings narrowly linked to it.

These rulers – the kings first, the leaders of the Koinon later – took surely the decision to construct edifices in Dodona, to monumentalize the sanctuary, as a way to show their power and wealth. This religious landscape was radically changed with the appearance of the structures mentioned above. If we consider that the construction project of Dodona was requested by those who ruled in Molossia, was quarrying directly controlled by these governors? Or may it be a private business that provided the raw material for them? Both possibilities are attested in Antiquity.[87] There is no information about this in Dodona, but it seems reasonable to think that the whole process of quarrying and building was controlled by the state, which was interested in turning the shrine into a more monumental religious site and, at the same time, to show the power of the ruling class. Additionally, we have to also consider that all the investment may have not come from the state, but a part of it from donations of communities or particulars, as it is attested in other places such as Delphi and Epidauros.[88]

CONCLUSIONS

We may assume that quarrying activity took place therefore from the 4th century onwards, was especially important in the 3rd, and decreased after the Roman conquest of Epirus in 167 BCE. It required a remarkable investment of resources and time to extract and carry the blocks. In an experiment in Thasos, archaeologists calculated 22 man-hours to obtain a block measuring one-eighth of a cubic meter.[89] For this reason, the time needed to erect structures in Dodona, especially the theater, surely covered a long span of time, perhaps even generations in the case of the aforementioned building.

At the same time, the movement of people linked to quarrying, haulage, and building is worth to be considered. To make a comparison, Burford estimates 175 people connected to the construction of the 4th century temple at Epidauros, perhaps more than 200 if one adds other related tasks.[90] Dodona did not have such monumental temples, but the entire complex of the site, including especially the theater, undoubtedly required more people. They worked and lived there in different times throughout the long process in which Dodona turned from an open-air sanctuary into an urbanized religious center.

have provided a new interpretation. Her thesis implies mainly to reject the existence of an alliance between Molossian and other Epirote *ethne*. For a new hypothesis that considers the formation of the alliance before 331, see PASCUAL 2018.

[84] Hdt. 2.52.2.

[85] CABANES 1988. Although it was published some decades ago, this is still the most complete study concerning the Naia.

[86] KATSIKOUDIS 2005.

[87] RUSSELL 2013, 355; LONG 2017, 53-56 and 76.

[88] BURFORD 1969, 83-84.

[89] KOZELJ 1988, 39; LONG 2012 63.

[90] BURFORD 1969, 251.

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Fig. 1. Quarry mark (photo P. Kaplanis).

Fig. 2. Quarry mark (photo P. Kaplanis).

Fig. 3. Quarry mark (photo P. Kaplanis).

Fig. 4. Quarry mark (photo P. Kaplanis).

Fig. 5. Quarry mark (photo P. Kaplanis).

Fig. 6. Quarry mark (photo P. Kaplanis).

Fig. 7. Quarry mark (photo P. Kaplanis).

Fig. 8. Quarry mark (photo P. Kaplanis).

Fig. 9. Quarry mark (photo P. Kaplanis).

Fig. 10. Detail of bed stone layer (photo P. Kaplanis).

Fig. 11. Quarry mark (photo P. Kaplanis).

Fig. 12. Quarry mark (photo P. Kaplanis).