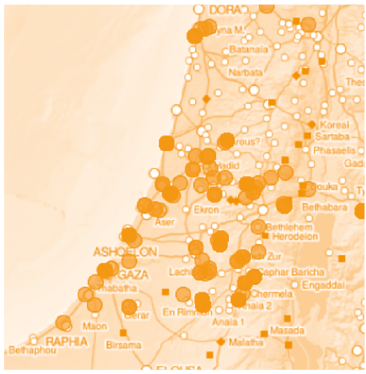
Marmora Bizantina: A digital corpus of marble finds from the southern Levant



Abstract: Archaeological excavations in the Levant have provided a significant number of marble finds dated to the early Byzantine period (4th – mid-7th century CE). Information on these objects is, however, scattered over numerous publications, hindering synthetic studies of marble imports that reached this part of the Mediterranean world. A way to address this problem was to create a database facilitating access to the dataset of marble finds from the southern Levant. This paper presents the *Marmora Bizantina* database, describes its content and interface, and discusses the geographic and chronological scope of the dataset. Some uses of the database are discussed, remarking on the limitations that need to be taken into account. The paper also provides information on the analytical tools available on the database website.

Keywords: archaeological database, marble, Levant, early Byzantine period, ancient trade

INTRODUCTION

The Eastern Mediterranean is a region devoid of marble outcrops. From the Achaemenid period onward, marble was, however, brought to this area and processed locally to produce finished products. Exponential

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growth in marble import began with the Roman conquest of the Near East and continued, on a large scale, throughout the early Byzantine period. Thus, finds from this part of the ancient world offer excellent research perspectives for analyzing large-scale marble consumption in a region that did not participate in its extraction. This aspect distinguished Arabia, Palestine, Phoenicia, and Syria from many other parts of the Mediterranean world, where the marble trade was dominated by locally or regionally quarried materials.

In the Levant, the study of marble objects has always been influenced by the art-historical approach, which has yielded important conclusions regarding artistic trends (e.g. Koçak and Kreikenbom 2023). The economic approach has also been popular, as exemplified by Moshe Fischer's (1998) pioneering analysis of the distribution of different categories of marble objects at Roman sites across Palestine. This research laid the groundwork for one of the best regional case studies in the recent in-depth analysis of the marble trade in the Roman Empire (Russell 2013).

Thus far, no similar research endeavor has been undertaken for the decorative stones imported into the southern Levant in the early Byzantine period (4th – mid-7th century CE). However, before such a synthesis can be attempted, it is necessary to inventory the marble objects scattered throughout the region. The rationale behind compiling such an inventory lies, among other things, in the fact that marble appeared on many more sites in the early Byzantine period than in the Roman period. This indicates an important change in trade patterns — a change that has yet to be explained.

To address this issue, a project was launched with an aim to compile a corpus of marble finds from the southern Levant [*Fig. 1*]. In addition to a simple online database in tabular form (Gwiazda 2022b), the collected data is also available for inquiry using various search modes and analytical tools. This online resource is intended to help achieve a better understanding of the cultural, social, and economic aspects of marble use in the early Byzantine period. Therefore, the dataset is not meant to be a mere catalog of finds, but is supposed to serve as a tool helping to provide answers to specific inquiries on the supply of marble to different types of sites. The need for such datasets is beyond doubt, given their increasing popularity in archaeological research. Over the past few years, several similar projects have been carried out to aid in the study of cultural (Gwiazda 2020; Patrich et al. 2020) and economic (Bes 2015; Bes et al. 2019) diversity and change in the Eastern Mediterranean.

This paper presents the rationale behind creating the *Marmora Bizantina* database, a research tool for the study of marble finds from the southern Levant. The geographic and chronological scope of the project, data collection principles, and the structure of the dataset are discussed below. Subsequently, the web-based application designed for analyzing the collected data and visualizing the results of various types of searches is introduced. The final section focuses on the identification of potential research avenues in which the dataset could be of use.

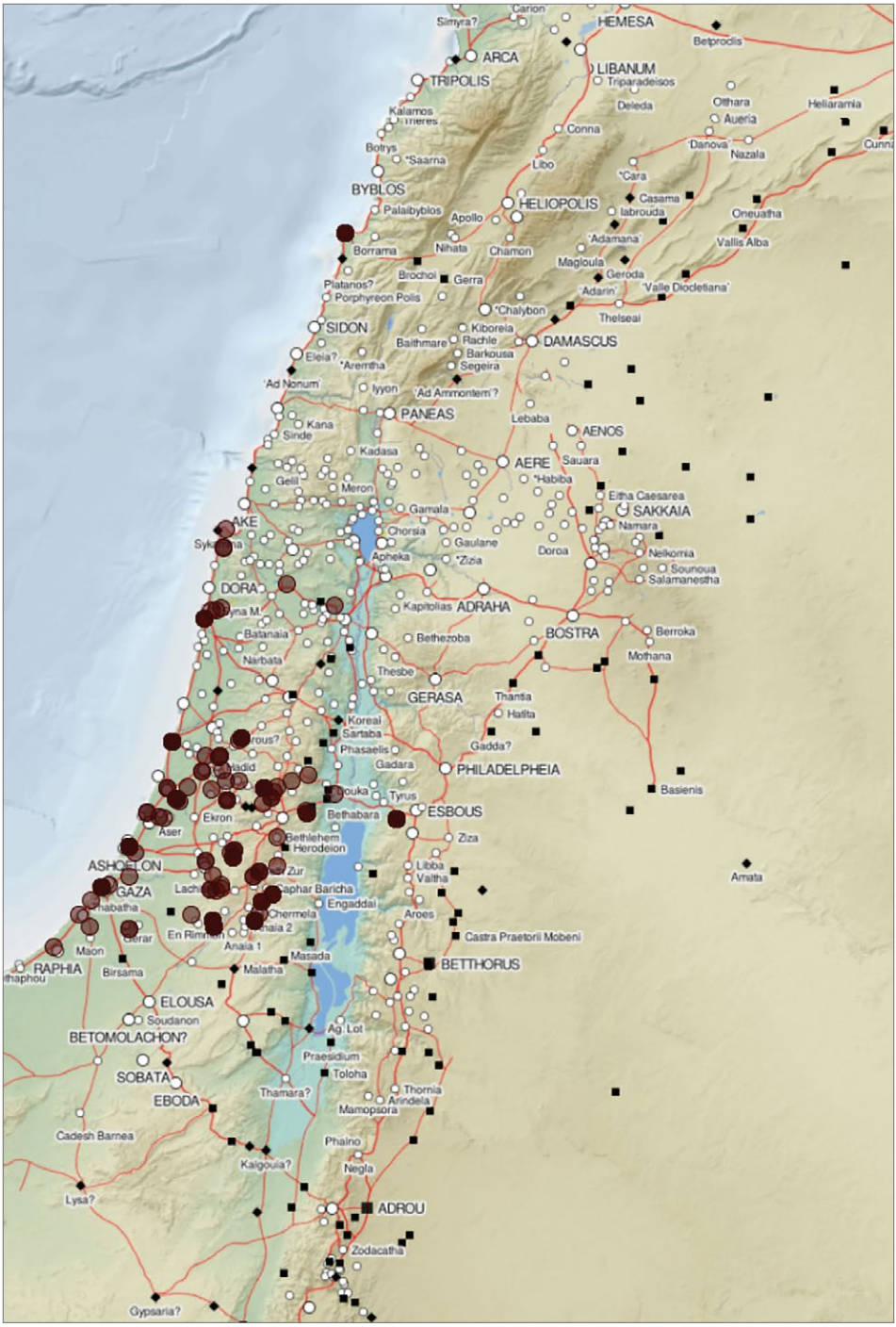

Fig. 1. A provisional map showing the southern Levantine sites that have yielded marble finds (Image M. Krawczyk and M. Gwiazda)

GEOGRAPHICAL AND CHRONOLOGICAL SCOPE OF THE DATASET

The dataset comprises finds from the southern Levant, where the state of archaeological research is much more advanced than in the northern part. The region encompasses the early Byzantine provinces of Arabia, Palaestina Prima, Palaestina Secunda, Palaestina Tertia, and Phoenicia Prima. This area coincides with the territories of the modern states of Israel, the Palestinian Authority, Jordan, and Lebanon.

As mentioned in the introduction, no marble deposits potentially important for supplying the local market have yet been identified in these areas. Thus, all the marble finds can be considered as imports from other parts of the Mediterranean. The main sources of marble for the Levant were the quarries located in Greece and western Asia Minor. Another key region for the extraction and export of decorative stones was Egypt, which mainly supplied varieties of granite. Therefore, the case of the southern Levant enables one to consider the stone trade solely from the perspective of trans-regional imports.

Although the primary objective of the project is to collect information on marble finds from sites dated to the early Byzantine period, the corpus also includes objects from both the Roman (1st century BCE – 3rd century CE) and the Islamic periods (up to the 10th century CE). Extending the chronological scope of the dataset enables application of a diachronic approach in analyses, providing an opportunity to identify any significant changes in the patterns of marble import between these periods. Additionally, finds of early Islamic date may be helpful, among other things, in reconstructing dynamics of decline in the use of marble after the Arabs took control of the Near East.

METHODS

STEPS IN DATA COLLECTION AND PROCESSING

Information on the marble finds included in the dataset has originated primarily from published excavation reports. The sources include available online databases, such as *The Archaeological Survey of Israel* (https://www.antiquities.org.il/survey/new/default_en.aspx), which provides information on numerous finds from surface surveys. However, only the objects datable to one of the three chronological periods key to the project (Roman, early Byzantine, and early Islamic) have been taken into consideration. The dating of individual objects is based mainly on their stratigraphic context. However, there is a large group of finds whose chronology relies on other factors. For example, sculptures and architectural details are most often dated on the basis of analogies and stylistic criteria. For some items of small size (e.g. table tops, mortars), parallels from other well-dated sites have been particularly helpful. Some objects bear inscriptions indicating the year of their creation,

while in other cases only paleographic criteria allow for an approximate dating. Lastly, the chronology of some of the marbles has been based on their function or the presence of decorative motifs. Examples of this group include church altars or chancel screens with depictions of the cross.

The inventory of marbles relies on all the publications known to the author. The only criteria used in their selection are those related to geography and chronology. For example, even well-dated marbles with inscriptions have been excluded from the dataset if information about their site of origin was lacking. For some publications predating the first half of the 20th century CE, the chronology of the archaeological contexts requires revision. For this purpose, indications deriving from research on oil lamps and ceramic vessels are taken into account. In recent decades, these two categories of artifacts have been the subject of numerous typo-chronological studies that enable establishing a more precise dating of the associated archaeological deposits.

Information derived from the published descriptions, as well as from accompanying drawings and photographs, is used to fill forms in FileMaker Pro Advanced 10, ensuring that each object is recorded in a standardized format. This has been achieved by introducing a limited set of descriptors focusing on the origin, function, and form of the individual finds. Some aspects of the marbles have been described using binary fields, where "0" corresponds to the absence, and "1" to the presence of a certain feature. In most cases, the precision of information about the geographic origin of the objects does not go beyond the level of the archaeological site. Therefore, such data cannot be used to analyze distribution in areas smaller than two square kilometers.

The collected data is subsequently exported to a table in .xls format. Following some updates, the dataset has been published on Zenodo, a repository developed as part of the European OpenAIRE program, which guarantees unrestricted access under the Creative Commons Attribution 4.0 International license. Each subsequent version of the uploaded data receives a new Digital Object Identifier (DOI) (Gwiazda 2022a). In parallel, the new version is uploaded to the *Marmora Bizantina* website, where the entire dataset is available for browsing and analysis (Gwiazda 2022b).

LIMITATIONS OF THE DATASET

A major issue to consider when analyzing the dataset is the highly variable state of research in different parts of the southern Levant. The differences become apparent upon comparison of historical regions. For example, the Galilee, located within the State of Israel, is much more thoroughly studied archaeologically than the neighboring Samaria, which is under control of the Palestinian Authority. The same problem applies to historical regions bisected by modern state borders. The southern part of Phoenicia, controlled by the State of Israel, is a case in point. It was excavated and surveyed much more extensively than the part of this region on the other side of the border.

A vexing problem is also the accessibility of the chronologically relevant material. For instance, the ancient city of Ptolemais (modern ʿAkkā), one of the most important sites in the region, provides little information of relevance to the database. This is due to the fact that most of the remains of urban architecture dated to the Roman and early Byzantine periods are located beneath structures erected in the Middle Ages and later. The same is true for Berytos (modern Beirut), which has been inhabited without any apparent interruption from the Bronze Age to the present day. In this case, however, large-scale urban excavations have uncovered numerous marbles, mainly associated with the Roman and, to a lesser extent, the early Byzantine phases of settlement. Nonetheless, the publication of this group of finds remains preliminary.

Another limitation to consider is the broad dating of some of the finds, sometimes exceeding a time span of two hundred years. This primarily applies to objects recovered from secondary deposits. However, even when dealing with churches with a secure founding date, one must be cautious about dating the marble liturgical furnishings found in them (e.g. chancel screens), as buildings of this kind tended to undergo modifications over the centuries of their use. In such cases, the evidence permitting to conclusively assign the finds to specific phases of use is often insufficient.

One must also keep in mind that marble was often reused. Evidence of this includes lime kilns with objects partly burned or prepared for burning, sometimes found in the vicinity (e.g. Tchekhanovets 2018: 224). Modifications impacting the functionality of the objects were also recorded. Examples of this practice include capitals reworked into mortars. However, as in the case of ceramic vessels, the durability of marble has greatly contributed to the preservation of these objects to our time, making them much more suitable for quantitative analysis than organic finds.

Lastly, a problem to consider is publication bias. It is common to find detailed descriptions of well-preserved objects that have artistic value (e.g. sculptures and reliefs) or carry inscriptions. This has led to an overrepresentation of some types, for example small marble tiles often used to record epitaphs in Late Antiquity (e.g. Ameling et al. 2014: 39–133, Nos 2174–2252). Descriptions of such objects are always accompanied by very detailed metric data. Items of the same type but without inscriptions were much more commonly used to decorate floors and walls of various buildings, yet publications merely record the fact of their discovery without providing metric and quantitative details. This is all the more surprising that at the same sites counting all fragments of pottery vessels is a standard procedure instrumental for reconstructing various aspects of local trade. Unique in this regard is the publication of marbles from churches in Humayma, which includes a catalog of all recovered fragments with detailed measurements (Schick et al. 2013). The observed biases necessitate a critical approach to the published data in order to benefit from its potential. However, with new discoveries, the quality of the published data will certainly improve, laying groundwork for more reliable hypotheses.

DATABASE CONTENT AND INTERFACE

The database uses a form with mutually independent object descriptors and metadata. By default, each object receives a separate description. The entries are devoted to marbles in the broader sense of the word, corresponding to the ancient understanding of this raw material, i.e. both genuine marbles (i.e. metamorphic rock composed of recrystallized carbonate minerals) and granites. None of the fields are relational, therefore the database structure itself is not discussed. The interface of the database is presented in detail below, defining the used terms and categories:

Catalogue no. records the unique inventory number assigned to each find (e.g. 0102, 3171, etc.). A single number is assigned to several marble fragments provided that they were certainly part of a single functional type. For instance, an altar partition broken into multiple fragments receives one inventory number. However, if the association of such fragments with a single object is uncertain, each is given a unique number. Separate numbers are also assigned to each of the columns, bases and capitals, which jointly formed, for example, a portico. This approach is due primarily to the fact that, in the early Byzantine period, the secondary use of columns that had originally been associated with various Roman-period buildings was fairly common. For the sake of consistency, this approach remains valid for *opus sectile* floors: each tile receives a separate inventory number enabling comparison of the number of tiles of various shapes and materials used in different pavements. The same rule applies to the floor tiles found in secondary deposits (e.g. trash dumps). However, publications rarely provide such detailed information. Therefore, in most cases considered thus far, it has only been possible to assign separate inventory numbers to groups of tiles characterized by the same shape, size, and material.

Country contains the name of the state that controls the territory in which the discovery was made.

Province refers to the early Byzantine unit of administrative division of the southern Levant (Arabia, Palaestina Prima, Palaestina Secunda, Palaestina Tertia, and Phoenicia Prima). However, it does not take into account the shifts in provincial borders during the Roman or Umayyad periods. Therefore, comparisons of assemblages from different periods should follow their geographic location rather than their historical administrative attribution.

Site name contains the modern and ancient names of the site, e.g. Beth She'an / Beisan / Skythopolis; Ascalon / Ashkelon.

Site type assigns the site to a type: village, town, monastery, and military settlement.

Port town is a binary field indicating whether the site is located directly on the Mediterranean coast. The privileged geographic position of such sites gave them easier access to imported marble. Therefore, they may be expected to have a marked overrepresentation of such finds compared to inland sites.

Pilgrimage site is a binary field indicating whether a given site was associ-

ated with places of religious significance for Christians, where pilgrimage traffic clearly contributed to economic development. Such places sometimes benefitted from funding by members of the imperial house. Therefore, the ability to exclude or include them when analyzing stone distribution permits to explore different aspects of marble use in imperial foundations. Both this field and the "Port town" field, described above, can be marked to distinguish sites that were simultaneously ports and pilgrimage sites.

Context allows to assign the place of discovery to a specific functional category: amphitheater, bathhouse, civic basilica, ordinary church, grave/cemetery, hippodrome, house, latrine, lime kiln, military camp, monastery, monastery church, nymphaeum, palace, pilgrimage church, press, public building, secondary deposit (e.g. trash dump), synagogue, theater, temple, and workshop. Surface finds and objects discovered during surveys fall into separate categories. In addition, it is possible to select the "no data" option from the list if publications do not provide information on where the object was found.

Context description provides space for a more detailed description of the object's findspot. For example, in the case of bathhouse complexes, it is possible to indicate the exact place in the complex where the marbles were discovered.

Color allows to select a single color that best characterizes the described object (e.g. black, white, gray-white, pink, etc.). The aim is to keep the list as concise as possible, so only primary colors and their combinations are included.

Provenance allows selection of one or more possible stone identifications (e.g. *Africano*, Aphrodisias, *cipollino verde*, Prokonnesos, etc.). The origin of a large number of colored stones is identifiable based on macroscopic observations. In the case of white marbles, on the other hand, archaeometric analyses are needed to determine their source. Therefore, white marbles are additionally distinguished from one another based on grain size, using a two-point scale (coarse and fine). It is also possible to classify the stones as unidentified marbles and granites.

Analysis is a binary data field used for indicating whether the object has been subjected to archaeometric analysis in order to establish the origin of the stone raw material.

Analysis results contains information about the type of archaeometric analysis carried out to identify the rock, and the results thereof.

Object type serves to assign the object to functional and/or formal categories. The possible choices are: altar, ambo, architectural element (e.g. lintel, seat, pier, archivolt, threshold, and doorjamb), architrave, baptismal font, capital, small capital, champlevé relief, chancel screen, chancel post, column, small column (i.e. altar support), column base, small column base, cornice, frieze, *intarsio*, menorah, mortar, *opus sectile*, pavement slab, pedestal, pestle, pilaster, plaque, reliquary, sarcophagus, sculpture, screen stela, table top, tesserae, tombstone, tympanum, wall revetment, weight, varia (e.g. mezuzah, medallion, door, stopper, etc.), and vessel. In the case of partly preserved objects, it is also possible to select the

"unidentified" descriptor. The list, though seemingly exhaustive, can be expanded further by adding new categories.

Reused is a binary data field for specifying whether the object was reclaimed for secondary use. Reuse may have involved a change of function by modification of the form, but a lack of change in the object's function or form was also possible, e.g. Roman sculptures decorating an early Byzantine building or an entire column reused in the construction of a wall.

Dimensions, recorded in centimeters, enable to calculate the approximate volume of the object (e.g. w. 110 x 100, h. 125 cm).

Volume (cubic meters) specifies the calculated volume of the object in cubic meters (e.g. 1.5125 or 0.004237) based on published data. In the calculations, the largest surface area of the object is multiplied by its height. The resulting value indicates the minimum volume of raw material used to create the object.

Inscription is a binary data field indicating the presence or absence of an inscription.

Object description is a text field in which, in the case of more complex objects, additional descriptions and indications of function may be added (e.g. round basin with plain rim).

Reference contains information on bibliographical data or internet resources used to create the description of the object.

Dating contains a time interval in which the object was created.

TPQ and *TAQ*, two separate fields, contain the *terminus post quem* and the *terminus ante quem* of the object's creation recorded in numerical form.

Centuries offers a choice of 11 binary data fields allowing to indicate the specific centuries to which the object has been dated. The earliest time interval is 100–1 BCE and the latest is 901–1000 CE.

Precise date, a binary data field, allows searching for objects with a precise dating, i.e., a narrow date range not exceeding 200 years.

WGS84 N and **WGS84 E** are two separate fields intended for recording the geographical coordinates of the object's find place. The spatial coordinates of sites are recorded in the World Geodetic System 1984 (WGS84) and expressed in decimal degrees.

Creation date contains the date when the record was created.

Modification date contains the date when the record was modified.

Record author contains the first and last name of the record author.

INTERNET INTERFACE

The dataset created using the defined criteria is presented on a dedicated website (Gwiazda 2022b), where individual entries, complete with illustrations of the objects and maps marking their sites of origin, can be browsed [*Fig. 2*]. The website comes with a number of additional features, including query and quantitative analysis tools.

Queries can be conducted using keywords or chronological criteria [*Fig. 3*]. It is also possible to search for specific

sites on a map with the aid of various filters. For example, this form of data visualization can show the distribution of sites with marble finds belonging to a particular category, in a specific type of building, over a specific time period. Once all the parameters have been specified, the map with the marked sites can be exported to .png format. This functionality is intended to be a kind of an open-access Geographical Information System for marble finds.

Another tool allows generation of bar graphs in .png format and presentation of the associated numerical data in tabular form (.xlsx format). Applying a single filter allows to produce a graphic representation of the number of occurrences of marble objects in various types of contexts. A two-filter query permits to add another criterion to the search [*Fig 4*]. It allows, for

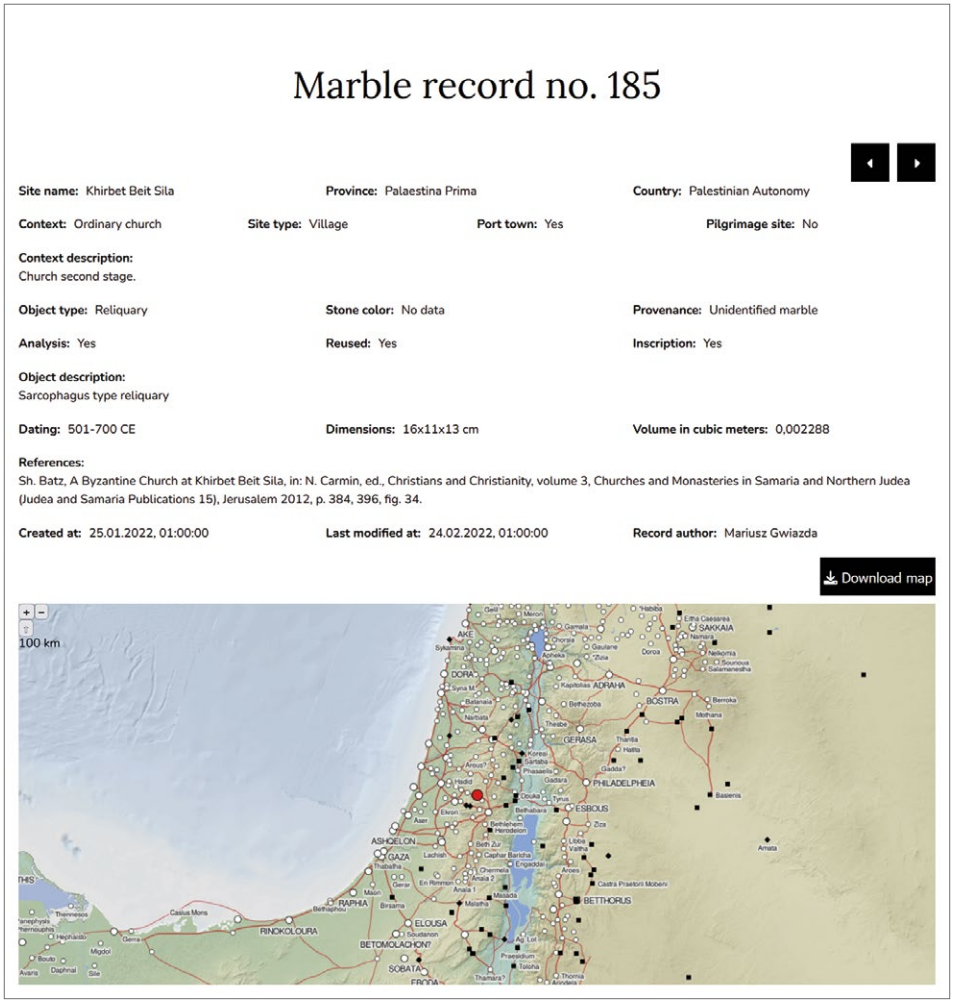

Fig. 2. An example of a record in the web application (Image M. Krawczyk and M. Gwiazda)

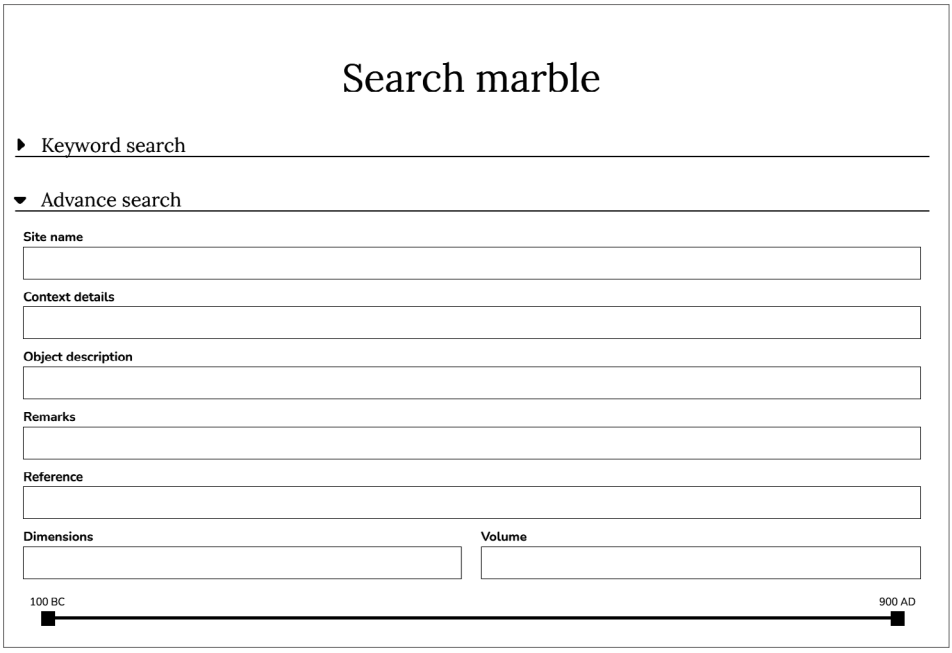

Fig. 3. Examples of search modes available in the web application (Image M. Krawczyk and M. Gwiazda)

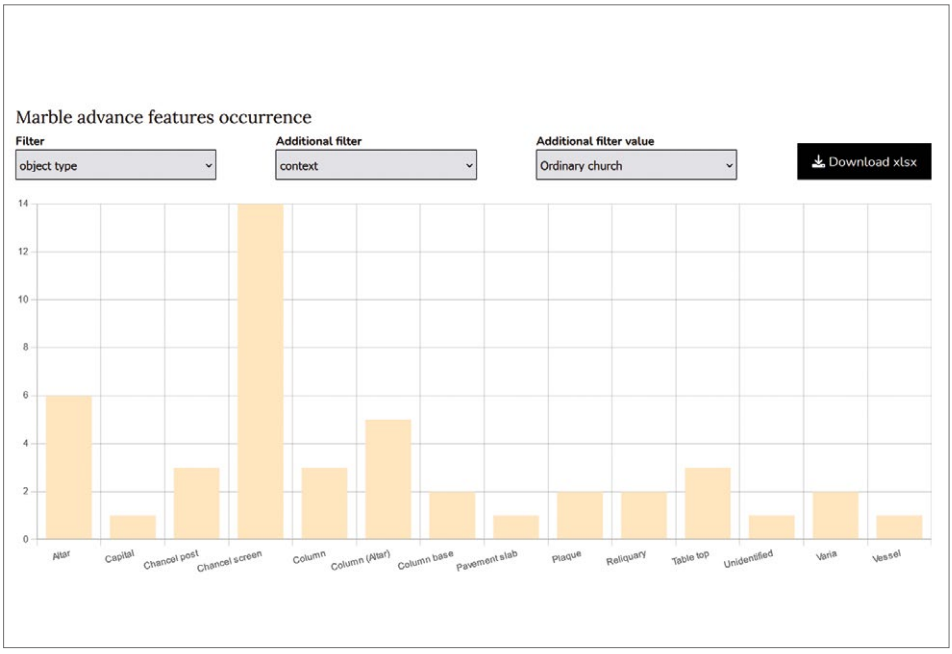

Fig. 4. An example of a graph obtained using the quantification tool available in the web application (Image M. Krawczyk and M. Gwiazda)

instance, to determine the number of columns associated with different types of buildings. The last two types of queries generate graphs showing the temporal distribution of the marble objects discovered, for example in different provinces, presenting the data separately or in combined form. These tools have a built-in statistical weighted date algorithm. The method has been applied successfully in quantitative analyses of large assemblages characterized by a varying precision of dating (Fentress and Perkins 1988; Fentress et al. 2004; Van Beek and Depauw 2013). This means that when an object is dated, for example, to the 3rd and 4th centuries CE, the value of 0.5 is assigned to each date, while in the case of only one date (e.g. the 3rd century), it receives the value of 1. This method of calculation gives more weight to finds with a narrow dating, e.g. an inscription that carries an annual date, and reduces the importance of objects with a less accurate dating.

POTENTIAL USES OF THE DATASET

The presented dataset is intended as a principal source of knowledge about marbles discovered in the southern Levant. It currently contains more than 4000 records, mostly concerning finds from Palestine, and it is growing steadily. It may be useful for comparative studies of similar finds from other parts of the Mediterranean and can also be linked to other large datasets collecting information on different groups of archaeological finds. Nevertheless, its primary purpose is to aid in research on the diversity of marble objects in the Levant. The studies may focus on the distribution of different categories of marble objects, considering factors like topography and distance from the Mediterranean ports in which the marble objects first arrived. The possibility to distinguish between various categories of finds, such as utensils (e.g. table tops), and elements of decorative (wall revetments and pavement tiles), structural (columns), and liturgical use (altars and chancel screens) may help to determine the prevalent categories of marble imports at different types of sites. Hypothetically, one may assume that marbles were more abundant in cities and on pilgrimage sites, but this assumption has not been proved so far. In addition, the dataset may help to investigate the diversity of marble assemblages dated to the early Byzantine period and discovered in cities and villages located far inland. Another potential field of research involves a variety of comparative analyses focusing on marble distribution and variation between the Roman and early Byzantine periods, leading to a better understanding of factors influencing exchange patterns in Late Antiquity. This should be possible after the quantification of various marble products, although no ready answers of historical significance are to be expected. The quantitative research may be treated as a point of departure for discussing problems related to the social dimension of the economy, considering the chronological and geographic context of the finds.

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