Reading and Designing the Area of Lambousa-Karavas: Acheiropoietos Monastery, Cyprus

First digital survey of the monastic complex

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Abstract: The object of this work is a survey of the Acheiropoietos monastery in Lambousa-Karavas, in Northern Cyprus. The study is the result of an international workshop in Girne, whose aim was the first survey campaign with laser scanning technology on this site. The Acheiropoietos Monastery has been under military control until 2006. During military occupation of the area the complex suffered a long process of decay that led to an advanced state of disrepair. The monastic complex is composed of three buildings: the church dates back to late byzantine period; it has been built between 11th and 12th century on the ruins of an Early Christian basilica, as can be seen by the remains in the external part of the apse. The original Greek cross plan has a dome. Later on two inner narthexes and a gothic external narthex were added to the church in different periods. These additions led to the present structure made of three aisles separated by pillars. Inside the church there is a wooden iconostasis and a baroque pulpit. In restricted areas an *opus sectile* floor can be seen and at the entrance of the nave there is a 17th century headstone. In the north side of the church the second block is situated: a two-floored building with external porticoes of 11th century. In the south side there is the third block: a one-floor building of mid-20th century. During the workshop a survey has been made supplying about 250 laser scans. Post production phase is the result of data processing and their transformations by software 3D model. The 3D model purpose was to extract plants, section and everything else useful to an adequate graphic restitution of the object. The final purpose was to create a cognitive framework, in order to program a plan of restoration work of the complex, because it is included in the architectonic heritage of the island.

Keywords: Laser Scanner Survey, Cultural Heritage, Cyprus, Lapithos, Monastery

Introduction

The main theme of this paper is the first survey made with a laser scanner in a Monastery named Acheiropoietos on the Northern part of the Cyprus Island. The survey took place during an International workshop whose object was to know and to enhance the value of the architecture in decay; the supervisors of the survey were Giorgio Verdiani and Andrea Braghiroli, from University of Florence. This architecture has been recently under the control of Cultural Heritage Department of Girne American University.
More precisely, this paper is a summary of the first Master Thesis written on this subject, whose object was to gather all the data of the survey. However, before analysing survey data, an historical background and a deep understanding of the current state of the complex is needed.

Historical description of the area of Lambousa-Karavas

The small villages of Lapithos and Karavas lie in the foothills of the Kyrenia Mountains close to the north coast of Cyprus. Behind them rises the peak of Kyparissovouno, one of the five fingers. The surrounding countryside, with its fertile agricultural land, has supported human life for thousands of years. The landscape here is well watered, thanks to the numerous streams and wells fed with rain captured by the steep mountains behind. The facing sea has played a crucial part in the life of the local populations over the centuries.

The kingdom of Lapethos has probably emerged during the first millennium BC, supposedly as a result of the growing economic and political connections between different communities during early Iron Age. The evidence for settlement in the area of modern Lapithos during the early Iron Age derives mainly from the burials around the modern village. The site is littered with the heavily eroded and quarried ruins of ancient structures and tombs, including industrial-sized fish-tanks and the remains of harbour works. Traces of an enclosing wall are also visible in the eastern part of the site, but its construction date and the area it enclosed are uncertain.

The site of Lambousa may have retained some degree of importance into the Hellenistic period because of its strategic position on the coast of Cyprus, which was effectively the northern boundary of the Ptolemaic kingdom centred on Egypt. In Roman times Lapethos was the centre of one of the principal regions into which Cyprus was divided, so presumably the main site was still an important administrative centre. Inscriptions and literary sources also record the existence of important public buildings and institutions, such as a gymnasium and possibly a theatre. Lambousa later became the seat of a bishop, another indication of its importance within the Roman political geography of the island. The town was sacked during the Arab raids of AD 653/4. Lapithos was the last stronghold of the invasion and, after the destruction of its walls, it capitulated following an agreement to trade gold and silver in change of the life for the inhabitants (HILL, 1940). It is possible that the famous Lambousa (or Cyprus) Treasures were buried during this period of crisis, which resulted in the abandonment of the coastal settlement. The population and the seat of the bishop transferred to the site of the modern village of Lapithos. Both Lapithos, and the village of Karavas which was also established at this time, were built using stone quarried from the ancient site (http://www.britishmuseum.org/research/publications/online_research_catalogues/ancient_cyprus_british_museum/ancient_kingdom_of_lapethos/introduction.aspx, BRITISH MUSEUM, 2005).

Since recently Turkish army has freed most of the military area it is now possible to visit much more of the site. Unfortunately it is in a dreadful status due to the proximity with the seaside and because a shepherd used to use the site as a shelter for his sheep. Anyway the island authorities have planned a Recovery Project. On arriving at the headland, tombs are clearly visible because they have been opened, and is also easy to wander inside quite freely. All these tombs were carved from the rock by hand and although the rock is pretty soft, the work to produce these tombs would have been quite hard.

A maze of tombs can be seen, some low lying under the ground with others located on top of them, some with additional chambers perhaps for a whole family as well as some probably for children as they are quite small. Although very faint, it is still possible to see some remains of the frescoes that were probably painted in honour to the departed within the tombs themselves. The site itself is huge and it’s highly complicated to

tell how many tombs there actually are, but taking in presumption that it was a city, there must be hundreds maybe even thousands ones, but major part of them are still covered.
Another important remain is what the majority believe to be a fish tank, however there have been claims that perhaps this was a Roman bath, considering the mosaic paths all around the tank. Anyway considering the fish tank hypothesis, the tank would have been used to store the fish with channels and inlets feeding the tank with clean water via sluice gates to change the water periodically, to keep the fish fresh until ready to be eaten or sold.
From the tank it is possible to see the remains of the city and steps which must have led down to the boats and ships below. At the end of the path is visible the entrance to the city itself, a ruin now, but it would once have been a huge structure made with rounded columns within the ruin which were perhaps taken from other places when Lambousa was being constructed.

Acheiropoietos monastery

The Acheiropoietos monastery (fig. 1) is a Greek Orthodox complex dedicated to Virgin Mary, it got its name from the expression “Acheiropoietos” that literally means “made without hands”, an icon believed to have been miraculously moved from its original location in Asia Minor by the Virgin Mary in order to save it from destruction due to the Turkish conquest. It lies in Kyrenia district and more precisely Lambousa, close to Lapithos, in Karavas village. Probably the church of the monastery is dedicated to another miraculous icon, a Latin one, “The Sacred veil of Saint Veronica” or perhaps “the Portrait of Christ sent to Abgarus, King of Edessa”. Another theory is based on the legend which is that the famous “Sudarium of Turin”, the shroud in which Joseph of Arimathea wrapped the dead Jesus, was brought here. Later on it was carried off from the church and Cyprus in 1452 by a princess of Savoy in order to present it in Turin Cathedral (JEFFERY 1918).
By the 19th century, the number of monks in the monastery has been reduced, and by the 20th century no one has lived there anymore. Since its construction, it has been an important institution for the religious life of the area, in fact since 1222 it has been headquarters of Lambousa bishop, one of the fifteen bishops of the island.
Since the area has been under military control for many years, is difficult to understand who, when and how has lived in the complex during 20th century. Nowadays it is controlled by “International Center for Heritage Studies” of American Girne University and a technical commission that involves both North and South Cyprus authorities is working to program a restoration project.
The date of its foundation is unknown but the katholikon (fig. 2) appears to have been built during the 11th or early 12th century. The first written references to the monastery are no older than the 15th century. The earliest mention is made by the Cypriot chronographer George Boustronios who informs us that the monastery held celebrations on 15th of August and all the residents of Kyrenia would go there for a church service marking the Feast of the Assumption. On that day in 1473, Boustronios notes, supporters of Queen Charlotte attempted to occupy Kyrenia castle, taking advantage of the fact that the residents were away.
At the beginning of the 16th century, a problem arose over the election of the Abbot of the Monastery and so, in April 1532, a meeting was convened in Lefkosia attended by the 43 monks of the Monastery of Panagia Acheiropoietos (this big number shows that the monastery was one of the largest Orthodox monasteries in

Cyprus). During this meeting they chose Philotheos as abbot of the monastery and, according to Venetian documents, in this occasion the name Acheiropoietos was chosen (PAPAGEORGHIOU 2010).
The monastery was possibly built in 11th century around the ruins of a 5th century early Christian basilica. The basilica was a three-aisled building like many contemporary basilicas in Cyprus. The apse survived and was incorporated into the mid-Byzantine monastery church. The ruins of the eastern sections of the side aisles of the basilica came to light in 1955 after limited excavations were carried out around the katholikon. The katholikon was built on the north and south stylobates of the central nave of the basilica and, until 1974 at least, the bases of columns belonging to the colonnades of the nave were discernible, incorporated in the south and north walls of the church. The central apse of the basilica communicated with the apses of the side aisles via narrow passages, typical characteristics in early Christian architecture in Cyprus, as in the basilicas of Saint Epiphanios at Salamis, Asomatos and Soli.
A special feature of the Basilica is the shape of the synthronon. While those in other basilicas in Cyprus are semicircular and restricted to the apse, as in Constantinople and the areas under its influence, in the basilica of Panagia Acheiropoietos, the places for the lower clergy were laid out in a straight row of tiered benches along the eastern edge of the stylobates of the nave, while the bishop's throne was located in the semicircular synthronon inside the apse, as in the basilicas of mainland Greece. The floor of the nave of the basilica was covered with opus sectile. It has survived in the eastern section of the church. The floors of the side aisles were covered with mosaics decorated with geometric patterns, which is not unusual in Cypriot basilicas.
The basilica was destroyed during the Arab raids (though no-one knows precisely when), possibly by fire or earthquake. This is suggested by the discovery of ash and by the triple reinforcement of the apse with two additional walls, one semicircular and the other five-sided. When the five-sided wall was erected, possibly during the Ottoman era, the three original windows of the apse were walled up and replaced by a new rectangular one. In the course of restoration work on the katholikon in 1963, the original windows were discovered and reopened. The passages via which the apse of the nave communicated with the apses of the parabemas were also discovered and reopened.
The present katholikon (fig. 2) was built in the 11th or 12th century over the nave of the basilica as a domed cross-in-square church. Marble columns and slabs from the templon of the basilica were incorporated into that of the katholikon. In the 18th century, when the Byzantine templon was replaced by the carved wooden iconostasis (fig. 3a) that was in place prior to 1974, the marble columns and the slabs remained in situ. From the painted decoration of the Byzantine church, a mural depicting co-officiating bishops survived on the lower section of the semi-cylindrical wall of the apse (fig.3b).
In the 12th century a narthex was added to the church. The central section of the narthex was surmounted by a small dome while the other sections were covered by semi-cylindrical vaults. In the 14th century an exonarthex was added, the south and central sections of which were covered by ribbed groin vaults and the north section by a vault. Much later, possibly in the 16th century, a Gothic exonarthex or rather a portico as it had no walls, was added, covered by ribbed groin vaults supported by the west wall of the exonarthex and four pillars on the west side which supported arches.
The surviving two-storey building on the north side and part of the west side of the monastery was built in the 18th century. The ground floor buildings on the south side of the monastery, were built during the 1940s and

1950s on the ruins of the monastery stables to house the early Christian finds and the mosaic floors found on the site of Ancient Lapithos and a big square base of a statue with a long inscription dedicated to Emperor Tiberius Cesare dated to 30 AD found in situ.
The 18th century carved wooden iconostasis into which a section of the Byzantine templon had been incorporated (four marble columns, two marble capitals and a marble slab decorated in bas relief) remained. As was customary, on top of the iconostasis was a carved wooden crucifix and, on either side, the Lypera. Beneath the large icon of the Virgin Mary, also by Philotheos, there was a lengthy inscription relating the history of the church and its icons up to 1765. At that time the monastery was administered by the Oikonomos Christoforos, “Fifty years ago, Turkish thieves from Karamania came and robbed the monastery and burned the library and everything in the monastery.” (PAPAGEORGHIOU 2010)
It seems that the exonathex, built in 16th century and decorated with sophisticated carvings, was offered by a certain Alessandro Flatro. He was a member of the well-known family whose name was given to the bastion of the walls of Nicosia in the parish of the Panagia Chrysaliniotissa. (IBID). In 1563 he was buried in the narthex of the katholikon of the monastery (fig. 2). Based on this information the carvings can be dated to the Venetian period, during while many elements: Greek, Latin, French and Italian melted together. The tombstone of Alessandro Flatro (fig. 4) is a slab of the harder variety of native marble. The inscription is in bad condition but, thanks to the record of the French historian M. de Mas Latrie we know that represents the deceased in a civilian costume with a border of ornamental details of a Renaissance type.

Laser scanning

The digital survey made with Scanner laser 3D has been planned in order to use only one instrument, the scanner tool. The entire survey campaign is based on 3D laser, without any topographic survey support. The 3D laser scanner used was a phase-shift type, a Zoller+Fröhlich Imager 5006h. This unit offers good accuracy combined with robust construction, fast operations and the possibility to use the same tripod of the topographic unit. This last feature can turn to be quite useful during integrated survey operations: with three or four tripods around the area it is possible to swap from one to the other, reducing the operational time of the entire process. The working range of this instrument goes from 0,4 to 79 metres (according to the technical specification of the manufacturer), in this survey the most usable data was ranging from one to 50 metres. The positioning of the scan stations was decided according to the shape and to the specific conditions of the terrain and of the remains (fig. 5). The surveys were completed taking 259 stations, all of them operated in full panoramic mode, and exploiting the characteristics of the 3D laser scanner in use, which was capable of scanning 360° on the vertical axis and 310° on the horizontal axis. The site has some vegetation on the northern external front, with various brushes and at the same time it has a small “empty” space with no relevant structures. The survey campaign lasted 5 working days.

Data treatment

The first data treatment dealt with the alignment of the point clouds; this was done using Leica Geosystem Cyclone. The topographical network was the base of the entire work, but, to ensure a solid result, each couple of scans were consolidated using geometrical matching between the clouds: the so called “cloud

constrain". This process took time and produced the first 3D digital point cloud model of the monastic complex (fig. 6). In this way the overall work, was simplified to a little less than 1,5 billion points. Thus this was still a "heavy" and not easy to use dataset, so it was used only for data extraction and not for interactive usage. A final version of the global point cloud was exported into Pointools Viewer (now Bentley Pointools) with interesting benefits in interaction and visual performance.
The dataset was later divided into multiple parts, according to each day of the workshop. In this way it was possible to manage the huge number of data dividing them in different parts. This process helped to simplify and to make much faster matching point clouds operations. The practical operations of data post processing were made using the Leica Geosystem Cyclone. This allows to import different point clouds one by one. The matching operations with the software gave as a result many archives that were included in a new database comprehending five archives plus an editing one, which can be used in matching operations of various point clouds.
In total the matched clouds are 242, made of 1,5 billion of points, that are the equivalent of 70 GB. The use of software Pointools made the 3D model faster and easier editable, moreover the rendering resulted having a much higher definition.

Post production and graphic elaboration

Starting from tridimensional model, vertical and horizontal sections have been extracted in order to graphically represent the complex (fig. 7-8). The number and the position of these sections are based on characteristics of the architectonic object of the monastery.
The graphic representation of the survey connected three kinds of data: geometric, architectonics and material. For each kind of data there has been an operational step, which was repeated for every graphic representation. We will use the katholikon plan as an example to describe each of the technical operations.
In the first phase the software Leica Cyclone and Autocad have been used. Using Leica Cyclone a plan has been created with the command "reference plane", I have set the origin of this plane on a vertex of the rectangle made of the ground floor of the katholikon. The reference plane has been rotated until the system axes overlapped the sides of the rectangle. For the purpose of creating the horizontal section of the building, I moved the origin of reference plane at the distance of 1,3 metres on the 3rd axis. Once I finished the positioning phase, I set the command "cutplane" from the "reference plane". After that I set the "slice" command with a thickness of 5 centimetres in order to display only the points contained in the slice set. Then I exported three snapshots of the object viewed in tif format with a resolution of 10-thousand x 6 thousand dpi. Using software Photoshop I merged those three snapshots to obtain one raster image to be imported in Autocad. In Autocad I drew a polyline connecting all the points; this helped me to obtain the section line of the plan.
The second phase concerns to the graphic representation of the elements in perspective view of the plan (fig. 9). Using the software Pointools I extract from 3d model the same snapshots corresponding to the plans extracted from Leica Cyclone. In Pointools instead of an intersection plan, a 3d box has been created. If oriented like the section plan, the 3d box allows to frame all the points in it and to extract tif files reproducing the prospect. In this phase too I used Photoshop to merge all the snapshots and create one file to be

imported on Autocad. Here I drew some lines describing all the architectural elements as moulding, pillar bases, headstone, etc.
The third phase consists of the material representation of fronts of the church (fig.10). After defining the architectural data I used the wireframe drawing as a grid where I've overlapped the photos took during the survey. Using Photoshop I rectified the pictures and I overlapped them on the Autocad drawings. In this way I got the right correspondence between pictures and drawings (fig. 11).
All these representations helped to outline the church construction phases. The plan of the katholikon area highlights the origin of the outcrops next to the apse and the southern aisle; in fact it confirms, according to bibliographical references, to belong to an Early Christian Basilica (5th century).

Conclusions

This work can be considered as a starting point to study the history of the complex and to plan a restoration to reuse these spaces in these days. In fact, in the Northern Monastery building, at the second level, the third column from the West is dangerously leaning; the column base is not properly supported, and is about to fall. The arches and the wall above are dangerously leaning outward, and both the slab and the roof are severely damaged. In the same position, a joint between two different construction phases is clearly visible, causing in time progressive displacements of the columns. Three different restoration operations were accomplished in the past on this part of the building to prevent the columns from leaning outward. The last intervention, consisting of metal scaffolding, is preventing this very column to rotate off its axis. The scaffolding has moved in the years, so the displacement of the column base has increased and is continuing to grow, causing the rotation off the vertical line of the column, and a severe risk for the building. This is one of the most important problem of the complex, for this reason before thinking to a possible reuse, would be essential to make it safer.

Figures

Fig. 1 – Entrance of the monastic complex (Copyright: Carmine Canaletti, February 2015)

Fig. 2 – Front of the katholikon (Copyright: Carmine Canaletti, February 2015)

Fig. 3 – The iconostasis and inside the apse (Copyright: Carmine Canaletti, February 2015)

Fig. 4 – The headstone of Alexandro Flatros (Copyright: Carmine Canaletti, 2015)

Fig. 5 – An example of occlusion during the survey operation.

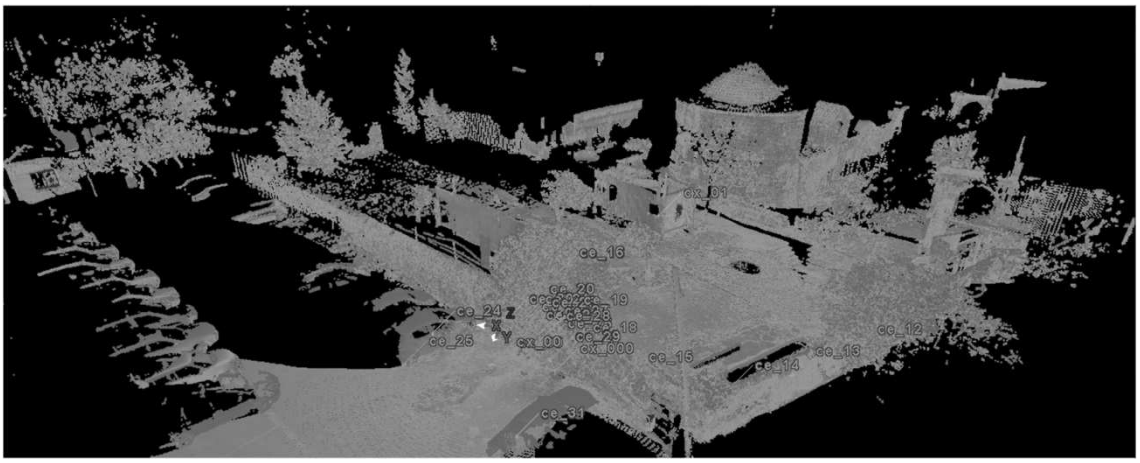

Fig. 6 – View of the point clouds in the software Cyclone Leica Geosystem.

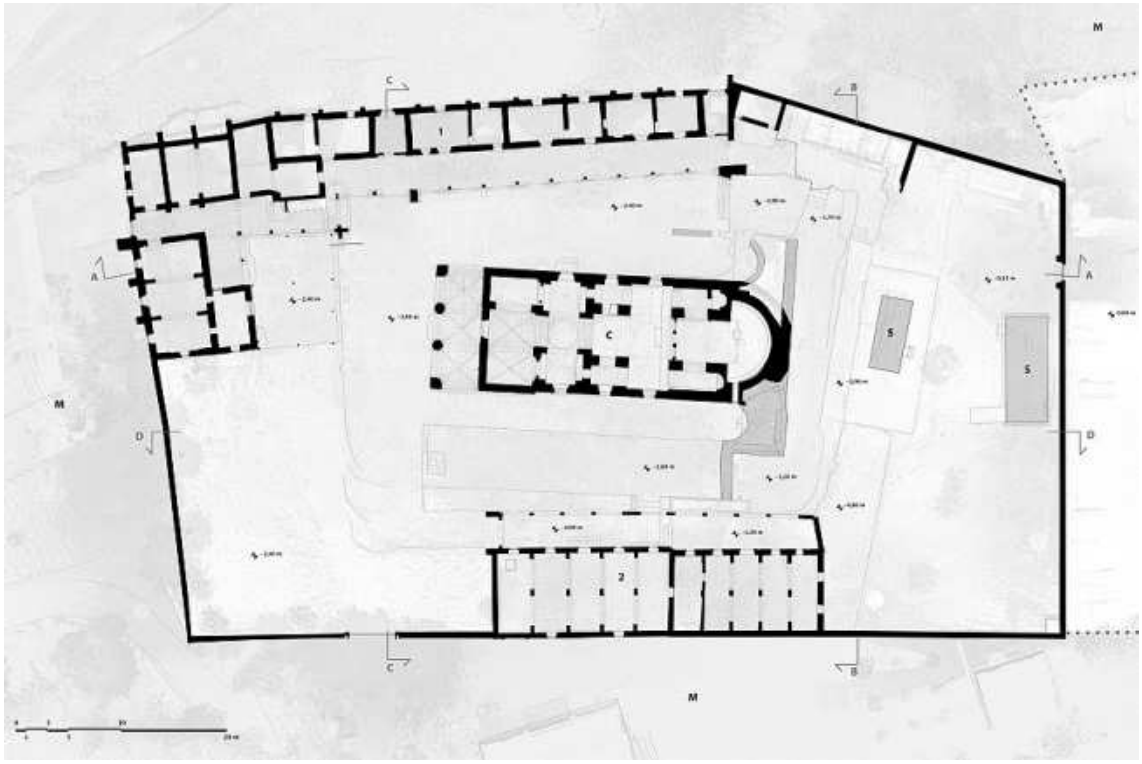

Fig. 7 – Digital survey, plan of the Monastery. Carmine Canaletti (2015), Lettura e progetto dell'area di Lambousa-Karavas, Cipro, rapp. G. Verdiani, co-rapp. A. Camiz, Università degli Studi di Firenze, Scuola di Architettura, Laurea Magistrale in Architettura 4/s.

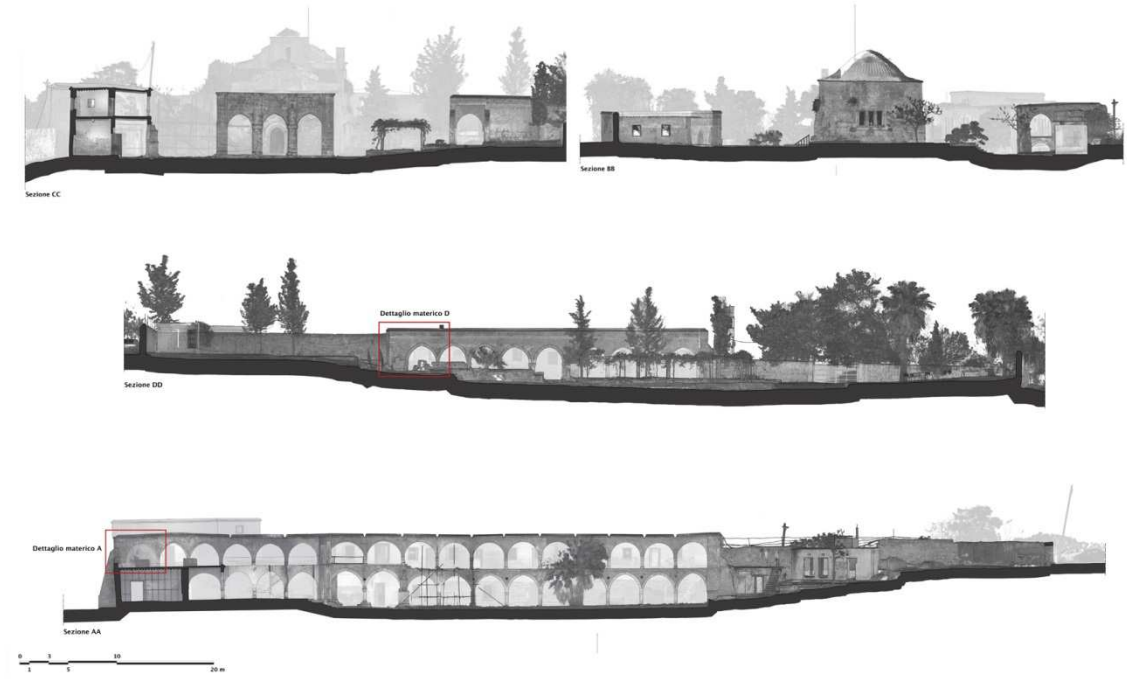

Fig. 8 – Digital survey, internal elevations and sections of the Monastery. Carmine Canaletti (2015) Lettura e progetto dell'area di Lambousa-Karavas, Cipro, rapp. G. Verdiani, co-rapp. A. Camiz, Università degli Studi di Firenze, Scuola di Architettura, Laurea Magistrale in Architettura 4/s

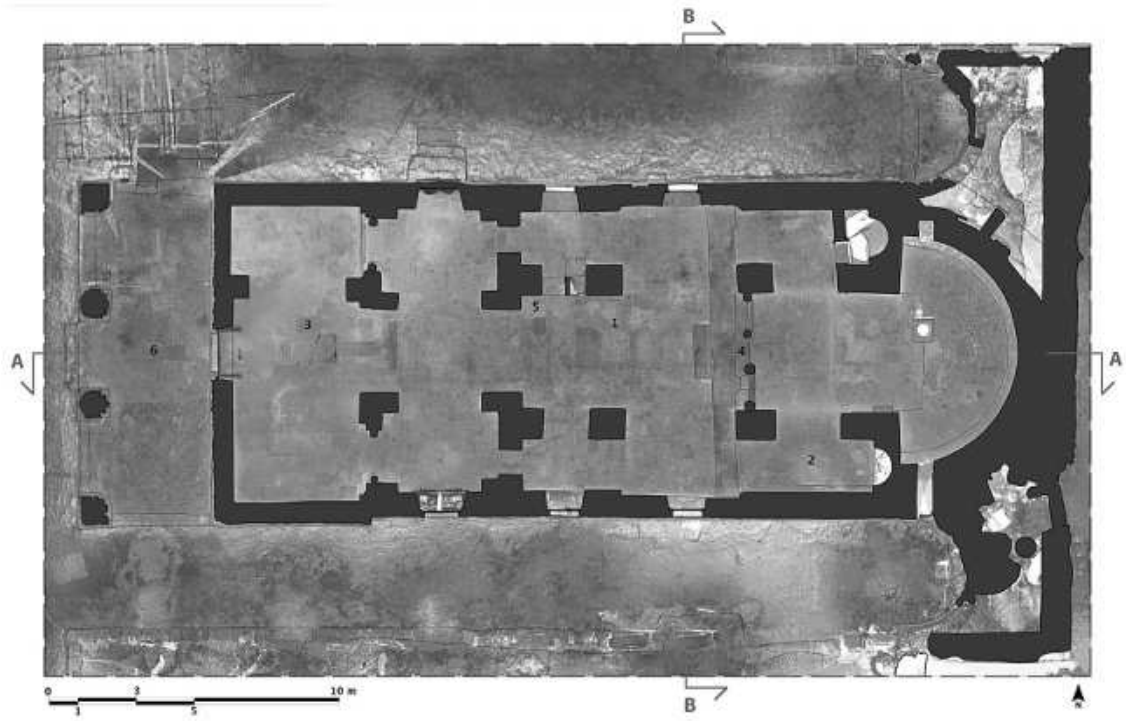

Fig. 9 – Digital survey, plan of the Church. Carmine Canaletti (2015), Lettura e progetto dell'area di Lambousa-Karavas, Cipro, rapp. G. Verdiani, co-rapp. A. Camiz, Università degli Studi di Firenze, Scuola di Architettura, Laurea Magistrale in Architettura 4/s

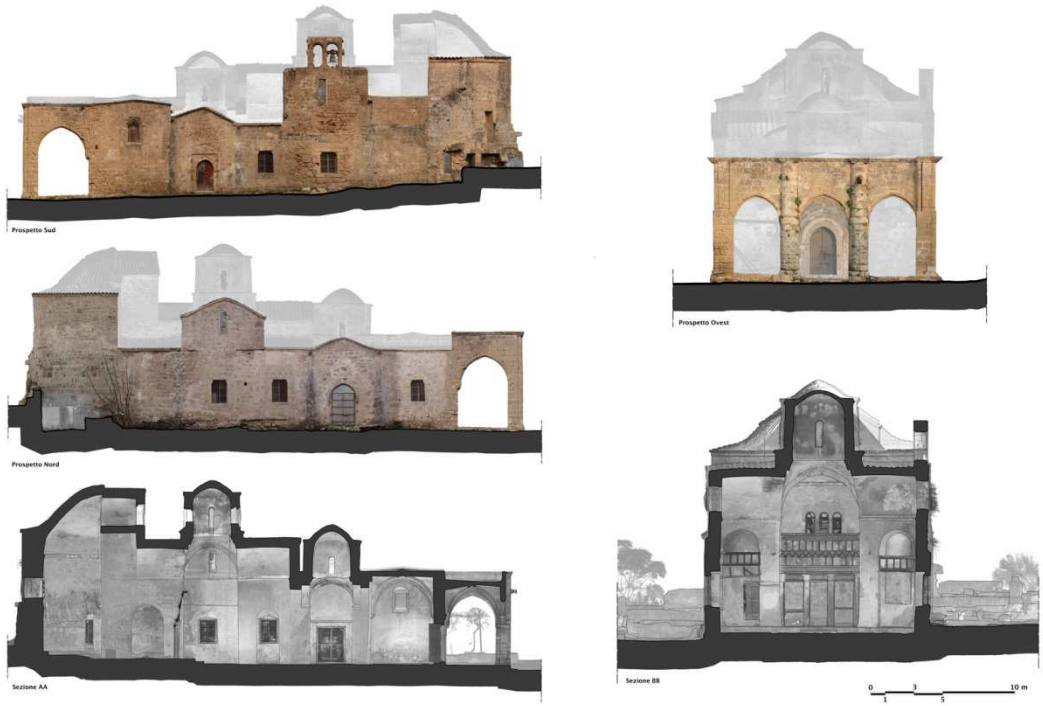

Fig. 10 – Digital survey, elevations and section of the Church. Carmine Canaletti (2015), Lettura e progetto dell'area di Lambousa-Karavas, Cipro, rapp. G. Verdiani, co-rapp. A. Camiz, Università degli Studi di Firenze, Scuola di Architettura, Laurea Magistrale in Architettura 4/s

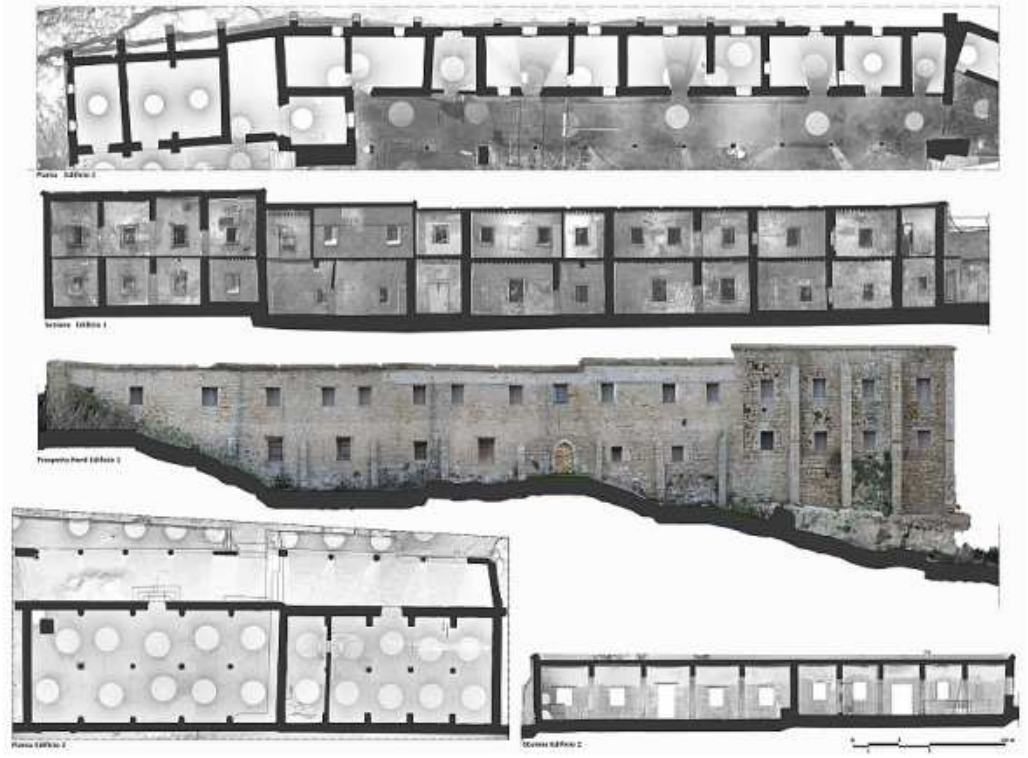

Fig. 11 – Digital survey, external elevations and sections of the Monastery. Carmine Canaletti (2015), Lettura e progetto dell'area di Lambousa-Karavas, Cipro, rapp. G. Verdiani, co-rapp. A. Camiz, Università degli Studi di Firenze, Scuola di Architettura, Laurea Magistrale in Architettura 4/s

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