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UNDERGROUND CITIES OF KAYSERI (TURKEY)

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Abstract
Although the region known as "Cappadocia" is located in the Nevsehir-Urgup-Goreme triangle of Anatolia (Turkey), the capital of that region in ancient times was the antique Caesarea city which is known as Kayseri today. Kayseri, located 75 km east of the present Cappadocia, has also been affected by the intensive volcanic activities which began 10 million years ago. Some were only small vents, but a total number of 68 volcanoes around Kayseri had been erupting in Pliocene-Pleistocene times. That eruption phase, which continued even until historical times, piled up more than 100 m of thick ignimbrite around Kayseri. As the same in Nevsehir-Urgup-Goreme, in antique Caesarea this volcanic tuff was dug by the local people, and houses, churches, and underground cities were built into the rocks. Different from the known touristic places of Cappadocia, the rock dwellings and underground cities of Kayseri have not hitherto been investigated. Nevertheless, underground structures of that region have such an architectural quality to compete with the dwellings in other parts of Cappadocia. Around the city, which had been the cradle of Christianity in Anatolia beginning from the 3rd century, there are several underground cities carved in order to shelter from the invasions beginning from the 7th century. This new project is totally different from all our previous works. We find new and hitherto unexplored underground cities on every spot around Kayseri. Apart from several rock settlements, eight underground cities on the walls of deep valleys around the city, which were unknown and not recorded before, had been explored and surveyed. Those underground cities are rather different than the ones around Goreme. Apart from the architectural differences, at least some of them were not used again after the first construction period, whilst in other cases even the excavation of the underground city is uncompleted. When appreciated in this context, the underground cities of Kayseri have features to shed light on the beginning of this type of architecture, which is different from Goreme, where most examples were continuously enlarged and new passages added during the history.
Keywords: underground city, artificial caves, Kayseri, Turkey.

Riassunto
La regione conosciuta come Cappadocia, situata al confine di quattro province dell'odierna Turchia, è testimone di insediamenti ininterrotti fino ad oggi. Le rocce tufacee, prodotte dai vulcani attivi nel tardo Pliocene e Pleistocene nella regione, sono state scavate dalle popolazioni del luogo ed utilizzate per diversi scopi, come abitazioni, fienili, chiese e città sotterranee realizzate per riparo e nascondiglio. Anche la necessità di acqua per irrigare è stata superata e risolta con "metodi trogloditici". A causa della carenza di acqua, sulle pianure della Cappadocia possono essere impiantate solo coltivazioni a secco. L'acqua scorre solo nelle valli, dove si trovano i principali terreni agricoli. Nei tempi antichi la necessità di acqua per irrigare è stata risolta con la realizzazione di cunicoli scavati all'interno delle rocce tufacee in quelle valli. A prima vista può sembrare illogico prelevare l'acqua che scorre sulla superficie per immetterla in un lungo cunicolo sulla parete di una valle, per gli enormi sforzi connessi alle operazioni di scavo. Ma in tal modo si otteneva l'irrigazione continua e controllata delle terre destinate all'agricoltura e le gallerie erano anche funzionali a diminuire la portata dell'acqua di superficie, al fine di ampliare la superficie destinata a coltivativo e proteggere le valli dalle inondazioni. Oggi tutte le valli della Cappadocia conservano uno o più cunicoli, ma solo tre di essi sono stati fino ad ora esplorati nel dettaglio. Il sistema delle gallerie idrauliche della Valle di Guvercinlik (Piccionaia), a Uchisar, è probabilmente l'ultima di due (o forse tre) gallerie idrauliche scavate in epoche differenti in questa valle, oltre ad essere la più lunga attualmente nota. Con una lunghezza totale di 1840 metri, 14 collegamenti con la superficie e diverse gallerie laterali, il condotto principale rappresenta un meraviglioso esempio di ingegneria idraulica di epoca medievale.
***Parole chiave**: Cappadocia, galleria idraulica, canali sotterranei.*

Introduction

Almost all the underground cities in Anatolia are very unique to antique Cappadocia region, which includes the provinces of Nevsehir, Aksaray and Kayseri. These defensive settlements dug into soft tuff rocks contain long tunnels and living areas protected by mill stone doors to defend the local people in case of attack. Approximately 200 underground cities have been found in Anatolia so far, 90% of them in Cappadocia. The academic articles about these structures are very limited and only a few inventory works had been done (Bixio, 2002; Bixio *et al*, 2012; Ayhan, 2004).

We have started to investigate the underground settlements and rock dwellings around Kayseri (Fig. 1) according to a protocol we have signed with Kayseri Municipality and CEKUL Trust in January 2014.

Within the following eight months, eight underground cities and three underground structures with uncertain usage were found, explored and surveyed in the region. The underground cities of Kayseri can be examined in three different groups:

- ***Those having unclear use***: In spite of mill stone

Fig. 1: location map.
Fig. 1: ubicazione dell'area.

doors and very long tunnels, Ali Dagi (Ali Mountain) and Ali Saip Pasha underground cities have very few living areas. So, it is likely that these underground structures were either temporary hiding places or escape tunnels rather than underground cities. Due to its diverse architecture, Swallow Valley Underground City can also be included in this group.

- *Small and re-used underground cities*: The underground cities around Kayseri (namely, Belagasi no. 1 and 2, Otedere Valley no. 1 and 2, Catalin and Penzikli) were smaller compared to the known major Cappadocian examples. From the structural point, it can be thought that all those underground cities were built to protect a small village for a short term raid rather than protecting a large population. Also; at least some of those underground structures of Kayseri were dug towards steep walls and connected to windowed, large rooms opening to the valleys. It is also quite interesting that some tunnels of the underground cities end suddenly without connecting to any chamber or room. Those half-dug tunnels give us the idea that the effort was ended as the threat of raid was diminished. Similarly, the big windowed rooms built on rock walls prove that the structures were later changed and turned into appropriate areas for daily living.

- *Classic Cappadocian Style*: To the southwest, closer to Nevsehir Region, underground cities become similar to the known Cappadocian style, excavated in flat areas within several layers. Doganli and Guzeloz are such examples.

Ali Dagi Underground City

This structure is located in Talas province of Kayseri, is 528 m-long and, when compared with the others known, does not show the features of an "underground city". Even if we accept that the stone mill door behind the entrance of the gallery was used to defend that passage, there is a single chamber after this gallery and a large cistern reached after a 180 m-long tunnel (Fig. 2).

Further, it is obvious that three rooms at the north exit were firstly built as storage and a church, and then transformed into dovecotes by the windows opening outside. On the other hand, there is not a single collapsed or clogged gallery in the whole structure and it seems that all tunnels were abandoned at a certain point without any further diggings.

Ali Saip Pasha Underground City

This underground structure is also in Talas province and, as the previous one, whether it is an underground city or not is controversial. This structure can be reached through the basement of a 19. century house, connects to two separate and very small residential areas to E and W, and consists of a single tunnel. Total length of the tunnel is 916 meters, width changes between 60–85 cm. and height between 150-210 cm. There is a mill stone door on the beginning of the branch gallery to the NW. But there is no passage or settlement protected by this door. It is assumed that these northern galleries were not digged. The ceiling of the final 50 m section of the main tunnel is V-shaped, a feature that has never been seen in any other underground city before.

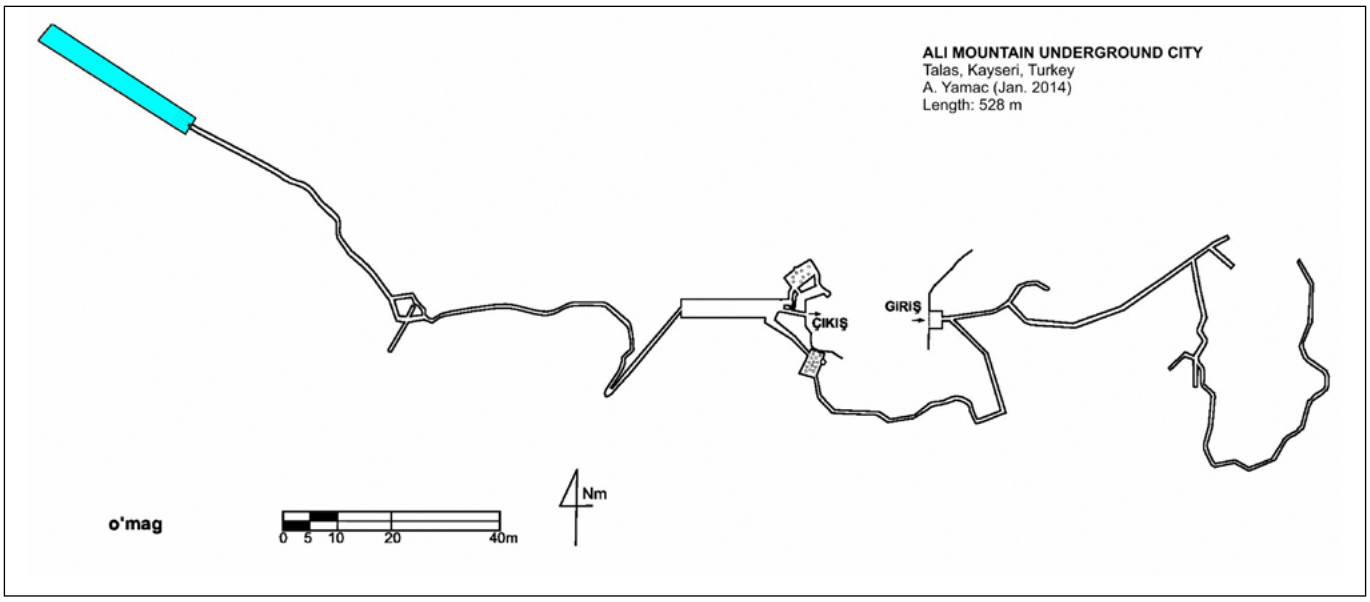

Fig. 2: Ali Mountain Underground City (drawing A. Yamaç).
Fig. 2: città sotterranea del Monte Ali (elaborazione A. Yamaç).

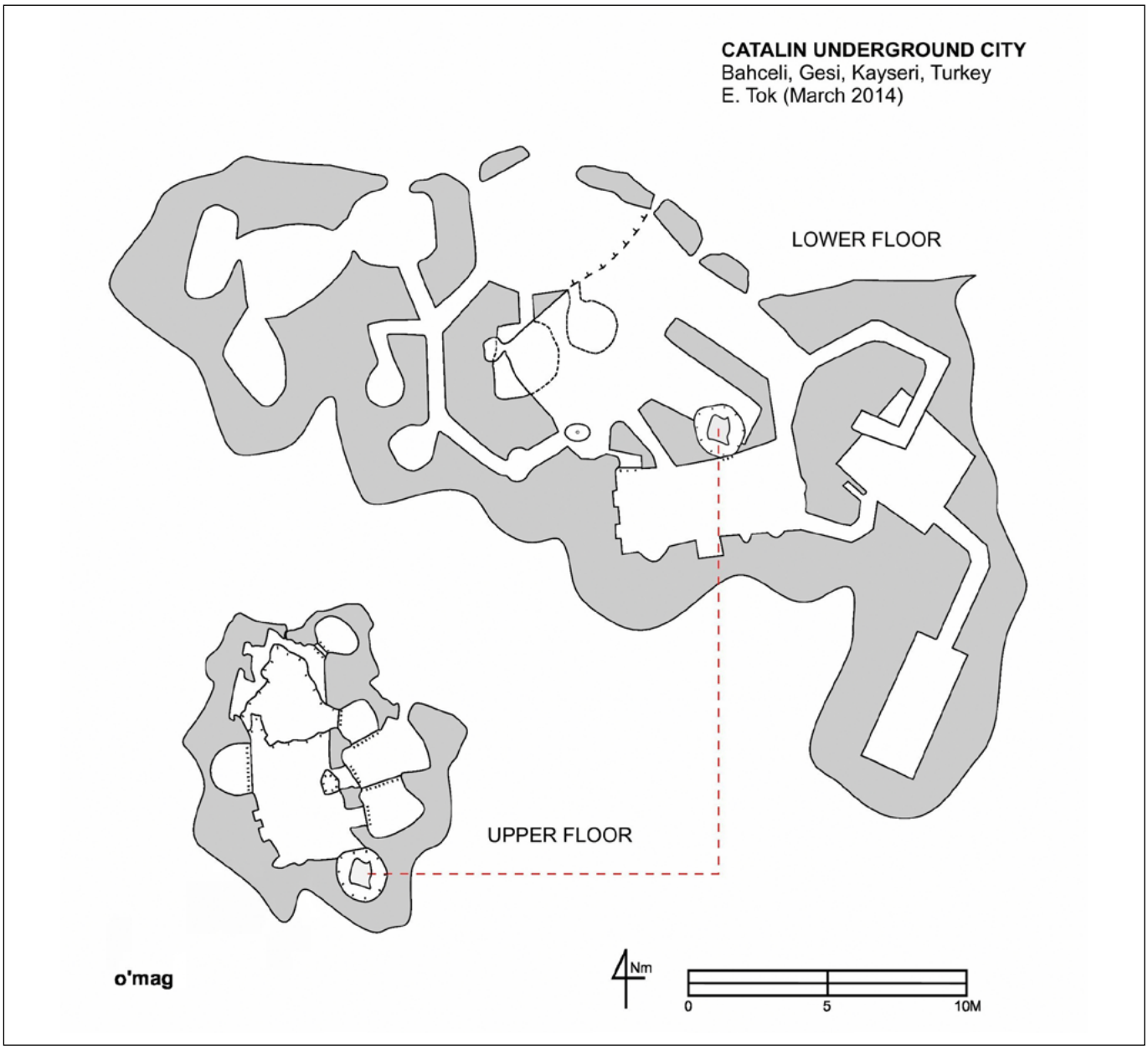

Fig. 3: Catalin Underground City (drawing E. Tok).
Fig. 3: città sotterranea di Catalin (elaborazione E. Tok).

Catalin Underground City

This underground city is located on the estern Gesi province of Kayseri, at the western wall of Degirmenderesi Valley, built as three floors in a very narrow area. The total structural area of the three floors of the underground city is 621 m^2, with 18 rooms in the structure. A millstone door used to close the tunnel on the W side of second chamber is at the entrance. On the eastern section, a branch tunnel was left incompleted, apparently reaching the upper floor. Within the same section, at the lower floor, two grand chambers which can be reached after a millstone door are interesting structural features of this underground city. Especially, the deepest and final room with the measures 5x2 m has a barrel vault roof with a rarely seen architecture. It is not possible to estimate the construction date of the structure but we can say that the entrances were used as settlements after the construction. The main structure was probably established to protect a small number of people against local raids (Fig. 3).

Penzikli Underground City

This underground city is located on the opposite of Catalin Underground City, at the E slope of the same valley; it has a narrow entrance which has been opened later. Penzikli Underground City is different from its neighbor underground city, and from all others surveyed in Kayseri. Following the 14 m-long corridor after the entrance, we found 22 rooms on two storeys. Most rooms are facing two separate large chambers and some sidewalls were broken to extend the rooms but never used later. With broken sidewalls and new connections established, this underground city has a maze-like plan, with a total area of 725 m^2.

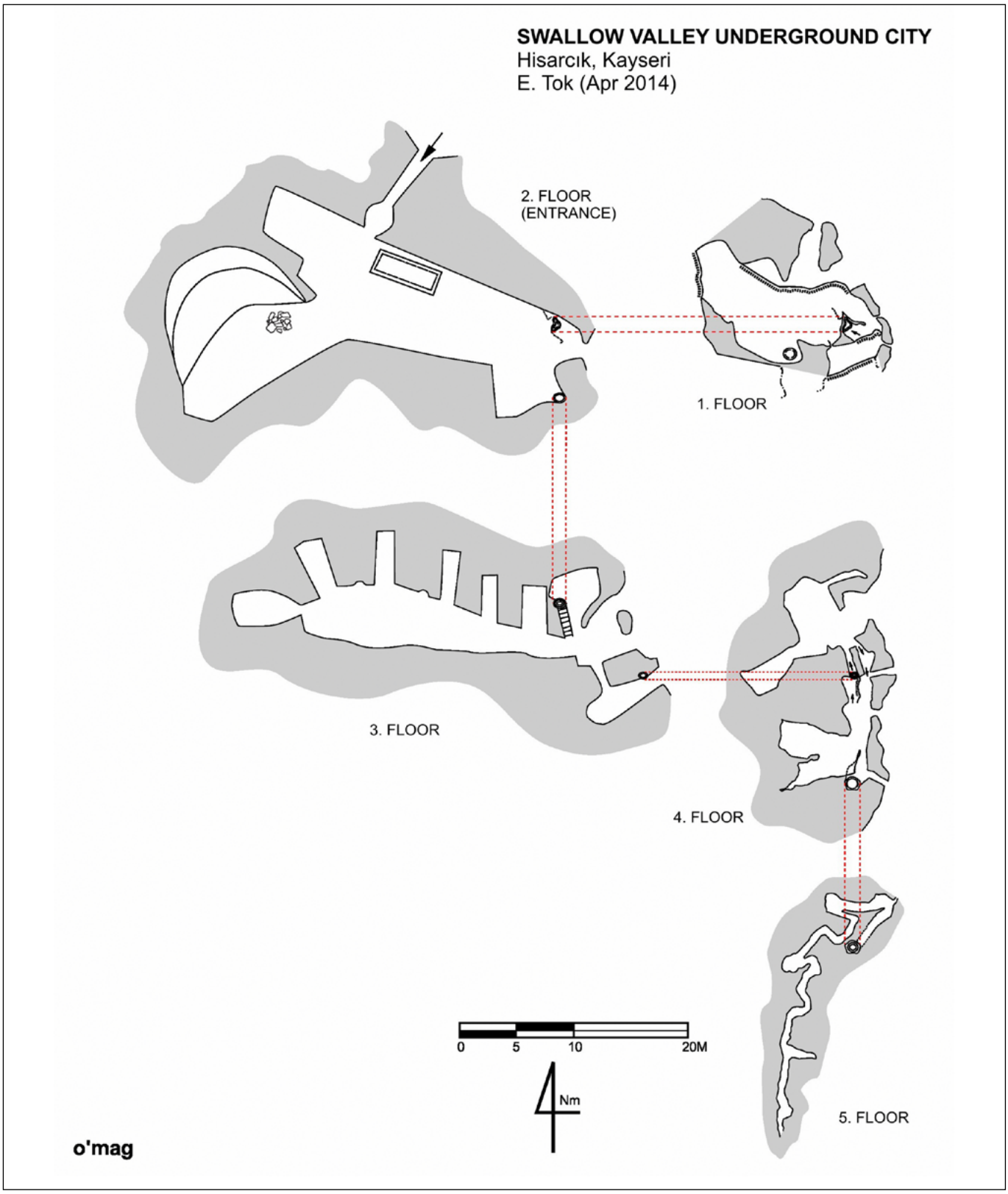

Fig. 4: Swallow Valley Underground City (drawing E. Tok).
Fig. 4: città sotterranea della Valle della Rondine (elaborazione E. Tok).

Swallow Valley Underground City

This underground city, named as Asarkaya in Yorukoglu 1990 and Bixio et al 2012, is located on the road from Kayseri to Mount Argeus, by the slope which faces the Swallow Valley. It is a five-storeys rock settlement with a total length of 505 m and -56 m deep. Its main features are the five floors vertically carved on a rock wall, and its opening toward the valley. The deepest gallery after the fifth storey, which is assumed to reach the valley floor, is clogged.

The lack of defensive doors and the existence of windows directly opening to the valley let us assume that the structure was not built for defensive purposes, but for settlement. However, structural characteristic

Fig. 5: East face of Otedere Valley Underground City No 1. Stone walls on top of the cliff can be seen on the upper right corner (photo A. Yamaç).
Fig. 5: versante Est della città sotterranea n° 1 della Valle di Otedere. Nell'angolo in alto a destra della falesia sono visibili le mura in pietra (foto A. Yamaç).

like an entrance reachable through a very steep slope, a very large chamber (likely public) at the first storey, the existence of 6 different rooms in the chamber of the second storey, show that this structure is quite different from the many rock settlements in Kayseri (Fig. 4).

Otedere Valley Underground City no. 1

This structure is probably one of the most interesting underground structures of Kayseri. It has many windowed chambers on its steep rock side which frontages Otedere Valley, and shows a 4-5 m-high stone wall on both sides towards the slope. Along with the tunnels and millstone doors, those high stone walls on the slope make us assume that the structure was transformed into a cliff dwelling from an underground settlement (Figs. 5 and 6).

There are two tunnels from the entrance room. The E tunnel is blocked by debris after 3 m. At the entrance of the W tunnel, there is a huge *in situ* millstone door (1.52 m in diameter and 42 cm thick). The main gallery suddenly ends 40 m below. On the other hand, a small branch of this gallery reaches a chamber with windows fronting Otedere Valley, and then an underground chamber (size 14x8 m). Another tunnel that goes from W of this chamber reaches another chamber at the top storey. The frontage of this is completely open to Otedere Valley. With its interesting architecture this structure is different from all the underground cities known. Even though its chambers with wide windows fronting the valley makes us think that this is a rock settlement, underground passages protected by millstone doors and a large underground chamber supported by pillars make the structure architecturally a very different hiding place. Looking as a whole, we can think that this underground city began to be dug but was later left aside and then, after a certain time, some of its parts were used as settlements.

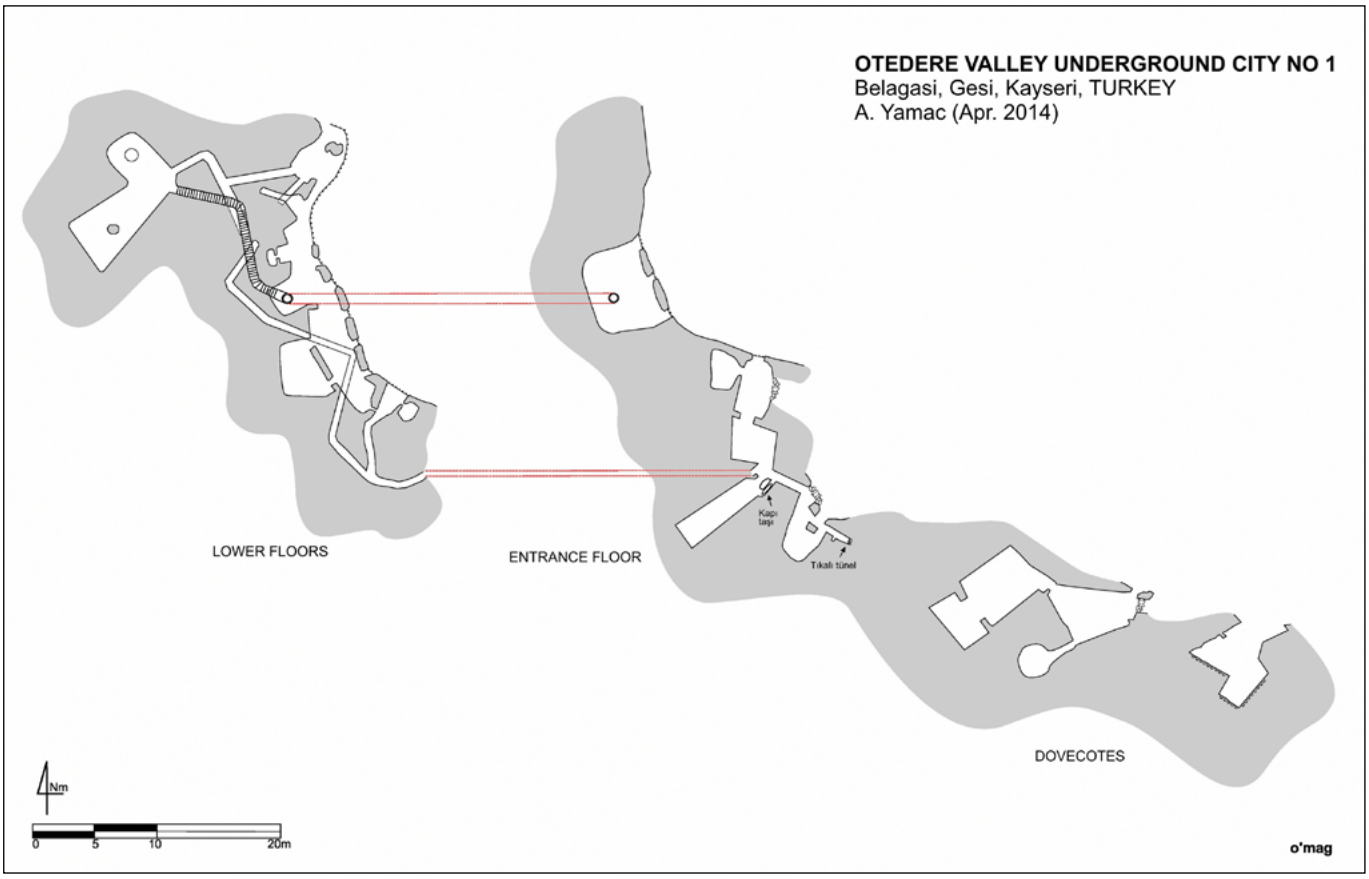

Fig. 6: Otedere Valley Underground City No 1 (drawing A. Yamaç).
Fig. 6: città sotterranea n° 1 della Valle di Otedere (elaborazione A. Yamaç).

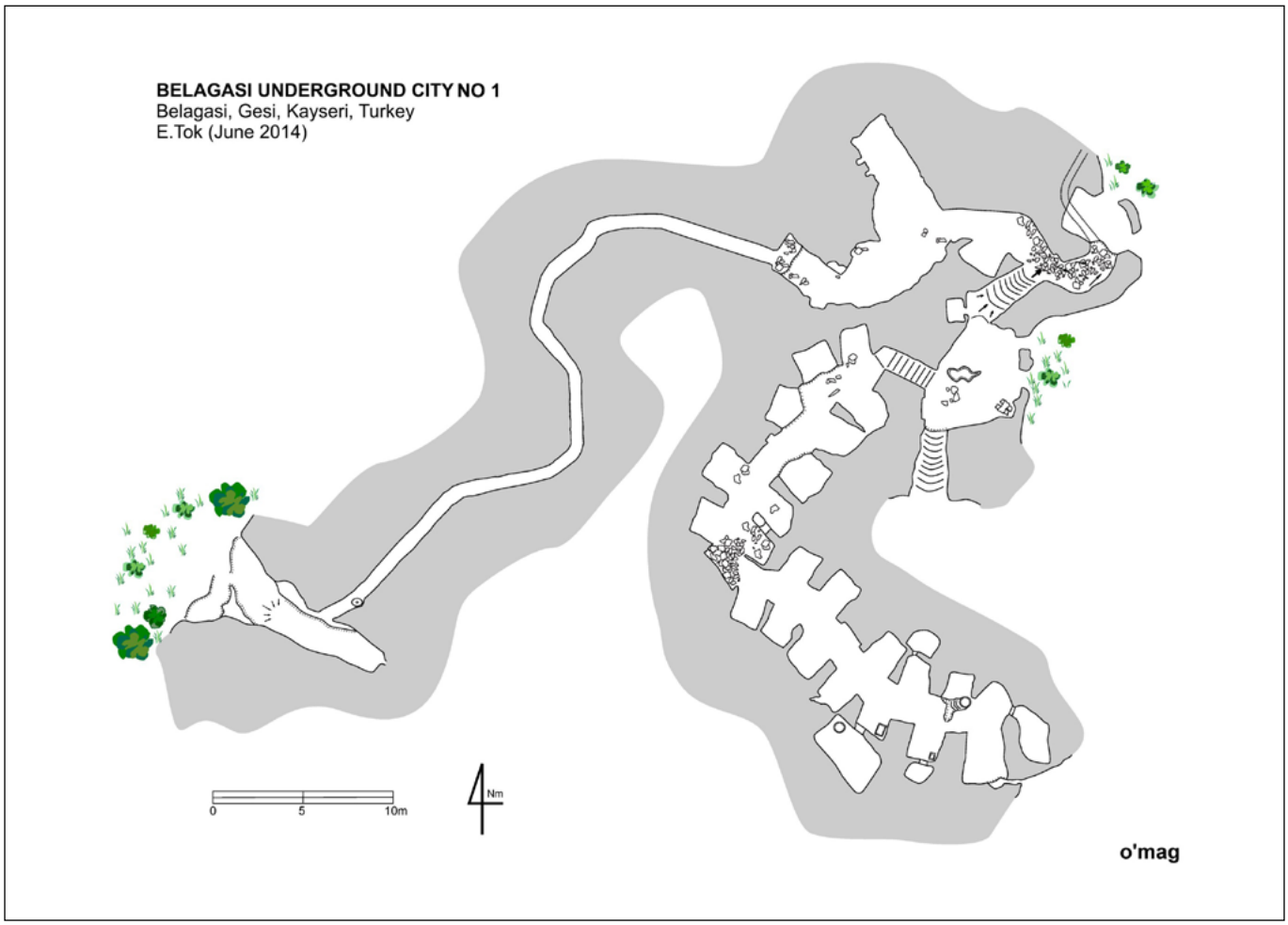

Fig. 7: Belagasi Underground City No 1 (drawing E. Tok).
Fig. 7: città sotterranea n° 1 di Belagasi (elaborazione E. Tok).

Otedere Valley Underground City no. 2

Entrance to this underground city is through a tunnel located at the S wall of a rock dwelling house. At the end of the tunnel there is a 6x2 m size chamber, followed by an *in situ* millstone door. Before this chamber, the tunnel develops to the E by straight carved stairs for 13 meters on a 30° slope. With this landing ending at a crossroads, 6 meters below the entrance floor is reached. Here, three different tunnels bring to three chambers. The NW and the SE chambers have a plain architecture; the western side has a grand chamber reached by a short stair containing a clogged communication hole and a tunnel stuck by debris after 8 meters. The existence of clogged communication hole on the ceiling might prove that there is another room on the upper storey. Even though there are two underground cities, there is no remnant of an ancient settlement in this 2 km-long valley.

Belagasi Village Underground Cities no. 1 and 2

On the northern opening of the Otedere Valley, 10 km from Kayseri, we can see this cave dwelling village which is an abandoned old Armenian village. Two of the rock settlements in the village are connected to two different underground cities. These two structures were built for defensive purposes, and they both have millstones at the entrances. Belagasi Underground City no. 1 can be reached from the slope where the village is located. This first underground city, 10 m E of the water channel of the village, is accessed through an *in situ* millstone door. The tunnel develops for 42 m, is 70-80 cm wide and 90 cm high. The defensive settlement shows a considerable structural change after this long tunnel, opening in a large chamber. After this room, there are two other chambers, both facing the Otedere Valley. The structure behind these chambers is astonishing: on both the sides of a 34 m-long corridor, there are 24 small rooms (Fig. 7).

The main tunnel of Belagasi Underground City no. 2 begins from the back wall of a rock house 40 m away from the first underground city. The entrance is protected by a stone door and connected to countless chambers. Structurally different from the first one, those chambers are carved on top of each other, located at both sides of the tunnel. Belagasi Underground City no. 2 has a total of 52 small chambers and living areas, the highest number for all the known underground cities of Turkey.

Belagasi Village and those two underground cities are at the entrance of Otedere Valley, which has two more underground cities, explained above. These four underground cities in a small distance have a total of 128 living spaces, that is nearly five times more than the total number of houses the village has. The reason that the residents of such a small village like Belagasi built four different underground cities with so many chambers is unknown.

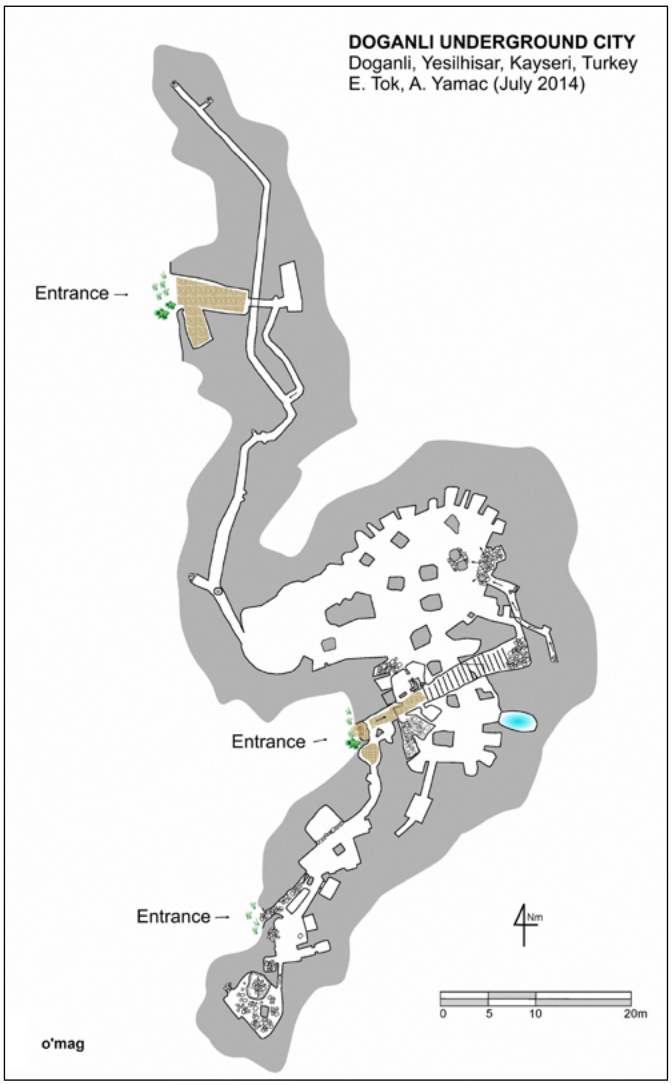

Fig. 8: Doganli Underground City (drawing E. Tok, A. Yamaç).
Fig. 8: città sotterranea di Doganli (elaborazione E. Tok, A. Yamaç).

Doganlı (40 Steps) Underground City

Doganlı Village, located in the Yesilhisar Province of Kayseri has an underground city 2 km SE of the plain, mentioned in various sources (Yorukoglu, 1990; Gulyaz & Yenipinar, 2003). This underground city was surveyed and mapped by us for the first time. Its name (40 Steps) comes from the stairs carved on the rocks at the main entrance with 38° of slope. The main chamber reached after the entrance is very impressive: supported with 15 pillars, is larger than all known underground chambers of Turkey, with a total area of 510 m². During our research we found a cistern within the chamber, still containing 2 m-deep, crystal clean water which proves the quality of the structure. There are two tunnels on each side of this chamber, one of them separated into branches, is 74 m-long and then is clogged. One branch of this gallery reaches the upper storey and is connected to the surface by a large chamber. All tunnel connections that reach the surface have been defended by millstone doors. There is also a small church inside the southern chamber (Fig. 8). This giant underground city, with three different surface connections and many clogged galleries, is 2 km from Doganli Village, in the middle of an empty plain, which makes us think that a very old settlement occupied the plain, of which no remnants are left. Different from many examples in Kayseri, Doganlı Underground City must have been not used after the construction period.

Guzeloz Underground City

Two millstone doors (the largest in Cappadocia) are at the lower entrance of this underground city, located on the E slope of Guzeloz Village (Fig. 9). The cave entrance on the 80 m NE of the old settlement of Village on the slope is not the original entrance of the underground city, that is, on the other hand, represented by the back wall of a rock carved house on the rock walls. The double tunnel following lower entrance room is architecturally very interesting. One of the tunnels is protected by huge millstone doors; continuing to the SW, and most probably to the village below the slope, it is clogged after a short distance.

The other tunnel continues for 42 meters with huge dimensions (4 m wide, 2 m high) which are uncommon among the tunnels of the other underground cities. Near to the end of this wide tunnel a shaft with a height of 9 meters reaches to upper storey. All storages and rooms of Guzeloz Underground City are located in the upper storey, where there are seven rooms of which five are possibly used as storages (Fig. 10).

Conclusions

There are tens of underground cities dug into the tuffaceus rock in Kayseri, the capital of antique Cappadocia. Different from its neighbor Urgup-Goreme, these underground cities are not well known and no research has ever been conducted so far. With this project, many cave dwellings and

Fig. 9: millstone door at the lower entrance of Guzeloz Underground City (photo A. Yamaç).
Fig. 9: porta-macina all'ingresso inferiore della Città Sotterranea di Guzeloz (foto A. Yamaç).

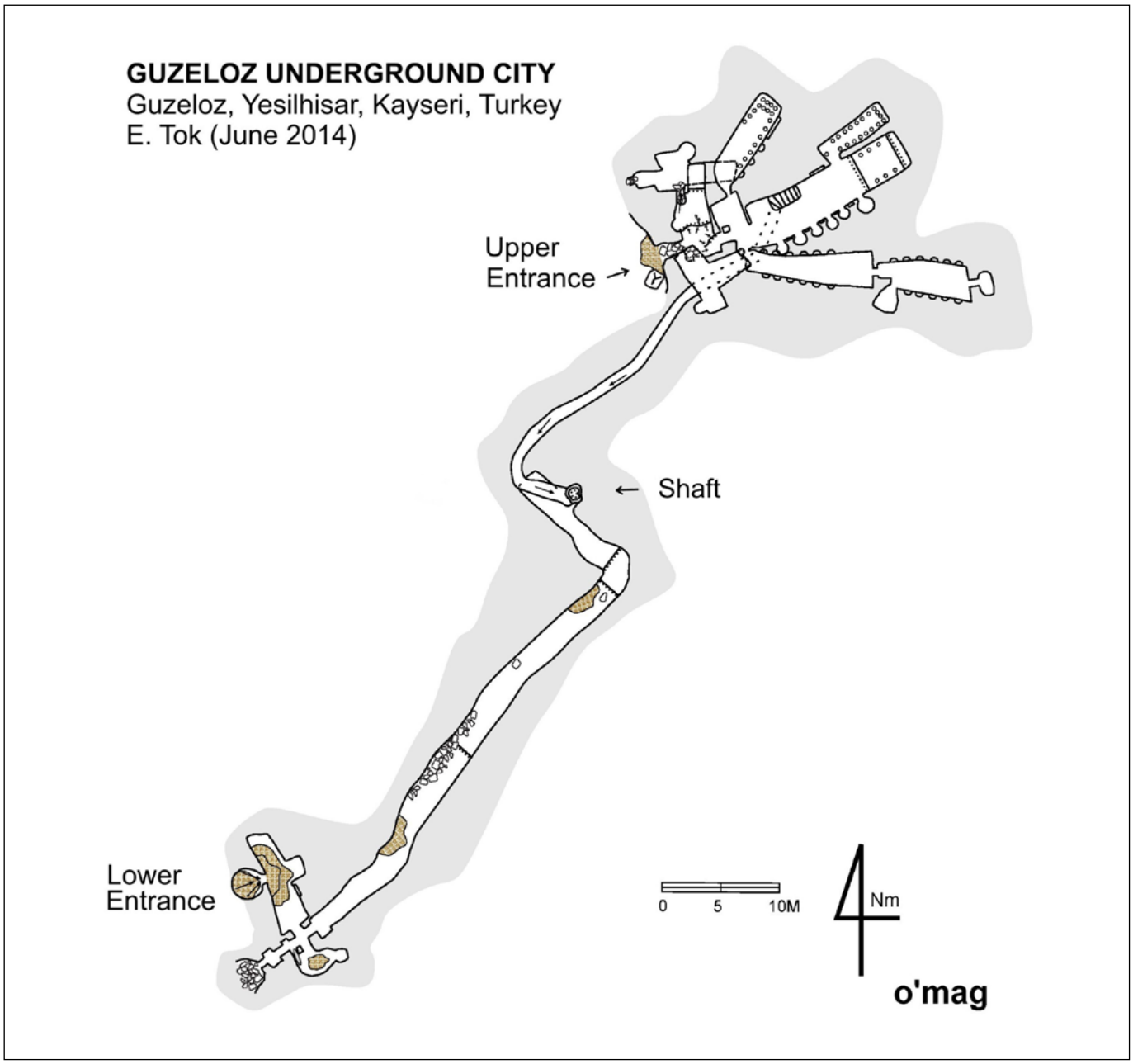

Fig. 10: Guzeloz Underground City (drawing E. Tok).
Fig. 10: città sotterranea di Guzeloz (elaborazione E. Tok).

several underground cities were surveyed, and here described in a comprehensive way. In addition to the 11 underground cities, we had been informed that there are at least 19 more in the province. We hope that, within this project, at least some of those historical heritages will be cleaned, excavated and protected.

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References

Ayhan A., 2004, *Geological and Morphological Investigations of the Underground Cities of Cappadocia Using GIS*, PhD Thesis (unpublished), ODTU, Ankara.

Bixio R., 2002, *Repertorio delle strutture sotterranee della Cappadocia, in Cappadocia, le città sotterranee,* Istituto Poligrafico e Zecca dello Stato, pp. 293-307, Roma.

Bixio R., Caloi V., De Pascale A., Castellani V., Traverso M., Triolet J., Triolet L., 2012, *Cappadocia, records of underground sites,* Archaeopress publisher of British Archaeological Report (BAR), International Series 2413, Oxford.

Gulyaz M.E., Yenipinar H., 2003, *Rock Settlements And Underground Cities of Cappadocia*, Nevşehir.

Yorukoglu O., 1990, *Tarihçesi, Tanıtımı, Plan ve Fotoğrafları ile Kappadokya Yeraltı Şehirleri,* Ankara.