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ANCIENT RESERVOIR AT ATHYRA, CONSTANTINOPE AT RISK: THE VALUE OF COMBINED HISTORICAL, ARCHAEOLOGICAL AND GEOARCHAEOLOGICAL DATA

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ABSTRACT

The surveys of the İstanbul Prehistoric Research Project that have been carried out since 2014 in and around the İstanbul Büyükçekmece Lake, discovered not only prehistoric materials but also a considerable number of small findings, ceramics and architectural elements from the Classical Period. A great deal of effort was spent to identify the long wall, extending roughly along the lake's ancient coast line, which surfaces during the years of drought when the lake's water recedes considerably. Antique geographers mention the region in a line or two, as a small town named after Athyra(s), a river flowing into the Marmara Sea from the north. Procopius, an important historian of the 6th Century, informs us in his book 'On Buildings' (Greek: Περικτισμάτων, Periktismáton; Latin: De aedificiis) that Emperor Justinian built a reservoir at the request of people affected by drought in a town called Athyra, near Constantinople. At first glance, knowing that the lake now not only supplies its ever-growing nearby population but also provides fresh water to İstanbul, the information given by Procopius didn't seem to be convincing. The team focused its efforts to investigate if the embankment belongs to the mentioned dam, or not. The team consulted the historic records and also correlated with the other surface findings such as different artifacts, ceramics, and architectural elements to build a context. Underwater Side Scan Sonar, Geomorphological and Paleoclimatological work confirmed that the region, despite its ample fresh water sources available nowadays, was suffering a serious drought during the sixth century.

KEYWORDS: Constantinople, Büyükçekmece Lake, Athyra, Justinianus, Reservoir, Procopius

1. INTRODUCTION

Büyükçekmece Lake is situated 35 kilometersⁱ west of the Bosphorus in Istanbul (Fig.1). Its entrance from the Sea of Marmara was sealed in 1989 with a dam constructedⁱⁱ by the General Directorate of State

Hydraulic Works, changing the brackish character of its water to a fresh one, in order to supply drinking water to an ever-growing population in Istanbul (Fig. 2).



Figure 1. Location of Büyükçekmece Lake.



Figure 2. Aerial Photo -Büyükçekmece Bay.



Figure 3. Büyükçekmece Lake shrank in 2013-2014.

2. METHODS & RESULTS

The study was carried out in five stages: First an extensive survey was carried out to determine archaeological material, then ancient sources were researched, also the environment was examined geomorphologically and underwater side scan sonar and Environmental magnetism of Lagoon sediments researches were done in the lake.

From 2014 to 2019, the scientific team of the Istanbul Prehistoric Research Project (ITA)ⁱⁱⁱ carried out extensive archaeological and geomorphological surveys around the lake and in adjacent areas where the water recently receded, finding architectural remains and other artifacts such as ceramics, steles and stones tools. Especially towards the end of the sum-

mer of 2014, the lake's shoreline shrank by between 500 meters and 2.5 kilometers, offering much to discover about the region's distant past.

The finds recovered in and around the lake ranged in date from prehistoric times to Late Antiquity. One of these discoveries was a long embankment-like architectural structure (This structure was observed between the coordinates from 41,025822° N - 28,581691° E to 41,024283° N - 28,576624° E), with a width of 1.5 to 2 meters, made of locally available pebbles, sand, sandstones and limestone. It had been cemented with lime (Fig. 4 a - d). In addition, the building blocks scattered towards the lake also attracted attention. (Fig. 4 e).



Figure 4a. Embankment made of pebbles, sand, sand stones and limestone.



Figure 4b. A less obvious part of the embankment



Figure 4c. Looking towards north, the embankment follows roughly the coastal line.



Figure 4d. A close up view of the embankment.



Figure 4e. The building blocks scattered towards the lake.



Figure 5. Stones belonging to bigger buildings.



Figure 6. Column Capital with Justinianus monogram (inverted)



Figure 7. (October 2019) The image of the low level ancient embankment parallel to the modern dam line emerging by the waters.

Due to their long period of submergence, some parts of the structure were decayed and top-level stones were either scattered around or had been removed, to be used in construction of local houses in historic times. Cut stones belonging to bigger buildings (Fig. 5) some parts of columns, and a capital with an imperial monogram were discovered in the northern side of the embankment (Fig. 6).

The ITA team followed this architectural structure towards the modern dam, which is situated to the north of the stone-built Ottoman bridge, commissioned by Suleiman the Magnificent from Sinan the Architect, after the collapse of the previous one during the great flood of 1563 (Çelebi, 2002, p. 157). Western travelers called it "Ponte Grande - The Great Bridge" (Ayyıldız, 1963, p. 3220).

During the survey, it was possible to follow the traces of the ancient embankment for roughly 300 meters in the direction of the Sea of Marmara, up to 120 meters from the modern dam. From that point onwards, the structure becomes wider and higher, looking like a modern construction. It also emerges above the surface, every summer, towards the end of August or early September when the lake water level is at its annual nadir. This part is immediately adjacent to the north of the modern dam and gives the impression that the modern construction follows the original line of Justinian's dam. The team contacted State Hydraulic Works' Istanbul Regional Office to find out if they had photographs taken prior to or during the construction of the modern dam that might enable the team to see the original position of the embankment. Unfortunately, they didn't have

any official record but they were able to introduce the team to an older employee who actually worked on this project. He remembered the existence of a low-level ancient embankment parallel to the line separating the Sea of Marmara and the lagoon (Fig. 7)^{iv}.

According to the information provided by the State Hydraulic Works, the limestone embankment the team followed between the coordinates 41,025822° N - 28,581691° E and 41,024283° N - 28,576624° E pre-dated the modern dam and it became clear that the continuation of the limestone embankment was below the modern structure.

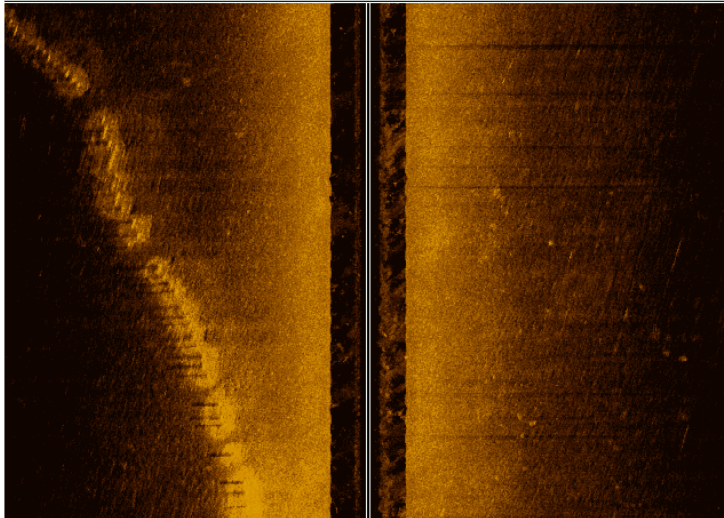
2.1 Side Scan Sonar

Another discovery came during the underwater survey in 2016 using side scan sonar. Parts of the same embankment structure were detected in two other locations, about 400 meters from the eastern coast of the lake (Fig. 8a) It is possible to see the actual readings recorded during the sonar works. Figure 8b shows the principal landmarks discussed in this paper and the locations of these two underwater structures. The general understanding is that the discovered underwater structures follow the ancient coastal line of the 6th century AD (Fig. 8c) that is why some sonar images look like they were taken on the land rather than from the lake. Position of the embankment in the water also shows water levels of the lake depended on seasonal draughts (Fig. 8d).



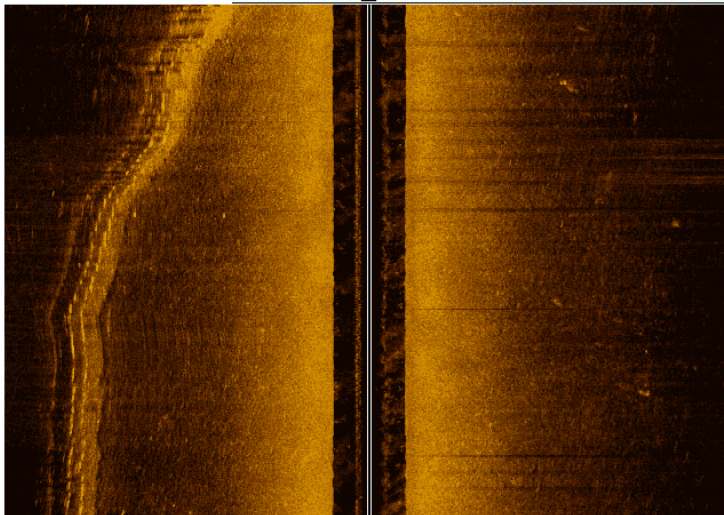
Büyükçekmece Lake
Researched areas by Side Scan
Sonar
 (Points on the yellow part was
 in the lake zone in 2016)

30 Left (m)  Right 30



One of the examples of sonar images
Deep: 3.1 meters
41.04.102 / 28.33.756

30 Left  Right 30



One of the examples of sonar images
Deep: 2.9 meters
41.03.850 / 28.34.028

Figure 8a. Sonar research area and two examples to embankments.



Figure 8b. Underwater side scan sonar results.



Figure 8c. Detected embankment lines to show possible continuity - photomosaics of the sonar images of the embankment.



Figure 8d. Coastline and lake level on 2019 and 1984.

2.2 Environmental magnetism of Lagoon sediments

It was not possible to obtain permission to take cores from Büyükçekmece lake due to the fact that it is one of the main fresh water reservoirs supplying Istanbul. Instead, the work was carried out in Küçükçekmece lake, which is only 12 km east and which have very similar characteristics.

Core KCL12P2 was recovered at the depths of -20 m from southern basin of Küçükçekmece Lagoon. The sampling, magnetic, and geochemical measurements were performed at the Paleomagnetic Laboratory in İstanbul University- Cerrahpaşa, Paleomag-

netic Laboratory in GFZ, and EMCOL in İstanbul Technical University, respectively. Here we present the results of mineral magnetic (magnetic susceptibility (K_{lf}), Hard Isothermal Remanent Magnetisation (HIRM)) and geochemical (Ca) analysis of core KCL12P2. Magnetic susceptibility (κ_{lf}) was measured by Kappabridge susceptibility meter. IRM intensities acquired in a peak field of 1.5 T are defined as the saturation IRM (SIRM). HIRM was calculated by $HIRM = (SIRM + IRM - 300) / 2$ using a reversed field of -0.2 mT (Bloemendal et al., 1992). Itrax XRF core scanner equipped with XRF-EDS was used for Ca element measurement (Thomson et al., 2006). The age model of core KCL12P2 is based on three cali-

brated radiocarbon dates and tuning the Ca record of core KCL12P2 with and $\delta^{18}\text{O}$ record from Sofular Cave in Zoguldak (Fleitmann *et al.*, 2009) which is located 250 km far away from the lagoon (Makaroglu *et al.*, 2016).

2.3 Sediment analysis

Here we first present high-resolution mineral magnetic and Ca record for the last 2500 years BP. High κ_{LF} and HIRM values indicate an increase in the content of high coercivity ferromagnetic minerals (Evens *ve* Heller, 2003) which are physically derived from the catchment area under the dry climatic con-

ditions (Robinson, 1986; Hesse, 1997; Olfield, 1985; Blomendal, 1998). High Ca concentration and $\delta^{18}\text{O}$ values are also related with dry climatic conditions (Ön, 2011). According to the magnetic and geomagnetic properties of core KCL12P, such dry period with low fresh water and terrigenous inputs occurred between 1500-1700 a BP (Fig. 9). Indeed, the oxygen isotopes (high $\delta^{18}\text{O}$) record from Sofular Cave in Zonguldak (Fleitmann *et al.*, 2009) also support a dry climatic condition at the area during this period (Fig. 9).

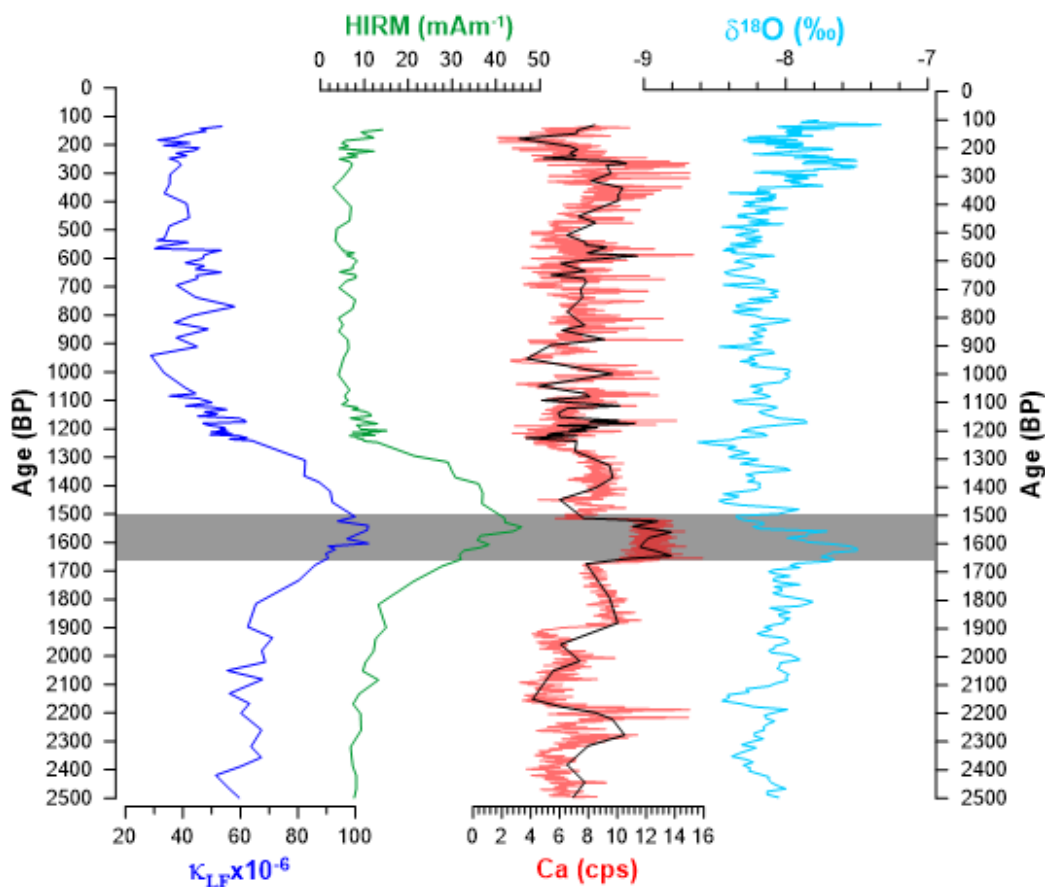


Figure 9. Down-core κ_{LF} , HIRM and Ca profiles for core KCL12P2. Grey bar represents the dry climatic condition for the studied area. For comparison, the magnetic and Ca record from KCL12P2 and Sofular $\delta^{18}\text{O}$ record (Fleitman *et al.*, 2009) are also shown.

3. DISCUSSION

The eastern and the northern parts of the lake's basin consist of flat terrain. To this day, they are also the most fertile agricultural farmlands. These underwater structures made us think that the reservoir was designed to have a limited extension in order to preserve the precious agricultural land. The underwater structure most probably extended uninterrupted all along the lake's original eastern coastal line (Şahin and Kurnaz 2014, p. 26). This may also explain the low height of the embankment wall we found on land because a higher dam wall would

mean more water collected and a bigger lake inundating more farmlands.

When we noticed the limestone structure for the first time, during the survey season of 2014, it was interpreted as a sort of breakwater, built right at the entrance to the lake, which would originally have been a seawater bay off the north of the Sea of Marmara, to provide shelter for ships (Aydingün *et al.*, 2015, pp. 1-12). Our initial idea was encouraged by a passage written by the Roman historian Ammianus Marcellinus (325-391). He mentioned a harbor with its own coast and a high tower, used as lighthouse

(Ammianus, 1862, p. 287; Külzer, 2008, p. 272). Symeon the Logotheteor Magistros, a historian of the tenth century, reported, based on earlier sources, that there was a 600 feet wide (approx. 230 meters) channel at the entrance of the lake (Fig. 2). On the eastern side of that channel, there was a fortified trade harbor in antiquity called Athyra (Magistros, 2006, p. 614). These written sources provide valuable information concerning the conditions of the entrance of the lake during late antiquity and the Byzantine period. Based on contextual findings and

available written sources, the discovered limestone structure was tentatively dated to the sixth century. However, a deeper analysis of both medieval sources and modern scientific papers led to a different interpretation. Cores taken from Küçükçekmece Lake, 11 kilometers (Fig. 10) east of our survey area, showed that there was an increasing problem with drought in the region of Constantinople between the fourth and the sixth century AD by Makaroğlu's studies (2017, pp. 103-110).

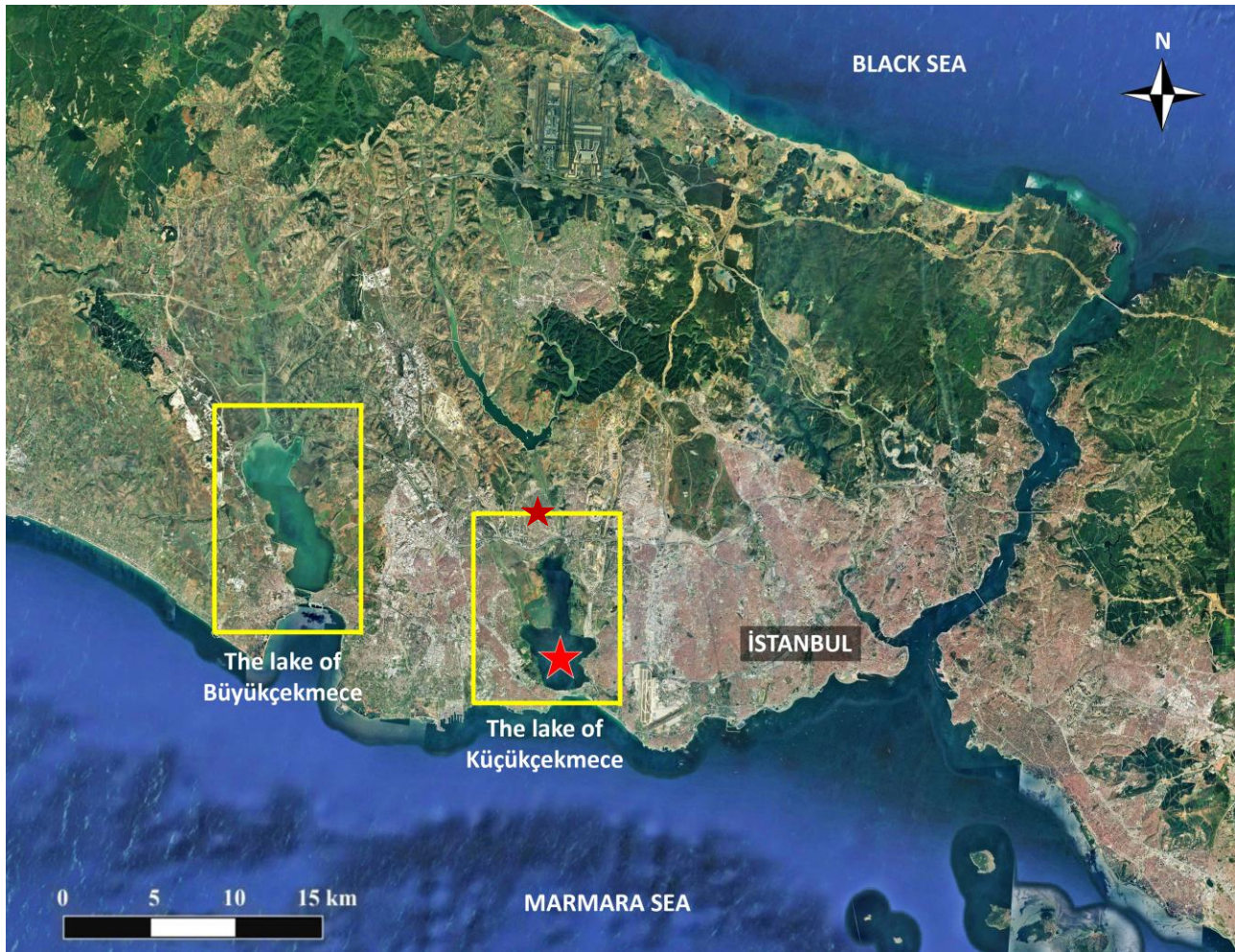


Figure 10. Büyükçekmece and Küçükçekmece Lakes. Red star shows the location of core KCL12P2 taken from Küçükçekmece Lake.

Accordingly, aqueducts and water channels were built over kilometers to transport fresh water from the northwestern highlands while many cisterns were constructed inside the city itself (Bono et al., 2001, pp. 1325-1333; Crow, 1995, pp. 109-124; Crow et al., 2008). During this time, around the year of 536 but probably extending to a full decade, a catastrophic and climatic event effected the whole Northern hemisphere, diming the sun light, dropping the average temperatures by 2°C, and causing a widespread drought (Toohey et al., 2016, pp. 401-412; Keys, 2000; Larsen et al., 2008, pp. 1-5). The

Athyras River, receiving its waters from northern hills and forests, was reduced to a stream. Consequently, living conditions deteriorated around Büyükçekmece Lake.

The historian Procopius of Caesarea reported in his book 'On Buildings IV.18-19' that the people of Athyra were not able to use the water of the river anymore and were suffering from water shortage. Therefore, they asked for help from Emperor Justinianus I (527-565) to solve their problem:

"Beyond Rhegium, there is a town called Athyra and their dwellers are tormented by an extreme drought. To

solve their problem he built a reservoir, thus he was able to collect water in a most correct time and was able to furnish it when needed. He also repaired the ruined parts of the perimeter wall"^v.

To such an extent, Procopius attested the construction of a reservoir at Athyra in the sixth century. One of the material finds we recovered nearby, to strengthen the evidence that the reservoir belongs to the Justinian period, was a typical sixth century capital, with the imperial monogram (Fig. 7). This type with monograms capitals appears first in the churches of Sts. Sergius and Bacchus, St. Sophia and at St. John Hebdomon in Justinianus Period (Zollt, 1994, 100-102).

Justinian's reservoir was planned approximately 800 meters north of the shoal separating the lagoon lake and the Sea of Marmara. In that way, it would be possible to collect fresh water to meet the locals' need while still preserving an inner harbor between the shoal and the reservoir. In the meantime, positioning the embankment wall more to the south, closer to the Marmara Sea, could have risked contamination of the reservoir by sea water seepage.

During the surveys carried out on the eastern side of the lake, around the coordinates of 41.01.11 N – 28.35.01 E, in the swamps left by the receding lake water and along the lake's coastal areas, substantial quantities of ceramics; both local and from some distant parts of the Mediterranean, the Aegean and the Black Sea belonging to fifth century BC and onwards were collected. Amongst these artifacts; well-known amphorae from Rhodes and Thasos, pottery fragments such as lekytos and skypos, unguentarium, Megara cup, black or grey furnished pieces, Athens's western hill ceramics, fishplates and a baby bottle were recovered. Two vessels, from the Hellenistic-Early Roman period, were found in the lake floor, almost intact (Fig. 10 a-b). Besides, an African style little Spatheion amphora belonging to the fifth century was collected fully intact (Fig. 10c). The other findings were Hellenistic-Roman funerary steles (Fig. 11 a-b), oil lamps (Fig. 10 d), coins (Fig. 12), fragments of sigillata and Early Byzantine period's marble decorative architectural fragments with inscriptions (Fig. 13a-b)

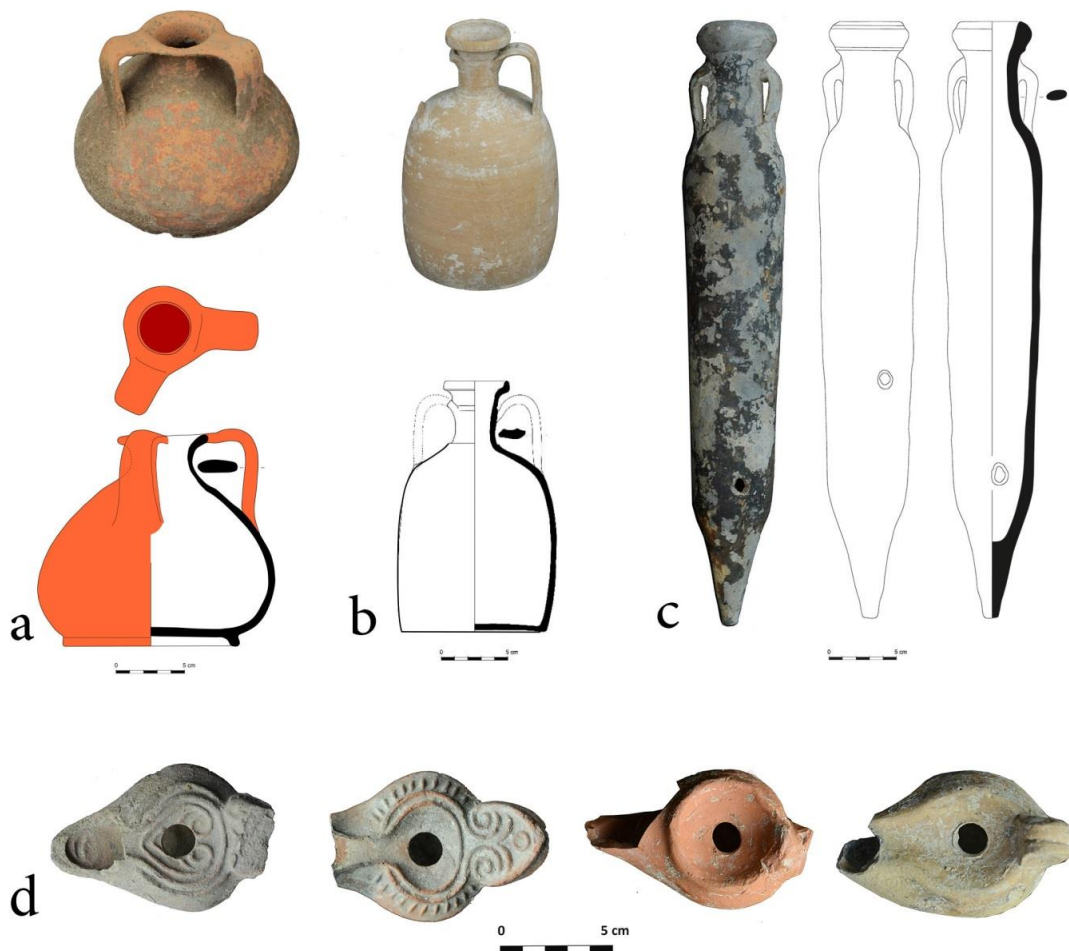


Figure 10. Materials that can be dated from the 1st century to the 7th century, which were recovered as intact from the lake when the water was drawn.

The high concentration of archaeological finds at the eastern coast of Büyükçekmece Lake indicates not only the settling of the region since prehistoric times, but also the existence of a trade harbor during the Hellenistic and Roman periods. The comparatively few archaeological finds from the Byzantine and Ottoman periods demonstrates a decline of both the harbor and the nearby settlement after the sixth century.

The Roman geographer Strabo was the first source to mention Athyras. He wrote that, after Selymbria (modern Silivri) one has to cross the Athyras

River to reach Byzantium (Strabo, *Geographia*, VII, 56). Later travelers and authors mentioned the existence of the small Greek colony Athyra (τὰ Ἀθύρα) founded at the place where the Athyras River reached the Sea of Marmara^{vi}. Despite the fact that the geomorphology of Büyükçekmece and its surrounding area was suitable for both agriculture and harbor building, the problem of defending the region against barbarian attacks, that is the lack of security, limited the size of the settlement to a bare minimum.



Figure 11a-b. Hellenistic-Roman funerary steles.

Ancient and medieval sources relate that Eastern Thrace with its productive agricultural areas suffered much from numerous attacks, raids and invasions. The main reason was the desire of the aggressors to conquer Constantinople, the most advanced city in the Early Middle Ages. The city's western territories which are within one or two days of walking distance are between the Black Sea in the north and the Sea of Marmara in the south. This relatively nar-

row land strip contains three lagoons; Durusu (Delkos/Derkos), Küçükçekmece (Bathynias/Region) and Büyükçekmece (Athyras) (Sayar, 2017, 283). The land is formed with flat hills and alluvium-filled, fertile plains and therefore doesn't provide much obstacles to incoming invaders on their way to the Byzantine capital.



Figure 12. Coins from Hellenistic - Byzantine periods.



Figures 13 a-b. Early Byzantine periods decorative architectural fragments.

Eastern Thrace's productive lands suffered huge damage from Goths, Huns, Bulgarians and other Slavic and Turkish tribes. Among all these invasions and raids, Attila the Hun carried out the most devastating one in the year 447 AD (Soustal, 1991, p. 67; Külzer, 2008, p. 84).

During the same epoch, in the same region, there was also seismic activity causing great damage to Constantinople. A number of earthquakes were recorded by the historians during the reign of Justinianus. The tremors of 533 caused widespread panic among the people. The tremors continued in the years of 540, 541, 545, 547, 551, 554 and 555. However, what struck the city and surroundings on the 14th of December, 557 was a seismic terror, which killed a great number of people and left the city undefended to barbarian attacks because of the collapse of the city walls (Croke, 2005, pp. 70). In the western territories of the Empire, highly damaged by the assaults of the barbarians and the earthquakes, life was getting more and more difficult and unbearable. Emperor Justinianus carried out an offensive against the Proto-Bulgarians and organized a campaign of resto-

ration in different parts of the Balkan Peninsula in the year of 540. At the same time, there were renovations of aqueducts, palaces and certain public buildings in Athyra, Raidestos (Tekirdağ) and Selymbria (Külzer, 2008, p. 271). Procopius reported that in Athyra, Emperor Justinianus built the reservoir, fortifications and in the north of the Büyükçekmece Lake, a fortress called Episkopeia^{vii}. After the death of Justinianus, Athyra and its surroundings were frequently attacked. The Avars invaded the region in the years of 616 and 626, the Arabs in the 670'ies, the Bulgarians in 813, 913 and 924 and the Pechenegs in 1090. One of the most ferocious attacks against the region happened when the Byzantine Empire was under the rule of the Latins, in 1206, shortly after the fourth Crusade. The French knight and historian Geoffrey de Villehardouin, who also took part in the conquest of the city during the fourth Crusade, reported that: "Following the conquest of Constantinople by the Latins, Romanian and Bulgarian King Johanitza organized a military campaign against the Latins and in Athyra he massacred all the local population who surrendered despite his word to give his mercy. In addition, he demolished all the buildings and fortifications (Villehardouin, 111).

After this last blow, life in Athyra could not recover for a long time. The Catalan Company plundered the region in 1305. In spring 1345 AD, the city was demolished again during the Byzantine civil wars. During the Ottoman period, Büyükçekmece with its caravanserai close to the eastern end of the stone bridge, built by Sultan Suleiman was a halting place on the way from the inner Balkans to the capital. In his book "Itinerarium Hierosolymitanum et Syriacum" the Dutch traveler Johannes Cotovicus (died 1629) described Athyra (Büyükçekmece) as a halting station ten miles from Rhegium^{viii}. Three centuries later, in the 19th century, the famous scholar Konstantin Josef Jireček, who studied the Roman military roads, described Athyrain the same terms, as a halting station (Jireček, 1877, p. 54).

It is possible to see the remains of historical Athyra in the foundations and walls of buildings belonging to the Ottoman period (Evliya Çelebi, I/III: 1712). In some restaurants in and around Büyükçekmece, Hellenistic and Roman amphorae, discovered by local fishermen, are used as decoration elements. Furthermore, it is also possible that some columns and capitals nowadays decorating public parks originate from Athyra (Fig. 14a-b)



Figure 14 a-b. Some columns and capitals nowadays decorating public parks in Büyükçekmece

4. CONCLUSION

After examining the historical records, it was evident understood that there had been a large population in the region in the 6th century AD and local fertile agricultural lands were important for the supplying of the capital. Paleoclimatic studies have proven the occurrence of a serious drought which

corroborates that confirms the information provided by Prokopius. We believe think that the set we found including with ancient sources, archaeological remains, underwater sonar studies and earth science studies, taken in context with the ancient sources, means that we have identified remains belonging to the Justinianus reservoir.

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ⁱThe XXII miles shown in the Tabula Peutingeriana are equivalent to 35.4 kilometers. A modern study of the map shows a very similar distance between the Million Stone of Constantinople and Büyükçekmece Lake.

ⁱⁱ The dam's construction started in 1983; it was finalized in 1989.

ⁱⁱⁱ The ITA Project is headed by Ass. Prof. Dr. Şengül Aydingün from Kocaeli University; since 2007, it has investigated all the archaeological remains in the west of the Istanbul Metropolitan Area.

^{iv}State Hydraulic Works' Istanbul regional director Mr. Hakan Emiroğlu informed that he actually took part in the construction of the dam in the eighties. He confirmed that there was an old embankment on the interface between the lake and the sea, on which they built the new dam.

^v Procopius, https://penelope.uchicago.edu/Thayer/E/Roman/Texts/Procopius/Buildings/4C*.html IV.18/19. (14.06.2020)

^{vi} Except from ancient writers such as Strabo VII, 54; Plinius 4,18; and Ptolemy 3, XI who referred to Athyra in one or two sentences, several later historians like Agathias of Myrina V.3, Ammianus Marcellinus,287/8, John Kinnamos, Nicetas Choniates 832/23, Symeon Magistros and Theophanes should be mentioned in this context. Concerning modern scholarly literature, see among others Grammenos–Petropoulos, 2007; Velkov, 1977; Külzer, 2008, pp. 273-274.

^{vii}Procopius, “Beyond Athyra there was a place locals called Episkopeia. Emperor Justinianus recognized that the whole area was open to barbarian attacks and large parts of the territory were undefended, because of a lack of fortresses” Buildings IV,8,19. Therefore, he ordered the construction of a fortification near Athyra with a sophisticated defense technology; (Külzer, 2008, pp. 270-274).

^{viii}The travel guide Johannes Cotovicus prepared after the journey he made during the years of 1598-1599 through Corfu, Zakynthos, Crete, Rhodes, Cyprus, Jerusalem and Syria.