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Roman Aquariums: A Study of Unpublished Roman Aquarium in Hermopolis Magna

(Architectural and Analytical study)

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Abstract: The study deals with an architectural building (i.e an aquarium) found in Hermopolis Magna, Middle Egypt. It probably dates back to the late Roman period. Notably, this aquarium is the only building of its kind in the region of Middle Egypt. This structure is an aquarium, as evidenced by its style of construction, proportions, wall cavities, and pottery pots with broken apertures that fish used to spawn in. The study aims to describe the aquarium and analyze each part of the structure. Moreover, it compares this aquarium with similar aquariums dating back to the same era. In this study, the researcher followed the descriptive, the comparative and the analytical methods.

Keywords: Aquarium, Hermopolis Magna, Roman Period, Water Tower, Aquaculture.

الأحواض الرومانية لتربية الأسماك: حوض روماني غير منشور بهرموبوليس ماجنا (دراسة معمارية تحليلية)

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الملخص: يركز هذا البحث على دراسة أحد المباني المعمارية في منطقة الأشمونين والمتمثل في حوض لتربية الأسماك، وهذا المبني لم يتناوله أحد بالدراسة والبحث من قبل وينشر لأول مرة، والجدير بالذكر أن هذا المبنى هو الوحيد من نوعه في منطقة مصر الوسطى بشكل عام وفي منطقة الأشمونين بشكل خاص، يتناول أيضا البحث بشكل أساسي الأسباب التي دفعت الباحث إلى تصنيف ذلك المبنى على أنه حوض أسماك من خلال طريقة البناء والأبعاد، وأيضًا التجاويف الموجودة بالجدران التي تحوي أواني فخارية ذات فتحات مكسورة، والتي استخدمتها الأسماك لوضع البيض. وفي هذه الدراسة عقد الباحث العديد من المقارنات بين هذا المبنى والمباني المماثلة في جميع أنحاء مصر والتي تعود إلى نفس الحقبة التاريخية، ومن خلال هذه المقارنة تبين أن هذا المبنى يُمثِّل حوض لتربية الأسماك، ويعود إلى العصر الروماني المتأخر.

الكلمات الدالة: حوض سمك، هيرموبوليس ماجنا، العصر الروماني، برج مياه، تربية الأحياء المائية.

Introduction:

In Middle Egypt's Minia Governorate, next to the little village of *Ashmunin*, are the remains of the ancient city of Hermopolis. It was the residence of god Thoth since ancient Egypt era and continued till the Greco Roman Period.[1] Now the city is covered by a mound approximately 1 kilometer long and 1.5 kilometer wide.[2] The name *Ashmonin*, which in Old Egyptian is *Khemenio* (number eight), was given to honor the eight deities who were associated with the entire area. Then it was named Hermopolis (Ἑρμοῦ πόλις) during the Ptolemaic age, meaning the city of Hermes, as the Greek compared between Greek god Hermes to the Egyptian god Thoth. Due to the city's vastness and several massive structures, the Romans gave it the name Hermopolis Magna, which means grand Hermopolis.[3] During the Coptic era it was called *Shmon* or *shamno*, and in Arabic it was known as *Al Ashmounien*الأشمونين! By the middle of the third century A.D., there were more than 30,000 people living in the city.[4]

History of aquariums through ages

Since the Sumerians started raising fish in made-up ponds 4500 years ago, fish scenery has a long history. Additionally, images of fish aquaculture in ponds and basins were found in the ancient Egyptian culture. The rich in ancient Egyptian dwellings and temples bred this fish in basins[5]. In the Pharaonic period, where the Egyptians created several lakes, many of which were related to religious temples and regal palaces, such as the lakes in Karnak and Dendera, fish farming was performed along the banks of the Nile.

Scenes of breeding fish dated back to the Middle Kingdom and represent fish farming ponds filled with fish. These scenes are found in the northern Palace in the Tell El-Amarna area,[6] as well as the tomb of (Neb-Amun), which traced back to 1350 BC on the western bank of Luxor on a scene representing many fruit trees such as palms and sycamores, and in the middle a rectangular water basin filled with fish (Fig. 1)[7].

As for the Greeks, they were farming fish in natural places such as lakes, and they also used reservoirs and artificial springs to preserve the fish that were sacred to many gods, specifically in the cities of eastern Greece, where fish are often kept in tanks in

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[1] باسم سمير الشرقاوي، محافظة المنيا المواقع الأثرية والمزارات الدينية، (القاهرة: المجلس الأعلى للآثار، ٢٠١٠)، ١٩١.

[2] Jeffery Spencer, Spencer Jeffery, *Excavations at el*-Ashmunein: Topography of the Site v.1, (London: British Museum press, 1984), 3.

[3] Alan Wace, (1959), *Hermopolis Magna, Ashmunein: The Ptolemaic sanctuary and the basilica*, (Alexandria: Alexandria University press, 1959), V.

[4] جونيفيف هوسون & دومنيك فالبيل، الدولة والمؤسسات في مصر من الفراعنة الأوائل إلى الأباطرة الرومان، ترجمة: فؤاد الدهان (القاهرة: دار الفكر للدراسات والنشر والتوزيع، ١٩٩٥) ٢٥٥.

[5] NurEfsan Göreci and Deniz Demirarslan, "Aquarium as a design element in houses", *Research & Reviews in Architecture*, Planning and Design (2021): 27-28.

[6] Higginbotham James Arnold, "Artificial fishponds in Roman Italy during the late Republic and early Empire", (PhD, the University of Michigan, 1991), 6.

[7] Richard Parkinson, *The painted Tomb-chapel of Nebamun* (London: British Museum Press, 2008), 52-132-137.

sacred places to the gods or inside temples, and the fish were kept for two main purposes, either for eating or for decoration. *Diodorus of Sicily* mentions that there is a fish tank built by the citizens of Acragas after the Battle of Himyra in the early fifth century BC, Diodorus describes this basin as "the depth of the basin was twenty feet and twenty stadiums (two and a quarter miles)".[1]

For the Romans, fish ponds during the first centuries before and after AD were one of the most important pillars of the economy, whether these fish were freshly extracted from the lakes or in breeding ponds,[2] fish was one of the important meals during the Roman era for all segments of society, whether rich or poor, which is the motive behind the fishermen in making them always strive to keep fish fresh for as long as possible, and then establish fish breeding ponds and salt pans and preserve it. [3] In view of the importance of fish to the Romans, they created ponds to raise them so that man would be in control of the process of raising fish, as a result of the difficulty of fishing from the seas and the dangers they contained. Over time, the process of raising fish inside ponds and ponds became a common practice carried out by the Romans.[4]

Romans were interested in fish breeding and catching fish for food and entertainment. They created ponds and basins fed by sea water from the ocean, and they often kept these fish in basins made of marble, [5]so in ancient Rome fish was very important, as it represented an important meal for the upper classes in Roman society at the time, which made these classes interested in constructing fishponds in their homes in order to obtain fresh fish.[6]

Moreover, fish was considered as one of the most important meals for the Romans, especially the inhabitants of the Roman coastal parts. Although fish was available for all classes, there were some kinds of fish that were limited only for rich people such as sturgeon fish that spread all over the region and had a remarkable role due to scarcity and high price in the late time of the Roman Republic, which made the fish meal an influential social and economic factor and then returned to the importance of fishponds.[7]

Fish breeding basins spread in Italy during the first centuries BC and AD, as these basins were used for breeding fish and reproduction, also, some of them were used for decoration purposes, ornamenting wealthy people's villas and houses. As fish for the wealthy classes was very important as a symbol of social status. During the first century BC, freshwater fish were more suitable for the table of the poor, while fishing from salt water was more valuable and was often food for the wealthy. Fishing and raising fish for the Romans is one of the manifestations of luxury.[8] In this regard, we must mention

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[1] Diodorus Siculus, Bibliotheca Historical. Loeb. 11.25.4.

[2] King Allyson, "An Examination of the Economic Role of table fish in Ancient Rome", (Master of Arts, University of Kansa, 2013), 30.

[3] هبه فاروق حسن، "مصانع حفظ الأسماك خلال العصر الروماني في مناطق غرب البحر المتوسط ومناطق البحر الأسود عند البسفور دراسة أثرية"، مجلة الاتحاد العام للآثاريين العرب، العدد١، (٢٠٢١): ٣٥٨.

[4] Allyson, "An Examination of the Economic", 73.

[5] Göreci and Demirarslan, "Aquarium as a design": 7.

[6] Allyson, "An Examination of the Economic Role", 4.

[7] هبه فاروق حسن، "مصانع حفظ الأسماك خلال العصر الروماني"، ٣٥٨.

[8] Arnold, "Artificial fishponds in Roman Italy", 10-11.

Cicero's reference in his letter about the upper class in which he complains about the owners of fishponds and spending a lot on them instead of spending on the Roman Republic. Despite that, in the late Roman Republic, fish farming became a symbol of social status more than economic, that is, fishponds became in the late Roman Republic with a social significance in addition to its economical role. Over time, the possession of these ponds became for the purpose of decorating gardens in villas and homes for the sake of decoration only. Whoever owns a fish tank has become one of the wealthy class.[1]

The studied aquarium is one of the most significant structures in the area of *Al Ashmonin*. The study aims to publish the aquarium for the first time and to describe and analyze each part of the structure. Moreover, it provides a comparison study with similar aquariums dated from the same era. In doing so, the researcher followed descriptive, comparative and analytical methods of research to accomplish the study.

Descriptive study

The structure is rectangular in shape (Figs. 2;3"a,b"). The building is approximately 10.30 meters long from north to south from the outside, and 8.30 meters long inside. The building is approximately 12.30 meters long from east to west and 9.90 meters long from the inside.[2]

The northern wall is 1.10 m thick (Fig. 4), reaching a height of 3.40 m at its highest point on the northeastern side and 0.70 cm at its lowest point on the northwest side due to the wall's deconstruction and dust-covering. The building's most damaged wall is thought to be this one. It should be mentioned that this wall was subject to deterioration from the outside because of the amount of dust that fell on and covered it. A group of nine cavities are found in the northern wall which in turn contain pottery vessels (Fig. 5). The maximum diameter of these pots was 25 cm, while the minimum diameter was 20 cm, with an equal depth of 30 cm.

The southern wall, which is regarded as the best wall of the structure, is 1.10 meters thick (Fig. 6), reaching a height of 5.10 meters at its highest point and 2.60 meters at its lowest. The mortar, which is a mixture of red dust and lime, is applied to the wall from the inside to prevent water leakage. The mortar layer's thickness was approximately 0.30 cm, and it's important to note that this wall has nine internal cavities that are filled with pottery pots. As a result, the number of internal cavities in the northern wall is equal to the number of cavities in the southern wall.

The pots equal thickness and maximum diameter of 25 cm are also recorded, as is their minimum diameter of 20 cm and equal depth of 30 cm. This parity in the number of cavities and pots demonstrates the architect's expertise in identifying and upholding the building's symmetry and balance.

The eastern wall is 1.10 m thick, which is the same as the thickness of the building's other walls (Fig. 7a,b).Similar to the southern wall, the eastern wall is in better shape

[1] Allyson, "An Examination of the Economic", 20.

[2] Sincere thanks and appreciation to the Chief Inspector of the Antiquities of Malawi (West of the Nile), Mr., Sayed Abdel Malik Abdel Hamid, and Mr., Salama Naji Mohamed, the Inspector of Mallawi Antiquities, for accompanying the researchers during the field visiting the building and raising the dimensions.

than the western and northern walls. This wall has a maximum height of 5.10 meters on the southeast side and a minimum height of 3.20 meters in the middle. It is internally lined with a mortar layer that varies in thickness from (0.30 cm: 0.50 cm). A total of nine cavities that are perforated through the inside of the wall contain ceramic pots with a maximum diameter of 25 cm and a minimum diameter of 20 cm and an equal depth of 30 cm (Fig. 8).

The western wall's thickness is 1.10 m, its highest point is 2.60 m on the southwest side, and its lowest point is 0.70 m on the northwest side (Fig. 9).A mortar layer that spans in thickness from 0.30 to 0.50 cm covers this wall, and six cavities are filled from the inside with ceramic pots. The pots have a maximum diameter of 25 cm, a minimum diameter of 20 cm, and a depth of 30 cm.

Analytical study

It is clear from the building's measurements that it has a symmetrical form. All four of the building's walls measure 1.10 meters thick, as can be seen by looking at their thickness. Also, there are an equal number of cavities between each pair of opposing walls. While there were six cavities in each of the eastern and western walls, there were nine cavities in each of the northern, southern, and western walls. Additionally, it should be noticed that all of the cavities in the building's walls have the same width and depth (Fig. 10), indicating that the architect who designed the structure was well aware of the value of architectural symmetry.

Stone and burned bricks, which were utilized to pave the basin's floor with stone, are among the most durable building materials that were available during the Roman era. In order to make it easier to remove the debris accumulated in the floor, the floor is also seen to be decreasing as we get closer to the center.

In contrast to its widespread use during the Roman era, when burnt bricks of uniform shape and equal sizes were used to connect them with a layer of mortar to strengthen the walls, the use of burnt bricks in the construction of that basin is known to have been limited during ancient Egyptian times.

The dimensions of the moulds (length 25 cm, breadth 12 cm, and thickness 8 cm), and it was discovered that the dimensions of these moulds are extremely similar to what Roeder indicated regarding the dimensions of the moulds in Hermopolis.[1]

The dimensions of the bricks used in that basin are similar to the dimensions of the bricks found in Armant (Qena Governorate), which ranged between (length 34 cm) width 17 cm x thickness 8.5 cm. They are also similar to the sizes of the burnt bricks in Alexandria and Karanis (Fayoum Governorate), in terms of the length that ranges between 24 cm: 25 cm, the width between 12 cm: 25 cm, and the thickness ranges between 3.5 cm: 8 cm (34 cm x 16 cm x 7 cm).[2]

[1] Gunther Roader, "Die Kasmogonie Von Hermopolis", *Egyptian religion* 1, no.1, edit by Samuel A. B .Mercer, (1933): 11.

[٢] ممدوح ناصف المصري، "عمارة المنازل في مصر منذ عصر أغسطس حتى الفتح العربي ٣٠ ق.م. – ٦٤١ م"، (رسالة دكتوراه غير منشورة، قسم الآثار- كلية الآداب – جامعة طنطا، ٢٠٠١)، ٣٨١.

As for the method used in the construction, it is the Headers & Stretchers method (Fig.11).[1]It's also important to note that the internal surfaces of the walls were covered with Opus Signinum, a coating of pink mortar that ranges in thickness from 0.30 to 0.50 cm.[2]

Due to the strength of the walls supporting the water pressure in the basin, which is intended to be estimated at 105 Cubic meters of water, the walls of that basin are distinguished by being thick, since the thickness of the walls is 1.10m.The highest height of the walls was approximately 5.10 m on the southeast side of the southern wall and the eastern wall, but it reached 9.90 m to the west from the interior.

It's possible that rainfall was gathered in tanks for later use or that the basin was manually filled with water. No drainage or water supply lines were seen in the walls or floor of the basin when the researchers investigated it in the field. So far, it seems like the water removal process also involved human labor. Because there is no archaeological evidence outside or inside the basin that points to a water supply or drainage system like those seen in the Roman public baths, we are convinced that the building was not a Roman public bath.

By examining the architectural features of the basin, we are able to ascertain the purpose of the structure that corresponds with those features. The building is undoubtedly used as a fish breeding basin because it has architectural features such as cavities that hold spherical pottery inside and cracks that allow water to circulate. As the proprietors of fishponds, whether fresh or salty, were interested on the presence of architectural fractures, in order for the water to carry out the circulation process, as this is the primary and crucial element in keeping fish alive.[3]

Comparative Study

In Egypt, a number of aquariums from the Roman era were discovered. The researcher made a comparison between them and the Hermopolis aquarium. These aquariums can be found in Egypt in the areas of Canopus City, Al-Qabbary Area,

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[1] It is about building a row of bricks horizontally, interspersed with a row of bricks in a vertical manner alternating between a horizontal and a vertical row in order to connect the stone blocks and the molds of burnt bricks. This method used in building that basin dates from the second century BC until the second century AD. This layer of mortar is a mixture of red dust mixed with powdered marble and lime, and the use of this layer was to prevent the seepage of water. See

- مني حجاج، في عمارة الإغريق، (الإسكندرية: كلمة للنشر والتوزيع، ٢٠٠٧)، ٥٠.

[2] For more on opus signinum see:

- Barbara Tsakirgis, "The Decorated Pavements of morgantina II; The opus signinum", *American Journal of Archaeology*. 94, no. 3 (1990): 428-430.

[3] Allyson, "An Examination of the Economic", 20.

Shatby Area, and Front of First Pylon in Karnak. (Fig. 12). Moreover, the researcher compared with example of aquariums found in Punta dellaVibra dellaVipera in Italy.

1. Aquarium found in front of first Pylon in Karnak

Incomparingthe basin with other structures that have all the aforementioned components and were also uncovered in various locations throughout the Roman era, it was proven to us that the building's purpose, which rests in being a basin for rearing fish. For example, the basin discovered by Lauffray in front of the first pylon in the Karnak temples in Luxor (Fig. 13)[1]. This basin and that of Hermopolis are comparable in that they both include cavities that house pottery fish breeding pots. It is important to note that fishpond, which is located in the Hermopolis region, is regarded as the best in the size of the structure and the architectural elements.

2. Aquarium found in Al-Qabbary area in Alexandria

The fish breeding tank discovered in Al-Qabbary area in Alexandria, which takes a rectangular shape, and is built of stones and red bricks, and the dimensions of that building (length 3.3 m x width 2.1 m x height 1 m) (Fig.14), is similar to the aquarium of Hermopolis in terms of the cavities within both and the pottery vessels installed in the walls, where these cavities were used as a shelter for raising and feeding fish.[2]

3. Aquarium found in Shatby area in Alexandria

It is worth mentioning that the Hermopolis Magna Aquarium is similar to the basin that was discovered in the Shatby area in Alexandria (Fig. 15), which takes an octagonal shape, and its walls include, in the lower third of them, cavities inside which are pottery vessels used by fish for feeding and breeding.[3]

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[1] For more on this aquarium see:

- Jean Lauffray, "Abords Occidentaux du premier pylône de Karnak", Le dromos, la tribune et les aménagements portuaires, Paris ," *Kêmi 21*, (1971): 118-124.

- Mansour Boraik, "Excavations of the Quay and the embankment in front of Karnak temples, Preliminary report", *Karnak 13*, (2010): 65-66.

- عبد الحميد مسعود، "تربية الأسماك في ضوء دراسة مبني روماني بالكرنك"، مجلة وقائع تاريخية، العدد ٢٩، (٢٠١٨):٤٢٧-٤٣٤.
- خالد عصام الدين محمد، "مدينة ديوس بوليتيس الكبرى (الأقصر) في العصرين البطلمي والروماني- دراسة أثرية"، (رسالة دكتوراه غير منشورة-قسم الآثار- كلية الآداب- جامعة عين شمس،٢٠١٩)، ٨٧.

[2] Habachi Labib, "Occasional archaeological discoveries, reported to the Graeco -roman museum in 1941-2", *Bulletin de la Société Royale d'archéologique d'Alexandrie 35, NS Vol. XI. 2, Alexandrie*, (1942): 110.

[3] for more about the shatby basin see ..

- Adriani Achille, *Annuaire du muséegréco-romain , 1935-1939*, (Alexandrie,1940), 149-150, pl. lxi, 1, fig, 62.
- Labib, "Occasional archaeological discoveries" 109-113.

4. Aquarium found in city of Canopus

A square-shaped fish tank was found in the city of Canopus (currently Abu Qir) by Breccia (Fig. 16). Its area is (10 m long x 10.5 m wide, 1.80 m high). One of the walls of that tank from the inside contains cavities with spherical pottery. [1]The nozzle of this shape is along the surface of the wall in the same style as in the basin of the Hermopolis area under study, as well as the basins of the Al-Qabbary area and the Shatby area, as this is considered to be the style of the most important architectural pillars that the architect put into consideration when implementing these pottery vessels that fish use for feeding and hiding in order to lay eggs and reproduction.

5. Aquarium found in Punta della VibradellaVipera in Italy

It is noted that it is similar to the fish aquarium in the area of Hermopolis Magna, in the basin of Punta della Vibradella Vipera in Italy (Fig. 17) in terms of shape and architectural planning despite the difference in terms of the source of water represented by freshwater channels. Although the Hermopolis basin derives water from manual filling, the Villa dellaVibra basin derives water through the canal from the Anio River. The basin traced back to the first century BC. [2]

Primary Remarks

- It worthy to note that the pottery vessels, which are found in the shape of cavities in the walls of the basins, are one of the distinctive architectural components of fishponds from the Roman era in Egypt. This feature indicates that the basin is used for fish breeding. In case of Hermopolis Magna basin we found a number of nine cavities in both southern and northern walls, and six cavities in the western and eastern walls.
- The cracks found in Hermopolis Magna basin that helps in the circulation of water, which is necessary for fish life. as the large size compared to the rest of compared basins, which assures that this basin was used for an economic purpose rather than a social one,
- In addition to the presence of the circular and clear element of the towers in both the eastern and southern walls, in order to support the basin to bear the circulation of water.
- Fish basins are constructed in a way that help with controlling the movement of fish and facilitating the flow and circulation of water and in some cases regulate the degree of salinity of the water in order to be suitable for the reproduction and preservation of fish. It is worth noting that these ponds vary in size between large and small.[3]

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[1] Breccia Evarist, "Le rovineeimonumenti di Canopo", *Monuments de l' ÉgypteGréco -Romaine, Vol. I, Bergamo,* (1926): 36-37.

[2] For more on this aquarium see:

- Annalisa Marzano & Giulio Brizzi, " Costly display or economic investment? A quantitative approach to the study of marine aquaculture", *JRA22*, (2009): 223-224.

[3] Arnold, "Artificial fishponds in Roman Italy"1.

Closing Remarks

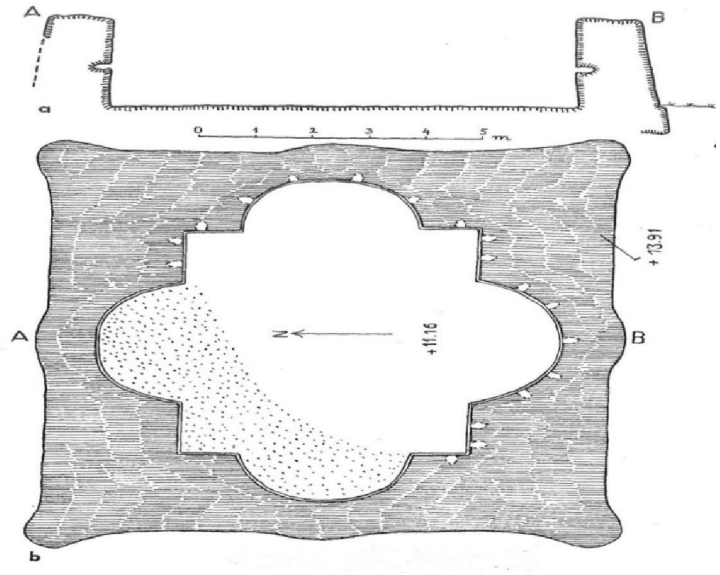
- Hermopolis Magna's aquarium was originally one of four water tanks discovered in the city that date back to the early Roman era. However, in the late Roman era, sometime after the third century AD, some architectural changes were made to the second water tank, which is located above the so-called kom el kanisa, to be converted to an aquarium.
- There are archaeological remnants not far west of the church mound near Kom al-Nar that Roeder believes are from the Gymnasium, but Bailey's excavations at the site revealed evidence that shows it is a unique location for the industry of drying and salting fish. Archaeological evidence has also shown the existence of structures dedicated to oyster farming. [1]
- It turns out that the geographical proximity of places to the aquarium supports the idea that there are several industries related to fish in that city that needed a large aquarium, such as the studied aquarium.
- The value of fish, their breeding, and their variety of uses—whether for social purposes of ornamentation or for economic ones—are also obvious.
- It is believed that the history of the building of Hermopolis Magna Aquarium dates back to the late Roman period, according to a number of justifications, the most important of which are the dimensions and size of the red bricks used in the construction of the building, whose dimensions range between (12 cm x 15 cm x 8 cm), (25 cm x 11 cm x 6.5 cm), (24 cm). 12cm x 8cm) (24cm x 11cm x 7.5cm). [2]and they are the scales that the building used to have for building during the late Roman era.
- - The facility located in Hermopolis Magna is nothing but a fishpond, which is likely to be freshwater fish, given that the source of the water near it is the Nile River.
- The aquarium located in Hermopolis Magna dates back to the Roman era, perhaps during the early period, due to the building materials used, which are the stones used in the floors and the burnt bricks, which are the materials that were commonly used during the Roman era, and this is confirmed by the size of the bricks ranging from (12 cm x 15 cm x 8 cm), ((25cm x 11cm x 6.5cm, (24cm x 12cm x 8cm), (24cm x 11cm x 7.5cm) which are the same sizes used in Alexandria and Karanis in Fayoum, as well as Armant in Qena, which is dated to the Roman era, and this is also confirmed by the use of the Opus Signinum method in covering the basin, which is one of the methods of covering the walls used during the Roman era.
- Through the size of the aforementioned basin mentioned in the dimensions of the building, it confirms that it is a basin for raising fish for economic reasons and not an ornamental one. This assumption is supported by the fact that the basin is located near an area designated for the processing and manufacturing fish.

[1] Bailey Donald, *Excavation at Al Ashmunein 4, Hermopolis magna, Buildings of Roman period, British Museum Expedition to Middle Egypt*, (London, 1991), 54

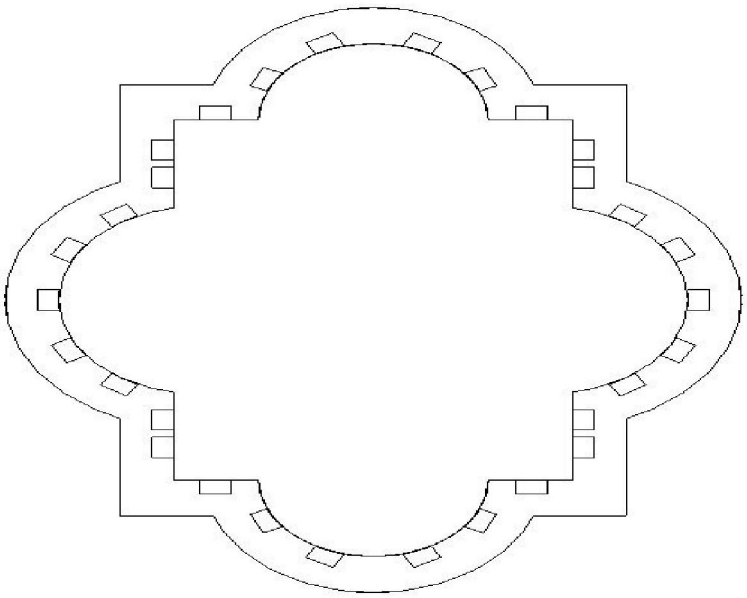
[2] Donald, *Excavation at Al Ashmunein*, 67.

List of Figures

(Fig.1): A view of the Neb Amun cemetery depicting a fish tank. After;
Parkinson, "The painted Tomb-chapel of Nebamun" 152.



(Fig.2) A horizontal projection of the Aquarium. After;
Gunther Roader, "Hermopolis 1929-1939, WVPM 4, (Hildesheim: 1959), Plate. 12 a-b.



(Fig.3a): Vertical Projection Aquarium of Hermopolis Magna
(Prepared by the researcher)

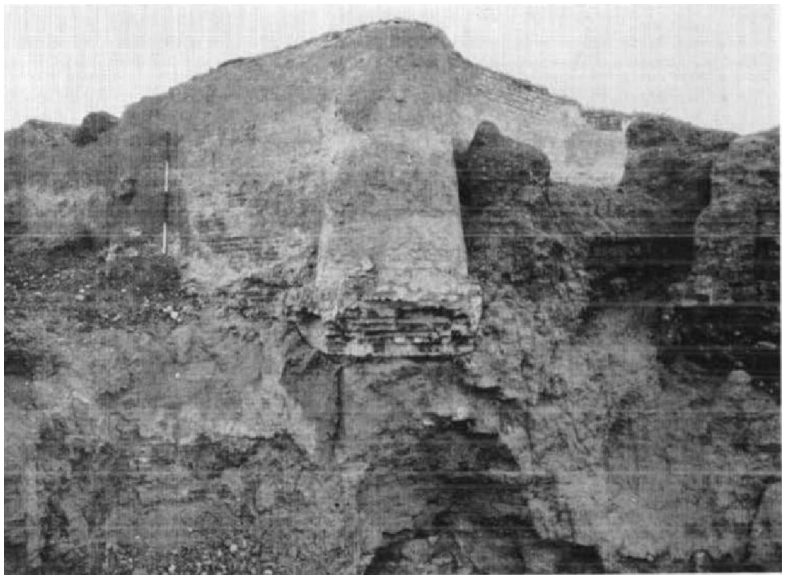
(Fig.3b) A three- dimensional model of the aquarium was built according to the dimensions of the building.
(Prepared by the researcher)

(Fig.4): The Northern wall of the Aquarium.
(Photographed by the researchers)

(Fig.5): A picture showing the internal cavities of the northern wall, as well as the architectural cracks in the building from the site.
(Photographed by the researchers)

(Fig.6): A picture showing the south wall from the outside being in a good condition.
(Photographed by the researchers)

(Fig.7a): The eastern wall from the outside of the building, which is in good condition.
(Photographed by the researchers)



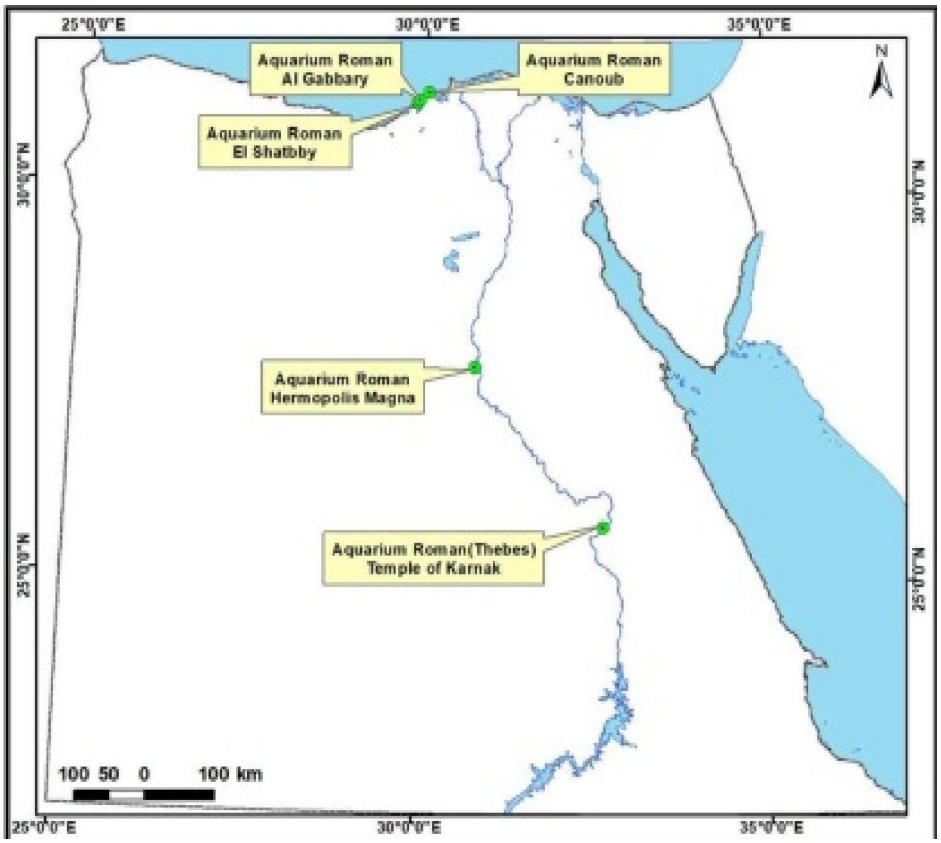
(Fig.7b): The Aquarium from the southeast side. After;
Gunther Roader, "Deutsche Hermopolis -Expedition 1931-1932", MDAIK 3, (1932), plate. 27a.

(fig.8): Details of the eastern wall from the inside.
(Photographed by the researchers)

(Fig.9): A picture showing the details of the western wall from outside.
(Photographed by the researchers)

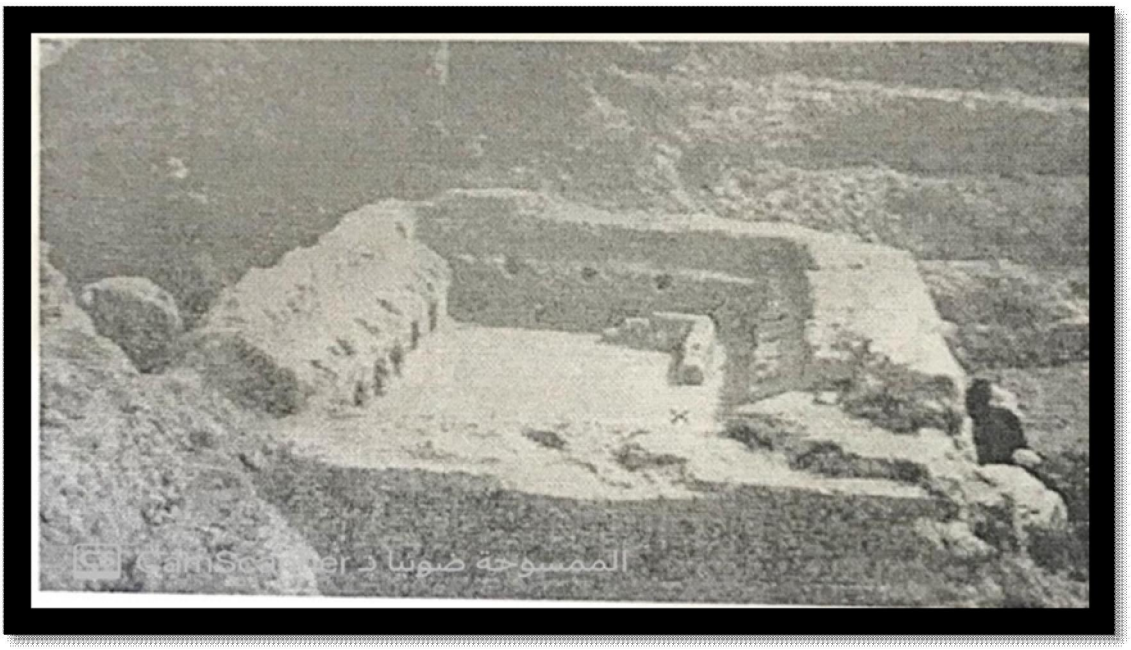
(Fig.10): A picture of a model the cavities in the walls of the building.
(Photographed by the researchers)

(Fig.11): Remains of the northern wall showing the construction method used to construct the basin.
(Photographed by the researchers)

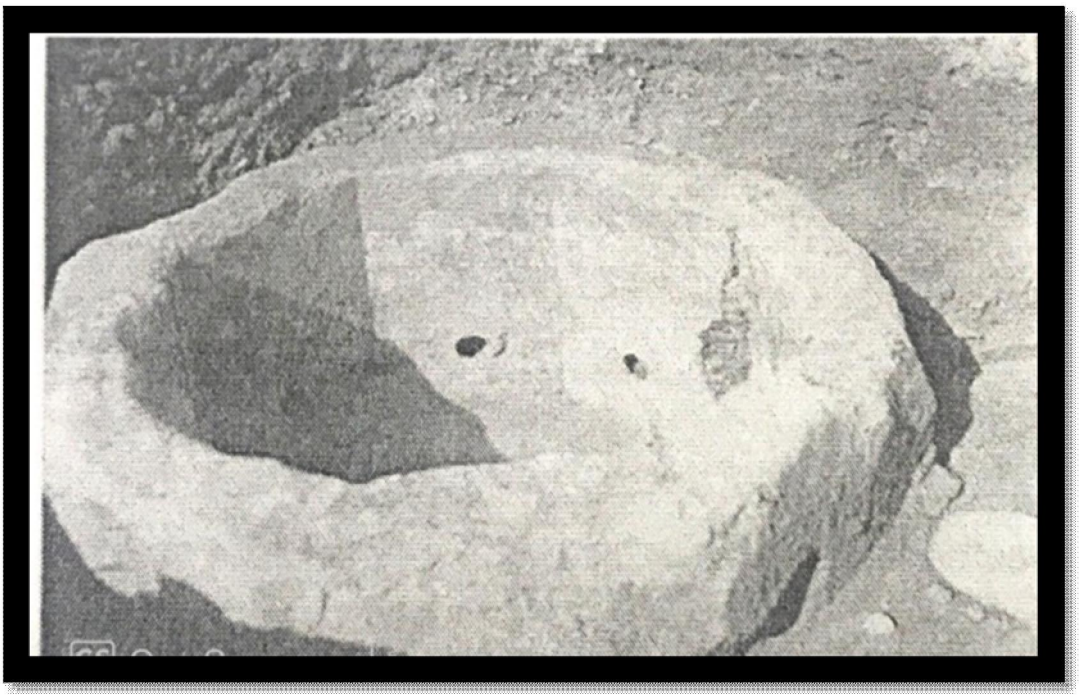


(Fig.12): places of Aquariums found in Egypt.
(Prepared by tony)

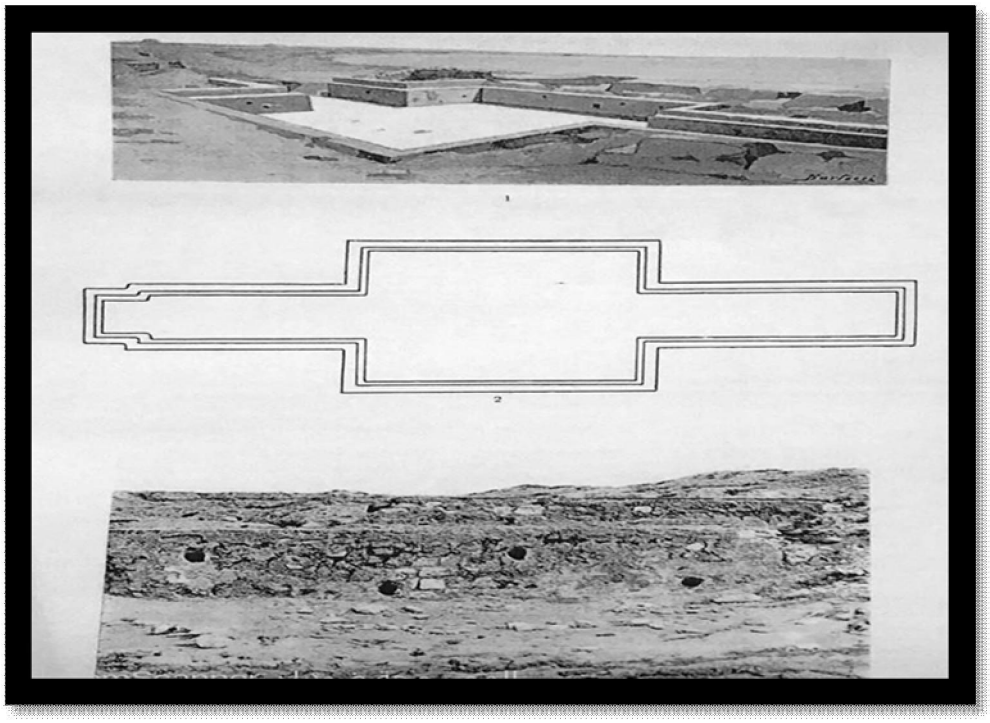
(Fig.13): A picture showing the fishpond in the Karnak temples area in Luxor. After;
مسعود، "تربية الأسماك في ضوء دراسة مبني روماني بالكرنك"، ٤٥٥، صورة ١.



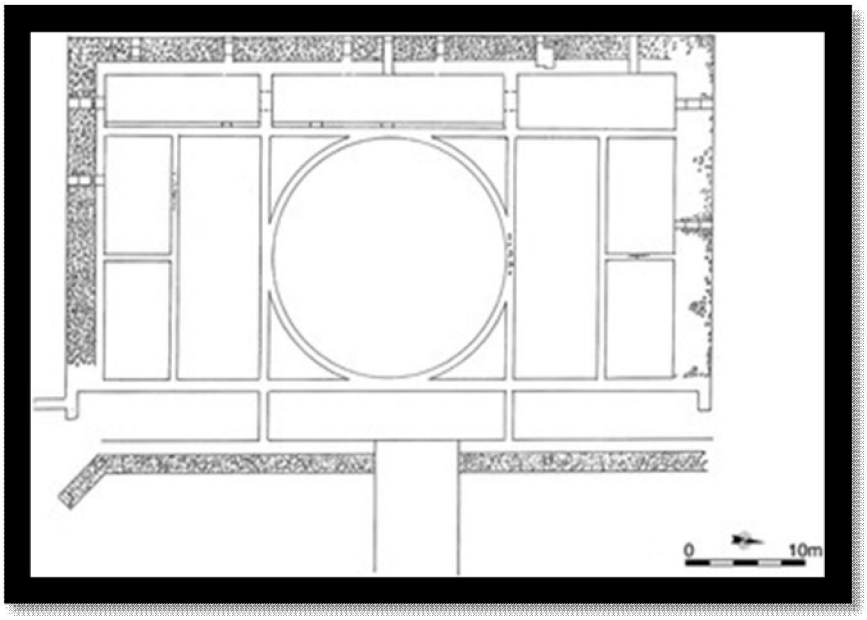
(Fig.14): Aquarium in AL Gabbary area in Alexandria. After;
Labib, "Occasional archaeological discoveries" 110, pl. XXV, fig, 2.



(Fig.15): The Aquarium octagonal shape in Shatby area. After;
- Achille, "Annuaire du muséegréco-romain" 149, pl. LXI, 1, fig, 62.



(Fig.16): Aquarium in the Canopus area. After;
- Evarist, "Le rovineeimonumenti di Canopo", pl. IX, fig, 1-3.



(Fig.17): Aquarium in Punta Della Vibra, Italy. After;
- Marzano& Brizzi, "Costly display or economic" 224, fig.3.

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