

Ceramic Circulation in Lower Egypt During the Middle Bronze Age

A major topic of study in archaeology is the movement of goods and people. To answer some of these broad complex questions, archaeologists utilize a technique called compositional analysis. Compositional analysis can identify where an archaeological sample was produced because it analyzes the raw materials that are in that sample. In addition to identifying the origins of artifacts, compositional analysis can help to establish trade and exchange relationships. This technique can also help establish where people came from when they migrated to new areas. If people migrate to a new area, compositional analysis can help determine where that group originated based on where the materials for their pottery came from. This can be done by analyzing artifacts that were specific to that group to determine where they were produced. Compositional analysis can be useful in determining origins of artifacts however; this technique can only identify regions or areas of where these artifacts were made (Rice 2015, 298). This technique typically analyzes the materials of an artifact's clay, and this results in the identification of regions or areas that have similar materials in the clay. Compositional analysis is used in provenience studies, which can aid in determining the origins of materials and people that had migrated. Compositional analyses are useful when identifying the movement of goods and people, and are well demonstrated in the case of the Hyksos people.

The Movement of Goods and People

The questions that archaeologists ask about the movement of goods and people can be difficult to answer. In order to approach the questions that archaeologists ask, they assume that

there is contact between people when new objects appeared at a site in an earlier period. Some of these questions address the way in which these objects appeared in different places, and some of these questions address whether the objects in new places were the result of trade and exchange or whether the migration of people. In order to establish trade and exchange networks between different sites, archaeologists first have to determine the contact between different sites.

It is important for archaeologists to determine the start of contact between different archaeological sites (Renfrew and Bahn, 349). This can be examined by information, goods and commodities that are transferred between cultures (Renfrew and Bahn, 347). One example of the transfer of goods between cultures that Renfrew and Bahn (2012) used was: if two different sites, A and B, were far away from each other contact between these two cultures could be determined by objects found at A that are made with materials only found at B (Renfrew and Bahn 2012, 348). This implies there was contact between the two sites because of the appearance of new materials at site A. This implies that people from site B made the appearance of the new objects at site A possible. Renfrew and Bahn (2012) discussed the start of contact between two different cultures without the use of compositional analysis. However, the addition of compositional analysis to that approach could make the results much more accurate. Archaeologists can utilize compositional analysis in order to understand the contact between different cultures at two different sites or at one site. Compositional analyses can be used to determine trade networks as well as the origins of ethnic groups as they appear in new areas.

Understanding the movement of goods and people is an important topic in archaeology. It can reveal the way in which different sites were in contact with each other. This can result in understanding the way in which sites grew into large urban centers with increased trade and exchange. The movement of goods and people can also reveal the way in which ideas spread

between sites through new trade connections. One way that archaeologists can gain information on this subject is through the use of compositional analysis because these analyses determine what materials were in the objects that were being traded.

Compositional Analysis

Compositional analysis is a method that is widely used in archaeology to determine what materials are present within an archaeological object. Compositional analysis identifies the raw materials in an artifact, specifically it identifies which elements are present in the artifact. Ceramics are the most common archaeological artifact used in compositional analysis. This is because ceramics are the most abundant archaeological find. The ultimate goal with this particular analysis is to ascertain the region where a sample's raw materials originated (Rice 2015, 298). These analyses can be helpful in provenience research to determine if ceramics were made with local clays or clays from different regions. The origin of the clays allows for archaeologists to establish where people came from if they migrated to new regions. If people migrated to a new region that already had people living there, compositional analysis could be used to distinguish between the two groups. The group that moved to the new region would most likely bring artifacts and ceramics that were specific to them. These artifacts and ceramics could be utilized in a compositional analysis study and determine where that new group of people came from. While compositional analysis is useful in provenience studies to identify where artifacts were produced, these analyses are only able to identify regions or areas. Compositional analysis is only able to identify the regions that an artifact was produced, not a specific location. For example, if an artifact is analyzed the results would be that it was produced in Egypt, it would not be able to identify a specific place or archaeological site in Egypt. There are many different

compositional analyses that can be performed on artifacts for example, neutron activation analysis.

Neutron Activation Analysis

Neutron activation analysis (NAA) is one way to perform compositional analysis. NAA was first discovered in 1936 and in 1954 it was concluded that NAA could be applied in archaeology (Bode 2017, 209; Glascock and Neff 2003, 1517). NAA uses neutrons to make a sample radioactive, which releases energy (Bode 2017, 209). This energy is in the form of gamma radiation and the elements in the sample begin to decay according to their specific half-lives so that they can become stable again (Bode 2017, 209). Based on the different half-lives, elements can be identified and the amount that element is present in (Bode 2017, 209). The results from NAA can be placed into statistical analyses and then groups can be identified. The groups then correspond to different regions and areas. These groups help archaeologists identify the provenience of different artifacts. Compositional analyses are implemented in archaeology because they can identify trade and exchange between cultures as well as identify ethnicity in the archaeological record (Glascock and Neff 2003, 1517). NAA is a useful compositional analysis because it is highly accurate and precise and can detect elements at low concentrations (Bode 2017, 209). While NAA is useful, it is expensive to conduct and it requires the use of a nuclear reactor (Bode 2017, 209; Rice 2015, 298).

In a case study conducted by Attas, Yaffe, and Fossey (1987) NAA was used to identify clay sources from ceramic samples found in Crete. The authors used NAA for compositional analysis to determine trade and exchange between cultures, specifically the Argolis and Corinthia. The ceramics found in Crete corresponded to areas near the Argolis and Corinthia,

which means that the ceramics were not produced at those specific sites (Attas, Yaffe, and Fossey 1987, 89). This led the authors to conclude that ceramics were produced at production centers close to the Argolis and Corinthia. There was only exchange between short distances because the ceramics were from outside of the sites examined.

In a case study by Tomlinson, Rutter, and Hoffmann (2010), NAA was implemented on ceramics from Kommos, Crete during the Late Bronze Age. The point of this study was to determine if the origins of ceramics samples could be identified using stylistic attributes (Tomlinson, Rutter, and Hoffmann 2010, 13). Some studies have relied on identifying the origins of ceramics based on stylistic attributes. The use of compositional analysis in addition to identifying stylistic attributes allows for a more accurate study. Compositional analysis can confirm or refute predictions of where a vessel was made based on its stylistic attributes. If archaeologists only used stylistic attributes to identify trade between places, there could be a major error in the conclusions. This is because sometimes a style of pottery can originate in one area, and then that style could be copied by local people in another area. Tomlinson, Rutter, and Hoffmann's (2010) study found that 15 to 18 of 21 samples were correctly identified as Mycenaean and 42 of 48 samples were correctly identified as Cypriot (Tomlinson, Rutter, and Hoffmann 2010, 219). This study was able to correctly identify the origins of some of the sampled ceramics however, there were some samples that were not identified correctly. If stylistic attributes were only used to determine ceramic origins, some of these identifications could be wrong. This study was able to confirm that Kommos was trading with Cyprus during the Late Bronze Age. The results of the analysis concluded that the ceramics that were identified as Cypriot were in fact coming from Cyprus (Tomlinson, Rutter, and Hoffmann 2010, 219).

The case studies by Attas, Yaffe, and Fossey (1987) and Tomlinson, Rutter, and Hoffmann (2010) addressed questions about the origins of ceramics from their sites in order to establish trade networks. Attas, Yaffe, and Fossey (1987) aimed to identify trade between Argolis and Corinthia. Tomlinson, Rutter, and Hoffmann (2010) wanted to know if using stylistic attributes of ceramics found at Kommos was a viable way to identify where that sample was made. Tomlinson, Rutter, and Hoffmann (2010) also identified that Kommos had exchange networks with Cyprus. Both of these case studies do not address questions about identity or ethnicity. However, it is possible for NAA to answer questions about identity and ethnicity.

The Hyksos Enigma

The Hyksos Enigma Project is an ongoing project that aims to understand the origins of the Hyksos people (The Hyksos Enigma Project). The Hyksos Enigma project utilizes an interdisciplinary approach in order to understand the origins of the Hyksos and the impact their culture had on Egypt (The Hyksos Enigma Project). This Haberberger research focused on the impact the Hyksos had on Egypt by examining the ceramics that were found at Tell el-Dab'a.

The Hyksos established their capital Tell el-Dab'a, also known as Avaris, in the Nile Delta during the Middle Bronze Age which was from 1900/1875 BCE to 1550 BCE (McGovern 2000, 1). The term Hyksos generally refers to the rulers of Egypt during this time in the Middle Bronze Age. The Hyksos capital today was called Tell el-Dab'a, but in the Egyptian histories, the Hyksos capital was referred to as Avaris (Curry 2018, 1-2). There is much speculation about the origin of the Hyksos. The primary excavator of Tell el-Dab'a, Manfred Bietak, suggested that the Hyksos were from Byblos in the northern Levant (Bietak 1996, 14). However, after a compositional analysis study on the ceramics from Tell el-Dab'a, Patrick McGovern suggested

that the Hyksos were from Southern Palestine (McGovern 2000, 75). The rule of the Hyksos in Egypt was unusual because foreigners did not typically rule Egypt. When the Hyksos arrived in Egypt, the Egyptian Middle Kingdom had collapsed, which left Egypt fragmentary and easy to take over (Curry 2018, 1). The Hyksos were then able to continue their rule because of their powerful army.

The way in which the Hyksos established their capital is a matter of debate. Some scholars argued that there were Egyptians already at the site before the Hyksos arrival, and some scholars discussed that there were Asiatics that occupied the site before the Hyksos. Bietak (2016) argued that Egyptians were already living at Tell el-Dab'a because there was a settlement complex that did not contain any Hyksos ethnic markers before their arrival in the Second Intermediate Period (268). Booth (2005) however, stated that there was an early Asiatic settlement at Tell el-Dab'a with Canaanite characteristics before the Hyksos arrival (23). The arguments that both Bietak and Booth made, illustrates the debate among scholars of who was present at Tell el-Dab'a before the Hyksos. There was also major debate over the chronology of Egypt during the Middle Bronze Age. The primary excavator Bietak utilized the lower chronology and McGovern utilized the middle chronology (McGovern 2000, 1). There are also questions regarding the nature of the Hyksos establishment. It is unclear if there was a violent takeover of the area or if it was a peaceful one. Curry (2018) suggests that the most likely scenario was that the Hyksos were immigrants who were trying to escape drought and famine (2). Curry (2018) states that before the Hyksos established their capital, this area served as a major port for the Egyptians (3).

The Foreign Relations of the “Hyksos”

The Foreign Relations of the “Hyksos” by Patrick McGovern was the focus of this Haberberger research. McGovern’s case study aimed to determine the economic developments and social developments at Tell el-Dab’a through the identification of the provenience of selected ceramics (McGovern 2000, 70). McGovern (2000) found that there was an abundance of trade that occurred between Southern Palestine and Tell el-Dab’a (73). He discussed that this trade was mainly one way, from Southern Palestine to Tell el-Dab’a (McGovern 2000, 73). In this case study, samples of four types of ceramics were chosen to be analyzed by NAA. The four ceramic types were Canaanite amphorae, polished vessels, painted vessels, and miscellaneous vessels. This Haberberger research focused on the amphorae because throughout the Middle Bronze Age they had the highest percentage of imports. Canaanite amphorae were a class of utilitarian ware, and were used to store goods such as liquids (McGovern 2000, 73). I examined the data from McGovern’s study to see the changes in the amphorae throughout the time the site was occupied.

Throughout the case study, McGovern utilized the middle chronology for his dates (McGovern 2000, 1). McGovern also had to utilize a specific sampling strategy in order to conduct this study. McGovern chose the Canaanite amphorae, painted vessels, polished vessels, and the miscellaneous vessels, because they “sufficiently representative of the whole corpus, period by period” (McGovern 2000, 4). McGovern also had the primary excavator Bietak choose the samples (McGovern 2000, 4). This was done in order to address questions about the early development of the site once the study had been completed (McGovern 2000, 4). NAA requires the use of known standards, a sample with a known origin must be utilized when analyzing a sample with an unknown origin. McGovern was able to address this issue with the help of other archaeologists who provided pottery samples and clay. The changes that occur with the

importation of Canaanite amphorae will give an indication of trade networks and the movement of people.

The Foreign Relations of the “Hyksos” case study illustrated the way in which compositional analysis can aid in identifying the movement of goods and people. The circulation of goods was seen in the Canaanite amphorae at Tell el-Dab’a. These amphorae were new to Egypt and had not been imported before the Hyksos rule. These Canaanite amphorae were mostly from Southern Palestine. This established that there was contact between Egypt and Southern Palestine during this time period. The Canaanite amphorae also demonstrated the movement of people. The Hyksos were foreigners in Egypt and brought this new type of vessel with them when they migrated. The Canaanite amphorae were mostly found in residential contexts. The ceramics also flowed from Southern Palestine to Egypt which suggests that the people moved from Southern Palestine to Egypt. Throughout the Hyksos occupation at Tell el-Dab’a, the Canaanite amphorae had different importation patterns.

Temporal Patterns

Canaanite amphorae were the most abundant ceramic type found at Tell el-Dab’a. These amphorae were utilitarian wares that stored goods such as liquids (McGovern 2000, 74). For example, some of the amphorae tested positive for wine storage (McGovern 2000, 74). Throughout the Middle Bronze Age there was a high importation rate of Canaanite Amphorae from Southern Palestine (Figure 1) (McGovern 2000, 71). The Canaanite amphorae started to be imported to Tell el-Dab’a in the Middle Bronze Age IIA period at about 70% (Figure 1) (McGovern 2000, 71). During the Middle Bronze Age IIB-C period, where McGovern places the Hyksos arrival, imported Canaanite amphorae hit its peak and were about 100% of imports that

originated from Southern Palestine (Figure 1). When compared to the other vessels that originated from Southern Palestine, the Canaanite amphorae were the most dominant import to the site (Figure 1). The importation of Canaanite amphorae from other areas that were not of Southern Palestinian clay was less than one per cent, which suggests a preference for amphorae from Southern Palestine (Figure 2) (McGovern 2000, 35). This pattern was consistent throughout the Hyksos rule at Tell el-Dab'a. In addition, during the Middle Bronze Age IIB-C period Canaanite style amphorae produced using local Nile clay saw a significant increase from 2% in the MB IIA and MB IIB periods to 22% in the MB IIB-C period and then further increased to 25% in the MB IIC period (Figure 3) (McGovern 2000, 71). While the people were producing Canaanite style amphorae from local clay, there was still a high importation rate of these vessels from Southern Palestine (McGovern 2000, 35). The Canaanite amphorae were most dominant in domestic contexts, which suggest that people were using them most likely for storage.

Spatial Patterns

The spatial patterns were analyzed through the use of GIS. GIS stands for geographic information systems and is a computer based system that can share spatial or non-spatial information (Schweik, Bradley, and Smith 2013, 1). This program was used in this project in order to determine the distribution of Canaanite amphorae and Tell Yahudiyeh jars throughout the Ancient Near East. This was completed with the use of the data that was collected in the NAA study in *The Foreign Relations of the "Hyksos."* The dataset was available for download through the Archaeometry Laboratory at MURR and was sorted with the use of pivot tables in Excel. In Excel, the data was sorted by the number of Canaanite amphorae that were found at each site and were produced using Southern Palestinian clay. The data was sorted again by the

number of Yahudiyeh jars that occurred at each site. These jars were made with local Nile clay. They were sorted by the amount that occurred at each site in Egypt and the Levant. The results of this spatial analysis are based on the samples that were selected for NAA analysis. This GIS project focused on the Canaanite amphorae and the Yahudiyeh jars in order to have a spatial view of the distribution of two different styles of vessels in the Ancient Near East.

Canaanite amphorae that were made with clay from Southern Palestine were found in abundance at Tell el-Dab'a and Thebes (Figure 4). At Tell el-Dab'a there were 299 vessels and at Thebes there were 47 vessels found at the sites. It can be seen spatially that the amphorae from Southern Palestine were mostly being found at two Egyptian sites. These amphorae were imported from Southern Palestine to Tell el-Dab'a and Thebes through trade. The trade was most likely from Southern Palestine to Tell el-Dab'a then to Thebes. This could be seen through the high abundance of amphorae at Tell el-Dab'a and the second highest abundance at Thebes. However, the trade network is different with the Yahudiyeh jars.

The Tell Yahudiyeh jars that were made with local Nile clay were found in abundance at Tell el-Dab'a and Mtoune (Figure 5). At Tell el-Dab'a there were 34 vessels made with Nile clay and at Mtoune there were 7 vessels made with Nile clay. Tell el-Dab'a was located in Egypt and Mtoune was located in the Levant. These jars were typically made at Tell Yahudiyeh in Egypt however, there were more of these jars found in Tell el-Dab'a (34 vessels) than in Tell Yahudiyeh (1 vessel). The jars were most likely traded from Tell el-Dab'a and then to Mtoune, which was located in the Levant. The trade was from Egypt to the Levant. The temporal patterns and the spatial patterns could lead to many different meanings.

Interpretations

The results from the temporal patterns and the spatial patterns can have many different interpretations. There could be many different factors as to the reason the Canaanite amphorae were being imported from Southern Palestine. The Egyptians could have come into contact with these people and enjoyed their goods. The Egyptians could have imported many Canaanite amphorae from Southern Palestine at a high rate because they wanted the products inside them. This would have occurred before the Hyksos arrived at Tell el-Dab'a. The goods could have been well liked after some time and spread down to Thebes. This could be the reason that there were Canaanite amphorae found in Thebes during the Middle Bronze Age. Another explanation for the high importation of the amphorae could be because Tell el-Dab'a was a hot spot for trade. There could have been people bringing the amphorae to Tell el-Dab'a re-export them to other places. There also could have been merchants importing the Canaanite amphorae to the site to then distribute them to other places. During the Middle Bronze Age IIB-C period the Canaanite amphorae were being produced with local Nile clay. This could be because the Egyptians admired the style of the Canaanite amphorae and started to make them themselves. The production of Canaanite amphorae at Tell el-Dab'a with Nile clay could also be the Hyksos people producing storage vessels in a way that they were used to, they were just using their new resources in order to do so. These explanations illustrate the way in which compositional analysis can aid in identifying trade networks as well as the movement of goods and people.

Conclusion

The case of the Hyksos demonstrates the use of compositional analysis in archaeology. The high importation rate of Canaanite amphorae from Southern Palestine started in the MB IIA period. This was most likely the result of trade because the Egyptians enjoyed the products that

were in the vessels. The Canaanite style amphorae were produced with local Nile clay at a low percentages during the MB IIA, MB IIA-B, and MB IIB periods at about 2%. This could reflect Egyptian imitation of the style, or a small Canaanite population already present prior to the establishment of Hyksos rule. In the MB IIB-C period, the importation of the amphorae from Southern Palestine was about 100%, compared to other vessels being imported at this time. During the MB C period, the importation of the Canaanite amphorae was around 90% compared to other vessels that were imported from Southern Palestine. The high importation of Canaanite amphorae in the MB IIC was most likely the result of the Hyksos preference for products made from their homeland. At the same time in the MB IIB-C period, the Canaanite amphorae were being produced using local Nile clay and consisted of 22% of the ceramics made with that clay type. In the MB IIC period Canaanite style amphorae increased production to 25%, which could reflect Canaanite immigrants continuing to make their own traditional pottery style with the local clay that was available to them. This could be because the people there needed more storage vessels and started producing them themselves. This is likely because most of the Canaanite amphorae were found in residential contexts. The changes that occur throughout time with the Canaanite amphorae demonstrated the movement of goods because the amphorae were used for transport and storage, especially for liquids. This movement was from Southern Palestine to Egypt. The case of the Hyksos also demonstrated the movement of people. The high importation rate of the Canaanite amphorae was mostly from Southern Palestine. The people were most likely importing goods from their homeland because they had a preference for those goods. The Egyptians had been importing Canaanite amphorae before the Hyksos rule and began to make some local imitations of that style of vessel. When the Hyksos established their capital and arrived in significant numbers, they began to make Canaanite amphorae locally at a significantly

higher rate. The increase of Canaanite style amphorae production was a clear indication of the migration of people to a new area.

Figures

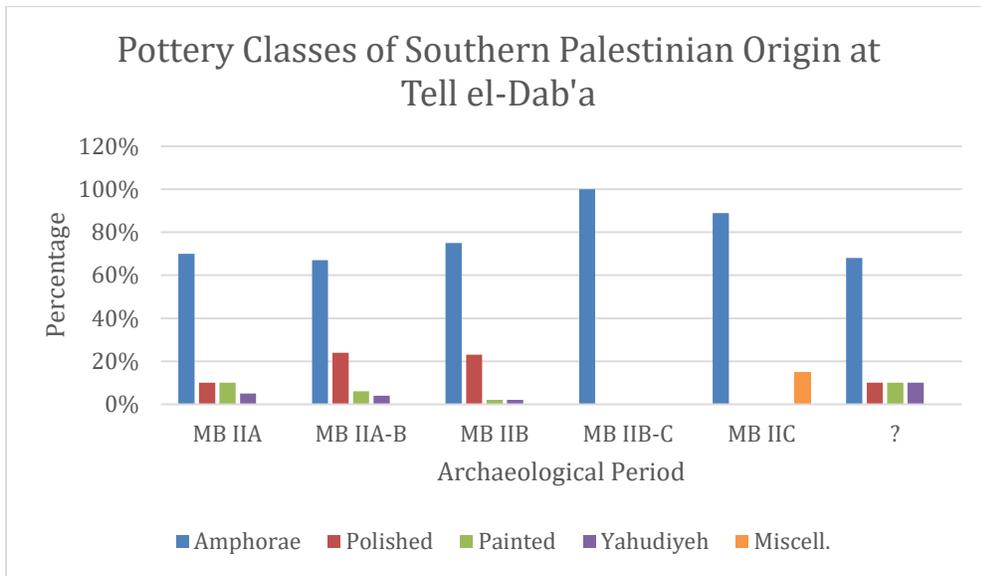


Figure 1: bar chart that depicts the relative percentage of the four ceramic types made from Southern Palestinian clay (McGovern 2000, 71).

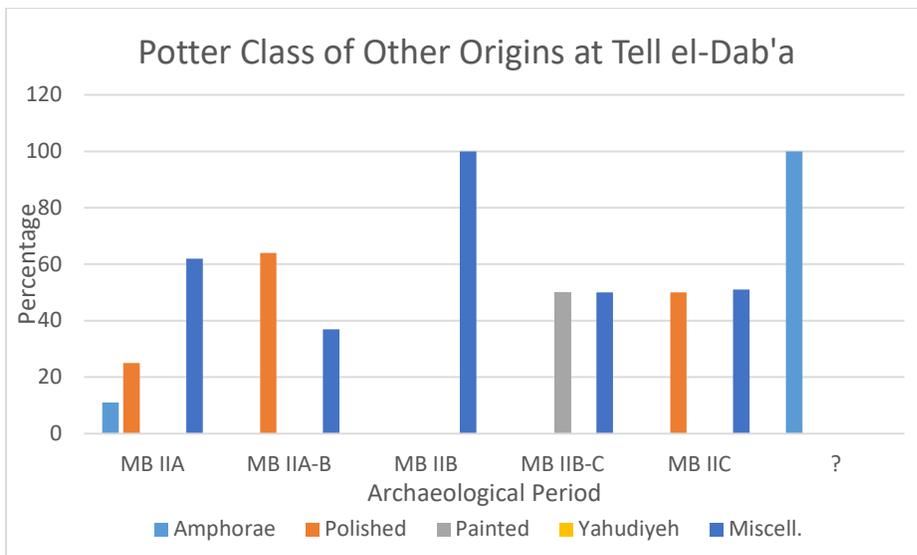


Figure 2: bar chart that depicts the relative percentage of the four ceramic types made from other origins clay (McGovern 2000, 72).

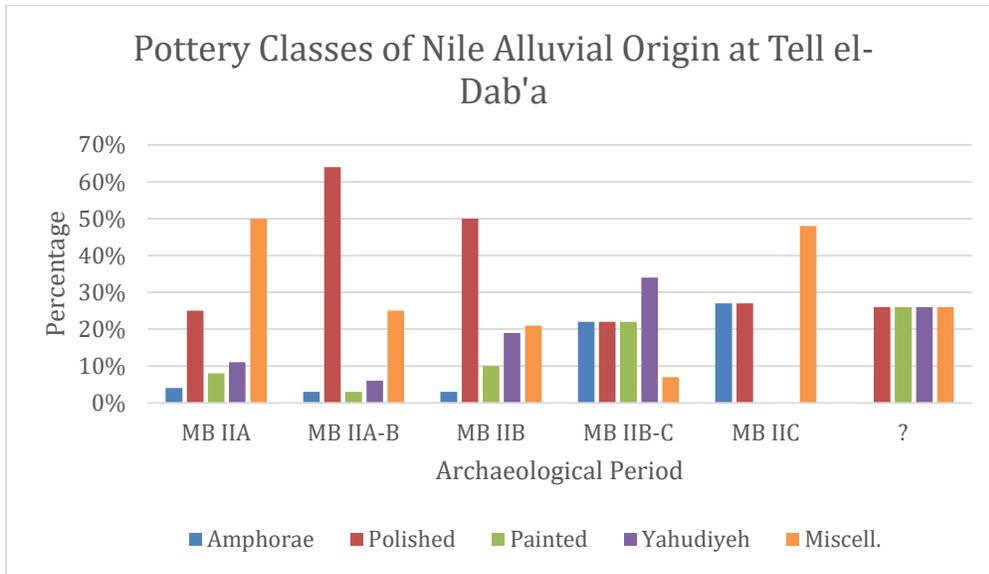


Figure 3: bar chart that depicts the relative percentage of the four ceramic types made from local Nile clay (McGovern 2000, 71).

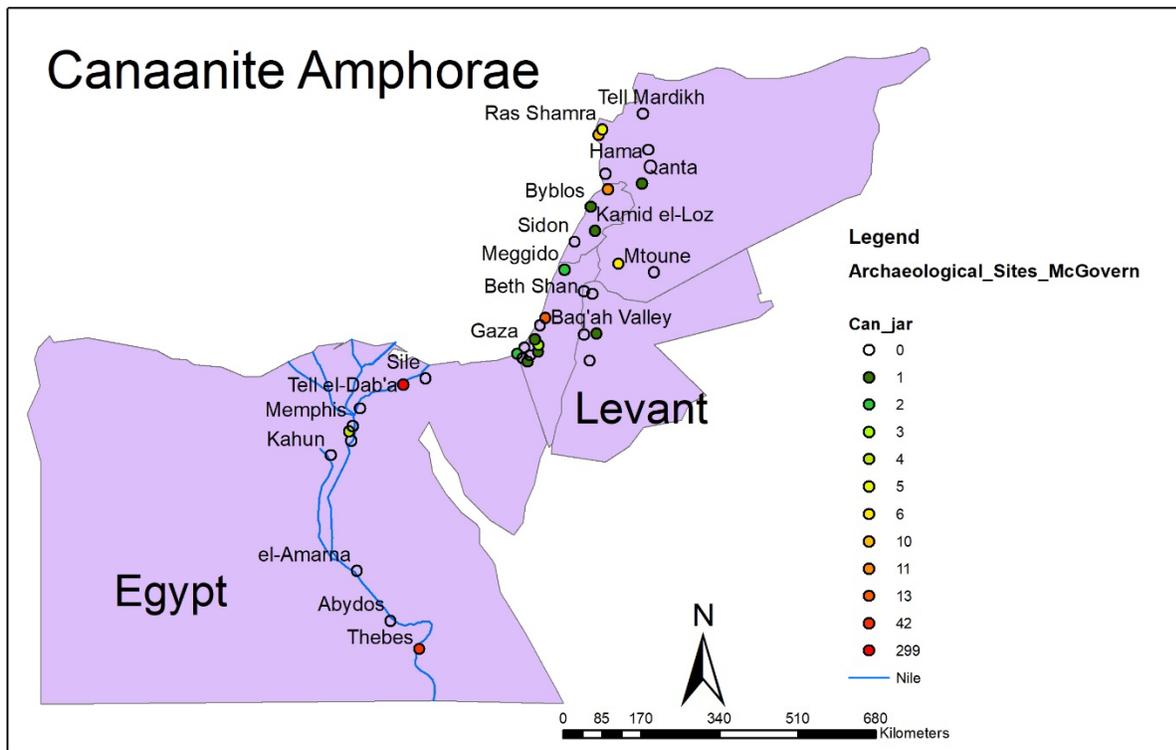


Figure 4: GIS map of the number of Canaanite amphorae found at each site that. These amphorae were made with clay from Southern Palestine.

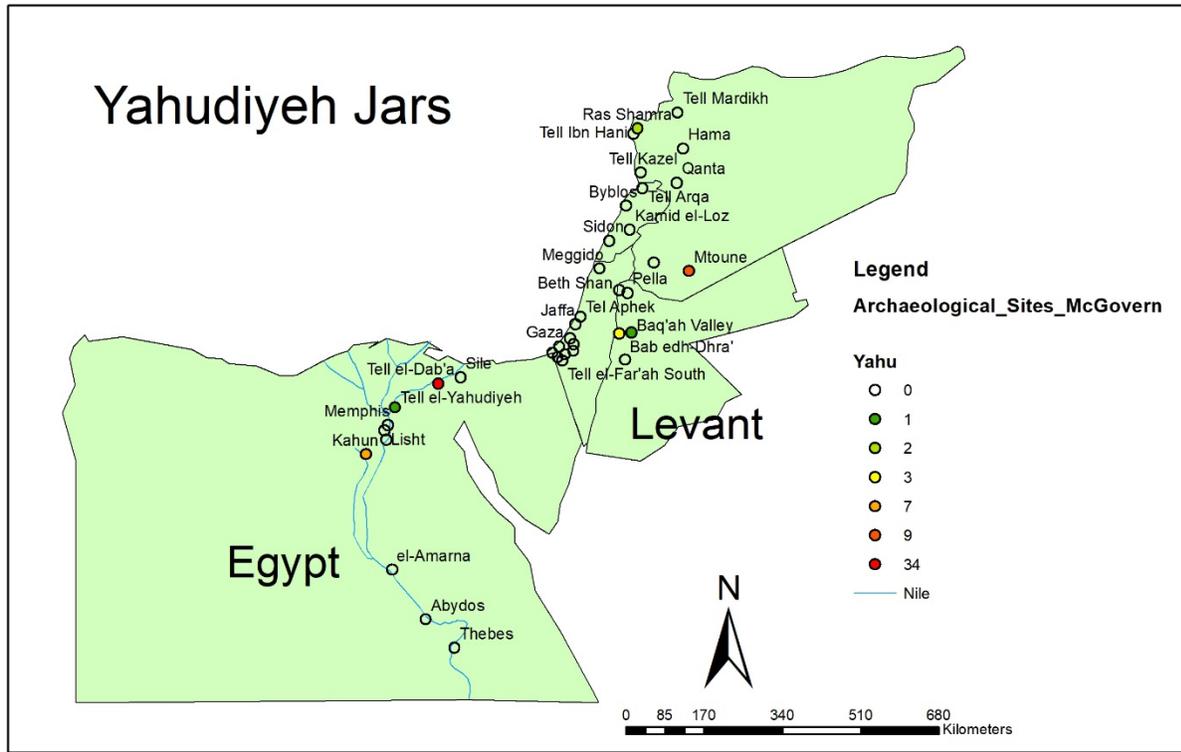


Figure 5: GIS map of the number of Yahudiyeh jars found at each site that. These jars were made with clay from Egypt.

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