NEW BYZANTINE COINS TREASURE ON SYRIAN COAST: STATISTICAL STUDY

Nuevas monedas bizantinas tesoro en la costa de Siria: Estudio estadístico

Bashar MUSTAFA**
Francisco J. ESQUIVEL***
José A. ESQUIVEL****

ABSTRACT: In this article we present for review and discussion 57 gold coins discovered in the vicinity of the ancient site of Amrīt (Syria). Initial examination reveals that these coins are probably from the time of Phocas, King of Amrīt. The lack of coins minted in this period, 602-610 AD, that have been found to date on the Syrian coast makes this discovery very significant and will shed light into this area and its remarkable history. Our primary focus will be to analyse this 57 finds from a statistical point of view rather than
relate the find to historical events contemporaneous with the manufacture of the coins.

The coins seem to have been manufactured in an exceptionally meticulous manner by highly skilled artisans evidenced by a minimum variability in weight among the set (C.V. = 1.44%). It is highly likely that two workshops produced the coins; one produced the major part of the cache, another produced the remainder of the set of coins, those of smaller dimensions and weight. The coins produced by the workshop that produced the greater proportion have a C.V. = 0.6%, while this variable for the set of smaller coins, produced by the second workshop is triple this value. Further, an analysis of variance (ANOVA) of the latter group shows statistically significant differences. The data indicate a high degree of homogeneity among the set of coins manufactured by the primary workshop, leading to the conclusion that these artisans were highly skilled and the manufacturing process robust, as the weight of gold in each is very nearly equal. However, with respect to diameter, standardization disappears as time passes; at the latter part of the period of production the coins were thinned while maintaining their weight and quantity of gold.

**KEYWORDS:** Byzantine, Gold coins, Levant, Amrīt, Statistical analysis.

**INTRODUCTION**

Without doubt, the history of Amrīt shows that this area epitomized the complexity of the ancient culture of the Levant and remains the most observable aspect of the regional archaeological landscape. For our analysis, it is beneficial to look into the political fate of the nearby island city-state of Arwad (Phoenician Qrn, 'rwd, (refuge), Greek Arados) to gain insight into the area’s history; let us review the geographical characteristics of this area. The region extending from the northern Nahr el-Kebir in the north to the Eleutheros River (the southern Nahr el-Kebir) in the south was probably Aradian territory (Al Maqdissi, 1993; Al Maqdissi and Benech, 2009). The site of Amrīt (ancient K-r-t M-r-t, Greek Marathus) is situated on the Syrian coast six kilometres south of the modern city of Tartus. Archaeological evidence and historical documentation indicate extensive maritime activity at the Amrīt site from as early as the Bronze Age (Besançon et
Amrīt itself has been identified as a typical site of the Phoenician culture in the present day Syrian coast (Yon and Caubet 1993: 60; Besançon et al., 1994; Bader, 1997). The site is believed to be an outskirt of the city of Arados on the neighbouring island, today known as Arwad and is primarily known today for its temple, necropolis, isolated tombs, and many more aspects of its material culture (Rey-Coquais, 1974; 1989; Aubet, 2008). The Roman period of this region started precisely in 64 BC (Bouchier, 1915; Butcher, 2003; De Jong, 2007), at the same time the epicentre of the area moved to Marathus. The Byzantine Empire, which convention states began in the sixth century during the reign of Anastasius (491-518), comprised two important traditions—the imperial Roman and the Christian (Grierson, 1999: 1). This difficult coexistence spanned more than three centuries.

CIRCUMSTANCES OF DISCOVERY

The coins were found on the 7th of August, 2011, in al-Muntar, a small town that belongs to Tartus city, about 18 kilometres to the south of Tartus. The ruins of the well-known city of Amrīt lie only 12 kilometres to the north of the site of this discovery. A vessel of pottery containing the coins was discovered accidentally as work was being completed by a tractor operator preparing land for building. The location was the so-called land of Bermael. Fortunately, the machine operator stopped immediately when he noticed the pottery. The news of the discovery was announced to the scientific community by the Directorate of Antiquities in Tartus, which subsequently assembled a team of specialists responsible for the excavation, preservation, and contextualization of the find. They documented the vessel and coins, along with the archaeological context of the discovery and removed the treasure to a safe location.

Unfortunately, we have no accurate record regarding the exact vessel position; we only know that it was uncovered accidentally in an urban area. The treasure comprises 57 gold coins, which were found well protected inside a clay pot. All coins seem to be Byzantine. Their being made of gold indicates they belong to the first period of Byzantine coinage, extending from Anastasius I (491-518) until the mid-eighth century (Kennedy, 1999; Garland, 1999). For our purposes, we may consider the Byzantine Empire as a continuation of the Roman
Empire, at least with respect to the region of the Levant, and is well-known for the coexistence of the Christian religious culture with that of the Greek (Warren, 1997). With that said, our present knowledge of the history of the area during the Byzantine period is limited. Thus the exact nature of the civilization of the Levant during the Byzantine era remains to be determined, a difficult task at this time due to the current situation in Syria. Thus, unfortunately a complete study of the culture during this period has not yet been made. In this article we will not concern ourselves so much with historical events possibly related to the treasure, but will present a statistical study in order to find correlations among the coins themselves and glean from them whatever information possible.
MATERIALS AND METHODS

The discovery, as we have mentioned above, consists of numerous bright gold coins. All resemble each other, but we can detect slight differences among the individual coins in weight and diameter. The weight of each coin in the find is between 4 and 4.90 grams, while the size of each is between 2 and 2.2 cm in diameter. The coins themselves do not present any special features beyond the expected minor variants of coins of the early Byzantine period.

Two characteristic portraitures are well representing in the sample. The first portrait represents the Byzantine Solidus. On the obverse is a cuirassed front-facing bust with the head of an individual, with shaggy locks and untidy beard wearing a plumed helmet and crown, and holding a globous crucifer in the right hand, draped, wearing a tunic covering his left shoulder.

The second Solidus coin on the obverse shows a cuirassed bust facing forward. The figure is crowned and the crown contains a forehead jewel. The figure is holding a globous crucifer in the right hand, and in the left, a shield with a horseman represented. On the reverse is a
potent cross mounted atop four steps, with CONOB written in the exergue.

Fig. 3. Solidus coin on the obverse shows a cuirassed bust facing forward.

The images in the hoard could correspond to the emperor Phocas and another one of the Byzantine Empire during the period of Tiberius II Constantine. With regard to the statistical analysis, we only have two basic data: weight and diameter. Two of the coins have been omitted from the analysis because they have a much lower weight than the rest. Therefore, the analyses will be made on only 55 coins.

The analysis performed on weight shows that there are two clearly defined groups with respect to this variable. The first one consists of coins of weight between $W>4.25$ grams and $W<4.35$ grams, the second between $W>4.40$ and $W<4.54$ grams which may indicate there were possibly two mints, one of which had less output than the other. (Fig. 4):
Fig. 4. Distribution of coins in two groups.

The average of all coins in the study of the data \( \text{Weight} = 4.44, \sigma = 0.064 \), showing that the complete distribution has a coefficient of variation of 1.44%, almost negligible. This provides a great homogeneity in the data indicating a high degree of skill among the craftsmen resulting in a high level of standardization with respect to the weight of gold contained within each coin. However, the workshop containing the largest number of coins shows a C.V. = 0.6%, while the one responsible for fewer coins (according to our hypothesis stated above) has parameters that triple these values (Sokal, 1982; Venables and Ripley, 2002).
The application of the Levene test to the variable Weight indicates that the groups have equality of variances and that the application of an ANOVA (Analysis of Variance) test provides that between both groups there are statistically significant differences with a level of significance $\alpha < 0.05$. This fact may be an indication that both workshops operated with similar precision, but they are not homogeneous in manufacturing since comparing the coins of both shows they have different average weights for the two groups. (Data are not available allowing us to confirm that one of the workshops was a parent workshop, with the work of the other being derived from the first.)

Regarding the variable of diameter, two coins have to be disregarded from the analysis due to the fact that their diameter lies outside the lower limit set for our analysis. The data are adjusted to a normal distribution of parameters ($Diameter = 2.01$, $\sigma = 0.007$), and a C.V. = 0.35%, practically null, showing the enormous homogeneity that exists in this variable (Fig. 5):

![Distribution of diameters](image)

Fig. 5. Distribution of diameters, showing that they fit a normal distribution.
The application of the normality test (t test for a sample) indicates that the confidence interval for the 95% confidence difference is

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\text{Diameter} \in (2.008, 2.012), \text{ with a level of significance } t=1999.925, \text{ gl}=54 \text{ and } <0.05.
\]

In addition, the data show a level of homogeneity with respect to the weight, indicating the near perfection achieved by the mints in the production of these coins (Fig. 6). The relationship between weight and diameter presents a very peculiar bivariate graph.

![Fig. 6. Relationship between Weight and Diameter.](image_url)

There is no bilinear correlation to use, but we may highlight a relationship in values grouped in parallel bands with the characteristic of being grouped in bands of 0.010 cm amplitude (1 mm) in diameter (Sokal, 1982; Venables and Ripley, 2002).
This fact provides proof that the error was very small, so much so that perhaps the coins were manufactured in series using a die, easily manufactured, duplicated, and transported, maintaining the values of precision and reliability.

CONCLUSIONS

Discoveries on the Syrian coast continue to amaze scholars. Prior to this find, excavations in this area have produced no significant numismatic specimens dating to the Byzantine period.

For our study the weight of each coin was standardized with respect to a fixed reference of measure to achieve maximum homogeneity. Coin weights almost certainly were based on some divisor of the Phoenician siklo, which use was widespread in the Mediterranean (Bellinger, 1999). As already noted, two coins were eliminated from the data set due to their abnormally low quantity of gold. We attribute this to an unknown circumstance, but the possibility of a simple manufacturing error should not be ruled out. Among the remainder of the coins, the diameter is highly standardized, indicating that in this facet, the craftsmen exhibited great skill in the manufacturing process. In fact, the Byzantine metrological system became the standard of commerce during the period of use of these coins, displacing the Roman system.

The relationship between weight and diameter of these coins is possibly an important indication of the existence of a metrological system that, at least in the Byzantine coins and especially the Solidus, was established as a standard unit and used as the common currency system for commerce. Constantine I reformed the monetary system, a system protected by emperors until that time and previously based on the denarius for everyday transactions. After the abandonment of the denarius the solid became the foundation of the economy, the unit by which small-volume payments were measured, and the denarius lost the power of exchange causing a crisis in a large part of the population of artisans and small rural business owners.

The Eastern Empire adopted the solid, maintaining both weight and alloy content, and protected it from metal degradation and devaluation. (After the various devaluations of the Roman gold coin it be-
came standardized at a weight of 4.54 g, equivalent to 1/72 of a solid.)
In the reign of Basil II (976-1025) the appearance of the solid began to
change, becoming thinner but expanding in diameter.

This new version, called the *Nomism stamenon*, appeared slightly
later than the introduction of a submultiple (corresponding more or
less to one fifth of the unit), called *tetarteron nómisma* and coined
from the reign of Nicéforo II Phocas (963-969). The submultiples of
the solid, *oñginado, semis and tremis* have their last emission in the
pieces minted in the name of Basilio I (867-886). In the eleventh cen-
tury the monetary system underwent several devaluations until Alejo I
Comneno I (1081-1118) ascended to the throne. By this time the coins
could hardly be considered to have any gold content. These discs of
metal became thin and, during minting, acquired a concave shape.
Coins called *esquifadas* or *esquudillas* have a diameter greater than
that of the solids and are very thin.

The monetary upheavals were less severe because the empire, now
with its capital in Nicea, continued coining the same nominal coinage,
although progressively devalued. This progressive and unstoppable
debasement of the metal of the Byzantine coins during the last dynasty
of sovereigns (the Palaeologians) bears witness to a political and eco-
nomic decline that was impossible at that point to reverse. The latest
reform, undertaken by John V Palaeologus (1341-1391), abolished
gold emissions without further ado and the monetary system contin-
ued based solely on silver coins of large diameter that nevertheless
retained the name *hyperperon*, the name of the previous gold coin.

The existence of a basic relation between weight and diameter that
indicates the minimum interval of measurement (1 mm) points to the
existence of a metric standard for both variables, already established
in the area and commonly used. This pattern would provide an essen-
tial element in all Mediterranean trade, serving as a reference for a
basic system of measures. As this metric system became the basis of
trade, the Byzantine experience would become a progressively im-
portant factor in commercial systems of measurement. Further study
of this should be made, as it is also possible that this pattern merely
indicates limitations of measuring instruments in terms of accuracy.
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