Archaeological Research in the Digital Age

Proceedings of the 1st Conference on Computer Applications and Quantitative Methods in Archaeology Greek Chapter (CAA-GR)

Rethymno, Crete, 6-8 March 2014

Edited by

Constantinos Papadopoulos, Eleftheria Paliou, Angeliki Chrysanthi, Eleni Kotoula and Apostolos Sarris
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QUANTITATIVE DATA, HYPOTHESIS TESTING, AND ARCHAEOLOGICAL NARRATIVES: WAS THERE EVER A GREEK DARK AGE?

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Introduction

In Greek Archaeology, scholars have long debated the appropriateness of the term Dark Age, once used to describe the era between the last gasp of Bronze Age civilization and the "rise of the polis" during the Geometric and Archaic periods (now known more commonly as the Early Iron Age). Our general impression, based on the archaeological evidence, is that life during this period was nastier, shorter, and more brutish than it was in the preceding and following eras. However, a series of unexpectedly spectacular discoveries at the site of Lefkandi in the 1980s led some scholars to believe that the Greek Dark Age was not actually very dark, but that we had simply misread the evidence. In this paper, I present a new quantitative assessment of this evidence, based on a comprehensive database containing all known sites from the Late Bronze Age (periods both before and after the so-called palatial collapse), and from the subsequent Protogeometric and Geometric periods. Robust quantitative analysis of this data suggests that it is not likely to be biased or systematically flawed in a way which has made the Dark Age look "darker" than it really was. The methods demonstrated in this paper make apparent the value of gathering and taking seriously cumulative “big data” when we think about and construct archaeological knowledge.

1. Theoretical Background

Archaeologists have long had a problem with data. Our problem is not that we need more data. Our field has built up vast quantities of information over the past hundred years. Rather, the problem of archaeology is that the data we have is haunted by the ghostly spectre of the data that we know we are missing. Because we know that our data is full of gaps, but cannot identify with any precision the exact nature of those gaps, we have a very hard time figuring out what, in the big picture of history, our data really means. The archaeological record, as we know it, is itself an artefact of what we, the archaeologists, have managed to recover and record, rather than a faithful representation of some ancient source population.

If we were to hold in our minds an ideal representation of all the artefacts that once remained of a given ancient society, then eliminated all the evidence that does not survive the ravages of time, the evidence that
we fail to recognize because we do not have the tools to do so, and the evidence that archaeologists simply ignore or do not manage to dig up, we would get a subset of a subset of a subset of an unknowable unknown of an original body of evidence. One of the major problems of archaeological interpretation and theory has always been related to how and whether we can get a sense of what we are missing from the archaeological record, and how to integrate these supposed archaeological ghosts into the stories we tell about the past (Collins 1975, 27; Lucas 2012, 63-66).

In what follows, I propose that we can find a way to understand the absences as well as the presences in archaeological data if we leverage the methods associated with analysing ‘big data’ to find patterns in our datasets that are invisible when they are studied in small units.

2. Case Study

The Greek Early Iron Age provides an ideal lens through which to explain what I mean when I propose that we must try harder to understand the shape of our archaeological data. It has long been clear that we as a scholarly community know of fewer archaeological sites that date to the Protogeometric period than sites that date to the Late Bronze Age or to the Geometric period. Early scholars who studied the Early Iron Age, primarily A. Snodgrass, V. Desborough, and N. Coldstream, thus proclaimed this period a Dark Age (Coldstream 1977, Desborough 1972, Snodgrass 1971). Later scholars, however, have pointed out that there is a variety of possible explanations for the lack of remains, which might suggest that the Dark Age was not so poor, but that the material record is poor for other reasons - maybe scholars have ignored it, or it is difficult to recognize, or it exists in parts of the physical environment that have not been investigated much (Foxhall 1995, 239). According to at least one prominent Early Greek archaeologist “the concept of a dark age is more of a modern scholarly construct than one based on solid archaeological evidence… in the end, the only thing ‘dark’ about Early Iron Age Greece is our knowledge of it.” (Papadopoulos 1996, 253).

Papadopoulos (1996) and Foxhall (1995) have made important distinctions between patterns in the ancient past and patterns in the archaeological dataset. And because the archaeological dataset is the only thing we have, besides entrenched scholarly narratives, upon which to build our understanding of this entire period, ‘the possibility that the data are being systematically misinterpreted in some way, or that there is some other embedded error in our approach, deserves serious consideration.’ (Dickinson 2006, 94). However, I argue that it is not really enough to raise these kinds of questions about the nature of our archaeological data set, or to idly speculate on whether we have a distorted picture of the data due to some bias in archaeological practice, since this does not really move us forward very far. In order to really understand whether or not the Dark Age really is an illusion, we must seek to test hypotheses about possible causes of distortion against the archaeological data itself.

3. Method

Using data, theories about the causes of diachronic variability in the archaeological record can be tested. For instance, if Dark Age sites in Greece were being systematically ignored by archaeologists until the 1970s, but treated fairly afterwards, we would expect the annual rate of Dark Age site discovery to increase after 1970 in a way that diverges from the rate of discovery of other archaeological sites in Greece. If Dark Age settlements were missing from the archaeological record because people during this period built houses in archaeologically invisible ways, we would expect the proportion of settlement sites to burial sites from this era to be unusually low compared to the proportion of these kinds of sites from other eras in Greek history. And if Dark Age pottery were simply impossible to recognize in survey assemblages, we would expect patterns in survey discovery rates to be uniformly low across all survey zones. Arguments about the epistemological basis of an archaeological Dark Age can thus be logically tested and falsified in convincing ways, provided the existence of a comprehensive dataset containing all of the relevant archaeological sites discovered in Greece along with a number of key attributes, such as date, method, and extent of discovery and exploration.

4. Data

Using a variety of previously published resources, I generated a geodatabase including all archaeological sites discovered in Greece since 1870. I generated the database purely based on previously published excavation and survey reports, or pre-existing studies of regions or time periods that aggregated such data, with a focus on primary excavation reports. Although most Anglophone archaeologists collecting similar but smaller-scale datasets in recent years have continued to rely on outdated sources, a much more thorough and current compendium of known archaeological sites in Greece can be found in Syriopoulos 1995. This work consists of several thousand pages of rich archaeological data, organized by period and region. Syriopoulos lists every known site from Prehistoric Greece (the Neolithic through Geometric periods) up to date through 1990, along with all of the publications of material from each site, from excavation fascicles to preliminary reports in the Archaiologikon Deltion. My data for sites discovered before 1990 is largely culled from this resource, but it has been updated to include all available information from preliminary site reports.
and full publication regarding sites excavated between 1990 and 2000 as well. Other extraordinarily useful sources for up-to-date regionally specific site discovery and description include Ksifaras 2004, Giannopoulos 2008, and Farinetti 2011. In consultation, then, with a wide variety of sources, I assembled a database which I estimate includes 3,733 individual sites, or approximately 90% of all known sites in Greece with material that dates to the Bronze to Iron Age transition (Late Bronze IIIB (LBIIIB, c. 1350-1200 BCE), LBIIIC (c. 1200-1050 BCE), Protogeometric (PG, c. 1050-900 BCE), and Geometric (G, c. 900-700 BCE) periods). Some sites did not have reliable information involving their dates or circumstances of discovery or had not been adequately published, and so I omitted them when calculating the figures below. The database stores the date of discovery, the period or periods that have also been discovered at the site, the method of discovery (survey, excavation, chance finds, etc.), the type of site (settlement, artefacts, isolated tomb, cemetery), and a variety of other attributes (Table 1).

### Table 1 Select fields within Late Bronze Age to Early Iron Age Site Database, created for assessing the validity of the notion of a Dark Age in Greece.

<table>
<thead>
<tr>
<th>Category</th>
<th>IIIB</th>
<th>IIIC</th>
<th>PG</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>3382</td>
<td>1534</td>
<td>847</td>
<td>2970</td>
</tr>
<tr>
<td>Site Name</td>
<td>Miraka Rema</td>
<td>Kaminakion</td>
<td>Romanos</td>
<td>Antissa</td>
</tr>
<tr>
<td>Chronology</td>
<td>IIIB;IIIC</td>
<td>IIIA;IIIB;III C</td>
<td>PG</td>
<td>PG;G</td>
</tr>
<tr>
<td>Type</td>
<td>Artefacts</td>
<td>Artefacts</td>
<td>Settl.</td>
<td>Cem.</td>
</tr>
<tr>
<td>Method</td>
<td>Survey</td>
<td>Survey</td>
<td>Exc.</td>
<td>Exc.</td>
</tr>
<tr>
<td>Discovery</td>
<td>1966</td>
<td>1982</td>
<td>1960</td>
<td>1930</td>
</tr>
<tr>
<td>Prim. Pub. Language</td>
<td>Greek</td>
<td>English</td>
<td>Greek</td>
<td>English</td>
</tr>
<tr>
<td>Source</td>
<td>Delton 1966 Chr 171</td>
<td>Lasithi Survey p.61</td>
<td>AD 1960 Chr 200</td>
<td>BSA 1930-1 166-178</td>
</tr>
</tbody>
</table>

5. Testing Hypotheses

In what follows, I use this ‘big dataset’ from Early Greece to test three different hypotheses that have previously been put forward in order to “explain away” the poverty of material that we have from the Early Iron Age. In doing so, I demonstrate the general principal that by applying logical, hypothetico-deductive strands of reasoning to large quantities of archaeological information we can move forward significantly in our understanding of the patterns that we see in the ancient past, and the ultimate meaning of the undulations that exist in accepted narratives of Early Greece.

5.a Scholarly Bias

I begin by testing the notion that archaeologists have distorted the material record by ignoring PG material before interest in it increased during the last few decades. One possible source of distortion in the data could be a historical bias in the investment of archaeological resources in investigating Bronze Age and historical rather than PG sites, since the former have long been of greater interest to more archaeologists than the latter. If the rate of discovery of Early Iron Age sites changed significantly after the surge of interest that was sparked by the spectacular Lefkandi discoveries in 1980, this might suggest that there is a lot of PG material out there that may have been missed in the early parts of the century when people were not looking for it. However, if the rate of discovery of PG sites aligns closely with the rate of discovery of sites from other PH periods through time, then that should mean that the archaeological record has probably not been distorted by archaeologists’ investigative priorities.

### Table 2 Accumulation of known sites from IIIB-G through time, raw data.

<table>
<thead>
<tr>
<th>Sites known</th>
<th>IIIB</th>
<th>IIIC</th>
<th>PG</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900</td>
<td>58</td>
<td>29</td>
<td>16</td>
<td>35</td>
</tr>
<tr>
<td>1910</td>
<td>111</td>
<td>47</td>
<td>38</td>
<td>78</td>
</tr>
<tr>
<td>1920</td>
<td>158</td>
<td>64</td>
<td>56</td>
<td>107</td>
</tr>
<tr>
<td>1930</td>
<td>225</td>
<td>87</td>
<td>82</td>
<td>140</td>
</tr>
<tr>
<td>1940</td>
<td>312</td>
<td>116</td>
<td>134</td>
<td>201</td>
</tr>
<tr>
<td>1950</td>
<td>327</td>
<td>123</td>
<td>140</td>
<td>211</td>
</tr>
<tr>
<td>1960</td>
<td>486</td>
<td>191</td>
<td>218</td>
<td>328</td>
</tr>
<tr>
<td>1970</td>
<td>700</td>
<td>304</td>
<td>325</td>
<td>496</td>
</tr>
<tr>
<td>1980</td>
<td>845</td>
<td>381</td>
<td>381</td>
<td>643</td>
</tr>
<tr>
<td>1990</td>
<td>1011</td>
<td>473</td>
<td>477</td>
<td>757</td>
</tr>
<tr>
<td>2000</td>
<td>1229</td>
<td>569</td>
<td>575</td>
<td>897</td>
</tr>
<tr>
<td>2010</td>
<td>1331</td>
<td>604</td>
<td>619</td>
<td>941</td>
</tr>
</tbody>
</table>

The raw numbers show that we have discovered more sites with pre and post Dark Age material than sites with Dark Age material to date (Table 2). However, we would need to interpret this distribution differently if the rate of recovery of Dark Age material appeared to be increasing over time. If the rate of Dark Age recovery spiked in the last few decades, that would suggest that the overall number of Dark Age sites could reasonably be expected to eventually catch up to Bronze Age sites, and that the Dark Age’s current disadvantage could be due to historical biases in archaeological practice.
However, plotting the discovery of sites from all four periods over the course of the 20th century shows good correlation for the curves of all periods of site discovery through time. In order to make the difference in rates of site discovery more easily readable and visually obvious, I have normalized the data. To do this I divided the number of sites of each period discovered in each decade by the total number of sites eventually known, thus eliminating distortion in the visualized data based on quantitative differences in the overall totals of the data categories. The graph of normalized data thus shows the decade-by-decade pace of IIIB, IIIC, PG, and G site discovery through time - that is to say, the pace for each period to today's known total number of sites (1). Once again, there is excellent correlation for all four curves through time, with only slight diachronic variation (Fig. 1). Thus, the data suggest that, from a synoptic view, the difference between the amount of known Mycenaean and Geometric and known Dark Age material culture is not the result of biases in archaeological practice in the early history of exploration in Greece.

**5.b Flimsy Settlements**

Second, I test whether we do not have many Early Iron Age sites because the scrappy remains of PG settlements do not tend to survive to be discovered. Regardless of whether archaeologists have always paid close attention to Dark Age material, there could be some other reason that they do not find it, even when they are looking for it. One suggestion that has been made is that we do not have many Dark Age sites because the scrappy remains of the Dark Age do not survive well within settlement sites. If this were the case, we would expect tombs to dominate the archaeological record for Dark Age Greece. That is to say, if settlements from the Dark Age do not survive well, or if most Dark Age people were transhumant pastoralists who left little in the way of settlement remains behind, we would end up knowing most about the period from cemeteries, suggesting that we are missing huge chunks of settlement material.

In order to assess whether or not this is true, I have broken down the database of sites according to my categories of ‘Period’ (IIIB, IIIC, PG, or G) and Type (Cemetery, Settlement, Settlement/Cemetery together, Artefacts). According to this distribution, the proportion of sites where archaeologists have found stratified architectural remains is slightly higher for IIIB and IIIC sites than it is for Early Iron Age sites. Likewise, the percentage of cemeteries known from the Dark Age is, as a total percentage of the data, high relative to the percentages from the IIIB, IIIC, and G periods (Fig. 2). While these differences do confirm the notion, long-recognized, that archaeologists find more PG cemeteries than they do PG settlements, the differences are not huge.

Based on the data, it does not seem very likely that the difference of a few percentage points in datasets of this relatively small size are large enough to account for the overall nearly 3:1 ratio of Bronze Age settlement sites to PG settlement sites observed in the total dataset. In general, the remarkable similarity of site-type distribution between all four of these periods strongly suggests that we have a comparable, if not totally equivalent, knowledge base for each.

If these settlements exist, why do we still have the pervasive sense that the Early Iron Age record is so impoverished in settlement evidence? One possible explanation for the dissonance is suggested in the data - an unusually high percentage of Dark Age settlement deposits (62% for PG vs. 49% for IIIB) consist of modest structures, found by the Ephorate and published in Greek. It may, then, simply be the case that the Anglo-American archaeological community, may not be aware of their existence since they do not ever filter into our normal spheres of knowledge.

**5.c Poor Visibility in Surveys**

Finally, one other possible explanation that has been put forward for the fact that we do not know of many sites dating to the Early Iron Age is that it is the result of the way that archaeologists go about their work,
focusing on concentrated settlements rather than searching for small-scale dwellings scattered throughout an agricultural landscape. If this were true, we might expect Early Iron Age sites to score well in archaeological surveys, in which archaeologists look for cultural material that is spread around in the landscape.

This does not appear to be the case. The ratio of IIIB:PG sites found by surveys is more than 3:1, higher than the overall ratio of IIIB-PG sites of about 2:1. In addition, the percentage of all known PG sites known from surface finds in the countryside is not inordinately high (Fig. 3). At first glance, then, it does not appear that we are missing a great deal of Early Iron Age material that is spread around in the countryside.

But, once again, we need to think again about the meaning of this information carefully before drawing definitive conclusions. It has long been recognized that there are differences in the durability and distinctiveness of pottery from different periods, and that artefacts from some periods may not score well in surveys because they are difficult to recognize or because they are too easily destructible to survive in surface deposits. If Dark Age material were difficult to recognize in survey, however, we would expect to find little to no Dark Age material in any surveys anywhere. But, while PG surface remains are not inordinately abundant, they are also not particularly sparse. Of all known PG sites, 31% come from the identification of artefacts in surveys. However, the ratio of IIIB:PG sites found by surveys is more than 3:1, higher than the overall ratio of IIIB:PG sites of about 2:1. In addition, the percentage of all known PG sites known from surface finds in the countryside is not inordinately high.

In addition, the appearance of Dark Age artefacts appears to vary significantly by region. Dark Age survey material has appeared in some regions, notably in the site registers from the Vrokastro, Almiros plain, and Methana surveys, among others, suggesting that Early Iron Age material is recognizable in surveys where it does, in fact, exist. The kind of variation that we see in the number and proportions of Dark Age material identified in survey data strongly suggests that the methods archaeologists have developed in order to identify surface remains are sensitive enough to pick up variation in assemblages of Dark Age material, and are thus not missing huge amounts of that material in systematic ways.

Conclusion

What all of this data shows most clearly is that there is no better explanation in the data for the scarcity of Dark Age material than that it is simply scarce. There does not seem to be a systematic bias in the archaeological record making this period look darker than it is. It is a satisfying conclusion, which allows us to go from a situation in which we think we have less material, but can’t distinguish between the causes of material impoverishment (e.g. whether it is felicitous and based upon non-ancient causes or whether it actually reflects past poverty). But, more broadly, this case study makes clear a method by which the fragmentary historically contingent nature of the archaeological record can be remedied, at least somewhat and at least in some cases, by a “big data” approach to the entire archaeological record. By systematically examining the possible causes for variation in the nature of archaeological datasets through time, we can at least begin to reconstruct patterns of rise and fall in the past with better accuracy and confidence, and be in a better position to reach robust conclusions about the broad strokes of the story of the human past.

References


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