Haggai Olshanetsky – Lev Cosijns*

Challenging the Significance of the LALIA and the Justinianic Plague: A Reanalysis of the Archaeological Record

https://doi.org/10.1515/klio-2023-0031

Summary: The Late Antique Little Ice Age (LALIA), and the Justinianic Plague, were recently suggested as the possible culprits for settlement contraction and population decline that supposedly occurred in the 6th c. CE. According to some who support this claim, these changes contributed to the weakening of this empire, which eventually led to the loss of vast territories and its defeat by the Persians and Arabs in the first half of the 7th c. CE. The assumptions that climate and plague had devastating impacts in the 6th c. CE are largely based on selected textual evidence, and archaeological evidence outside of the boundaries of the Eastern Roman Empire. As the current article will show, it seems that these assumptions are inherently incorrect as vast amounts of evidence, including archaeological survey data, settlement patterns, shipwreck analyses, pottery distribution in the Mediterranean and other material, indicate that there was no decline in the 6th c. CE. On the contrary, it is possible that there was a peak in population size in the second half of the 6th c. CE, suggesting that the LALIA and the Justinianic plague were limited in their impact.

Keywords: Late Roman, Shipwrecks, Justinianic Plague, Late Antique Little Ice Age (LALIA), Early Islamic, Transitions, Archaeological Survey

Why do empires fall? This is one of the questions that fascinate many, both in academia and among the general public. In the search for an answer, emotions are high, and imagination can run wild. Human intervention, mostly in the form of war, is commonly attributed to the decline of empires. Up until 40 years ago, historical research was oriented to this line of thinking. However, in recent decades, new suggestions have emerged that attributed the rise and fall of empires to climate

Article note: Both authors equally contributed to this article.

***Kontakt: Haggai Olshanetsky**, University of Warsaw, E-Mail: h.olshanetsky@uw.edu.pl
Lev Cosijns, University of Oxford, E-Mail: lev.cosijns@arch.ox.ac.uk

and disease.[1] Many of the suggestions focused on the decline of the Roman Empire, with Kyle Harper's work being the most infamous of them all.[2] Some believe that the Roman-Persian war of 602–628 CE, including the 14 years of conquest of Judaea/Palaestina (modern-day Israel and the West Bank) and Egypt, and the Islamic conquest after the Battle of Yarmuk of 636 CE, should not be viewed as the sole causes for the decline of the Eastern Roman Empire.[3] The same researchers tried to claim that the Empire was already weakened in the 6th c. CE due to climatic and epidemiological disasters that contributed to the occurrence and consequences of the said wars. These calamities were the Late Antique Little Ice Age (LALIA)[4] and the Justinianic plague,[5] whose initial occurrence transpired in 541 to 544 CE,[6] and which allegedly had multiple occurrences in the 200 years that followed and supposedly caused a decline in the size of the population.

Researchers, such as Harper and Sarris, point to climate and disease while mainly basing their hypotheses on selected textual evidence.[7] There are other publications in support of this theory, such as those that were published by the NEGEVBYZ project.[8] The publications of this project supposedly reveal a decline in

1 Frankopan 2023.

2 His most well-known research: Harper 2017; especially see pages 244–245, 292–293.

3 Regarding the debate on the use of Byzantine instead of Late Roman or Eastern Roman Empire, see: Elton 2018; Heather 2018. In the research conducted on the Eastern and Western Roman Empires, there is a stark difference in the terminology used, especially in archaeological publications. Levantine scholarship (especially in the fields of archaeology and papyrology) tends to use the term Byzantine to define the period between 284 CE (used in Egypt) or 325 CE (used in Israel, Lebanon and Syria) until 636 CE. Similarly, Late Roman is defined as the 2nd and the 3rd centuries CE. On the other hand, in western scholarship the period from 325 to 636 CE is called the Late Roman period. We agree with Elton (2018) and Heather (2018) regarding the lack of any significant change in the beginning of the 4th century CE in the east, which would deem the change in terminology from Roman to Byzantine as acceptable and logical. Only from 636 CE is there enough significant change in the Eastern Roman Empire to warrant a new entity, the Byzantine Empire. Therefore, the following definitions have been implemented in the current paper. The term Late Western Roman Empire is used to describe the west from 325 CE to the fall of the west in 476 CE. The term Late Eastern Roman Empire is used to describe the east from 325 CE until 636 CE. The terms Late Roman and Byzantine are only used in connection with archaeological finds and dating that use these terms. In these cases, we usually mark the relevant dates in brackets at the beginning of the relevant discussion.

4 Büntgen 2016; see also the following notes.

5 Sarris 2002; Little 2007; Meier 2016; Bar-Oz 2019, 8239–8246; Meier 2020; Sarris 2020; for further publications, see the following notes.

6 For a discussion on the use of occurrences rather than waves for the Justinianic plague, see: Eisenberg – Mordechai 2020.

7 Harper 2016, 2017; Sarris 2022.

8 Cosijns – Olshanetsky 2022, 6.

the 6th c. CE using micro-scale archaeological data from the north-western Negev desert. Dating a decline to this period is usually linked to the Justinianic plague and/or LALIA as the main instigator, or as an indirect cause.[9] It is important to emphasise that former research claiming that there was high mortality, and significant environmental and social impacts, due to the Justinianic plague and the LALIA, neglected to use the majority of the available archaeological data.

Consequently, the current article wishes to answer these researchers by showing that there was no decline in the 6th c. CE, and that no late 6th c. CE crisis and decline occurred. In addition, it will be suggested that the Eastern Roman Empire was at the peak of its power and population at the end of the 6th c. CE. This claim will be supported by evidence from micro and macro-scale data from throughout the Mediterranean, showing that no general decline in population occurred in the mid-6th c. CE. The north-western Negev desert and the cities of Jerusalem and Scythopolis in Judaea/Palaestina,[10] will be used as examples of data in the micro-scale. This will be followed by an analysis of data on the macro-scale, such as information from whole regions and countries consisting of thousands to tens of thousands of sites spread over large geographical areas. Information from archaeological surveys conducted in Israel, Cyprus, Turkey and North Africa will be discussed, alongside an examination of shipwreck data indicating the peaks and declines of naval commerce in the Mediterranean.[11] By visualising the data on a micro and a macro-scale, it can be seen that the LALIA and the Justinianic plague did not have long-lasting consequences in the Eastern Mediterranean. Moreover, the data collated on the micro and macro-scale definitively depict the settlement decline as occurring from the 7th c. CE and onwards. The micro and macro-scale data will be used to complement each other and show how these changes, or lack of changes, were not limited to any specific area.

Introduction to the Debate Surrounding the Decline of the Eastern Mediterranean

As was previously mentioned, two elements were suggested as the perpetrators for the supposed decline in the population and the number of settlements during the 6th c. CE in the Eastern Roman Empire. The first of the two is an environmental phe-

9 Fuks 2017, 210–218; Bar-Oz 2019, 8239, 8246–8247; Fuks 2020, 19780, 19787–19788; Langgut 2020, 174–175; Fuks 2021, 159–160; Yan 2021, 1731–1732; Avni 2023.

10 Avni 2010; Taxel 2013.

11 Leidwanger 2020, 110–122.

nomenon usually defined as the LALIA. Scholars describe the LALIA as a period of cooling in the northern hemisphere which caused a decrease in the annual average temperature.[12] This cooling period is linked to a series of volcanic eruptions over a period of ten years starting in 536 CE.[13] Some argue that the volcanic eruptions lowered the average summer temperatures across the northern hemisphere by 1.6 °C, yet this decrease varied significantly from region to region. While the higher latitudes of the northern hemisphere experienced a decrease of more than 2 °C,[14] the lower latitudes, encompassing all the territories of the Roman Empire, experienced a decrease in temperatures as little as 0.25 °C to 1 °C. In the southernmost areas of the Roman Empire, including Egypt and Judaea/Palaestina, average temperatures decreased only around 0.25 °C.[15]

On the other hand, Antti Arjava showed in his seminal work that there is no textual evidence to indicate that the dust cloud of 536 CE, which supposedly covered the sun and kickstarted the LALIA, had any effect outside of Europe. On the contrary, the ancient sources explicitly mention that this dust cloud's effect was limited almost exclusively to Europe.[16] According to Arjava, it is probable that the effects of the volcanic eruptions of 536 CE were limited to the north of latitude 35.[17] This would mean that most of the territories of the Eastern Roman Empire, including Judaea/Palaestina and Egypt, were not affected. Instead, Arjava highlighted that the only territory in the Eastern Roman Empire where there is textual evidence for the effects of this dust cloud is Asia Minor (modern-day Turkey).[18] Moreover, all the literary, papyrological and epigraphic sources do not state that there were any long-lasting effects. Similarly, the few ancient authors that explicitly discuss the phenomenon, mentioned that its effects did not last more than one or two years, with no source describing long-lasting effects on the agricultural yields.[19]

Despite this small variation in temperature in many regions, and the lack of written sources, some scholars claim that the cooling severely impacted the Mediterranean weather system, and subsequently caused the eastern part of the Roman Empire to collapse.[20] Moreover, there are some who claim that the impact of this climate change was significant and lasted over a hundred years, from 536 to

12 For a review of the literature on the subject until 2017, see: Helama 2017.
13 Sigl 2015, 547; Büntgen 2016, 231, 233; Toohey 2016; Peregrine 2020, 1, 5.
14 Sigl 2015, 547–548.
15 Peregrine 2020, 2–3.
16 Arjava 2005, 80–81.
17 Arjava 2005, 82–83.
18 Arjava 2005, 83, 93.
19 Arjava 2005, 83–94.
20 McCormick 2012.

660 CE.[21] However, palaeoclimatologists continue to debate the extent and impact of the LALIA, and some suggest that it only lasted from 536 to 560 CE.[22] Contrary to those who claim that the LALIA had negative effects on the environment and empire, other researchers argue that such a small drop in temperature in the Negev desert does not necessarily produce negative effects, but on the contrary may have a slight positive effect, rendering such areas as marginally more fertile and expanding the extent of arable land.[23] Another study revealed that there is no visible link between climate change and social stability, including the frequency of societal changes in different areas of the world.[24] Paula Kouki has similarly demonstrated that in some regions, there is no connection between the climate proxies of a given region, and the region's changes in settlement size and number. According to her, this situation casts doubt on the reliability of the available climate proxies, as well as on the designation of some periods as having an optimum climate.[25]

With regards to the Eastern Roman Empire, the LALIA is usually not the only accused party that supposedly caused the decline, the other being the Justinianic plague. This plague first hit the Roman Empire, and especially the city of Constantinople, in the years 541 to 544 CE.[26] It allegedly spread to the far corners of the Empire, in supposed occurrences that swept the area over the following two hundred years.[27] However, numerous recent publications suggest that the impact of the Justinianic plague was not as cataclysmic as some scholars have suggested.[28] According to these scholars, there is no hard evidence that this plague decimated the Empire, or that the numerous occurrences attributed to the Justinianic plague in the following 200 years were cataclysmic, or even that all can be attributed to the same plague.[29]

It is important to note that there is some debate regarding the origins of the Justinianic plague, and when exactly to date its first occurrence. According to the phy-

21 Büntgen 2016; Fuks 2017, 210.

22 Peregrine 2020, 1.

23 Bruins 2012, 33–35, 39–40.

24 Peregrine 2020, 5.

25 Kouki 2013, 206–211; Rosen 2017, 16.

26 Prok. BP. II, xxii–xxiii; for modern literature on the Justinianic plague, see for example: Sarris 2002, 174–175; McCormick 2015, 345; 2016, 1005; Eisenberg – Mordechai 2019, 25546, 25548; Mordechai – Eisenberg 2019; Mordechai 2019.

27 Sarris 2002, 2020; for the catalogues detailing the plague attestations that were claimed to show instances of reoccurrence of the Justinianic plague, see: Stathakopoulos 2004, 177–386; Harper 2017, 304–315.

28 For the scholars who have suggested that the effects of the Justinianic plague were severe, see: Harper 2017; Sarris 2020; McCormick 2021.

29 Eisenberg – Mordechai 2019; Mordechai – Eisenberg 2019; Mordechai 2019.

logenetic data, the earliest strain of this pandemic was found in Edix Hill, located near Cambridge in the UK, and the sampled individual was radiocarbon dated to 474–637 CE at 95.4 % probability. However, the archaeological dating of this burial was pre-550 CE.[30] As this is the earliest *Y. pestis* (bubonic plague, attributed to the Justinianic plague) strain of the period, Sarris stated that this burial can and should be dated from the late 5th to the early 6th c. CE.[31] This in turn suggests that the Justinianic plague did not start during Justinian's reign but earlier, and that it may have reached the territories of the empire from a completely different direction, despite previous assumptions and what is stated in contemporary sources.[32]

Furthermore, the closest ancestor to the *Y. pestis* strain accredited to the Justinianic plague originates from the Tian Shan mountains in Central Asia, and is dated to the 2nd c. CE. This has brought some to suggest Central Asia as a possible location for the divergence event that birthed the Justinianic plague variety. Therefore, this, alongside a possible earlier dating for the occurrence of the plague in Europe, brings weight to the theory that the migration of the Huns to Europe brought the ancestors of the Justinianic plague to Europe.[33] Thus, the plague victim from Edix Hill advances the supposed onset of the plague which supposedly ravaged the Mediterranean, while also raising questions on its infection rate as people may have lived alongside it for many centuries. Furthermore, no one has claimed there was a decline in the population in the 5th c. CE, or the very beginning of the 6th c. CE, due to disease, especially in the eastern Mediterranean basin. This lack of an epidemiological outbreak in the textual records for this period is glaring, especially if the disease was already prevalent in the region.

Consequently, a team of archaeologists headed by Guy Bar-Oz surveyed and excavated the settlements of the north-western Negev desert in Judaea/Palaestina as part of the NEGEVBYZ project to try and determine the causes for the decline of the north-western Negev settlements: the Justinianic plague, the LALIA, or the Persian invasion and the Islamic conquest. The project placed great emphasis on the correlation between date and cause: if a decline occurred in the mid-6th c. CE, it is indicative of the Justinianic plague and the LALIA, but if dated to the 7th c. CE, it should be connected to the wars.[34] Thus, the NEGEVBYZ project ventured to survey,

30 Keller 2019, SI Table S13.

31 Sarris 2022, 342–343.

32 Benovitz 2014, 488; Keller 2019, SI 18–23; Mordechai 2019, 25547.

33 De Barros Damgaard 2018, 372–373; Keller 2019, 12368.

34 A search focusing on specific years, such as several years in the mid-6th c. CE, in order to find a connection between a decline and the Justinianic plague and the LALIA, or a few specific years in the 7th c. CE, in order to connect the decline to the Islamic conquest, can create a bias. This type of bias was defined by Sessa as sucking-in, meaning that specific dates and the search for them can draws in finds, events and processes that took many years and occurred before the search date

excavate and sample the sites in order to re-examine the date of their decline.[35] Therefore, the current article will also examine this dating and the correlation between this decline and several important, catastrophic events that occurred in the same period, and may have affected the process of decline as a whole.

The Micro-Scale Data

Before the general trends of decline in the Roman Empire can be examined, the nature and dating of this deterioration must be examined at a smaller scale, in individual sites and micro-regions. One of the best regions where this can be done effectively is in the region of Judaea/Palaestina. This area has been extensively and consistently excavated in the last century, with numerous sites and finds being constantly analysed and published. Due to this large number of sites with vast amounts of information, only the region of the north-western Negev, and the cities of Scythopolis and Jerusalem will be examined in detail, combined with a later examination of the Archaeological Survey of Israel.

North-Western Negev Settlements

A decrease in population in other parts of the Empire would create a decrease in the population of the arid regions, as people would move to recently vacated lands, which were safer and more fertile. Thus, such arid regions are considered good indicators of societal change, and so great emphasis was placed on their excava-

or after: Sessa 2019, 236–237; henceforth, the current article will attempt to avoid searching and connecting events and drastic changes to famous dates, such as the 540's or 636 CE. The proposed approach takes into consideration that history is composed of complex processes that continue for decades, and even centuries, and the initiating cause is not clear in all the processes. All the archaeological tools, such as radiocarbon dating, are in-line with this approach as the accuracy and range provided are in decades at best. The decline was a long process that started in the first half of the 7th c. CE and escalated around the middle of this century. However, this continued into the following two centuries albeit at a more moderate pace. As the current article will show, definitive and famous dates such as 636 CE need to be abandoned, as the decline started before, and the year 636 CE did not represent a turning point for the historic reality of the previous two decades. The Islamic conquest, and their wars with the Empire, were part of a long series of military conflicts that were part of the same process of wars and decline and was very similar to other wars. Therefore, they should not be used as the alleged starting point of settlement contraction.

35 Bar-Oz 2019, 8241, 8246–8247; Fuks 2020, 19780, 19787–19788.

tions and subsequent analysis.[36] One such area where a supposed decline would be visible is the settlements of the north-western Negev desert (Fig. 1).

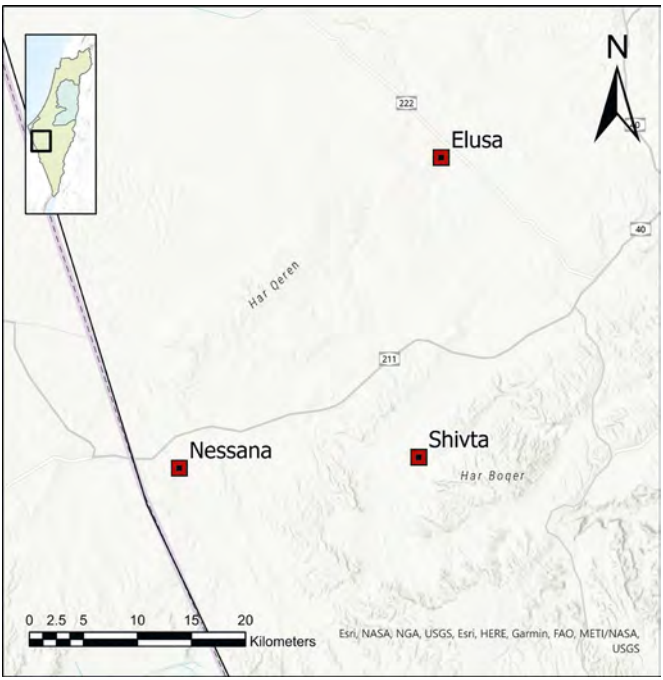

Fig. 1: Map of the north-western Negev and its vicinity with the city of Elusa and the settlements of Nessana and Shivta indicated. The map was created by using ArcGIS Pro 2.9.3.

The site at the crux of the theory regarding the decline of this region is Elusa. Originally a Nabatean waystation that was established in the 3rd c. BCE,[37] it evolved into the main polis of the Roman Negev a few centuries later. The city prospered during the 4th to the 6th c. CE from its extensive agriculture and viticulture industry.[38] The polis was surrounded by a number of large garbage mounds, and the surveying team conjectured that an abandonment of trash mounds could be an indicator of the breakdown of municipal facilities, societal collapse, and an emigration of people.[39] Thus, a survey and an examination of the garbage mounds surrounding

36 Rubin 1998; Olshanetsky – Cosijns 2021, 8.

37 Bar-Oz 2019.

38 Rubin 1998; Lantos 2020.

39 Bar-Oz 2019, 8245; for research that used garbage mounds to examine societal processes, see: Rathje – Murphy 2001; Bar-Oz 2007; Spiciarich 2017.

the city of Elusa was conducted, and their end use was dated through the use of radiocarbon dating and ceramic typology. According to them, the polis and the surrounding settlements started to deteriorate in the mid-6th c. CE, and so this decline was attributed to the Justinianic plague and the LALIA.[40] However, the methods of dating used by the NEGEVBYZ project were problematic.

Regarding the radiocarbon dating, only eight botanical samples were dated from an area of more than thirteen hectares. In addition, five of these samples originated from one excavation trench 1.3 m deep.[41] Moreover, the samples were taken from areas which did not have an extensive representation of pottery sherds designated to later dates, even though there were several areas on the trash mounds with large quantities of such sherds. The radiocarbon dating of organic samples from such areas would have been best suited for understanding the last use of the trash mounds, but this did not occur.[42] Furthermore, the botanical sample from probe 22 was claimed to indicate that the end use of the mound happened in the mid-6th c. CE. However, the full date range of this sample is 425 to 580 CE.[43] The fact that the dating of the botanical sample was rounded down, and the full range of dates was not provided in the article, is not the only problem with this dating.[44]

When inputting the radiocarbon data into the newly updated OxCal (a program used to calibrate radiocarbon dates),[45] a version that was unavailable to the NEGEVBYZ project in 2019, the dates for all the samples were pushed forward, with the new dating for probe 22 being 435 to 597 CE at 95.4 % probability.[46] A further analysis of the dates using the mathematical modelling function in the OxCal program was also implemented.[47] In this case, the raw dates of the eight samples were entered into a single-phase model to try and calculate the possible end date of the garbage mounds, something the original publication neglected to do. According to the model, the end use of the mound fell within a large range of 476 to 681 CE at 95.4 % probability, or 515 to 599 CE at 68.3 % probability.[48] It is important to note that the dating and modelling are so imprecise due to the severe lack of dates for such a large area. Moreover, the samples were taken from places where there were

40 Bar-Oz 2019, 8239, 8246–8247; Fuks 2020, 19780, 19787–19789; Langgut 2021, 174.

41 Bar-Oz 2019, 8244, Fig. 5.

42 Regarding the location of the later pottery sherds, see: Bar-Oz 2019, 8244, Fig. 4; regarding the location of the probes from which the C^{14} dates were obtained, and their relation to the different survey squares, see: Bar-Oz 2019, 8241, Fig. 2.

43 Bar-Oz 2019, 8244 Fig. 5, SI Table S6.

44 Bar-Oz 2019, 8243.

45 Bronk Ramsey 2009; Reimer 2020.

46 Olshanetsky – Cosijns 2023, Fig. 1a.

47 This was not conducted by the NEGEVBYZ project.

48 Olshanetsky – Cosijns 2023, Fig. 3.

no recent ceramic sherds, unlike other areas on the mound where there were such recent sherds dated to the 7th c. CE. Consequently, it is safe to argue that the radiocarbon dates, be they modelled or unmodelled, and especially when considering their limited number, do not prove that the garbage mounds ceased to be used in 550 CE.

The second dating method used to complement and strengthen the radiocarbon dating of the garbage mounds was ceramic typology, which was entirely based on a 1995 article by Majcherek describing the dating of Gaza jars.[49] In Elusa, vast numbers of Gaza jar sherds were found, especially from those belonging to Majcherek's Type 2 and Type 3. According to Majcherek, Type 2 represents the 4th to the end of the 5th c. CE, while Type 3 was in production from the end of the 5th until the beginning of the 7th c. CE, with a peak in its production after 535 CE.[50] More updated typologies of this jar, which is also called the Late Roman Amphora 4 (LRA 4), have slightly amended Majcherek's dating. Pieri divided Majcherek's Type 2 into two separate typologies, one dated to the 4th and 5th c. CE called LRA 4A2,[51] and the other dated to the second third of the 5th c. to the first half of the 6th c. CE, known as LRA 4B1.[52] Majcherek's Type 3, reclassified as LRA 4B2, was re-dated to the beginning of the second half of the 6th c. to the 7th c. CE.[53] Sazanov attempted to further improve on this classification and categorised the vessels into smaller sub-categories.[54]

Conversely, the team at Elusa incorrectly assigned Type 3 to Levantine archaeology's Middle Byzantine period (450 to 550 CE).[55] Additionally, as stated by Majcherek, vessels are often used long after their production has ceased,[56] as usable jars and vessels were not discarded simply because they were no longer produced. Therefore, it is safe to assume that Type 3 was still used extensively in the first quarter of the 7th c. CE and later, until the Islamic conquest of 636, and possibly even a few decades after. Hence, Type 3 represents the norm during the end of the Middle and all of the Late Byzantine archaeological periods in the Levant. Accordingly, the ceramic record suggests a longer and prosperous habitation of the region, rather than a deterioration in the mid-6th c. CE.[57]

49 Majcherek 1995, 168–169.
50 Majcherek 1995, 168–169.
51 Pieri 2005, 104, n.209.
52 Pieri 2005, 106, n.252.
53 Pieri 2005, 106, n.269.
54 Sazanov 2017.
55 Bar-Oz 2019, 8243.
56 Majcherek 1995, 168–169.
57 Cosijns – Olshanetsky 2022, 7–9; Olshanetsky – Cosijns 2023.

This is supported by the large concentration of pottery sherds from the Late Byzantine i.e., from post 550 CE,[58] which were found in squares VII–IX of the survey that was conducted on the garbage mounds of Elusa.[59] The ceramic concentration in these squares was larger than any other found in the other survey squares, and was highly unusual. Thus, these squares may have been the last areas where garbage disposal was practiced, and it strongly suggests that this continued well into the 7th c. CE,[60] and indicates that the cessation in municipal services occurred only in the 7th c. CE.[61]

This lends weight to discoveries that show a shift in the ratio of pottery typologies in the Negev, showing a drastic increase in the number of sherds, and especially the percentage of bag-shaped jars, compared to a decrease in the percentage of Gaza jar sherds, especially in the assemblages of Shivta (Sobota) and Nessana. According to the NEGEVBYZ project, Gaza jars were used only for trade, and were especially built to be transported on camels and ships, while bag-shaped jars were used for storage.[62] This, alongside a change in the ratio between grain seeds and grape pips in different contexts, had brought them to say that the decrease in Gaza jar sherds correlates with a change in agricultural produce.[63] However, bag-shaped jars had a dual purpose and were also used for trade.[64] Their sherds can be found in large quantities throughout the Empire, similar to the dissemination of Gaza jars (Fig. 2).[65]

Moreover, there is a stark increase in the total number of sherds found after 550 CE, possibly indicating an increase in the industrial capacity and prosperity of the region. This is especially noticeable in Area A in Nessana, which was dated to 550 to 700 CE, where a total of 16,148 sherds were found, a larger number than all the other areas and contexts from all the sites combined.[66] Such a number can be used to support a population peak in the early 7th c. CE, or it can be characterised as untrustworthy and possibly anomalous.

In terms of yield change, grape pips were found in higher numbers from contexts dated to after the mid-6th c. CE than in previous periods. Thus, it is definitely not a reliable indication of a decline in the viticulture industry, nor sufficient evi-

58 This definition is according to the NEGEBYZ project typology.

59 Bar-Oz 2019, SI Table S3(B).

60 C^{14} dating was not conducted in these survey squares, albeit the ceramic there was of a later date, and it is the place where an end-use of the garbage mound can be properly established.

61 Olshanetsky – Cosijns 2022; 2023.

62 Fuks 2020, 19783.

63 Fuks 2020, 19783.

64 Mango 2001, 50; Kingsley 2004, 118; Pieri 2005, 114–125.

65 Reynolds 1995, 71–72; Pieri 2005, 114–125.

66 Fuks 2020, SI Table 3.

Fig. 2: A distribution map of LRA 4 amphorae (in red, top) and LRA 5 amphorae (in blue, bottom). The data for this distribution map was taken from: Lloyd 1977; Kingsley 1999; Pieri 2005.

dence for a decline of the region.[67] It is also worth noting that the number of botanical remains, such as pips and seeds, is small, so changes in their ratio could be incidental. Furthermore, most of the botanical finds were dated to post-550 CE,[68] which can indicate that the peak in agricultural production occurred in the late 6th or the 7th c. CE, or possibly accidental. Additionally, the dating of the data from Shivta, Elusa and the other Negev sites, needs to be amended. As elaborated previously, what was dated to 450 to 550 CE should be at least redated to 475 to 636 CE or 550–650 CE, if not later. During this period, the grape pip percentage of the cereal and grape assemblages reported in the middens of Shivta and Elusa sites was 42 % and 43 %, respectively, making it the phase with the largest percentage of grape pips. As a result, it implies the highest period of viticulture output was at least until, and in the first few decades following, the Islamic conquest.

The shift in the pottery and botanical assemblage ratios can be explained by the Roman-Persian wars, which severed trade routes, curtailed the sale of commodities, and constricted the market. It may also have compelled a conversion from Gaza jars to bag-shaped jars in the hope that the produce could be stored, and the conflict would finish shortly so that the product could be sold. Bag-shaped jars were chosen because they were easier to store than Gaza jars but could still be used for transportation. The Islamic Conquest prolonged and exacerbated the degradation of trade and markets, potentially driving many farmers to bankruptcy. It is plausible to infer that conflicts and trade restrictions also encouraged many farmers to switch from growing grapes to growing grain, as grain, despite being less profitable, was easier to store for longer durations. This transition may have caused a decrease in the area's prosperity, as well as the deterioration and eventual abandonment of the sites in the following decades.

Another option is that the Gaza jars were less prevalent in the Negev after the wars reached the area, as the vessels arrived, most likely filled, from the coastal region.[69] As the Negev settlements' ability to import products decreased, so did the quantity of imported vessels and the ability to reuse them for export. Consequently, the Negev villages began to increase the local manufacturing of bag-shaped jars.[70] This theory could be tested further by examining the colour of the sherds and determining their origins.

---

67 It is not even certain if wine export was the main income for the region: Seligman 2020.

68 Fuks 2020, SI Table 2.

69 Pieri 2005; Erickson-Gini 2022.

70 Gaza jars are exclusively imported and are not local to the Negev desert, as their colour ranges from pink to reddish yellow: Pieri 2005; on the other hand, numerous bag-shaped jars found in the Negev were locally produced, with a distinct pale yellow colour, although only some were defined as "Elusa ware": Erickson-Gini 2022, 185 (Fig. 47); Erickson-Gini – Mamalya 2022, 155–157.

The decline of the area drove traders and farmers into bankruptcy. Since pigeons were raised for their faeces, which was used as fertilizer, the abandonment of pigeon towers in the Negev could be an indication for that decline.[71] In a recent article of the NEGEVBYZ project, pigeon bones from several towers were radiocarbon dated, providing a range of dates in the second half of the 6th c. and the beginning of the 7th c. CE, suggesting that the decline occurred in the 7th c. CE.[72] Like the case of Elusa, a meagre number of tests were done, and so these dates are not enough to conclusively prove and provide exact dates. For example, only three bones were examined in Horvat Saadon, with date ranges of 430–585 CE, 430–600 CE and 440–640 CE at 95.4 % probability.[73] According to these results, it is possible that the use of these facilities in Horvat Saadon continued into the late 6th c. and even the 7th c. CE, such as in other places. The finds in other towers in Shivta and Beer Sheba provided later dates, which can indicate a decline in the 7th c. CE, whose causes are most likely connected to the general deterioration of commerce and wealth due to the Persian war and the Islamic conquest, as the NEGEBYZ project pointed out itself.[74]

The presented data, including a reinterpretation of the radiocarbon dates and the ceramic typology of the north-western Negev settlements, indicate that the decline, economic deterioration, and partial abandonment of the region most probably occurred from the 7th c. CE. This is corroborated by the presence of certain ceramic typologies originating from the east, and Judaea/Palaestina in particular, throughout the Mediterranean. These vessels, namely Gaza jars (LRA 4) and bag-shaped jars (LRA 5), were widely found in multiple sites, such as Marseille, Naples, Carthage, eastern Spain and Alexandria, from contexts dating to the end of the 6th and the first decades of the 7th c. CE.[75] According to the archaeological record, there was a collapse in the presence of these vessels from the early to the mid-7th c. CE. This implies that trade in the eastern Roman Empire reached a height in the late 6th and beginning of the 7th c. CE. The further implications are that both the settlements in Judaea/Palaestina, as well as in the rest of the Roman east, were at the pinnacle of their industrial capabilities, and provided commodities to the entire Mediterranean basin during this period.

The communities of the north-western Negev also relied on the export and contents of these vessels (LRA 4 and LRA 5), as is evident by the number of their

71 Regarding pigeon tower abandonment, see: Tepper 2018; Yan 2021.

72 This conclusion is derived from our own examination of the dates, and so differs in parts from what is stated in the article: Yan 2021.

73 Yan 2021, 1726.

74 Yan 2021, 1731–1732.

75 Reynolds 1995, 155–160.

sherds found throughout the region, especially in archaeological contexts dated to post-550 CE. This, as well as other evidence, suggests there was a peak in the prosperity and welfare in the sites of the Negev in the late 6th and early 7th c. CE. This is substantiated by the corpus of papyri and inscriptions from Nessana, most of which are dated to before the Islamic conquest. Their contents show that Nessana and its surroundings reached a maximum in size and population in the late 6th and early 7th c. CE.[76] Other evidence for the region's later prosperity comes from the dedicatory inscriptions for buildings and new mosaics from within Negev settlements, such as the mosaic floor in the church in Shivta from the year 607 CE.[77] Both the construction of new buildings and the instalment of new mosaics are considered as major indicators of wealth and economic prosperity.

To summarise, there is no clear evidence for a decline in the north-western Negev region in the 6th c. CE, whether from Elusa's garbage mounds, the region's pigeon towers, or other archaeological data. Rather, the evidence suggests that there was continuity in everyday life and that the decline occurred from the 7th c. CE. This suggests that neither climate nor the Justinianic Plague played a role in the region's collapse. Conversely, the region's decline was caused by a long period of warfare between the Romans and the Persians, and later the Arabs, which destroyed the trade routes to and from the north-western Negev desert.

Cities in Judaea/Palaestina

Further examples of demographic and economic decline dated to the 7th c. CE can be seen in archaeological sites from the centre of Judaea/Palaestina. An example for this can be found in Scythopolis, where the public buildings were so neglected during the 7th c. CE that they were dismantled by the public for use as building materials.[78] This is also visible in other archaeological sites, such as the cities of Yavne-Yam, Yavne, and Emmaus, and various other agricultural settlements in their vicinity.[79] The causes of this societal and economic collapse can be explained by the deterioration of the trade routes and economy as a result of the region's political control changing multiple times in a relatively short time period. In addition, the new rulers of the region were in an almost constant state of war with the late Eastern Roman Empire, and the local population possibly fled to what was left under the rule of the Emperor in Constantinople. Therefore, due to extensive

76 Magness 2003, 179–180.
77 Sivan 2008, 83–84.
78 Tsafrir – Foerster 1997, 145; Avni 2010, 44.
79 Taxel 2013.

migration and the instability of the economy and trade, the settlements and cities of the eastern Mediterranean deteriorated.[80]

On the other hand, the city of Jerusalem remained relatively stable in the 7th c. CE as the Persian and Islamic conquests of the city did not destroy the infrastructure of the city.[81] This may have been due to the importance of the city as a seat of power in the area and an important administrative centre.[82] However, there are discoveries of mass graves in Jerusalem dated to the Persian conquest, which are also mentioned in ancient texts. These texts show that the Christians were marched out of the city to be killed, and so there are few visible signs of destruction in the city itself.[83]

The Macro-Scale Data

As is evident on the micro-scale, there was no apparent deterioration which can be attributed to a change in the climate or society in the 6th c. CE in the north-western Negev, and in the regions of Jerusalem, Scythopolis and Yavne. To fully determine whether the examined regions were the exception or the norm, it is important to compare this information with what occurred during this period in larger regions and other areas.

Shipwreck Analysis

The first type of information that can provide a broader picture is an analysis of shipwreck data, based on two well-known databases: the shipwreck database of Harvard University,[84] and the Oxford Roman Economy Project (OXREP) data-

80 One of the greatest problems in archaeology is to understand what happened to the people when there is no evidence of a destruction layer, or when mass graves are not found. A main argument against the high mortality of the Justinianic plague is that mass graves linked to the plague are scarce. On the other hand, the Persian war contains evidence for mass graves, although it is not feasible to suggest that the population of the area was decimated due to war as, similar to other wars, refugees and expulsion are common. Exactly where these refugees travelled to is, at the moment, unclear in the archaeological record.

81 Avni 2010.

82 The Muslims, and especially the Persians, tried to maintain civility and preserve the previously established administrative system: Foss 2003, 58, 62–63.

83 Tchalenko 1953, 55; Avni 2010.

84 The Harvard database was taken from: McCormick 2020.

base,[85] which is partially based on the Harvard database.[86] These databases aggregated data on shipwrecks from antiquity, including their dates, site/shipwreck name, GPS location, and cargo. However, the biggest impediment to easily interpreting this data is a lack of information on the body of water from which the ship came. Consequently, this information was completed, with the combined dataset including the body of water in which each shipwreck was found. This enabled the easy exclusion of ships that were not discovered in the Mediterranean Sea.

But why do shipwrecks matter? The use of this type of data implements a method that has recently been applied in different studies, such as Justin Leidwanger's latest book.[87] This method assumes that the number of shipwrecks has statistical significance, and greater amounts of maritime traffic are reflected in higher numbers of shipwrecks in certain periods. As the number of ships in use increases, so does the probability that some of them will sink due to storms and other calamities. Generally, the comparison of the number of shipwrecks between half-centuries and centuries is considered acceptable and common, and is an important tool in understanding the volume of sea-borne trade. The assumption at the foundation of this system is that unique catastrophic events leading to numerous ships sinking simultaneously are short-lived and rare, and a comparison between long periods neutralises the distinctive effect of such calamities.[88]

The main obstacle in employing shipwrecks is the difficulty in exactly establishing the date of the ship's sinking. As a result, in most cases, only broad estimates are available, ranging from a few decades to many centuries, depending on the type and extent of investigation undertaken on the shipwreck by surveyors and/or excavators, as well as the artefacts uncovered. To compensate for this difficulty, the full date range of each shipwreck was inputted into the graph. Thus, a ship can appear in multiple columns. This method is not entirely accurate, but it provides a valuable and universal picture, although with some deviation.[89] The outcome of this method is that the sum of all the columns would vastly outnumber the number of ships appearing in the database. Leidwanger presented similar raw figures in his book. However, the number of ships he examined was less than what will be presented here.[90] Henceforth, the data in this article will be the most comprehen-

85 The OXREP database was taken from: Strauss 2013.

86 For the Harvard and OXREP databases, before their unification and without a column explicitly detailing from which body of water the ship came from, see: http://oxrep.classics.ox.ac.uk/databases/shipwrecksdatabase, last accessed 21.03.2023.

87 Leidwanger 2020, 110–153.

88 Leidwanger 2020, 13–14, 113.

89 Wilson 2009, 33–34.

90 In Leidwanger's book, there is a chance that there is a mistake in the graphs, as the sum of all the columns were smaller or similar to the number of ships that, according to Leidwanger, were

sive and up-to-date data available, despite the fact that it is only a partial study of a continually evolving dataset.[91]

As can be appraised from the data showing the number of shipwrecks in the whole Mediterranean (Fig. 3), there was an increase in the number of shipwrecks in the Late Republic. As Rome gradually united the entire Mediterranean Sea, and the Mediterranean truly became a *mare nostrum*, naval traffic and trade became safer and easier, leading to a surge in commerce during the relatively peaceful 1st c. CE.[92] In addition, the thrill of suddenly available exotic commodities boosted this peak in naval commerce.[93] With the possible novelty of the exported goods wearing off, there is a decline in the number of shipwrecks in the 2nd c. CE.

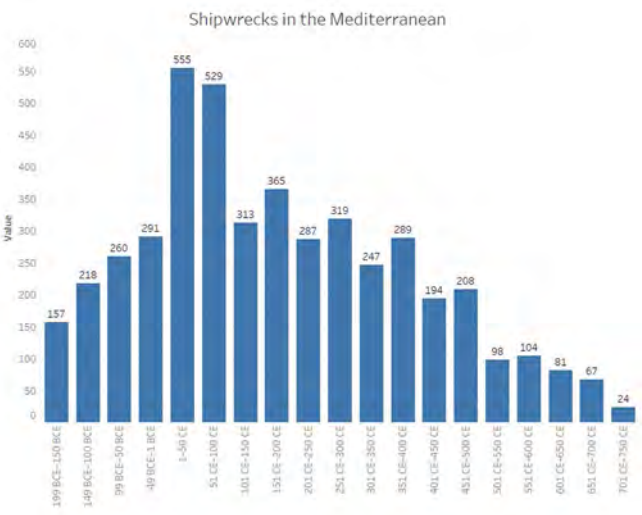

Fig. 3: Graph showing the number of shipwrecks per period in the Mediterranean according to the Harvard and OXREP databases.

included in the graphs. As was explained, the sum should have been significantly larger, than the number of ships that were inputted into the graph: Leidwanger 2020, 116, Graph 4.2.

91 For the Harvard and OXREP databases, before their unification and without a column explicitly detailing from which body of water the ship came from, see: http://oxrep.classics.ox.ac.uk/databases/shipwrecks_database, last accessed 21.03.2023.

92 Regarding the defeat of Antonius and Cleopatra at Actium in 31 BCE as marking the unification of the entire Mediterranean under Roman rule, and its implications on trade and the term *mare nostrum*, see, for example: Carter 1970; Gruen 2005; Eck 2007; Goldsworthy 2014; Fratantuono 2016.

93 Regarding the boost in demand for exotic goods, see: Bobou 2021, 158.

However, from the 2nd c. to the end of the 5th c. CE, the number of shipwrecks remained consistent and near to what was seen at the end of the Republic, implying that this was a regular level of naval trade during full Roman control of the entire Mediterranean. Then, at the very end of the 5th c. CE, there is a sharp decline of almost fifty percent in shipwreck numbers. The reason for such a severe reduction was most probably due to the fall of the Western Roman Empire in the late 5th c. CE.[94] The fall of the west also symbolised the decline of the city of Rome and other western trade cities and their hinterlands, and their subsequent reduction in population. Later, stability in the number of shipwrecks can be seen in the 6th c. CE, followed by a decline from the 7th c. CE onwards. This decline was most probably an outcome of the Persian war, and the Islamic conquest shortly after, which deprived Constantinople of most of the territories that were previously under the rule of the Eastern Roman Empire. These events damaged the trade networks between the former regions of the Empire, as well as between the eastern and western sides of the Mediterranean.

When comparing the trends of shipwrecks in the entire Mediterranean to the eastern Mediterranean, and when contrasting the two sides of this sea, this image becomes clearer, and the contrasts between the eastern and western Mediterranean become more pronounced (Fig. 4 and 5).[95] This was done to eliminate the numerical bias of the shipwreck data, as more research was conducted in the western Mediterranean, and the original data is focused mainly on this area.

In the eastern Mediterranean, there was an increase in maritime traffic in the last two centuries BCE. This increase reached a peak in the 1st c. CE, similar to what is visible in the Mediterranean as a whole. However, contrary to the general trend, after a slight decrease there was stability in the 2nd and 3rd c. CE, followed by a continued increase in the number of shipwrecks which reached a peak in the late 5th c. CE, with this trend continuing until the beginning of the 7th c. CE. This peak was even greater than the one in the 1st c. CE, demonstrating the Eastern Roman Empire's stability as well as the potential that trade was even more robust in the region during Late Antiquity. The peak in eastern Mediterranean trade continued at least until 600 CE, and so implies that there was no decline in the mid-6th c. CE.[96]

---

94 Regarding the fall of the Western Roman Empire, see: Heather 2005, 385–459; Ward-Perkins 2005, 138–146; Wickham 2005, 33–34; Elton 2018, 195–244.

95 The line of separation between the eastern and western Mediterranean was decided according to longitude 20. All the ships that were found along the Mediterranean coastline of Greece, Cyprus, Turkey, Lebanon, Syria, Israel, Egypt and the eastern part of Libya were defined as shipwrecks from the eastern Mediterranean. Alongside these, ships which were found and surveyed in Mediterranean international waters east of longitude 20 were also defined as such.

96 Both McCormick and Avni wrongly concentrate on the western Mediterranean when discussing a decline in trade in the 6th c. CE. Furthermore, this is inherently wrong as a decline in trade in the west occurred in the second half of the 5th c. CE (Fig. 5): McCormick 2012; Avni 2023.

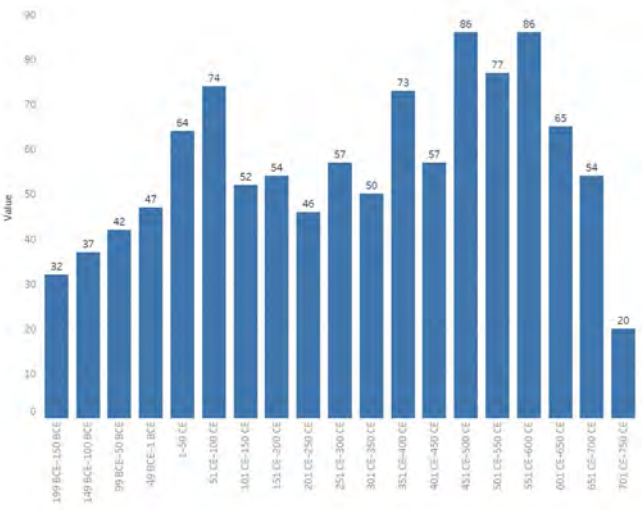

Fig. 4: Graph showing the number of shipwrecks per period in the eastern Mediterranean according to the Harvard and OXREP databases.

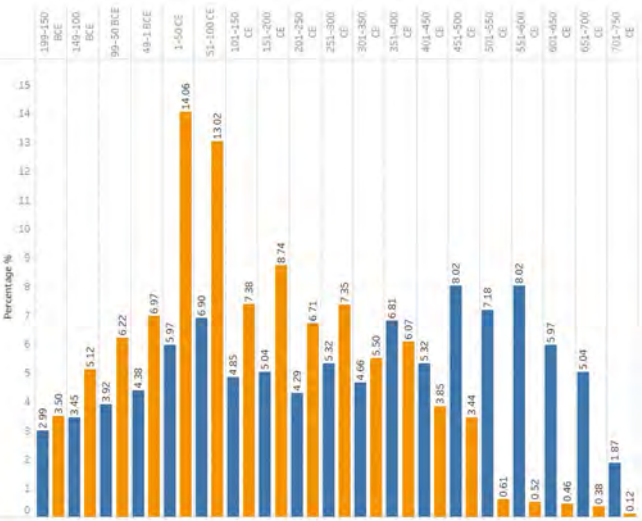

Fig. 5: Graph comparing the percentage of shipwrecks in each half century, out of the total number of shipwrecks in that half of the Mediterranean, according to the Harvard and OXREP databases. Orange represents the western Mediterranean, blue represents the eastern Mediterranean.

This stability in maritime trade in both the Mediterranean as a whole, and specifically the eastern Mediterranean during the 6th c. CE, diminishes the arguments of different researchers who have claimed that the Justinianic plague and the LALIA were major factors in the breakdown of the Eastern Roman Empire. In addition, following the 6th c. CE, there is a fall in the number of shipwrecks during the 7th c. CE in both the Mediterranean as a whole, and the eastern Mediterranean in particular. Such a trend highlights that the deterioration of naval commerce occurred in the 7th c. CE and was most probably connected to the Roman-Persian War of 602–628,[97] and the Islamic conquests that started in 636.[98] The Arab wars with the empire further deteriorated the situation and hampered commerce well after the 7th c. CE.[99]

Since the shipwreck data is based on dating, which provides a range rather than precise years, it is crucial to note and demonstrate that this information and conclusions are consistent with other evidence. These include the quantitative analysis of settlement trends in Judaea/Palaestina, a comparison with other regions, and other previously discussed and soon to be analysed findings.

Archaeological Survey of Israel

The Archaeological Survey of Israel is the most thorough archaeological survey conducted in a country. The entire country was carefully divided into survey grids of 100 km^2 (10x10 km) in the early 1960s, with each grid being published as a survey map,[100] of which 70 % have been surveyed and published since the 1960s.[101] Each map was published after a team of archaeologists systematically surveyed the area on foot, and methodically inspected every square metre of the grid where possible. Individual teams plotted, marked, and noted any site with signs of anthropogenic activity, as well as dated the site where possible using indicative sherds or other artefacts. Upon the completion of a survey, the team would include a summary and analysis of the various periods identified in the survey grid, as well as their conclusions concerning changes in settlement patterns, the date of these changes, and their possible causes.

97 Regarding the war, see: Foss 2003; Howard-Johnston 2006; Avni 2010; Pourshariati 2017.

98 Regarding the Islamic conquest, see: Butler – Fraser 1978; Nicolle 1994; Ibrahim 2002; Mikhail 2016.

99 Kaegi 1992; Fouracre 2008; Sarris 2011; Donner 2014.

100 Dagan 2009, 222; Sion 2014; Authority 2022.

101 For the full list of survey maps, see note 105.

Other important surveys conducted in Israel outside of the general Israel survey is a recent salvage survey in Beth Shemesh,[102] as well as emergency surveys in Judaea and Samaria in the West-Bank between the years 1967 and 1968.[103] Moreover, there are the Manasseh Hill Country Surveys that were conducted by Adam Zertal and encompass most of the territories of Samaria.[104] All these surveys were conducted in a similar manner to the Israel survey, and each map and survey were published individually, electronically and/or in hard copy. Some of them were more organised and straightforward, while others were less so. The information from all the mentioned surveys was collected, and a quantitative analysis of the number of settlements from the Hellenistic to the Early Islamic period was conducted.[105]

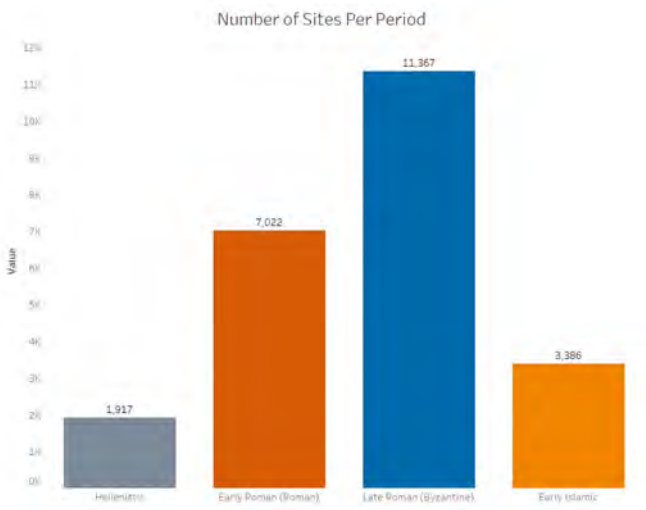

Fig. 6: Graph indicating the number of sites per period in modern-day Israel.

102 Dagan 2010; Dagan 2011.

103 Kochavi 1972.

104 Zertal 2004, 2008; Zertal – Mirkam 2016; Zertal – Bar 2017, 2019; Bar – Zertal 2021, 2022.

105 The current research and graphs include data from the Beth Shemesh survey, the 1967–1968 salvage survey, all the volumes of the Manasseh Hill Country survey published up until now (note 79), as well as the following maps in the Israel survey: 1, 2, 4, 5, 7, 8, 11, 11/1, 15, 15/1, 18, 18/1, 18/2, 18/3, 19, 20, 22, 23, 24, 26, 27, 28, 29, 30, 31, 32, 33, 36/1, 36/2, 36/3, 39, 40, 40/1, 41, 44, 45, 46, 47, 48, 49, 52, 53, 54, 56, 57, 58, 59, 61, 62, 63, 64, 66/67, 69, 70/71, 72, 76, 77, 78, 80, 82, 83, 83/1, 83/2, 83/12, 84, 85, 87, 88, 89, 91, 92, 96, 98, 101, 102, 104, 105, 106, 108/2, 109/4, 109/5, 109/7, 110, 112, 114, 120, 121, 125, 127/128, 129, 131, 132, 136, 139, 140, 143, 144, 145, 146, 147, 153, 154, 155, 156, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 177, 178, 183, 187, 193, 194, 195, 196, 198, 199, 200, 201, 202, 203, 204, 206, 207, 212, 213, 214, 216, 217, 219, 220, 224, 225, 234, 238, 255, 256, 257/259, 258, 260, 261, 262, 263, 264, 265, 266.

Figure 6 represents the overall quantitative analysis of the survey results,[106] and a significant increase in the number of sites with anthropogenic activity is visible during the Early Roman period (red-brown), defined as the mid-1st c. BCE until the beginning of the 4th c. CE. In this period, the number of sites more than tripled compared to the Hellenistic period (column in grey representing the end of the 4th c. BCE until the mid-1st c. BCE). More significant is the continuous increase in the number of sites from the Early Roman to the Late Roman period (blue column which represents the early 4th c. to the early 7th c. CE). This 61.77 % increase over the preceding period establishes the Late Roman period as a high point in the number of sites in Judaea/Palaestina, which was only surpassed in the 20th c. CE. The substantial increase points to a well-documented population explosion that happened throughout the Eastern Roman Empire. However, this settlement boom ended in the 7th c. CE, followed by a protracted period of decline in the number of sites and population.

Thus, when did the number of settlements peak between the 4th to the beginning of the 7th c. CE? There was a severe contraction, and the number of active sites during Early Islamic period was fewer than a third of what had previously been active under the reign of the Eastern Roman Empire. If the peak arrived in the mid-6th c. CE, the decline in the number of sites can be tied to the LALIA and the Justinianic plague. On the other hand, a decline in the 7th c. CE would indicate that climate and plague most probably did not majorly contribute, and the main reasons for this deterioration was manmade – the Roman-Persian wars and the Islamic conquest.

Fortunately, the surveyors left plenty of information that can help determine the timing of the fall. Numerous surveyors indicated that it is possible that there were more Early Islamic settlements than what was indicated in the maps and surveys, as the pottery found was of the types that may have continued several decades into the Early Islamic period. Hence, it seems that the Byzantine (Late Roman) ceramic, and many of the identified Byzantine (Late Roman) sites can be dated to the Late Byzantine period (550–636 CE). These observations prompted researchers, such as Gideon Avni, to define settlements with such assemblages as Byzantine-Early Islamic in the surveys they conducted,[107] defining hundreds of sites as such.[108] Furthermore, many surveyors saw the cause of the said decline as the Islamic conquest, and they believed that this decline continued throughout the

106 There were several previous studies which partially analysed the archaeological surveys of Israel: Avner 2006; Holzer 2010; Avni 2014, 192–300; Nol 2022, 48–88.

107 Avni 2014, 191–353.

108 The said maps are from the surveys in the Negev desert, and Avni took part in many of them: 193, 198, 199, 200, 202, 206, 207, 224, 225.

first few decades of Early Islamic rule.[109] In fact, just one surveyor suggested that the decline could be linked to the Justinianic plague.[110] Other surveyors either did not deal with the issue of decline, or attributed the decline entirely to the Islamic conquest.[111]

The reliability of the survey, its finds, and the dating of the Byzantine period in particular, were in the midst of several academic discussions and major analyses. Today, the accepted opinion is that in most of the Byzantine sites, the finds are from the later period,[112] and their use continued into the first decades of the Early Islamic period.[113] Moreover, a re-examination of some of the survey squares in the Galilee was conducted, alongside a new survey, excavations and dozens of test pits and probes. This examination showed that the original survey finds stand the test of time and a more thorough examination, and the reliability of this data is high.[114] It is important to note that the survey finds for a single site may be inaccurate, but the survey as a whole is accurate in detecting general changes and trends in large regions – the type of research and debate that the current article wishes to conduct.

To conclude, the ceramic typologies that were found in the different sites caused the different researchers and surveyors to assume that settlement decline occurred in the 7th c. CE and occurred due to the wars and geopolitical changes which transpired during this period. This hypothesis that claims the effects of the Justinianic plague and the LALIA were limited, and minimal, and anthropogenic activities and war were the main causes, is also supported by other evidence. For

109 Regarding such claims, and references to pottery of the type that continued from the Byzantine to the Early Islamic, see maps: 1, 2, 4, 5, 7, 8, 15/1, 18, 18/2, 18/3, 20, 22, 24, 28, 29, 36/1, 39, 41, 44, 49, 54, 56, 57, 59, 80, 82, 83, 87, 88, 89, 96, 98, 101, 102, 109, 120, 125, 127, 128, 136, 139, 140, 162, 164, 166, 167, 168, 169, 170, 172, 173, 174, 177, 178, 193, 194, 195, 196, 225.

110 The maps are 18/1; in map 213 the collapse was attributed to earthquakes which happened in 501 and 502, or the Justinianic plague.

111 There are those who claimed that the reason for this is that when the surveys were published, there was insufficient awareness for the Justinianic plague, and the debate around this only became more prominent in the last two decades, while the definition and the debate around the LALIA is the outcome of the last few years. However, this awareness should not change the dating of the pottery. In order for these two phenomena to be significant, the dating of the decline and abandonment needs to be in the 6th c. CE, and not in the 7th c. CE. The fact that the surveyors did not feel that the decline occurred in the 6th c. but rather in the 7th c. CE still stands. Furthermore, it is important to note that many of the surveys, including the Beth Shemesh survey, the Manasseh Hill Country surveys, and many of the Israel survey maps, have been conducted and published in the last decade, when the awareness of these two phenomena was constantly increasing. Yet, no change in the finds or the conclusions of the surveyors can be seen.

112 Sivan 2008, 89–91.

113 Avni 2014, 191–353.

114 Franḳel 2001.

example, dated inscriptions provide evidence of a vibrant daily life and the construction of numerous buildings even after the 6th c. CE in modern-day Israel and Jordan. While a decrease in the number of such finds occurred briefly in the fifth decade of the 6th c. CE, it was immediately followed by a full recovery, inferring that the effects of the Justinianic plague or the LALIA were short and minimal in the Eastern Roman Empire. On the other hand, a sharper decrease in these dated inscriptions can be found in the 7th c. CE due to the Persian war. Even though there was a slight recuperation the following decade after 628 CE, when Rome recovered the area, an even sharper decline was visible after the Islamic conquest of 636 CE, after which there was no recovery.[115] The trend of stability in terms of the number of inscriptions in the 6th c. CE can also be seen when looking at the eastern Mediterranean basin as a whole.[116] Thus, the decline and abandonment of settlements in the Late Eastern Roman Empire most probably needs to be dated to the 7th c. CE and not to the 6th c. CE.

Archaeological Surveys and Excavations in Turkey, Cyprus, and Greece

Evidence for this trend can also be seen in surveys and excavations in some regions of Asia Minor (modern-day Turkey).[117] During the Late Roman period (325–636 CE), for example, the Maeander Valley saw a rise in agricultural acreage, population, and settlement size.[118] Similar trends were also seen in Phrygia,[119] Miletus,[120] Sagalassos,[121] and the Troad.[122] Moreover, several recent works have emphasised and demonstrated that an increase in population occurred in many regions of the Anatolian countryside in the 4th c. CE, and that this pattern persisted until the mid-7th c. CE in several phases.[123]

115 Di Segni 1999, 159–163.

116 Mordechai 2019, 25549–25550.

117 Regarding the general topic on increase in the size of the population, and an increase in the use of new territories for agriculture, and the foundation of new settlements in the region: Heather 2018, 60.

118 Thonemann 2011, 55, 259.

119 Niewöhner 2013, 60.

120 Niewöhner 2011, 109.

121 Vanhaverbeke 2021, 258–260, 272.

122 Cook 1973; Rose 2011, 164; Cook claimed that there was a decrease in maritime traffic, yet the data presented in the current article, which contains information that he did not possess, disprove this suggestion.

123 Roberts 2018, 312.

The first phase, from the 4th to the early 6th c. CE, was devoid of any climatic change, be it an increase or decrease in temperature or precipitation. Yet, during the second phase of this trend, from the mid-6th to the 7th c. CE, there was an increase in population density that was only matched in modern times and is comparable to the demographic fluorescence in Judaea/Palaestina and other Mediterranean basin regions. This second phase of growth overlapped with a colder period and higher precipitation, which coincides with the LALIA. While the LALIA is commonly thought to be between 550 and 660 CE at most, this colder and wetter period lasted until the mid-8th century CE. Such a climate was reputedly ideal, which may have contributed to the expansion in population and agricultural industry witnessed in other sections of the Mediterranean. Even though there was no change in climate in the mid-7th c. CE, the number of sites and the regional pollen record decreased.[124] This decline, like in other regions, was driven by anthropogenic elements. War ravaged the land, decimating trade, which was especially destructive in Anatolia, as it became the principal border zone between the Byzantine Empire, which arose from the ashes of the Eastern Roman Empire, and the Islamic Caliphates.[125]

Another notable example is the archaeological excavations and surveys carried out in Cyprus. From them, it is clear that a peak in the number of settlements, and in many cases in their size, occurred between the 5th and 7th c. CE. The scholars emphasised in numerous places that the peak must be dated to the end of the 6th c. or the beginning of the 7th c. CE, and that the decline began only in the mid-7th c. CE in most regions, and lasted for a very long time after.[126]

The same can be seen in Greece, with many areas declining only in the 7th c. CE. This is evident from the archaeological surveys conducted in Greece, which can generally be split into two main groups. The first is surveys where there is a peak in habitation during the Classical and Hellenistic period, a decrease between the Hellenistic and Early Roman followed by centuries of stability until the end of the Late Roman period. The second is a gradual increase in habitation which reached a peak in the Late Roman period. An unequivocal trend, visible in almost all the surveys, is a stark decline in the 7th and/or 8th c. CE, as can be seen in Laconia,[127]

124 Roberts 2018, 313–315; Maranzana 2021, 566.

125 Roberts 2018, 319–320.

126 Regarding Dhiorios-Mersineri, see: Rautman 2021, 194; regarding the district of Famagusta, see: Rautman 2021, 194–195; on the Vasilikos Valley: Todd 2013, 106–109; Rautman 2021, 202–205; it is important to note that in Cyprus, there was a tide of constructing new churches in the 5th and the 6th c. CE, which is well documented in the archaeological record.

127 Armstrong 1996, 352; Shipley 1996, 259–260.

Methana,[128] Boetica,[129] Argolid,[130] and the Asea valley.[131] The deterioration that can be seen in the 7th and 8th c. CE cannot merely be associated with an unfamiliarity with the ceramic assemblage, as the material culture of the 6th to 8th c. CE in most of the Greek sub-regions is well understood.[132] Thus, this decrease is due to an abandonment of territories and sites. However, there is a chance that some of the sites that were considered abandoned were not necessarily so.[133]

The decline in population can be seen not only through the abandonment of sites, but also through other finds such as the decrease in the size of the Basilica at Perissa in Santorini in the 8th c. CE.[134] It is true that the number of sites that continued after this period is greater than what was presumed in the past, yet the severe decline in the size of the population is undoubtable.[135] In general, the 7th c. CE saw the newly transformed Byzantine Empire reorganise their holdings in the Aegean region, and heavily invest in fortifications throughout these islands. While there was a decline in population in several areas of Greece, Gortyn in Crete saw an increase, visible in the division of larger buildings to create new public and private spaces, as well as the construction of a new church.[136]

While it is relatively established that a decline in settlement size and number occurred in the 7th or 8th c. CE in Turkey, Cyprus and Greece, this region saw numerous events in the 6th c. CE which should and could have caused a deterioration of the area. One of the most concrete examples is the tsunamigenic earthquakes in the middle of the 6th c. CE.[137] However, instead there was rapid renovation and rejuvenation of the region, especially in the port of Kos in Greece,[138] and Beirut in Lebanon.[139] Such rapid recovery and rejuvenation of cities after devastating natural disasters is substantial evidence of an economically resilient and demographically stable Empire, which was possibly at its strongest.

128 Bowden – Gill 1997b, 77–78; 1997a, 84–85; Koukoulis 1997, 97.
129 Bintliff – Snodgrass 1985, 157–160.
130 Jameson 1994, 224, 229–243.
131 Forsén 2003, 264; Forsén – Karivieri 2003, 310–312.
132 Armstrong 1996, 352.
133 Poulou 2023.
134 Poulou 2023, 19–20.
135 Poulou 2023.
136 Poulou 2023, 26–27.
137 Elias 2007.
138 Poulou 2023, 22.
139 Hall 2004, 70–76.

Archaeological Surveys in North Africa

North Africa is divided into two distinct regions. Egypt lies on one side, with modern-day Tunisia, Libya, Algeria, and Morocco on the other. Egypt is typically differentiated because it is greatly influenced by the Nile, whose sources depend on the monsoons of the Indian Ocean.[140] During the late 2nd to the 5th c. CE in southern Egypt (Upper Egypt), there is a well-documented fall in the number of sites and population.[141] Conversely, the northern part of Egypt (Lower Egypt), comprising the Nile Delta and Alexandria, had a boom in population and settlements from the 4th to the 7th c. CE.[142] This corresponds and is verified by what can be seen in other countries of the Mediterranean basin, and supports the notion that a population fall did not occur in the 6th c. CE due to the Justinianic plague, but rather in the 7th c. CE due to warfare, and the deterioration of trade.

The rest of North Africa is another important region for understanding the changes occurring in the mid-6th to the early 8th c. CE due to its unique history.[143] Compared to the climate of Egypt, the other regions of Northern Africa are part of the Mediterranean climate zone. This region saw frequent changes in control from the early 5th until the 8th c. CE, with the Vandal invasion ending the Late Roman period in 429 CE.[144] Their Kingdom lasted over a century before being deposed by the Eastern Roman Expeditionary force led by Belisarius, who was dispatched by Emperor Justinian I. Following a year of warfare, the conflict concluded with the Vandals' ultimate surrender in 534 CE.[145] These changes in governance corresponded to the settlement of people in the newly conquered regions, who carried their own distinct material culture with them, synthesising with the local one. As a result, these changes are readily visible in the archaeological record, and so distinct and relatively short periods of time may be recognized using the ceramic assemblage.

The lands of North Africa were ruled by the Late Eastern Roman Empire from 534 CE until the Islamic conquest in the late 7th c. CE, a period known in archaeology as the Byzantine period.[146] As a result, the Islamic period is usually defined only from 689 CE.[147] Therefore, due to the Byzantine archaeological period coinciding

140 Mahmoud – Gan 2020.
141 Peacock 2006, 137–139; Sidebotham 2011, 259–260.
142 Alston 1999, 138–141; Wilson – Grigoropoulos 2009; Kenawi 2014; Römer – Bailey 2019.
143 Regarding these trends in the general region of North Africa: Hirschfeld 1997; Rubin 1998.
144 Conant 2022, 376–378.
145 Conant 2022, 383–386.
146 Morrison 2022, 415–418.
147 Fenwick 2022.

with the beginning of the LALIA and the Justinianic plague, an examination of this region's archaeology will reveal whether these calamities had a significant impact on the Eastern Roman Empire.

Although some surveys in North Africa show a decline in the number of sites in the 5th or 6th c. CE, this was attributed to a change in the fabric of the society before the LALIA and Justinianic plague or the reconquest conducted by the Eastern Roman (Byzantine) Empire, with a movement from an extensive agricultural hinterland to nucleated communities in urban centres. Yet in some cases, these conclusions may be derived from problems in the dating of the ceramic assemblages.[148] Nevertheless, under Eastern Roman/Byzantine control, when the LALIA and Justinianic plagues reportedly plagued the Empire, there was no general decline in population size in the region. Even those attempting to downplay the significance of the Islamic Conquest in the deterioration of societal structures in North Africa are forced to admit that according to the archaeological record, the main decline occurred in the following century and a half after the Islamic Conquest, i.e. in the late 7th and throughout the 8th c. CE.[149] The best way to examine this period, and overcome the problems of dating visible in older surveys, is to examine one of the latest surveys. The Thugga survey was conducted by the University of Trento (Italy) and the Institut National du Patrimoine of Tunisia, and an area of 660 km^2 was surveyed in the Medjerda Valley in the Tunisian High Tell.[150] In this survey, 643 anthropogenic features were detected and documented. There were 141 separate characteristics and locations dated between 31 BCE and 250 CE, and this number climbed to 153 sites between 250 CE and the Vandal conquest of 430 CE. The number of sites decreased to 147 during the Vandal period, which lasted from 430 to 533 CE. By contrast, the number of sites climbed to 176 during the rule of the Eastern Roman Empire (534–690 CE). However, after the Islamic conquest, the number of sites decreased, with only 21 sites and features attributed to the 8th–13th c. CE (Fig. 7a and b).[151]

148 For a detailed analysis of the different surveys, and an explanation of the results and why the dating of past surveys may have been biased, see: Fenwick 2013.

149 Fenwick 2022, 428–431.

150 De Vos Raaijmakers – Attoui 2013; De Vos Raaijmakers 2013.

151 De Vos Raaijmakers – Attoui 2013; De Vos Raaijmakers 2013.

Period	Dates
Libyan/Punic	8th c.–146 BCE
Late Republic	146 BCE–Augustan age
Roman I	Augustan age–Decius (249–251 CE)
Roman II	250–430 CE
Vandal	430–533 CE
Byzantine	550–650/690 CE
Islamic	8th–13th c. CE

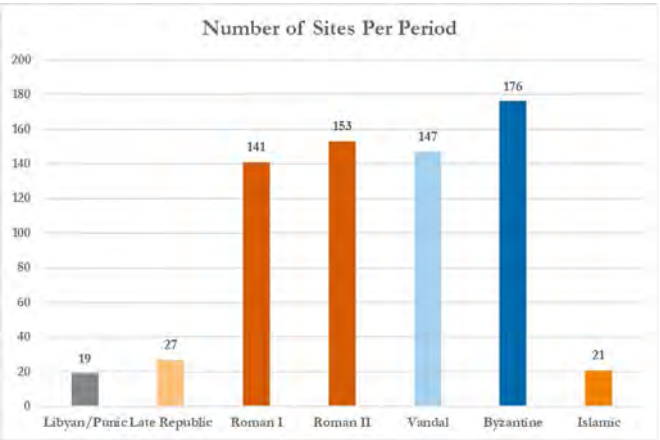

Fig. 7a and b: Graph indicating the number of settlements per period in the Thugga region, modern-day Tunisia. Data taken from: http://rusafricum.org/en/thuggasurvey/datazioni_siti/, last accessed 04.08.2023.

According to this survey, while an area was ruled by the Eastern Roman Empire and was not influenced by wars, invasions, raids, or brief conquests, the region thrived. When the LALIA and the Justinianic plague were the only supposedly apocalyptic occurrences that a region experienced, there was no decline, while in some places there was a peak, suggesting that they were not nearly as devastating in that region. Since the Justinianic plague's outcome is death, and its consequences could never be described as positive and conducive to population growth, the LALIA with its small fall in temperature could be considered beneficial, similar to what Bruins suggested,[152] as it possibly encouraged and supported the prosperity under Eastern Roman rule. This is true not only for Vandal North Africa, that was conquered by

152 Bruins 2012, 39–40.

the Eastern Romans, but also for other Vandal territories which were conquered by the Empire, such as the islands of Corsica,[153] and Sicily.

Conclusion

As demonstrated in this article, the utilisation of micro- and macro-scale data allows us to gain a better understanding of the general status of the Late Eastern Roman Empire in the 5th and 6th centuries. The combination of these two types of data has been employed not only to supplement, but also to better understand the demographic and economic transformations that occurred in the Eastern Mediterranean between the 5th and 7th c. CE. As such, there is no evidence that any community in the north-western Negev desert declined in the 6th c. CE. These previous assertions for such a fall were inaccurate and based on incorrect dating, meaning that the decline should be dated to the 7th c. CE.

The fact that the decrease occurred in the 7th c. CE entirely excludes at least one of the suggested causes of the decline, the LALIA, as this short-term climate shift with its repeatedly questioned effects happened mainly in the mid-6th c. CE. Additionally, research undertaken in Judaea/Palaestina clearly reveals that there was no significant temperature shift during the mid-6th c. CE. The seventy or more years between the LALIA and the settlement drop show that this short-term change in climate played no role in the decline.

The other alleged 'culprit,' the Justinianic plague, is similarly unrelated to this fall. From the mid-6th to the beginning of the 8th c. CE, the Justinianic epidemic is said to have lasted 200 years. The fundamental issue with this pandemic is that most experts agree on its size and chronology with considerable accuracy in the mid-6th c. CE. However, there is considerable controversy about its impact, morbidity, and duration, with a substantial lack of mass graves ascribed to the time, fuelling this debate. Furthermore, the consequences and breadth of the disease in the regions of the Eastern Roman Empire are still being debated. Nevertheless, given that the decline was a long process that only started in the 7th c. CE, it can be concluded that it was most likely caused by anthropogenic actions in the form of geopolitical, social, and economic changes brought about by wars between the Late Eastern Roman Empire on the one hand, and the Persians, and later the Arabs, on the other. This is especially true since after the first occurrences of the pandemic in the mid-6th c. CE, the Eastern part of the Mediterranean basin experienced a peak in population and number of sites, suggesting that the Justinianic

153 Castiglia – Pergola 2023, 137, 151–152.

plague was not severe and possibly inconsequential in the long term. Furthermore, some of the finds from certain areas in Turkey and North Africa imply that there was higher precipitation in certain areas, which may have assisted in settlement and population expansion, and contributed to the peak in population at the end of the 6th century CE. Therefore, it is possible that the climate change in those sub-regions may have counter-balanced the higher mortality rates during the Justinianic plague.

As there was no change in the climate in the mid-7th c. CE and the pandemic occurrences became more sporadic and milder, the reason for the deterioration of the area most probably was the constant state of war and the deterioration of trade and central organization. This decline, which was encouraged by bouts of conflict, continued into the 8th c. CE.

Acknowledgments: The authors would like to thank John Haldon and Lee Mordechai for their advice and comments throughout the research process of this project, which eventually produced this article. Their help greatly improved the product of this ongoing research. If there are still any mistakes in the article, they are ours and ours alone.

Bibliography

Alston 1999: R. Alston, The Revolt of the Boukoloi. Geography, History and Myth, in: K. Hopwood – R. Alston (eds.), Organised Crime in Antiquity, London 1999, 129–153.

Arjava 2005: A. Arjava, The Mystery Cloud of 536 CE in the Mediterranean Sources, DOP 59, 2005, 73–94.

Armstrong 1996: P. Armstrong, The Survey Area in the Byzantine and Ottoman Periods, in: W. G. Cavanagh (ed.), The Laconia Survey. Continuity and Change in a Greek Rural Landscape, London 1996, 339–401.

Israel Antiquities Authority: I. A. Authority, The Archaeological Survey of Israel, 2022, https://survey.antiquities.org.il/#/, last accessed 19.02.2023.

Avner 2006: U. Avner, Settlement Patterns in the Wadi Arabah and the Adjacent Desert Areas. A View from the Eilat Region, in: P. Bienkowski – K. Galor (eds.), Crossing the Rift. Resources, Settlements Patterns, and Interaction in the Wadi Arabah, Oxford 2006, 51–74.

Avni 2010: G. Avni, The Persian Conquest of Jerusalem (614 C.E.). An Archaeological Assessment, BASO 357, 2010, 35–48.

Avni 2014: G. Avni, The Byzantine-Islamic Transition in Palestine. An Archaeological Approach, Oxford 2014.

Avni – Bar-Oz – Gambash 2023: G. Avni – G. Bar-Oz – G. Gambash, When "the Sweet Gifts of Bacchus" Ended. New Archaeological Evidence for Settlement Changes and the Decline of Wine Production in Late Antique Southern Palestine, BASO 389.1, 2023, 1–19.

Bar-Oz 2007: G. Bar-Oz et al., "Holy Garbage". A Quantitative Study of the City-Dump of Early Roman Jerusalem, Levant 39, 2007, 1–12.

Bar-Oz 2019: G. Bar-Oz et al., Ancient Trash Mounds Unravel Urban Collapse a Century before the End of Byzantine Hegemony in the Southern Levant, PNAS 116.17, 2019, 8239–8248.
Bar – Zertal 2021: S. Bar – A. Zertal, The Manasseh Hill Country Survey, VI: The Eastern Samaria Shoulder, from Nahal Tirzah (Wadi Far'ah) to Ma'ale Ephraim Junction, Leiden 2021.
Bar – Zertal 2022: S. Bar – A. Zertal, The Manasseh Hill Country Survey, VII: The South-Eastern Samaria Shoulder, from Wadi Rashash to Wadi 'Aujah, Leiden 2022.
Benovitz 2014: N. Benovitz, The Justinianic Plague. Evidence from the Dated Greek Epitaphs of Byzantine Palestine and Arabia, JRA 27.1, 2014, 487–498.
Bintliff – Snodgrass 1985: J. L. Bintliff – A. M. Snodgrass, The Cambridge/Bradford Boeotian Expedition. The First Four Years, JFA 12.2, 1985, 123–161.
Bobou – Raja – Romanowska 2021: O. Bobou – R. Raja – I. Romanowska, Historical Trajectories of Palmyra's Elites through the Lens of Archaeological Data, Journal of Urban Archaeology 4, 2021, 153–166.
Bowden – Gill 1997a: H. Bowden – D. Gill, Late Roman Methana, in: C. Mee – H. A. Forbes – M. P. Atherton (eds.), A Rough and Rocky Place. The Landscape and Settlement History of the Methana Peninsula, Greece, Liverpool 1997, 84–91.
Bowden – Gill 1997b: H. Bowden – D. Gill, Roman Methana, in: C. Mee – H. A. Forbes – M. P. Atherton (eds.), A Rough and Rocky Place. The Landscape and Settlement History of the Methana Peninsula, Greece, Liverpool 1997, 77–83.
Bronk Ramsey 2009: C. Bronk Ramsey, Bayesian Analysis of Radiocarbon Dates, Radiocarbon 51.1, 2009, 337–360.
Bruins 2012: H. J. Bruins, Ancient Desert Agriculture in the Negev and Climate-Zone Boundary Changes During Average, Wet and Drought Years, Journal of Arid Environments 86, 2012, 28–42.
Büntgen 2016: U. Büntgen et al., Cooling and Societal Change During the Late Antique Little Ice Age from 536 to around 660 A.D., Nature Geoscience 9.3, 2016, 231–236.
Butler – Fraser 1978: A. J. Butler – P. M. Fraser, The Arab Conquest of Egypt and the Last Thirty Years of the Roman Dominion, Oxford 1978[2].
Carter 1970: J. M. Carter, The Battle of Actium. The Rise and Triumph of Augustus Caesar, London 1970.
Castiglia – Pergola 2023: G. Castiglia – P. Pergola, Late Antique and Early Christian Corsica. An Archaeological Overview, in: A. C. Barba – D. Tanasi – R. Miccichè (eds.), Archaeology of the Mediterranean During Late Antiquity and the Middle Ages, Gainesville 2023, 135–155.
Conant 2022: J. P. Conant, The Vandals, in: R. B. Hitchner (ed.), A Companion to North Africa in Antiquity, Hoboken 2022, 375–390.
Cook 1973: J. M. Cook, The Troad. An Archaeological and Topographical Study, Oxford 1973.
Cosijns – Olshanetsky 2022: L. Cosijns – H. Olshanetsky, Did the Byzantine Negev Settlements Exhaust the Surrounding Environment? A Response to "Environment and Horticulture in the Byzantine Negev Desert, Israel: Sustainability, Prosperity and Enigmatic Decline", Graeco-Latina Brunensia 27.2, 2022, 5–14.
Dagan 2009: Y. Dagan, Archaeological Surveys in Israel and Their Contribution to Our Understanding of Settlement Distribution. The Judean Shephelah – a Case Study, in: H. Sağlamtimur et al. (eds.), Studies in Honour of Altan Çilingiroğlu. A Life Dedicated to Urartu on the Shores of the Upper Sea, Galatasaray 2009, 217–228.
Dagan 2010: Y. Dagan, The Ramat Bet Shemesh Regional Project. The Gazetteer, Jerusalem 2010.
Dagan – Bonfil – Sharon 2011: Y. Dagan – R. Bonfil – I. Sharon, The Ramat Bet Shemesh Regional Project. Landscapes of Settlement from the Paleolithic to the Ottoman Periods, Jerusalem 2011.
De Barros Damgaard 2018: P. De Barros Damgaard et al., 137 Ancient Human Genomes from across the Eurasian Steppes, Nature 557.7705, 2018, 369–374.

De Vos Raaijmakers – Attoui 2013: M. De Vos Raaijmakers – R. Attoui, Rus Africum, I: Le paysage rural antique autour de Dougga et Téboursouk. Cartographie, elevés et chronologie des établissements, Bari 2013.

De Vos Raaijmakers – Attoui – Battisti 2013: M. De Vos Raaijmakers – R. Attoui – A. Battisti, Rus Africum, II: Le paysage rural antique autour e Dougga. L'aqueduc Aïn Hammam-Thugga, cartographie et relevés, Bari 2013.

Di Segni 1999: L. Di Segni, Epigraphic Documentation on Building in the Provinces of Palaestina and Arabia, 4th–7th c., in: J. H. Humphrey (ed.), The Roman and Byzantine Near East, II: Some Recent Archaeological Research, JRA Supplementary Series 31, Portsmouth (Rhode Island) 1999, 149–178.

Donner 2014: F. M. Donner, The Early Islamic Conquests, Princeton 2014.

Eck 2007: W. Eck, The Age of Augustus, Oxford 2007.

Eisenberg – Mordechai 2019: M. Eisenberg – L. Mordechai, The Justinianic Plague. An Interdisciplinary Review, Byzantine and Modern Greek Studies 43.2, 2019, 156–180.

Eisenberg – Mordechai 2020: M. Eisenberg – L. Mordechai, The Justinianic Plague and Global Pandemics. The Making of the Plague Concept, AHR 125.5, 2020, 1632–1667.

Elias 2007: A. Elias et al., Active Thrusting Offshore Mount Lebanon. Source of the Tsunamigenic AD 551 Beirut – Tripoli Earthquake, Geology 35.8, 2007, 755–758.

Elton 2018: H. Elton, The Roman Empire in Late Antiquity. A Political and Military History, Cambridge 2018.

Erickson-Gini 2022: T. Erickson-Gini, Evidence of a Late Byzantine Period Earthquake and a Monastic Stable at 'Avedat (Oboda), 'Atiqot 107, 2022, 153–197.

Erickson-Gini – Mamalya 2022: T. Erickson-Gini – H. Mamalya, A Late Roman Caravanserai and Early Byzantine Winepress near Be'er Mash'abim (Bir 'Asluj) in the Central Negev, in: A. Golani et al. (eds.), Archaeological Excavations and Research Studies in Southern Israel, Jerusalem 2022, 139–167.

Fenwick 2013: C. Fenwick, From Africa to Ifrīqiya. Settlement and Society in Early Medieval North Africa (650–800), Al-Masaq 25.1, 2013, 9–33.

Fenwick 2022: C. Fenwick, The Arab Conquests and the End of Ancient Africa?, in: R. B. Hitchner (ed.), A Companion to North Africa in Antiquity, Hoboken 2022, 424–438.

Forsén 2003: B. Forsén, The Archaic-Hellenistic Periods – Conclusions, in: J. Forsén –B. Forsén (eds.), The Asea Valley Survey. An Arcadian Mountain Valley from the Paleolithic Period until Modern Times, Stockholm 2003, 247–271.

Forsén – Karivieri 2003: B. Forsén – A. Karivieri, The Roman-Early Modern Periods. Conclusions, in: J. Forsén – B. Forsén (eds.), The Asea Valley Survey. An Arcadian Mountain Valley from the Paleolithic Period until Modern Times, Stockholm 2003, 307–331.

Foss 2003: C. Foss, The Persians in the Roman near East (602–630 AD), JRA 13.2, 2003, 149–170.

Fouracre 2008: P. Fouracre, The New Cambridge Medieval History, I: c.500–c.700, 2008.

Frankel 2001: R. Frankel, Settlement Dynamics and Regional Diversity in Ancient Upper Galilee. Archaeological Survey of Upper Galilee, Jerusalem 2001.

Frankopan 2023: P. Frankopan, The Earth Transformed. An Untold History, London 2023.

Fratantuono 2016: L. Fratantuono, The Battle of Actium 31 BC. War for the World, Barnsley 2016.

Fuks 2017: D. Fuks et al., Dust Clouds, Climate Change and Coins. Consiliences of Palaeoclimate and Economy in the Late Antique Southern Levant, Levant 49.2, 2017, 205–223.

Fuks – Avni – Bar-Oz 2021: D. Fuks – G. Avni – G. Bar-Oz, The Debate on Negev Viticulture and Gaza Wine in Late Antiquity, Tel Aviv 48.2, 2021, 143–170.

Fuks 2020: D. Fuks et al., The Rise and Fall of Viticulture in the Late Antique Negev Highlands Reconstructed from Archaeobotanical and Ceramic Data, PNAS 117.33, 2020, 197801–199791.

Goldsworthy 2014: A. K. Goldsworthy, Augustus. From Revolutionary to Emperor, London 2014.
Gruen 2005: E. S. Gruen, Augustus and the Making of the Principate, in: K. Galinsky (ed.), The Cambridge Companion to the Age of Augustus, Cambridge 2005, 33–52.
Hall 2004: L. J. Hall, Roman Berytus. Beirut in Late Antiquity, London 2004.
Harper 2016: K. Harper, People, Plagues, and Prices in the Roman World. The Evidence from Egypt, The Journal of Economic History 76.3, 2016, 803–839.
Harper 2017: K. Harper, The Fate of Rome. Climate, Disease, and the End of an Empire, Princeton History of the Ancient World, Princeton 2017.
Heather 2005: P. J. Heather, The Fall of the Roman Empire, London 2005.
Heather 2018: P. J. Heather, Rome Resurgent. War and Empire in the Age of Justinian, New York 2018.
Helama – Jones – Briffa 2017: S. Helama – P. D. Jones – K. R. Briffa, Dark Ages Cold Period. A Literature Review and Directions for Future Research, Holocene 27.10, 2017, 1600–1606.
Hirschfeld 1997: Y. Hirschfeld, Farms and Villages in Byzantine Palestine, DOP 51, 1997, 33–71.
Holzer 2010: A. Holzer et al., Desert Kites in the Negev Desert and Northeast Sinai. Their Function, Chronology and Ecology, Journal of Arid Environments 74.7, 2010, 806–817.
Howard-Johnston 2006: J. Howard-Johnston, East Rome, Sasanian Persia and the End of Antiquity, Historiographical and Historical Studies, Variorum Collected Studies, Aldershot 2006.
Ibrahim 2002: R. R. Ibrahim, The Battle of Yarmuk. An Assessment of the Immediate Factors behind the Islamic Conquests, Fresno 2002.
Jameson 1994: M. H. Jameson et al., Countryside. The Southern Argolid from Prehistory to the Present Day, Stanford 1994.
Kaegi 1992: W. E. Kaegi, Byzantium and the Early Islamic Conquests, Cambridge 1992.
Keller 2019: M. Keller et al., Ancient Yersinia Pestis Genomes from across Western Europe Reveal early Diversification during the First Pandemic (541–750), PNAS 116.25, 2019, 12363–12372.
Kenawi 2014: M. Kenawi, Alexandria's Hinterland. Archaeology of the Western Nile Delta, Oxford 2014.
Kingsley 1999: S. A. Kingsley, Specialized Production and Long-Distance Trade in Byzantine Palestine, Diss. University of Oxford, 1999.
Kingsley 2004: S. A. Kingsley, Shipwreck Archaeology of the Holy Land. Processes and Parameters, London 2004.
Kochavi 1972: M. Kochavi, Judaea, Samaria and the Golan. Archaeological Survey, 1967–1968, Jerusalem 1972.
Kouki 2013: P. Kouki, Problems of Relating Environmental History to Human Settlement in the Classical and Late Classical Periods – the Example of Southern Jordan, in: W. V. Harris (ed.), The Ancient Mediterranean Environment between Science and History, Leiden 2013, 213–231.
Koukoulis 1997: T. Koukoulis, Medieval Methana, in: C. Mee – H. A. Forbes – M. P. Atherton (eds.), A Rough and Rocky Place. The Landscape and Settlement History of the Methana Peninsula, Greece, Liverpool 1997, 92–100.
Langgut 2020: D. Langgut et al., Environment and Horticulture in the Byzantine Negev Desert, Israel. Sustainability, Prosperity and Enigmatic Decline, Quaternary International 593, 2020, 160–177.
Lantos – Bar-Oz – Gambash 2020: S. Lantos – G. Bar-Oz – G. Gambash, Wine from the Desert. Late-Antique Negev Viniculture and the Famous Gaza Wine, Near Eastern Archaeology 83.1, 2020, 56–64.
Leidwanger 2020: J. Leidwanger, Roman Seas. A Maritime Archaeology of Eastern Mediterranean Economies, Oxford 2020.

Little 2007: L. K. Little, Plague and the End of Antiquity. The Pandemic of 541–750, New York 2007.
Lloyd 1977: J. A. Lloyd et al., Excavations at Sidi Khrebish, Benghazi (Berenice), Supplements to Libya Antiqua V, Tripoli 1977.
Magness 2003: J. Magness, The Archaeology of the Early Islamic Settlement in Palestine, Winona Lake 2003.
Mahmoud – Gan 2020: S. H. Mahmoud – T. Y. Gan, Multidecadal Variability in the Nile River Basin Hydroclimate Controlled by Enso and Indian Ocean Dipole, Science of The Total Environment 748, 2020, 1–18.
Majcherek 1995: G. Majcherek, Gazan Amphorae. Typology Reconsidered, in: H. Meyza – Y. Młynarczyk (eds.), Hellenistic and Roman Pottery in the Eastern Mediterranean. Advances in Scientific Studies-Acts of the II Nieborów Pottery Workshop, Nieborów, 18–20 December 1993, Warsaw 1995, 163–178.
Mango 2001: M. M. Mango, Beyond the Amphora. Non-Ceramic Evidence for Late Antique Industry and Trade, in: M. Decker – S. A. Kingsley (eds.), Economy and Exchange in the East Mediterranean During Late Antiquity. Proceedings of a Conference at Somerville College, Oxford – 29th May, 1999, Oxford 2001, 87–106.
Maranzana 2021: P. Maranzana, Resilience and Adaptation at the End of Antiquity. An Evaluation of the Impact of Climate Change in Late Roman Western-Central Anatolia, in: P. Erdkamp –J. G. Manning – K. Verboven (eds.), Climate Change and Ancient Societies in Europe and the near East. Diversity in Collapse and Resilience, Cham 2021, 561–586.
McCormick 2012: M. McCormick, Movements and Markets in the First Millennium. Information, Containers and Shipwrecks, in: C. Morrisson (ed.), Trade and Markets in Byzantium, Washington, D.C. 2012, 51–98.
McCormick 2015: M. McCormick, Tracking Mass Death during the Fall of Rome's Empire I, JRA 28.1, 2015, 325–358.
McCormick 2016: M. McCormick, Tracking Mass Death during the Fall of Rome's Empire, II: A First Inventory of Mass Graves, JRA 29, 2016, 1004–1007.
McCormick 2021: M. McCormick, Gregory of Tours on Sixth-Century Plague and Other Epidemics, Speculum 96.1, 2021, 3896.
McCormick 2012: M. McCormick et al., Climate Change during and after the Roman Empire. Reconstructing the Past from Scientific and Historical Evidence, The Journal of Interdisciplinary History 43.2, 2012, 169–220.
McCormick 2020: M. McCormick et al., Summary Geodatabase of Shipwrecks, 1500 BCE to 1500 CE, in: Mapping Past Societies, Initiative for the Science of the Human Past, Cambridge (MA) 2020, https://docs.google.com/spreadsheets/d/11fk5YeQ4eFOnYSBNpUdHp4TP42gJ7wY5/edit#gid=970169931, last accessed 21.03.2023.
Meier 2016: M. Meier, The 'Justinianic Plague'. The Economic Consequences of the Pandemic in the Eastern Roman Empire and Its Cultural and Religious Effects, Early Medieval Europe 24.3, 2016, 267–292.
Meier 2020: M. Meier, The 'Justinianic Plague'. An "Inconsequential Pandemic"? A Reply, Medical History 55.2, 2020, 172–199.
Mikhail 2016: M.S.A. Mikhail, From Byzantine to Islamic Egypt. Religion, Identity and Politics after the Arab Conquest, London 2016.
Mordechai – Eisenberg 2019: L. Mordechai – M. Eisenberg, Rejecting Catastrophe. The Case of the Justinianic Plague, P&P 244.1, 2019, 3–48.
Mordechai 2019: L. Mordechai et al., The Justinianic Plague. An Inconsequential Pandemic?, PNAS 116.51, 2019, 25546–25554.

Morrison 2022: C. Morrison, Late Roman, Vandal, and Byzantine Coinage in Africa, in: R. B. Hitchner (ed.), A Companion to North Africa in Antiquity, Hoboken 2022, 410–423.
Nicolle 1994: D. Nicolle, Yarmuk, 636 AD. The Muslim Conquest of Syria, London 1994.
Niewöhner 2011: P. Niewöhner, The Riddle of the Market Gate. Miletus and the Character and Date of Earlier Byzantine Fortifications in Anatolia, in: O. Dally – C. J. Ratté (eds.), Archaeology and the Cities of Asia Minor in Late Antiquity, Ann Arbor 2011, 103–122.
Niewöhner 2013: P. Niewöhner, Phrygian Marble and Stonaemasonry as Markers of Regional Distinctiveness in Late Antiquity, in: P. Thonemann (ed.), Roman Phrygia. Culture and Society, Cambridge 2013, 215–248.
Nol 2022: H. Nol, Settlement and Urbanization in Early Islamic Palestine (7th–11th Centuries). Texts and Archaeology Contrasted, New York 2022.
Olshanetsky – Cosijns 2021: H. Olshanetsky – L. Cosijns, The Persian Invasion of 614 A.D. As a Possible Catalyst for the Decline and Fall of the Negev Settlements, Diogenes 12, 2021, 4–25.
Olshanetsky – Cosijns 2022: H. Olshanetsky – L. Cosijns, Did They Influence at All? A Re-Analysis of the Effects of the Late Antique Little Ice Age and the Justinianic Plague on the Eastern Roman Empire During the 6th and 7th Centuries CE, Muza 5, 2022, 24–41.
Olshanetsky – Cosijns 2023: H. Olshanetsky – L. Cosijns, Did We Stop Throwing away the Garbage? Negating Urban Collapse at Elusa in the Sixth Century CE, IEJ 73.1, 2023, 88–104.
Peacock 2006: D.P.S. Peacock et al., Myos Hormos – Quseir Al-Quadim. Roman and Islamic Ports on the Red Sea, Oxford 2006.
Peregrine 2020: P. N. Peregrine, Climate and Social Change at the Start of the Late Antique Little Ice Age, Holocene 30.11, 2020, 1643–1648.
Pieri 2005: D. Pieri, Le commerce du vin oriental à l'époque byzantine (Ve–Viie siècles). Le témoignage des amphores en Gaule, Beyrouth 2005.
Poulou 2023: N. Poulou, Digging in the Dark. The Islands of the Aegean and Crete from Late Antiquity to the Early Middle Ages, Late Sixth through Ninth Centuries CE, in: A. C. Barba – D. Tanasi – R. Miccichè (eds.), Archaeology of the Mediterranean During Late Antiquity and the Middle Ages, Gainesville 2023, 13–52.
Pourshariati 2017: P. Pourshariati, Decline and Fall of the Sasanian Empire. The Sasanian-Parthian Confederacy and the Arab Conquest of Iran, London 2017.
Rathje – Murphy 2001: W. L. Rathje – C. Murphy, Rubbish! The Archaeology of Garbage, Tucson 2001.
Rautman 2021: M. Rautman, Valley and Village in Late Roman Cyprus, in: W. Bowden – L. Lavan – C. Machado (eds.), Recent Research on the Late Antique Countryside, Leiden 2021, 189–218.
Reimer 2020: P. J. Reimer et al., The Intcal20 Northern Hemisphere Radiocarbon Age Calibration Curve (0–55 Cal Kbp), Radiocarbon 62.4, 2020, 725–757.
Reynolds 1995: P. Reynolds, Trade in the Western Mediterranean, A.D. 400–700. The Ceramic Evidence, Oxford 1995.
Roberts 2018: N. Roberts et al., Not the End of the World? Post-Classical Decline and Recovery in Rural Anatolia, Human Ecology 46.3, 2018, 305–322.
Römer – Bailey 2019: C. Römer – D. M. Bailey, The Fayoum Survey Project. The Themistou Meris, Leuven 2019.
Rose 2011: C. B. Rose, Troy and the Granicus River Valley in Late Antiquity, in: O. Dally – C. J. Ratté (eds.), Archaeology and the Cities of Asia Minor in Late Antiquity, Ann Arbor 2011, 151–171.
Rosen 2017: S. A. Rosen, Basic Instabilities? Climate and Culture in the Negev over the Long Term, Geoarchaeology 32.1, 2017, 6–22.
Rubin 1998: R. Rubin, The Roman-Byzantine Empire and Its Desert Frontiers. The Negev vs Tripolitania. A Comparative Study, Cathedra 89, 1998, 63–82.

Sarris 2002: P. Sarris, The Justinianic Plague. Origins and Effects, Continuity and Change 17.2, 2002, 169–182.
Sarris 2011: P. Sarris, Empires of Faith, Oxford History of Medieval Europe, Oxford 2011.
Sarris 2020: P. Sarris, Climate and Disease, in: E. Hermans (ed.), A Companion to the Global Early Middle Ages, Leeds 2020, 511–537.
Sarris 2022: P. Sarris, Viewpoint New Approaches to the 'Plague of Justinian', P&P 254.1, 2022, 315–346.
Sazanov 2017: A. Sazanov, Les Amophores Lra_4. Problèmes de typologie et de chronologie, in: D. Dixneuf (ed.), LRCW 5: Late Roman Coarse Wares, Cooking Wares and Amphorae in the Mediterranean. Archaeology and Archaeometry, Oxford 2017, 629–650.
Seligman 2020: J. Seligman, Were the Central Negev Settlements Suppliers or Importers of Gaza Wines?, JRA 33, 2020, 249–270.
Sessa 2019: K. Sessa, The New Environmental Fall of Rome. A Methodological Consideration, Journal of Late Antiquity 12.1, 2019, 211–255.
Shipley 1996: G. Shipley, The Survey Area in the Hellenistic and Roman Periods, in: W. G. Cavanagh (ed.), The Laconia Survey. Continuity and Change in a Greek Rural Landscape, London 1996, 257–337.
Sidebotham 2011: S. E. Sidebotham, Berenike and the Ancient Maritime Spice Route, Berkeley 2011.
Sigl 2015: M. Sigl et al., Timing and Climate Forcing of Volcanic Eruptions for the Past 2,500 Years, Nature 523.7562, 2015, 543–549.
Sion 2014: O. Sion, The Archaeological Survey of Israel, Qadmoniot 47.148, 2014, 58–66.
Sivan 2008: H. Sivan, Palestine in Late Antiquity, Oxford 2008.
Spiciarich – Gadot – Sapir-Hen 2017: A. Spiciarich – Y. Gadot – L. Sapir-Hen, The Faunal Evidence from Early Roman Jerusalem. The People Behind the Garbage, Tel Aviv 44.1, 2017, 98–117.
Stathakopoulos 2004: D. Stathakopoulos, Famine and Pestilence in the Late Roman and Early Byzantine Empire. A Systematic Survey of Subsistence Crises and Epidemics, Aldershot 2004.
Strauss 2013: J. Strauss, Shipwrecks Database. Version 1.0, 2013, http://oxrep.classics.ox.ac.uk/databases/shipwrecks_database/, last accessed 21.03.2023.
Tazel 2013: I. Taxel, Rural Settlement Processes in Central Palestine, ca. 640–800 C.E. The Ramla-Yavneh Region as a Case Study, BASO 369.369, 2013, 157–199.
Tchalenko 1953: G. Tchalenko, Villages antiques de la Syrie du nord. Le Massif du Bélus à l'époque romaine I, Paris 1953.
Tepper 2018: Y. Tepper et al., Pigeon-Raising and Sustainable Agriculture at the Fringe of the Desert. A View from the Byzantine Village of Sa'adon, Negev, Israel, Levant 50.1, 2018, 91–113.
Thonemann 2011: P. Thonemann, The Maeander Valley. A Historical Geography from Antiquity to Byzantium, Cambridge 2011.
Todd 2013: I. A. Todd, Vasilikos Valley Project 12. The Field Survey of the Vasilikos Valley III, Sävedalen 2013.
Toohey 2016: M. Toohey et al., Climatic and Societal Impacts of a Volcanic Double Event at the Dawn of the Middle Ages, Climatic Change 136.3–4, 2016, 401–413.
Tsafrir – Foerster 1997: Y. Tsafrir – G. Foerster, Urbanism at Scythopolis-Bet Shean in the Fourth to Seventh Centuries, Dumbarton Oaks Papers 51, 1997, 85–146.
Vanhaverbeke 2021: H. Vanhaverbeke et al., Late Antiquity in the Territory of Sagalassos, in: W. Bowden – L. Lavan – C. Machado (eds.), Recent Research on the Late Antique Countryside, Leiden 2021, 247–279.
Ward-Perkins 2005: B. Ward-Perkins, The Fall of Rome and the End of Civilization, Oxford 2005.
Wickham 2005: C. Wickham, Framing the Early Middle Ages. Europe and the Mediterranean 400–800, Oxford 2005.

Wilson 2009: A. Wilson, Approaches to Quantifying Roman Trade, in: A. Bowman – A. Wilson (eds.), Quantifying the Roman Economy, Oxford 2009, 213–249.
Wilson – Grigoropoulos 2009: P. Wilson – D. Grigoropoulos, The West Nile Delta Regional Survey, Beheira and Kafr El-Sheikh Provinces, London 2009.
Yan 2021: X. Yan et al., Ftir Bone Characterization and Radiocarbon Dating. Timing the Abandonment of Byzantine Pigeon Towers in the Negev Desert, Israel, Radiocarbon 63.6, 2021, 1715–1735.
Zertal 2004: A. Zertal, The Manasseh Hill Country Survey, I: The Shechem Syncline, Leiden 2004.
Zertal 2008: A. Zertal, The Manasseh Hill Country Survey, II: The Eastern Valleys and the Fringes of the Desert, Leiden 2008.
Zertal – Bar 2017: A. Zertal – S. Bar, The Manasseh Hill Country Survey, IV: From Nahal Bezeq to the Sartaba, Leiden 2017.
Zertal – Bar 2019: A. Zertal – S. Bar, The Manasseh Hill Country Survey, V: The Middle Jordan Valley, from Wadi Fasael to Wadi 'Aujah, Leiden 2019.
Zertal – Mirkam 2016: A. Zertal – N. Mirkam, The Manasseh Hill Country Survey, III: From Nahal 'Iron to Nahal Shechem, Leiden 2016.