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"A Great and Terrible Event": Historical Evidence for the 551 CE Tsunami at Akko, Israel

Emma Heidtman
University of Rhode Island, emma_heidtman@my.uri.edu

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“A GREAT AND TERRIBLE EVENT”: HISTORICAL
EVIDENCE FOR THE 551 CE TSUNAMI AT AKKO,
ISRAEL
BY
EMMA HEIDTMAN

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF
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MASTER OF ARTS IN HISTORY THESIS

OF

EMMA HEIDTMAN

APPROVED:

Thesis Committee:

Major Professor Bridget Buxton

Rod Mather

Mary Hollinshead

Nasser H. Zawia
DEAN OF THE GRADUATE SCHOOL

UNIVERSITY OF RHODE ISLAND
2015

ABSTRACT

In 2001, the Old City of Akko in northern Israel was declared a UNESCO World Heritage site. This designation was based on the Old City's well-preserved Ottoman and Islamic-era town and the partly subterranean ruins of the once-thriving Crusader port. Five years of excavation, from 2009 to 2014, have uncovered more of Akko's history as a strategic naval outpost for several iterations of Mediterranean Sea power, particularly during the Hellenistic Age. However, evidence for Akko's harbor operations during the Byzantine period is still being uncovered. In light of recent discoveries in geoarchaeology, scientists have learned that part of Akko's Byzantine history includes the tsunami of 551 CE, which struck the port cities of the Levantine coast from as far north as Beirut to the port of Caesarea Maritima, 64 kilometers to the south. This tsunami had substantial and meaningful consequences for Akko's harbor and the surrounding town, which led to long-term effects on the city following the disaster.

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CHAPTER 1

INTRODUCTION

In 2001, the Old City of Akko in northern Israel was declared a UNESCO World Heritage site. This designation was conferred in recognition of the Old City's well-preserved Ottoman and Islamic-era town and the partly subterranean ruins of the once-thriving Crusader port. Five years of excavation by the Israel Antiquities Authority, from 2009 to 2014, have uncovered more of Akko's history as a strategic naval outpost, particularly during the Hellenistic Age. However, evidence for Akko's harbor operations during the Byzantine period is still being uncovered.¹ Evidence suggests that this once vital and strategic port diminished in significance sometime after the first century BCE and was no longer being used for military purposes, but simply for local trade.²

In light of recent geoarchaeological discoveries, there is reason to believe that Byzantine Akko was impacted significantly by a tsunami and earthquake event that is attested in 551 CE. No research to date has attempted to examine the specific effects such an event might have had on Akko. This tsunami struck the coastline of what is now modern day Lebanon, and affected Beirut, the 'jewel of Phoenicia', considerably enough

¹The final publication of the recent IAA-URI excavations in Akko's Roman and Hellenistic military harbor is forthcoming, pending pottery and sediment core analyses. For the purposes of this study, the "Byzantine Empire" covers the early period of the Byzantines' dominion over the Eastern Mediterranean, starting with Constantine I's reign in 330 CE and ending with Heraclius and the Islamic conquests, who ruled until 641 CE. The Roman period is considered as the years between the establishment of Roman rule in the Near East, approximately 63 BCE, until 285 CE with the establishment of Eastern and Western empires under Diocletian

²An earlier tsunami was probably responsible for Akko's degradation after the Early Roman period. Pieces of broken coral, one of which has been dated to the 1st century BCE, are indicative of a high energy event which dumped a large amount of biological material into Akko's harbor. (Personal Communication, J. Sharvit)

that the law center there had to be moved farther south to the port city Sidon.³ Caesarea Maritima, known for its splendid early Roman harbor built by King Herod the Great of Judea, was also struck by this particular tsunami during the Byzantine Period.⁴ The purpose of this study is to address the question of how the tsunami impacted Akko based on the available evidence, and consider the broader historical implications of what seems to have been a major regional disaster.

This paper will first consider the historical framework of the sixth century, detailing major events of this era. The first chapter will specifically address the two major military offensives fought by the Byzantine Empire against the Sasanian Persians and the established barbarian kingdoms in the West, and the economic implications that accompanied this warfare. The second chapter of this study presents available evidence about the 551 CE tsunami itself, including the extent of its impact, written reports about the event that have survived from the ancient world, and its significance within a larger geological trend known as the Early Byzantine Paroxysm. The third chapter will discuss the historical evidence for the situation in Byzantine Akko before the tsunami of 551 CE, and evidence for an earlier earthquake event attested in the region in 502 CE.

In the final chapter, the tsunami's impact on surrounding cities will be explored. Large urban centers like Caesarea Maritima and Scythopolis provide the best comparison because of their proximity to Akko, as well as an apparent period of economic decline which each experienced in the second half of the sixth century. Such decline could have occurred at Akko also, albeit on a smaller scale. The central historical question, which has been raised recently in the studies of Caesarea by Goodman and Dey is to what extent

³ For studies on this particular tsunami as it relates to other cities that were affected, see Darawacheh et al. 2000, Elias et al. 2007, Goodman et al. 2009, & Goodman & Dey 2010..

⁴ Herod the Great established the harbor and city of Caesarea Maritima between 25-13 BCE.

the 551 CE earthquake and tsunami, and presumed destruction of coastal infrastructure, contributed to the military preparedness and economic resources of the region before and into the period of Persian and Islamic conquests in the following century.⁵ The evidence compiled here will demonstrate that the tsunami of 551 CE and its accompanying earthquake contributed considerably to the decline at Caesarea and Akko. However, more archaeological and historical information must be gathered before a connection can be made between the decline of port cities and the military significance of Akko's geographic position in the centuries following.

This study is important for several reasons. First of all, this report has notable implications for the future of tectonic study in Israel and the Near East. Israel sits atop the Dead Sea Transform (DST), an active tectonic fault system. Although predicting earthquakes is nowhere near an exact science, tsunami hazard evaluation studies have revealed that the risk of a large seismic event is a distinct possibility in the near future.⁶ Historical earthquake evaluations have been critical to showing the pattern of tectonic events in the past and for making educated predictions to prepare for such disasters. Second, Akko is a critically important historical site, with many undiscovered cultural resources. These resources are threatened, both by human activity, and natural forces such as erosion and tectonic activity. As underwater research in Akko harbor is

⁵Goodman & Dey 2010. Throughout this paper, I will use "Muslim" or "Islamic" when referring to the conflicts of the seventh and eighth centuries. These armies were united by their religion, and while their motivations for conquest may not have been consistently religious in nature, their identification as a religious group makes it so that Muslim or Islamic are the most appropriate terms for them. In addition, much of the literature on Akko refers to the city's "Islamic" period, and for consistency it will continue to be referred to as such. The Islamic period of Akko spans from 638 – 1104 CE. When "Arab" tribes are mentioned, I am referring to the groups of Arabs who existed on the fringes of the Byzantine Empire prior to the Mohammed's unification of these peoples and the establishment of Islam as a religion. While many of these tribes became Muslim later on, at the time that I am referring to in the sixth century, they were not unified under Islam.

⁶Salamon et al., 2008.

relatively new and has been focused in the Eastern Basin to date, this study will answer some unaddressed questions about Akko's past, specifically those about human activity and environmental interaction in the face of natural disasters. This study will also establish further lines of inquiry for future research into the role

Studying the 551 CE tsunami at Akko is not only necessary for placing this port city in the larger historical context of the Byzantine period, but also provides information on how the landscape and the people have responded in the past to natural disasters, and how they might react in the future.

CHAPTER 2

HISTORICAL BACKGROUND

The Eastern Mediterranean region underwent great changes during the sixth century. Christianity, now a dominant political force, further centralized and established itself as the primary religion of the land. Simultaneously, the physical landscape of Roman cities changed as churches were built in staggering numbers atop the trademark structures of the traditional Roman city, such as the forum and the eastern agora.⁷ Justinian I, the emperor who ruled the majority of the century, financed many of the church constructions as part of a massive building campaign. This campaign also supported the construction of multiple civic structures. The empire experienced the virulent and devastating precursor to the medieval Black Plague, whose effects ravaged the population. In the latter half of the century, the disease resurfaced four other times.⁸ The violent struggle between the Byzantine empire and the neighboring Sasanian Persians was all consuming; Antioch, a critical and strategic city of the Syrian province, was besieged and ransacked by the Persians no less than three times in this hundred-year period.⁹ While the Islamic conquests would not start until the seventh century, Arab influences and trading connections were growing increasingly present in eastern cities during sixth century. This influence paved the way for the rise of Islam, which would overtake most of the Byzantine Empire in less than a hundred years. The sixth century

⁷ See Saradi 2006; Kennedy 1985b. For the purposes of this paper, 'Roman' is defined as the period from the establishment of Roman rule in the area, approximately 63 BCE, until 285 CE with the establishment of Eastern and Western empires under Diocletian.

⁸Horden, P. 2005.

⁹ Decker, M. 2007, 234. Antioch refers to Syrian Antioch on the Orontes from this point on, unless otherwise specified.

represents critical changes in the ancient Roman world. This was not the world of a dying empire, but a world which was undergoing a transformation into the medieval period.

Theoretical Background

Thinking about the late antique period in terms of a transformation, rather than a death, was a theory first popularized by Peter Brown, who has long been considered one of the foremost scholars on the period. Brown demonstrated, through analysis of social and cultural history, that the ‘rise’ and ‘fall’ of the Roman empire was more complex than those two words imply.¹⁰ Brown argued that in terms of culture, the Roman world was equally innovative as the world of classical antiquity, and therefore cannot be regarded as a declining society.¹¹ Although Brown focused primarily on the Western Empire, the ideas he brought forth about the period have relevance to many geographical regions during the Byzantine Period, including the Near East.

Christianity no doubt was a driving force in the change from the classical Greco-Roman world to the medieval one and it permeated both the social and political life. However, Byzantine scholars who have studied the period after Brown have looked to other factors that facilitated changes in society. In recent years, scholarship by Averil Cameron has moved to the forefront of Byzantine history. Cameron focuses attention on the division between the Byzantine and Western Roman empires, and how the divisions between the two illuminate the major problems of the period. Both the Byzantine and Western Roman empires had the foundation leftover from the initial Roman system, but each region developed in a drastically different way. Principal among these differences

¹⁰ This focus on cultural history was a marked deviation from Browns’ predecessors, who had focused on ecclesiastical history.

¹¹ Brown 1971

were the earlier urbanization of the East, and the West's struggle to maintain political and military control, which placed a great strain on the economy.¹² Cameron's assessment of the period is that the Byzantine and Western Roman empires experience similar processes, just at vastly different times, which accounts for their disparate histories.¹³

Trade and its role as an indicator of change within the Empire is another major theme of the period.¹⁴ The importance of trade is especially significant for Akko, whose history is intricately connected to its role as a port. Trade connected Mediterranean ports and people and was responsible for the infrastructure and connections that sustained the empire. A decline in trade, which is supported by archaeological and ceramic evidence dating to the seventh century, is seen as a cause of weakness in this system.¹⁵ The downturn in trade had various causes. In some cases, economic production was dismantled by natural disaster, such as plague or earthquake, and in other cases warfare with both Persians and Arabs caused a disruption in the exchange of goods. Gradually Arab invaders gained control of strategic ports, and the network of trade was ablated, at least to some degree.¹⁶ Control of trade allowed for an easier takeover of Roman territory until the Byzantine Empire was significantly reduced in size, both geographically and in terms of political influence. As more ceramic evidence is pieced together, this view of trade has fluctuated and it is most likely that trade was only one factor among many causing disruption in the entire empire.

¹² Cameron 2012, 87.

¹³ Cameron 2012, 88.

¹⁴ McCormick 2002.

¹⁵ Cameron, A. 2012, 208-209. Another work which highlights the importance of trade in the Mediterranean during this period is McCormick (2001). McCormick shows how the economy experienced downturn by using ceramic evidence, and how that same evidence shows an upturn in the eighth century.

¹⁶ The extent to which the Arab takeover affected Mediterranean trade is debated; the 'Pirenne thesis' developed by Henri Pirenne in the 1970s, saw the conquests as the end of the long-distance trade in the Mediterranean, however others, such as Horden & Purcell (2001), note that trading relationships with new areas were now available under the Arabs.

A similar yet alternative theory looks to the increase of Arabic cultural influence in the East at an early date. Starting in the fourth century, Arab groups lived on the fringes of the Byzantine Empire. Their participation in the army and interactions with the empire was important because it illustrates that these groups were already a large part of military society during the sixth century.¹⁷ Trade with Arab communities introduced that culture early on and made the transition to an Islamic regime less shocking. In this way, the rise of Islam was a continuation of late antiquity in the sense that it inherited the late Roman world.¹⁸ This view is influenced by the *longue duree*, or a long view of time, which was introduced in a Mediterranean context first by Pirenne and then expanded upon by Horden and Purcell.¹⁹ To view the transition from the Roman empire to the Islamic world requires an abandonment of traditional historical periods, and assumes that the transition may have happened at different times for different places in the empire. However, this transition was not part of, as Kenneth Holum has described it, a 'homogenous' timeline from the beginning of late antiquity to the coming of Islam.²⁰

This study assumes no one factor can be selected as the reason for the Roman world's transition to the Medieval one, and it will not rely on any one particular aspect. In addition, the Roman world was not just a global system, but also localized by region. Events which devastated one province may have gone wholly unnoticed in other parts of the empire. The challenge now is to determine what these influencing factors were for Akko and the region surrounding it, what their scale and scope were, and how they were

¹⁷ Cameron 2012, 169. Cameron cites several examples of Arab tribes that interacted with the Byzantine and Persian empires as 'clients' of the state during the sixth century. These tribes resided in different areas all over the east, but were especially present in the Arabian Peninsula, the 'fringe' of both empires. Some groups were Christianized; however, the majority had become Muslim by the end of the century.

¹⁸ Holum 2005, 219. Cameron 2012, 209.

¹⁹ Horden & Purcell 2000.

²⁰ Holum 2005, 219.

interrelated. With the presentation of the historical framework, the tsunami of 551 CE can be contextualized with the concurring historical events.

Economic Conditions

The economic conditions of the Byzantine Empire were favorable leading up to the sixth century. This was the result of a well-developed bureaucratic infrastructure descended from the earlier Roman system and supplemented by reforms initiated by Justinian during the early years of his reign. The extensive and flexible trading network throughout the Mediterranean protected these auspicious conditions from collapse. The overlap in trading 'spheres' was such that if one area suffered from decreased production, other 'exchange zones' were only mildly affected and could fall back on other goods and trading links.²¹ The redundancy of the economic system lent itself to the idea that the late antique economy, though interconnected, was far from a whole, unified system. Individual areas were influenced by different factors and therefore had different economic experiences.²²

The East was certainly more prosperous during the Byzantine period than the West for a variety of reasons. The involvement of the East, in particular Syria and Palestine, in long distance trade around the Mediterranean, may have been responsible for a steady flow of goods and economic welfare. The main exports of Syria and Palestine were olive oil and wine, produced in large quantities, and distributed all around the

²¹Haldon 2005, 37-38

²²Cameron 2012, 170.

Mediterranean.²³ In addition, traffic of people on pilgrimage to Jerusalem and other holy sites may be partially responsible for economic prosperity of the area.²⁴

The imperial coffers were filled by taxes collected from around the empire. Although attempts were made by the government to systematically collect taxes, the procedure was fraught with problems and required reforms multiple times between 300 and 600 CE, under several different emperors.²⁵ One issue of the taxation system was the emphasis on taxing the land and the people who worked it, which neglected a significant source of revenue in the taxation of wealthy senators. However, the traditional view of the senators, and indeed, many of the emperors, was that wealth itself exempted people from taxation, and this issue was never rectified.²⁶

The army was the most expensive part of the Byzantine Empire's budget during late antiquity and the constant drain on resources was a huge obstacle to waging war. Staffing the Roman force was not hindered by lack of populace. The majority of the force consisted of contracted for-hire barbarians in large numbers and the army became increasingly dependent on this system.²⁷ During the sixth century, both the Byzantine and Persian empires relied on Arab groups living in desert encampments for soldiers.²⁸ The difficulty with the Roman army lay in the demands of the soldiers to be paid immediately and in kind.²⁹ The amount paid to the army represented a enormous drain on the financial resources of the empire during the sixth century, especially considering there was not a

²³ Cameron 2012, 172.

²⁴ Cameron 2012, 172. Cameron cautions placing too much emphasis on pilgrimage as a source of income in Palestine and Syria, although during the sixth and seventh centuries there would have been a lot of traffic as a result of pilgrimage to Christian sites, and routes that would have traveled south towards Mecca.

²⁵ Cameron 2012, 97.

²⁶ Cameron 2012, 97.

²⁷ Shaw 2005, 135

²⁸ Cameron 2012, 169.

²⁹ Cameron 2012, 98.

single decade without serious conflict. Conservative estimates show that the Roman army was somewhere between 600,000 and 650,000 men. When translated into actual economic impact, payment to this number of people is interpreted as three quarters of the expenditure of the empire.³⁰ With figures such as these, the government was left with one-fourth of the budget to pay all other expenditures, including natural disaster relief or building efforts. Additionally, there was no opportunity to build up a treasury surplus with constant warfare.³¹

Despite the problems, the Byzantine empire ran with some degree of efficiency. The empire not only had enough revenue to finance a standing army, but also had enough to wage years of war with Persia while still able to pay large sums in the form of tribute that were often a part of such exploits.³² Continuous emphasis on the army and its constant demand for monetary resources kept the economy flowing, and due to the widespread stations of army battalions, coin circulated over the entire empire.³³ Such is the economic system that was in place when the 551 CE earthquake occurred in the Byzantine Empire. The implications are that Constantinople would have had the means to acquire monetary resources for natural disaster relief fund if it was needed. Beirut received some of these funds, which was enough to move the established law school there to nearby Sidon. Several years later, Beirut, whether from imperial or local funds, was partially rebuilt, although the city was reduced in size and was not of the same architectural layout.³⁴

³⁰ Both estimates (men & money) are from Shaw 2005, 141.

³¹ Shaw 2005, 142

³² Cameron 2012, 97.

³³ Cameron 2012, 99.

³⁴ Hall 2004, 76.

Warfare and Political Change

Military activity in the Eastern Mediterranean during the sixth century was dominated by the Byzantine Empire's struggle with the Sasanian Persians. The struggle with Persia was not a new event. The Romans and their eastern neighbors had been engaged in intermittent struggle since the third century over the borderlines between the two powers.³⁵ Posts on the border between the Roman East and Persia in the third and fourth centuries were established, not for launching territory-grabbing campaigns or for defeating the enemy, but rather for maintaining prestige, keeping communications open, and monitoring the border.³⁶

The struggle in the Byzantine Period began under Justin I (518 - 527CE) and concluded in the so called 'eternal peace treaty' of 532 CE. However, peace did not last and continued under Justinian with most of the fighting taking place between 540 and 545 CE on the eastern frontier. Eastern cities and rural areas bore the majority of the devastation and paid most monetary demands without assistance from Constantinople.³⁷ A more realistic fifty-year peace treaty was established in 561, only after the Persians had captured several cities in the Near East at quite a cost for the Empire.³⁸

War waged by Persia against the Romans almost always had monetary motivations. At the end of the fifth century, the Persian treasury found itself depleted after a long drought and attacks on the northern border with the Hephthalite Huns.³⁹ The

³⁵ Cameron 2012, 112.

³⁶ Cameron 2012, 188.

³⁷ Mitchell (2014, 395) notes that no peace was concluded with Persia without payment. This applied to each individual town that was besieged by the Persian army, and eventually it extended to the empire as a whole under the 'eternal peace'

³⁸ Cameron 1993, 114. Over the twenty years of fighting, the empire paid out a significant instalments of gold to the Persians, and the peace treaty included a clause which required the Roman empire to pay an annual sum of 30,000 gold coins.

³⁹ Greatrex 2005, 481&483.

most obvious and immediate consequence of the Persian wars for the Roman Empire was the amount of money demanded by and paid to Persia to protect eastern cities. In some cases, as in Aleppo and Antioch in 540, money was not sufficient to prevent the Persians from invading. Khusro I (531- 579 CE) attacked both Aleppo and Antioch despite a payment of two thousand pounds of silver negotiated with the bishop of Aleppo.⁴⁰ Similarly, the annual payment of five hundred pounds of gold to the Persians by Constantinople following the 'eternal peace treaty' of 532 CE did not stop additional skirmishes from breaking out.⁴¹

Following the battles that broke out during Justin I's reign, Justinian I (527-565 CE) attempted to strengthen the eastern cities that were vulnerable to attack. These defenses proved to be useless after Justinian's trusted general, Belisarius, and his troops were recalled to the western front for reconquest, leaving the new fortifications inadequately enforced with manpower. In 540 CE, Khusro was able to easily move through the eastern provinces and wreak havoc on its cities.⁴² Archaeological evidence from Antioch provides little trace of destruction from the siege warfare of Khusro's campaign, however the city was at least partially rebuilt after 540 CE, as new streets were constructed and new fortifications to the city walls were built.⁴³ There is, however, discontinuity in the archaeological record at Antioch. While portions of the city were rebuilt, by the time the Muslims were in control during the seventh century, only a small portion of what was once occupied was still inhabited.⁴⁴ After the Persian siege of 540 CE, the archaeological record indicates that Antioch's population diminished and only

⁴⁰ Cameron 1993, 188.

⁴¹ Cameron 1993, 189.

⁴² Greatrex 2005, 487.

⁴³ Foss 1997, 192 & 194.

⁴⁴ Foss 1997, 193.

certain parts of the city were reoccupied and rebuilt, demonstrating the deleterious effect that the wars had on a city the size of Antioch.⁴⁵ In the Islamic world of the seventh and eighth century, Antioch was no longer as important as it had been under Roman rule.

Later on, the willingness of Justinian to concede to the Persian monetary demands was a source of embarrassment for the Roman government. Justin II (565-574 CE), Justinian's nephew and successor, tried to reverse his uncle's concessions with unprovoked attacks on Persian territory in 572 CE.⁴⁶ This conflict was predicated on the control of the Persarmenia in the Caucus region, where Armenian Christians had come into conflict with their Persian rulers.⁴⁷ Persarmenia had always been a source of contention between the Persians and the Romans, as it was a region rich in resources as well as a natural barrier between the two empires and the northern tribes. However its physical geography and climate made it difficult to conquer by force.⁴⁸

Aside from the obvious drain on the financial resources of the Roman Empire, the conflict with Persia totaled almost half a century of military resources and diplomatic efforts. Justinian, and his predecessor had no dreams of conquest, rather he wished to exercise diplomacy to find a peaceful solution and solidify his political position with his adversary. The Persian emperors, Khusro I in particular, were not so inclined to diplomacy because of their precarious financial position. The Persians also had no ambitions of territorial acquisition, with the exception of their occupation of the East in the latter half of the century and the struggle over Armenia. The consequence in the long

⁴⁵ Foss 1997, 192. While Cameron (2012) suggests that there was no material evidence of either the Persian or Arab invasions in Palestine (Jerusalem), the dating of buildings to immediately following the siege of 540 in Antioch provides convincing evidence. Foss (1997,191): Antioch was the capital of a province of the Eastern Roman Empire, a substantial claim to its importance and size.

⁴⁶ Greatrex 2005, 489.

⁴⁷ Mitchell 2014, 396.

⁴⁸ Greatrex 2005, 495-496.

term, at least in some small part was two empires, drained of resources, who had little recourse when the Muslims invaded in the early seventh century. This may not have been the case in all parts of the empire, but at least in some cities, such as Antioch and the cities of northern Syria, defense systems were ineffective against the Islamic armies.

There is no doubt that the conflict between the Byzantine and Sassanid states represents one of the most important ongoing events of late antiquity. There is also the possibility that in their obsession with each other, both the Romans and the Persians were not aware of the growing threat of the Islam to their immediate south; when the Muslims actually invaded in full force, neither power was prepared.⁴⁹ The lack of preparedness was geographically significant. While the frontier zone was intensely fortified, both sides had left strategic areas with inadequate defense which was eventually attacked from the south.⁵⁰

In the west, 533 CE saw the North African Vandal kingdom in turmoil. Disputes over the line of succession had left the government unsteady and fragile. Justinian watched closely from Constantinople and while he may have preferred to wait for peace with Persia, he decided instead to recall his trusted general Belisarius from the eastern front and send him with a massive force to over take the weakened kingdom in North Africa.⁵¹ The campaign was initially successful and by the time Justinian died in 565 CE, parts of Italy as well as North Africa were back under the rule of the Byzantine Empire.⁵²

⁴⁹ Shaw 2005, 163.

⁵⁰ Shaw 2005, 163.

⁵¹ Pohl 2005, 463. This was a serious force; Pohl states that 500 ships with a sailing crew of 30,000 in addition to 15,000 combined infantry and cavalrymen were sent to Carthage.

⁵² Pohl 2005, 465.

The conquest of North Africa was achieved with just two battles. Several years later, the Vandals had disappeared entirely as a separate, ruling ethnic group.⁵³

The motivation for Justinian's rash action was to recapture former Roman territory in the west, which had been lost to the so-called barbarian kings for over seventy-five years.⁵⁴ During seventy-five years of separation, not much had changed in terms of political and economic arrangements, and the kingdoms, although ethnic divisions separated them, had retained old Roman civic structures and ran their lands in a similar fashion. These kingdoms were Christianized societies comprised of people who had already been integrated into Roman culture for several centuries. However, the barbarians were also weak as they had relied solely on the leftover Roman structure for their administration and did not adapt changes based on their own needs.⁵⁵ Almost a full century after the last Western Roman Emperor was deposed, the barbarian kingdoms only hope for success was the support and alliance of the Byzantine emperor and communication with Constantinople.⁵⁶ While the barbarians were barbaric in name only, those in the east, including the emperor, still regarded the barbarians as ethnically separate from Roman citizens even though they had adopted the Roman lifestyle.⁵⁷ Justinian's actions then, were merely a struggle for power, for much of the everyday operations in the western kingdoms were still reliant on the East. Likewise, the strategic

⁵³ Geary 2005, 122.

⁵⁴ The term barbarian was, as is pointed out by Geary (2005) and Pohl (2005), an invention of the Roman world. With the exception of the Persians, barbarians had come to apply to pretty much every society outside of the 'civilized' roman world. Throughout the Byzantine Period, barbarian ethnic identities fluctuated much more than a single ethnical division between 'civilized' and 'barbaric' would imply.

⁵⁵ Pohl 2005, 465.

⁵⁶ Pohl 2005, 455.

⁵⁷ Pohl 2005, 458-459.

geography of Italy and North Africa were still important as they were closer in proximity to Constantinople than other Barbarian kingdoms.⁵⁸

Despite the similarities between the East and West, Romans in the West were still quite different and were accustomed to the rule of the so-called barbarians. When the invasions under Justinian began, the West was resistant to Byzantine rule and saw the armies as 'Greek' invaders.⁵⁹ This resistance made it difficult to impose any sort of tax structure onto the population following the conquest, and the conquest placed a burden on the taxpayers at home in the east.⁶⁰ Barbarian attacks in the East and rebellious uprisings within the empire, were not prevented by Justinian's actions. His success in North Africa and Italy created more problems than they solved, and the Byzantine empire faced more attacks from the barbarians in the north, much closer to home, such as the Slavs and the Avars.⁶¹

The significance of fighting two draining military offensives on opposite sides of the known world, aside from the extraordinary financial impact, was an increase in fortifications construction in Byzantine towns. The build up of fortifications, and the funds needed for such projects were especially important in the east, and most certainly due to the threat of outside forces. Fortifications could change a city's status within the administration of the empire. The term 'city' during the Byzantine Period was not necessarily applied based on population or size, rather in some instances a city was termed a *polis* rather than a *kome*(town) when fortifications were built around it.⁶² For

⁵⁸ Geary 2005, 123. Geary suggests that geographic proximity was part of the reason that North Africa and Italy were the focus of reconquest, and why kingdoms such as the Franks and the various tribes of Britain remained unmolested.

⁵⁹ Pohl 2005, 463.

⁶⁰ Pohl 2005, 471.

⁶¹ Pohl 2005, 469-471.

⁶² See Saradi (2006, 96-100) for a description of city nomenclature.

example, Caesarea built a new city wall in the late fourth or early fifth century.⁶³

Although there is little to no record on the dimensions and structures of Akko during the Byzantine period, and despite its smaller size, its leaders may have seen the need for a military fortification to defend from outside forces.

Plague

The Early Medieval Pandemic or EMP, the ancestor of the pestilence that ravaged Europe in the fourteenth century, arrived in the Near East in July of 541 CE, near the Nile Delta.⁶⁴ Also known as the Justinianic Plague, the disease reached the capital in the spring of the following year, and at its culmination affected nearly the entire Eastern Mediterranean and spread into the west, reaching as far as Ireland in 545 CE, before disappearing.⁶⁵ The lack of sources creates difficulty in assigning a death toll to this disease, and even some literature scholars, known as 'deniers', state that the sources that do describe the disease exaggerate the impact.⁶⁶ However reasonable the logic, those who study the disease in earnest draw on what can be reasonably inferred from the 14th century written sources and physical evidence and estimate that approximately twenty to thirty percent of the population succumbed to their symptoms.⁶⁷

The impact of the plague is also difficult to ascertain. Aside from brief mentions by Procopius and John of Ephesus, there is little to no evidence of the plague in other literature.⁶⁸ In the absence of written records, there is no way to know how much the

⁶³Raban&Holum 1996, xxx.

⁶⁴Horden 2005, 134.

⁶⁵Horden 2005, 135 – 136.

⁶⁶ See Horden (2005, 148-151) for an explanation of 'denier' logic.

⁶⁷Horden 2005, 149.

⁶⁸Horden 2005, 154.

plague would have affected the transformation of urban life that was going on in the Byzantine Period. It is especially dangerous to attribute the reduction in building or economic activity to reduced population without substantial evidence.⁶⁹ The absence of a complete collapse in structure throughout the empire would suggest that the plague did not have as great an impact as an eighth or a sixth of the population would warrant. There is also no visible economic impact in the archaeological record; the coinage of the Byzantines remained the same, in size and in circulation.⁷⁰ Furthermore, the plague was apparently not a big enough population depressor to influence the relative triumph of Justinian's armies, which fought two major wars during the tenure of the disease.⁷¹

It is impossible to attest that the plague, widespread as it was, had an irrevocable impact on the late antique economy and society in a way that would be meaningful to the larger interpretation of the period. However, given the epidemiological associations with the bubonic plague of a millennium later, it can be supposed that the disease may have had an impact locally before it moved on to another area. Throughout its first wave in the 540s the disease reached Egypt first, and then moved through the near eastern coast until it reached Constantinople.⁷² Following that, it came to Antioch in the summer of 542 CE, then to the Persian army in modern day Azerbaijan in the fall. Given that the plague took a slow course throughout the empire, there is the possibility that the local impacts were greatly felt, however this disease was not as impactful as described and did not have reverberating effects on the empire as a whole. The economic collapse which may have devastated one area may have been absorbed by the structure of the empire, much in the

⁶⁹ Cameron 2012, 158.

⁷⁰ Horden 2005, 155.

⁷¹ Horden 2005, 156.

⁷² Halden 2005, 135. It proceeded in a similar slow course in a westward direction, reaching Rome at the end of 543 CE.

way a collapse in trade may have been absorbed in an extensive trading network. The plague was a short-term event with localized effects that had a less significant impact in the long-term.⁷³ In the short term, the influence would have affected different areas at different times, and the long-term impact was not felt because the empire was able to sustain itself by drawing upon other resources.

The absence of an impact on the recruitment of Justinian's military may just be attributed to the fact that peoples from outside the empire, most notably Arab tribes, which were not affected by the plague as far as the record is concerned, and barbarians from the edges of the empire sustained the army.⁷⁴ In addition, it seems as though the plague had the most significant impact on the urban areas.⁷⁵ Presumably, given the nature of the disease and the conditions necessary to sustain it, closer quarters in cities were able to support the virulent existence of the disease. If the disease did not affect the population of the countryside, then recruiting in the army would have not been affected as the majority of the army, prior to the recruitment of non-Romans, came from the rural, not urban, areas.⁷⁶

Christianity

‘Christianization’ is very much a theme of the Byzantine Period and had a serious impact on the social, political, and religious development of the period.⁷⁷ Ecclesiastical issues within the religion were important; however for the purposes of this study, the

⁷³ This sentiment is echoed by Halden (2005, 155.) and Lee (2005, 118.) in his discussion on recruitment in the army and the plague.

⁷⁴ Lee (2005, 118) mentions Huns, Heruls and Lombards as being present in significant numbers in the army of this period.

⁷⁵ Lee 2005, 118.

⁷⁶ Lee 2005, 118

⁷⁷ Cameron 2012, 58.

architectural and visible changes that Christianity imposed on the landscape that are of primary importance. The presence of Christianity did not directly impose urban change, rather monetary contributions donated by the church imposed new, religious buildings on the landscape. In addition the church's increased role in civic issues was partially responsible for the Christianization of urban centers.⁷⁸ Churches had become visible in the Roman city under Constantine, who built several churches both in the East and the West.⁷⁹ There are several examples of the ornate decoration style of the period, however, these elaborately built basilicas, such as St. Sophia in Constantinople, were the exception. Most cities and towns built multiple churches that were less decorative, and illustrate the influence that Christianity had on the landscape.⁸⁰ Many churches were purposely constructed on top of pagan temples.⁸¹ In Caesarea for example, the impressive temple of Roma and Augustus built under Herod was replaced by an octagonal church in the mid sixth century.⁸²

Conclusion

The historical information presented in this section is not meant to provide a complete history of the Byzantine period. Rather it serves to indicate the most significant factors involved in the historical development of Akko and the surrounding area, so that it is clear what was happening at the time that the tsunami of 551 CE struck. First, the empire was experiencing a significant financial strain in the form of war with Persia

⁷⁸ Cameron 2012, 160.

⁷⁹ Cameron 2012, 60. Constantine built the first St Peter's Basilica, and he and Helena, his mother, each built churches in Palestine, in Jerusalem and in Bethlehem.

⁸⁰ Cameron 2012, 62. Multiple churches were not built as a response to population size, but were often built to show off wealth of the town or of a particular individual, or to commemorate saints.

⁸¹ Saradi 2006, 359.

⁸² Raban&Holum, 1996, xxx.

and the barbarians in the west. While that may not have had a direct role in Akko's history, it would mean that the capital may not have had the financial resources to support the communities devastated by a natural disaster. Individual cities and towns may have relied on local taxes, but that was provided that the towns had an alternate source of revenue aside from what, if any, finances they received from Constantinople.

Additionally, plague was spreading throughout the empire, and although there are no indications in the history of either Akko or Caesarea for this pestilence, it is not hard to imagine that even smaller urban centers such as these would have been affected in some capacity. During the sixth century, churches were being built at an exorbitant rate because of the growing influence that the Christian church had on the empire and also in individual areas. The public spaces, such as theaters and forums that were so central to the classical city of the centuries before, were disappearing and being replaced by religious buildings. Akko would have been no exception; the bishop who resided in the town would have required his own basilica, and there may have been additional churches built as well by individual contributors. Fortifications were required in most cities and even towns and throughout the century there was near constant threat of invasion on the frontier of the Byzantine Empire. Although there is no specific mention of Akko being raided by a Persian force, the Sasanian armies penetrated deep into the empire at certain points, such as at Antioch in 540 CE. There is the possibility that the leaders of Akko would have built fortifications as a precautionary measure.

CHAPTER 3

EVIDENCE FOR THE 551 CE TSUNAMI

Ancient Accounts

The tsunami of 551 CE was recorded by four ancient authors who were within or close to the reign of Justinian I (527-565 CE). One account was recorded by a pilgrim, one Antoninus who came from Piacenza on the Italian Peninsula. Setting out from Constantinople, he traveled to Byblos (Byblus), Tyre(Trieris) and Beirut (Berytus) sometime in the 570s. He recorded that these cities were destroyed by an earthquake during the reign of Justinian.⁸³

We came to the island of Antharidus near Syria and then to Tripolis in Syria, where St. Leontius is buried. This and other cities were reduced to ruins by an earthquake in the time of the emperor Justinian. Then we came to Byblus, which was also destroyed with its inhabitants, and so to the city of Trieris, which was also reduced to ruins in the same way.... Then we came to the magnificent city of Berytus, where there was recently a center for literary study. That city was also destroyed. The bishop of the city told us that, without counting foreigners who were staying there briefly, thirty thousand known people had been killed. The city itself lies at the foot of the mountain of Lebanon.

From Berytus we came to Sidon, which is low lying on one side and clings to the Lebanon mountain.... From Sidon we came to Sarepta, a city of moderate size which is strongly Christian.... Departing from Sarepta we came into the city at Tyre...And from there we came to Ptolemais. The city is honorable; the monastery is good.

(Antonini Placentini Itinerarium 1-2.)

This itinerary highlights the destruction of the 551 CE earthquake. Clearly the damage was so severe that when Antoninus was traveling through the area twenty years after the

⁸³ [*Exeuntibus nobis de Constantinopoli venimus...*] *Antonini Placentini Itinerarium*, 1.

event, the cities of the Levantine coast were still in ruins.⁸⁴ Antoninus presumably came from the west before he set out from Constantinople and his account implies that he had not heard of this disaster until he saw the wreckage. Antoninus' origin point may suggest that the news of the earthquake and tsunami did not reach other parts of the empire after their occurrence. Antoninus' account also suggests that the cities south of Beirut, Sarafand (Sarepta) and Tyre, had less noticeable destruction from this earthquake, or perhaps had been repaired by the 570s. Although Antoninus only mentions Ptolemais briefly in his description, the account shows that at this point Ptolemais is still a city, and still standing. Unfortunately, Antoninus gives no indication of the size of the city or what effects the earthquake may have had on it.

Another account comes from the Chronicle of John Malalas (491-578 CE), a Greek writer who lived in Antioch.

In the 14th indiction a severe and tremendous earthquake occurred throughout the land of Palestine, in Arabia and in the land of Mesopotamia, Antioch, PhoeniceMaritima and PhoeniceLibanesis. In this terror the following cities suffered: Tyre, Sidon, Berytus, Tripolis, Byblus, Botrys and parts of other cities. Large numbers of people were trapped in them. In the city of Botrys part of the mountain called Lithoprosopon, which is close to the sea, broke off and fell into the sea. The piece of the mountain formed a harbor, in which very large ships were able to anchor. The city had not had a harbor in the past. The emperor sent money to all the provinces and restored parts of these cities. At the time of the earthquake the sea retreated out to the deep for a mile and many ships were destroyed. Then at God's command the sea was restored to its original bed. (John Malalas, *Chronographia*, 18. [485])⁸⁵

⁸⁴ While the recovery time may seem excessive, the destruction of Pompeii in 62 CE may provide a worthwhile comparison. In 79 CE, when Mount Vesuvius erupted, the citizens of Pompeii may have still been in the process of repairing the city from the earthquake seventeen years earlier. For a discussion of the possibly delayed repairs at Pompeii, see Beard, M. 2008. *The Fires of Vesuvius: Pompeii Lost and Found*. Cambridge:Harvard University Press, discussion on pp 12-15.

⁸⁵ English Translation of John Malalas' *Chronographia* available in Jeffreys, Jeffreys & Scott (1986, 291).

From Malalas' account, it is evident that Syria Salutaris was included in the scope of the 551 CE earthquake, as well as portions of Mesopotamia.⁸⁶

In the account of John of Ephesus (507-588 CE), a church leader living in Asia Minor, he reports that the earthquake was felt further down the coastline from Tyre:

In the year 870 [551CE], there was a severe earthquake, and Beirut collapsed, as did many coastal cities and villages in Galilee, Arabia, Palestine and Samaria. Along the whole Phoenician coast, too, the sea withdrew and retreated nearly two miles. As for the terrible disaster and the great and remarkable portent which happened in the city of Beirut in Phoenicia, when the earthquake took place and the cities collapsed, we have decided to make it a warning sign for the knowing of posterity. For when the earthquake came from heaven, the sea withdrew and retreated from Beirut and the other coastal cities of Phoenicia for a distance of nearly two miles; the dreadful depths of the sea became visible and various and amazing sights were revealed: sunken ships full of different cargoes, and other things too when the waters had retreated from the land. Some ships which were moored in the harbors settled on the sea-bottom since at God's command they had been left high and dry as the water flowed away... then a tremendous surge of the sea rushed up to return to its original depth, overwhelmed and consumed all these wretched people in the depths of its swirling waters. They had rushed to find wealth in the depths of the sea and, like Pharaoh, they went down to the depths and were drowned like stones, as it is written; and God rolled the waters of the sea over them, as the flood burst forth and flowed back to its former abundance. Those who were still on the edge of the shore were hurrying to go down; when they saw the deep sea rushing back to its former position, those who were closest to the land fled out. But after they had escaped, as if from hunters, a violent earthquake took place, which overturned houses in the cities, especially Beirut; they fell and crushed those who had escaped the sea and nobody survived. As the sea was rising up against them from behind, the earthquake brought down the city in front of them... When this report was received the emperor Justinian sent gold through several noblemen, who removed and carried out innumerable human bodies and restored the city to some extent.
[John of Ephesus, *Ecclesiastical History*. 2.326-7]⁸⁷

⁸⁶ The rural areas beyond what is now the Syrian coastline, stretching from Apamea to the Persian border, was known as Syria Salutaris in the Byzantine Period.

⁸⁷ The citation for this passage is problematic. It is a lengthy footnote in the text of Malalas by Jeffreys, Jeffreys & Scott (1986, 291-2). See Hall (2004, 82, fn. 108) for further explanation on the origin of this particular source. Pauses in this passage were put in for brevity and are my own.

This account shows that the emperor did provide some support for those affected by this disaster, although he did it through the noblemen who were presumably living in the surrounding area.⁸⁸

The chroniclers of this event, on occasion, confused the time of the year as well as the location of the actual destruction. Agathias Scholasticus (530 - 582/594CE), who served as an historian for Justinian between 552 and 558, also recorded this event. In his account, however, the 9 July event is clustered together with earthquake activity that occurred on mainland Greece. Agathias also recounts that the 9 July event occurred "in many parts of the empire."

In summer time, roughly during the same period, there was a violent earthquake in Constantinople and in many parts of the Empire, with the result that several cities both on the islands and the mainland were razed to the ground and their inhabitants wiped out. The lovely city of Berytus, the jewel of Phoenicia, was completely ruined and its world-famous architectural treasures were reduced to a heap of rubble, practically nothing but the bare pavements of the buildings being left. Many of the local inhabitants were crushed to death under the weight of the wreckage, as were many cultivated young men of distinguished parentage who had come there to study the Law. There was, in fact, a long tradition of legal studies in the city, and the law schools conferred an aura of peculiar privilege and distinction on the place. At this point, then, the professors of law moved to the neighboring city of Sidon and the schools were transferred there, until Berytus was rebuilt. The restored city was very different from what it had been in the past, though it was not changed beyond recognition, since it still preserved a few traces of its former self. But this rebuilding of the city and the subsequent return of the schools was not to take place for some time yet. (Agathias 2.15.1-4. *The Histories*)

Since the law school in Beirut was temporarily relocated to Sidon several kilometers to the south, researchers have assumed that damage was less severe south of Beirut, and have disregarded any other sites as having been affected by the earthquake of 551 CE.⁸⁹

⁸⁸ The noblemen referred to here could either be those born into an aristocratic family or men who had achieved this status through their wealth. See Hall 2004, 72.

Problems in Historical Earthquake Evaluation

Several difficulties emerge when evaluating ancient sources that discuss natural disasters, and the 551 CE earthquake is no exception. Detailed accounts of an earthquake's effects are frequently left out of sources altogether, particularly when they concern events in cities of lesser importance.⁹⁰ For example, in the accounts of 551 CE, only John Malalas and Antoninus of Piacenza mention that the earthquake affected cities other than Berytus and Sidon. In addition, the reports concerning the 551 CE event are varied. Some, such as Agathias and John of Ephesus write about Berytus and the localized damage that occurred there, whereas others, like John Malalas, recount the earthquake's impact as far away as Mesopotamia and Greece.

Ancient accounts are also problematic because the observations of authors are often lacking the detail a modern geologist or archaeologist demands when researching earthquakes. Ancient descriptions are colored by religious fervor which may obscure or add details about the event. Due to religious uncertainty and strife during the early Byzantine period, historical events such as earthquakes were exploited to support various religious and political causes, which often distorts the historical record.⁹¹ Because of the religious sensationalism, wording is often suspiciously dramatic, so that accepting such phenomenon at face value only becomes more plausible when several accounts overlap and details are repeated.⁹² While Malalas reported that Mount Lebanon physically broke

⁸⁹ Geologists have focused their research on the coastline of modern day Lebanon and disregarded any evidence that the 551 earthquake affected further south than Sidon. See Darawacheh et al. 2000, Elias et al. 2007.

⁹⁰ Guidoboni 2003, 783.

⁹¹ Stiros 2001, 547.

⁹² Guidoboni 2003, 783.

off into the sea, his lack of geological precision makes interpretation difficult.

Historically, this level of destruction would be plausible in the case of a very large earthquake. No geological evidence to date corroborates his impressions, although one could conclude that the earthquake made a significant impact based on Malalas' embellished reaction.

Modern as well as ancient commentators have sometimes confused or connected several different seismic events as a single major earthquake.⁹³ Combination of multiple events can erroneously expand the limits of an earthquake beyond its actual size. One such instance is the 365 CE earthquake, which reportedly impacted almost the entire Mediterranean, including Alexandria and cities in Greece, Crete, and on the Eastern coast of Italy.⁹⁴ Accounts of the earthquake, however, do not indicate that a single event affected all of these areas at once, but offer details more indicative of individual tectonic disturbances. The magnitude required for an event as large as the 365 CE earthquake is near impossible.⁹⁵ Therefore, it has been proposed that the event must be broken into several different earthquakes, all occurring in the 360s. Such a large geological event has not been ignored by geologists; however, the evidence for the 365 earthquake is more limited than that of the 551 CE earthquake.⁹⁶ The combination of different earthquakes is also an issue in the study of the 551 CE earthquake. In the case of the 551 CE earthquake, Agathias confused the earthquake of 551 CE with an earthquake that occurred in Greece during the autumn of 551CE, as well as earthquakes which occurred

⁹³ This phenomenon is discussed in Salamon et al. 2008, 712.

⁹⁴ Ambraseys et al. 2002, 752.

⁹⁵ Ambraseys et al. 2002, 752.

⁹⁶ A geological signature for the 365 CE earthquake was found in parts of the Ionian Sea; see Polonia et al. 2013. This evidence still needs further geological explanation and correlation with historical accounts of this event, however it is promising for the study of this earthquake and its parameters.

in 554 CE and 561 CE.⁹⁷ While multiple events have been suggested in the case of the 551CE earthquake, the damage on the coast of Lebanon is consistent in all accounts, confirming that this area was the most affected.⁹⁸ The damage and the extent of the earthquake is now supported by geophysical evidence.⁹⁹

Interpreting archaeological sites using earthquake catalogues is problematic for the study of historical disasters, especially if the archaeological evidence for a particular earthquake is not evaluated outside of the catalogue.¹⁰⁰ Ancient accounts and archaeological evidence have two separate dating systems; ancient accounts often mention specific dates for earthquakes, and archaeological earthquake is dated by its place in a stratigraphic sequence. These two types of evidence should be evaluated independently.¹⁰¹ Another concern when trying to identify and isolate the effects of a particular earthquake is the known tendency of archaeologists to suspect earthquakes in the case of suspicious damage on a site.¹⁰² If excavators assume a particular time sequence, they could conclude that the damage fits temporally with an earthquake or natural disaster with a relatively close date to the stratigraphy without the proper

⁹⁷The earthquake of 554 occurred in Bithynia, and the earthquake of 561 damaged Cilicia and the surrounding provinces.

⁹⁸ See the description given by Russell (1985, 45) of the 551CE event; he suggests that the earthquake that affected the Lebanese coastline was probably separate from the event recorded by Procopius while traveling with Belisarius in Greece. The magnitude of this event, while quite large, would most likely not have reached Greece, although it is possible that the Greek event was an aftershock of the original earthquake. In addition, there were other sites recorded in various ancient accounts, such as Alexandria, that were possible earthquake sites; these places were probably the victims of aftershocks rather than the main event.

⁹⁹ Elias et al 2007. See the discussion of the evidence below

¹⁰⁰ Earthquake catalogues are lists or compilations of earthquakes, usually for a particular region or area. For the Middle East region, the most notable are Seiberg, 1932; Ben-Menahem, 1979; Guidoboni et al., 1994; Ambraseys and Jackson, 1998; Sbeinati et al., 2005.

¹⁰¹ Guidoboni 2003, 787.

¹⁰² See Morhange et al. 2014, for a discussion of neocatastrophism and tsunamis; these authors argue that the recent availability of better technology and tsunami evidence has caused a rise in the attribution of collapses of civilizations or major archaeological sites as a result of tsunamis or natural disasters by scholars.

research.¹⁰³ For example, collapsed walls or buildings are often attributed to earthquake activity. In many cases, this damage may be reasonably attributed to other factors, such as war or intentional dismantling.¹⁰⁴ In the case of 551 CE, misdirection of evidence has not happened, primarily because geological cores have independently dated the earthquake's presence at certain sites outside of written or archaeological sources.

Another issue arises when scientists trained in relatively exact sciences attempt to make purely qualitative and problematic textual descriptions of an earthquake correspond to precise quantitative measure, such as moment magnitude, a measure of an earthquake's strength.¹⁰⁵ Intensity levels studied by researchers and their assignment to historical earthquakes is not an exact science, and can vary depending on the sources used and accepted criteria of the assessment.¹⁰⁶ In studying the earthquake of 551CE, magnitude determinations have varied depending on the historical accounts used to quantify the damage based on the historical accounts, the incorporation of geological research with those accounts, or the interpretation of geological evidence alone. For the 551 CE earthquake, the magnitude has been placed somewhere between 7.0 and 7.5.¹⁰⁷ While it is therefore reasonable to assume that the magnitude at the epicenter of the 551 CE earthquake may be between 7.0 and 7.5, the intensity may be lower the farther away from the epicenter a site is.

¹⁰³ For a discussion of correctly evaluating potential archaeological earthquake damage, see Ambraseys, 2005.

¹⁰⁴ Ambraseys et al. 2002, 749.

¹⁰⁵ This type of assessment was done by Darawchek et al. 2000.

¹⁰⁶ Ambraseys, N. et al., 753.

¹⁰⁷ Darawachek et al 2000 place the magnitude at 7.3. Salomon et al. (2008, 710) give a general description of the magnitude as "large", ranging from $7.8 > M_s > 7.0$.

“Historiography” of the Tsunami: Interdisciplinary Research up to the Present

Kenneth Russell, who was the first modern historian to write in English on historical earthquakes in Palestine, surveyed the ancient accounts that discussed the earthquake of 551 CE and listed the major cities affected by the tsunami as Tripoli, Byblos, Tyre, Beirut and Sidon.¹⁰⁸

He stated that tremors may have been felt in other parts of the Eastern Mediterranean, such as Alexandria.¹⁰⁹ If the earthquake had actually affected Alexandria, it would seem that the earthquake of 551 CE was much larger than indicated by the limited destruction of the Lebanese coast. If indeed there were a tsunami off the Lebanese coast as reported, there would have been offshore thrusting which would have left geological signs on Cyprus.¹¹⁰

Russell points out that the 551 CE tsunami may have been confused with other earthquakes that occurred around the same time. Procopius' *The Wars of Justinian*, written while the author traveled with Justinian's general Belisarius, indicates that another earthquake affected Southern Greece in that same year, with effects in the towns around the Gulf of Corinth, as well as a tsunami in the Gulf of Euboea.¹¹¹ (Procopius, *De Bellis*. 8.25.16-23) Russell notes that Procopius did not mention the July event in the Syrian region, most likely because neither Procopius nor Belisarius heard of, or

¹⁰⁸ Russell (1985) drew this information from the *Chronographia* of Theophanes, Georgius Cedrenus, and the *Antonine Itinerarium*.

¹⁰⁹ Russell 1985, 45. He points out that although there is record of seismic waves been felt in Alexandria, there was most likely no damage.

¹¹⁰ Russell 1985, 45. Russell proposes Cyprus of a candidate based on the fact that the 365 CE earthquake, which has similarities with the 551 CE earthquake, produced 'downward displacement of the sea floor in the Mediterranean.' See Elias 2007, discussed later in this section, for evidence on the tsunami on the Levantine coast.

¹¹¹Stiros (2001) suggests the possibility that the distance between the two gulfs is proof that there were two separate events in Greece during this time, one affecting the Gulf of Corinth, and one affecting the Gulf of Euboea. Whether this is substantiated or not, two major events in the same year would still have had an impact on each region (Lebanon and Central Greece) and possibly the empire as a whole.

experienced, the 551 CE earthquake. It is quite possible that the occurrence of two major earthquakes in the same year could have caused confusion in later written accounts, especially during a century when there were multiple seismic events. To further complicate the issue, histories written several centuries later have confused two additional earthquakes, which occurred in 554CE and 561CE, with the July 551CE event, because they had similar details. Unfortunately, Russell notes that confusion between these events was evident in the catalogs of the modern era. During his research he separated these events and narrowed down what areas were actually affected by the July 551 CE earthquake. Based on his findings, he reached the conclusion that only the 551 CE earthquake affected the Levantine coastline and Northwest Arabia. Geological cores at Caesarea and side scan sonar survey offshore from Beirut confirm the presence of the 551 CE earthquake on the Levantine coast, although thus far, there is no information for the presence of the tsunami of 551 CE in Arabia.

Russell proposes that the villages of the Galilee region were affected by the 551 CE earthquake, even though this region is several kilometers inland from the coast which was the primary area of destruction.¹¹² At the time of his publication, this conclusion would have seemed dubious, for he relied strictly on the account of Michael the Syrian, patriarch of the Syriac Orthodox church who lived from 1126 CE - 1199 CE.

At the same age, on the coast of the Phoenicia, the city of Tripoli was engulfed and thus Beirut, Byblos, Botrys, and the cities of Galilee. The sea retreated two miles on itself, and ships were lying on the seafloor. (The Chronicle of Michael the Syrian, 9.29

Additionally, Michael the Syrian's account combined parts of the 551 CE event with earthquake events from 554 and 558 CE. However, evidence from the site of Scythopolis,

¹¹² Russell 1985, 46.

now Bet She'an in Israel's modern day Galilee region, indicates that the earthquake of 551CE did occur in this region and destroyed parts of the Roman city.¹¹³

Based on the particular stress and reported damage at Beirut, the epicenter of the 551 CE earthquake was probably offshore of the city, which sits directly along the left-

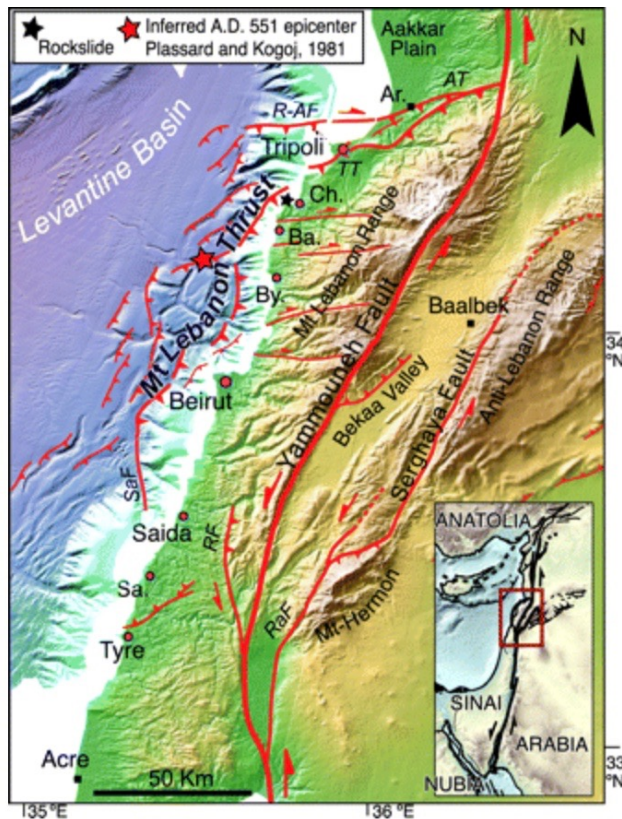


Figure 1: The epicenter of the 551 CE earthquake. After Elias et al. 2007.

lateral Roum fault, forming the western edge of the Arabian tectonic plate.¹¹⁴ (Fig. 1) The offshore scenario seems the most geologically plausible because the tsunami followed the earthquake. The tsunami would have occurred as a result of offshore thrusting from seismic activity beneath the ocean floor, and would have been less likely to occur if the epicenter was further inland.¹¹⁵ The offshore epicenter is further supported by the ancient accounts and the

estimated magnitude of the 551 CE tsunami, which stresses the destruction along the coastline.¹¹⁶ Both the textual information and the geological research that has been done on this particular earthquake point to it being the strongest and most damaging

¹¹³Tsafirir&Foerster 1997.The evidence for the earthquake at this site will be discussed at length in Chapter 5.

¹¹⁴ The coordinates for this epicenter are given as 34.00N and 35.50 E. Darawacheh et al 2000.

¹¹⁵Darawacheh 2000, 409. If the epicenter was offshore from Beirut, Darawacheh et al speculated that the earthquake should have affected Cyprus; the event was not reported here during ancient times. Further geological research on Cyprus.

¹¹⁶ Elias et al. 2007 confirmed this scenario several years after it was first proposed in Darawacheh et al 2000.

earthquake to occur in the Levant during the Byzantine period.¹¹⁷ Based on the earthquake's predicted magnitude, three additional towns can be included in earthquake's destructive range because of the towns' placement within the previously determined range of the event.¹¹⁸ Placing these towns within the earthquake's range is circumstantial and becomes plausible based on the magnitude of the earthquake and analysis of the historical accounts. However, geological inquiry has not been specifically conducted at these sites and they are not mentioned in ancient accounts.

There is a possibility that aftershocks from the 551 CE earthquake were felt elsewhere in the Near East.¹¹⁹ Aftershocks from a magnitude like that of the 551 CE earthquake are common and would explain why there are so many other reports from areas which supposedly experienced damage from the 551 CE tsunami. Aftershocks, however, are not an excuse to attribute archaeological evidence to earthquake damage. For example, archaeologists attributed earthquake damage at Petra with the earthquake of 551CE and had concluded that the Jordan Valley east of the Dead Sea and the Jordan River were particularly affected by the earthquake and its aftereffects.¹²⁰ This conclusion was discarded after the discovery of a set of scrolls which recorded property owners at Petra post-dating the supposed destruction in the mid-sixth century, as well as dating of ceramics showing that the church established at Petra continued to function well into the seventh century.¹²¹ Petra is one example illustrating the dangers of relying solely on geological earthquake catalogues for dates of earthquakes.

¹¹⁷Darawacheh 2000, 411. This is based on the magnitude these researchers have assigned to the earthquake in general, and their extension of the earthquake's radius.

¹¹⁸ The three additional towns are: the island of Aradus (modern Arwad), Trieris (modern Shikka) & Sarepta (modern Sarfand). Darawacheh 2000, 411.

¹¹⁹ Rucker & Niemi 2010.

¹²⁰ Russell 1985, 45.

¹²¹ Rucker & Niemi 2010, 101.

A side scan sonar survey conducted off the coast of Lebanon in 2003 provided geological evidence for the potential disruptions on the seafloor that the 551CE earthquake may have caused off the Lebanese (particularly Beirut) coastline.¹²² The mountain that Beirut is situated on, Mount Lebanon, sits on the easternmost edge of the Arabia-Sinai tectonic plate and directly to the west of the Levantine fault line.¹²³ As this plate is actively shifting, the potential for earthquakes in the region above it is high. Despite this, there is not a great deal known about the processes of these shifts and their potential impact on the land. The 2003 survey helped to answer some questions about the tectonic processes of this region and the bathymetric data from the survey was also used in the interpretation of the 551 CE earthquake. The sonar survey also identified the Mount Lebanon thrust, a previously unidentified tectonic rupture also known as the Tripoli-Roum thrust, as the probable tectonic source of the 551CE earthquake as well as several other earthquakes that have struck the Lebanese coastline in the past two millennia.¹²⁴ In addition, the sonar survey also points to the earthquake of 551CE as the strongest to ever occur on the coastline.¹²⁵

The tsunami following the 551 CE earthquake was the result of a seismic seafloor rupture. This rupture is visible in the sonar data that was collected. The bathymetric profile shows several ruptures in the sea floor, accompanied by west facing escarpments between Saida and Tripoli. These ruptures were not one contiguous line along the coast; they are broken up into several formations. However all of the ruptures are parallel to the

¹²² Elias et al 2007.

¹²³ Elias 2007, 755.

¹²⁴ Elias et al 2007, 757.

¹²⁵ Sub-seafloor data, such as the work conducted by Goodman-Tchernov& Austin (2015) should be collected off the coast to further confirm this.

coastline.¹²⁶ These escarpments are attributed to earthquake activity because of their identical resemblance to dip-slip ruptures on land from other earthquakes that have occurred. In submarine landslides that have caused tsunamis, the geological signature is unique compared to other earthquake signature.¹²⁷ The escarpments that were analyzed were almost all west-facing, which implies that the Arabian plate was the tectonic plate which was thrust upward during the event that caused the escarpments. From the 2003 side scan survey, it became apparent that there were no submarine landslides associated with these escarpments. Therefore, the tsunamigenic activity shown in these surveys was a direct result of tectonic shifting and was not a result of underwater slumping occurring before or after the earthquake.

Dating these escarpments to the 551 CE tsunami provides the most definitive challenge of this type of geological research. If possible, C14 and OSL should be acquired from cores gathered directly from the escarpments, but at present time cores have not been collected. Following the side scan sonar survey, researchers involved in this study extrapolated dates of the escarpments using C14 dates from corresponding upward thrusts on the shore. Based on this information, the researchers were able to rule out any event after the seventh century as responsible for the underwater escarpments. The steep terraces above the Lebanese shoreline have long been presumed to be a result of tectonic shifting. The most recent uplift on the shoreline, 80 cm above the current mean sea level, has been dated to the middle of the sixth century.¹²⁸ This means that the last uplift in elevation along the Lebanese coastline occurred at that time. These topographical benches are a direct result of tectonic shifting. The connection has been

¹²⁶ See Figure 2, Elias et al. 2007, 756.

¹²⁷ Elias et al. 2007, 757.

¹²⁸ See figure 2C & page 757, Elias et al. 2007.

made between the benches on land and underwater because of the estimated magnitude of the earthquake, which was substantial enough to uplift both the sea floor and the land terraces 80 cm. Other major seismic events known from the eleventh to fourteenth century have been ruled out because of the C14 dates of the land terraces. If this assumption is correct, then the dating of the land terraces can be extended to the seafloor terraces.¹²⁹

With the establishment of the Tripoli-Roum fault line as the cause of the 551 CE uplift and the height of Mount Lebanon, the escarpments from the sonar survey once again points to an offshore epicenter close to Beirut for the 551CE earthquake.¹³⁰ The Tripoli-Roum faultline is an offshore thrust that extends underneath Mount Lebanon and onto the sea floor, making an epicenter located in the sea much more likely than one on land. In earthquake and tsunami research, submarine tectonic activity is the most common cause of tsunamis.¹³¹ The location of the epicenter, coupled with the reports from ancient authors, confirms that Beirut would have been the most heavily damaged city. In addition, the 2003 sonar data dispels the notion suggested in Darawcheh et al. that the Roum fault line, which runs north west upwards towards the Mediterranean from several kilometers inland from north of Galilee to Beirut, was responsible for the uplift and subsequent earthquake.

Geological marine cores have confirmed the presence of the 551CE tsunami at the ancient harbor of Caesarea Maritima.¹³² These cores were drawn from the sea floor at Caesarea, and then the layers of the cores were analyzed. Two distinct tsunami deposits

¹²⁹Elias et al. 2007, 757.

¹³⁰ Elias et al. 2007, 757, suggests that the epicenter was offshore from Tabarja, a coastal city 28 km north of Beirut. Stiros also suggests the possibility that the 551 earthquake was directly related to the reactivation of the Cyprus Arc, and the extension of the Eastern Anatolian Faultline into the water off the coast of Cyprus. According to Stiros, the AD 551 earthquake, “destroyed probably the whole of the Lebanon [coastline] and affected the wider area [meaning Cyprus].”

¹³¹ Papadopoulos 2007, 516.

¹³² Goodman-Tchernov & Dey 2010.

were identified, dating to 115 CE and 551 CE. These deposits were characterized by particular clusters of shells and pot sherds as well as objects, such as shells and pebbles,

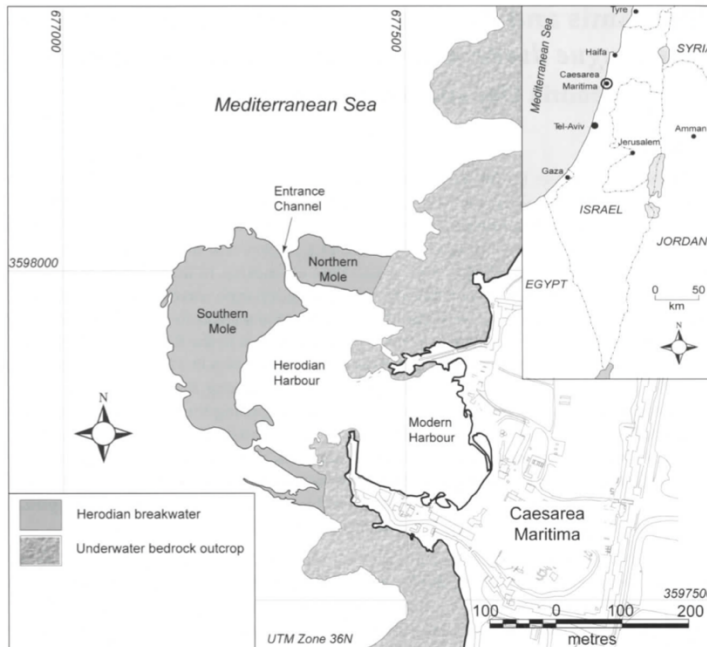


Figure 2: The harbor at Caesarea today. After Goodman & Dey 2010.

from the land or areas of the sea that would not normally be present in deep water where the cores were drawn. The different sand deposits and bivalve shells were dated using optically-stimulated luminescence (OSL) and radiocarbon dating, respectively, to the different events in question, 115, and

551 CE. While these cores are groundbreaking for the study of the tsunami of 551 CE, this type of research is not without limitations. The accuracy of carbon dating can be relied upon to make conclusions, however, the margin of error does leave some room for doubt. There are several reasons why these dates are accurate for the tsunami of 551 CE. First, the carbon 14 dates are consistent with the other methods of dating, like OSL and the types of pottery that were found in the cores themselves. Second, the range of dates corresponds with the dates given by ancient authors for the tsunami of 551 CE, as well as with bathymetric data taken in Caesarea's harbor. Finally, the tsunami left distinctive deposits on the seafloor, which were present in the cores. The only other recorded natural disaster in this immediate area was the 502 CE earthquake which specifically struck

Akko and there was no tsunami that accompanied this event. It is unlikely that this geological core can be associated with a different event.

One challenge of this research is differentiating tsunami events in the core with large storms that may have produced smaller, yet similar conditions on the coast.¹³³ Tsunamis have indications in the geological record that set them apart from large storms, such as deposition of beach type sand and pebbles or high-value pottery and goods in a deep ocean area.¹³⁴ Tsunamis tend to leave large deposits of particles and pebbles, and particles of larger sizes than a large storm event would.¹³⁵ The most important differentiation between storm deposits and tsunami deposits is the depth to which they are able to penetrate and make an impact on the ocean floor. Tsunami events are able to affect greater depths than a storm.¹³⁶ The 551 earthquake was observed as a large tsunami deposit across all the cores taken in the geological survey at Caesarea, and all the necessary indicators for associating the deposit with a tsunami instead of a storm were present in the geological cores drawn.¹³⁷

The dates of the geological cores drawn at Caesarea, as well as the implications of the cores for the status of the harbor have also been confirmed and supported by bathymetric data taken at Caesarea using a sub bottom profiler.¹³⁸ Three tsunami ‘horizons’ were identified that roughly coordinate to the three known tsunami events at Caesarea: the Santorini Eruption of the Late Bronze Age, the 115 CE tsunami and the 551

¹³³ Goodman et al. 2009, 944.

¹³⁴ See Goodman et al. 2009, 944 -945. This article gives a full description of the tsunamigenic indicators used in the analysis of the geological cores taken from Caesarea.

¹³⁵ See Figure 4, Goodman et al. 2009, 945.

¹³⁶ Goodman et al. 2009, 945. The influence of tsunami versus storm deposits is shown in particle size distributions, which are represented visually as contour maps in this article.

¹³⁷ Goodman et al. 2009, 945.

¹³⁸ Goodman & Austin 2015, 448.

CE tsunami.¹³⁹ These horizons reflect the state of the sea floor when the tsunami deposit was buried, which can sometimes take several years after the event itself to form. The tsunami horizon that occurred most recently in time is associated with a tsunami event in the eighth century and the tsunami of 551 CE. Because the acoustic profile is associated with both events, it is difficult to draw conclusions about the harbor from the data. The confusing acoustic profile occurs because the second event, the tsunami of 749 CE, mixed sediment with seafloor deposit that was still developing after the tsunami of 551 CE. However, what the profile does suggest is that the sea floor was in a much more degraded condition in the sixth century than it had been previous centuries. Either way, the profile reinforces the picture of the harbor at both points in Caesarea's history: following the late antique period, the harbor was not as large as it had been in the past and was not as protected as it had been when the outer harbor was still functioning. With the harbor in this state, ships most likely anchored offshore, and there was not a large enough anchorage to accommodate the functions of the harbor.¹⁴⁰ Both tsunami events had a significant impact on the development of Caesarea as an urban center, as was directly tied to its functionality as a harbor.

In future, Akko harbor could benefit from the same type of bathymetric data. Although the sedimentological processes of Caesarea Maritima and Akko harbor are different, the principles of the bathymetric horizons would remain the same. Ideally, if tsunami horizons were identified in the bathymetric profile of Akko harbor, it would reflect the state of the sea floor following the burying of the tsunami deposits, just as they

¹³⁹ For the Santorini eruption and its dating see Manning (2014) and as it specifically relates to Caesarea, see Goodman et al. 2009.

¹⁴⁰ This is also supported by ballast deposits offshore from the harbor, which are parallel to the shoreline and suggest that ships were being anchored in open sea and then smaller ships were bringing cargo in. See Boyce et al. 2009.

have shown at Caesarea. Bathymetric data would identify whether or not the harbor floor changed after the 502 CE or 551 CE tsunami. If Caesarea's harbor was indeed changed by these two events, it would have enormous implications for Akko's development. In addition, the acoustic profiles at Caesarea have shown that there is difficulty differentiating between the 551 tsunami and the 749 tsunami because they occurred in such close proximity in the geological record. If this same methodology were applied at Akko, the results would reinforce what is already known about Caesarea's harbor and possibly provide new details.

Early Byzantine Tectonic Paroxysm (EBTP)

The period between the fourth and sixth centuries CE experienced a spike in tectonic activity and recorded earthquake activity in the Eastern Mediterranean.¹⁴¹ The sixth century alone experienced major seismic events with IX intensity or higher.¹⁴² Constantinople experienced this increase along with the rest of the Byzantine Empire. Writers of the day were acutely aware of this phenomenon and attributed it to the religious turmoil.¹⁴³ Geologically speaking, the interaction between the Anatolian and Aegean tectonic plates was responsible for increased tectonic activity.¹⁴⁴ This is called the 'Early Byzantine Tectonic Paroxysm (EBTP).¹⁴⁵

Intense bursts of earthquake activity are known in the geological community as

¹⁴¹ Stiros, 2001, 548 & 552. The limitations of the evidence for this are well discussed in the Stiros article, where he clearly points out that this period was faced with a paucity of historical documents and information compared to previous centuries. Despite the lack of information, the number of reported events increases almost double in size compared to prior centuries.

¹⁴² See table 1 in Stiros (2001, 552.) IX rating is according to the Mercalli intensity scale, which is 8.0 or higher in a magnitude rating.

¹⁴³ Stiros 2001, 553.

¹⁴⁴ Stiros 2001, 553.

¹⁴⁵ Stiros 2001, 546

“earthquake storms” and the EBTP is an example of this phenomenon.¹⁴⁶ One reason that large earthquakes tend to come in clusters is the fact that one large event will cause a rift along the main plate boundaries of an area, making them more susceptible to tectonic shifting.¹⁴⁷ The cluster effect may explain the confusion identified in Russell’s original Palestinian earthquake chronology. It is possible that several earthquake events occurred during 551 CE and that one event may have ‘triggered’ another event in a different part of the Mediterranean basin.

Several individual towns were known to have experienced multiple earthquake events during the estimated increased seismic period. Antioch experienced eight seismic events in fewer than two hundred years.¹⁴⁸ An important city such as Antioch would have had ample resources to rebuild itself several times over, but only because of its importance as a cultural, political and religious center. A small town such as Akko would have had limited resources to rebuild, and the likelihood of Akko’s ability to thrive afterwards is slim. While earthquakes and large scale natural disasters are not individually causative of decline, they can certainly have hazardous effects on already tenuous situations.¹⁴⁹ The 551 CE earthquake may not have had a long lasting impact on the empire as a whole, but it would have had a lasting impact on individual areas, and when combined, may have contributed to the larger condition of the Byzantine world. In addition, an earthquake ‘storm’ or even a series of mildly destructive events may have

¹⁴⁶ Nur 2003, 771.

¹⁴⁷ Nur 2003, 771.

¹⁴⁸ Stiros 2001, 554. Stiros (2001, 556.) suggests that the reason Antioch was recorded to have experienced so many seismic events is because it, along with Constantinople, has the most complete historical record of the area for the period in question

¹⁴⁹ Nur 2003, 772.

had a lasting impact on the empire, and the Near East in particular.¹⁵⁰

Shoreline uplift is well documented in association with tectonic activity.¹⁵¹

Shoreline uplift in association with the EBTP was recently recorded on the Lebanese coastline.¹⁵² The uplift that was recorded on this coastline varies in each place that was surveyed, and was between 120 and 140 centimeters above the present shoreline. The radiocarbon dates that were associated with this uplift were concentrated in the sixth century, therefore researchers speculated that the uplift may not, in fact, be due to repeated earthquake activity of the EBTP, but a result of one single event, the 551 CE earthquake. This uplift is significant because it shows the physical impact that the 551 CE earthquake had on the coastline. With an uplift of almost a meter and a half, the structures of the affected coastline would surely have been destroyed. Although the uplift recorded in this research study was concentrated above the Roum faultline, which roughly corresponds to immediately south of Beirut, there was some uplift recorded on the coastline from Saida south to Tyre. This research was conducted prior to the discovery of tsunami evidence at Caesarea.

As the tsunami evidence at Caesarea suggests, uplift could possibly have occurred south of Tyre, and the 551 CE earthquake affected a wider area than previously assumed. Since the uplift was recorded in areas connected to the Dead Sea Fault System, uplift may have occurred around or north of the Carmel fault line, which is part of this system. The Carmel fault line runs from below the Sea of Galilee towards the Mediterranean and ends at Mount Carmel; it is immediately south of Akko. Uplift has been convincingly

¹⁵⁰ There is precedent for civilizations being vulnerable to attacks based on earthquake damage, such as Jerusalem in 31 BC, Sparta in 469 BC and even possibly Jericho in 1400 BC (Nur 2003, 773.)

¹⁵¹ Stiros 2010, Pirazzoli 1996, Morhange 2006.

¹⁵² Morhange et al. 2006.

associated with Crete and the 365 CE earthquake through a variety of evidence.¹⁵³ While the 365 CE earthquake can probably be broken up into several smaller events, researchers have proven that the coastal uplift on the shores of western Crete resulted from the same cluster of events that occurred as far away as the Nile Delta.¹⁵⁴ Further investigation could be done to strengthen the association of the Lebanese uplift with the 551 CE earthquake, and any other uplift that may be found on the Levantine coast.

Coastal uplift associated with tectonic activity has also been identified as the cause of silted harbor basins in other parts of the Mediterranean.¹⁵⁵ Lechaion harbor at Corinth was most likely abandoned in the Archaic period because of the silting of the harbor that occurred after a tectonic uplift, which was dated to approximately 340 BCE. The uplift, in combination with the unsuitable location of the harbor¹⁵⁶, was the reason for the harbor's abandonment. At Lechaion, the silting of the harbor most likely began immediately after the uplift and the tectonic event. Following the uplift associated with either one or several earthquakes in the Byzantine period, similar processes could have occurred at the harbors of the Lebanese coastline. Cities on this coastline may not have had the resources to dredge the harbor enough for further use and as a result the harbors may have been partially or fully abandoned. The disuse and silting up of harbors happened elsewhere around the Mediterranean during the Byzantine period. Even Constantinople, the major hub of urban and maritime activity in the East, was not maintained during the Byzantine period, and was not used to its full capacity until the

¹⁵³ Stiros 2010. Aside from geological evidence, Stiros (2010) used historical, biological and archaeological evidence to prove the Cretan uplift with the earthquake of 365 CE. Coincidentally, the 365 CE earthquake is also associated with offshore thrusting and a tsunami.

¹⁵⁴ Stiros 2010, 550.

¹⁵⁵ Morhange et al. (2012) determined this association through analysis of cores taken from the harbor basin at Lechaion, Corinth, Greece.

¹⁵⁶ Lechaion harbor is not a natural harbor formation.

twelfth century.¹⁵⁷ At Akko, the deep water harbor, which today is located under the modern day marina, has over twelve meters of sand covering the kurkar, or bedrock, ridge.¹⁵⁸ Without further evidence, there is no way to associate the presence of a tectonic event with sedimentation of Akko harbor, although both the possibility of uplifted shorelines and sedimentation of the harbor certainly warrant further geological and archaeological investigation.

Implications of the tsunami of 551 CE for the development of Caesarea Maritima

Placing the 551 tsunami at Caesarea, which is quite plausible from the analysis of the geological cores, now raises questions about the development of the harbor there. Following the initial phase of destruction of the Herodian harbor presumably in the late first century CE, the harbor remained in relative disarray, and the underwater excavations conducted in the harbor suggests that sediment was continuously deposited there by natural wave processes and not removed.¹⁵⁹ Afterwards, the inner harbor of Caesarea experienced a resurgence of activity sometime in the early sixth century.¹⁶⁰ The harbor would have been limited in its activity when compared with the complexity of Herodian harbor, which had an inner and outer harbor area and deeper waters, but nevertheless would have seen frequent use for trading and economic activity.¹⁶¹

Anastasius I (491-518 CE) provided the means to restore part of the harbor

¹⁵⁷ Wilson (2011) states that several large storms in the mid sixth, eighth/ninth, and tenth centuries as the cause for sedimentation of the harbor. He does not however provide citation for these events, nor does he state which Byzantine earthquake he is specifically referring to.

¹⁵⁸ Sharvit, J. Personal Communication.

¹⁵⁹ The destruction of the Herodian harbor is still subject to debate, see Goodman et al. 2009, Raban 1996.

¹⁶⁰ Reinhardt & Raban 1999, 813.

¹⁶¹ Reinhardt & Raban (1999, 813) note that according to Blackman, there were no large harbors, like those that operated in the early empire, functioning in the Mediterranean after the third century.

sometime during his reign, which will be discussed in a later section.¹⁶² The recorder of the reconstruction, Procopius of Gaza, did not mention whether or not the restoration was in response to a natural disaster or a particular event. Since the harbor had been in disrepair for two centuries, the renovations may have been done to revitalize economic activity in the area. A natural disaster such as an earthquake was unlikely to cause any further economic downturn in a harbor already in disuse.¹⁶³ Whatever the cause, the harbor did undergo a revitalization of economic activity, both before this renovation.¹⁶⁴ The underwater geological analysis of the Caesarea Harbor project estimated that the harbor was destroyed sometime during the sixth century, and was not rebuilt or used in any substantial way, except in a minor capacity by the Muslims and the Crusaders.¹⁶⁵

The evidence suggesting a resurgence of Caesarea's harbor in the fourth to sixth centuries is varied. The stratigraphic layers dating to the Byzantine period contained a large amount of anthropogenic material, including wooden timbers and botanical material.¹⁶⁶ Based on the geoarchaeological evidence, the harbor shifted and sand continued to build up within the inner harbor, leaving the shoreline farther out to sea than it was during the Roman and Early Byzantine periods. While there was no direct evidence show that a shift in the harbor was due to a major catastrophic event, the subtle movement in the makeup of the harbor does show that some sort of geological process was responsible. During the Early Byzantine Period, the sea level rose 0.5m and heavy

¹⁶² Reinhardt & Raban 1999, 813.

¹⁶³ quoted in Hohlfelder 2000, 44. Panegyricus In Imperatorem Anastasium 19

¹⁶⁴ Reinhardt & Raban (1999) note that goods were loaded onto smaller craft to be brought into the inner harbor at this time, described below, and as such a large, deep harbor was not necessarily needed for the everyday economic trade and activity of the day.

¹⁶⁵ Reinhardt & Raban 1999, 813.

¹⁶⁶ Reinhardt & Raban 1999, 813. The excavators found olive and date pits in this deposit.

sand bars shifted inwards towards the shore.¹⁶⁷ The 551 CE tsunami was large enough on the Levantine coastline to possibly change the size and composition of Caesarea's harbor, at least on the sea floor. Since economic activity or settlement in the city was nowhere near what it had once been, the earthquake and tsunami was not recorded.

While further historical analysis must be done on the functionality of the harbor during the Byzantine period, Caesarea was still the capital of one of the Palestinian provinces at this time, and a shipwreck found seaward from the outer harbor reveals that vessels continued to be anchored here in the fourth and fifth centuries. Ballast stone clusters dated in the harbor show that the harbor remained a shipping center well into the sixth century.¹⁶⁸ Ballast deposits to the west of the remains of the harbor show that in the third and fourth centuries there was most likely a designated anchorage beyond the harbor where ballast was unloaded on to smaller ships. Once the goods were unloaded, they were brought into the port on smaller vessels while the larger vessels remained anchored at sea.¹⁶⁹ This method of cargo transport further reinforces that the inner harbor in use during the Roman period was not in use starting in the third and fourth centuries. Optically Stimulated Luminescence (OSL) and carbon dating of shells show that this anchorage site was used into the Late Byzantine period, suggesting that at the very least the inner harbor was not repaired during this period and remained too shallow for most trading vessels. In addition, there is a large accumulation of fourth to sixth century pottery in the sixth century ballast pile as well an absence of pottery in the inner harbor that has been excavated. This evidence further supports the idea that the inner harbor

¹⁶⁷Raban 1996.

¹⁶⁸ Boyce et al. 2009.

¹⁶⁹OSL and carbon dates were obtained from shells within the ballast piles showing the date ranges to be 1st-2nd century AD. Boyce et al 2009, 1524.

basin was not used as an anchorage.¹⁷⁰ The large volume of activity that the harbor was able to accommodate during the Roman and Herodian periods was not in effect during the Late Roman and Byzantine period. Despite the fact that the harbor probably fell into disrepair sometime after the first century CE, it has been suggested that Caesarea was still the only large, protected harbor in the central Levantine coast for several centuries.

Even though the harbor was not maintained, there was still the possibility that the remains of two outer breakwaters were sturdy enough to keep it protected without regular maintenance to the original stonework.¹⁷¹ Hohlfelder points out that although the political importance of Caesarea as the capital of Palestina Prima fluctuated during the fourth and fifth centuries, it would have still necessitated at least some measure of a functioning harbor, whatever its capacity. As the foundation for the breakwaters and the harbor was already there, it would have made economic sense for the Byzantine emperors to send funds to repair the existing facilities rather than building an entire new harbor elsewhere.¹⁷² Whether or not Akko was not being used as a harbor remains to be seen.

Discussion of Evidence & Implications for Akko

If we take the magnitude of the damage in Beirut at half the face value implied in the written sources, placing the epicenter underneath or very near the city is a reasonable conclusion. Ambraseys & Melville point out that in their study of historic earthquakes in Persia, the epicenter of an earthquake larger than 5.5 Mb will have a destructive area of

¹⁷⁰ Boyce et al. 2009, 1525.

¹⁷¹ This is suggested in Hohlfelder 2000, 42. While he does not cite any particular evidence to back up this claim, his extensive knowledge of and years spent at Caesarea harbor may suffice as such.

¹⁷² Hohlfelder 2000, 42 & 44.

roughly 20 kilometers around said epicenter.¹⁷³ If an earthquake has at least a magnitude greater than 7.0, which the 551 CE earthquake is presumed to be in every retroactive calculation done by researchers, there is usually an association with a ruptured faultline. Even if the fault line is located several miles off the shoreline, the damage incurred by such a rupture generally reaches several hundred kilometers around the epicenter.¹⁷⁴ Through a compilation and analysis of reported damage and the affected areas, the most likely scenario is that the threat of damage from an earthquake is not limited to the immediate areas underneath or adjacent to fault lines, but can radiate outwards for considerable distances.¹⁷⁵ The 551 CE tsunami was reported as a 5 on the traditional Sieberg-Ambraseys tsunami scale, meaning that it was categorized as “very strong”, and on the reevaluated tsunami scale of Papadopoulos and Imamura it was noted as an 8, which places it in the “heavily damaging” category.¹⁷⁶ Caesarea is 165 kilometers away from Beirut and the earthquake of 551 CE made enough of an impression on the Levant to be registered in the geological record of Caesarea’s harbor. Akko, only 112 kilometers away from the presumed epicenter, would have felt the earthquake of 551 CE as much, if not more, both geologically and in terms of the human impact.

The magnitude of the 551CE tsunami is reported by several analyses as 7.5.¹⁷⁷ The Mount Lebanon fault system is approximately 26 kilometers long and has serious implications for the seismic hazard evaluation of Lebanon and its coastline.¹⁷⁸ According

¹⁷³ Ambraseys & Melville 1982.

¹⁷⁴ Stiros, 2000, 549. This seems to be also associated with other sources, and it may be worth looking into them to see if they come up with an actual numbered radius associated with large earthquakes such as this one.

¹⁷⁵ Degg 1990, 300.

¹⁷⁶ Intensity reported in Papadopoulos & Fokaefs, 2007. Intensity scale taken from Papadopoulos & Imamura 2011.

¹⁷⁷ Elias et al. 2007, Huijer et al. 2011, Heidbach & Ben-Avraham 2007, 302.

¹⁷⁸ Huijer et al. 2011, 70.

to the mapping of the Mount Lebanon Thrust System (MLT), the end of the MLT is located 82 kilometers away from Akko, and would have been actively moving during the 551 earthquake. Therefore, without even counting the distance calculations of the epicenter away from Akko, the actively moving faultline would have been quite close to the city and would have had at least moderate effects on the ground. A cross section illustrated by Huijer et al, shows that a large majority of the coastal towns of Lebanon lie directly below the MLT, and if the faultline moves, these towns would be adversely affected by the shifting.¹⁷⁹ North of Haifa, the coastal shelf is approximately 20km wide and has an average slope of 6-8 degrees. South of Haifa, the coastal shelf widens to 50-60km, and the slope decreases to an average of about 3 degrees.¹⁸⁰ Using this geological division, Akko should be considered a part of the Mount Lebanon Thrust System, based solely on the fact that geologically, the coastline of Akko is much more similar to the areas of the north than of those to the South.

Conclusion

The 551 CE earthquake was a strong seismic event which had a large impact on the Levantine coast. Geological research has proved that the tsunami that accompanied the 551 CE earthquake struck as far away from Beirut as Caesarea Maritima. Akko was certainly hit by the tsunami and the earthquake, and the port facilities may have been impacted. While it will not be possible to completely fill in the gaps of Akko's history, the details of the 551 CE earthquake and tsunami are significant enough for the region as a whole, and therefore can extend with reasonable certainty some details about Akko's

¹⁷⁹ Huijer 2011, 69 & 70.

¹⁸⁰ Degg et al. 1990, 299.

Byzantine history. With further historical study, and more importantly, with further archaeological excavation both on land and underwater, more of Akko's Byzantine history can be written.

CHAPTER 4

BYZANTINE AKKO

The history of Akko's harbor has been illuminated by five years (2009-2014) of joint excavation between the University of Rhode Island (URI) and the Israel Antiquities Authority (IAA).¹⁸¹ Ancient harbor installations and remnants of a Hellenistic port were revealed initially through underwater geophysical survey. While the full extent of the ancient harbor has yet to be established, excavations and large storms during the winter of 2014 – 2015 have uncovered jetty structures and a deep water basin, indicating that Akko was once comparable to Caesarea in terms of ship capacity.

The peninsula that Akko's ancient and modern port is situated on was not the initial site of urban occupation. Tel Akko, approximately one kilometer south from the present day city, was a Bronze Age Canaanite settlement. The tel continued to be occupied until the 2nd century BCE, and the port was settled sometime in the 3rd century BCE, during the Hellenistic period. Akko's port was critical during the Hellenistic Period because of its role in the struggle for power between the Ptolemaic and Seleucid Empires.¹⁸² The settlement was also home to a mint and coins were issued under both Ptolemaic and Seleucid rule.¹⁸³ During the Fourth & Fifth Syrian Wars, Akko changed

¹⁸¹ Akko was known during the Hellenistic Period as Ptolemais, and was probably named as such in 259 BCE, during the reign of Ptolemy II Philadelphus. (*Cairo Zenon Papyri* 25004). It continued to be called as such during the Roman period and into the Byzantine Period; on the Peutinger map, which represents the Roman world in either the 4th or 5th century, it is still referred to as Ptolemais. During the Arab period, Akko became 'Akka. Under the Crusader armies, 'Akka was anglicized to 'Acre'. At present, the city is known either by Akko, its Hebrew name, and Akka, its Arabic name. See Artzy (2015) for more information on the city's elaborate naming history.

¹⁸² Akko's role in the Syrian wars is documented in Polybius; see 5.61-2, 70.

¹⁸³ Syon 2010, 67-69.

hands several times between the two powers. Losing the port ultimately proved fatal for the Ptolemies, who relied on Akko's harbor to house a substantial portion of their naval force.

The presumed end of Hellenistic occupation at Akko occurred with an earthquake and possible tsunami in 92 BCE.¹⁸⁴ However, Akko did not disappear entirely as the port continued to be used after it was conquered by the Romans in the 60s CE. Even with the completion of the large harbor at Caesarea in the late first century BCE, written sources mention that the port was still used as a strategic base. Akko was visited by Julius Caesar (47 BCE) and Octavian during their Near Eastern campaigns, and Vespasian used the port as a military and naval base during the Jewish wars (66-70 CE).¹⁸⁵

Byzantine Akko

Little is known about Akko's strategic and commercial functions around this time.¹⁸⁶ During the 2013 season of the joint URI-IAA excavation, a half-meter layer of Late-Roman and Byzantine pottery was found in the harbor, suggesting that a large, destructive event not related to normal human activity impacted Akko. Prior to the URI-IAA excavation, all archaeological remains from the harbor dating to the Byzantine period had been discovered at the entrance to the eastern basin, which is also the entrance to the modern fishing port and marina.¹⁸⁷ The pottery that was found here was fairly uniform in type and is thought to have originated from a single wreck.¹⁸⁸ A group of

¹⁸⁴ Unpublished information from the excavations at Akko provided by Buxton, Sharvit, & Goodman-Tchernov, 2015.

¹⁸⁵ For Vespasian's use of the port see Josephus, *Jewish Wars*, 3.2.4 32-34.

¹⁸⁶ The Bishop of Akko attended the Council of Constantinople in 553 CE.

¹⁸⁷ Galili et al. 2010, 198.

¹⁸⁸ Galili et al. 2010, 199.

thirteen Byzantine iron anchors was also found during these early surveys, 2,000 meters southwest of the present day marina. These anchors were probably being carried into the port and may have been needed for ships to moor in the open sea. Such anchors may have been necessary to secure and accommodate a high demand for larger ships in the open sea rather than the shallow western basin. The larger vessels would have dispatched smaller vessels into port to unload cargo.¹⁸⁹

During the Roman period the western basin, protected by the southern breakwater, saw much vessel traffic. Galili et al. suggested that vessels with a draught of up to 2.5-3 m would have fit comfortably in the western basin. According to the depth at which pottery material was found, the western harbor was probably four meters deep during the Roman period. The southern breakwater protecting the harbor may have been construction remaining from the Hellenistic period and repaired numerous times, or perhaps a new structure from the early Roman period.¹⁹⁰ Early excavators of the harbor theorized that the southern breakwater was constructed during Roman period because Akko harbor, in its natural state, would have been insufficient to service any sizable extension of the Roman navy.¹⁹¹ However, given the fact that Akko was already being used as a military harbor prior to the Roman period, it is more likely that the breakwater was built in the Hellenistic period and maintained during the Roman period.

¹⁸⁹ Galili et al. 2010, 204. 2000 m southwest of the present day marina.

¹⁹⁰ An alternative regarding the breakwater is that it was not in existence prior to the Hellenistic period. (Kersten 1993) and in fact was not constructed until Ibn Falun built up the harbor in Tyre's image during the 9th century. This seems to be an unfounded statement, given the importance of the harbor during both the Hellenistic and Roman times, especially the use as a military harbor under Ptolemaic rule, for access to the lands beyond in confrontation with the Selucids. These military powers would not have been able to use the harbor for military purposes if it was not in some way protected from the open ocean, thus requiring a breakwater.

¹⁹¹ Flinder, Linder, & Hall 1993, 224.

A substantial development of the harbor would have been necessary to accommodate such forces and enable the Roman navy to anchor at Akko for military operations. It is also possible that Akko would have had a lighthouse nearby to guide ships coming into the harbor.¹⁹² Lack of pottery in the harbor, however, points to the

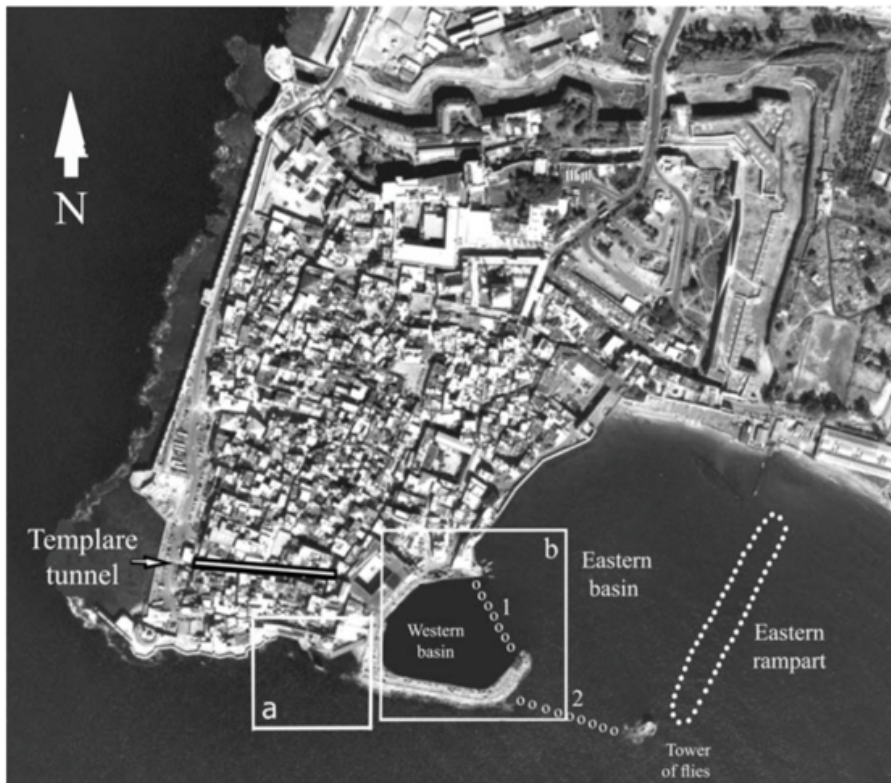


Figure 3 Map of Akko Harbor with key areas. After Galili 2010.

harbor's deterioration during the early Roman period. Whether this absence was due to neglect or a singular destructive event is uncertain.¹⁹³ A

singular layer of pottery dating to the late Roman period, particularly from the sixth century, makes a singular destructive event a more likely explanation for the continued disuse of the harbor in the Byzantine period. However, a reasonable assumption would be that the structures extant in the harbor during the Roman period remained standing, ruined or otherwise, during the Byzantine period, as there were no substantial architectural changes that would have affected the harbor during this several hundred-year period.

¹⁹² Rosen, Galili, & Zviely 2011.

¹⁹³ If Vespasian was still using the harbor for military operations, the deterioration can be placed after the 70s CE.

The 1964 excavations by Linder and Raban concluded that Akko was a small city during the Byzantine period and the harbor did not have enough maritime trade or importance to require further fortification or construction and thus fell into disrepair.¹⁹⁴ Galili et al. speculated that the harbor was not maintained as frequently as during the Roman period.¹⁹⁵ The harbor may have silted up, blocking access for all except small vessels. The lack of upkeep may have been due to the failure of the southern breakwater. Without the shield provided by the breakwater, the harbor would no longer have been protected from sediment traveling northward up the coastline. Two Late Roman and Early Byzantine shipwrecks and their associated artifacts at the entrance of the inner harbor of Akko, showed that trade in the port was between local communities in the Near East. The pottery associated with these wrecks contained amphora originating from the Aegean and Black Seas (50 %), the coasts of Syria and Palestine (40%), North Africa (3%) and the West (6%).¹⁹⁶ These statistics are a sharp contrast from the pottery of the Roman periods, which showed the same amount from the Aegean and Black Seas, 20% from Italy and the West and only 16% from Syria and Palestine. As the East and West grew apart, the localization of trade within the Byzantine Empire most likely increased, as the pottery profile from Akko shows.

The layout of the harbor at Tyre, however, could shed light onto the deterioration of Akko's port structures.¹⁹⁷ Tyre and Akko are natural harbors, which would have required lesser amounts of artificial construction, unlike the harbor at Caesarea. If the construction techniques used at Tyre were used in developing Akko's harbor, there is the

¹⁹⁴Kerster 1993, 19.

¹⁹⁵ Galili et al. 2010.

¹⁹⁶Galili et al. 2010, 199.

¹⁹⁷ Flinder, Linder & Hall 1993, 224.

possibility that they would have degraded and undergone repair in a similar manner. Tyre was used as a port during the Roman period because of its natural geographical protection and shape. Although specifics of the port's construction are unknown, geoarchaeological evidence indicates the harbor at Tyre was abandoned sometime during the sixth century, most likely due to cultural and political changes as well as tectonic instability.¹⁹⁸ When Ibn Talun reconstructed Akko harbor using Tyre as a model in the ninth century, he may have done so because the two harbors shared a similar layout.¹⁹⁹

551 CE in the context of other impacted harbors

Archaeological remains of several ancient harbors and geological cores similar to those taken from Caesarea, indicate the presence of the 551 CE tsunami at other ports north of Akko. As the ancient sources have reported, the tsunami of 551 CE had a significant impact on the cities of the Levantine coast. Geoarchaeological excavation of Beirut shows that harbor structures installed during the second to fourth centuries CE were in response to the city's economic growth and increased harbor traffic, as well as urban development and new public buildings. The harbor was also a response to the development of the surrounding hinterland, which saw an increase in mercantile activity and consequent importance of the Beirut as an urban metropolis within the empire.²⁰⁰ This growth was reflected in the size of the city itself, which was at its greatest extent 1.2 km by 0.8 km during the late Roman period.²⁰¹ The lack of surviving evidence about the harbor in the later Roman and early Byzantine periods is attributable to its repeated

¹⁹⁸ Marriner et al. 2005, 1294.

¹⁹⁹ Repairs done at Akko during the ninth century will be further explained in the next chapter.

²⁰⁰ Marriner et al. 2008, 2510.

²⁰¹ Mikati & Perring 2006, 45.

destruction by tsunamis and earthquakes.²⁰² Analysis of cores taken at the presumed site of Beirut's harbor suggest that a partial abandonment of the site, or at least significant decline in economic activity, occurred in the seventh and eighth centuries.²⁰³ This is consistent with written accounts that the city was impacted greatly by the 551 CE tsunami; each written source for the tsunami of 551 CE recorded that Beirut experienced the greatest impact from the event. Excavations show that certain sections of Beirut were wholly abandoned after 551 CE, and although an official was dispatched by Justinian to aid in rebuilding, there is little to no indication that these sections were rebuilt in the sixth or seventh centuries.²⁰⁴ In addition, there are clear destruction layers in the archaeological record.²⁰⁵

The suggestion of the archaeologists involved in the excavation of Beirut is that the Byzantine Empire retreated to Anatolia following the catastrophe of the 551 CE tsunami, both institutionally and in numbers of administrative officials in the provinces.²⁰⁶ Prior to the tsunami, the Empire was extended over a large area and was able to maintain itself because of key centers of administration throughout the Near East. Following the destruction by the tsunami, officials may not have been able to provide administrative duties in several of those key areas, and with their retreat, left the Levant particularly open to other political influences, such as Persia, and later, the Islamic conquests.

Geoarchaeological analysis for the port of Tyre has shown that the port, which was constructed by the Romans sometime after the area was conquered in 64 BCE, was

²⁰² Marriner et al. 2008, 2510.

²⁰³ Marriner et al. 2008, 2511

²⁰⁴ Marriner et al. 2008, Mikati & Perring 2006, 49.

²⁰⁵ Marriner et al. 2008, 2511.

²⁰⁶ Marriner et al. 2008, 2512.

partially abandoned during the sixth to eighth centuries.²⁰⁷ This disrepair is also seen in the geoarchaeological record at Sidon. Both harbor sites saw the deterioration of the harbor and trading activity is not specifically attributed to tsunamigenic activity, it is however, considered a significant factor. Despite the fact that the earthquakes of the sixth century were probably responsible for the destruction of the harbors at Sidon and Tyre, analysis of sea level at both harbors note that in the case of these two cities, the EBTP is not a valid argument for tectonic activity, and in fact, their period of most tectonic activity occurred after the sixth century.²⁰⁸

The tsunami of 502 & its impact on Akko& Caesarea

Two ancient accounts, Pseudo-Joshua the Stylite and the Chronicle of Edessa, report a great fire and an accompanying earthquake in 502 CE with an intensity rating of 8.0 that damaged the same coastline areas by 551.²⁰⁹ The most significant impression taken from these accounts is the report that,

On the same night in which that great blazing fire appeared, the city of Ptolemais or Akko was overturned, and nothing in it left standing. Again, a few days after, there came unto us some Tyrians and Sidonians, and told us that, on the very same day on which the fire appeared and Ptolemaic was overturned, the half of their cities fell, namely of Tyre and Sidon. (Chronicle of Joshua the Stylite, 47.)

The devastation that accompanied the earthquake of 551CE could very well have destroyed Akko, and the city may not have ever been able to recover port capabilities

²⁰⁷Marriner 2008, 1294. Semi abandonment is linked to coarse sand, which was not continually dredged and maintained as it would have been if the harbor was in use. During Roman and Byzantine times, sediment accumulated in harbors in this area (Marriner 2008, 1295.) at a rate of 10 mm/yr and required constant dredging. This resulted in a fine grained silt, which was not present in the deposits related to the 6th - 8th centuries.

²⁰⁸ Marriner et al. 2006, 1529. See figure 19, Marriner et al., (2006) which shows that at Sidon and Tyre, although there were less large earthquakes after the sixth century, these two coastal cities experienced relative demise that was not necessarily related to repeated earthquake damage.

²⁰⁹ Salomon et al. 2008, 710.

during the Byzantine Period. Akko may have sustained so much damage in 502 CE that it was not mentioned in reports of 551 CE because the city and the harbor had not recovered from their ruin fifty years earlier. Sidon and Tyre may have also been hit quite severely, however Joshua the Stylite's record clearly indicates that whatever was in existence at Akko was completely gone after the 502 CE earthquake, whereas there may have been more left of Sidon and Tyre, or they may have had the necessary resources to rebuild.

The earthquake of 502 may have initiated an imperial response to rebuilding the harbor at Caesarea. Sometime early in the reign of Anastasius I, Procopius of Gaza wrote, "The harbor of the city named after Caesarea had disintegrated through age, and lay open to every threat of the sea. Its structure no longer measured up to the category of harbor, but its former condition it kept in name alone..." "But by your will the city is rejuvenated, boldly receives ships, and is full of supplies."²¹⁰ Excavations at Caesarea have shown physical evidence of Anastasius' restoration at the site of the Northern Breakwater. Sometime in the early sixth century, a large amount of rubble was placed on the top of the outer breakwaters, which may have been Anastasius's engineering response to restoring functionality to the harbor.²¹¹ The southern seawall was also rebuilt and it is still visible in the harbor today underneath the Medieval city wall.²¹² In addition, there is evidence that as part of this reconstruction of the harbor, several areas adjacent to the harbor were reconstructed as well, including the temple platform and the vaults underneath it.²¹³ Whatever the restoration process, the harbor was functioning in some

²¹⁰ Procopius quoted in Hohlfelder, 44. (*Panegyricus In Imperatorem Anastasium* 19)

²¹¹ Hohlfelder 2000, 51.

²¹² Raban 1996, 657.

²¹³ Raban 1996, 657.

capacity in the Byzantine Period. After the restoration however, the harbor was once again in disrepair. Hohlfelder suggests that the subsequent breakdown of the harbor's structure may be due in part to a single event such as the 502 CE or 551 CE earthquakes, or to the repeated destruction of the coastline resulting from the Early Byzantine Tectonic Paroxysm, discussed in the previous section.

In the absence of physical evidence, only suggestions may be offered regarding how the disuse of Caesarea impacted Akko. Despite the fact that the harbor's capabilities may have declined, Caesarea was so reliant on its maritime economy that it would have required at least some functioning port facilities to survive.²¹⁴ If the harbor at Caesarea had been functioning in the Byzantine Period due to restoration by Anastasius, there was, perhaps, no need to use or restore the harbor at Akko, particularly given the fact that Caesarea had potential to accommodate a larger number of ships. There were challenges to using Caesarea as a port. The harbor was not a natural haven and it was vulnerable to the ocean and its elements, requiring constant upkeep to prevent the sea from retaking the coastline.²¹⁵ Akko, which is a natural harbor, may have required less upkeep than Caesarea, however the assembled structure may have been ill-prepared to withstand whatever natural disasters occurred during the period.

Furthermore, if the harbors immediately surrounding Akko were functioning on a larger scale serving the needs of the Byzantine Empire during the late fifth and sixth centuries, it may be possible that Akko's port was not needed at all. Ships coming into to the Levant for large scale trading operations would have used the harbor whose facilities were best able to accommodate them. This scenario only makes sense if one of the

²¹⁴ Raban 1996, 664.

²¹⁵ Hohlfelder 2000, 44.

surrounding harbors, such as Sidon, Tyre, or Caesarea were being used as a large harbor for the needs of the area. Research by Goodman and Dey shows that even though the breakwaters at Caesarea may have declined in the fourth and fifth centuries, there is a substantial amount of archaeological debris to suggest that the harbor was still in frequent use. The continued usage of the port at Caesarea, may have been due to the increased demand in the area resulting from increased pilgrimage. Economic prosperity is seen during the fourth and fifth centuries in Caesarea and other sites in Palestine as a result of increased pilgrimage combined with investment by the Emperor into churches and other buildings in the Holy Land.²¹⁶ Caesarea could have provided an access point to land for those coming to visit Jerusalem and the surrounding holy sites. The idea of a small but thriving harbor is echoed in the *Panegyric* of Procopius, and supported by the archaeological research reported in Goodman and Dey.²¹⁷ The harbor at Akko, on the other hand, may have only been used in the Byzantine period as a harbor for local people living in the surrounding area, possibly for small trading vessels, but certainly not for any military operations. If the harbor was not functioning on a large scale or even on a moderate scale before the 502 CE or 551 CE earthquakes, there would have been no economic reason to restore its former glory as a Hellenistic and Roman military harbor.

Goodman and Dey also suggest that Anastasius' reconstruction discussed in Hohlfelder's research occurred after 502 CE, as a means of 'disaster-relief', although they are not sure as to why Caesarea was only restored in the early sixth century instead

²¹⁶ Raban & Holum 1996, xxx.

²¹⁷ Goodman and Dey 2010, 277. The evidence presented is in the form of wrecks dating to the period, as well as a substantial amount of ballast stones also from the same period. Goodman and Dey suggest that the port was "lively" in the 4th and 5th centuries, with a functioning inner basin and a relatively deteriorated outer basin, which nevertheless still accommodated the necessary amount of trading volume.

of earlier in Anastasius' reign.²¹⁸ Caesarea may have been reconstructed after the disaster of 502 CE to accommodate whatever activity was lost due to the destruction of Akko. Caesarea may have had to pick up the slack, so to speak, following 502CE, since whatever amount, however small, of trading and activity that would normally have been done at Akko would have been impossible following the harbor's complete decimation. Goodman and Dey also report that economic activity after the Anastasian restoration increased, and the harbor enjoyed relative prosperity, declining only after the mid-century and the 551 CE tsunami.²¹⁹ Whatever the outcome of 551 CE, if the harbor at Caesarea had not been restored or used after 551 CE, the foundations may have been laid for an economic downturn in Palestine, and the city may have never resumed normal activity after such an event.

Hohlfelder also points out the relationship between the functioning of the harbor at Caesarea and the success of the city itself.²²⁰ The harbor served as a trading hub, a landing point for pilgrims coming to the Holy Land, and an occasional port for imperial troops and naval forces. Without the port facilities to accommodate such activities, Caesarea may have declined in importance and had less of an impact on the economy of the surrounding area. Likewise, on a smaller scale, the decline in harbor facilities at Akko would have had a significant impact on the local trade of the region, even more noteworthy if it was out of use for a half a century or more. Ballast deposits and an abundance of Byzantine era ceramic remains shows that following whatever reconstruction of Caesarea's harbor that was undertaken during Anastasius' reign, the result was an economic upturn allowing the city to return to a functioning, if not

²¹⁸ Goodman and Dey, 2010.

²¹⁹ Goodman & Dey 2010, 278.

²²⁰ Hohlfelder 2000, 46.

prosperous, level. Without the necessary repairs, the logical conclusion would be that Akko's importance as a port was directly tied to its disuse during the Byzantine period. Disuse of the harbor, of course, not limited to the Anastasian imperial period; if Akko's harbor was not restored in the Byzantine period after being used in the first and second centuries CE, there would have been little to no chance that Akko would have continued to be used for any significant trading or imperial activities, and may have faded into obscurity except on a proximately local level.

On a similar note, the wealth and prosperity of Caesarea would have affected those living in the provinces surrounding it. De Signi notes that “ [Caesarea was] made vulnerable by its preeminence.”²²¹ In other words, Caesarea had to maintain at the very least, a facade of economic vitality in order to prevent rumors of food shortage and possible riots.²²² The ability to maintain such a vitality was at least in some part dependent on the harbor. When Procopius of Gaza described the state of disrepair of the harbor before Anastasius' rebuilding efforts, he was also quick to mention the destitute people who were not able to get the needed food and supplies from ships coming into the harbor.²²³ Without the harbor to supplement the agricultural supply coming in from the surrounding lands, the notation of an economic depression in the archaeological record at Caesarea is hardly surprising to see. Likewise, Akko's citizens and those who lived in the surrounding area would have continued to rely on their port for some imported goods and would not have prospered if their harbor was not operating at full capacity.

As Caesarea was the gubernatorial seat of the Palestinian provinces, the governor was responsible for public building and the funding of such projects. It would seem

²²¹ De Signi 1996.

²²² De Signi 1996, 576.

²²³ De Signi 1996, 577.

however, that the bishops of individual cities and towns were responsible for assessing the need, especially after a natural disaster or civil violence.²²⁴ Akko was part of the Phoenician province, and at the time of the 502 and 551 CE events, the capital of the province was Tyre, so the governor there would have given the responsibility of rebuilding the city to the bishop of Akko. Restoration would have been dependent on the funds available, both from Akko itself, from the province, and, if available, from the imperial relief fund.

Following Anastasius' restoration of the northern breakwater, excavators have pointed out that a platform was installed in front of the Temple Platform. This platform was abandoned sometime around the mid-sixth century CE. Raban attributes a deposition of coarse materials pointing to the abandonment to the 551CE tsunami.²²⁵ From the mid sixth century until the Islamic conquest of Caesarea, the harbor continued to silt up.²²⁶ A silted harbor suggests that it was not rebuilt following the tsunami, and was never again used as a significant port under the Byzantine Empire. Furthermore, the silted harbor points specifically to a decline in harbor functioning after the tsunami struck. Avner Raban, the leading Israeli archaeologist who conducted excavations at Caesarea's harbor for many years, theorized early on that the harbor was not maintained after the first century CE, and that the harbor started to silt up sometime after 70 CE.²²⁷ Until the restoration by Anastasius in the sixth century, the harbor continued to have sediment and other materials brought into it; depositions of pottery, food remains and marine seashells

²²⁴ In Caesarea, after the Samaritan revolts of 536 CE, the governor of Caesarea dispatched the bishops of Ascalon and Pella to assess the damage and charged them with using the tax money given to them for rebuilding efforts.

²²⁵ Raban 1996, 662.

²²⁶ Raban 1996, 662.

²²⁷ Raban 1996. Sedimentological evidence from the harbor shows that there was a change from a calm harbor environment that would have been from the protection of the breakwater, to a more turbulent environment without any protection from the open ocean.

have been found dating to the Late Roman period in several areas of the harbor.²²⁸ As Goodman and Dey have noted, the starting point for the harbor's disuse was most likely the tsunami of 115 CE.

Goodman et al. cite evidence from terrestrial excavations up and down the Israeli coastline of deposits of marine sediment and organisms that is an indication for the tsunamis of 551 CE and 749 CE. These deposits were sighted at excavations of Caesarea's Tel before the marine core deposits at Caesarea gave solid, dated evidence for these disasters.²²⁹ The deposits were noted to contain thick shells and marine sediment, some incorporated into concrete poured during the Roman period.²³⁰ The previous conclusion about these deposits was that they were shells and sediment used by humans in building projects.²³¹ However, there are several inconsistencies in using these deposits as evidence for human impact on the landscape, the most notable of which is that they are too thick and inconsistent with stratigraphy of excavated buildings.²³² In addition, there are deep-water bivalve organisms in the deposits, which would not have been moved from the sea floor without a high-energy natural force, such as a tsunami.²³³ These deposits, if confirmed with marine cores from these sites, will show that the 551 CE tsunami had an effect further south than just Caesarea, possibly as far as Ashkelon. It is possible that there are similar remains of these deposits at Akko; however Tel Akko, may be too far away from the coastline to have any deposits, and the modern day town is built over the area that would need to be excavated, making confirmation of this impossible.

²²⁸ Raban 1996, 656

²²⁹ Goodman et al 2014, 365. These deposits may be seen at Dor, Achziv, Shikmona, Ashkelon, Michmoret, and Yavneh Yam.

²³⁰ Ronen 1980.

²³¹ Ronen 1980.

²³² Goodman et al 2014. 366

²³³ Goodman et al 2014., 366.

These deposits are significant for Akko and Caesarea as tsunami candidates. Despite whatever gaps there may be in the geological and archaeological evidence for the sites further south than Caesarea, the wider range suggested by the evidence provides a further point of argument for the tsunami hitting Akko. Additionally, if the tsunami of 551 CE affected further south than Caesarea, than the earthquake accompanying it was larger than previously thought. A geological impact on such a wide area would have required a large and monumental tectonic shift. Furthermore, if the remains of the tsunami of 551 CE are present along the coastline of Israel, there is the potential to find confirmation of this event north of Beirut, or as far away as Cyprus.

CHAPTER 5

AFTERMATH OF THE 551 CE TSUNAMI

Historical Developments in the Levant following 551 CE

The prevailing opinion has been that during the sixth and seventh centuries, the Near East experienced a decline in economic and commercial activity. This theory was first discussed in the 1960's by A.H.M. Jones, who argued that the third century crisis in Rome was directly responsible for economic depression in late antiquity.²³⁴ While this theory may not be applicable in the Western Roman Empire, , the archaeological evidence for decline in the Byzantine Empire varies by individual sites.²³⁵ Building and economic production in rural areas experienced a boom. In contrast, the experiences in most of the major Near Eastern cities reflected the tumultuous events of the time period, such as plague, warfare and earthquake. These urban sites experienced "short-term dislocations", and while the vitality of such sites was disrupted, in some cases they recovered during the centuries that followed.²³⁶ Other cities experienced this dislocation and were unable to recover under the new Islamic order. While cities may have declined in economic vitality, the rural regions may have assumed the prominence and production once held by the cities, and the balance may have been enough to maintain economic continuity. The urban landscape was integral to the Byzantine world, however, and

²³⁴ Jones 1964.

²³⁵ Cameron 2012, 156. archaeological evidence is indicative of a functioning, if not prosperous maritime trading pattern in the Western empire through the seventh century, and only a real decline in the eighth century. This is in sharp contrast to Jones' view, where trade and economic links were supposedly severed in the sixth century and dropped off in the seventh.

²³⁶ Walmsley 2007, 321.

despite the growth in urban population, the rural areas remained responsible for Byzantine economic vitality.²³⁷

Analysis of seventh and eighth century material culture from rural Syria-Palestine argues for more economic stability than instability in the area.²³⁸ Patterns in the settlement indicate that elsewhere there was a boom in agricultural production and population along the eastern border of Syria during the Byzantine Period.²³⁹ Trade between Egypt and the Levant increased in the seventh century. Large quantities of the typical Egyptian wares have been found at sites in the southern Levant, such as Pella and Jerash. This was a new trading relationship not seen on such a large scale in the previous centuries.²⁴⁰ Distribution of goods from Syria to Egypt also proceeded through the sixth and seventh centuries uninterrupted.²⁴¹ The city of Jerash was reduced in size, however this was most likely due to an expansion of rural areas occurring around the same time in the seventh century.²⁴² Rural areas, such as the Golan, southern Palestine, the Negev, and the limestone steppes of rural Syria reached their highest settlement density in the sixth and seventh century.²⁴³ Several sites in the countryside, such as those in the Darum area of southern Palestine, Umm al-Jimal and Khirbat al-Samra in the Jordanian steppes, were established in the seventh century.²⁴⁴ The establishment of these communities may have originated from migration of elite citizens who fled the cities of the Levant because of

²³⁷Cameron 2012, 147.

²³⁸Walmsley, 2007.

²³⁹Decker 2007.

²⁴⁰Walmsley 2007, 330. Walmsley also notes trading patterns on the Red Sea, and the distribution of Palestinian Fine Table Ware and "Jerash Bowls" as evidence for increased, or at least normal trading activity during this century.

²⁴¹Walmsley 2007, 330.

²⁴²Walmsley (2007, 337.) believes that people migrated to areas that weren't affected by plague or later on, to places which were closer to areas of increasing importance, such as the Umayyad capital of Damascus or pilgrimage routes to the Arabian Peninsula.

²⁴³ Cameron 2012, 169.

²⁴⁴ Walmsley 2007, 336.

plague and security threats from the Persian and Muslim armies. This boom in rural building and economic production is also evident further north in Syria. The rural lands surrounding the major cities were densely irrigated with technologically complex agricultural systems, exemplifying that, at least in farming and production, the area maintained a certain output of resources. The rural hinterlands surrounding Antioch and Damascus most likely saw an influx of population.²⁴⁵

Analyses of coins hoards dating to the mid-seventh century also reflect some measure of economic continuity and demonstrate that, at the very least, the monetary system of Syria-Palestine continued through the transition from Byzantine rule to the Umayyad Caliphate.²⁴⁶ In addition, sites such as Apamea in Syria show a large variety of coinage, the dates of which are varied and include some dating to the years of war between the Byzantines and the Muslims.²⁴⁷ The number and variation of coins shows that the mints of the area were still manufacturing at a reasonable rate. The coin hoards do suggest that there was some measure of political instability and that people were burying their wealth in haste. Because most of these coin hoards date to the mid-seventh century and not before, it is possible that there was some economic fluctuation and instability during the early Islamic invasions, becoming settled once the Islamic presence became an accepted norm.

Urban centers underwent drastic transformation in the sixth and seventh centuries. Cities went from open-air agoras and linear urban plans to small over-crowded streets

²⁴⁵Mitchell 2014, 332.

²⁴⁶Walmsley 2007, 323. While Walmsley (2007) cites a 'clear rise' in the number of hoards from the seventh century, it is possible that there were just more found from this century and the hoards of other centuries have not been discovered.

²⁴⁷Walmsley 2007, 325. These include coins from the years 613-638 CE and from the reign of Constans II.

dotted with mosques and hammams.²⁴⁸ Public spaces like the agora were developed into residential spaces, and residences that were once large, splendid, and for a single household were subdivided into smaller, modest spaces.²⁴⁹ Public spaces in use prior to the Byzantine period, such as theaters, were overtaken by other buildings or dismantled for masonry materials. The inhabitants of Caesarea for example stopped using their theater sometime after the third century, and the stones used as building supplies in other parts of the city.²⁵⁰ Although towns and larger cities were reduced in size during the seventh century, certain buildings and town centers were altogether abandoned while other previously unused areas were built up.²⁵¹ These changes to the urban landscape suggest a shift in priorities toward a concentration on areas that were previously unimportant. Urban areas were becoming smaller and more concentrated while rural areas were becoming more populated. The tradition of urban life, with government and religious centers established within them, did not change with the transition with the Islamic conquest. Instead, certain cities that had been important under the Byzantine Empire declined, and others rose in importance.²⁵² Likewise, cities did not transform immediately, as some cities had Islamic elements before the conquests began, and still others had distinctly classical features long after the conquests ended.²⁵³

The cities of northern Syria felt the hardship of war and sources. Archaeological and epigraphic evidence show that these cities did experience decline in the sixth

²⁴⁸Kennedy 1985b, 5.

²⁴⁹Cameron 2012, 155.

²⁵⁰Raban & Holum 1996, xxxi.

²⁵¹Walmsley (2007, 334) reports this happening at Pella, Jerash and even Antioch.

²⁵²Kennedy 1985b, 4.

²⁵³Kennedy 1985b, 17.

century.²⁵⁴ Antioch was certainly reduced in size from the time of late antiquity until the Muslim conquests, going from 150,000 inhabitants to a population somewhere between 50,000 and 75,000.²⁵⁵ In addition, under the Umayyad caliphate and later Islamic caliphates, Antioch was not a capital city, and was instead a minor city much reduced in size.²⁵⁶ The cities of southern Syria, were not as involved in the fight against the Sassanians, and as such, cities such as Bostra and Damascus continued to expand in size, population and prosperity during the sixth century. These cities only start to show signs of decline after the Islamic conquests were over in the Near East in 641 CE.²⁵⁷ Despite the changes, at least initially the administration of Eastern cities and provinces did not change with the Islamic conquests. The new rulers continued using the existing Byzantine administrative system and also used the Greek speaking officials already in place.²⁵⁸ It is not hard to see then, that if the Muslims continued the use of Byzantine administration into the late seventh century, they would have not drastically changed anything else, such as city layout or trading infrastructure. Real changes in administration and structure did not begin until after the Umayyad caliphate disintegrated and the capital was moved to Baghdad (750 CE).²⁵⁹

Urban decline is seen clearly at the Roman site of Scythopolis, now modern day Beit She'an. Archaeological excavations show that Scythopolis experienced vitality in the first half of the sixth century.²⁶⁰ Several construction projects were built under both Justin

²⁵⁴ Mitchell 2014, 333. The archaeological evidence for Antioch's reduction in size was discussed above. Inscriptions show that building did not

²⁵⁵ Decker 2007, 236.

²⁵⁶ Decker 2007, 236.

²⁵⁷ Mitchell 2014, 359.

²⁵⁸ Cameron 2012, 199.

²⁵⁹ Cameron 2012, 207. See also for Islamic historical perspectives Hoyland (2015), Kaegi (1992)

²⁶⁰ Tsafirir & Foerster 1997, 116 - 118.

I and Anastasius I.²⁶¹ Lack of building projects under Justinian I is surprising considering the many structures commissioned by the emperor under his empire-wide building program.²⁶² However, the epigraphical evidence shows that building stopped after the century's midpoint, with only two dated inscriptions after 551 CE. The inscriptions point to an economic downturn in Scythopolis, and there have been two main theories for this decline. Firstly, Scythopolis was one of the main battlegrounds of the Samaritan revolts, which occurred in 529 CE, and secondly, the Justinianic plague heavily affected the area from the fall of 541 CE until the early summer of 542 CE.²⁶³ Without a doubt, these two events were important to the city's development. However, Scythopolis was certainly struck by the earthquake that accompanied the tsunami of 551 CE. Furthermore, a concentration of resources in other parts of the region, such as the devastated maritime cities in Phoenicia and Palestina, may have resulted in imperial and private patronage of Scythopolis in the years following 551 CE.

The main basilica in Scythopolis, built under Anastasius, was destroyed by the earthquake.²⁶⁴ The effects are seen in the columns of this building, which all fell together, most certainly due to the volatile movement of the ground below. Excavators have hesitated in associating this and other damage with the earthquake. Their reluctance has been due to lack of evidence for the magnitude of 551 CE in comparison to the 363 CE and 749 CE earthquakes, both of which had struck Scythopolis. In addition, the difficulty in assigning the tsunami a role in the development of Scythopolis lies in its distance from the proposed impacted areas and Scythopolis, just under sixty kilometers inland.

²⁶¹ These include the western bathhouse complex, a basilica, and several churches, all of which have inscriptions stating that some monetary contribution came from the emperor.

²⁶² Tsafir & Foerster 1997, 117.

²⁶³ Tsafir & Foerster 1997, 118.

²⁶⁴ Tsafir & Foerster 1997, 125.

However, the consensus reached in recent research is that the 551 CE earthquake was the largest tectonic event to affect the region during the Byzantine period. Combining this fact with the geological dates from the Caesarea harbor cores provides enough evidence of the wide-ranging impact of the earthquake and tsunami, including much of the Levantine coast and inland cities such as Scythopolis. While the Samaritan revolts and Justinianic plague would certainly have had an impact on Scythopolis, the earthquake of 551 CE would surely have affected the livelihood of this city.

In the second half of the sixth century, Scythopolis went from an organized town with all the markings of a prosperous Roman city, to a city overrun with narrow streets, encroaching public buildings and no sign of those public works that were evident in the previous centuries.²⁶⁵ The buildings of the city, particularly public places, were not repaired and some buildings even showed signs that they were dismantled for materials.²⁶⁶ These changes have been cautiously associated with decline primarily because using changes in urban architecture as a sign of deterioration is not a solid indicator of economic downturn, but only as a change in style. In other discussions, the transformation of Eastern cities is a sign of increasing Arab influence on the area, and represents a changing approach to urban planning that would be used after the Islamic conquests.²⁶⁷ However the fact remains that this so called 'decline' is much more evident in Scythopolis than it is in other areas of the Levant. Indeed, the changes identified in the urban layout here occurred earlier than in other cities and long before the Persian and Muslim invasions may have been seen in the archaeological record. For example, Jerusalem has no evidence of any type of architectural change before the Persian

²⁶⁵Tsafir & Foerster 1997, 141.

²⁶⁶Tsafir & Foerster 1997, 141.

²⁶⁷See Kennedy 1985b.

conquest in the late sixth century, and buildings were erected in a traditional, Roman style as part of the Justinianic building program.²⁶⁸

There is no evidence that Scythopolis was harmed or attacked during the Muslim conquests, and in the aftermath Tiberias was chosen as the main capital of al-Urdunn, the Islamic province which roughly corresponds to Palestina Secunda.²⁶⁹ Finally, Scythopolis was destroyed in 749 CE by a massive earthquake.

Caesarea & Akko after the 551 CE tsunami

The tsunami of 551 CE had a significant impact on daily life in Caesarea. Prior to the tsunami, merchants likely took in large supplies of grain and goods from the surrounding rural areas, which were stored in private warehouses built adjacent to several large, likely merchant-owned mansions. During the excavations of these warehouses, archaeologists found a layer of water deposited sand above the warehouse floors in excavation area KK.²⁷⁰ Prior to geoarchaeological study of Caesarea, this layer of sand was seen as abandonment layer from the early seventh century; not wishing to live under Muslim rule, the elite who resided in these mansions fled the city and their warehouses were left unused for many years. When considered in light of the 551 CE event, the sand layer instead appears to have been left by the tsunami's course. After the sand layer was deposited and the mansions were abandoned, irrigation channels and gardens were established on top of the houses and agricultural storage areas during the seventh century.²⁷¹ The supply of goods in these warehouses was most likely destroyed by the

²⁶⁸Tsafir & Foerster 1997, 143.

²⁶⁹Tsafir & Foerster 1997, 145.

²⁷⁰These warehouses were built in the fourth through sixth centuries. Holum 2011 25, 29.

²⁷¹Holum 2011, 1.

tsunami, thereby reducing the functionality of Caesarea and requiring occupants of the city to rely on other resources. The warehouse (*horreum*) that had supplied the city during the Roman period may not have been affected as it was maintained and used until the 630s, and probably held large amounts of oil and grain.²⁷² It is possible that Caesarea and its inhabitants were able to rely on this warehouse to store goods. However, this would only make sense if commodities continued to be brought in from surrounding rural lands following the tsunami of 551 CE. It should be noted that a resumption of normal activity might not have happened immediately. Other archaeological evidence shows that there was an effort to clean up the port city after the tsunami of 551 CE. Several buildings dating to the later sixth century have been identified as new construction or reconstruction of older buildings, demonstrating that at least part of the city remained functional.²⁷³

The impact of the 551 CE event on Caesarea's harbor had a significant effect on the maritime import and exportation of goods in the Levant.²⁷⁴ Following the tsunami of 551 CE, ceramic remains from the harbor show that amphorae coming into the port were increasingly from local areas, and not as wide reaching as they had been in previous centuries. On land as well, excavations of area LL show that more transport vessels were arriving from the surrounding rural areas, presumably because the harbor was available to import large amounts of goods as it once had.²⁷⁵

²⁷² Holum 2011, 25.

²⁷³ Holum 2011, 24. Goodman et al. 2014, 359

²⁷⁴ Goodman & Dey 2010, 281. Holum (2011) is also inclined to include the Justinianic plague in the economic dislocation that occurred specifically in Caesarea. Plague has also been used to show economic decline at other sites in the decades before the seventh century: Kennedy 1985a.

²⁷⁵ Goodman & Dey 2010, 281.

After the Muslim conquest of Caesarea in 640 CE, the city experienced significant depopulation, with wealthy residents fleeing to Anatolia and never returning.²⁷⁶ This transformation may have begun even earlier than expected. Dating of numismatics from the terraced gardens established the southwest zone show that the structure of the city may have changed even during the siege of Caesarea (634- 641 CE). Early Islamic Qasariyah became a small town, with its population, layout, and architecture of an entirely different makeup from its Byzantine and Roman ancestors.²⁷⁷

During the eighth century, bathymetric data collected at Caesarea has also shown that another tsunami struck the coastline in 749 CE. Following the destruction of this tsunami, the harbor was intentionally filled with rubble.²⁷⁸ As a result, the shoreline was expanded and in turn would have made the harbor smaller, which was already significantly silted up starting in the seventh and eighth centuries.²⁷⁹ The reduction of the harbor in the eighth century points to a changing attitude toward the use of the harbor as a trading port. It is possible that there was reduced mercantile activity with a smaller harbor at Caesarea than there had been in the centuries beforehand. Whatever the case, although Qaisariyah was still populated during the Islamic period, the wall built during the ninth century that encircled the city indicates that the population was one tenth of what it had been during the Byzantine Period.

Akko was partially rebuilt sometime after 877 CE by Ibn Tulun (835-884 CE), caliph of Egypt, following his conquest of Syria and parts of Palestine. He was inspired

²⁷⁶Goodman et al 2014., 368. Patrich (2011, 43) points out that the depopulation was definitely due to abandonment, as no archaeological evidence of fire or deliberate damage to buildings have been found thus far in the city. See Levy-Rubin (2011, 164); she describes the exodus of the Byzantines to Anatolia through her translation of an obscure Arabic text (The Samaritan chronicle of Abu 'l-Fath).

²⁷⁷Patrich 2011, 59. Goodman et al. 2015, 357.

²⁷⁸Goodman et al. 2014, 369.

²⁷⁹Goodman et al. 2014, 370.

by the harbor at Tyre, and wanted to recreate the fortifications and port he saw there at Akko, now called Akka.²⁸⁰ The practice at the time was to use non-hydraulic mortared rubble contained within a caisson, the method most likely used at Akko.²⁸¹ Early excavation reports stated that the shipbuilding industry under the Muslims made Akko an important naval base that was only eclipsed in prominence and proliferation by Alexandria.²⁸² Akko was not the only harbor repaired during the Islamic period, as the Caliphate of Egypt restored the port of Clysma shortly after conquering the area in 643 CE.²⁸³ The disuse and ill maintenance of Byzantine harbors could have been a common problem and several may have required reconstruction during the Islamic period.²⁸⁴ It would be a stretch to assume that Ibn Tulun rebuilt the harbor at Akko during the ninth century as a result of the 749 CE earthquake. However, there is the possibility that Caesarea was not able to accommodate the trading activity it once had. There is also the possibility that Akko was closer in proximity to the larger ports to the north, such as Sidon, Tyre and Beirut, and Ibn Talun saw the possibility of creating new mercantile activity and opportunities at Akko.

Surprisingly, there is a relative lack of Islamic pottery finds from past excavations at Akko harbor.²⁸⁵ It is unusual that the harbor would have been built up during the ninth century and then left unused. An alternative explanation for this paucity of finds is that previous excavations were conducted in areas separate from where the harbor was rebuilt

²⁸⁰Galili et al. 2010, 204.

²⁸¹Wilson (2011) claims that the Muslim reconstruction of Akko's harbor would have used this type of building as the method for hydraulic concrete had fallen out of practice by this period.

²⁸²Flinder, Linder & Hall, 201. "Survey of the Ancient Harbour of Akko, 1964-1966"

²⁸³Wilson 2011, 52. Clysma coordinates to the modern town of Suez, at the entrance to the Red Sea.

²⁸⁴Wilson 2011, 52.

²⁸⁵Stern 2013, 164.

or those areas that saw the most use.²⁸⁶ To explore the state of the harbor further during the later Byzantine period, more excavation needs to be done. It is possible that the submerged rampart adjacent to the Tower of Flies was built during the Islamic period and functioned as a breakwater, although a rampart would only have functioned as such if the harbor were located in the eastern basin. The use and reconstruction of the harbor during the Islamic period could mean that the Akko harbor was not in use from some time in either the Roman or Byzantine period until approximately the middle of the ninth century. Archaeological research suggests that during the Crusader period the harbor was constructed in front of the Pisan quarter, on the seaward side of the natural anchorage. It most likely built on top of the ancient breakwater.²⁸⁷ This hybrid construction can still be seen today.

Conclusion

Archaeological and historical research has shown that urban centers of the Near East experienced an economic downturn in the early seventh century. Conversely, rural areas, such as the Negev desert, flourished. However, Scythopolis, Akko, and Caesarea experienced economic decline in the latter half of the sixth century, much earlier than most other urban centers of the area. Decline in these cities was directly related to the effects of the tsunami of 551 CE. Scythopolis experienced damage from the earthquake and may also have been affected by the reduction in its trading capacity through Akko and Caesarea's ports. The tsunami of 551 CE most likely destroyed or significantly damaged any harbor structures at Akko and Caesarea, and since each city

²⁸⁶ Stern 2013, 164.

²⁸⁷ The Crusader period of Akko is defined as 1104 CE until 1291 CE.

was reliant on its harbor for economic vitality, the region and its citizens were adversely affected by this event.

CHAPTER 6

CONCLUSION

The tsunami that struck the Eastern Mediterranean in 551CE was a natural disaster that made such an impression in the collective memory of the area that it was written about for several hundred years after its occurrence.²⁸⁸ Recent research in the geological and archaeological history of the Levantine coastal region has revealed physical evidence of the tsunami's destruction. This evidence shows that the 551 CE tsunami impacted Beirut, Sidon, Tyre and Caesarea Maritima, and caused such extensive damage at these cities that severe economic, military, and political consequences may be assumed. In addition, excavations in the eastern basin of Akko's ancient harbor revealing a 6th-century destruction layer suggest that this port, also, was devastated by the 551 CE tsunami - or perhaps a combination of several earthquake-tsunami events that occurred in the first part of the century. Akko's activity as a port demonstrably went into decline after the 6th century.

Overall, the sixth century was a period of transition in the Near East. Justinian I, the Byzantine emperor from 527-565 CE, put a great deal of strain on financial resources of the empire through an almost continuous series of military campaigns. In addition, the Justinianic plague spread through the Byzantine Empire and killed a significant portion of the population – an estimated 25 million just in the initial outbreak. In the midst of these events, the 551 CE earthquake and tsunami devastated the coastline of what is now northern Israel and Lebanon. Sonar analysis of submarine escarpments off the coast of Beirut has revealed the geological impact of this tsunami. This sonar profile indicates an

²⁸⁸ See Goodman & Dey 2010.

epicenter either directly underneath or slightly offshore from Beirut, which was a major port and important city during the Byzantine Period. Modern attempts to reconstruct the magnitude of the earthquake associated with the tsunami of 551 CE have proposed an event within a magnitude of 7.0 and 7.5.

The event was large enough to cause vertical uplift along the coastline near Beirut, which is still visible today both on land and underwater. Given the environmental conditions along the Levantine coast and the issue even today with harbors silting up (for example Haifa, which requires regular dredging), such a major uplift is likely to have caused extensive damage to local harbor facilities, including their mechanisms for flushing out silt. Certainly at Caesarea there is evidence of the inner basin silting up in the 6th century, and this process likely contributed to the contemporary decline of other Levantine ports as well.

Geological cores from the seafloor at Caesarea Maritima likewise indicate the impact of a major tsunami at this site in the 6th century. These findings demonstrated that the 551 tsunami impacted a far larger area, extending much further to the south, than was originally apparent from the evidence collected around Beirut. This means that a large number of the region's other most important ports including Caesarea, Dor, Akko, Sidon were likely severely damaged.

Akko during the sixth century was a small town. Maritime trading activity appears to have been concentrated in the Western Basin (the 6th century layer of pottery, proposed as the destruction layer of the tsunami, came to light alongside the submerged Hellenistic port facilities in the Eastern Basin).²⁸⁹At this time, Akko's trade was small-scale and predominantly local. Local records show that the town and harbor were

²⁸⁹ Galili et al. 2010.

extensively damaged by an earthquake in 502 CE. When the tsunami of 551 CE struck, Akko had likely not yet recovered from the devastating event fifty years earlier (though to date it had not been possible to separately identify these two events in the archaeological record). Nearby in Caesarea, the earthquake of 502 CE prompted Anastasius I to rebuild the harbor there, including the inner breakwater. In the aftermath of the 551 CE tsunami, Caesarea's harbor contracted in size, and the town itself showed signs of decline. That said, it is important to keep in mind that cities throughout the Near East diminished in size and importance at this time; however, rural settlements began to proliferate, and the economy of the Byzantine Empire in the Near East remained stable despite the turmoil.

While the destruction of the tsunami was certainly influential in the development of the towns and harbors of Akko and Caesarea, it is hard to determine what other impacts that this event may have had. Certainly, archaeological evidence at Caesarea shows that the city became less important after 551 and may not have been trading on a grand scale as it had in centuries before. The tsunami was certainly a factor in the city's decline – but even to the time of the Persian and Islamic conquests it nevertheless remained well-populated and strategically important.

The relative lack of early Islamic pottery at Akko suggests that it remained a small trading center without wider-reaching influence. As a coastal town with an economy presumably heavily based on fishing and trade, Akko certainly would have suffered economically after the 502 and 551 events – though we cannot know the extent to which the decline of maritime trade was alleviated by an increase in the productivity of

Akko's chora, following the general pattern of increased agricultural activity in the Near East during this period.

Akko became a major center of the Islamic shipbuilding in the mid seventh century, and was used as a port by the Umayyad caliphate as naval power became an important part of their culture. Akko evidently recovered from the impact of the 551 tsunami in the following centuries. Akko's revival as a port and center of shipbuilding and its eventual eclipse of Caesarea in the medieval period shows that there typical historical pattern for port towns impacted by the natural disasters of the 6th century, and the military disasters (at least for the Byzantines) of the 7th century. This is one of the reasons why further archaeological investigation of the ports of Caesarea, Akko, and other Levantine coastal towns is important.

Although the evidence presented here has specific implications for Akko's Byzantine period, the potential implications are far broader. Akko today is a significant cultural heritage site, as its recent designation as a UNESCO World Heritage site confirms. However, while the focus of archaeological work in the Medieval-Ottoman old city emphasizes preserving the past within a living community, the potential for significant and illuminating discoveries in the seas surrounding Akko is only beginning to be realized.

Today, human development and natural forces such as erosion and tectonic activity threaten the survival of underwater cultural heritage along the Eastern Mediterranean Coast. Further investigation into the seismological history of Akko's ancient port, and those of other Levantine coastal towns, has the potential to shed important new light on the critical centuries of the Near East's transition from a frontier

of the Byzantine Empire to a center of Islamic medieval culture and power. Furthermore, a greater understanding of the impact of past seismic events must inform present-day expectations and planning for what will one day, inevitably, occur again.

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