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A QUANTITATIVE ANALYSIS OF THE EARLY CHRISTIAN CHURCHES OF CENTRAL LYCIA

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Volume I
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Since the publication of R. Martin Harrison’s seminal work, ‘Churches and chapels of Central Lycia’ in 1963, numerous scholars have focused on the region, attracted by the large number of extant remains. From large-scale surveys, such as The Tübingen Lycia Project and Tabula Imperii Byzantini, to site-focused archaeological examinations (such as Morganstern 1983, Hohlfelder 2005, and ed. Akyürek 2017), researchers have long endeavoured to understand the architectural development and influence of the churches through the lens of comparative architectural analysis, both within Lycia as well as in a wider context.

This thesis brings a new perspective: by employing methodologies based on cultural evolution, or 'descent with modification' (Mesoudi 2016), it is possible to consider the architectural development of these ecclesiastical structures in a different light. In archaeology this method is applied to artefacts through the study of cultural traits, 'units of transmission that permit diffusion and create traditions' (O’Brien et al. 2010). Often, researchers use common, easily reproducible artefacts, but by switching from the micro-scale of artefacts to the macro-scale of large, architectural constructions, it is possible to consider architectural structures as these units of transmission (Jordan & O’Neill 2010).

This thesis analyses the cultural traits of the 162 Christian churches of Central Lycia, through data collected from 44 sources. Through exploratory data analysis and nearest neighbour analysis, it answers four primary questions: 1) Is there quantitative evidence for a temporal change in the cultural and geographic traits of the churches of Central Lycia, 2) Are there different patterns in church building between the three sub-regions of Central Lycia. 3) Do churches with synthronons have a specific, unique function, and 4) Are churches with a triconch apse related to St. Nicholas of Holy Sion.
Question one has been analysed through the lens of traits that directly relate to current theories on temporal change: nave area, construction technique, apse shape, and geographic location. Both questions three and four consider the relationship between presence of a synthronon or triconch apse and other cultural traits, including location-based analysis. Finally, any regional differences are discussed in the analysis of the above three questions.

Based on the results of these tests, this thesis suggests that unlike the arguments put forth in previous modern scholarship, Central Lycia does not see a religious decline, but rather that it sees a shift in accessibility to Christianity; these smaller churches indicate not only a stronger community relationship to the church, but also an interest in worship over-elaborate architectural designs.
Lay Summary

Since the publication of R. Martin Harrison’s, ‘Churches and chapels of Central Lycia’ in 1963, numerous scholars have focused on the region, attracted by the large number of extant remains. From large-scale surveys to site-focused archaeological examinations, researchers have long endeavoured to understand the architectural development and influence of the churches through the lens of comparative architectural analysis, both within Lycia as well as in a wider context. This thesis brings a new perspective: by using methodologies based on cultural evolution, it is possible to consider the architectural development of these churches in a different light. In archaeology this method is applied through the use of cultural traits, which are easily identifiable features of an object. Though usually used on smaller objects such as pottery, by considering a church as a single archaeological artefact, the same method can be applied.

This thesis analyses the cultural traits of the 162 Christian churches of Central Lycia, through data collected from 44 sources. Through exploratory analysis and statistical testing of the traits, it answers questions relating to the presence of specific cultural traits as well as regional variation and change over time. The results of these tests suggests that unlike the arguments put forth in previous modern scholarship, Central Lycia does not see a religious decline over time, but rather it sees a shift in accessibility to Christianity; these smaller churches present throughout the region indicate not only a stronger community relationship to the church in this period, but also an interest in worship over-elaborate architectural designs.
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I. INTRODUCTION

I.i Lycia

The mountainous region of Lycia lies at the southwestern corner of the Anatolian peninsula in modern Turkey. The region has been described as 'particularly rugged' (Foss 1994, 1), as Lycia is where the Taurus mountains meet the Mediterranean, in most places plunging from heights of c. 1000 metres straight into the sea (Akyürek 2016, 466). The many geological faults that run northeast - southwest across Lycia have made the region somewhat difficult to inhabit, as the arable land lies in small slivers in between the mountains (Softa et al. 2018). The three major cities of Lycia are: Xanthos in western Lycia, Myra in central Lycia, and Limyra in the east. Not coincidentally, these three cities are built on the plains of the three main rivers that cut through the mountains of Lycia (Akyürek 2016, 466). The majority of communication and trade in antiquity was carried out through contact with the sea due to the difficult terrain impeding the progress of land-based trade (Akyürek 2016, 467). All of the three major cities in Lycia had associated harbour settlements, which would have been essential to their functioning within the wider Mediterranean context (Akyürek 2016, 467). The main source of wealth in the region was timber, which was used for ship building (Foss 1996, 3). Lycia also produced incense, which would have been part of pre-Christian and Christian religious rituals (Foss 1994, 6).

Under the Emperor Constantine, Lycia was made its own province, with Myra as its capital (Foss 1996, 19). This change in the political structure of provinces separated Lycia from the region of Pamphylia, with which Lycia had been joined since the Roman period (Foss 1994, 2). The first Christian Saint recorded in the region is the third century saint, Nicholas of Myra. Saint Nicholas of Myra was born in Patara, the harbour settlement of the city of Xanthos (Bean 1978, 85). Xanthos was one of the first Lycian cities; the first mention of it comes from the early sixth century BC (Bean 1978, 49).
Xanthos held prominence as one of the largest and most important civic centres of Lycia through the Roman period (Foss 1994, 9; Foss 1996, 1), though in the late Roman period, Myra and its port at Andriake began to gain prominence over Xanthos (Foss 1996, 15). While Xanthos did have a bishop in the Christian period, Myra was the seat of the archbishop who governed the entire bishopric (Bean 1978, 53; Foss 1994, 26). In the fifth century, Myra was designated as a metropolis by Theodosius II, making it the civil and ecclesiastical capital of the Lycian province (Foss 1994, 23). Lycia was a fairly prosperous province in the sixth century (Foss 1996, 20), and many of the largest buildings from this period are still visible in the ruins of Myra and Andriake (Akyürek 2016, 478). Trade was likely the primary source of economic activity that sustained the province, as the Lycian ports were part of a trade route that ran from Constantinople to the Levant and Egypt, often via Cyprus (Foss 1996, 20; Akyürek 2016, 467). Archaeological evidence for purple dye production is also visible at two central Lycian cities, Andriake and Aperlae (Foss 1994, 17; Leadbetter 2003, 128; Akyürek 2016, 475). The identification of a purple porphyry Roman milestone from the period of Diocletian in Aperlae (Leadbetter 2003) is an indication that the city of Aperlae was specifically associated with the production of the dye. The purple dye, which is produced through the harvesting of huge quantities of murex trunculus molluscs, was a status symbol from as early as Phoenician times and was worn almost exclusively by Roman Emperors, and then by both the Emperor and the Church in the Christian period (Leadbetter 2003, 128 & 133).

There are a number of mentions of the ruins found in Lycia from historic sources, dating from the writings of the pilgrim Saewulf in 1102 to nobleman Coriolano Cippicio in 1473 (Harrison, 1963, 122). A number of antiquarian travellers also visited Lycia. Francis Beaufort, who had been tasked with creating an Admiralty Survey of the south coast of Turkey, visited in 1811-12, (Harrison 1963, 124). Texier travelled to Lycia in 1835, and while there wrote an archaeological account of both Myra and the church at Dereağzı
Modern archaeological research in Lycia was begun by R. Martin Harrison, who conducted a survey of the churches of Central Lycia in 1960 (Section I.ii.a), and Jurgen Borchardt, who conducted an archaeological survey of Myra and Andriake in the late 1960s.

**Fig. I.1: The study area: Central Lycia.**

This thesis will focus on the ecclesiastical structures of early Christian Central Lycia. Central Lycia can be defined as encompassing the area surrounding the ancient cities of Myra (modern Demre) and Kyaneai, running from the Alaca mountain in the east to Cape Uluburun in the west (Fig. I.1). The southern slopes of the Eren mountain range, including the ancient city of Arneai (Fig. I.1), mark the northern extent of the study area. The study area roughly covers the geographic extent under both the direct political and religious influence of Myra, in the pre-Christian and Christian periods (Foss
1994, 26). As Myra was the seat of thebishopric, studying the area directly under its power provides an opportunity to better understand the relationship between ecclesiastical posts and the churches built within their spheres of influence. Central Lycia is also an ideal study area due to the number of extant architectural remains from the early Christian period, which are unparalleled elsewhere in Anatolia except in Cilicia and Isauria (see Hill 1996). The rugged terrain and low settlement density, along with the relatively mild climate have provided the environment for the preservation of church ruins, which has made the region popular with researchers since the 1960s. While as of yet there is no systematic study of early Christian churches in Southern Anatolia, the churches of Central Lycia are a small but representative sample of churches from the early Christian world. The wealth of scholarly work on individual churches, and the more recent detailed survey work of *Tabula Imperii Byzantini* (Hellenkemper & Hild 2004), and the Tübingen Lycia Project (Universität Tübingen, 2019) have helped to fill out the dataset for this region in particular. This thesis is the first to combine these many, diverse sources on the churches of Central Lycia into a single dataset for analysis.

Central Lycia can be divided into three geographically based sub-regions: the Alaca Mountain, the Coastal Plains, and the Upland Hills (see also, Foss 1994, 26). The Alaca Mountain region, which will be referred to as the abbreviated ‘Alaca’, comprises of the area taken up by the mountain for which it is named. The Coastal Plains (‘Plains’) sub-region includes the combined area of the Myra plains surrounding the city and the inland Kasaba plains. Finally, the Upland Hills (‘Hills’) comprises of the hill-country around Kyaneai, extending down to the coast to include the islands around Kekova (see Fig. I.1). The analysis in this thesis is carried out on the 162 published churches in the study area. In a few cases, published churches have not been included in the analysis due to lack of archaeological evidence (see Section III.i). The process in which the churches were recorded is discussed in detail in the Chapter III: Methodology.
Non-archaeological sources from the Christian Period are rare in Central Lycia. Epigraphic evidence is scant. The dedicatory inscriptions at Alakilise and the baptism at West Asarcık are the only epigraphic sources which provide any evidence for this study (see *Tabula Imperii Byzantini* for any additional inscriptions). There are also no significant iconographic sources in the study area. While Lycia is mentioned in a few historical sources from the early Christian Period, such as the lists of bishops from religious councils (Harrison 1963, 119-20, also see *Tabula Imperii Byzantini*), all of these come from outwith Lycia. The only primary historical source from the Christian period in Central Lycia is the sixth century *Life of St Nicholas of Holy Sion*, which follows the life the Saint who lived and worked at the Monastery of Holy Sion on the Alaca Mountain (Ševčenko & Patterson Ševčenko 1984, 11).

I.i.a The *Life of St Nicholas of Holy Sion*

The *Life of St Nicholas of Holy Sion* tells of the foundation of Holy Sion and of the many miracles worked by St Nicholas throughout his lifetime (Ševčenko & Patterson Ševčenko 1984). Holy Sion was founded during Nicholas’s childhood after his uncle, the abbot of the nearby Akalisos monastery, had a vision to build a new monastery on the nearby hills (Ševčenko & Patterson Ševčenko 1984, 33). The *Life* chronicles the construction of the Monastery of Holy Sion, Nicholas’ travels to the Holy Lands, as well as recording Nicholas’ working of miracles in the countryside surrounding the Holy Sion monastery (Ševčenko & Patterson Ševčenko 1984). As the Justinianic plague took place during Nicholas’ lifetime, the *Life* provides an account of how the plague affected both the city of Myra and the surrounding countryside (Ševčenko & Patterson Ševčenko 1984, 16). An episode in the *Life*, concerning the relationship between Nicholas of Holy Sion and the archbishop of Myra, centres around the outbreak of the plague, and will be discussed in more detail later in this thesis (Section VIII.iii). Many of the other events recorded in the life chronicle the daily interactions
between the Holy Sion monks and the people living on the Alaca mountain. The *Life* also records an incident where Nicholas is made Bishop of Pinara, a city in Western Lycia, by the Archbishop of Myra, but uncharacteristically he seems to retain his title as abbot of Holy Sion (Ševčenko & Patterson Ševčenko 1984, 16). Then, after getting into an argument with the local magistrates and clergy in Pinara, he leaves the city to go back to Holy Sion (Ševčenko & Patterson Ševčenko 1984, 16). The *Life* records that Nicholas of Holy Sion died in 564 (Ševčenko & Patterson Ševčenko 1984, 11). At some point after his death, the legends of Nicholas of Holy Sion are merged with that of Nicholas of Myra, and the two are celebrated as a single Saint Nicholas in an annual festival held in Myra (Ševčenko & Patterson Ševčenko 1984, 12 - 14). The *Life* is a valuable source for understanding the landscape of the Alaca mountain in the early Christian period, and as such, it is regularly referenced in the discussion chapter (Chapter V) of this thesis.
I.ii. Church Architecture

Early Christian church architecture has long been a topic of scholarly interest. Since the first publication of Richard Krautheimer’s *Early Christian and Byzantine Architecture* in the 1960s, it has been a standard textbook for anyone working on the topic of early Christianity. So, too has Cyril Mango’s *Byzantine Architecture* (1976). More recently, the work of Robert Ousterhout’s *Master Builders of Byzantium* (1998) highlighted the change in architecture and construction in the post-Iconoclastic period, shifting focus away from the earlier churches discussed in detail by Krautheimer and Mango. All three of these authors have made a distinct impact on the field as a whole, including on the archaeological research done in Central Lycia. In order to better understand how their theories of early Christian church architecture have affected the work carried out in Central Lycia, it is worth individually considering their distinct approaches to church architecture.

Krautheimer’s analysis of early Christian churches come from the perspective of an architectural historian. Focus is given to the development of the early Christian Basilica and the traits associated with it, as well as the development of this architecture in the major cities of the early Christian period (Krautheimer 1986, 39 - 92). As with Mango, much attention is paid to the Justinianic churches of Constantinople (Krautheimer 1986, 201 - 82), which are often referenced as an influence for the designs of many churches outwith the capital. For example, Krautheimer (1986, 285), refers to the Dereağzı Church (Fig. A.29), located in the Plains region of Central Lycia, as ‘com[ing] close to Justinian’s own architecture’. While he acquiesces that the church is dated to the ninth century, Krautheimer (1986, 285) argues that the design of the church is based specifically on the Hagia Irene. While the church is very likely to be linked to Constantinople due to both the design of the church and the construction materials used (Morganstern 1983, 92), it is better compared to later churches such as the Monastery of Constantine Lips (Morganstern 1983, 87). Equally, the assumption that the Dereağzı Church is
a throwback to an earlier Constantinopolitan design makes it easy for scholars to consider the church without any relationship to its local context. For example, the layout of the Dereağzı Church is quite similar to the Apollonia Theatre Church (Fig. B.1), which is also in Central Lycia, though neither Krautheimer, Mango (1976), or the author of the monograph on Dereağzı, Morganstern (1983) mention the similarities in the design and construction of these two sites. This is often the issue with publications that focus on the influence of Constantinople or other major cities in the early Christian period; there is an assumption that the churches in the provinces are often derivative, and thus these publications do not often consider inter- or intra-regional patterns in much detail. This has often been the case with the triconch church in Central Lycia, as will be discussed below (Section I.iii-iv).

In his 1991 article, ‘Approaches to Byzantine Architecture’ Mango scrutinises the four primary approaches to the field thus far: typological, symbolic/ideological, functional, and social and economic. Mango (1991, 41) shows a clear distaste for the typological method, which he describes as buildings being ‘labelled and pigeon-holed’. While Mango’s (1991, 41-42) criticism in this article focuses on the different ‘schools’ of building construction and design often touted by early scholars using this methodology, more modern typological interpretations are often much less grandiose, but still problematic (see Section I.iii.b). His assessment of the symbolic, too, is relevant for this research. While it is undoubtedly clear that the symbolic nature of church architecture was incredibly important to the patrons and builders of early Christian churches, one must tread somewhat carefully when interpreting every aspect of church architecture as symbolism (Mango 1991, 42). Considering how the churches function within the context of the liturgy is a better aim, as the liturgy is what often dictated the design of the church (Mango 1991, 43). The shift in liturgy during the Transitional Period (see definition below, Section I.iv), and the potential affect this had on church design is not often discussed in the literature on Central Lycia, as the
focus of scholarship is often on the earlier, larger churches, and the
discussion of later churches is coloured by the presumption that the region
was badly affected by the Arab raids at this time. This issue will be tackled
primarily by a consideration of temporal change (Sections I.iv & VII). It is
somewhat ironic that Mango (1991, 42) associates the typological
categorisation of churches to the process of categorising ‘biological
specimens’, as this thesis uses a methodology derived from the analysing of
biological traits (Section II). However, I hope that Mango would see this as a
continuation of the process of ‘extremely meticulous archaeological analysis
of buildings’ that he predicted would be the future of the study of early
Christian architecture.

Outsterhout’s work on early Christian architecture has taken a distinctly
different path that that of Krau theimer or Mango. There is a practical aspect
to his approach which is incredibly compelling, and which in many ways
takes the interpretation of church architecture back from the grandiose to the
practical. This is not to say that there is a lack of interaction with liturgy or
symbolism in Ousterhout’s work, but rather that they are considered along
with the realities of church construction and use. For example, his analysis of
the reuse of architectural material at the Church of the Holy Sepulchre in
Jerusalem does not immediately assume that the reuse is equated with
decline, but rather that the stones and architectural features themselves have
meaning, and that their reuse was purposeful (Ousterhout 2003). This goes
against the ideas found in much of the literature on Central Lycia, where any
reuse of building materials is seen as a sign of decline (Section I.iii.d).
Ousterhout, too, argues against the typological approach to early Christian
architecture. In his analysis of the later churches of Constantinople (2000),
he points out that these churches were not just a string of traits that were
theoretically influenced by other churches, rather that they were part of a
functioning neighbourhood and city, with histories of their own (Ousterhout
2000, 250). Again, this is a cry for context outside of typological comparisons,
which the study of Central Lycia is sorely lacking, even though the first studies in the region did attempt to consider context.

In order to better understand the study of Central Lycia within the context of the wider challenges facing the study of early Christian churches, it is worth considering the first modern work on the region, ‘Churches and Chapels of Central Lycia’ by R. Martin Harrison. Harrison was undoubtedly influenced by his contemporaries such as Krautheimer and Mango. Indeed, Mango’s (1991, 42) article on methodological approaches even references Harrison for his work on the church of St Polyeuktos in Constantinople, which suggests that Harrison’s work influenced Mango as well. Equally, it is clear that Harrison’s research effected the other scholars who have worked in the region since, as many of his theories and later biases have carried over into their work (see Section I.iii).

I.ii.a R. Martin Harrison

Harrison’s survey, the findings of which were published in an Anatolian Studies article entitled, ‘The Churches and Chapels of Central Lycia’ (1963), roughly covered the areas this project refers to as the ‘Myra Plains’ and ‘Alaca Mountain’ sub-regions. Harrison’s publication provides descriptions of 37 ecclesiastical sites, including the first published ground plans of Alakilise (Fig. A.3)1, Alakilise N Saraylı (‘Alaklisie Chapel’ in Harrison, Fig. A.5), Dikmen (Fig. A.31), Muskar (Fig. A.54), Devekuyusu (Fig. A.31), West Asarcık (‘Karabel’ in Harrison, Fig. A.22), Arneai Churches A and B (Figs A.17 & A.18), Andriake Churches A-E (Figs A.7 - A.10), Gürses (Fig. A.36), Sura Plateau (Fig. A.60), Sura Valley (Fig. A.59), Tersane Harbour (‘Kekova Island’ in Harrison, Fig. A.61), and Yavıköy Path Church (‘Uçağız Chapel’ in Harrison, Fig. A.68). His article also included a number of drawings of architectural carvings, as well as photographs of the structures as they stood

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1 Where newer, more detailed plans are available, these have been referenced instead of Harrison’s originals.
in 1960 (see Section III.i.d for more on Harrison’s 1963 article). The method of analysis used by Harrison (1963), which involves the describing of the architectural features and ground plans of a church in order to ascertain any typological patterns, is still used today both in Lycia and throughout the study of early Christian architecture.

Harrison’s description and analysis of the churches in his 1963 article have undoubtedly shaped the manner in which the ecclesiastical architecture of Central Lycia is discussed today. His typological dating of West Asarcık to no later than AD 630, which he argues makes it the earliest triconch on the Alaca mountain (Harrison 1963, 150), is still widely accepted by scholars working in the region. For example, Altripp (2010e, 337) uses Harrison’s fifth century date of West Asarçık from the 1963 publication to comparatively date the sculpture and the structure, Church East of Karakuyu, to the sixth century. The typological dating of sites in Central Lycia has been common, as the only church in the region with an epigraphic date is Alakilise, whose re-dedication inscription gives the date of 812 (Harrison 1963, 126). Harrison is also the first scholar to associate the triconch apse trait, which appears a number of times in churches on the Alaca Mountain with Saint Nicholas of Holy Sion. Since his publication, scholars studying the region have all followed suit, and it is generally assumed that the triconch churches on the Alaca Mountain are monastic. In his 1963 article Harrison also makes a ‘strong case’ for identifying the West Asarçık church with the Monastery of Holy Sion (Harrison 1963, 150). Clive Foss, another well-known scholar whose research focused on early Christian Lycia, follows this classification (Foss 1991, 309; 1994, 28), while Grossman and Severin, who studied the region in the 1970s, were more sceptical even though they could provide no other alternative (Grossman & Severin 2003, 100 - 01). Only recently has this theory been challenged: Turkish epigrapher Mehmet Alkan has argued against this theory based on the description of the site in the Life, suggesting that the Sion Monastery is in reality the triconch church at Alacahisar. Another Turkish scholar, architectural historian Bülent İşler, has however
countered this (Clow 2014, 84-5), with an argument about the layout of the monastery that stems from Harrison’s initial identification. This disagreement is a good example of why Harrison’s works remains so integral to the study and analysis of the churches of Central Lycia. Equally, it highlights the focus that scholarship has on the Alaca mountain, and on Holy Sion.

Harrison continued to study Lycia after this initial work in the region, publishing numerous articles providing a more detailed analysis of sites from his 1963 article (Harrison 1977 & 1979), as well as publishing an analysis of the previously unrecorded early Christian settlement at Arif, near Arykanda in northern Lycia (Harrison 1980). In his later articles, Harrison began commenting more regularly on a phenomenon he believed was evidenced in the architectural remains: a post sixth-century decline. In his 1977 article ‘Lycia in Late Antiquity’, Harrison comments that the walls built around the cities of Andriake, Xanthos (western Lycia), and Arykanda are a part of a, ‘pattern of urban decline or collapse’ (Harrison 1977, 10). These sentiments continue to appear in his 1980 article, ‘Upland Settlements in Early Medieval Lycia’, where he states that, ‘the classical city as a rule declined or collapsed in Late Antiquity’ (Harrison 1980, 109). The theory of post sixth-century decline is another aspect of Harrison’s scholarship which continues to affect modern interpretations of the early Christian churches of Central Lycia, especially when discussing the chronology of sites from this period. The impact of Harrison’s research in Central Lycia is still clear; modern articles still regularly reference his original 1963 article as well as the many subsequent publications for both the analysis of architectural features as well as theoretical frameworks.
I.iii Current Challenges

Any new research on the early Christian churches of Central Lycia faces a number of challenges, in terms of both the biases found in previous scholarship and the fragmentary architectural remains of the churches themselves. While numerous surveys have been carried out in the region, many of the churches remain unexcavated, so dating the various periods of construction and use can be problematic (I.iii.c). This has led many of the scholars working in the region to use a typological approach to date and interpret the churches (I.iii.b), and, as discussed above (Section I.ii) this method can be quite limiting. Scholars working in the region also often focus on the churches of the Alaca Mountain (I.iii.a), which is somewhat unsurprising as the Life provides good primary referencing material. However, this can sometimes lead to a lack of contextualisation in the wider landscape of Central Lycia, as the churches on the Alaca Mountain should not be considered as if they exist separately of the rest of the region. Finally, there is the ever-pervasive issue of post sixth century decline (I.iii.d). Originally brought up by Harrison (see Section I.ii.a), the idea of a decline in fortunes and church building in Lycia is found throughout the scholarly work on Lycia, though some current scholars favour the decline theory more than others. In order to bring any new perspectives to the study of churches in Central Lycia, all of these challenges and perspectives need to be considered and accounted for in the methodological approach (also see Chapters II & III).

I.iii.a Focus on Alaca Mountain

Between the initial publication of Harrison’s on the churches of the Alaca mountain, which brought scholarly attention to the large number of extant remains in the region, and the details of early Christian life relayed in Life of St Nicholas of Holy Sion, it is no wonder many of the scholars working in this region focus on this sub-region of Central Lycia. The survey of the Alaca
Mountain carried out by Grossman and Severin (2003, see Section III.i.c), focuses predominantly on the same churches as Harrison, though their analysis provides more detail about the individual churches, and often includes more accurate plans of the sites. Foss (1991; 1994), too, focuses on the Alaca mountain in his publications on Lycia. His article, ‘Cities and Villages of Lycia in the Life of Saint Nicholas of Holy Zion’ (1991) does provide a context for the Life within the wider landscape of Lycia but provides little analysis of the function of the monastery past Nicholas’ death. Foss’ 1994 article also discusses the Life and the relationship between the Life and the Alaca mountain at length. Some recent scholarship has also focused the mountains. The current survey work being done by İşler and İşler (İşler 2013; İşler 2016; İşler & İşler 2017) has been helpful in fleshing out the archaeological record of the region (see Section III.i.f.4). However, the area between the Alaca mountain and the Tübingen Lycia Project survey area (Section III.i.a), has yet to be surveyed at the same level. All of this research has led to a wealth of information on the Alaca mountain, which has the possibility of biasing any analysis carried out on the churches.

I.iii.b The Typological Approach

As discussed above (Section I.ii), the typological approach to church analysis often leads to an oversimplification of the data to fit a label. The most obvious example of this in Central Lycia is the triconch church (see West Asarcık: Fig. A.22, and Section III.i.b.2). Harrison (1963, 149) was the first to suggest that the triconch design came from Egypt. This has generally been accepted by scholars. Grossman and Severin (2003, 134) suggest that the inspiration came from the Holy Land, though the specific triconch design is only found in Lycia. More recently, Sweetman (2017, 29) has said that the triconch apse is found ‘quite often’ in Lycia, though the actual frequency of this trait is not fully considered. Yet, little analysis of how exactly all of the triconch churches of Lycia relate to each other has been carried out. Equally, the question of
where the triconch came from adds little to this discussion, as the specific construction style is unique to Lycia, and even to the Alaca mountain (Grossman & Severin 2003, 134; also see Sections V.i.c.2 & VII.iii.b). At this stage the presence of the triconch church in Lycia is just another attribute to mention, rather than a point of analysis.

More generally, the interpretation of churches as having a specific function can often be based off of a single feature. In their analysis of the church at Gökkaya (Fig. A.33), Marksteiner and Niewöhner (2006, 95) argue that the use of a pier (or pillar) in the place of a pillar for the division of the aisles and nave can be seen as an indication that the church is monastic. Evidence for this is primarily based on the location of a few other Lycian ‘pier churches’, which are in areas with a lack of settlements (Marksteiner & Niewöhner 2006, 95), though all but one of these churches are located in either eastern or western Lycia. The only church in Central Lycia Marksteiner and Niewöhner (2006, 95) use as evidence is Danabaşı Dereköy (Fig. A.28), which has not been interpreted as monastic by any other scholars who have published material about the site (Harrison 1963, 183; Grossman & Severin 2003, 19-20; Hellenkemper & Hild 2004, 512). Marksteiner and Niewöhner (2006) do not, however, mention another pillar-church: Kyaneai Church A Basilica (Fig. A.46). Kyaneai Church A Basilica and Gökkaya are both in the Hills sub-region and are geographically relatively close to each other. Kyaneai Church A is likely not a monastic church due to its location in the necropolis of the city of Kyaneai, though the actual function is unclear (Altripp 2010a, 285). This method, of only choosing the churches which support an argument and ignoring stylistically similar churches that do not fit the argument is an indication of why typological interpretations can be problematic when used by future researchers. In order to better understand the relationships between the features of churches in Central Lycia, a new methodology needs to be applied.
I.iii.c Dating

The majority of the churches in the region have been dated based on either comparison to known architectural layouts or typologies of carved decoration, the issues with which have been outlined above. The only church in the region that is concretely dated based on epigraphic evidence is the Alakilise Internal Church, which is re-dedicated to the Archangel Gabriel in AD 812 (Harrison 1963, 126). The only radiocarbon date from Central Lycia comes from Morganstern’s (1993, 64) test on the Dereagzi Fort. The result of their analysis suggested that construction was carried out between the dates of c. AD 834 – 918 (Morganstern 1993, 64). Recent research, however, has highlighted issues with previous methodologies for radiocarbon dating of mortar (see Nawrocka et al. 2005), which would have been used for these samples, rendering them inaccurate.

Examples of comparative and typological dating can be seen across the sources. Harrison (1963, 150) argues based on architectural carving that the latest possible date for West Asarcik would be c. AD 530. Peshlow (2010, 201) attempts to date the Tersane Harbour Church based on the distinctive alternating brick and stone design (Fig. B.2) on the apse arch, but then argues that the church lacks the architectural features typical of a later structure. He then argues that based on comparison to other churches in the region, such as Gemile Ada in Western Lycia, the church is likely to be 5th - 6th century (Peshlow 2010, 203). Marksteiner and Niewöhner (2004, 34-39) have dated the Istlada Basilica to the 6th century, primarily based on the carved decoration. Altripp (2010) provides hypothetical dates for the majority of the churches in the Tübingen Lycia Project survey area, all of which have been decided based on comparative and typological dating. For example, he dates Settlement I East Church to the 9th to 10th century based comparison with similar church designs begin showing up outside of Central Lycia (Altripp 2010e, 315), and Settlement L Kocaboyunuz Basilica to ‘Late Antiquity’ due to the comparatively large size of the church (Altripp 2010e, 327). This is the
general trend. Larger, three-aisled basilicas are dated to the earlier period, while smaller-single aisled churches are dated later. One rather odd example of this method can be found in Sweetman’s (2017) dating of Dereağzı (Fig. A.29) to the sixth century, presumably due to its size, even though the design of the Dereağzı church is clearly associated with a later period and a different liturgy than that of the sixth century (Morganstern 1986, 169). Sweetman’s (2017) interpretation highlights the one of the many issues of typological dating. Often the construction technique is also used as evidence for a typologically based date, with mortar and rubble masonry, or any reuse of building material being a sign of a church built in the later period (see Sections III.ii.c.2 & VII.ii). While typological dating has been accurate in certain cases, until the sites are excavated the dating will remain speculative.

I.iii.d Decline

Another major bias portrayed in the sources is that of post sixth century decline, which is first found in Harrison’s (1963, see Section I.ii.a) scholarship on the region. In one of his later articles, Harrison (1980, 109) references the ‘dark centuries’ after the ‘decline’ of the classical city from the seventh century onwards, after what is described by Harrison, and many subsequent scholars, as an ‘Arab invasion’. This ‘invasion’ is a series of recorded raids, carried out across the seventh to tenth centuries, which scholars have often assumed ‘inflicted devastation’ upon the coast of Anatolia (Foss 1994, 2-3). The decline argument is also taken up by Clive Foss (1994, 48), another influential scholar of the region. At various times in his 1994 article on the Lycian Coast, Foss references ‘collapse’, ‘decline’, ‘dark ages’, and even, ‘universal desolation’ when discussing post-sixth century Lycia. Often these comments are specifically in reference to the remodelling of early, three-aisled basilicas to single-aisled structures (see Kyaneai Church A Internal Church: Fig. A.47, Korba Internal Triconch Church: Fig. A.45), or to the construction of a small, single-aisled church built within the remains of an earlier basilica (see East Asarçık Internal Church: Fig. A.21, Istlada Internal
Church: Fig. A.31). The re-modelling of earlier three-aisled churches to single-aisled structures, the construction of a single-aisled free-standing church in nave of an earlier, often three-aisled structure, and the re-use of building materials are all seen as a visible sign of this ‘decline’ and ‘collapse’. The primary reasoning behind this is the smaller size of the later internal churches, and the assumed lack of funds to quarry new building materials.

These same views on decline are argued by many scholars working in Central Lycia, though they are not present in some of the more recent sources, such as Altripp’s (2010e) catalogue (see Section III.i.a), which may suggest they are falling out of favour. In their discussion of Ištıada Basilica and Internal Church, Marksteiner and Niewöhner (2004, 44, see Section III.i.c & Fig. A.39), also reference the ‘common phenomenon’ of ‘decline’ in the ‘dark centuries’. However, in their publication of the İnişdibi church (Fig. A.40), they reference the, ‘cliché of decline and decay’. Niewöhner (2009, 93), points out that not all small churches from second period of construction replace earlier basilicas, and thus perform a different function unique to that period. His comment edges towards, though does not directly land on a possible different interpretation of the later period churches, which will be discussed in more detail in Section VII.iv. None the less, Marksteiner and Niewöhner (2004, 44-45; 2009) still refer to these later period structures as ‘chapels’ rather than ‘churches’. Equally, the later internal churches are often not given as much academic attention as the earlier churches. In Harrison (1963), internal churches that do not interact with the earlier church structure often receive only one line of description (Harrison 1963, East Asarcık: 136, Gürses: 140-42 Sura Plateau: 143). The current Kekova survey team (Section III.i.f.3) often do not discuss evidence for multiple phases of construction, even when they are visible in the photos and architectural plans they have published.

There are a number of potential issues with the ‘decline’ argument as applied to the later churches of Central Lycia. Firstly, there is the assumption that
Arab raids decimated the coast and surrounding countryside. Even the historical records of the raids suggest that they were not too frequent (Foss 1994, 2-3). As the raids were not constant, this would have allowed the residents of the coastal settlements to rebuild, even if the Arab fleet’s presence in the eastern Mediterranean was likely to have slowed down trade (Foss 1994, 3). Second, the interpretation of the reuse or downsizing of churches as an indication of decline needs to re-evaluated. The primary scholarship that deals with later reuse and remodelling of churches comes from outside Central Lycia. Ousterhout’s (2003) work on reuse, as well as his detailed analysis of later period Christian churches (Ousterhout 1998), both highlight how differences in architectural layout and reuse of earlier material may look awkward to a modern eye, even though this would not have been how they were seen in antiquity. The same perspective can be found in Stewart’s 2010 assessment of the five remodelled Cypriot churches on the Karpas peninsula. The conversion of the roofs of these churches into vaults often required the churches walls to be internally and externally strengthened, which sometimes led to awkward designs (Stewart 2010). However, these conversions were carried out with great care towards retaining earlier liturgical features, and with tremendous effort to maintain the footprint of the church. This is a reminder that the later churches of Central Lycia, including internal churches, need to be considered with a fresh eye. Temporal change is an important part of the Christian period, which is especially studied in Constantinople, and as such needs to be considered regionally as well.
I.iv Research Questions

The multitude of extant standing remains in Central Lycia are both a blessing and a curse. They are why the region has already been intensively studied and surveyed, which has led to the many challenges laid out above (Section I.iii). Equally, the sheer amount of churches in Central Lycia provides a great dataset with which to work. This thesis brings a new perspective: by employing methodologies based on cultural evolution, or ‘descent with modification’ (Mesoudi 2015, see Section II.i), it is possible to consider the architectural development of these ecclesiastical structures in a different manner than has been done previously. This method breaks the churches down into individual cultural traits, that is 'units of transmission that permit diffusion and create traditions' (O'Brien et al. 2010), in order to quantitatively analyse the data (see Section II.ii for more discussion of cultural traits, and Section III.iii for quantitative analysis).

In order to do this, I have defined four research questions, which will guide all analysis carried out in this thesis: 1. Are there different patterns in church building between the three sub-regions of Central Lycia? 2. Do churches with synthronons have a specific, unique function? 3. Are churches with a triconch apse related to the Alaca Mountain and St. Nicholas of Holy Sion? 4. Is there quantitative evidence for a temporal change in the cultural and geographic traits of the churches of Central Lycia? These traits will be analysed through the lens of a variety of cultural traits, such as: nave area, construction technique, and geographic location, all of which directly relate to current interpretations of change over time (see Section I.iii). By considering regional variation, I hope to help even out the bias in research towards the Alaca mountain sub-region. This seems at odds with the fourth research question; however, it is important to consider whether quantitative analysis of the data will provide evidence for such an interpretation. It is worth pointing out that I will not be considering where the triconch apse originated, or how it came to Central Lycia, but rather what purpose it serves within the region, as
considering its origin would provide no benefit to this study. The synthronon
is a feature that is always noted by scholars working in Central Lycia and
beyond, but never interpreted. While its basic function is known (see Section
III.ii.b.1), there has been little attempt to contextualise this within the regional
architecture and ecclesiastical organisation of the region. With so little
discussion of synthronons in the literature, this is perhaps the hardest
question for which to interpret any results, however, this also makes it one of
the more interesting questions.

Finally, it is worth considering the terminology used to describe these
churches. The terms Late Antique, Early Byzantine, Middle Byzantine, Late
Byzantine, and Early Medieval all bring with them a multitude of different
meanings and interpretations, which makes the use of any of these terms
somewhat problematic in a thesis aiming to dispense with preconceived
notions about periodisation. Perhaps the biggest change in the architecture
of early Christian churches comes in the Transitional Period. This period, as
defined by Ousterhout (2019, 245-247), covers the seventh to mid-ninth
centuries, and includes the Iconoclastic period (AD 726-843). From the
Transitional Period onwards, a shift in worship and liturgy led to the
construction of smaller, centrally planned churches, which were often darker
than the pre-Iconoclam structures (Ousterhout 1998, 7-10; Ousterhout
2019, 249 & 260-61). Building techniques also changed, favouring lower tech
processes (Ousterhout 1998, 40). The beginning of the Transitional Period
can be used as a turning point in architecture and terminology in this thesis
as well. While I will consistently refer the entire period as ‘early Christian’,
the churches will be referred to as being from the ‘earlier period’ or ‘later
period’ of construction. Churches from the earlier period are pre-Transitional
Period (c. fifth to early seventh centuries), while churches from the later
period are from the Transitional period onwards (c. mid-seventh to fourteenth
centuries). As this shift is also reflected in the relationship individuals had
with the church (Ousterhout 1998, 11), this terminology can also relate to the
time period more generally. The aim is, after all, to understand not just the
process of church construction and design, but also who was constructing these churches and why they made the choices they did.
II. CULTURAL EVOLUTION

As discussed above (Section I.iii.a-d), there are a variety of challenges when attempting to study early Christian architecture. At present, there have been few attempts to analyse churches in a quantitative manner, which leaves open the possibility of this method of analysis. Central Lycia is an ideal candidate for such analysis due to the large number of extant architectural remains, and high volume of publications on churches in the region (see Section I.i). With a variety of methods of quantitative analysis becoming more common in archaeology (Smith 2015), the question then becomes: what is the best approach to studying these churches?

Without a strong methodological framework and clear research questions, the results of any quantitative analysis cannot be properly interpreted and contextualised, thus rendering the analysis useless” (Smith 2015, 19).

Cultural Evolution is the theory that cultural traits evolve in the same manner as biological traits. During the last decade there has been a substantial increase in the number of archaeological research projects applying evolutionary frameworks in order to explore the variation of material culture (see Sections II.i-ii below). This methodological framework allows for the analysis of a variety of traits as recorded on artefacts, or more generally on any type of material culture developed by past societies, in a manner that allows relationships between traits and changes over time to become more visible to the researcher. While it has been used on complete architectural structures in an anthropological manner (Section II.iii.b), as of yet there are no examples of the method applied to incomplete architectural structures like the churches of central Lycia. However, the use of cultural traits as the unit of analysis makes it possible to manage some of the current challenges in the study of the central Lycian churches, such as the pre-existing biases of previous scholarship (see Sections I.iii.a-d). This chapter provides a general overview of cultural evolutionary theory (Section II.i), followed by a more focused synopsis of the same theory within the field of archaeology (Section
II.i Cultural Evolution

In his review of Cultural Evolution as a theoretical framework, Mesoudi (2016, 481) defines Cultural Evolution as, ‘the theory that socially transmitted information evolves in the manner laid out by Darwin in *Origin of Species*, i.e. it compromises a system of variation, differential fitness and inheritance… [where] ‘Culture’ is defined as socially transmitted information’. In modern scholarship, there is a common misconception that Darwinian evolution is a theory that prescribes evolution in subsequent stages, such as the evolution from ‘barbarian’ societies to ‘civilised’ ones (Mesoudi 2016, 482). This interpretation of Darwinian evolution, however, comes from Victorian-era sociologists, who skewed the theory towards their own culturally imperialist ideals, and these interpretations are not part of the theory of Cultural Evolution’ (Mesoudi 2016, 482-3). It is also worth noting that the theory of Cultural Evolution not include the modern discoveries that have since become a part of the scientific research biological evolution, even though the modern processes applied to this research are still relatively similar that found in Cultural Evolution (Mesoudi 2016, 484). As there is still some confusion surrounding the idea of ‘evolution’, there is a need for a definition of the term that is separate from the modern discoveries in the field of Biological Sciences. The three main principles of Evolution, as defined by evolutionary biologist Richard Lewontin in his 1970 article, ‘The Units of Selection’, and modified by Mesoudi (2016, 483), are:

1. Different entities in a population vary in their characteristics (principle of variation).

2. These entities have different rates of survival and reproduction (principle of differential fitness).
3. There is a correlation between parent and offspring entities in those characteristics that contribute to differential fitness (principle of inheritance).

All that is needed for evolution, and thus Cultural Evolution, to take place are inheritance and variation (Mesoudi 2016, 484). The means by which this inheritance of information occurs in cultural evolution is social learning (Mesoudi 2016, 483 & Lycett 2015, 22), where social learning is defined as, ‘learning that is influenced by observation of, or interaction with, another animal (typically conspecific, i.e. of the same species) or its products’ (Heyes 1994, 207). There are some other key differences between biological evolution and cultural evolution. While biological evolution only involves two parent organisms, cultural evolution often includes many more ‘parent’ artefacts (Jordan & O’Neill 2010, 3879). Equally, evolutionary biologists are often primarily interested in tracing the presence of specific inherited traits, i.e. features such as eye colour or wing deployment, which are defined as ‘homologies’, the vertical transmission of traits. Archaeologists, however, have an interest in both homologies and ‘homoplasies’, which are traits that exist in multiple species or artefacts, but do not share a common ancestor (Jordan & O’Neill 2010, 3879). Viewing cultural changes, as reflected in artefact variation, as an evolutionary process provides a framework within which archaeologists can run quantitative analysis on the variation and change within a cultural dataset (Mesoudi 2016, 493).
II.ii Cultural Evolution in Archaeology

The theory that differences or change over time in archaeological artefacts, either geographically or temporally, can be considered a reflection of behavioural differences between societies is a foundational idea in the field of archaeology. ‘Behaviour’, another complex term in need of definition, can be defined as ‘the product of any choice or action implemented by human actors that influence details of the recipe involved in artefact production’ (Schillinger et al. 2017, 641-2). The archaeological focus on artefact change over time and space is visible in the methodological focus on typologies across the many sub-fields and specialities found in archaeology. For example, artefact typologies are integral to the dating stratigraphy layers, and building typologies can assist archaeologists in hypothesising construction dates of un-excavated architectural structures. The theoretical framework of cultural evolution allows for archaeologists to approach typologies not just from the visible patterns, but also from the perspective of the changes in social learning which would have affected the differences in the artefact designs visible to us today. And, since material artefacts leave a direct physical and temporal record of social learning, these patterns can then be studied and analysed through an analysis of their traits (Lycett 2015, 23). In order to do this, however, we must first define how artefacts can be broken down into quantifiable traits that allow for analysis.

From an archaeological perspective, cultural evolution and transmission is the process of artefacts falling into lineages based on the socially learned behaviours used in their creation. This can be tracked by analysing changes in artefact traditions and then analysed through the recording of features known as cultural traits (O’Brien et al. 2010, 3803; Lycett 2015, 22). Cultural traits can be defined as, ‘units of transmission that permit diffusion and create traditions – patterned ways of doing things that exist in identifiable form over extended periods of time’ (O’Brien et al. 2010, 3797). While cultural traits may provide insight into both micro and macro changes in the
archaeological record (Schillinger et al. 2017, 653), the traits themselves are not always visible within the archaeological record (O’Brien et al. 2010, 3803). For example, we cannot necessarily infer the various decisions that went into the making of a ceramic vessel, such as the exact throwing technique or tempering method, as these are based on culturally learned behaviours exhibited by the maker. Looking at artefacts from the present, we can only hypothesise these behaviours through the proxy of the artifact, in this case the ceramic vessel (O’Brien et al. 2010, 3803; Schillinger et al. 2017, 642: Fig. B.3). As seen in the above example, traits can also be influenced by multiple factors at the same time (Schillinger et al. 2017, 643). In these instances, the learned cultural techniques used by the artifact maker combine into features that are visible on an artifact in the archaeological record (O’Brien et al. 2010, 3803), such as vessel wall width, and rim shape. Therefore, traits themselves are not always ‘visible’, as they only exist in conjunction with the artefact maker, but the manifestation of them can be seen in artefacts (O’Brien et al. 2010, 3797).

O’Brien et al. (2010, 3802) suggest the use of the term ‘recipe’ to describe the make-up of ‘ingredients’ that go into a cultural trait; this term usefully mirrors the production of biological traits. This interpretation of artefacts being made up from a ‘recipe’ suggests that small changes to a single ‘ingredient’ will have an impact on the final artefact (Schillinger et al. 2017, 643). This theory was tested by Schillinger et al. (2017), in an experiment that drew from the biological method of using ‘model organisms’, such as fruit flies, to better understand evolutionary processes. They asked two sets of participants to create a copy of a hand axe out of foam, with the hand axe occupying the role of a ‘model organism’, or in this case ‘model artefact’ (Schillinger et al. 2017, 644-5). In this experiment, the different ‘ingredient’ in the artefact ‘recipe’ was the shaping tool: one group of artifact makers used a plastic knife while the other group worked with a vegetable peeler to shape a hand axe out of foam (Schillinger et al 2017, 645). They then measured the
different carried out statistical analysis on the differing morphometric traits of the dataset.

This study along with all the other examples discussed in Section II.iii use variations on the methodology set out by Lycett (2009, see also O'Brien et al. 2010, 3798-9) to gather the morphometric data. This process considers all different aspects of morphometric data, as well as categorical data, as cultural traits which can then be included in quantitative analysis (O'Brien et al. 2010, 3798-9). Using Principal Component Analysis (PCA), Schillinger’s team found that there were two discernible clusters of objects: those made using the peeler, and those made using the plastic knife (Schillinger et al. 2017, 650). This result shows that a single different ‘ingredient’ or change in the ‘recipe’ was identifiable statistically. The results also show a different side of cultural trait analysis: when there is a statistically significant difference in the traits of an artefact, it does not necessarily mean there was an intent by the maker to change the object, rather that the socially learned behavioural ingredient was changed which then affected the maker (Lycett 2015, 24; Schillinger et al. 2017, 654). Going forward, this is an indication to archaeologists that identifiable patterns in artefact variation do not have to come from major cultural changes, but from minor differences in learned behaviour, where these changes have the ability to create a wider impact at both a micro- and macro- evolutionary level (Schillinger et al. 2017, 653).

Phylogenetics, or the study of evolutionary relationships often through the production of a phylogenetic tree (cladogram), is another method often used in the study of cultural transmission (O'Brien et al 2010; Lycett 2015; Mesoudi 2015). In Biology, phylogenetic reconstruction is the primary method used to test for relationships between ancestors and their descendants (Garcia Rivero & O'Brien 2014, 3). In archaeology, the same method is applied to artefact descent with modification, using cultural instead of biological traits to analyse artefact trait variation and transmission over time (see Jordan & O'Neill 2010; Garcia Rivero & O'Brien 2014; and Rubio-
Campillo et al. 2018). While phylogenetics are not used in this thesis, they are crucial to understanding the only previous work done with cultural trait analysis and architecture (see Section II.iii.a, and Jordan & O'Neill 2010) and provide the opportunity for the expansion of analysis methods in future research.
II.iii Practical uses in Archaeology

II.iii.a Artefacts

Archaeologists using cultural evolutionary methods often focus on the cultural traits of common, easily reproducible artefacts. Lithics are one such example, as collecting morphological data is relatively straightforward (Mesoudi & O'Brien 2008; Lycett 2009; Lee Lyman et al. 2009). An often-straightforward way of collecting data for cultural trait analysis is to collect morphological data by defining ‘landmarks’ on the artefact which act as traits (Lycett 2009; O’Brien et al, 2010; Schillinger et al 2017). Landmarks (Fig. B.3) are morphological features that can ‘be identified according to explicit and clearly defined rules’ (Lycett 2009, 81; also see O’Brien et al. 2010). In recent years, research using morphological traits has rapidly expanded past lithics to include a variety of artefacts that easily allow for landmark identification and analysis. Li et al. (2014) examined the morphological features and find spots of the trigger mechanisms from the crossbows of the Terra Cotta Warriors in China in order to decipher further information about the logistics, organisation, and standardisation required to undertake the design and construction of the monumental Quin tomb. The function of the complex trigger mechanism required consistent performance of the same job, thus allowing for standardisation testing (Li et al. 2014, 130). The team began by identifying the three main parts of the mechanism (the handle, the tumbler, and the rocking lever), then by identifying visible typologies within the three different parts, before finally measuring the morphological traits (Li et al. 2014, 130-31). The results from their multivariate analysis provided evidence for statistically different metrical groups, in which the typological groups derived from visual analysis for both the tumbler and the rocking lever did not match the metrical groups (Li et al. 2014, 131). Based these results, the team has hypothesised that the different metrical groups indicate different batches of production, where one workshop would make all the needed parts for a set of crossbows, then assemble, then start again (Li et al. 2014, 133-
This hypothesis ties in with the metallurgical study carried out on the arrowheads, where every 100 arrowheads had a unique chemical make-up, thus also suggesting batch production (Li et al. 2014, 136). Through the analysis of cultural traits, the team was able to better understand the process of producing the crossbows, as well as to draw larger conclusions about craft organisation for the building of the Qin tomb. The difference in how the team visually classified the crossbow mechanism pieces into a typology, versus the statistically derived metrical groups, highlights the benefits of a quantitative methodology.

Morphometric cultural traits have also been used in the study of ceramic finds. In their 2018 paper, Coto-Sarmiento et al. used a cultural evolutionary methodology to analyse social learning links between workshops producing Dressel 20 amphorae in the Roman province of Baetica. As the making of amphora would have been a socially learned and transmitted skill, a cultural evolutionary framework suits the analysis of this pottery production (Coto-Sarmiento et al. 2018, 117). As the design of Dressel 20 amphora was consistent for approximately 300 years, analysing the cultural traits allows for identification of small changes in design that could identify relationships between pottery production sites in the region (Coto-Sarmiento et al. 2018, 118-119). To test this, the team analysed the morphometric traits (Fig. B.4) of Dressel 20 rims from five production sites with similar sample sizes, all located within close proximity to each other (Coto-Sarmiento et al. 2018, 118-19). The visualisation of Principal Component 1 & 2 on from the PCA analysis (Coto-Sarmiento et al. 2018, 121: Fig. B.5) suggests that the relationships between PC1 and PC2 are relatively similar, but differ slightly by workshop, as well as suggesting that the biggest difference can be seen between the two workshops that are farthest apart (Coto-Sarmiento et al. 2018, 119, 121: Fig. B.5). This was backed up by the Mantel Correlation Test, which found that statistically closer workshops are more similar and that workshops farther away from each other are less similar (Coto-Sarmiento et al. 2018, 120). As with the above study, the differences both
within workshops and between workshops could only be identified through analysing the morphometric traits using an evolutionary framework. The lack of uniformity in the results of the PCA suggests that potters were not regularly moving between workshops (Coto-Sarmiento et al. 2018, 120). This study provides a method for examining social learning processes by focusing analysis on a single artefact across multiple sites, which can easily be applied to other examples of regional artifact variation (Coto-Sarmiento et al. 2018, 122).

Bevan et al. (2014) have also considered how to study morphometric traits on artefacts with less obvious ‘landmarks’ for measurement: the terra cotta warriors themselves. In this study the research team’s aim was to undertake 3D morphometric analysis of the ears of the warriors, in order to examine patterns of variation which could be linked back to specific ceramic artists (Bevan et al 2014). As ear morphology varies massively in biological populations and is already used in forensics to identify individuals, it should allow for diagnostic analysis on the warriors (Bevan et al. 2014, 252). In order to analyse the ears, the team first went about creating point density photogram clouds of the warrior’s heads (Bevan et al. 2014, 250-51). Since ears do not have consistently discernible landmarks, they decided to extract the point density clouds for each ear before standardising, ‘size, position, orientation and point density’ of each ear for ease of comparison (Bevan et al. 2014, 252-53). This then allowed for morphological comparison through a distance matrix, the result of which permits for both statistical clustering and potential future phylogenetic analysis (Bevan et al. 2014, 253). The results of their analysis indicated that the majority of ears were ‘approximately similar shapes’, but that overall there was a significant amount of variation (Bevan et al. 2014, 254). When considered in comparison with the results of analysis on the weaponry which showed minimal variation (above, Li et al. 2014), this is especially notable and thus requires further investigation (Bevan et al. 2014, 254). From here, the team plan to test the warrior ear variation in comparison to a modern male population, as well as to consider phylogenetic
analysis (Bevan et al. 2014, 254). When considering morphological features of anthropomorphic artefacts, ascertaining visual typologies without landmarks can be quite difficult for researchers. The method of morphological trait analysis used by Bevan et al. (2014) within the cultural evolutionary framework, allows for the use of quantitative methods, which have, in this instance, illuminated unexpected diversity in ear design.

Cultural traits do not solely have to take the form of morphometrics. In their 2018 paper Rubio-Campillo et al. use cultural evolutionary methods to consider whether amphorae stamps can be used as a proxy for examining mobility and trade networks in the Roman Empire. As clay amphorae production sites are often easily discernible in the archaeological record, Rubio Campillo et al. carried out data analysis on the relationship between production site and find spot (Rubio-Campillo et al. 2018, 38). As with the dataset from central Lycia, the dataset used in this study has been collected from a multitude of projects across many different countries, leading to inherent biases in the collection methods, formats, and methodological approaches (Rubio-Campillo et al. 2018, 38). One such example is the higher frequency of recorded amphorae in Northwest Europe and the western Mediterranean, likely due to differences in the focus of archaeological research in those regions (Rubio-Campillo et al. 2018, 39). In order to quantify the similarity and dissimilarity between individual sites, the team created a Jaccard distance matrix, the results of which indicated a high rate of dissimilarity due to the consistent small number of unique stamps found at each individual site (Rubio-Campillo et al. 2018, 39). They then employed the Multi-Response Permutation Procedure (MRPP) to account for data fragmentation and sampling bias (Rubio-Campillo et al. 2018, 40). This process indicated an uneven distribution of stamp codes (Rubio-Campillo et al. 2018, 41: Fig. B.5 and 42), which suggests that depending on their geographic location, provinces were supplied in different manners (Rubio-Campillo et al. 2018, 42). The analysis also showed the strong links between
the distribution centres and the amphorae’s final destination (Rubio-Campillo et al. 2018, 42).

As MRPP is used for statistical significance, but not for similarity, the team then created a second matrix in order to use the clustering algorithm ‘neighbour joining’ to group statistically similar provinces (Rubio-Campillo et al. 2018, 42). This algorithm ‘generates an unrooted binary tree’ which can be visualised as a specific type of phylogenetic tree called a cladogram (Rubio-Campillo et al. 2018, 42). The cladogram (Fig. B.5) shows two main clusters, the first of which is the Mediterranean provinces, and the second of which is the European provinces on the limes (Rubio-Campillo et al. 2018, 42). While the overall pattern found within their dataset is of geographically closer sites having similar stamps, there are two main exceptions visible in this data: the provinces with a high military presence, and those that are along the ‘Atlantic-Rhine route’ (Rubio-Campillo et al. 2018, 44). While previous research has suggested that trade along the Atlantic would have been too dangerous, the ‘Atlantic-Rhine’ cluster visible in this data analysis argues against that suggestion (Rubio-Campillo et al. 2018, 44). Overall, their results suggest how amphorae stamps can be used as proxies for long distance trade within the Roman Empire (Rubio-Campillo et al. 2018, 42). Equally, the use of cultural evolutionary methodologies allows for a better, and in places different, understanding of Roman trade networks which otherwise would have been indiscernible through the large amount of data.

Cultural evolutionary analysis is not limited to working with only morphometric datasets or categorical datasets. In their 2014 paper, Garcia-Rívero and O’Brien ran phylogenetic analysis to consider the accuracy of recent proposals on the purpose of Neolithic engraved plaques from the southwest of the Iberian Peninsula. The hypothesis they are testing was put forward by Katina Lillios, who argues that the plaques are a combination of an ideographic writing system and heraldic items; a combination of two of the many previous theories (Garcia-Rívero & O’Brien 2014, 1). Her hypothesis,
which argues that the number of horizontal rows of engraving correspond
with hereditary distance from the original ancestral group, assumes that the
number of horizontal bands directly relate to time, even though this proposal
was not tested against radiocarbon dates or stratigraphic information
(Garcia-Rívero & O’Brien 2014,1-2). As Lillios’s hypothesis had been widely
accepted among archaeologists working in the region, Garcia-Rívero and
O’Brien (2014, 2) decided to test the hypothesis by building phylogenetic
trees based on the identification of common traits between the artefacts.
These trees quantify the co-presence of the traits on each given pair of
elements and group the ones with higher degrees of similarity. Additionally,
they chose to weight their programme creating the phylogenetic models to
favour Lillios’s hypotheses (Garcia-Rívero & O’Brien 2014, 2).

As with Rubio Campillo et al.’s (2018) dataset, the open access database of
Iberian plaques was also inconsistent in its descriptions of the individual
plaques. In order to account for this, Garcia-Rívero and O’Brien (2014, 3)
created their own classification system based on the specific ‘characters’, or
traits, as referenced in Lillios’s research. The traits, ‘base decorative motif’,
‘structure’, ‘tattoo straps’, ‘necklace’, and ‘head motif’ (Fig. B.6), all describe
the engravings on the plaques themselves (Garcia-Rívero & O’Brien 2014,
3). Determining phylogenetic relationships in this study was carried out
through the process of testing for ‘maximum parsimony’, wherein the model
identifies the cladogenetic trees that ‘require... the least number of
evolutionary steps required to arrange the… units under study’ (Garcia-
Rivero & O’Brien 2014, 4). This process necessitates the generation of a
large number of possible genetic trees for comparison, which allows the
incompatible trees can be removed, and the most parsimonious trees
selected (Garcia-Rívero & O’Brien 2014, 4). When testing for parsimony, it is
possible to give certain traits more analytical weight, so for some tests the
team chose to weight ‘base decorative motif’, a trait key to Lillios’s
hypothesis, essentially skewing the tests in her favour (Garcia-Rívero &
O’Brien 2014, 6). The result of the analysis revealed a high level of
parsimony across a variety of procedurally generated trees, suggesting that Lillios’s hypothesis is inaccurate (Garcia-Rívero & O’Brien 2014, 7-9). While some of the parsimonious trees match Lillios’ hypothesis, overall too many of the parsimonious trees contradict her hypothesis for it to be considered correct (Garcia-Rívero & O’Brien 2014, 11). The radiocarbon dates for the material excavated from the same contexts as the plaques also provide dates that disagree with her hypothesised order of engravings (Garcia-Rívero & O’Brien 2014, 11). Garcia-Rívero and O’Brien’s (2014, 12) conclusion based on the phylogenetic analysis is that there was a ‘common ideological background’ between the groups of people living on the southwestern Iberian Peninsula in the Neolithic, which would allow for different groups to have created similar designs. In this example, the use of cultural evolutionary methods have not only allowed the authors to disprove the prevailing hypothesis about the purpose of the Neolithic plaques, but also allowed them to suggest a new theory that will aid in future research on the topic.

II.iii.b Architecture

So far, all of the research presented in this section has focused on the study of single artefacts produced either by an individual or a workshop, all with a clear purpose. How can this micro-analysis of easily reproducible artefacts link to studying the early Christian churches of central Lycia? Taking the unit of analysis from a micro-, i.e. artefactual, to macro- scale, i.e. architectural, allows for the study of monumental structures that would have required a significant amount of time from a highly organised society to create (Jordan & O’Neill 2010, 3876). For example, the construction of a new building would have had a wider effect on the surrounding community than the creation of a single arrowhead or amphora. In their 2010 article, Jordan and O’Neill consider whether the styles of the wooden long-houses built by hunter-gatherer communities in the Pacific Northwest display evidence for certain types of cultural transmission, and if the transmission of those traits has been affected by language constraints (Jordan & O’Neill 2010, 3875). Currently,
this is the only study in the field of archaeology and anthropology that analyses buildings through the lens of cultural evolution, which makes it an ideal reference point for this thesis.

One of the major principals of cultural evolution is the theory that cultures tend to imitate other cultures rather than creating new methods independently, even though the process of this on a community level is often unclear (Jordan & O'Neill 2010, 3875). There are two main models for how skills and methods are transferred, and they are referred to as the branching hypothesis and the blending hypothesis (Jordan & O'Neill 2010, 3875). The branching model is the splitting and modifying of cultural traditions, which happens over time as new generations go about the modification of cultural traditions over time (Jordan & O'Neill 2010, 3875). At times this can mean that a pocket of insulated local traditions form, which will then exhibit ‘strong patterns of vertical transmission’ (Jordan & O'Neill 2010, 3875). The blending model is found when cultures are consistently in contact with other cultures, in a manner that the blending of cultural ideas is ongoing in a process that creates a ‘blur’ of cultural traits (Jordan & O'Neill 2010, 3875-76). Jordan and O'Neill's (2010, 3876) paper aimed to investigate whether the use of cultural traits in the construction of the Pacific Northwest long-houses were characterised by branching or blending, and then to test for a relationship between house types and difference in languages across the region.

A typology for the long-houses of the Pacific Northwest has existed since the 19th century (Jordan & O'Neill 2010, 3877). There are two main house-types: the houses in the north of the study area, which have a gabled roof, and the houses the south of the study area, which have a shed roof (Jordan & O'Neill 2010, 3877). The long-houses were built completely of timber and are part of a larger tradition of woodworking and carved wooden decoration within the hunter gatherer communities (Jordan & O'Neill 2010, 3876). The construction process for these structures would have required sustained, coordinated labour that was most likely managed by the chiefs and specialist builders
within the community, and the processes of construction is thought to have involved up to 200 individuals (Jordan & O'Neill 2010, 3876-77). As the decision to build a new long-house often revolved around the arrangement of new elite marriage, the building of these structures was also a visible social statement (Jordan & O'Neill 2010, 3877). The houses themselves were constructed to include a variety of features, i.e. a recipe of traits, as laid out in Table 2 of Jordan and O'Neill's (2010, 3876 and 3878: Table 2) article. In this study, Jordan and O'Neill have chosen to only analyse the longhouses with that exhibit evidence for the absence or presence of a full set of traits (Jordan & O'Neill 2010, 3877-79). The 17 long-houses with a complete set of recorded traits, and the list of standardised traits, both of which were recorded by Drucker (1955), form the basis of Jordan and O'Neill's study (2010, 3877-79). In total, there are 15 ‘general [trait] categor[ies]’ which are broken down into a total of 55 ‘trait descriptions’, or traits, all of which were recorded in a binary manner, where ‘1’ indicates the presence of a trait, an ‘0’ indicates absence (Jordan & O'Neill 2010, Table 2: 3878).

In order to ascertain whether or not the pattern of transmission of traits for the long-houses has been through the branching or blending model, the team first by created a model of a phylogenetic tree, with the tree-creation programme set to select trees with maximum parsimony, which can then be tested for closeness of fit (Jordan & O'Neill 2010, 3879 - 80). Closeness of fit was then tested using the ‘Retention Index’ (RI), ‘which calculates the amount of homoplasy as a fraction of the maximum possible homoplasy’; the smaller the amount of homoplasy, the more likely the traits were transmitted through branching (Jordan & O'Neill 2010, 3879 - 80). By additionally using the NeighborNet technique, the team was able to consider potential clustering while also creating a visualisation that could assist in assessing the transmission method (Jordan & O'Neill 2010, 3881-82). The results from the NeighborNet plots (Fig. B.7) of housing traits indicates an overall pattern of branching, where the houses in the southern group are separate from the northern group, and where the southern group have been visualised in a
more tree-like structure which suggests a branching transmission (Jordan & O’Neill 2010, 3883). Visible in the plot of the northern houses, however, is a pattern of boxing, which suggests blending, or hybridisation (Jordan & O’Neill 2010, 3883). Their Retention Index result demonstrated a ‘strong signal for vertical transmission’, which has led them to accept the suggestion of branching for the dataset overall, even with the box-like structures visible in the plot of the northern long-houses (Jordan & O’Neill 2010, 3883).

As their second aim was to consider the effect of language on the housing traits, the team then tested whether the pre-existing language tree (Jordan & O’Neill 2010, 3881: Figure 2) correlated with the newly created architectural trait tree by calculating their overall similarity (Jordan & O’Neill 2010, 3882). On average, the relationship between the architecture tree and language tree were more similar when compared to each other than when compared to a random sample, which indicates that they share a ‘broadly similar pattern of branching descent’ (Jordan & O’Neill 2010, 3885). The final method the team used involved for the statistical difference between the two trees: ‘If there is no statistically significant difference between the…tree for housing, and the tree constrained by language history, then a hypothesis of perfect co-transmission can be accepted’ while a significant difference would lead to a rejection of the hypothesis (Jordan & O’Neill 2010, 3882). In this case, the tree produced for housing in relationship to language was significantly different than their original housing tree and meaning perfect co-transmission did not take place and that they rejected their hypothesis (Jordan & O’Neill 2010, 3885).

Even with the rejected hypothesis, Jordan and O’Neill’s study still provided new quantitative results that will affect future studies of long-houses in the Pacific Northwest. For example, branching patterns are much stronger in the southern group of houses, while in the north, there is an indication of more hybridisation, which can be seen in the boxing patterns visible in their plot (Jordan & O’Neill 2010, 3885, Fig. B.6). However, it is when these results are
tied into pre-existing research on the culture of these communities that the results of this analysis take on a new light. Previous researchers (Drucker 1955, 46) observed a difference in the organisation of the kin groups in the north and south of the study area: northern kin groups were matrilineal and avunculocal, while the southern kin groups were patrilineal and patrilocal (Jordan & O'Neill 2010, 3885). Men from the northern group would, at a young age, go live with their mother’s uncle while in the southern group the men would end up living in the same long-houses as their male ancestors (Jordan & O'Neill 2010, 3886). This difference in the distribution of kin groups correlates with the patterns found in the NeighborNet plot, which suggests that the movement of men to their mother’s uncle’s house would foster more hybridisation of traits, while patrimonial inheritance fostered a branching transmission of traits (Jordan & O'Neill 2010, 3886).

This study especially has implications for the implementation of cultural evolutionary methods in the study of ecclesiastical architecture in Central Lycia. Jordan and O'Neill (2010) provide a framework for moving from the micro-analysis of a single, easily reproducible artefact to that of a macro-artefact, in this case a building made up of standardised traits, where the traits are a specific set of features expected to be either absent or present (Jordan & O'Neill 2010, Table 2: 3878). There are, however, many ways in which the study of the 162 churches in Central Lycia are made more complex than their study of long-houses. Jordan and O'Neill (2010, 3879) have only used the 17 sites that contain the information for all of their 55 traits, while the dataset for this study on Central Lycia contains a myriad of missing information that must also be considered when running analysis. Equally, Jordan and O'Neill's (2010, 3877) study uses anthropological data from the 19th century, which meant that the researcher gathering the data, Drucker (1955), was working with buildings that were still in use. None the less, as is the case with the churches of Lycia, the real interest in Jordan and O’Neill’s study is the connection of the buildings back to the community that built and
used them; in this case the realisation that the different organisation in kin groups had a strong, visible effect on transmission of cultural traits.

**II.iii.c Central Lycia**

The methodologies and overarching theories lined out in Chapter I provide a good starting place for a modern study on the churches of Central Lycia. However, the lack of quantitative methodologies makes answering question regarding temporal change, or differing church functions challenging. Cultural evolutionary methods thus allow for these theories to be tested and analysed in a new way. And, while the primary aim is to answer questions that have often come up in the literature, this method also allows for the discovery of new associations and relationships between early Christian churches, in a manner similar to the results of Jordan and O’Neill’s (2010) analysis discussed above.

By creating a list of cultural traits for the Central Lycian churches, it is also possible to consider the churches not only as a single structure, but as a series of choices, where construction was carried out based on a number of different culturally learned behaviours, which may change based on the use of different ‘ingredients’. These could be highlighted in different choices in the building process, such as construction technique (Section III.ii.c.2), or the external shape of the apse (Section III.ii.c.3), as well as in the choice to include a specific feature, such as an atrium (Section III.ii.b.4). These behaviours and choices can change over time, which may then lead to different choices in building, both in the construction itself and in the placement of later churches (see Chapter VII). Temporal change is a key question of this study, and as such the analysis will be carried out in a manner that emphasises the study of these traits (see Chapter IV).

Analysis within a cultural evolutionary framework can also highlight differences in architectural features or artefacts that are not immediately
visible to the research, as was seen in Li et al. (2014). The inclusion of certain traits may act as a marker for a church with a specific liturgical function and provide a starting point for a better assessment of the churches within that dataset. Equally, the application of cultural evolutionary methods may also result in evidence for the opposite. For example, scholarship on the early Christian churches of Central Lycia has always highlighted the perceived relationship between churches with triconch apses (Sections I.iii.b & III.ii.b.2), St. Nicholas of Holy Sion, and the Alaca Mountain. As is seen in Garcia-Rívero & O’Brien (2014), however, the application of cultural evolutionary methods can challenge well accepted hypotheses.

It is still entirely possible that the use of this methodology could support the ideas and theories of the previous and current researches working in Central Lycia. This would not make the study unsuccessful, rather it would strengthen the case for these hypotheses by providing quantitative results that fit within these pre-existing theories. It would also then provide a framework for future scholars, who, as archaeological investigation continues in the region, could further fill out the database and run the same tests again, checking to see if the new data alters the results in anyway. This is, however, unlikely to be the case. The complexity and variety of both the sources used for the compilation of the database, as well as the cultural traits themselves (see Chapter III for both) will undoubtably provide, at the least, new connections and relationships between traits and churches, and at best, provide results which clearly answer the research questions as set out in Chapter I.
III. MATERIALS AND METHODS

This chapter details the materials and methods used for the creation of the database, as well as an overview of the methodologies used to carry out analysis on the dataset. I created the database of 162 churches and their cultural traits through collating data from a variety of published sources which are all detailed below (Section III.i.a-f). Which sources were used for each church/entry can be found in two places in the database: in the ‘Source’ column, which provides citations for all academic sources that discuss each site, and in the ‘Description’ column, which provides either a summary or direct translation of the sources. At times, the source that discuss the church, such as the *Tabula Imperii Byzantini* (see Section III.i.b), only provides a brief entry on the individual church which does not include any additional or differing information from the other sources discussing the same church. When this has occurred, it has been noted in the ‘Discussion’ column. The limitations of these sources (Section III.i.g), as well the biases present in the study area (Section III.i.h) are also considered below.

Section III.ii provides a definition and scholarly background for the cultural traits recorded for this study. The cultural traits are divided into three types: morphometric traits (Section III.ii.a), absence / presence traits (Section III.ii.b), and categorical traits (Section III.ii.c), all of which are defined below. For each trait, I have also provided information about any difficulties with the process of categorisation, such as the different terminology used for construction techniques in German (Section III.ii.c.2). Where to find the cultural trait breakdown in the excel database, as well as a key for the list of the abbreviations used in the database, are also provided in this section.

Finally, the ‘Quantitative Analysis’ section (III.iii) outlines the methodologies used for analysis. Two main methods are used in this study: exploratory data analysis (Section III.iii.a) and nearest neighbour analysis (Section III.iii.b). Section III.iii.a also covers the two main visualisation tools used in this thesis to carry out exploratory data analysis: bar graphs and box plots. Section III.iii.b then provides an overview of nearest neighbour analysis, including a
description of the process, how to interpret the results, and the potential downsides of the method. The methods outlined here are all utilised in the Results (IV) chapter.

III.i. Sources and Biases

The data for the 162 churches of Central Lycia studied in this thesis was collected from over 40 different sources, including books, articles, dissertations, and personal correspondence. The sources span over 50 years of fieldwork and research and include data from various long-term projects as well as work on individual sites. These 162 sites represent all of the published churches of Central Lycia at the time of writing, excluding those with too little archaeological evidence to be included in analysis (See below Sections, III.i.a – f for not included sites, and Section III.i.h.2 for discussion of Survival Bias). With such a variety of multinational publications being produced over an extensive period of time, scholars working in Central Lycia have employed a range of different methodologies when examining the data, which has led to a variety of interpretations. As such, an overview of all sources used in the collection of data, as well as any key points or issues within those sources, are provided below.

III.i.a The Tübingen Lycia Project

The Tübingen Lycia Project, directed by Professor Frank Kolb, was an extensive archaeological survey of the ancient city of Kyaneai and the surrounding countryside which ran from 1989 to 2001 (2019, Universität Tübingen). The primary survey covered an area of 106 by 130 km², with additional surveys in specific areas totalling to 20 km². In total, the survey team recorded evidence for approximately 3,300 upstanding remains of ancient settlements. The primary publications for the project are the ten

\[ \text{June 2019} \]
Lykische Studien German-language volumes edited by Professor Frank Kolb, with additional material being published in a further 18 monographs and 60 journal articles (2019, Universität Tübingen).

The ten publications from the Tübingen Lycia Project that were used as sources for this database, have proved essential to this project. Of the 162 churches in the catalogue, 64 sites included data found in these ten publications. Michael Altripp’s chapter from Lykische Studien 9 (2010e, 311-50), ‘Katalog der kirchen und kapellen des Yavu-berglandes’, was integral to the data collection process. This catalogue not only provided a list of the 57 churches within the survey area, but also provided a list of additional sources from within the Tübingen Lycia Project, as well as the published location of the church plans, if the plans had been published. These publications included chapters from Lykische Studien 2 (1995), Lykische Studien 3 (1996), Lykische Studien 7 (2006), Lykische Studien 8 (2008), and Lykische Studien 9 (2010), as well as a report of the 1989 survey at Kyaneai published in Istanbuler Mitteilungen (Miller, 1991), and the PhD dissertation, Bauern in der Polis. Ländliche Siedlungen und agrarische Wirtschaftsformen im zentrallykischen Yavu-Bergland (Şanlı - Erler 2006), which contains the majority of the ground plans published by the Tübingen Lycia Project.

While extensive, the entries in Altripp’s (2010e) catalogue are varied in the amount of data recorded, as well as the level of detail documented at each individual site. For example, the entry for Settlement XXIV between Tüse and Ayıbeleni (Altripp 2010e, 323) is just over 100 words long, while the entry for Divle 2 Basilica (Altripp 2010e, 331-32) is just over 600 words long. There are 16 churches in the catalogue that do not have published ground plans, though not all of these have been included in my final database. Five of the sites from Altripp’s catalogue do not have enough information to be included in the analysis: ‘Çardaklı/Çildamları/Kirandağ, located in the area surrounding Phellos’ (2010, 346), Trimanlar, Settlement LXVII (2010b, 346), Settlement LXXVI by Gölbaşı (Şanlı - Erler 2006, 273; Altripp 2010e, 349),
'Church (?) in Hellenistic Tower settlement in the Turkish settlement of Ikikuyu/Davazlar' (2010e, 349), and Church west of Ikizkilise Tepesi (2010e, 350). Altripp’s (2010e, 346) entry for Çardaklı/Çildamları/Kırandağ states that the church ground plan is not determinable due to it having been completely built over by modern Turkish buildings, and even though it is likely to have been ‘rather large’, it is listed as Byzantine. The lack of plan or upstanding remains has led me to exclude this church from the database for this study.

As with the above church, the ecclesiastical structure at Trımanlar, Settlement LXVII (Altripp 2010e, 346) is also not planned or measured. It is described by Altripp (2010e, 346) as a ‘three-aisled basilica (?) from the early Byzantine period (?)’. The possible church is also in Şanlı - Erler (2006, 291), who describes the numerous architectural decorative elements which are incorporated into the house presumably built on top of the church. Due to the large number of architectural carvings, Şanlı - Erler (2006, 291) has argued that the church must have been a three-aisled basilica, however, the lack of any upstanding remains and the potential that the architectural fragments in the modern house may have come from more than one ancient structure have led me to not include this church in the database. The presence of a church at Settlement LXXVI by Gölbashi is also only indicated by the presence of a few carved decorative architectural features (Şanlı - Erler 2006, 273), though in this instance there are even less carvings than at Settlement LXVII. The same is true for ‘Church (?) in Hellenistic Tower settlement in the Turkish settlement of Ikikuyu/Davazlar’ where the main evidence for the presence of a church comes from two fragments of a ‘Byzantine Christian votive inscription’ (Altripp 2010e, 349). Finally, it seems as though the Church west of Ikizkilise Tepesi has only been recorded during a survey and was never written up or published in a manner accessible to the Altripp (2010e, 350). When considered in conjunction with the traits chosen for analysis (Section III.ii), Altripp’s catalogue entries for these churches do not provide enough detail to be used for this study.
Additionally, Karakuyu (Altripp 2010e, 339) and the Church East of Karakuyu (Altripp 2010e, 336-39) are in the database for this study and have been used in the exploratory data analysis, but are not included in any maps of the region or any quantitative analysis requiring GPS points, as I was unable to locate the sites on the comprehensive map of the study area (ed. Kolb 2008, Faltplan 2; Fig. B.8). The map itself is worth mentioning; *Lykische Studien* 9 (2010) is the final *Lykische Studien* publication, but the only comprehensive map of the study area is published in *Lykische Studien* 8 (2008), and at present, there is no digital map available online. This may be due to the funding for the Tübingen Lycia Project running out after 2003 (2019, Universität Tübingen). Şanlı - Erler’s (2006) catalogue at times include GPS points, and these have been used to locate the 16 sites with ecclesiastical structures where the coordinates are present in the catalogue. These sites are Settlement I, Settlement XIII, Settlement XXIV, Settlement XXVII, Settlement XXXI Basilica by Kilise, Settlement LVIII at Çakaldere, Settlement LXVII West Hıdırlar, Settlement LXX west of Divle, Settlement LXXI in Turkish Hoyran Village, Settlement LXXII Üçtepe, west of Trysa, Ikizkilise Tepesi LXXVII, Settlement LXXIX Çürüt, Settlement LXXXI by Yarımahr, Settlement LXXXIII at Sütkaklık Tepesi north, Settlement LXXXVIII at Bademağacı, and Settlement XCI at Inbaşı Tepesi (Şanlı - Erler 2006). In some instances, multiple GPS points have been given to indicate the extent of the site (Şanlı - Erler 2006, 197). In the case of Settlement LXXI in Turkish Hoyran Village, unfortunately the GPS coordinates have been mis-printed, and thus were unable to provide an exact location for the site (Şanlı - Erler 2006, 264). This is the case with the point for the southern extent of Settlement LXXII Üçtepe, west of Trysa, though the northern extent of the site is printed correctly and was thus used in locating the church geographically (Şanlı - Erler 2006, 266).

In total, only 15 of the 64 sites sourced from the Tübingen Lycia Project had published GPS coordinates. As such, locating the majority of the individual settlements required a manual assessment of the map (Fig. B.8). From there,
the sites were added to Google Earth, which required either finding of the individual church structures on Google Earth satellite images, or the approximation of the church location based on features discernible both on Tübingen Lycia Project map and on Google Earth. Without exact GPS points, some of the church coordinates for the sites in Altripp’s (2010e) catalogue cannot be exact, however, an approximate location in this instance still allows for geographic analysis, which has as of yet not been done on these ecclesiastical structures in Hills, especially in conjunction with the churches in Alaca and Plains as well.

As the Tübingen Lycia Project has been running for an extended period of time, there are instances where the plans of churches were published, but then have been re-drawn and re-described at a later date. One such example is Settlement XXXI Basilica by Kilise: The church was originally published and planned by Geppert in *Lykische Studien* 3 (1996, 83-86, Fig. B.9), but then re-planned by Şanlı - Erler (2006, Fig. A.78) with slight changes to the structure, such as indicating a doorway between the north aisle and northeast annex, a feature which was not on Geppert’s plan (Altripp 2010e, 320). Altripp (2010e, 320) also notes that the presence of this doorway calls into question Geppert’s interpretation of the annex as part of a second phase, showing that in this instance the difference in planning has led to a different interpretation. While Altripp’s catalogue is relatively clear in terms of citing other sources, it does often reference other publications without summarising their content. This can make the process of extracting data difficult for the reader, with the above example being one of many times acquiring two additional publications was needed to fill out a single database entry.

**III.i.b Tabula Imperii Byzantini**

*Tabula Imperii Byzantini 8: Lykien und Pamphylien* (Hellenkemper & Hild 2004) was another key source for the gathering of data. Tabula Imperii
Byzantini (TIB) is an ongoing project to ‘create a historical atlas of the Byzantine space from Late Antiquity to the Early Modern period’ (TIB 2019). The project produces publications of specific regions, or groups of regions, within the Byzantine world, with each publication including an introduction to the history and geography of the region, as well as a catalogue of all known sites within the project’s time frame. So far, 12 TIB volumes have been published, with a further six volumes in various stages of publication. As TIB 8 was published in 2004, before the four most recent Lykische Studien publications, not all of the sites mentioned in Altripp’s catalogue show up in TIB. However, TIB covers the whole of Lycia, and thus includes sites in both Alaca and Plains, as well as those in Hills not covered by Lykische Studien, such as the coastal sites in that region.

As with Lykische Studien, the catalogue entries in TIB often vary in size and detail. As it is an atlas, the style of writing is often abbreviated to a bullet-point style, rather than having been written in full sentences. At times, this lack of detail can make interpretation of the data difficult, especially when comparing a TIB entry to that of another source discussing the same site. The maps provided with the publication are at a scale of 1:800,000 (TIB 2019, see Fig. B.10), and while degree and minute coordinates are provided with each entry, both the map and the coordinates given are much too broad to provide an exact location for individual sites. Fortunately, for most sites, there are additional publications that provide more details about the church location.

III.i.c Additional German Sources

Früchristliche und Byzantinische Bauten im Südöstlichen Lykien: Ergebnisse Zweier Surveys, by P. Grossman and H. G. Severin (2003), is an analysis of the data collected through multiple surveys carried out by the authors in the Alaca and Plains region on the known churches within the area from 1974 to 1977. The sites included in the publication are: Andriake, Sura,
Danabaşı/Dereköy, Kök Burunu, Muskar, Alakilise, Devekuyusu, Yilanbashi, Karabel, West Asarcık, East Asarcık, Alacahisar, Güceyman Tepesi, Arneai, and Çamarkası. The only church in Grossman and Severin (2003) not included in this project is Kök Burunu, as the site is on the east slope of the Alaca mountain and thus much more accessible from Limyra, which is outside the bounds of this study. For this publication, Grossman & Severin (2003) produced numerous ground plans, many of which have been used to gather the data for this database (see Section III.ii.a). The publication also includes a catalogue of carved decoration, as well as extensive photographic documentation of the sites (Grossman & Severin 2003, 141-170).

While the plans produced by Grossman and Severin which provide a differing perspective from other early publications have been useful, some of the plans present a highly hypothetical reconstruction of certain sites. This has then led to later researchers citing these plans as factual, when in actuality the ground plan of the structures can only be reconstructed through excavation. The two sites where this occurs most notably are Muskar and Çamarkası, both of which were in a poor state of preservation even in the 1970s. Muskar (Grossman & Severin 2003, 27-33, Fig. A.54) is presented as a three-aisled triconched transept basilica. While the remains of the south conch as drawn on the plan, and the numerous other triconch apsed structures in Alaca could lead to the interpretation of a triconched apse (see Alacahisar (Fig. A.2), West Asarcık (Fig. A.22), Devekuyusu (Fig. A.31), and Dikmen (Fig. A.32)) many of those structures also have chapels to the south of the apse, as do other churches in Alaca without a triconch apse (see Alakilise, Turant Dağ), so the possibility that this semi-circular feature is not part of a similar structure cannot be ignored. Çamarkası (Grossman & Severin 2003, 116-118, Fig. A.27) is reconstructed similarly to Muskar: as a three-aisled, tri-conched, transept basilica, with two additional smaller apses placed in either side of the main apse, in the north walls of the transept conches. In this case, there is more evidence for the apse and transept aspect of the church, however, the remains are still incredibly fragmentary.
Even though the above discussed plans are the only published plans of both Muskar and Çamarkası, they are too hypothetical to use for taking measurements, and have not been used for that purpose in this study.

Thomas Marksteiner has contributed a number of publications to the study of Lycia, four of which have been used in the creation of this study’s database. *Trysa: Eine Zentrallykische Niederlassung im Wandel der Zeit* (Marksteiner, 2002), is an extensive description and analysis of the ancient city of Trysa, including its two churches. This publication is associated with the Tübingen Lycia Project, as Trysa falls within the Tübingen Lycia Project survey area.

Though the publication is just under 300 pages long, the description of the two single-aisled churches take up only three pages (Marksteiner 2002, 47-49). The two churches are not described in Altripp’s catalogue (Altripp 2010e, 346), where the catalogue entry just lists Marksteiner’s publication. The three additional publications authored by Marksteiner were done in conjunction with Dr. Philipp Niewöhner. These articles are the result of a different set of surveys carried out by Marksteiner and Professor Andreas Konecny in Istlada and the surrounding regions from 1994 to 1997. In all three cases, Niewöhner was not originally part of the survey project, but was brought in at a later date to assist with the analysis of the Christian structures (Marksteiner & Niewöhner 2004, 21: footnote 1; Marksteiner & Niewöhner 2006, 83: footnote 1; Marksteiner (ed.) et al. 2009, 86: footnote 1).

‘Die Kirche von Istlada in Lykien’, published in 2004 (Marksteiner & Niewöhner) is a detailed examination of both the Istlada Basilica and adjoining chapel, as well as Istlada Internal Church. While providing a more complete analysis than many other sources, the strong voice of the authors comes through the interpretation. One such example can be found in the section considering the function of the church, ‘The southern corridor and the annex chapel at its eastern end are not necessary for ordinary worship and do not belong, such as the atrium, the standard equipment of a parish church’ (Marksteiner & Niewöhner 2004, 41). Another can be found in the
discussion of the internal church, ‘The decline of Late Antiquity churches in post-antiquity is a common phenomenon in Lycia. It is associated with the so-called Dark Centuries, the early Middle Ages, during which Lycia was repeatedly plundered by the Arabs, maritime trade along its coast came to a standstill and, at most, still seem to have been rebuilt’ (Marksteiner & Niewöhner 2004, 44). This comment directly relates back to the previously discussed (Section I.iii) theoretical frameworks relating to decline, which are clearly in play in Marksteiner and Niewöhner’s analysis. I have checked with a German colleague about the strong opinions that can be read in the translations, and he confirmed that this was also true in the original text. This strong authorial voice carries through the two additional publications (Marksteiner & Niewöhner 2004, Niewöhner in ed Marksteiner et al. 2009).

As discussed below (Section III.i,g), the study of church architecture in Lycia is rife with hypotheses that have yet to be tested in a quantitative manner and this is a clear example of such; none the less, the detailed descriptions provided were helpful in constructing this study’s database.

‘Die Ruinen von Gökkaya. Ein Siedlungsplatz in der Umgebung on Istlada in Zentrallykien’ (Marksteiner & Niewöhner 2006) details the remains of the small settlement of Gökkaya, including the church, which were discovered by Konecny in 1996 during the Istlada survey (Marksteiner & Niewöhner 2006, 83: footnote 1). The church is discussed in much detail (Marksteiner & Niewöhner 2006, 85-95), though the only published plan of the Gökkaya basilica (Fig. A.33) is a low resolution, which has made gathering measurements somewhat difficult and less accurate. ‘Der Burgberg von İnşdibi bei Istlada in Zetnrallykien. Antike Festung und byzantinische Kapelle’ (Marksteiner (ed.) et al. 2009) provides a detailed description and plan of the survey of the fortress and church found at İnşdibi in 1997, which were also discovered as part of the Istlada surveys (Marksteiner (ed.) et al. 2009, 86: footnote 1). It contains a detailed phasing of the church as well as a high-resolution plan (Niewöhner in ed Marksteiner et al. 2009, 92-102, Fig. A.40), and numerous photographs of the structure.
The final German-language source used in the compiling of this database is ‘Die kirche von Tersane auf Kekova Adasi. Überlecunnen zum Lykischen Kirchenbau’ by Urs Peschlow (2001). This article describes the apse of the now collapsed Tersane Harbour Church (Fig. B.2), where the apse arch was constructed in alternating brick and stone, a style not often seen throughout Lycia (Peschlow 2001, 197 - 201). Though the apse is now collapsed, it and the other churches on the island of Kekova, both in the Tersane harbour area as well as elsewhere on the island, are discussed at length in the publications by the current Turkish survey team (Section III.i.f.3), thus providing some local context for this structure.

III.i.d English Language Sources

While the works of R. Martin Harrison have already been discussed in Section I.ii.a, it is worth indicating which publications of his have been used in the database. I have included 33 of the 37 churches recorded in his original publication, ‘Churches and Chapels of Central Lycia’ (1963). Three of the churches fall on the eastern side of the Alaca mountain and thus are considered within the sphere of influence of Limyra and not Myra. These churches are, as listed in the article, Asarönü (Harrison 1963, 126), Kök Burunu (Harrison 1963, 138-39), and the Kök Burunu chapel (Harrison 1963, 139). The only other church in Harrison that is not included in this database is Gömbe (Harrison 1963, 138), which is located on the Emalı plain, north of Eren Dağ, and thus outside of this survey area. Harrison’s 1963 article is the only published source for four of the churches in the database: Gürses and Gürses Internal Church (140, 142), which may have since been destroyed, Myra Castle (140), and Myra Castle Ridge (140). The 1963 article also includes 12 plans that were used for nave are measurements: Alakılise N Saraylı (Fig. A.5), Arneai Church A (Fig. A.17), Arneai Church B (Fig. A.18), Dikmen and Dikmen Internal Church (Fig. A.32), Gürses Basilica and Gürses Internal Church (Fig. A.36), Sura Plateau Phases 1 - 4 (Fig. A.60), Yavıköy
Path Church (Fig. A.68). Though the Sura Plateau church is also mentioned in other sources, Harrison is the only one to provide a plan of this now demolished church (Bayburtluoğlu 2004). Harrison’s 1963 publication, and its description of the Karabel church (West Asarcık), were also used for the basis of my examining of West Asarcık in my MSc Dissertation (Scardina MSc, 2013).

Two additional publications by Harrison were used when compiling the database. In this case they both relate to the same church, Turant Dağ. The Turant Dağ church is first published in Harrison’s 1979 article, ‘Nouvelles Découvertes Romaines Tardives et Paléobyzantines en Lycie’, where it is briefly described without an accompanying architectural plan, and not planned, as closely resembling the Karabel (West Asarcık) church (Harrison 1979, 232). The church is mentioned again in TIB, where it is again described as being part of the ‘Karabel/Alaca group’ (Hellenkemper & Hild 2004, 898). It is then mentioned in Kate Clow’s walking guide (see below), at which point it is described as a ‘triconch church’ (Clow 2004, 75). This designation seems to have come from Harrison’s posthumous publication, *Mountain and Plain, From the Lycian coast to the Phrygian Plateau in the Late Roman and Early Byzantine Period* (2001), where he describes the church as ‘triconchos in plan’ (Harrison 2001, 28). This comment is also referenced by the most recent surveyors, Bülent İşler and Nesrin Aydoğan İşler (2017, 180 footnote 10), who note that Harrison’s 2001 publication describes the church as a triconch but does not provide a plan. In their publication, they describe the church in more detail than Harrison, where they point out that the apse is not a triconch, rather that it is semi-circular internally and flat externally (İşler & İşler 2017, 180). The church they describe, however, matches the non-triconched plan of Turant Dağ that is provided in Harrison’s 2001 publication (Fig. A.65), which has in turn been used to take measurements for this study. It seems that both Clow (2014) as well as İşler and İşler (2017) were misled by the description of Turant Dağ given in Harrison (2001, 28), however, as the plan in Harrison 2001 almost
exactly matches the description given by İsler and İsler (2017). It is likely the confusion came over Harrison’s description of the church as similar to West Asarcık, even though his initial publication did not include any mention of Turant Dağ being a triconch (Harrison 1979, 229, 232), when it does mention other structures as specifically having a ‘triconque’ (Harrison 1979, 225).

From 1967 to 1975, James Morganstern surveyed and analysed both the church at Dereağzı and the nearby fort of the same name. The resulting publications, ‘The Byzantine Church at Dereağzı and its Decorations’ (Morganstern 1983), and ‘The fort at Dereağzı and other material remains in its vicinity from antiquity to the Middle Ages’ (Morganstern 1993), are both extensive volumes discussing the sites at hand. The Dereağzı church is notable in that it is one of the few churches in Lycia often mentioned by scholars looking outside of Central Lycia (Krautheimer 1986, 285-87), due to its probable connection with Constantinople (Morganstern 1983, 92). My interpretations of the Dereağzı church, which were used in the compiling of this database, predominantly come from my MSc dissertation (Scardina 2013), which used Morganstern (1983) as a main source.

Compiling data for the church at Dereağzı Fort provided more difficult. The interpretation as laid out by TIB (Hellenkemper & Hild 2004, 716), varies greatly from that of Morganstern (1993, 42-84). Hellenkemper and Hild (2004, 716) argue that the church was a small, three-aisled basilica which at a later date was reduced to a single aisle, while Morganstern (1993, 43) states that the church was only ever a single aisle, with two curated religious spaces to either side. These spaces may have originally been meant to take the form of aisles, but as evidenced by three doorways blocked up during the construction process, at some point there was a shift in the church design (Morganstern 1993, 44). The evidence presented by Morganstern (1993, see page 44: Fig. 10) has led me to catalogue this church as a single-phase, single-aisled church rather than the multi-phased constructions suggested by TIB (2004).
Another source which bears mentioning is *Saint Nicholas Ways* (2014), the walking guide published by hiker and amateur historian Kate Clow, which includes some details of the churches on the Alaca mountain. For this publication, Clow contacted a number of Turkish scholars, and as such was able to record the GPS locations of some of the remote mountain churches which allowed her to publish an accurate map of the walking route. The book also includes some interpretation regarding the *Life of St Nicholas of Holy Sion*, as well as the location of the churches mentioned in the *Life*, including a discussion of the location of the Sion Monastery (Clow 2014, 45-86). Both the map, and the Turkish place-names used by Clow have been useful when compiling the database, as have the GPS points provided to me by Kate Clow.

**III.i.e Aperlae**

There are over 20 publications relating to the site of Aperlae, though only six have been used in the collection of data due to their focus on the ecclesiastical structures in the city. The original publication (Carter 1978) of the site was an amateur survey carried out by Robert and Cynthia Carter from their personal yacht in the 1970s. Their interest in the site eventually led to the 1996 to 2002 survey carried out by Professor Robert Hohlfelder and Professor R. Lindley Vann, from which the majority of publications relating to Aperlae were produced. Recently the site has been surveyed again by a team from Selçuk University (Aslan 2010), who have also carried out surveys on the nearby Kekova island. The primary publication that covers all four churches identified during the first survey is, ‘The Early Christian Churches in Lycia: Evidence from Aperlae’, which discusses the Upper church (Vann et al. 1999, 739-41), Lower Church (Vann et al. 1999, 741-743), the ‘Inundated Church’ (Subscribed Triconch Church in database; Vann et al. 1999, 743-44), and the ‘Second Inundated Church’ (Harbour Church in database; Vann

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3 Email from Kate Clow, received 12.11.15
et al. 1999, 744-46), with some of their publications covering the individual churches in more detail. The interpretation of the churches both in the survey publications, as well as in *TIB*, have also been considered thoroughly in my article, ‘The Churches of Byzantine Aperlae: A Re-appraisal’ (Scardina 2018).

‘A Church Beneath The Sea At Aperlae, Lycia’ (Hohlfelder & Vann 1999) focuses on the discovery and planning of the Subscribed Triconch Church’s two phases. Both the data provided in the article and the measurements from the plans (Fig. A.13 & Fig. A.15) have been used in the database. In Scardina (2018, 692), I have also included a discussion of the possible baptismal function of this structure, based on comparisons with chapels with similar apses at both Andriake Church B (Fig. A.7) in Plains, and at Olympos (Gokalp & Yildirim 2008, Fig. B.11), which falls outside of the study area in Eastern Lycia.

Though it is discussed in Van et al. (1999), the best plans of the Harbour Church are published in Hohlfelder’s 2005 article, ‘Swimming Over Time: Glimpses of the Maritime Life of Aperlae’. In Hohlfelder’s (2005, 197) figures 15.13 (Fig. A.12) and 15.14 (Fig. B.12), Hohlfelder not only provides a measurable plan, but also his interpretation of the two phases of the church. The second phase that includes a ‘new’ wall to the south of the church, has led Hohlfelder (2005, 198) to argue that the addition of the wall renders the small chapel of the harbour church unusable. This is based on the date given to the Christian period city wall of, ‘Late Antique’, which is thought to have been before the church (Hohlfelder 2005b, 195). However, evidence presented by the Turkish team suggests that the ‘Late Antique wall’ that makes up the southern wall of the chapel may have actually been a pre-existing wall when running along the chapel, which suggests the church was built after the wall, rather than the other way around (Scardina 2018, 694-95). The same ‘wall’ as planned by Hohlfelder (Fig. B.12), changes in construction style to the west of the church (Aslan 2010, 185), which again
suggests a different interpretation than that set out by Hohlfelder (Scardina 2018, 694-95). All of this has led me to consider the church a single phase, rather than the two suggested by Hohlfelder (2005).

Though I have used the survey publications and *TIB* in the database for the Aperlae Lower Church entry (see Hohlfelder & Vann 2000, and Vann et al. 2001, 82: Fig. 6 for the plan), the primary source for both this structure and the Upper Church is the MA thesis by Mary Tindle at the University of Colorado, *The Churches of Aperlae, A Coastal Town in Ancient Lycia* (2000), which was written as part of the survey project. The phasing for the Upper Church, however, comes from the analysis in Scardina (2018, 690-91), which combines the phases of construction as interpreted by Vann et al. (1999), Tindle (2000), and *TIB* (Hellenkemper & Hild 2004). The plan of the church is provided in eds Vann and Hohlfelder (1998, see Fig. A.16), though more complex interpretations are found in the above-mentioned publications.

**III.i.f Turkish Sources**

In the last decade, the majority of the research being done in Central Lycia has been carried out by Turkish teams. The academic style of Turkish material provides for different issues of interpretation than found in English or German sources. Often results are presented with little interpretation, which is saved for a final publication, along with more detailed plans of sites. However, in the case of Kekova Island and Alaca Mountain, the recent Turkish publications have provided much more detail than can be found in previous academic works by non-Turkish scholars, which has made it possible to include these churches in the analysis.

**III.i.f.1 Myra**

The church of Saint Nicholas of Myra has proven to be somewhat problematic in terms of interpretation due its history of building modifications
up until the modern era. Since 2012, the ongoing excavations at the church have been led by Dr Ebru Fındık. There are numerous publications on various aspects of the excavation work on the site, though they often cover the specific season’s work or certain finds, though a book covering the restoration work at the church is planned (Doğan et al. 2015, 22). The plan used for the database comes from Doğan et al. (2015, see Fig. A.55).

The Myra Alakent church was excavated in 2010 by a team led by Dr. Engin Akyürek from underneath the alluvial mud that had covered the church since the 14th century (Akyürek 2013, 14-15). It has since been published in the detailed volume, Alakent Church. A Byzantine Monument at Myra (12th - 13th Centuries) (ed. Akyürek 2017). The church itself is notable for both the level of preservation of features such as the of the roof (ed. Akyürek 2017, 74) and the decoration (ed. Akyürek 2017, 86-88), as well as the late date.

III.i.f.2 Andriake

The ongoing survey at Andriake is chronicled in a large number of published articles, but as of yet no comprehensive volume on the site. A good overview of the recent excavation works can be found in, ‘Andriake: The Port of Myra in Late Antiquity’ (Akyürek 2016), which discusses the industrial nature of the city, though he argues for the post 7th century collapse of ‘Roman civilization’ and with it the site (Akyürek 2016, 479). As the archaeological work at Andriake is ongoing, not every seasonal publication includes information relating to the churches. Fortunately, the excavated plan of Andriake Church B was published in 2013 (Çömezoğlu, 318), in the context of the excavated bronze objects found in the northernmost chapel of the church (Çömezoğlu 2013, 317).

While the publications of the current excavation team have been helpful, perhaps the best overview of the site, and the six churches within it, can be found in the PhD dissertation by V. M. Tekinalp (2000) from Hacettepe
University, Geç Antik Dönem Sonrasında ve Ortaçağ’da (M.S. 4.-14. yy) Andriake Kenti. The dissertation includes detailed plans and phasing of all the churches, as well as a catalogue of all carved decoration or liturgical furniture found within the churches. Due to the level of detail provided, Tekinalp (2000) has been the main source on Andriake used in this study’s database.

III.i.f.3 Kekova

The Tersane Harbour Church, which is first mentioned by Harrison (1963, 144, and Section III.i.a.4 above), and then later published by Peshlow (2010, and section III.i.d above), was the primary focus of scholarship on Kekova island until recently. TIB (Hellenkemper & Hild 2004, 581-83) does mention more churches on the island than just the harbour church, including a chapel within a ‘house’, and a church with a chapel to the southwest. Without the work of the current survey team, however, the data provided by TIB would be difficult to decipher.

The current survey team, run by Erdoğan Aslan of Selçuk University, is the same team that carried out the more recent underwater surveys of Aperlae (Section III.i.d). While there are currently seven publications from the Selçuk survey that cover ecclesiastical material, unfortunately the locations of the churches are not always consistently noted, nor were plans provided for all structures. As they are in the process of preparing the publication, the survey team were unwilling to provide me with this information⁴, though hopefully the publication will be useful to integrate into future research. Nonetheless, the publications still contain a wealth of newly discovered material that has been included in the database.

There are two main settlement areas on Kekova, one around the Tersane Harbour and now collapsed church on the west side of the island (‘Tersane’

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⁴ Email from Yusuf Kılıç, received 25.01.19
churches in the database, Fig. B.13) and the settled area in the centre of the northern coast of the island ('North' churches in the database, Fig. B.13). The publication of the 2010 survey first introduces the Kekova North Port Church (Aslan 2011, 234-35), which names the structure 'D39'. In 2015, the team went back to the northern settlement and carried out a much more detailed survey (Aslan & Kılıç 2016, 44), though the church is given a different number in this article, 'KY-6', and the plans are in a lower resolution than the 2011 publication. Kekova North Transept Church and Kekova North Submerged Church are also published for the first time in the 2016 article (Aslan & Kılıç 2016, 30-32). As the churches are part of the same complex, they have been given the same number by the survey team, ‘KY-29’, with Kekova North Transept Church being, ‘KY-29a’ and Kekova North Submerged Church being, 'KY-29f'. As Kekova North Submerged Church shares a wall with Kekova North Transept Church, and as the construction technique for the non-shared walls of the Submerged Church are less complex (Aslan & Kılıç 2016, 32), it is likely that the Transept Church was built first, and then the Submerged Church was built at a later date. As such, I have considered them as separate structures.

Another church published in the 2016 article is the three-aisled Kekova North Basilica and its Internal Church (Aslan & Kılıç 2016, 32-33), labelled ‘KY-119’ by the survey team. Though the survey team do not discuss any potential phasing, both the plan and the photograph (Fig. A.44 & Fig. B.14) suggest that in a second phase, the aisles were walled off. As such, the church has been listed as two entries in the database. Kekova North Basilica is the church discussed by TIB with a southwestern subsidiary chapel. Though the chapel is not mentioned in the 2016 publication nor is it drawn on their plan, an apsed structure is visible to the south of the narthex, so the church has been listed as having a subsidiary chapel in the database. As mentioned by TIB (Hellenkemper & Hild 2004, 581), this is also the only church on Kekova island to have an externally three-sided apse (Fig. B.14).
The final church in the north settlement is the Kekova North Great Church, which is discussed in the publication of the 2016 survey (Aslan et al. 2017). Unfortunately, this publication is less detailed than that of the 2015 survey, and as such, no plan of the church is given, only an aerial photograph (Fig. B.15). There is evidence that the church had a second phase in the publication photograph: the stylobate between the nave and the south aisle has been dismantled, and a wall was built across the divide between the nave and the north aisle. The church has thus been recorded in the database as Kekova North Great Church Phase 1 & Phase 2.

Kekova Lighthouse Church, which is located on the very eastern tip of the southern side of the island (Fig. B.13), was also discovered in this season.

The main publication that covers the churches in the Tersane settlement is from the 2012-2013 seasons (Aslan (ed.) 2014). The remains of the Tersane Great Church (Göçer 2014, 341-42) are described reasonably well, however, there are no photographs of the church, nor specific plans of the church in the publication. The church may be on the very low-resolution plans of the Tersane area provided in the publication (Aslan (ed.) 2014, 349: Çizim 1 & 2), but it is not discernible. The only known published plan comes from an article by Aslan (2015) on fish sauce production on Kekova (Fig. A.62). Luckily, there are some good images of the Tersane Monastery in the 2014 publication (Fig. B.16), which allowed for the identification of the site’s GPS coordinates. The publication also provided dimensions for the apsed room within the monastery complex (Göçer 2014, 340). Finally, the publication discusses the Tesane Building Complex Church, which is part of a larger building complex, but due to the Christian imagery (Göçer 2014, 343) is clearly an ecclesiastical structure. Once again, the publication has included measurements, but no plan and in this case no image. Luckily, Professor James Crow of the University of Edinburgh had an image of the Building Complex Church, taken in the 1990s, the photos of which also assisted in the locating of the structure geographically.
**III.i.f.4 Alaca Mountain**

The only Turkish scholars currently publishing on the architectural remains of the Alaca mountain are by Dr. Bülent İşler and Dr. Nesrin Aydoğan İşler. Their survey data was an integral source for new material in the Alaca region. As part of his PhD dissertation, İşler re-measured and planned both East and West Asarcık, as well as the surrounding structures; these plans have been used in for the collection of measurements for this database\(^5\). Additionally, I have used İşler’s 2013 article on rural house architecture in Lycia to refute Grossman and Severin’s (2003, 92) theory that the East Asarcık settlement is monastic. More recent publications by İşler, such as ‘Surveys on the Byzantine Settlements around Alacadağ in Lycia’, have provided more detail about the small churches of Beymelek (Beymelek Lagoon 1-3 in database, İşler 2016, 218-20), Alakilise S Church (İşler 2016, 222-23), and the Günağı church, which was first discovered by İşler’s team (İşler 2016, 220-22). The results of their 2016 survey (İşler & İşler 2017), covers much of the same area, though this year they were able to visit the settlement and church on Turant Dağ, which they aim to measure and produce a plan of the church after future study. As more of the İşler’s survey results, which always include both images, detailed descriptions, and accurate plans, are published, they can be included into the database for future studies.

**III.i.g Limitations of Sources**

**III.i.g.1 Dating**

As discussed previously (Section I.iii.c), the dating of churches in Central Lycia has caused a considerable amount of difficulty for scholars studying the region. This has led to bias in interpretation of sites, often based on the presence of certain traits such as mortar and rubble masonry (Section

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\(^5\)Email from Dr. Bülent İşler, received 22.08.14
III.i.c.2), or a specific external apse shape (Section III.i.c.3). In order to mitigate some of these biases, the dataset used for analysis does not include the proposed dates of sites as a unit of analysis. In theory, if there are distinct differences in churches from the earlier and later period of construction. The interpretation and dating given by the various sources referenced in each church entry have still been included in the ‘Description’ column of the database.

III.i.g.2 Decline

As discussed in Section I.iii.d, internal churches are often seen as a sign of decline in Central Lycia. Generally, scholars have a difficult time describing these internal churches, which in turn has, led to difficulties in considering how to catalogue these sites. The primary concern with any internal remodelling or with a smaller church built inside the ruins of an earlier church is how to record this phenomenon in the database. The solution is easier in the case of the smaller free-standing internal church, the building of which would have likely necessitated the earlier structure to be in a non-functioning state. As such, I have considered internal churches as new structures built at the same geographic location as the earlier church. In practical terms, this means giving these sites their own entry in the database as well as recording a separate GPS point for the internal structure. This choice is slightly more difficult when it comes to internal rebuilds and remodels, as it is unclear whether the original church would have been in a state of disuse before the remodelling, or rather if the remodelling was an update to the original structure. In some cases, the remodels retain the original structure and apse (see Kyaneai Church A Internal Church: Fig. A.47), while in others the original structure is retained, but a new apse is built (see West Asarcık Internal Church: Fig. A.22). However, it is clear that in both cases the experience of being in the church would have changed due to these alterations. For the purposes of analysis, I have considered any alterations to the nave, aisles, and apse of a church, i.e. anything that changes the internal
space experienced by both the clergy and laity, as a different structure in the database. This then allows for these spaces to be considered independently of the first Christian structure built on the same site.

There is also an issue with terminology. The word ‘chapel’, which is to describe many of the free-standing internal churches, in itself brings with it biases that can affect interpretation. Generally, liturgy cannot take place within a chapel in the same way that it can within a church, though archaeological evidence for some of the smaller churches in the region suggest liturgy could indeed be carried out at these sites (see Settlement XIII: Fig. A.72). In order to avoid these assumptions, I have chosen not to use the word ‘chapel’ in the title of any of these sites in the database.

**III.i.h Intensity and Survival Bias**

**III.i.h.1 Intensity Bias**

There are also issues inherent in how the archaeology of Lycia has been studied, such as: which areas have been studied, the level of detail, i.e. a dig of a single site versus a survey, and the comprehensiveness of each publication. All of these issues can all be considered a part of ‘intensity bias.’ The published data on Central Lycia is certainly biased towards the Hills region, as that area was intensively surveyed by the Tübingen Lycia Project. Though the İşlers’ are currently working through the Alaca region, the mountain is difficult to access, and they work with a small team, so it is still possible that there are some undiscovered sites in Alaca. The areas not covered by survey projects, such as the coastline of Hills, and the Plains not within the Myra and Andriake project area, have not been intensively surveyed and thus means that there may be more yet to be discovered ecclesiastical structures in those areas. An example of a minimally studied and virtually unpublished site is Razaman’s Church. Razaman's Church is a structure only identified in Tindle’s (2000, 87-88) thesis, and named after the
local team member who directed them to the site. Though it was difficult to find, the three-aisled church was clearly visible on Google Earth, as were the two apses at the termination of each aisle described by Tindle (2000, 88). This is a distinct feature that shows up less often in Central Lycia than in other regions, but which does appear at two nearby churches: Settlement I East Church (Fig. A.70), and Büyük Avaşar Church 3 South LXII (Fig. A.26). This is an example of the difficulties faced when analysing the churches; without the inclusion of Razaman’s Church, any interpretation of Settlement I East Church and Büyük Avaşar Church 3 South LXII might be skewed.

**III.i.g.2 Survival Bias**

As is the case with all quantitative archaeology studies, we are always biased by what material remains have survived to be studied. This survival bias can affect both the ability to collect data, as well as the ability to analyse and interpret the data, especially if the survival of archaeological sites is not considered correctly.

Modern Central Lycia is fairly sparsely populated, with the only major modern city in the region being Demre, which itself is relatively small in comparison to neighbouring Finike to the east. The hilly nature of Central Lycia, along with the relatively dry climate for the majority of the year, has led to the good preservation of architectural remains in the Alaca and Hills sub-regions especially. As discussed above (III.i.a-f), Central Lycia has been studied by scholars from multiple different countries who have applied different methodologies to their surveys and analysis of the ecclesiastical sites in Central Lycia. Considering that the Hills sub-region has been the most intensively surveyed, and is a sparsely populated and slightly difficult terrain, the sample from Hills, of 101 churches, is likely to be a representative sample. This does not mean the number of churches should be directly compared to Alaca and Plains; Hills is also geographically the largest sub-region, so it should not be expected that there are around 70 churches
missing from the archaeological record in both Alaca, which currently has a total of 33 churches, and Plains with 28 churches. Though all of Central Lycia has been surveyed and studied for over fifty years, Harrison’s 1963 article set the tone for a focus on the Alaca mountain churches. The triconch churches, which are constructed of ashlars and decorated with complex architectural carvings (see Sections V.ii & VI), are a focus of many of the above-mentioned sources. Due to this scholarly interest, new churches on Alaca have been regularly discovered and added to publications.

When examining a map of the region showing church distribution (Fig. III.1), there are clearly less churches marked in the area around modern Demre and in the Kasaba valley. The Plains region is a combination of two alluvial plans: the Demre Plain, located on top of the ancient city of Myra, and the Kasaba Valley, which runs to the north of the eastern end of the Hills region and to the north of the Alaca Mountain and Demre gorge (Fig. I.1). The recently excavated Myra Alakent (Fig. A.56) church is an indication of what may lie below both the modern city of Demre and the Kasaba valley. Ancient Myra is covered by alluvial silt that can be anywhere from 4m to 8m deep
(Akyürek 2013, 18), due to a process of regular flooding and mudslides that ceased the majority of habitation of the ancient city in the 14th century (Akyürek 2017, 249-50). It is highly likely that Myra had more churches than just the St. Nicholas church, which itself was actually connected to the city by a covered pathway, and thus not within the centre of Myra (Foss 1994, 24). Indeed, the *Life of St Nicholas of Holy Sion* mentions the cathedral of Myra, dedicated to Holy Peace, which has yet to be discovered underneath modern Demre (Ševčenko & Patterson Ševčenko 1984, 103). There is a similar concern for the Kasaba valley. In modern times, the Kasaba valley is predominantly used for farming, with some sparse clusters of settlement, and is surrounded by mountains and hills on all sides. The only currently known church located on the floor of the valley is the Dereağzę Church, which is on a slight rise along the relatively flat valley floor. Arneai Church A - D and Çamarkası are also off the Kasaba valley, though their location slightly up the south slope of the Ernez mountain has kept them safe from alluvial mudslides. Due to the survival of Dereağzę, it is likely that other larger structures would have survived, though none have been identified. However, the survival of archaeological remains is biased towards larger structures, and as such it is reasonable to assume that some smaller churches, like those positioned around Beymelek (Beymelek Lagoon 1-3, and Beymelek Village), or the Myra Castle (Myra Castle and Myra Castle Ridge), existed on the floor of the valley in the Christian period. Like ancient Myra, it is likely that over time the alluvial silt has been washed down the mountains surrounding the Kasaba valley, covering any ancient sites.

Despite these biases, a quantitative analysis of the ecclesiastical remains of Central Lycia can still provide results that would not be possible when analysed by the methods traditionally used in this region (see Section II). The datasets for Alaca and Hills are reasonably complete for an archaeological dataset, which, due to the potential destruction or building over of sites can never be entirely complete, and thus they can provide a good baseline to interpret the results for Plains. Just how different the three regional subsets
are from each other, and how much data could potentially be missing from Plains, is considered below (Sections V.i & VI.i). Overall, the dataset compiled for this analysis of churches in Central Lycia includes 162 sites, which, considering the relatively small geographic area covered, should allow for a reasonable margin of error in any complex analysis carried out. The potential lack of data both due to survival bias throughout Central Lycia, and within the Plains sub-region especially, will be considered throughout the Results (IV & VI) and Discussion (V & VII) chapters.
As discussed in Section II.iii, the primary manner in which archaeological artefacts are analysed within a cultural evolutionary framework is through ‘landmark’ features, or traits, which can ‘be identified according to explicit and clearly defined rules’ (Lycett 2009, 81). These features can be morphological (Li et al. 2014; Coto-Sarmiento et al. 2018; Bevan et al. 2014; see Section II.iii.a for more detail), or non-morphometric. Non-morphometric traits take the form of either descriptive categorical traits (Rubio-Campillo et al. 2018; Garcia-Rivero & O'Brien 2014; see Section II.iii.a), or through the identification of absence or presences of traits (Jordan & O'Neill 2010, see Section II.iii.b for more detail). Jordan and O'Neill (2010), used the absence or presence of 55 architectural traits to analyse 17 long houses, however, they chose not to analyse any houses that did not have evidence for all 55 architectural traits, thus excluding certain sites from their analysis. As discussed above (Section III.i.h), when working with archaeological material there will almost always be missing data, so for the 162 churches of Central Lycia, all of sites will be included in analysis where possible. In order to create the best database of traits that make up macro-level artefact, which for this study is an early Christian church, I have included all of the different types of ‘landmark’ traits mentioned above. These are both morphometric (III.ii.a) and non-morphometric traits, where the non-morphometric traits are: absence / presence traits (III.ii.b) and categorical traits (III.ii.c). The choice of traits derives from a synthesis of the specific architectural features mentioned by both the sources on the churches of Central Lycia (Section III.i.a-f), as well as by prominent works on the history and development of early Christian church architecture (Krautheimer 1986; Mango 1986).

### III.ii.a Morphometric Traits

All of the measurements taken for this study have been done with Adobe Acrobat using the ‘measure’ tool. The plans are highly varied in both scale
and resolution, which at times has made taking accurate measurements from the plans challenging. If a church plan was at a low enough resolution to cause problems when taking measurements, it has been noted at the bottom of the ‘Description’ entry for that church in the database. All of the measurements have been taken in metres, up to the second decimal point, though any analysis has considered the measurements more generally by focusing on the full metrical value in order to avoid any issues from potential inaccuracies.

<table>
<thead>
<tr>
<th>SITE</th>
<th>Fig Location</th>
<th>n_length</th>
<th>s_length</th>
<th>e_width</th>
<th>w_width</th>
<th>nave_area</th>
<th>ratio</th>
<th>m_cert</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ağalar LVII</td>
<td>LykStud 2 1995, 103: Abb. 35</td>
<td>4.07</td>
<td>4.06</td>
<td>2.69</td>
<td>2.69</td>
<td>10.92</td>
<td>1.51</td>
<td>4</td>
</tr>
</tbody>
</table>

Table III.1: Example of database entries showing only the morphometric traits and related traits

For this study, I have collected the interior measurements of the church, defining the internal footprint as the space with which the laity and clergy would have interacted, and where the liturgy would have been carried out. All measurements include both the nave and aisles, but exclude the apse, narthex, and any ancillary buildings. I have recorded the following measurements (Table III.1) for this study: north length (‘n_length’ column in database), south length (‘s_length’), east width (‘e_width’), west width (‘w_width’), and nave area (‘nave_area’). In order to record the north and south length, as well as the east and west width, I utilised the ‘distance tool’ in Adobe Acrobat, and to record the nave area, where it was possible to measure the entire nave area (see Table III.2), I utilised the ‘area tool’. By using a different measurement tool for the area, I was able to exclude architectural features that would have taken up space within the church. Finally, I have also included the length width ratio (‘ratio’), which was calculated by averaging the north and south length and the east and west
width, then dividing those averages\(^6\). Where either a single measurement
was missing, or where only one length and width were recorded, I used the
available measurements to calculate the ratio. The citation for the source of
the plan used in the collection of measurements can be found in the ‘Fig
Location’ column in the database (Table III.1).

<table>
<thead>
<tr>
<th>Database</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No measurements given in publication. No area taken</td>
</tr>
<tr>
<td>1</td>
<td>Measurements only available from publication. Area has been estimated if at least one length or width was provided.</td>
</tr>
<tr>
<td>2</td>
<td>Measured from plan, but only able to collect one or two of the four perimeter measurements. Area has been estimated if at least one length or width was collected.</td>
</tr>
<tr>
<td>3</td>
<td>Measured from plan, but only able to collect three of the four perimeter measurements. Area has been estimated from collected measurements.</td>
</tr>
<tr>
<td>4</td>
<td>Measured from plan, all four perimeter measurements collected. Area has been measured independently.</td>
</tr>
</tbody>
</table>

Table III.2: Measurement Certainty scale with description of values used in database.

The majority of sources provide either measurements, a plan, or both, for
each of the individual churches they discuss. When only measurements are
given, sometimes it is not clear if the measurements provided are for the
space within the church or the external footprint, as well as whether or not
the apse is included in these measurements. For example, for the Alakisle
church, Hellenkemper and Hild (2004, 609-10) state that the church is 9m by
5m, with a wall thickness of 0.75m. More recently, however, İşler (2016, 223),
has published only the interior measurements, which are c. 7.65m by 3.4m,
thus highlighting the estimated nature of the measurements provided by
Hellenkemper and Hild. Unfortunately, for the churches without plans, I have
had to rely on the measurements provided by the sources, which are still
better than a complete lack of data for this analysis. Whether or not the
source has indicated if the measurements they provide are internal or
external can be found in the ‘Description’ section of the entry for the church

\[^6\] \(((n\_length + s\_length)/2) \times ((e\_width + w\_width)/2) = nave\_area\]
in the database. I have also included a cardinal variable that indicates measurement certainty (‘m_cert’) on a scale of zero to four, where zero is least certain and four is most certain. The specific breakdown of the scale described above can be seen in Table III.2.

III.ii.b Absence / Presence Traits

For this database, I have recorded the absence or presence of seven traits: a synthronon (‘synth’ in database), a triconch apse (‘tri’), a narthex (‘narthex’), an atrium (‘atrium’), architectural carved decoration (‘carved_deco’), one or more subsidiary chapels (‘sub_chap’), and funerary monuments (‘funer’). These traits are all various architectural features that can be present in an early Christian church (Krautheimer 1963, 43 & 94). The possible database entries for each trait can be seen in Table III.3.

<table>
<thead>
<tr>
<th>Trait</th>
<th>Database Entry</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synthronon, Triconch Apse, Narthex, Atrium, Subsidiary Chapel, Funerary Monuments</td>
<td>A</td>
<td>Absence of trait</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>Presence of trait</td>
</tr>
<tr>
<td></td>
<td>unknown</td>
<td>Source and/or plan does not provide enough evidence for absence or presence of trait</td>
</tr>
<tr>
<td>Carved Decoration</td>
<td>A</td>
<td>Absence of carved decoration</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>Presence of original carved decoration</td>
</tr>
<tr>
<td></td>
<td>R</td>
<td>Reused carved decoration present</td>
</tr>
<tr>
<td></td>
<td>unknown</td>
<td>Source and/or plan does not provide enough evidence for absence or presence of trait</td>
</tr>
</tbody>
</table>

Table III.3: List of absence / presence traits, options as entered into the database, and a description of each option.

Normally, when dealing with absence / presence traits, one would not consider anything but the absence or presence of the trait a possible option to include within the database (see Jordan & O’Neill 2010, 3879: Table 2). However, with architectural remains it was at times difficult to choose ‘absence’ when it was impossible to know if the trait was absent, or whether the issue was that the archaeological evidence was no longer present above ground. As such, I chose to include ‘unknown’ as a possible entry. How and
when I have chosen to use ‘unknown’ for a specific trait will be discussed by trait (see below, Sections III.ii.b.1 - 7). Finally, as can be seen in Table III.3, for carved decoration there is a fourth possible option within the database: ‘R’ or reused carved decoration. Originally, I had only been using the absence / presence / unknown categorisations for the carved decoration trait, but I realised that this would be creating an incorrect representation of the churches; how can carved decoration be analysed as a category if reused carved decoration was categorised as ‘presence’, or not categorised at all? This issue led to my inclusion of the ‘reused’ option. At this stage, carved decoration as a category falls somewhere between absence / presence traits and categorical traits, but this is the nature of working with larger, macro-level artefacts that exhibit multiple phases of use which must be accounted for. By amending the database entries for those churches with reused carved decoration, I have been able to trace patterns in not only presence of original carved decoration, but in presence of reused carved decoration.

III.ii.b.1 Synthronon

Fig III.2: Left, close up plan of the synthronon in the apse of the Myra Nicholas church. Right, synthronon in the Myra Nicholas church looking southeast. Source: Left, Doğan, Fındık & Bulgurlu 2015: Drawing 1. Right, Author.
A synthronon is defined as, ‘the bench or benches reserved for the clergy’ arranged in a semi-circular manner in the main apse of a church (Krautheimer 1986, 520, see Fig. III.2). On average, archaeological evidence for the presence of a synthronon is relatively clear due to the distinctive nature of the feature (Figs A.6 & B.17). There are, however, times when the identification of a synthronon can become more difficult. As noted in the definition, it is possible for a synthronon to be a single bench, rather than the easier to distinguish multiple benches. There are only two churches in the study area with a single bench: Settlement LXX west of Divle (Fig. A.84), and Settlement LXXIX Çürüt (Fig. A.86), and in both cases Altripp (2010e) struggles with the choice to identify them as such.

For Settlement LXX west of Divle, Altripp (2010e, 329) first suggests that the potential single-bench synthronon is actually evidence for repairs of the apse, however, in a footnote (Altripp 2010e, 329: Footnote 17), he then states that based on comparison to other apse repairs such as at Kyaneai Church A, the bench-like structure is unlikely to be for that purpose. In the example Altripp (2010e, 329: Footnote 17) cites, Kyaneai Church A, the primary issue with the internal instability of the foundations of the apse were due to issues building on steep terrain. Outside the Tübingen Lycia Project study area, Aperlae Subscribed Triconch Phase 2 also exhibits evidence of apse instability (Hohlfelder and Vann 1999, 211), however in this case it is likely to be due to the unique shape of the apse and is stabilised not from the interior but from the exterior. When compared with clear archaeological evidence for structural modifications to church apses which were carried out in a distinctly different manner to that of Settlement LXX west of Divle, I have listed as having a presence of a synthronon in this database.

The single bench synthronon at Settlement LXXIX Çürüt is evidenced by a layer of stones that runs around the apse which abuts the apse wall itself, rather than having been built into it, which Altripp (2010e, 333) compares to other well-known basilicas where this is the case. In nearby Western Lycia,
there are two examples of a synthronon not being constructed into the apse, but rather abutting the apse construction: Gemile Ada Church II, and the Medieval Town Church at Patara. At Gemile Ada Church II, the synthronon is separated from the apse by a semi-circular passageway that runs underneath the apse (Fig. B.17), constructed partially of mortar and rubble, and partially of the rock formation below the church. The Medieval Town Church at Patara is perhaps more similar to Settlement LXXIX Çürüt, as the synthronon, and the fill between the steps and the apse wall, abuts the masonry of the apse wall rather than binding with it (Fig. B.18). The similarities to these nearby structures once again suggest that the single band of stonework at Settlement LXXIX Çürüt is indeed a synthronon. As the site is not excavated, it also may be possible that it is a multi-step synthronon, and that the lower levels are just beneath ground level (Altripp 2010e, 333).

There are six sites where the absence or presence of a synthronon is unknown. This is due to a lack of extant remains above ground in the area of the apse. If the archaeological evidence for the area in and around the apse is unclear, it is likely that any evidence of a synthronon is either no longer present or is below the ground.

III.ii.b.2 Triconch Apse

A triconch is a structure composed of three conches, where a conch is a ‘semi-circular niche surmounted by a half-dome’ (Krautheimer 1986, 517-21, also see Fig. III.3). The three conches of a triconch apse are all situated on the perimeter of a rectilinear space, with the conches coming of all but the west side of the square (Fig. A.2). The conches create a structure that could then support a pyramidal roof, or pendentives, which are the triangular sections in between arches that allow a rectilinear shape to be transformed into a circular one, thus supporting a dome (Krautheimer 1968, 519-20). A triconch can be an ancillary structure, such as the chapel at Andriake Church
A (Fig. A.6), or the chapel at the Lechaion Basilica in Corinth (Fig. B.19) or the apse of a basilical church, as is the case with many of the churches in Central Lycia. There is only one site where the absence or presence of a triconch is ‘unknown’: Arneai Church D. The only architectural remains visible above ground are two ‘internal’ conches (Grossman & Severin 2003, 116), though whether or not these could be in a position to suggest a triconch is unclear.

Fig III.3: Left, close up plan of the triconch apse at West Asarcık. Right, triconch apse at West Asarcık, looking east at central conch. Source: Left, author, after Harrison 1963: Figure 11. Right, Author.

While the five triconch churches in Alaca (Figs A.2, A.22, A.31, A.32, and A.34) have the traditional form of a triconch as described above, there are also churches in Hills, which, while classified as having a triconch apse, are modified versions of the traditional form. These modified triconch churches are Aperlae Subscribed Triconch Church Phase 1 (Fig. A.13), Aperlae Subscribed Triconch Church Phase 2 (Fig. A.14), Korba Triconch Basilica (Fig. A.45), and Korba Internal Triconch Church (Fig. A.45). At Korba, the northern and southern conches are at the end of a short transept, where the semi-domes of the conches connected to the main aisle via barrel-vaults (Altripp 2006, 81). It still may have been possible for these barrel-vaults to have supported either pendentives for a dome, or a pyramidal roof, which is why it is classified as a triconch apse. The Aperlae Subscribed Triconch
Church is named as such due to the way the three conches typical of a triconch apse have been subscribed into a semi-circular apse. Even though it would not have functioned quite the same manner architecturally, the design is still clearly related to the traditional triconch, and it thus bears comparison to the Alaca triconch churches.

**III.ii.b.3 Narthex**

![Fig III.4: Plan of Andriake Church A showing narthex to the west of the nave of the three-aisled church. Source: Tekinalp 2000: Levha 23](image)

A narthex (Fig. III.4) is a narrow hallway on the west side of a church that runs perpendicularly to the nave and aisles (Krautheimer 1986, 119). A church can have more than one narthex, in which case they are referred to as an ‘esonarthex’ (internal) and an ‘exonarthex’ (external); an eso- and exonarthex are only present at one site in Central Lycia: the Dereağzı Church (Fig. A.29), otherwise all churches with the presence of a narthex have just a single narthex. The presence of a narthex is usually fairly easy to identify archaeologically, due to its specific architectural location. There are 22 instances of the absence or presence of a narthex being unknown, which is usually due to a lack of archaeological remains at the west end of the church. Due to this lack of data, it is impossible to stay whether or not the church
would have had a narthex in the first phase. In the case of Gökkaya (Fig. A.33), a lime kiln and associated structures were built over the west of the church (Marksteiner & Niewöhner 2006, 84), thus covering any evidence for absence or presence of a narthex.

III.ii.b.4 Atrium

An atrium (Fig. III.5) is a courtyard to the west of the main basilica and narthex, which is usually surrounded on all four sides by a portico but with the central area open to the air (Krautheimer 1986, 517). Atria are more commonly present at churches built in the earlier period of construction (see Krautheimer 1986, 395-401). Atria were often constructed above cisterns, which has aided in identifying the presence of an out of use atrium from an earlier phase of a church. The absence or presence of an atrium is unknown at 10 sites. As with the narthex (III.ii.b.3), it is impossible to discern whether there is an absence or presence of the atrium due to the lack of plan and complex archaeological remains at sites such as the Davazlar Basilica. The Yılanbaşı Basilica (Fig. A.69) is another example of a site where the absence or presence of an atrium is unclear; the source (Grossman & Severin 2003,
does not mention the presence of an atrium, and later phases of construction have obscured any evidence from the earlier phase.

III.iib.5 Carved Decoration

Fig III.6: Close up of architectural carving on an architrave in the southeast chapel at West Asarcık. Source: Author

The churches on Alaca mountain are especially associated across scholarship with intricate architectural carvings (Fig. III.6), which were first highlighted by Harrison (1963, 145-48). Grossman and Severin (2003, 141-42) also discuss the propensity of this sub-region towards architectural carvings in their publication, and indeed provide a catalogue and images for all of the sculpture found and recorded during their survey (see Grossman & Severin 2003, 141-70, and Tafelen 1 - 36). This association of carved architectural decoration with the Alaca region specifically led me to include it as a trait for analysis. Evidence for presence of carved decorations comes from either the description of the site in the source or from images provided in sources. When the evidence for presence has come only from an image, I have noted this as well as providing the relevant figure number in the 'Description' section of the church entry in the database. Reused carved decoration (see above (Section III.iib) takes multiple forms: it can either be carved decoration from an earlier phase of a church, or architectural carvings
from a pre-Christian structure being integrated into the Christian buildings (see Settlement LXXIX Çürt).

There are only two churches in Central Lycia where the absence or presence of carved decoration is unknown: the Davazlar Basilica (see database) and the Kyaneai Church C Basilica. The Kyaneai Church C Basilica is a three-aisled ashlar basilica from the earlier period of construction, where in a later phase (Kyaneai Church C Single Aisle), the church is rebuilt in mortar and rubble to a single aisle that retains the original apse. The density of habitation in Kyaneai does not allow for the identification of earlier church remains as easily as at some more rural sites. It may be possible that the earlier phase of the church, the three-aisled basilica, did indeed have carved decorations that were repurposed or removed in the rebuild, but without further investigation it must be considered ‘unknown’.

III.ii.b.6 Subsidiary Chapels

*Fig III.7: Left, plan of West Asarcık showing Southeast Chapel. Right, apse of Southeast Chapel at West Asarcık, looking northeast. Source: Left, author, after Harrison 1963: Figure 11. Right, Author.*

For the purpose of this study, a subsidiary chapel (Fig. III.7) is an auxiliary building of a church, which either has an identifiable apse or any other architectural features that could mark it out as a chapel, such as a
sarcophagus or a baptismal font. While the majority of the chapels discussed have an apse that is either visible on the plan, or mentioned in the source, there are a few with no apse that would have served the function of a chapel. For example, at West Asarcık (Fig. A.22), the westernmost chapel, located off of the southern aisle, does not have an apse. Rather, it has a blind arch in the east wall (Fig. B.20), under which one of the two sarcophagi in the chapel is located. Another example of an apse-less subsidiary chapel can be found in Alaca. The chapel at Turant Dağ (Fig. A.65), located to the south of the apse, does not have an apse but is distinguishable by its baptismal font. A final example of the apse-less subsidiary chapel comes from Hills: in the second phase of Kyaneai Church A (Kyaneai Church A Internal Church), a single-aisled structure divided into two bays by a transverse arch but without an apse is built into the remains of the no longer in use north aisle (Fig. A.47). In the final phase (Kyaneai Church A Chapel Only), the only aspect of the church still in use was this chapel (Altripp 2010a, 285). Bearing this data in mind, it is likely that there are some chapels that have not been recorded as present in the database. Unfortunately, due to the lack of archaeological evidence, it is impossible to say whether they are indeed chapels or rather if they are ancillary buildings. However, not including the subsidiary chapel trait would be problematic, as many of the churches do not even have any auxiliary buildings, suggesting that the presence of a subsidiary chapel is still a trait that marks out some churches as different.

The three churches where the presence of a subsidiary chapel is listed as unknown are Arneai Church D (see III.ii.b.2 for issues with categorisation), Divle 2 Basilica, and Settlement XXVIII by Ürer. At Divle 2 Basilica, there is not enough archaeological evidence to indicate the absence or presence of a subsidiary chapel (Altripp 2010e, 331-32), which is why I have categorised it as ‘unknown’. At Settlement XXVIII by Ürer (Fig. A.77), the only archaeological evidence for the church is the apse and some of the east end of the church that was carved out of a natural rock formation (Şanlı - Erler
2006, 87-88). As the rest of the structure is no longer standing, without excavation the absence or presence of a subsidiary chapel is unknown.

III.ii.b.7 Funerary Monuments

Fig III.8: Above: Example of a Lycian style sarcophagus near the Istlada Basilica. Two additional sarcophagi can be seen behind this example. Below: Lycian rock-cut house (left) and temple (left) tombs from the Necropolis of Lmyra in eastern Lycia. Source: Author
Lycia is well known for its monumental tombs, many of which were built in the Lycian period (Bean 1978, 30) but some of which were still in use in the Christian period. Lycian tombs are either rock cut, such as the ‘temple-tombs’ and ‘house-tombs’ (Fig. III.8), or constructed of monolithic masonry, as with the ogival sarcophagi seen in Fig. III.8 (Bean 1978, 30). The majority of the funerary monuments present either nearby, or within the early Christian churches are sarcophagi, some of which display evidence of being re-cut with Christian motifs (see West Asarcik in database). In some cases, the churches were built in or near the necropolis (Istlada Basilica, Aperlae Lower Church), and in others, the funerary monuments are within the church complex (West Asarcik, Myra Alakent). There are four churches where the absence or presence of funerary monuments is unknown, and in all cases the archaeological remains of the churches have been built over to an extent that any funerary monuments would have been likely to be destroyed.

III.ii.c Categorical Traits

For the purpose of analysis, I have recorded four categorical traits for the churches of Central Lycia: the number of aisles (‘aisles’ in database), construction technique (‘con_type’), external apse shape (‘apse_shp’), and region (‘region’). The first three categorical traits (III.ii.c.1-3), are all aspects of church design and construction, which are consistently discussed across all sources on early Christian architecture. Each church has also been given a region designation (III.ii.c.4) predominantly for the purpose of comparing the different regions. How each trait option is entered into the database is designated in Tables III.4-7.

III.ii.c.1 Number of Aisles

Many early Christian churches from the Constantinian period onwards were built in a basilical style, that is with a central nave flanked by two or four aisles (Krautheimer 1986, 517), i.e. A three-aisle or five-aisle basilica. In Central Lycia, there are no known five-aisle basilicas, so ‘3’ is the highest
number of aisles recorded in the database (Table III.4). None of the churches currently identified in Lycia are of the centrally planned typology. In Lycia there are also two two-aisled churches, and a large number of single-aisled churches. While two-aisle churches are less common in Central Lycia, many examples can be found outside of the region (see Altripp 2008, 190-93).

<table>
<thead>
<tr>
<th>Number of Aisles</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>One aisle</td>
</tr>
<tr>
<td>2</td>
<td>Two aisles</td>
</tr>
<tr>
<td>3</td>
<td>Three aisles (two aisles and a nave)</td>
</tr>
</tbody>
</table>

*Table III.4: Trait options for number of aisles as entered into the database, and a description of each option.*

Within Central Lycia, single-aisle churches take two forms, either they are an internal remodelling of a structure wherein the aisles are walled off and thus no longer in use (Kyaneai Church A Internal Church, Kekova North Internal Church), or a structurally independent single-aisled building. In the case of the latter, these can appear either within the remains of a church from an earlier period (Istada Internal Church, Turant Dağ Internal Church), or in a new location (Andriake Church F, Beymelek Lagoon 1). Generally, the literature on Central Lycia assumes that single-aisle churches with a small nave area are from the later period of construction (Foss 1994, 21; Niewöhner 2009; Altripp 2010e, 315). While this is clearly the case for the single-aisled churches built within earlier basilicas, whether this is true for the rest of the single-aisled structures in Central Lycia, or at least the majority of them, has yet to be tested. The only church where the number of aisles is unknown is Arneai Church D.

**III.ii.c.2 Construction Technique**

Within Central Lycia, construction technique (Table III.5) has a strong association with both sub-region and period. As mentioned in Section III.ii.b.7, historically the region of Lycia has a strong association with rock cut
masonry and stonework. The Alaca mountain churches are specifically associated with ashlar masonry (Harrison 1963, 124), while mortar and rubble masonry alone is often associated with later periods, especially when employed on a single-aisle church (see III.ii.c.1 above). Brick inclusions are also often considered an indication of the later construction periods (Altripp 2010e, 329).

<table>
<thead>
<tr>
<th>Construction Technique</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASH</td>
<td>Constructed entirely of ashlar masonry</td>
</tr>
<tr>
<td>ASHCS</td>
<td>Constructed of a combination of ashlar masonry and cut rock</td>
</tr>
<tr>
<td>ASHMR</td>
<td>Constructed of a combination of ashlar masonry and mortar and rubble masonry, often where the apse is ashlar and the nave and aisles are mortar and rubble</td>
</tr>
<tr>
<td>ASHMRCS</td>
<td>Constructed of a combination of ashlar masonry, mortar and rubble masonry, and cut rock</td>
</tr>
<tr>
<td>BRICK</td>
<td>Constructed of mortar and rubble masonry with brick inclusions</td>
</tr>
<tr>
<td>MR</td>
<td>Constructed of mortar and rubble masonry</td>
</tr>
<tr>
<td>MRCS</td>
<td>Constructed of a combination of mortar and rubble masonry and cut rock</td>
</tr>
<tr>
<td>REASHMR</td>
<td>Constructed of a combination of reused ashlar masonry and mortar and rubble masonry</td>
</tr>
<tr>
<td>unknown</td>
<td>Construction technique unknown</td>
</tr>
</tbody>
</table>

*Table III.5: Trait options for construction technique as entered into the database, and a description of each option.*

Within Central Lycia, construction technique (Table III.5) has a strong association with both sub-region and period. As mentioned in Section III.ii.b.7, historically the region of Lycia has a strong association with rock cut masonry and stonework. The Alaca mountain churches are specifically associated with ashlar masonry (Harrison 1963, 124), while mortar and rubble masonry alone is often associated with later periods, especially when employed on a single-aisle church (see III.ii.c.1 above). Brick inclusions are also often considered an indication of the later construction periods (Altripp 2010e, 329).

Construction technique was probably the single most difficult trait to define, due to not only the diversity of techniques that can be employed, but also the difference in terms between German and English. When I first began the
process of compiling the database, I did not differentiate between stone-faced mortar and rubble, and mortar and rubble without facing. Often there is a disparity between different examples of stone-faced mortar and rubble, which would likely require multiple different categories within stone-faced mortar and rubble for analysis. Often how scholars define these features changes between individual or teams, so without adequate published images, defined typologies, or ideally an in-person site visit, it is too difficult for me to accurately create these categories. Equally, some English-speaking authors also do not differentiate between stone-faced mortar and rubble and mortar and rubble, which further complicates the issue.

The issue becomes more complex when considering German terminology for masonry. Generally, it is clear in German sources when the church is rock cut. The term for ashlar masonry, ‘Quadermauerwerk’, is also easy to distinguish and translate, as is any reference to ceramic bricks, as the terms ‘Mauerziegel’ or building bricks, and ‘Ziegelstein’, just ‘bricks’, specifically refer to baked clay. More difficult are the terms that refer to the varieties of mortar and rubble masonry: ‘Bruchsteinmauerwerk’, ‘Werksteinmauerwerk’, and ‘Hausteinmauerwerk’. ‘Bruchsteinmauerwerk’ translates as either ‘rubble masonry’ or ‘quarry-stone masonry’, ‘Werksteinmauerwerk’ translates as ‘stone masonry’, ‘ashlar masonry’, or literally as ‘worked stone masonry’, and ‘Hausteinmauerwerk’, essentially does not translate. Bruchsteinmauerwerk, then, can be translated as mortar and rubble masonry, though as with the English sources, this has at time been used to describe churches that have stone-faced mortar and rubble masonry. After some discussion with my German colleague, it seems Werkstein is not an ashlar as defined in archaeological terms, but rather, a stone that has been worked into a specific shape by a stonemason. In theory, a Werkstein could be a Quaderstein, but not all Werksteine are Quadersteine; this indicates that when used in a German source, Werksteinmauerwerk is likely to be stone-faced mortar and

7Translation websites do suggest that the term could refer to ashlars, but German-language sources make it clear that this is not the case.
rubble, where the stone has clearly been worked into its shape by a stonemason. A Haustein may be more or less the same, however, it is often used to describe stones that are not as worked as Werksteine. In this case, it may indicate a difference between mortar and rubble masonry with rubble fill, versus mortar and rubble where the same size of stone is used throughout. While this is sometimes noted by English-language sources, the construction would still be considered mortar and rubble.

With all of these terms, both in English and German, there are inconsistencies across the sources. If images have been provided, I have used those where possible to check against the terms used. The choice to not distinguish between stone-faced mortar and rubble construction, and mortar and rubble, in many ways evens out the disparities caused both by the different way the terms are used by different authors, and the different types of categorisation in different languages. Plus, considering this variety it is almost impossible to say what any author means exactly without visiting a site in-person. There are five sites where the construction technique is unknown. In all cases, this is due to the lack of mention of construction technique by the source, as well as a lack of images of the site.

### III.ii.c.3 External Apse Shape

<table>
<thead>
<tr>
<th>External Apse Shape</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>rock</td>
<td>The apse is carved from cut rock</td>
</tr>
<tr>
<td>flat</td>
<td>The eastern side of the structure is flat, with no indication externally of the presence of an apse</td>
</tr>
<tr>
<td>square</td>
<td>The apse is externally a squared-off semicircle</td>
</tr>
<tr>
<td>hex</td>
<td>The apse is externally three-sided</td>
</tr>
<tr>
<td>round</td>
<td>The apse is externally round</td>
</tr>
<tr>
<td>tri</td>
<td>Externally, the apse is tri-conched</td>
</tr>
<tr>
<td>trisquare</td>
<td>The internal apse shape is a triconch, but externally these conches are squared off</td>
</tr>
<tr>
<td>unknown</td>
<td>The apse shape is unknown</td>
</tr>
</tbody>
</table>

*Table III.6: Trait options for external apse shape as entered into the database, and a description of each option.*
Across the field of early Christian architecture, external apse shape (Table III.6) is often referenced as a feature that can assist with dating, however, how the styles are interpreted varies on academic convention. For example, most English-language and German-language scholars consider the externally three-sided apse to be from the earlier period of construction. The presence of the externally three-sided apse has even been used by scholars as evidence for dating a church to the earlier period of construction (Sweetman 2015b, 292). In comparison, the internally and externally semi-circular apse shape ('round'), is considered by German and English language scholars as a feature more common in the later period of construction. This can be seen on the introduction to the Tübingen Lycia Project church catalogue, where Altripp (2010e, 358) states that the majority of small churches, which in the catalogue are dated to the later period of construction, have apses which are internally and externally semi-circular. However, multiple times in their publications, the Kekova survey team (Göçer 2014; Aslan & Kılıç 2016) have commented that the externally round apses are from the 5th - 6th century, which would fall into the earlier period of church construction in Central Lycia. These comments are in reference to both the Tersane Great Church (Göçer 2014, 341), and the Kekova North Basilica (Aslan & Kılıç 2016, 33). In the case of the 2016 publication, they go on to state that externally flat apses, a feature which is associated with earlier constructions in German and English literature (Grossman & Severin 2003, 116), are from the later period of construction (Aslan & Kılıç 2016, 33).

The interpretation of external apse shape in relation to the construction period, as well as the differing interpretations of those relationships, make external apse shape an ideal trait to test. There are 22 sites where the external apse shape is unknown. This is either down to the absence of a plan, and the apse shape not being mentioned in the source, or due to the lack of archaeological data for the external apse shape. In some cases (Dikmen), the internal apse shape can still be discerned, but the external
shell of masonry has fallen away in a manner that makes external apse shape classification impossible.

### III.ii.c.4 Region

<table>
<thead>
<tr>
<th>Database Entry</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>alaca</td>
<td>The church is located on the Alaca mountain</td>
</tr>
<tr>
<td>plains</td>
<td>The church is located in the Myra plains region, which includes the modern Demre plain and the Kasaba valley</td>
</tr>
<tr>
<td>hills</td>
<td>The church is located in the upland hills of Central Lycia, which centres around Kyaneai and extends down to Asar Bay in the south.</td>
</tr>
</tbody>
</table>

*Table III.7: Trait options for region as entered into the database, and a description of each option.*

The sub-region (see discussion of defining sub-regions in Section I.iv) has been recorded for all of the churches in the database. Primarily, this allows for the comparison of traits by sub-region (Table III.7) rather than just within Central Lycia as a whole. At the same time, however, it allows for the analysis of the sub-regions themselves. The designation of these sub-regions as distinctive is an invention by modern scholars, which means that the accuracy of these sub-regions, in terms of the similarity or differences of churches within these regions, can now also be considered during the process of analysis.
III.iii Quantitative Analysis

Archaeological studies that use quantitative methodologies often follow a scientific outline and process; a practice followed by researchers using cultural evolutionary methods within the field. The first step is to define the dataset and the research question(s), before then detailing any hypotheses about the results. The second step is to carry out exploratory analysis, the results of which inform the tests run in the next stage of testing. This third step is the final stage of quantitative analysis, which usually comprises of running more complex statistical tests. Finally, the results of the tests are discussed with reference to the hypothesis, and any possible steps for future research are laid out (See Section II for a more detailed discussion of these papers).

There are a variety of different processes by which data can be explored and analysed within a cultural evolutionary framework. There are exploratory methods, such as the often used method of principal component Analysis (Li et al. 2014; Schillinger et al 2017; Coto Sarmiento et al. 2018), as well as multivariate statistical testing (Jordan & O'Neill 2010; Garcia Rivero & O'Brien 2014; Rubio Campillo 2018), which are utilised when constructing phylogenetic trees (see Section II.ii for more information on phylogenetics). To my knowledge, none of the research that has been done previously on the early Christian churches of Central Lycia, or indeed to any studies of early Christian architecture, have included any quantitative analysis. This has led me to focus this study predominantly on exploratory data analysis, as a manner of laying down a basic understanding of the distribution and relationships between the churches and the chosen traits. To do this I have employed a combination of bar graphs and boxplots (III.iii.a). Based on those results, I have also employed a form of spatial clustering analysis called Nearest Neighbour Analysis (III.iii.b). I have chosen these quantitative methods because of the nature of the dataset. Other methods such as PCA, linear regression, and chi-square testing have not been considered in this
thesis as they rely on multiple continuous numerical data points that are independent. The only continuous numerical traits in the database are length, width, and nave area, all of which are dependant variables.

**III.iii.a Exploratory Data Analysis**

Bar graphs are a visually clear way to indicate proportions of data (Drennan 2009, 71). All of the graphs for this study have been created in R Studio for R, using the ggplot2 package. In this thesis, I have utilised standard bar graphs to indicate distribution of a single trait, either categorical or absence / presence, across Central Lycia. When grouped, or faceted, by sub-region (Fig. IV.2), the same plots can indicate the difference in the proportions of certain traits between these regions. I have also employed stacked bar plots when comparing two different traits, though this only works with categorical or absence / presence traits. For example, in Figure IV.2, I compare the absence or presence of carved decoration to the absence or presence of an atrium (Section IV.ii.b.1). This graph not only shows the distribution of absence, presence, or reuse of carved decoration across the churches of Central Lycia in the bar height, but it also indicates the proportion of each bar where the church shows absence or presence of an atrium, which is indicated by fill. Stacked bar plots can also be faceted, which allows for comparison across-sub region (Fig. IV.3). We can then consider the relationship between the two traits, in the example, absence or presence of carved decoration with absence or presence of an atrium, which otherwise would not discernible.

A boxplot is a way of visualising morphometric data (Drennan 2009, 39). In this study, I have used boxplots whenever analysing the relationship of nave area to either a categorical or absence presence trait (Fig. IV.19). Box plots are characterised by a box, which is bound by the upper and lower quartile, and within which the median of the dataset is located (Drennan 2009, 28-29, 37). The whiskers, which are the vertical lines that extend from the top and
bottom of the box aspect of the plot, include all data points that lie within an area that is 1.5 times the length of the box on either end (Drennan 2009, 38). Any data point that falls above or below the whiskers is an outlier, which are indicated on the plots by a single dot. As with bar graphs, boxplots can be divided by categories, and faceted by sub-region, allowing analysis of the presence of a specific category of trait in comparison to nave area, both throughout Central Lycia, individually by sub-region.

If the subset of data is relatively small, this can at times lead to the box plot providing a skewed representation of the data. For example, Figure IV.22 shows the absence or presence of a narthex (x) in comparison to nave area (y). The plot in the Alaca sub-region for narthex presence suggests that the nave areas are relatively varied, extending from c. 25m² to 250m². However, when the actual data points are added to the plot, it is clear that this is not the case. In reality, the data points are in two visible clusters around two distinct nave areas, that is, the data exhibits a bimodal distribution. Whenever the boxplot has been skewed in this manner, I have included the individual nave areas as data points on the graph, which allows for better interpretation.

**III.iii.b Nearest Neighbour Analysis**

Nearest Neighbour Analysis is a method of clustering analysis that examines the distribution of sites by comparing the actual linear distance between all analysed sites with the expected linear distance between sites, with the aim of assessing whether the dataset is distributed in a clustered, random, or regular manner (Orton 2004, 301; Conolly & Lake 2006, 163-66; Darvill 2009). For this study, I have run Nearest Neighbour Analysis in QGIS (version 3.6). The process is accessed through Vector > Analysis Tools > Nearest Neighbour Analysis, which then requires the input of a specific raster layer for analysis. For this example, I have used a layer which includes all 160 churches with GPS points (Fig III.9, see Section III.i.a for more
information about the two churches with missing GPS points). The outputs from the Nearest Neighbour Analysis test, as generated by QGIS, can be seen in Table III.8. The Nearest Neighbour Index (NNI) is calculated by dividing the observed mean distance (424.13m) with the expected mean distance (1211.47m). The NNI always falls between 0.00 and 2.15, where 0.00 indicates a high level of clustering, 1.00 indicates a random distribution, and 2.15 indicates a regular distribution (Darvill 2009) (Fig. B.21). In this example, the NNI is 0.35, which is closer to 0.00 than to 1.00, thus indicating that the dataset as a whole exhibits clustering. The final output provided by QGIS is the z-score (Fig. B.22), which indicates the number of standard deviations away from the mean the result is located (Drennan 2009, 48). A positive z-score of 1.96 or higher indicates significant uniformity, while a negative z-score of -1.96 indicates a significant trend towards clustering.

Fig III.9: Map showing location of all 160 churches in Central Lycia with recorded GPS points
(Conolly & Lake 2006). If the z-score is greater than -1.96 and lesser than 1.96, i.e. Between -1.95 and 1.95, the results are not considered accurate. In this example, the z-score is -15.68, indicating a highly accurate interpretation of a trend towards clustering.

<table>
<thead>
<tr>
<th>Results for ‘All Churches’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected mean distance</td>
</tr>
<tr>
<td>Observed mean distance</td>
</tr>
<tr>
<td>Nearest Neighbour Index</td>
</tr>
<tr>
<td>z-score</td>
</tr>
<tr>
<td>Sample Size</td>
</tr>
</tbody>
</table>

Table III.8: Nearest Neighbour Analysis results for the 160 churches in Central Lycia

The predominant issue with the use of Nearest Neighbour Analysis in archaeology is that this method does not take into consideration the possibility that data can be clustered differently, or not at all, at different scales (Orton 2004, 300; Conolly & Lake 2006, 163). For Central Lycia, however, we already have a pre-defined scale within which to analyse data: the aim is to consider the churches within this specified geographical region. Still, this potential issue will be considered during any discussion of results (Chapter VI) and interpretation of data (Chapter VII). A second consideration is the issue posed by internal churches. The GPS points for internal churches are often in very close proximity, if not exactly the same, as the earlier churches built on the same location. This could possibly show up in the results as signalling clustering where clustering may not be present, however, when looking at temporal variability, this clustering would still be relevant to the analysis of site density. Internal churches will also be kept in mind during the discussion (Chapter VI) and data interpretation (Chapter VII).

When running any spatial analysis, it is also important to consider whether the analysis is aiming to explore first- or second-order effects. First-order effects are ‘global or large-scale trends’, which in archaeological terms, may indicate a relationship between nearby sites (Orton 2004, 299). Second-order
effects are ‘local or small-scale’ trends, which are either homogeneous due to the results being consistent regardless of sites, or heterogeneous, due to consistent variation across sites (Orton 2004, 299). Orton (2004, 299), notes that the majority of spatial analysis aims to explore first-order effects, but that through this process, any evidence for second-order effects are also considered. As this study is aiming to consider both overall temporal and geographic changes as well as changes, and differences between sub-regions, I will need to consider both first- and second-order effects in any spatial analysis.
IV. EXPLORATORY DATA ANALYSIS RESULTS

This chapter on the results of the Exploratory Data Analysis (EDA) results is organised by the different strands of exploratory analysis carried out, all of which were guided by the research questions as laid out in Chapter I.iv. First, I have carried out a basic analysis of the distribution of the non-morphometric traits (Section IV.i), both across the overall dataset and as broken down by sub region. This provides a benchmark against which to analyse the more complex results of the following sections of EDA. Section IV.ii considers the relationship between morphometric traits and categorical traits, with a focus on the nave area. Nave area is often cited as an indication of time period (see Section I.iii.c-d), and as such has been selected as a way of assessing questions relating to temporal change. The same is true for construction technique, which has also been connected to regional variation in Central Lycia (see Sections I.iii.a & III.i.g). Section IV.iii, then, considers the relationship between construction technique and the other categorical traits that directly relate to the overall process of church construction. In order to better understand the synthronon trait as laid out in the research questions, I have carried out EDA on the relationship between the synthronon and a number of additional cultural traits (Section IV.iv). Finally, in order to ascertain the significance of the triconch church in relationship to both the Alaca sub-region and St Nicholas of Holy Sion, I have run further EDA on cultural traits relevant to the research question (Section IV.v).

IV.i Distribution of Traits

This section describes the results of the EDA carried out on the distribution of all non-morphometric traits. The first half of this section covers the seven absence presence traits, and the second half the three categorical traits. It is organised as follows: Atrium (IV.i.a), Carved Decoration (IV.i.b), Narthex (IV.i.c), Subsidiary Chapels (IV.i.d), Churches with Synthronons (IV.i.e), Funerary Monuments (IV.i.f), Triconch Churches (IV.i.g), External Apse
Shape (IV.i.h), Construction Technique (IV.i.i), and finally, Number of Aisles (IV.i.j).

### IV.i.a Atrium

*Fig. IV.1: Bar plot showing absence or presence of atria (x) in Central Lycia across the three regions. See Table C.2 for R code.*

Within the dataset, there are 21 churches with an atrium, 131 without, and 10 churches where the absence or presence of an atrium could not be determined (Fig. IV.1). The largest number of churches with atria are in Alaca, followed by Hills, and finally Plains. In total, 11 of 33 churches in Alaca have an atrium (33.3%), 6 of 101 churches in Hills have an atrium (5.9%), and 4 of 28 churches in Plains have an atrium (14.3%).
IV.i.b Carved Decoration

Of the 162 churches in the dataset, 35 have original carved decoration, 17 have re-used carved decoration, 108 have no carved decoration, and the absence or presence of carved decoration at two sites is unknown (Fig. IV.2). Broken down by region, in Alaca there are 15 churches with original carved decoration and 5 with re-used decoration, 13 with original and 11 with re-used carved decoration in Hills, and seven with original and one with re-used decoration in Plains. The sub-region with the highest presence of carved decoration for both original and re-used is Alaca, followed by Hills, and then finally Plains.

Fig. IV.2: Bar plot showing absence, presence, or reuse of carved decoration (x) in Central Lycia across the three regions
IV.i.b.1 Relationship between Atrium and Carved Decoration

**Fig. IV.3:** Bar plot showing absence, presence, or reuse of carved decoration (x) in comparison with absence or presence of atria (fill) by region. See Table C.3 for R code.

In Alaca, all the churches with an atrium have either original carved decoration or re-used carved decoration (Fig. IV.3). In Plains, all of the churches with an atrium also have original carved decoration. Of the six churches in Hills with an atrium, two have no carved decoration, two have original carved decoration, and two have re-used carved decoration.
IV.i.c Narthex

Across the dataset, 41 churches have a narthex, 99 do not have a narthex, and for 22 of the sites the absence or presence of a narthex is unknown (Fig. IV.4). Of those 41 churches, more than half (24 churches, 58.5%) are in Hills. Proportionally, however, almost half of the churches in Plains have a narthex, while in Hills and Alaca, the number of churches with a narthex make up less than 25% of the overall churches within each individual sub-region. The small number of churches with a narthex in Alaca may be accounted for by the 12 sites where the absence or presence of a narthex is unknown (see Section III.ii.b.3 ).
IV.i.c.1 Relationship between Atrium and Narthex

There are only four churches of the 162 in the study area that have both a narthex and an atrium (Fig. IV.5). Two are in Plains: Andriake Church E and the Myra Nicholas church, and two are in Alaca: Alakilise and Alakilise Internal Church (Fig. IV.6). This means that in Alaca, there is only ever one church that has both an atrium and a narthex at any given time. In Plains, only two churches have both traits; this makes up for half of the churches with atria but only one fifth of the churches with a narthex in this sub-region. In Hills, none of the churches with atria also have a narthex.
Fig. IV.6: Point plot showing of all of the churches in the study area that have an atrium (x), in comparison to absence or presence of narthex (y) by region (colour). See Table C.6 for R code.

In Alaca the churches with atria do not have a narthex, with the exception of Alakilise and Alakilise Internal Church. In the Plains Andriake Church E and the Myra Nicholas church both have an atrium and a narthex. Only two other churches have atria in Plains (Andriake Churches B & D).
**IV.i.d Subsidiary Chapels**

![Bar plot showing absence or presence of subsidiary chapels (x) in Central Lycia across the three regions.](image)

*Fig. IV.7: Bar plot showing absence or presence of subsidiary chapels (x) in Central Lycia across the three regions.*

Of the 162 churches in Central Lycia, 37 have at least one subsidiary chapel, 122 have no subsidiary chapels, and for three sites, absence or presence of a subsidiary chapel is unknown (Fig. IV.7). In Alaca, nine of the 33 churches have subsidiary chapels (27.3%), and in Plains nine of the 28 churches (32.1%) have subsidiary chapels. The subsidiary chapel presence in Alaca and Plains are relatively similar proportionally in comparison to Hills. Only 19 of 101 churches (18.8%) have subsidiary chapels in Hills, though it is also worth noting that over half of the churches with subsidiary chapels (19 of 37) are in Hills.
IV.i.e Churches with Synthronons

In the study area, there are 19 churches that have a synthronon, 137 without a synthronon, and 6 where the absence or presence of a synthronon is unknown (Fig. IV.8). Five of the churches with a synthronon are in Alaca, 10 are in Hills, and four are in Plains. Proportionally there are a similar number of churches with synthronons in Alaca and Plains (15.2% and 14.3% respectively). The proportion of churches with a synthronon in Hills is lower (9.9%), though not too far removed from the other two sub-regions. Even though the number of churches with synthronons is proportionally smaller in Hills, the Hills synthronon churches make up for more than half of the overall number of churches in the synthronon subset.

*Fig. IV.8: Bar plot showing absence or presence of synthronons (x) in Central Lycia across the three regions.*
IV.i.f Funerary Monuments

Across Central Lycia, funerary monuments are present at 24 (14.8%) churches, absent at 134 (82.7%) churches, and at 4 sites (2.4%), the absence or presences of funerary monuments is unknown (Fig. IV.9. The largest amount of churches with funerary monuments is found in Hills, where the 18 churches with funerary monuments accounts for 75% of the total funerary monument subset. Churches with funerary monuments account for 17.8% of the total churches in Hills, in comparison to the 12.1% in Alaca and 7.1% in Hills.

*Fig. IV.9: Bar plot showing absence or presence of funerary monuments (x) in Central Lycia across the three regions.*
IV.i.g Triconch Churches

In total, there are only nine (5.6%) churches in Central Lycia with a triconch apse (Fig. IV.10, see Section III.i.b.2 for more about defining triconch apses). There is a single site, Arneai Church D, where the absence or presence of a triconch apse is unknown, and 152 churches (93.8%) without a triconch apse. Of the nine churches with a triconch apse, five are in Alaca (55.6%), four are in Hills (44.4%), and none are in Plains. Proportionally, the triconch churches make up 4% of the total churches in Hills, and 15% of the total churches in Alaca.

*Fig. IV.10: Bar plot showing absence or presence of churches with a triconch apse (x) in Central Lycia across the three regions.*
IV.i.h External Apse Shape

Across Central Lycia (Fig. IV.11), five churches have rock-cut apses (3.1%), nine churches have externally flat apses (5.6%), five churches have externally square apses (3.1%), 24 have externally three-sided apses (14.8%), 93 have externally round apses (57.4%), two have externally triconch apses (1.2%), two have triconch apses where the outside of the conches is squared off (1.2%) and the external shape of the apse is unknown for 22 sites (13.6%). The large number of churches where the external apse shape is listed as ‘unknown’ is discussed in Section III.i.c.3.

All seven external apse shapes are represented in Alaca (Fig. IV.12). There are three churches with rock-cut apses, three with externally flat apses, two churches with externally square apses, three churches with an externally three-sided apse, ten with an externally round apse, one triconch church with an externally tri-conched apse, two churches with a squared off triconch...
apse, and eight sites where the external apse shape of the church is unknown. As with the other two regions, the largest number of churches have externally round apses. Unlike the other two regions, however, in Alaca the number of churches that do not have an externally round apse (15 sites) outnumber the churches with externally round apses (10 sites). Alaca is the only region to have churches with the squared-off triconch external apse shape, which is present at West Asarcık and Devekuyusu. One of the two total churches with an externally tri-conched apse shape is also in Alaca: Güceyman Triconch. These sites make up three of the four churches with either a squared-off triconch apse or an externally tri-conched apse. There are two other sites in Alaca with an internal triconch apse: Alacahisar, which has an externally rock-cut apse, and Dikmen (Fig. A.32), where the external apse shape is unclear due to the ruinous state of the site.

In Hills two churches have rock-cut apses, five have externally flat apses, three churches have externally square apses, 16 have apses that are

Fig. IV.12: Bar plot showing external apse shape (x) distribution across the three regions of Central Lycia
externally three-sided, 62 churches have externally round apses, one church has a triconch apse that is externally tri-conched, and the external apse shape of 12 sites is unknown. The only external apse shape not represented in Hills is the squared-off triconch apse. Though the plot (Fig. IV.12) and count indicates that Hills has the largest number of externally round apses, it does not have the highest proportion of round apses by region. In Hills, the 62 externally round apses make up 61.4% of the external apse shapes, while in Plains the 20 externally round apses account for 71.4% of external apse shapes. The second most common apse shape in Hills is the externally three-sided apse. Hills has the largest number of externally flat and square apse shapes. The only other externally tri-conched apse outside of Alaca is in Hills: Aperlae Subscribed Triconch Church, which has a modified triconch apse. Korba Triconch Basilica also has a modified triconch apse, but in this instance the three apse conches are externally three-sided, instead of being externally tri-conched or squared-off. In its second phase, the Aperlae Subscribed Triconch Church has an externally square apse, due to the structure built behind the apse.

Only three external apse shapes are represented in Plains. There is one church with an externally flat apse, five churches that have an externally three-sided apse, and then 20 churches with externally round apses. The single church with an externally flat apse is Arneai Church C (Fig. A.19), one of four churches in the city Arneai, and the only one to not have an externally round apse.
IV.i.i Construction Technique

![Bar plot showing construction technique (x) distribution in Central Lycia.](image)

Eight construction techniques\(^8\) have been identified for the churches of Central Lycia (Fig. IV.13). For more information about the classification process for construction technique see Section III.i.ii.c.2. Across the dataset, there are 15 churches constructed of ashlar (9.3%), five churches constructed of a combination of ashlar and cut rock (3.1%), 19 churches with an ashlar apse and a mortar and rubble nave (11.7%), four churches built of a combination of ashlar, cut rock, and mortar and rubble (2.5%), 91 churches constructed of mortar and rubble (56.1%), 11 churches constructed of mortar and rubble with brick inclusions (6.8%), five churches that are a combination of mortar and rubble as well as cut rock (3.1%), seven churches built of reused ashlar blocks along with mortar and rubble (4.3%), and for five sites,  

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\(^8\) ASH – ashlar, ASHCS – ashlar and cut rock, ASHMR – ashlar and mortar and rubble, ASHMRCS – ashlar, mortar and rubble, and cut rock, BRICK – mortar and rubble with brick inclusions, MR – mortar and rubble, MRCS – mortar and rubble and cut rock, REASHMR – reused ashlars and mortar and rubble.
the construction technique is unknown (3.1%). The clear majority of churches are constructed of mortar and rubble. When combined, all the sites that include mortar and rubble construction make up 84% of the total dataset, which indicates the prominence of this construction technique in comparison to all other construction techniques. While the churches constructed only of ashlar, or of ashlar and cut rock, are often highlighted as a trait common in Central Lycia (Harrison 1963, 124; Altripp 2006, 85-87), these structures make up only 13% of the total dataset. When combined, all of the churches with cut rock as part of their construction make up 8% of the total dataset.

\[\text{Fig. IV.14: Bar plot showing construction technique (x) distribution across the three regions of Central Lycia.}\]

Of the 33 churches in Alaca, nine are constructed of ashlar, five are constructed of ashlar and cut rock, three have an ashlar apse and a mortar and rubble nave, one church is constructed of mortar and rubble with brick inclusions, 12 churches are constructed of mortar and rubble, one church is constructed of reused ashlar blocks and mortar and rubble, and the construction technique of two churches is unknown (Fig IV.14). There are no

\[\text{alaca} \quad \text{hills} \quad \text{plains}\]

\[\text{ASH} \quad \text{ASHCS} \quad \text{ASHMR} \quad \text{ASHMRCS} \quad \text{BRICK} \quad \text{MR} \quad \text{MRCS} \quad \text{REASHMR} \quad \text{unknown}\]

\[\text{count} \quad \text{con_type}\]

\[\text{con_type} \quad \text{ASH} \quad \text{ASHCS} \quad \text{ASHMR} \quad \text{ASHMRCS} \quad \text{BRICK} \quad \text{MR} \quad \text{MRCS} \quad \text{REASHMR} \quad \text{unknown}\]
churches constructed using either a combination of ashlar, cut rock, and mortar and rubble, or mortar and rubble with cut rock masonry. Though churches that include mortar and rubble construction still make up the largest overall proportion of churches in Alaca (17 churches, or 51.5%), the proportion of churches with ashlar or ashlar and cut rock construction is much higher than in Hills and Plains (14 churches, or 42.4%). Churches with ashlar apses and mortar and rubble naves make up 9.1% (3 sites) of the Alaca subset.

The Hills region is comprised of: four churches constructed of ashlar, nine constructed of a combination of ashlar and mortar and rubble, four churches built of ashlar, mortar and rubble, and cut rock, three constructed of mortar and rubble with brick inclusions, 64 of mortar and rubble, four churches constructed from a combination of mortar and rubble and cut rock, five churches built of reused ashlar blocks along with mortar and rubble, and the construction technique used for two sites is unknown (Fig IV.23). All of the construction techniques are represented in Hills. By far the majority of churches in Hills are constructed using mortar and rubble in some manner (95 churches, or 94.1%), more so than in the other two regions. Churches of either only ashlar masonry or ashlar and cut rock construction make up only 8% (8 churches) of the Hills subset. Churches constructed of mortar and rubble and ashlar make up 8.9% (9 churches) of the dataset; a similar proportion to the same construction type in Alaca. Hills is the only region to have churches built of a combination of ashlar, mortar and rubble, and cut rock.

Out of the 28 churches in Plains, two are constructed of ashlar, seven our built of a combination of ashlar and mortar and rubble, one is constructed of mortar and rubble with brick inclusions, 15 of mortar and rubble, one church is constructed of a combination of mortar and rubble and cut rock, one church is built of reused ashlar blocks and mortar and rubble, and the construction technique of one site is unknown (Fig IV.23). None of the
churches in Plains are constructed of ashlar and cut rock, or of a combination of ashlar, mortar and rubble, and cut rock. As with Hills, a vast majority of churches are constructed with mortar and rubble (89.3%, 25 churches). Churches constructed using only ashlar, or ashlar and cut rock make up 7.1% of churches (2 sites). The seven churches constructed with an ashlar apse and a mortar and rubble nave make up 25% of the total churches in plains, which is over double the percentage of churches in the other two regions.

**IV.i.j Number of Aisles**

![Bar plot showing the distribution of the number of aisles present in each individual church (x) within Central Lycia.](image)

Across the dataset there are 96 churches with one aisle (59.6%), two churches with two aisles (1.2%), 61 churches with three aisles (37.7%), and three churches where the number of aisles is unknown (1.9%). By far, the majority of churches have a single aisle, followed by three-aisled churches (Fig. IV.15).
In Alaca there are 14 churches with a single aisle, 17 churches with three aisles, and two churches where the number of aisles is unknown (Fig. IV.16). The two churches where the number of aisles is unknown are Bağlararası, which is only briefly mentioned by Clow (2014, 66), and the Güceyman Triconch, of which only the triconch apse remains (Fig. A.34, Grossman & Severin 2003, 113).

There are 69 churches with a single aisle and 30 churches with three aisles in Hills (Fig. IV.16). The number of single-aisled churches is over double that of three-aisled churches. As discussed above, Hills is the only region with any two-aisled churches.

In Plains, there are 13 churches with a single aisle, 14 churches with three aisles, and two churches where the number of aisles is unknown (Fig. IV.16). As with Alaca, in Plains there is a much more even distribution of churches.
between the one and three aisle categories. The only church where the number of aisles is unknown is Arneai Church D, of which only two apse-like walls and many fragments of architectural carving remain (Grossman & Severin 2003, 116).
IV.ii Area Results

All of the analysis in this section has been carried out using the 126 churches with recorded nave areas (see Section III.ii.a for more detail about measurements). Section IV.ii.a looks at the relationship between the nave area and the length width ratio, while the following sections analyse the association between the nave area and absence presence, then categorical traits. It is organised as follows: Atrium (IV.ii.b), Carved Decoration (IV.ii.c), Narthex (IV.ii.d), Subsidiary Chapels (IV.ii.e), Churches with Synthronons (IV.ii.f), Funerary Monuments (IV.ii.g), Triconch Churches (IV.ii.h), External Apse Shape (IV.ii.i), Construction Technique (IV.ii.i), and finally, Number of Aisles (IV.ii.j).

IV.ii.a Length Width Ratio

Overall, the length and width of the churches follows approximately the same ratio across all nave areas (Fig. IV.17). The ratio is also relatively consistent across all three regions, as can be seen by the lines of best fit by region plotted in Figure IV.2. Alaca is the only region where the data is distributed in a bimodal manner, with Hills and Plains show a consistent increase in both length and width along the same line without any visually clear gaps.
Fig. IV.17: Point plot of length (y) and width (x), faceted by region. The length and widths plotted have been averaged.

The churches with the largest area, as represented by length width ratio (Figs IV.17, IV.18) in Alaca have a smaller area than those in Hills and Plains, while the churches with the smallest area in Hills have a smaller nave area than both Alaca and Plains. In Hills there is a visually clear subset of seven churches where the width is less than the line of best fit (Fig IV.2): Aperlae Upper Church Phase 2, Kekova North Basilica Internal Church, Kyaneai Church A Internal Church, and Kyaneai Church B Internal Church. Only one church in the other two regions belongs to this subset: Sura Plateau Phase 2 in Plains. These are all second phases of an ecclesiastical structure wherein a three-aisle church has been narrowed to a single-aisle church by the walling off of the aisles, thus creating a church with a relatively long length and short width.
Fig. IV.18: Point plot of length (y) and width (x), by region (colour) with a line of best fit for each region. The length and widths plotted have been averaged. See Table C.1 for R code\textsuperscript{9}.

\textsuperscript{9} A sample code for each plot type has been provided in Appendix C.
All of the 21 churches with an atrium have a nave area measurement. According to the plot (Fig. IV.19), churches with larger areas are more likely to have an atrium. Even though the box plot for Hills is comparatively longer than the other regions, the median is still much higher than that in the Hills absence plot. There are a couple of notable outliers. In Alaca, East Asarcık Internal Church (nave area 10.5 m$^2$) is the lower outlier in the Presence column. There are seven outliers in the Hills absence column, all of which have nave areas over 200 m$^2$: Aperlae Upper Church Phase I (317.90 m$^2$), Kelova North Basilica (300.38 m$^2$), Korba Triconch Basilica (216.12 m$^2$), Kyaneai Church B Basilica (302.95 m$^2$), Kyaneai Church E Basilica (273.31 m$^2$), Settlement XXXI Basilica by Kilise (277.43 m$^2$), and Tersane Great Church (301.65 m$^2$).
IV.ii.c Carved Decoration

Of the 126 churches with a recorded nave area, there are 26 with original carved decoration, 13 with re-used decoration, and 88 without any carved decoration (Fig. IV.20). There are nine churches with carved decoration but without a recorded nave area; of those, all but two sites (Belos and Arneai Church D) are three-aisled basilicas which are likely to have a larger area (see Fig. IV.21). Of the four churches with no nave area and reused carved decoration, only one, Settlement LXXIX Çürüt, is a three-aisled basilica.

Fig. IV.20: Box plot of nave area (y) compared to absence, presence, or re-use of carved decoration (x), faceted by region
In Hills, the 12 churches with reused carved decoration on average have a lower nave area than those with original carved decoration. In Alaca, however, the box plot for the five churches with recorded nave areas and reused carved decoration indicates that these churches have a wide variety of nave areas: Alakilise Internal Church (254.42 m²), East Asarcık Internal Church (10.5 m²), West Asarcık Internal Church (220.43 m²), Dikmen Internal Church (39.15 m²), and Yılanbaşı Internal Church (27.97 m²). These nave areas are distributed in a bimodal nature, with Alakilise Internal Church and West Asarcık Internal Church in the upper group, and the rest in the lower group. It is worth noting that in Plains, there is only one church with re-used carved decoration: the Dereağzı Church.
IV.ii.d Narthex

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Fig. IV.22: Box plot showing absence or presence of a narthex (x) in comparison to nave area (y) by region, with individual churches represented as points. See Table C.4 and C.5 for R code.

Of the 126 churches with a recorded nave area, 36 churches have a narthex, 83 do not have a narthex, and 7 are unknown (Fig. IV.22). There are a further six churches that have a narthex but do not have a recorded nave area, and thus are not considered in this plot. Only six of 22 churches in Alaca with a recorded nave area have a narthex. The areas of these churches are distributed bimodally. Four of the narthex presence churches have a nave area in the median or lower quartile of the box plot, while the other two in this subset have nave areas in the top of the upper whisker. The two churches in the upper whisker are Alakilise and Alakilise Internal Church (both 254.42m²). The difference between the nave area two Alakilise churches and the other four is over 200m².
Of the 78 churches in Hills with a recorded nave area, 19 have a narthex. On average, the churches in Hills with narthex have a smaller nave area, except for the two outliers visible above the plot. The largest area that falls within the box and whisker plot is Settlement L Kocaboynuz Basilica, which has an area of 156.89m², and the two outliers are Kekova North Basilica (300.38m²) and Kyaneai Church B Basilica (302.95 m²). There as a clear gap of 143.49 m² between the nave area of Settlement L Kocaboynuz Basilica and the nave area of Kekova North Basilica.

Of the 26 churches in Plains with a recorded nave area, 11 have a narthex. The boxplot for presence of narthex indicates that on average, the churches in Plains with a narthex have a larger area than those without. While the plot is somewhat dispersed, the median nave area (Sura Valley, 184.88m²) is significantly higher than the median nave area in the absence of narthex boxplot (51.42m²). The only Plains church without a narthex that has a nave area larger than the largest church with a narthex (Sura Plateau Phase 1, 357.22m²) is Andriake Church D (471.62m²).

**IV.i.e Subsidiary Chapels**

Of the 126 churches with a recorded area, 34 have subsidiary chapels (Fig. IV.23). There are a further three churches with subsidiary chapels that do not have a recorded nave area: Dikmen (Alaca), and Kekova North Great Church Phase 1 as well as Phase 2 (Hills). Out of the 22 churches in Alaca with a recorded nave area, eight have subsidiary chapels. Within Alaca, the churches with subsidiary chapels have a considerably higher nave area than those without. The one outlier in the presence box plot is Alakilise N Saraylı (Fig. A.2). The remaining seven churches with subsidiary chapel presence are represented by a relatively compact box plot, indicating that the churches with subsidiary chapels are consistently larger and have similar areas, both within Alaca and across all three regions.
In Hills, 17 of the 78 churches with recorded areas have a subsidiary chapel. It is worth noting that there are seven outliers in the Hills absence plot, and that the box plot for subsidiary chapel presence in Hills presence is comparatively long. However, the median data point in the Hills absence plot is comparatively high. Notably, when evaluating the box plot of the 126 churches with nave areas (Fig. IV.24), the seven outliers in the Hills absence plot (Fig. IV.23) still show up as outliers in the overall nave area dataset. In the box plot for the overall dataset, there is an outlier in the presence plot: the Tristomon Farmhouse Basilica (487.17m²), which has the highest nave area of these 126 churches.
Fig. IV.24: Box plot comparing nave area (y) to absence or presence of one or more subsidiary chapels (x)

Of the 26 churches in Plains with a recorded nave area, 9 have subsidiary chapels. In Plains, churches with subsidiary chapels on average have larger nave areas than those without. While the upper whisker on the absence plot is relatively long, it only includes three sites, with a single outlier, Andriake Church D, significantly above the whisker. As mentioned above, Andriake Church D has the second largest nave area in the study area, and is also an outlier on the boxplot of the whole dataset with recorded nave areas (Fig IV.24).

**IV.ii.f Churches with Synthronons**

Of the 126 churches with a recorded nave area, 15 have a synthronon. Four of the churches with a synthronon do not have a recorded nave area and thus are not included in the area-based analysis plots. These churches are Kekova North Great Church Phase 1 and 2, Settlement XXVIII by Ürer, and Settlement LXXIX Çürüt, all of which are found in Hills.
Across all three regions, the nave areas of churches with synthronons are split into two distinct groups by nave area, which has led to the presence boxplots being longer than the absence boxplots (Fig. IV.25). In all three regions the median is relatively high in the box plot, however, this is primarily down to the small sample size. Additionally, there are six outliers in the Hills absence plot, which calls into question the relevance of the median of the box plot. The only region where there is a potential correlation between presence of a synthronon larger area is in Plains, where the boxplot for presence, as well as the median within the boxplot, indicate that churches with a synthronon have a larger area than those without, though the small sample size must still be taken into account. In the other two regions, churches with synthronons have areas that fall either the higher end of the overall dataset or the lower end of the overall dataset. The largest church with a synthronon, Tristomon Farmhouse Basilica, has an area of 487.17m$^2$,
and the smallest church, Büyük Avaşar Church 2 LXII, which only has a single step synthronon (Altripp 2008, 178), has a nave area of only 10.85m².

It is worth considering how the four churches without measurements could fit into the dataset with recorded nave areas. One of these churches is Settlement XXVIII by Ürer (Fig. A.77). The only measurable architectural feature at XXVII by Ürer is the east wall of the church (length 5.26m), including evidence that the site had three aisles. The only three-aisled church with a comparable east nave width, and three aisles is Kozakonaği Tepesi Basilica (east with 6.4m) which has a nave area of 57.6m² (Altripp 2010e, 334). Like XXVII by Ürer, Kozakonaği Tepesi Basilica is also located in the Hills region. Based on the consistency of the length-width ratio (Section IV.ii.a), it is likely that the church XXVII by Ürer would have had an approximately similar area, which can be estimated to fall between 50m² and 60m². The only measurable architectural feature visible on the plan of Settlement LXXIX Çürüt (Fig. A.86) is the east end of the church (width 6.31m), including evidence for the church having three aisles. As with XXVII by Ürer, the only church with three aisles and a similar nave width is the Kozakonaği Tepesi Basilica (east with 6.4m), which has a nave area of 57.6m². It is likely, then, that the LXXIX Çürüt church has a nave area between 50m² and 60m². These two churches thus fit within the lower nave area group of churches in Hills with the presence of a synthronon, along with the Kozakonaği Tepesi Basilica and Büyük Avaşar Church 2 LXII.

The publication (Aslan et al. 2017, 427) records Kekova North Great Church as 18.30 metres long by 54.75 meters wide. Presumably, the length of the complex includes the narthex as well as the staircase leading up to the narthex, while the width, which would otherwise be the largest in the study area, must include not only the basilica, but also all of the ancillary buildings to the north of the church up until they meet the northern coast of Kekova island (for a view of the complex see Fig. B.15). In order to estimate a nave area, we must consider other churches with similar nave lengths. Another
church on the Kekova island, which also has a synthronon, has a similar nave length: Tersane Great Church (Fig. A. 62), which has an average nave length of 19.08m. Considering the similarities between these two churches, it is safe to estimate that the nave area of the Kekova North Great Church would fall around the nave area of the Tersane Great church (301.5m²), i.e. around 300m². This would put the Kekova North Great Church in the group of synthronon presence churches in Hills with higher nave areas, thus retaining the bimodal nature of the dataset.

![Fig. IV.26: Point plot of area (y) for all churches with a synthronon and an area measurement. Region denoted by point colour.](image)

While the distribution of the nave areas for the churches with synthronons follows a bimodal distribution when divided by region, when plotted together, the data is no longer bimodally distributed. Instead, it covers the wide range of church areas not only within the synthronon presence subset, but also in comparison with the whole dataset (Fig. IV.26). This difference in distribution can be accounted for when comparing these results to the differences in nave area distribution by region for the overall nave area dataset, as
discussed in Section IV.ii.a (Figs IV.17 & IV.18). With this in mind, the region-by-region bimodal distribution (Fig. IV.25) is an indication that the subset of churches with synthonons can be considered as representative of the overall dataset.

**IV.ii.g Funerary Monuments**

![Funerary Monuments Box Plot](image)

*Fig. IV.27: Box plot of absence or presence of funerary monuments (x) compared to nave area (y), faceted by region.*

20 of the churches with a recorded nave area have funerary monuments (Fig. IV.27). Four of the churches with funerary monuments do not have a recorded nave area and thus are not included in the area-based analysis plots. These churches are Apollonia Area Roman Grave Church, Hıdırlar Church, Kyaneai Church A Chapel, and Settlement LXXXVIII at Bademağacı, all of which are in Hills. In both Alaca and Plains, the few churches that have funerary monuments have larger nave areas in comparison to the overall dataset, though there is a single outlier in Alaca, Turant Dağ Internal Church, which is an internal church. The median nave areas for the presence graph of these two regions is very similar (Alaca 227.1m², Plains 210.8m²), and is
c. 150m² above the median nave area of the Hills churches with funerary monuments (80.6m²). The nave areas of churches with funerary monuments in Hills are much more dispersed, and they follow a relatively similar pattern to the nave areas of the overall Hills subset. There is, however, a cluster of four churches with nave areas all around c. 400m², which all have funerary monuments. These are: Istlada Basilica (405.4m²), Tristomon Harbor Basilica (399.8m²), Kyaneai Church A Basilica (395.6m²), and Aperlae Lower Church (393.2m²).

**IV.ii.h Triconch Churches**

![Box plot of absence or presence of a triconch apse (x) compared to nave area (y).](image)

*Fig. IV.28: Box plot of absence or presence of a triconch apse (x) compared to nave area (y).*

Seven of the nine churches in the triconch subset have recorded nave areas. The two without recorded nave areas are the Güceyman Triconch and Dikmen. As only the triconch nave is fully intact, I have measured the internal width of the triconch for the three churches with a triconch apse that have a recorded nave area, in order to see if any approximation can be made. The
triconch apse widths are as follows: Alacahisar is 11.35m, West Asarcık is 12.63m, Devekuyusu is 12.67m, and finally Dikmen is 9.61m. Based on this, it is likely that the nave area of Dikmen would also fall between c. 150m$^2$ - 200m$^2$, though most likely at the lower end of this range. This estimated nave area would fall within the box of the current triconch presence plot. With Dikmen, I compared the width of the triconch itself (9.61m$^2$) to that of other triconch churches. The Güceyman Triconch is much smaller, with a width of c. 5.5m. As the remains are deeply buried (Grossman and Severin 2003, 113), it is unclear if the triconch is connected to a nave, or if it is a stand-alone structure. Due to the lack of archaeological data it is impossible to estimate a nave area, and thus will be left out of this discussion of nave area. However, based on the triconch width, it is worth noting it would likely have a smaller nave area than any of the other triconch churches.

When compared to the 119 churches in the dataset with a recorded nave area, but without a triconch apse, the churches with triconch apses have, on average, larger nave areas than churches without triconch apses (Fig IV.28). The median nave area of 182.8m$^2$ (Alacahisar) is just slightly lower than the top end of the upper quartile of the absence boxplot. The three churches with nave areas above the median in the presence plot, Korba Triconch Basilica (216.12m$^2$), West Asarcık (233.72m$^2$), and Devekuyusu (291.22) all fall above the upper quartile of the absence plot. All of the triconch church areas fall above the median for the absence plot (43.5m$^2$), the smallest triconch church having a nave area of 80.61m$^2$ (Korba Internal Triconch Church).

**IV.ii.i External Apse Shape**

Of the 126 churches with a recorded nave area, four have a rock-cut apse, seven have apses that are externally flat, four churches have externally square apses, 21 have externally three-sided apses, 80 churches have an externally round apse, one has a tri-conched apse, two churches have a
squared-off triconch apse, and the external apse shape of seven sites is unknown.

Fig. IV.29: Box plot showing apse shape (x) in comparison to nave area (y) for Central Lycia.

The datasets for three subsets: rock-cut apse, externally flat apse, and externally square apse, are all distributed in a bimodal nature (Fig. IV.129). This pattern is the least clear for the rock-cut apses, as the nave areas are more spread out. It is the most pronounced in the externally flat apses, which may be due to there being slightly more data points for that apse type. Relative to the rest of the dataset, the two churches with squared-off triconch apses have the highest median nave area, even though numerous sites with different apse shapes have higher individual nave areas. After the squared-off triconch, the externally three-sided apse has the highest median nave area (254.42m²), as well as the highest boxplot of all the apse shapes. The church with the smallest nave area in the externally three-sided box plot, Trysa Castle (38.28m²), is relatively high in comparison to the plots for other nave areas. Externally round apses have one of the lowest median nave
areas (33.26m²) and the box plot for this apse shape is relatively low. There are six outliers with larger nave areas for this plot, however, those six outliers make up only 7.6% of the total churches with externally round apses.

![Box plot showing apse shape (x) in comparison to nave area (y) for Alaca](image)

*Fig IV.30: Box plot showing apse shape (x) in comparison to nave area (y) for Alaca*

Of the 22 churches in Alaca with a recorded nave area (Fig. IV.30), three have a rock-cut apse, three churches have an externally flat apse, two have an externally square apse, two churches have an apse that is externally three-sided, nine churches have an externally round apse, two have a squared-off triconch apse, and one apse shape is unknown. Out of the 78 churches in Hills with a recorded nave area (Fig. IV.31), one has a rock-cut apse, three churches have an externally flat apse, two have an externally square apse, 15 churches have an apse that is externally three-sided, 51 churches have an externally round apse, one church has an externally triconch apse, and there are five sites where the external apse shape is unknown. There are 26 churches in Plains with a recorded nave area (Fig. IV.32), and of those, one church has an externally flat apse, four churches
have an apse that is externally three-sided, 20 churches have an externally round apse, and at one site the apse shape is unknown.

![Box plot showing apse shape (x) in comparison to nave area (y) for Hills](image)

**Fig. IV.31: Box plot showing apse shape (x) in comparison to nave area (y) for Hills**

When broken down by sub-region, relationship between area and external apse shape reveals different patterns. Three of the four rock-cut apses with recorded nave areas are in Alaca, and the data is no longer bimodally distributed. The churches with rock-cut apses in Alaca are all under 200m², with the largest nave area being 182.8m² at Alacahisar. The one rock-cut church in Hills, Tersane Great Church, has a nave area of 301.65m², which is over 100m² larger than the churches in Alaca. Only one additional church in Hills has a rock-cut apse, but it does not have a nave area: Settlement XXVIII by Ürer (Fig. A.77). I have already approximated the nave area of Settlement XXVIII by Ürer (Fig. A.77) to be c. 50m² in Section IV.ii.f (above). This would place the Settlement XXVIII by Ürer church on the lower end of the rock-cut apse subset. The amount that an area for Settlement XXVIII would change
the interpretation of the rock-cut apse subset is an indication that at present, the dataset is too small to make any clear interpretations.

![Box plot showing apse shape (x) in comparison to nave area (y) for Plains](image)

*Fig. IV.32: Box plot showing apse shape (x) in comparison to nave area (y) for Plains*

In both Alaca and Plains, the churches with flat external apses on average have larger nave areas, while those in Hills have relatively small nave areas. The only church in Alaca with a smaller nave area and with an externally flat apse is the Yılanbaşı Internal Church \((27.97m^2)\). Even though its nave area is considerably smaller than the other three churches in Alaca and Plains with an externally flat apse, the nave area of Yılanbaşı Internal Church is still larger than all three churches with an externally flat apse in Hills. There are two churches with externally flat apses that do not have a recorded nave area: Apollonia Area Roman Grave Church and Kyaneai Church A Chapel Only, both of which are in Hills. The Apollonia Area Roman Grave Church (Fig. B.23) is a free-standing Roman exedra grave that was later modified into the apse of a single-aisle barrel-vaulted chapel (Hellenkemper and Hild 2004, 477), and Kyaneai Church A Chapel Only is from the final period of
use for Kyaneai Church A, where only the chapel at the east end of the north aisle would have been in use (Altripp 2010a, 285). The Roman Grave church is likely to have had a relatively small nave area due to its original function, as is the Kyaneai Church A chapel, which would have had approximately the same width as the original basilica’s north aisle: c. 5m. In this case, the addition of these two sites follows the pattern set out in the box plot; the data is still likely to be bimodal, and the churches in Hills have smaller nave areas relative to those in Alaca and Plains.

Out of the four churches with an externally square apse, two are in Alaca and two are in Hills. The two churches with external square apses both have nave areas over 200m². In Hills, however, the two churches with an externally square apses have a relatively small nave area. The only church with an externally square apse and no recorded nave area is Settlement LXXIX Çürüt, which is in Hills. Though Settlement LXXIX does not have a recorded nave area, it does have a recorded east width, as do all of the other churches with externally square apse shapes. Settlement LXXIX has a similar east width to Kekova North Port Church, 6.31m and 6.88m respectively, and so it is likely that Settlement LXXIX would have a similar nave area to Kekova North Port Church (77.54m²). As with the externally flat apses, the additional church is likely to fit in with the dataset, where the data is still bimodal and where the larger nave areas are in Alaca, and the smaller nave areas in Hills.

There are only two churches with a recorded nave area and externally three-sided apses in Alaca, and they are an original basilica and then a later renovation of the same structure: Alakilise and Alakilise Internal Church. Though these two points only represent a single apse, the nave areas for these two churches still falls noticeably higher than the churches with externally round apses. Even when considering the upper outliers in the externally round box plot for Alaca, West Asarcık Internal Church (220.43m²) and Güceyman Basilica (156.28m²), the area of both Alakilise churches is
still higher (254.42m$^2$), so the pattern seen from the overall dataset for these two apses follows through in Alaca.

The pattern seen in the plots from the overall dataset (Fig. IV.29), where churches with externally three-sided apses have larger nave areas and churches with externally round apses have smaller nave areas, is consistent in Hills and Plains though with slightly less clarity. There are nine upper outliers in the externally round apse plot in Hills, and while there are no outliers in the externally round plot in Plains, the upper whisker of the plot extends past the externally three-sided apse plot. In Hills, the externally three-sided apse plot is comparatively long, with the smallest nave area belonging to Trysa Castle (38.28m$^2$), and the largest to Tristomon Farmhouse Basilica (487.17m$^2$). In Plains, the externally three-sided apse has a more compact plot than the externally round apse plot. Across the whole dataset, there are only four churches with externally three-sided apses that do not have recorded nave areas: Çamarkası in Plains, Muskar in Alaca, and Kyaneai Church C Basilica in Hills. Based on the plans of these three structures, the east width can be estimated to be c. 14m for Çamarkası (Fig. A.27), c. 13m for Muskar (A.54), and c. 15-20m for Kyaneai Church C Basilica. When compared to the other east widths of churches with externally three-sided apses, which have a median east width of 12.04m, the churches above fit approximately into the middle of the dataset for this apse type. Across the dataset, there is a correlation between churches with a three-sided external apse and a large nave area, as well as with churches that have an externally round apse and a smaller nave area, though there are more outliers in the latter.
Out of the 126 churches with a recorded nave area, nine are constructed of ashlar, five are constructed of a combination of ashlar and cut rock, 14 churches are constructed of ashlar as well as mortar and rubble, four churches are constructed of ashlar, mortar and rubble, and cut rock, eight are built of mortar and rubble with brick inclusions, 75 are constructed of mortar and rubble, four churches are built of mortar and rubble and cut rock, and seven are constructed of reused ashlar blocks and mortar and rubble (Fig. IV.33). Two of the construction technique subsets are more limited than others by the lack of nave area measurements: six of 15 ashlar masonry churches do not have a recorded nave area, and 16 of 91 mortar and rubble churches also do not have a recorded nave area. This is more likely to affect the results for ashlar churches, as the six churches make up 40% of that subset, while the 16 mortar and rubble churches with missing nave areas only make up 17.6% of that total subset.
There are three construction technique plots which are comparatively compact (Fig. IV.33), ashlar, mortar and rubble with brick inclusions, and reused ashlar with mortar and rubble. Of these, the reused ashlar and mortar and rubble plot has both the smallest plot, and the lowest median nave area, 28.11m² (Turant Dağ Internal Church). This suggests that churches constructed of reused ashlar and mortar and rubble have smaller nave areas. Even though there are only seven churches in the subset, the lack of variation in the plot indicates that it is representative of this construction technique type.

**Fig. IV.34:** Box plot of construction technique in Alaca (x) compared to area (y).

Churches constructed of mortar and rubble with brick inclusions on average have smaller nave areas. The median for this construction technique is almost twice that of reused ashlar with mortar and rubble, at 40.89m², which falls between Trysa Castle (38.28m²) and the Church East of Karakuyu (43.50m²). The single outlier in this plot is almost 200m² above upper
whisker: Dereağzı Church (310.18m²). As with a few of the other churches in this subset (Nenealanı Churches 2 and 3, Apollonia Theatre Church, and Tersane Harbour Church), the brick inclusions at Dereağzı Church take the form of brick bands running lengthwise along the walls (Fig. B.24)

Out of the three subsets with compact box plots, the ashlar plot is the only that correlates with a larger nave area. The ashlar plot has the second highest median nave area, 254.42m² (Alakilise), after the mortar and rubble and cut rock plot, which has a median nave area of 259.4m² (between Arneai Church C, 249.44m², and Alakilise, 254.42m²). There are two outliers in the ashlar plot: the point below the plot is the Tersane Building Complex Church (10.97m²), and the point above the plot is Aperlae Lower Church (393.20m²). These two churches may only be outliers due to the lack of nave area data for the additional six churches in this subset mentioned above. By looking at the information provided in the sources, it is possible to estimate where these six structures would fall within this plot. Two of the churches without nave areas also only have a single aisle: Belos (Clow 2014, 66), and the Muskar Area Church (Hellenkemper and Hild 2004, 891). These can be estimated to have a similar nave area to the only other single-aisled church constructed of ashlar, the Tersane Building Complex Church (10.97m²)

The additional four churches that do not have recorded nave areas have three aisles. One of these sites, Çağman, is described as a ‘small’ three-aisled basilica (Hellenkemper and Hild 2004, 492). The smallest church with three aisles and a recorded nave area is Razaman's Church, which has a nave area of 52.37m². If Çağman had a nave area similar to Razaman's Church, it would fall closer to the nave areas of single-aisled churches in this subset. The northern width of both Çamarkası and Kyaneai Church C Basilica were already considered in Section IV.i.i. With that discussion in mind, it is likely these two structures have a nave area between c.150m² - 200m², which would place them close to the box portion of the ashlar plot. This leaves the Dikmen Triconch Church. In Section IV.ii.h (above) I
estimated the nave area of Dikmen to be c. 150m$^2$ - 200m$^2$, though likely closer to 150m$^2$, placing it lower than the other nave areas in the ashlar plot. After these additional hypothesised nave areas are added to the ashlar subset, the nave area distribution is bimodal, rather than concentrated around the 200m$^2$ - 300m$^2$ range.

![Box plot of construction technique in Hills (x) compared to area (y).](image)

All of the churches constructed of ashlar and cut rock have a recorded nave area. As with the churches built of only ashlar, this subset has a bimodal distribution, though median nave area is relatively low in comparison to the ashlar subset, at 156.28 m$^2$ (Güceyman Basilica). All of the churches in this subset are in Alaca. The subset includes two churches that have a single aisle, and three churches with three aisles, where the single-aisled churches are in the lower nave area group, and the three-aisled churches are in the higher nave area group.
The boxplot for churches constructed of ashlar and mortar and rubble has the most variation in nave area. The church with the largest nave area in this box plot, Tristomon Farmhouse Basilica (487.17 m²), located in Hills, has the largest nave area of the nave area subset. The church with the smallest nave area in this subset is Settlement LXXXI by Yarımahr in Hills, which has a nave area of 17.24 m². When considered by region, the distribution stays much the same for Hills (Fig. V.35) and Plains (Fig. IV.36), though the box in the Plains box plot is somewhat shorter. There is only one church in Alaca (Fig. V.35) that is constructed of ashlar and mortar and rubble, and which has a recorded nave area: Yılanbaşı Basilica (210.6 m²).

The two additional churches in this subset that do not have a recorded nave area are Muskar (Fig. A.54) and Karabol. Based on the east width of Muskar, it is likely to have a similar nave area to Yılanbaşı Basilica (see Section IV.i.i). There is no plan for Karabol, though it is described as a three-aisled basilica and thus probably has a nave area around c. 230 m², which is the...
median nave area for churches in Alaca with three aisles. With this in mind, the Alaca graph would stay approximately the same, with a cluster of three nave areas around the 200m² - 230m² mark. These nave areas are slightly higher, but still close to the median nave area for the ashlar and mortar and rubble construction technique for all of Central Lycia, which is 179.87m² (between the Myra Nicholas church, 172.25m², and Gürses Basilica, 187.48m²). This means that the combined box plot would be likely be relatively similar even with the two additional nave areas from Alaca.

While mortar and rubble is the most common form of construction (Fig. IV.33), the median nave area is actually the second smallest across construction techniques, after reused ashlar and mortar and rubble. The four outliers in this plot in Hills are Istlada Basilica (405.37m²), Kyaneai Church A Basilica (395.57m²), and Aperlae Upper Church Phase 1 (317.9m²), and Sura Plateau Phase 1 (357.22m²) in Plains.

There are only five churches constructed of a combination of mortar and rubble and cut rock, one of which, Settlement XXVIII by Ürer, does not have a recorded nave area. Four of the five churches in this subset are in Hills, and one, Arneai Church B, is in Plains. Three of the churches have nave areas between 200m² and 300m², and then a single church, Tersane Monastery, has a nave area of 58.86m². In section IV.ii.e (above) I have approximated the nave area of Settlement XXVIII by Ürer to be around 50m², which would put it closer to Tersane Monastery than the other three churches.

All of the four churches constructed of ashlar, mortar and rubble, and cut rock are in Hills. The two churches with the higher nave areas are Kekova North Basilica (300.38m²) and Kekova North Internal Church (132.19m²), where the Basilica nave area is located at the upper extent of the upper whisker, and the Internal Church is located in the middle of the upper quartile of the box. The two churches with the lower nave areas are Kyaneai Church
F (10.91m²) and Kyaneai Church G (7.83m²), where the ashlars in both of these churches are re-used instead of original (Altripp 2010d, 306-7). This is perhaps an indication that this construction technique classification is not very accurate, as will be discussed below (Section V.i.c.2).

IV.ii.k Number of Aisles

![Box plot of number of aisles (x) compared to area (y), faceted by region.](image)

Across all three sub-regions, churches with three aisles have larger nave areas than churches with one or two aisles (Fig. IV.37). The distinction between the two groups is clearest in Alaca, where there is a gap of c. 100m² between the churches with a single aisle and three aisles. In the other two regions, there is no distinct gap, as there are outliers in the single aisle plot that would fit within the three-aisle boxplot. Still, the three median nave areas of the three-aisle churches for each region are all similar (Alaca 322.7m², Hills 221.8m², and Plains 249.4m²), which indicates that this assertion is still accurate. Even with the two outliers above the single aisle plot in Plains, and five in Hills, the median nave areas for the single aisle churches, and two
aisled churches, all fall below 100m², which indicates that churches with a single aisle on average have smaller nave areas. The two outliers in Plains are, Sura Plateau Phase 2 (183.96m²), and Arneai Church A (127.75m²), and the five outliers in Hills are Aperlae Harbour Church (132.5m²), Aperlae Upper Church Phase 2 (154.4m²), Kekova North Internal Church (132.2m²), Kyaneai Church A Internal Church (188m²), and Kyaneai Church B Internal Church (130.1m²).
IV.iii. Construction Technique Results

This Section considers the results of the EDA concerning construction technique that has not already been covered by previous sections. The first three sub-sections relate to absence presence traits, while the final two are an analysis of the association between construction technique and other categorical traits. It is broken down as follows: Carved Decoration (IV.iii.a), Churches with Synthronons (IV.iii.b), Triconch Churches (IV.iii.c), External Apse Shape (IV.iii.d), and finally, Number of Aisles (IV.iii.e).

**IV.iii.a Carved Decoration**

![Bar plot showing construction technique (x) in comparison to absence or presence of carved decoration (fill).](Fig. IV.38)

13 of the 15 churches (86.7%) constructed of ashlar masonry have original carved decoration (Fig. IV.38); this is the highest proportion of carved decoration across all construction techniques. The other two construction techniques with a high proportion of churches with a presence of original
carved decoration are ashlar and cut rock construction, where three of the five churches have original carved decoration (60%), and ashlar masonry with mortar and rubble construction, where six of the 19 churches have original carved decoration (31.6%).

Proportionally, more of the churches constructed of mortar and rubble and cut rock have original carved decoration (40%) than those constructed of ashlar masonry and mortar and rubble, even though this percentage accounts for only two churches. While there are eight churches with original carved decoration built of mortar and rubble, this only accounts for 8.8% of the total mortar and rubble churches. Ashlar constructed churches have the most original carved decoration (37.1%), followed by mortar and rubble (22.9%), ashlar and mortar and rubble (17.1%), ashlar and cut rock (8.9%), and finally mortar and rubble and cut rock (5.7%). There is only one church with original carved decoration which is built of mortar and rubble with brick inclusions (2.9%). No original or reused carved decoration occurs at churches constructed of a combination of mortar and rubble, cut stone, and ashlar masonry. Overall, churches predominantly constructed of ashlars (i.e. ashlar, ashlar and cut stone) account for 62.9% of churches (22 sites) with the presence of original carved decoration, while churches constructed primarily of mortar and rubble (i.e. all other construction techniques) with original carved decoration account for 31.4% (11 churches) of the total original carve decoration subset. This suggests that there is a correlation between churches constructed with original ashlars and churches with the presence of original carved decoration. Reused carved decoration only occurs in three construction techniques: mortar and rubble (15 churches), mortar and rubble with brick inclusions (one church), and reused ashlars with mortar and rubble (one church). The vast majority of churches with reused carved decoration are constructed of mortar and rubble (88.2%).
IV.iii.b Churches with Synthronons

The majority of times that a church is constructed of ashlar and mortar and rubble, the apse is ashlar and the body of the church is mortar and rubble, meaning that often the synthronon itself is then constructed of ashlar as a part of the apse. If ever this is not the case, I will reference the specific context. Of the five churches in Alaca with a synthronon, three have an ashlar apse and two have a mortar and rubble apse. In Plains, three of the four churches with a synthronon have ashlar apses, while one has a mortar and rubble apse. The apse construction technique is more diverse for the Hills churches with the presence of a synthronon: two have an ashlar apse, two have rock-cut apses, five have mortar and rubble apses, and one is constructed of mortar and rubble with brick inclusions. In total, eight of the churches with a synthronon have an ashlar apse (42.1%), nine have a mortar and rubble apse (47.4%), and two have rock-cut apses (10.5%). Additionally, the majority of the churches with synthronons in both Plains and Alaca have

Fig IV.39: Bar plot showing absence or presence of a synthronon (x-axis) in comparison with construction technique (fill) faceted by region.
apses constructed of ashlar, while the majority of churches in Hills have mortar and rubble apses (Fig. IV.39).

Fig. IV.40: Point plot of churches that have a synthronon in the Alaca region (x-axis) in comparison to area (y-axis), with the construction technique indicated by point fill.

Across the Alaca dataset, the 5 churches with synthronons account for 10% of churches constructed of ashlar, 25% of churches constructed of ashlar with a rock-cut apse, 33.3% of churches with an ashlar apse and a mortar and rubble nave, and 16.7% of churches constructed of mortar and rubble (Fig. IV.39). The two churches with synthronons in Alaca that are constructed of mortar and rubble are the two internal churches, which have a much smaller area than those with ashlar apses (Fig. IV.40).
Fig. IV.41: Point plot of churches that have a synthronon in the Hills region (x-axis) in comparison to area (y-axis), with the construction technique indicated by point fill. Churches graphed with a nave area of ‘0’ do not have a recorded nave area.

The synthronon subset of ten churches make up 22.2% of the total churches in Hills with an ashlar apse and mortar and rubble nave, 11.11% of the churches constructed of mortar and rubble with brick inclusions, 7.7% of churches constructed of mortar and rubble, and 50% of churches with a rock-cut apse and mortar and rubble nave (Fig IV.39). Four of the 10 churches with a synthronon do not have an area measurement but do have construction technique data (Fig IV.41). These are: Kekova North Great Church Phases 1 and 2, Settlement LXXIX Çürüt, and Settlement XXVIII by Ürer. Kekova North Great Church Phases 1 and 2 are both constructed of mortar and rubble. I have estimated the nave area of Kekova North Great Church Phase 1 (above, Section IV.ii.f) as being c. 300m$^2$. As in Phase 2 the north aisle is walled-off, but the south aisle and nave are still in use (Fig. B.15), it is also possible to estimate the nave area of Phase 2 of the Kekova North Great Church to be very roughly two-thirds of the original nave area, that is c. 200m$^2$. Settlement LXXIX Çürüt is also constructed of mortar and rubble, and I have estimated (above, Section IV.ii.f) the nave area to be
between 50m$^2$ and 60m$^2$. With these estimates in mind, we can see there are two nave-area groups of churches with synthronons constructed of mortar and rubble in Hills: the three churches with nave areas around 200 – 400m$^2$ (Kekova North Great Church Phases 1 and 2 and the Ištada Basilica) and then the two with nave areas around 55m$^2$ (Settlement LXXIX Çürüt and Settlement LXX west of Divle).

Settlement XXVIII by Ürer has a rock-cut apse and a nave of mortar and rubble. I have estimated (above, Section IV.i.f) the nave area to be around 50m$^2$. The only other church constructed of mortar and rubble with a rock-cut apse and synthronon is Tersane Great Church (Goçer in Aslan 2014, 340, also see Fig. A.62), which is also in Hills. Though these two sites have dissimilar nave areas, they do fall into the two nave area-based groups discussed above for mortar and rubble churches, as Settlement XXVIII by Ürer has a smaller nave area, and Tersane Great Church has a nave area of 301.65m$^2$. The two churches where the west wall and apse are constructed of ashlar, and the rest of mortar and rubble, are found in Tristomon. This combination of an ashlar apse and mortar and rubble nave does not often appear in the Hills region (Fig. IV.14).
Churches from the synthronon subset in Plains make up 42.9% of churches constructed with an ashlar apse and a mortar and rubble nave, and 6.7% of churches constructed of mortar and rubble (Fig. IV.39). It is difficult to make any direct comments about nave area and construction technique with only four sites to consider (Fig IV.42). However, as previously noted, the overall nave area for churches with a synthronon in Hills is relatively high.
IV.iii.c Triconch Churches

Fig. IV.43: Bar plot of churches showing the presence triconch apse (x), faceted by region, with the construction type indicated by fill.

Within the study area, four of the triconch churches are constructed of ashlars, one is constructed of ashlar and cut rock, two churches are built of mortar and rubble, one of reused ashlars and mortar and rubble, and the building material of one church, Güceyman Triconch, is unknown (Fig. IV.43). Güceyman Basilica is constructed of ashlars, so once again this might be the case for Güceyman Triconch, but without further investigation it is unclear. The two churches constructed of mortar and rubble are both phases of Aperlae Subscribed Triconch Church. The only other triconch church that was constructed using mortar and rubble is the Korba Internal Triconch Church, where the second phase remodelling reuses the ashlars from the original church, along with mortar and rubble. The remaining six churches with recorded construction techniques were built of either ashlars alone (West Asarcık, Devekuyusu, Dikmen, and Korba Triconch Basilica) or a
combination of ashlars and cut rock (Alacahisar). The single triconch church constructed of ashlars from Hills, the Korba Triconch Basilica, accounts for 25% of the total churches constructed of ashlars in Hills, while the three ashlar churches in Alaca account for 33.3% of the total churches with ashlar construction in Alaca. Together, these four triconch ashlar churches make up 26.7% of the total churches constructed of ashlars across the whole of Central Lycia. Additionally, the Alacahisar church accounts for 20% of the total dataset (five churches) of churches constructed of a combination of ashlars and cut rock.

![Graph](image)

**Fig. IV.44:** Point plot of churches with a triconch apse (x) by nave area (y), with the construction type indicated by fill.

When the construction techniques of the triconch churches is plotted by nave area, it is clear that there is a correlation between triconch churches constructed of ashlar, or ashlar and cut rock, and a larger nave area. There is also a correlation between the use of mortar and rubble, or reused ashlars and mortar and rubble, and a smaller nave area. As discussed above (Section IV.ii.h), there is no recorded nave area for Güceyman Triconch or Dikmen, but at least for Dikmen, which is constructed of ashlar masonry (Fig.
I have estimated the nave area to be c. 150m² to 200m² (Section IV.ii.h), which would make the nave area c.50m² larger than Phase 1 of Aperlae Subscribed Triconch Church.

**IV.iii.d External Apse Shape**

Churches that are constructed of mortar and rubble and have an externally round apse account for 38.2% of the total churches in Central Lycia (Fig. IV.45). No other combination of construction technique and external apse shape come close to this. The second most common combination of construction technique and external apse shape are churches with mortar and rubble construction and an externally three-sided apse (6.8%). Externally round apses are present across every single construction technique, as well as being the most common apse shape overall (Fig IV.11). Churches with externally three-sided apses are found across six of the eight construction techniques, only absent from mortar and rubble and cut rock, and reused ashlar and mortar and rubble.
Churches with a squared-off triconch apse are only constructed of ashlar and as is seen in Fig. IV.12, are only present in Alaca (Fig IV.12). All five churches with rock-cut apses are constructed of either ashlar and cut rock, or mortar and rubble and cut rock. Externally flat and externally square apses are relatively uncommon (see Section IV.i.a.8) and are both distributed across only three construction techniques. Externally flat apses are present at two churches constructed of ashlar, one church constructed with an ashlar apse and mortar and rubble nave, and six churches constructed of mortar and rubble. Externally square apses are present at one church constructed of ashlar, one church constructed of a combination of ashlar and cut rock, and three churches built of mortar and rubble. In both cases, the majority of churches are still constructed of mortar and rubble, the most common construction technique. Except for ashlar constructed Arneai Church C in Plains, all fourteen of the churches with externally flat or square apses are in Hills or Alaca.
Fig IV.46: Bar plot of construction technique (x) in comparison to number of aisles (y)

Across Central Lycia (Fig. IV.46), churches of every construction technique, except for reused ashlar and mortar and rubble, have both three aisles and one aisle. All seven churches constructed of reused ashlar and mortar and rubble have only a single aisle. Both two-aisled churches are constructed of mortar and rubble. For churches constructed using three techniques, the majority of churches have a single aisle: ashlar with mortar and rubble and cut rock (3 of 4 churches, 75%), mortar and rubble with bricks (8 of 11 churches, 72.73%), and mortar and rubble (63 of 91 churches, 69.23%). For churches constructed using the remaining four techniques, the majority of churches have three aisles: ashlar (12 of 15 churches 80%), ashlar and cut rock (3 of 5 churches 60%), ashlar with mortar and rubble (12 of 19 churches 63.16%), and mortar and rubble and cut rock (4 of 5 churches 80%). Still, the largest percentage of churches with three aisles are constructed of mortar and rubble (25 of 16 churches, 41%).
IV.iv Synthronon Results

This Section covers the results of the EDA relating to the presence of a synthronon that has not been covered by previous sections. It is broken down as follows: Atrium (IV.iv.a), Carved Decoration (IV.iv.b), Narthex (IV.iv.c), Subsidiary Chapels (IV.iv.d), Funerary Monuments (IV.iv.e), and finally Apse Shape (IV.iv.f).

IV.iv.a Atrium

Fig. IV.47: Bar plot showing absence or presence of a synthronon (x-axis) in comparison with presence of an atrium (fill).

Out of the 19 churches with synthronon, five have an atrium, ten do not have an atrium, and at four sites the absence or presence of an atrium is unknown (Fig. IV.47). The five churches that have both a synthronon and atrium are: East Asarcık and Günağı in Alaca, the Iştıada Basilica in Hills, and Andriake Church B and Myra Nicholas in Plains. Churches with the presence of both a synthronon and an atrium make up 23.8% of the atrium subset, and 26.3% of the synthronon dataset.
IV.iv.b Carved Decoration

Ten of the churches with a synthronon have original carved decoration, five have re-used decoration, and four have no carved decoration (Fig. IV.48). The four churches with no evidence of carved decoration are: Andriake Church A, Büyük Avaşar Church 2 LXII, Sura Valley, and Tristomon Harbour Basilica. In the case of Tristomon Harbour Basilica, it is likely that any visible carved decoration has been removed by the modern villagers of Üçağız. The four churches with reused carved decoration have reused architectural carvings from the early Christian period. At Settlement LXXIX Çürüt, however, the reused architectural carving is an ionic volute, which is likely to be from a pre-Christian structure (Altripp 2010e, 334). As can be seen in Figure IV.46, there is a clear correlation between presence of original

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Carved decoration potentially from around the 6th century can be found decorating the roundabout in the centre of Üçağız.
or re-used carved decoration and the presence of a synthronon, considering that the majority of the churches in the Central Lycia dataset do not have carved decoration of any kind (61.52%, 108 churches). In total, the churches with synthronons make up 26.79% (15 churches) of the total set of churches with either original or reused carved decoration.

When broken down by region, there are some discernible differences in the distribution of original and reused carved decoration presence (Fig. IV.49). All of the churches with synthronons in Alaca have carved decoration. Alaca has the highest percentage of churches with carved decoration (60.61%, 20 churches) across the Central Lycia dataset. In Hills, the majority (80%, 8 churches) of churches with a synthronon have either original or reused carved decoration. As 22.77% (23 churches) of churches in the region of Hills as a whole have carved decoration, the proportion of churches with carved decoration and a synthronon indicates there is a significant correlation between the two traits. In Plains, two of the four churches with a synthronon

Fig. IV.49: Bar plot showing absence or presence of a synthronon (x-axis) in comparison with presence of carved decoration (fill) faceted by region.
have original carved decoration, and two have no architectural carvings. Plains is the only region where none of the churches with a synthronon have re-used decoration. The amount of churches with carved decoration in Plains is closer to that of Hills at 28.57% (8 churches). As this is a relatively small subset, and as the synthronon subset for Plains is divided in half by absence or presence of carved decoration, there is no discernible pattern or relationship between the two traits in Plains.

**IV.iv.c Narthex**

![Fig. IV.50: Bar plot showing absence or presence of a synthronon (x-axis) in comparison with presence of a narthex (fill) faceted by region.](image)

Of the 19 churches with a synthronon, seven have a narthex, nine do not have a narthex, and at three sites, the absence or presence of a narthex is unknown (Fig. IV.50). In Alaca, the two churches with narthex and a synthronon are the internal churches, Dikmen Internal Church and Yılanbaşı Internal Church. In Hills, the only churches that have a narthex are phases 1 and 2 of Kekova North Great Church. The majority of churches with both a
A narthex and a synthronon are in Plains: Andriake Church A, Myra Nicholas, and Sura Valley. The only church with a synthronon that does not have a narthex in Plains is Andriake Church B.

**IV.iv.d Subsidiary Chapels**

![Bar plot showing presence of synthronon (x) in comparison to absence or presence of subsidiary chapels, faceted by region.](image)

*Fig. IV.51: Bar plot showing presence of synthronon (x) in comparison to absence or presence of subsidiary chapels, faceted by region.*

Of the 19 churches with a synthronon, eight have a subsidiary chapel, ten do not have any subsidiary chapel, and the absence or presence of a subsidiary chapel is unclear at a single church (Fig. IV.51). While there are nine churches in Alaca with a subsidiary chapel, none of the churches with a synthronon have a subsidiary chapel. In Plains, all four churches with a synthronon have a subsidiary chapel, though there are 15 additional churches in the region that have subsidiary chapels. In Hills, only four of the 10 churches with a synthronon also have a subsidiary chapel. This makes up 21.1% of the total number of churches in Hills with subsidiary chapels, so while there may be some correlation between the two traits, the relationship is not especially clear. Due to the disparity in the results of this exploratory
analysis, it is worth considering the relationship between these two traits across the three sub-regions, it is worth considering how these two traits might relate to other cultural traits discussed above.

The five churches that have both a synthronon and a subsidiary chapel all have areas over 150m\(^2\), which is above the median of the Central Lycia nave area dataset (51.84m\(^2\)) as well as the mean of that dataset (115.35m\(^2\)), indicating that these churches are have a larger nave area in comparison with the overall dataset (Fig IV.52). However, a further five churches that have a synthronon, but do not have a subsidiary chapel, also fall into this set of churches with a comparatively large area. This indicates that among the synthronon subset, larger area does not necessarily indicate the presence of a subsidiary chapel; this differs from the analysis for the whole nave area dataset, where the presence of a subsidiary chapel on average correlates with a larger nave area (Section IV.ii.e). Across both subsets, though, the smaller the church, the less likely it is to have a subsidiary chapel.

Fig. IV.52: Point plot for all churches with a synthronon and area (y), showing absence or presence of subsidiary chapels (colour). Points located on '0' do not have a recorded nave area.
Additionally, the complete absence of subsidiary chapels from Alaca, in comparison to the complete presence of subsidiary chapels in Plains, the region that is geographically closest to Alaca, could be an indication of regional differences.

**IV.iv.e Funerary Monuments**

Across all three regions, the presence of a synthronon does not directly correlate with the presence of funerary monuments. Only three of the 19 churches have funerary monuments either within the church (Myra Nicholas in Plains) or within close proximity to the structure (Istlada Basilica and Tristomon Harbour Basilica in Hills). None of the churches in Alaca with a synthronon have funerary monuments (Fig. IV.53). The Lycian sarcophagi to the south of the Istlada Basilica pre-date the basilica Marksteiner & Niewöhner 2004, 45). This is likely to be the case with the Tristomon Harbour Basilica as well, where there are Lycian sarcophagi to the east of the east
end of the north aisle, as well as further east of the structure. These are not discussed in the TIB entry (Hellenkemper & Hild 2004, 896), but can be seen in the plan of the site (Marksteiner 2010, 117), and in photographs taken by the author in 2014 (Fig. B.25). The only other church in Plains that has any relationship with funerary monuments is Arneai Church C. Arneai Church C is outside the Arneai city walls and surrounded by a number of sarcophagi which are referred to as 'late antique' by Hellenkemper and Hild (2004, 454) and 'late' by Grossman and Severin (2003, 114), indicating that like the Myra Nicholas church, and unlike the churches in Hills, they too are from the Early Christian period.

IV.iv.f Apse Shape

![Graph showing apse shape](image)

*Fig. IV.54: Bar plot showing absence or presence of a synthronon (x-axis) in comparison with external apse shape (fill) faceted by region.*

Nine of the churches with a synthronon have externally round apses, three have externally three-sided apses, three have externally square apses, two have an externally flat apse, and two have apses that are carved out of pre-existing rock formations (Fig. IV.54). None of the churches with a synthronon
have a squared-off triconch apse or an externally tri-conched apse. The majority of churches, both across the whole dataset (see Section IV.i.a.5) and within the synthronon subset, have externally round apses.

Churches with synthronons account for 9.7% (9 churches) of the 93 churches with an externally round apse, 12.5% (3 churches) of the 24 churches with an externally three-sided apse, 75% (3 churches) of the four churches originally built with an externally square apse, 22.2% (2 churches) of the nine churches with an externally flat apse, and 33.3% (2 churches) of the six churches with a rock-cut apse. In both Hills and Plains, the majority of churches with a synthronon have externally round apses. In Plains, the only church with a synthronon without an externally round apse is the Myra Nicholas church, which has an externally three-sided apse. There are only two churches with both a synthronon and an externally flat apse are in Alaca: Yılanbaşı Basilica and Yılanbaşı Internal Church, which retains the apse from the first phase of construction (see Fig. A.69). Churches with a synthronon and an externally square apse only appear in Alaca and Hills, as there are no churches with externally square apses in the entire Plains region (see Section IV.i.h).

Churches with synthronons make up the largest percentage of externally square apses. The three churches with both a synthronon and an externally square apse are East Asarcık and Günağı in Alaca, and Settlement LXXIX Çürüt in Hills. The other two churches with externally square apses that do not have a synthronon are the second phase of Aperlae Subscribed Triconch Church, where a rectangular structure is added to the externally tri-conched apse to support the structure (Fig. A.14), and Kekova North Port Church, the smallest church in the North Settlement of Kekova.
IV.v Triconch Results

This Section covers the results of the EDA carried out in relation to the presence of a triconch apse that has not been covered by previous sections. It is broken down as follows: Atrium (IV.v.a), Carved Decoration (IV.v.b), Subsidiary Chapels (IV.v.c), Apse Shape (IV.v.d).

In Central Lycia there are a total of nine churches (Fig IV.10) that have a triconch apse: Alacahısar (Fig. A.2), Aperlae Subscribed Triconch Church Phase 1 (Fig. A.13), Aperlae Subscribed Triconch Church Phase 2 (Fig. A.14), West Asarcık (Fig. A.22), Devekuyusu (Fig. A.31), Dikmen (Fig. A.32), Güceyman Triconch (Fig. A.34), Korba Triconch Basilica (Fig. A.45), and Korba Internal Triconch Church (Fig. A.45). Two of those sites, Aperlae Subscribed Triconch Church Phase 2 and Korba Internal Triconch Church are internal churches rebuilt into the earlier structure. The five triconch churches in Alaca all conform to the traditional definition of a triconch church, while Korba and the Aperlae Subscribed Triconch are modified triconch churches, though their apses are ‘modified’ in different manners from each other (see Section III.ii.a.2 for more discussion about the ‘traditional’ triconch versus the ‘modified’ triconch).

So far, the majority of the features analysed have occurred in all three of the sub-regions, but there is an absence of churches with triconch apses in Plains. The only church that has previously been argued to have a modified triconch apse similar to Korba is Çamarkası (Fig. A.27), though as discussed in Section III.i.c, the plan by Grossman and Severin (2003) is too hypothetical to include. There are, however, two triconch chapels in Plains: the triconch chapel at Andriake Church A (Fig. A.6), and the modified triconch chapel at Andriake Church B (Fig. A.7). The potential purpose of these structures, and their relationship to the triconch churches discussed in this section, will be considered in more detail in Section VIII.iii.
IV.v.a Atrium

Fig IV.55: Point plot of churches with a triconch apse (x), separated by region (y), with the absence or presence of an atrium indicated by fill.

There are only three churches with triconch apses that have an atrium: Alacahisar, West Asarcik, and Devekuyusu, all of which are in Alaca (Fig. IV.55). At the two other triconch churches in Alaca, Dikmen and the Güceyman Triconch, it is not entirely clear whether or not there could have been an atrium present at the church. When considering the plan in relationship to the Güceyman Basilica (both in Fig. A.34), it is unlikely that there would have been space for an atrium on the Güceyman Triconch, especially considering that Güceyman Basilica already has an atrium. While there is not an obvious relationship between the presence of an atrium and a triconch apse, it is still notable that the three churches with the presence of both traits are in Alaca. These three churches, Alacahisar, Devekuyusu, and West Asarcik, make up 27.3% of the total churches with atria in Alaca (11 churches). These three triconch churches are also the most similar in terms of architectural design and trait presence of the nine triconch churches.
relationship between these three churches will be further considered below (Section V.iv.a.3).

IV.v.b Carved Decoration

![Diagram](image)

Fig. IV.5: Point plot of churches with a triconch apse (x), separated by region (y), with the absence or presence of carved decoration indicated by fill.

Of the triconch subset, five of the churches have original carved decoration, one has re-used carved decoration and three of the churches have neither original nor re-used carved decoration (Fig. IV.56). The only potential evidence of any architectural decoration at Aperlae Subscribed Triconch Church are the two undecorated column drums left in situ underwater at the site (Hohlfelder & Vann 1999, 211). As the structure is inundated and only the ground plan remains, it is possible that some architectural decoration has been lost. Of the churches at Aperlae, the only one with any extant carved decoration is Aperlae Lower Church, which may indicate that carved decoration was not a common feature for churches in Aperlae. As mentioned above, the remains of the Güceyman Triconch church are so deeply buried that only the internal cupola of the north conch, and the corner of the south
conch are visible (Grossman & Severin 2003, 113). It is, however, worth noting that on Güceyman Tepesi Grossman and Severin (2003, see Fig. B.26) identified four fragments of architectural carvings, which they suggested came from the Güceyman Basilica. The presence of these architectural carvings may suggest that the whole complex is decorated with carved decoration. However, without excavation, it is impossible to say whether or not the Güceyman Triconch specifically was decorated with architectural carvings, so for this study, it has to be classified as ‘absence’. Korba Internal Triconch Church is classified as having ‘reused’ caved decoration as the second phase of the church includes fragments of the original structure that have carved decoration, such as the barrier screen (Altripp 2006, 81). Though the absence or presence of carved decoration is not clear at three of the sites, there is still a visible relationship between triconch churches and carved decoration.

There has not been much discussion in scholarship about the relationship between the presence of an atrium at churches with triconch apses, however, as seen above (Sections IV.i.b.1 & IV.ii.b-c), there is a correlation between churches with larger nave areas, and the presence of both carved decoration and an atrium. Triconch churches on average have larger nave areas (IV.ii.h), and as seen here, there is also a correlation between triconch churches and carved decoration, so the relationship between triconch churches and the presence of an atrium should also be considered.

**IV.ii.c Subsidiary Chapels**

Of the nine churches with triconch apses, six churches have a subsidiary chapel and three do not (Fig. IV.57). Two of the three churches without a subsidiary chapel are both phases of the Aperlae Subscribed Triconch Church. As with many other aspects of the Güceyman Triconch, the level of the soil makes it impossible to determine the absence or presence of a subsidiary chapel, so at present it has been classified as absence. Both
phases of the Korba triconch church have a subsidiary chapel with an internally and externally semi-circular apse that is accessible through an entrance in the apex of the south conch. The chapel was built in the first phase of construction, but importantly it is still accessible in the second phase.

Fig. IV.57: Point plot of churches with a triconch apse (x), separated by region (y), with the absence or presence of a subsidiary chapel indicated by fill.

The chapel at Alacahisar, which has an apse that is internally semi-circular and rectangular on the outside, is accessed from a doorway in the north conch (Fig. A.2). There are three chapels at West Asarcık. The first, a baptistery that is shaped similarly to the subsidiary chapel at Alacahisar, is off the north conch, where the two funerary chapels, of which the northernmost is earlier, are accessed from the southern aisle before the triconch apse (Fig. A.22). At Devekuyusu the chapel, itself a triconch, is located off of the north conch of the main church (Fig. A.31). Finally, the chapel at Dikmen, which has an apse that is semi-circular both internally and externally, is accessed from the south aisle (Fig. A.32), similarly to Korba. The north conch chapels at Alacahisar and West Asarcık are distinctly similar
in design and construction. For example, the area of the Alacahisar north conch chapel, without the apse, is 65.82m², and the West Asarcik north conch baptistery chapel area is 79.26m². As the exploratory analysis has indicated, not only is there a visible relationship between churches with triconch apses and the presence of subsidiary chapels, there is also a relationship between the triconch apse and the specific choice of location for the subsidiary chapel off of either the north or south conch of the triconch.

**IV.i.d External Apse Shape**

*Fig. IV.58: Point plot of churches with a triconch apse (x), separated by region (y), with the external apse shape indicated by fill.*

While the *internal* apse shape is that of a triconch, it is worth noting that the external apse shape does vary, even with such a small sample size (Fig IV.58). Alacahisar is the only church with a rock-cut apse, though, as can be seen on the plan (Fig. A.2), the south and east conches have been carved out so that they are mostly free of the pre-existing rock formation, thus creating a squared-off triconch shape. A rectangular structure, built to the east of the Aperlae Subscribed Triconch it’s the second phase, is most likely
a supporting edifice (Hohlfelder and Vann 1999, 211). As with the Alacahisar, this is another example of the external apse shape not fitting within the specified traits. This difficulty with classification marks these churches out as distinct, and thus will be considered in any interpretation (Chapters V & VII).

At the Korba Triconch Basilica the three individual apses are all externally three-sided. In the second phase, the eastern apse is rebuilt to an externally round shape, using mortar and rubble along with ashlars (Altripp 2006, 81). The external apse shape of Dikmen could not be determined as the external shell of the structure is not preserved (see Fig. A.32). Within Central Lycia, there is not one distinct external apse shape for a triconch church.
V. DISCUSSION OF EXPLORATORY DATA ANALYSIS

Below is a discussion of the results of the Exploratory Data Analysis (EDA), broken down into sub-sections by research question. The first section covers the evidence for Regional Variation (V.i) as interpreted from the EDA. This covers the results from Sections IV.i – iii. The second section concerns the Synthronon trait (V.i), and provides a discussion of the results pertaining to synthronons from Sections IV.i-iv. The third section is a discussion of the Triconch Churches (V.iii), and discusses the results laid out in Sections IV.i-iii and IV.v. Lastly, the section on Initial Findings (V.iv) considers how the above analysis relates to previous scholarship on St Nicholas of Holy Sion, as well as potential evidence in the EDA results for temporal change, before finally considering how to carry out the Nearest Neighbour Analysis (Chapter VI) with all of this analysis in mind.

V.i Regional Variation

This section provides a discussion of the results of the EDA as they pertain to research question one, ‘Are there different patterns in church building between the three sub-regions of Central Lycia?’ (Section I.iv). I first discuss Nave Area Distribution (V.i.a), before considering the evidence for sub-regional variation as it relates to the Absence Presence traits (V.i.b) and Categorical Traits (V.i.c). The absence presence section is organised as follows: Atrium (V.i.b.1), Carved Decoration (V.i.b.2), Narthex (V.i.b.3), Subsidiary Chapels (V.i.b.4), and finally, Funerary Monuments (V.i.b.5). And the categorical traits section is broken down into: External Apse Shape (V.i.c.1), Construction Technique (V.i.c.2), and Number of Aisles (V.i.c.3). Overall, it is clear that there are indeed regional variations between the churches in the Alaca Mountain, the Upland Hills, and the Coastal Plains. The churches on the Alaca Mountain often stand out from the other two
regions, due to their concentration of certain construction techniques (ashlar, ashlar and cut rock), the presence of the triconch church, and the presence of carved decoration and subsidiary chapels. Additionally, certain apse shapes that are common in the other two regions (round, three-sided) are not found as regularly in Alaca. The churches from the Upland Hills region are also associated with certain traits over the other two regions (funerary monuments). Hills also has the highest concentration of single aisle churches, as well as the only two two-aisled churches. The churches in Hills constructed of mortar and rubble account for a higher proportion than in the other two regions as well. And finally, in the Coastal Plains sub-region, there are a higher proportion of both narthexes and churches constructed of ashlar and mortar and rubble than in the other two regions.

V.i.a Nave Area Distribution

The nave areas of the 22 churches in Alaca are distributed in a bimodal manner (Fig. IV.17). The 78 churches in Hills with recorded nave areas have both the lowest nave area of the whole dataset (İnişdibi Phase 1: 4.07m², Fig. A.40), and the highest nave area of the whole dataset (Tristomon Farmhouse Basilica: 487.17m², Fig. A.67), as well as having the largest number of churches with relatively small nave areas (Fig. IV.17). This is likely to be due at least in part to the intensive survey in the region (see Section III.i.h.2 for intensity bias). The 26 churches in Plains have a similar distribution to the other two sub-regions, though the church with the smallest nave area in the Plains subset (Myra Castle: 15m²), has a larger nave area compared to the other two regional subsets. Plains also has the largest median nave area of all three regions (Fig. IV.19). The above mentioned (Section IV.i.b.1, also see Fig. IV.18) subset of six churches with larger widths than the average churches in Central Lycia are all internal churches. Unlike the free-standing internal churches, however, these are all second phases wherein a three-aisle church has been narrowed to a single-aisle church by
the walling off of the aisles, thus creating a church with a relatively long length and short width in comparison to the overall dataset.

V.i.b Absence Presence Traits

V.i.b.1 Atrium

There are proportionally less churches in Hills with atria than the other two sub-regions. There is also a clear correlation between the presence of an atrium and a larger nave area. In the plot showing the relationship between nave area and presence of an atrium (Fig. IV.19), the single outlier below the graph in the Alaca presence plot is East Asarcık Internal Church, which has a nave area 10.5 m². In this instance (Fig. A.21), the internal church is built into the nave of the earlier church such that it abuts the western wall of the earlier church. Due to this design choice, the entrance to the single-aisled East Asarcık Internal Church is what would have been the entrance to the nave of the earlier church, which would have required churchgoers to enter through the atrium of the earlier church. In the Hills absence plot, there are seven outliers above the graph. Based on nave area alone, these seven churches would be expected to have an atrium, but do not. In the case of three churches, Aperlae Upper Church Phase I, Kekova North Basilica, and Kyaneai Church E Basilica, pre-existing structures from before the Christian period would have constrained the building space available to the west of these churches, which may indicate that the lack of atrium was a purely pragmatic choice. Notably, Andriake Church D (Fig. A.9) has the second largest recorded nave area, as well has having an atrium with a peristyle and cistern, a feature that appears in churches from the reign of Constantine onwards (Krautheimer 1986, 517 and Stewart 2019, 136).

V.i.b.2 Carved Decoration

The largest percentage of churches (42.9%, 15 churches) with the presence of original carved decoration are in Alaca (Fig. IV.2). In terms of count, there
are a similar number of churches with both original and reused carved decoration in both Alaca and Hills. Proportionally, however, Hills has the smallest number of churches with original or reused carved decoration. In all three regions, the larger the church, the more likely it is to have original carved decoration (Fig. IV.20). This is exceptionally clear in both Alaca and Plains, but even in Hills, where the whiskers of the box plot extend farther in both directions, the median nave area is about the same as Alaca. The boxplot suggests that there is indeed a correlation between larger area and presence of original carved decoration. The five churches in Alaca with the presence of reused carved decoration are all internal churches. The bimodal distribution of their nave areas corresponds to the style of internal church; both Alakilise Internal Church and West Asarcık Internal Church have been remodelled within the original plan, while the other three are single-aisled freestanding structures built within the nave of the earlier church on that site. The single church with re-used carved decoration in Plains, the Dereağzı Church has an accepted date of late 9th to early 10th century (Morganstern 1983, 89). Architectural carvings in the style found in Central Lycia, especially in Alaca, are often an indication of both the significant cost of the building and the importance of the donor or associated saint (Niewöhner 2017b).

Even though the sample size is low, the total of churches with both an atrium and either original or re-used carved decoration is twice the size of those with an atrium and no carved decoration. In summary, there does there appears to be a correlation between churches that have atria and the presence of carved decoration, though not all churches with carved decoration have an atrium.

The results of the exploratory analysis on construction technique in comparison to absence or presence of carved decoration indicated that there was a relationship between both ashlar and ashlar and cut rock masonry and the presence of carved decoration (Fig. IV.38). The largest percentage of churches (64.7%, 11 churches) with the presence of reused carved
decoration are in Hills (Fig. IV.2). Reused decoration only appears at churches constructed of mortar and rubble, mortar and rubble with brick inclusions, or reused ashlar and mortar and rubble (Fig. IV.38). These churches with reused carved decoration might make up only 16.5% of the churches constructed of mortar and rubble, but the correlation between mortar and rubble construction and reused carved decoration is still visibly clear. Even though these three construction techniques are slightly different, it is notable that all three techniques use mortar and rubble as their main materials, as well as that reuse of carved decoration does not occur at any church with original ashlar masonry.

V.i.b.3 Narthex

Although the highest number of churches with the presence of a narthex are in Hills, the highest proportion of churches with narthexes by region is in Plains (11 churches, 39.3%), while in Hills and Alaca, the proportion of churches with narthexes makes up less than 25% of the subset (Fig. IV.4). The difference in the proportional presence of narthexes across the three regions, where Plains has proportionally the highest number of churches with narthexes (Section IV.i.a.3) suggests that there might have been different building traditions in Plains. Also notable is the relationship between the narthex and atrium trait in Hills, where no single church has both traits. This could indicate a difference in transmission patterns either geographically or temporally.

In the Alaca presence plot (Fig. IV.22), there are only two churches in the larger nave area cluster: Alakalise and Alakilise Internal Church (Fig. A.3), the latter of which is the rebuild and re-dedication in 812 of the former (Harrison 1963, 126). If the Alakilise churches are considered outliers, then the average nave area of churches with narthexes in Alaca is comparatively small for the region as a whole. Churches with narthexes in Hills have a larger overall nave area than churches with narthexes in Alaca, as well as
churches without the presence of a narthex in Hills, however, in comparison to the overall dataset, the median nave area for this subset is still relatively low (median = 57.6m$^2$). Still, as with the results of the distribution, the results of the nave area in comparison to known narthexes shows similar patterns in both Alaca and Hills, where the presence of a narthex is associated with a smaller nave area. In Plains, however, churches with narthexes are associated with a larger nave area (Fig. IV.22). As indicated by the boxplot for narthex presence in Plains in Figure IV.22, the median nave area for this subset is noticeably higher than the other presence boxplots (median = 184.88m$^2$). This once again suggests a difference in building tradition in Plains, as the churches with narthexes on average are not only a larger percentage of the churches in the sub region, but also on average larger churches than in the other two regions. In Hills, the narthex churches have an overall lower area, with the median nave area being c. 80m$^2$, though this is higher than the median nave area of the narthex absence plot, which is 41.46m$^2$. The median nave area of the Hills presence plot would also still be higher than the median for the Alaca presence plot if the two Alakilise churches are removed. In Plains, the majority of the churches with a narthex have a relatively large nave area overall, and especially in relationship to the data from the other two regions.

V.i.b.4 Subsidiary Chapels

Churches with subsidiary chapels are much more common in Alaca and Plains, where they make up about 1/3 of the churches in each region. On average, churches with subsidiary chapels have larger areas, even though the pattern is less distinct in Hills and Alaca than in Plains. The outlier in the already long Plains absence plot (Fig. IV.23) is Andriake Church D, which has already been singled out in the exploratory analysis due to its large nave area (see Section IV.ii.a.2.i). The presence of subsidiary chapels is more noteworthy when compared to the absence or presence of other specific
architectural traits, such as synthronons (IV.ii.b.3) and triconch apses (IV.ii.c.3), which will be discussed below.

V.i.b.5 Funerary Monuments

There is a clear relationship between the presence of funerary monuments and the Hills region, as 90% of the total subset of churches with funerary monuments are in Hills. Churches with funerary monuments also make up almost 20% of the total churches in Hills, which is notably more than any other absence presence trait. Additionally, the nave areas of churches with funerary monuments in Hills are significantly more diverse than those in Alaca and Plains. While the sample size is low, the median nave areas for churches with funerary monuments in Alaca and Plains being so close indicates that these two sub-regions have similar learned traditions around the construction of funerary monuments at churches with larger nave areas. In Hills, there is a different tradition associated with funerary monuments, as they are present at churches spanning across nave areas. The subset of four churches with nave areas around c. 400m², which account for the second to fifth largest nave areas recorded in Hills, were all built at pre-Christian urban centres (Istlada, Tristomon, Kyaneai, and Aperlae), which also have pre-Christian necropoli. Often, the first churches at a pre-existing urban centres were built within or next to a necropolis, which is likely the case at these four cities, as well as others within the dataset. This highlights another issue with this cultural trait: the presence of funerary monuments has been decided based on the presence of a nearby sarcophagus (III.i.b.7). This definition does not take into account the Lycian tradition of cut-rock graves, which often appear on sheer rock faces nearby settlements. For example, the majority of rock-cut graves around Myra are found in the Demre gorge, running from near the city to the Kasaba valley. In summary, while this cultural trait does provide some evidence of regional variation, the way of defining funerary monument presence may need to be reconsidered for future studies.
V.i.c Categorical traits

V.i.c.1 External Apse Shape

There are less visible regional distinctions apparent in the external apse shape distribution. The most common external apse shape is the externally round apse, followed by the externally three-sided apse, though it is worth noting the only churches with externally three-sided apses in Alaca are both phases of Alakilise. This marks Alakilise and Alakilise internal churches out as distinct from the rest of Alaca, and also indicates a break in architectural styles between Alaca and the other two regions. Alaca also has the lowest number of externally round apses, as well as having the only squared-off triconch apses. While these results seem to indicate that the apses in Alaca were built based on differing traditions than both Hills and Plains, the pattern for externally flat apses in comparison to nave area indicates that this is not always the case. In Alaca and Plains, churches with flat apses have larger nave areas, while in Hills they have smaller nave areas. In both instances, the patterns for Alaca and Hills differ the most. Overall, a larger nave area correlates with both the externally three-sided apse, and the squared-off triconch apse, while a smaller nave area correlates with an externally round apse. These results suggest that some of the perceived relationship between the externally round, and externally three-sided apses and period of construction (see Section III.i.c.3) may not be accurate. Across the dataset, ashlar is a comparatively rare method of construction, except for in Alaca, where the construction technique makes up almost half of the region’s churches. In both Hills and Plains, mortar and rubble constructions make up an overwhelming majority of sites, while in Alaca this construction technique is only a small majority. There are also more than twice as many churches with ashlar apses and mortar and rubble naves in Plains than in Alaca and Hills.
The distribution of the externally three-sided apse shape across six of the eight construction techniques suggests that there is not a relationship between this apse shape and construction technique (Fig. IV.43). In the instance of the squared-off triconch apse, there is a correlation between ashlar construction technique, external apse shape, and the Alaca region. The other external apse shape that directly correlates with any construction techniques is the rock-cut apse. All of the churches with a rock-cut apse are constructed of either ashlar and cut rock, or mortar and rubble and cut rock. These two construction techniques also each correlate with a region (Fig. IV.12); churches constructed of ashlar and cut rock with rock-cut apses are only found in Alaca, and churches constructed of ashlar and mortar and rubble with rock-cut apses are only found in Hills.

While there is a clear relationship between externally round apses and mortar and rubble construction, the externally round apse is still distributed across all construction techniques and regions. Externally three-sided apses are also distributed across the majority of construction techniques and in this instance, do not directly correlate with any of those construction techniques or to any regions. There are, however, correlations between many of the apses and construction techniques that make up a relatively small portion of the dataset, such as the squared-off triconch and ashlar construction in Alaca, and rock-cut apses with mortar and rubble and cut rock construction in Plains.

V.i.c.2 Construction Technique

In Central Lycia, the most common construction technique is mortar and rubble, which accounts for over half of the churches (Fig. IV.13). The majority of the mortar and rubble churches are located in Hills (Fig. IV.14), where there is a clear association between this construction technique and a smaller nave area (Fig. IV.35). The proportion of churches that are built of either ashlar masonry, or a combination of ashlar and cut rock masonry are the highest in Alaca. The use of either of these construction techniques is
uncommon in Central Lycia, except for in Alaca. In Plains, churches constructed of mortar and rubble and ashlar masonry, where the ashlers are employed for the construction of the apse, make up 25% of the churches (Fig. IV.14). This is a higher proportion than in the other two regions, where churches constructed of a combination of mortar and rubble and ashlar masonry make up c. 9% of the churches both Alaca and Plains. The only two churches constructed of ashlar or ashlar and cut rock in Plains are Arneai Church C and Çamarkası. Both are located on the east end of the Kasaba valley, slightly up the south slope of Ernez mountain and thus geographically removed from the majority of churches in Plains.

With such a small number of churches constructed of a combination of mortar and rubble and cut rock, it is difficult to draw any concrete conclusions. However, it is worth noting that the three churches with larger nave areas would all fall in the upper whisker of the mortar and rubble plot, and that the two churches with comparatively lower nave areas would fall within the upper quartile of the box of the mortar and rubble plot (Fig. IV.33). This indicates that the churches with mortar and rubble and cut rock construction are indeed different from those with just mortar and rubble construction; on average, they have a comparatively higher nave area.

There are only four churches constructed of ashlar, mortar and rubble, and cut rock, all of which are found in Hills. They are: Kekova North Basilica, Kekova North Basilica Internal Church, where the second phase retains the original apse (Aslan & Kılıç 2016, 33), Kyaneai Church F (Altripp 2010d, 306), and Kyaneai Church G (Altripp 2010d, 307), where the two Kyaneai churches are actually partially constructed of re-used ashlar rather than originals. In the case of both phases of Kekova North Basilica, the apse is constructed of ashlar, while the rest of the structure is predominantly mortar and rubble. The Kekova North Basilica is unique within the dataset for having an ashlar apse, and a nave constructed of both mortar and rubble and, in the southern aisle, construction out of the cut natural rock (Aslan & Kılıç 2016,
Perhaps this church and internal church should be considered as part of the subset of churches with an ashlar apse and a mortar and rubble nave. The same goes for the two Kyaneai churches. While parts of the churches are constructed of cut rock, they share more similarities with the reused ashlar and mortar and rubble churches, as their ashlar blocks are reused (Altripp 2010e, 306-307). When the nave areas of these churches are compared to the box plots for the construction techniques they might better fit within (Fig. IV.33), there is a visible relationship between those nave areas and the churches mentioned above.

In both cases, the rocky nature of the geomorphological feature of the region has led to the need to cut the natural rock formation to form a flat terrace for the construction. On Kekova and at Kyaneai, this was a way of creating a flat terrace within which to construct the church. The two churches in Kyaneai seem to have specific functions within the site, which would have required them to be built at these specific locations; Church F is located directly by two cisterns at a high point of the south end of the city (Altripp 2010d, 307), and Church G is located by the secondary necropolis of Kyaneai, again on a small rise (Altripp 2010d, 308).

Additionally if the bar plot for churches constructed of a combination of ashlar, mortar and rubble, and cut rock, was divided up into the groups suggested in Section IV.ii.a, two churches with externally three-sided apses (Kekova North Basilica and Kekova North Internal Church) would be added to the churches constructed of mortar and rubble with an ashlar apse, which does not disrupt the visible pattern, and the two churches with externally round apses (Kyaneai Churches F and G) would be added to the reused ashlar and mortar and rubble column, where the churches would continue to all have externally round apses.
V.i.c.3 Number of Aisles

Just under 40% of the churches in Central Lycia have three aisles, and just under 60% have a single aisle (Fig IV.15). Proportionally, there are approximately 20% more churches in Alaca and Plains with three aisles than in Hills, but then the Hills region has over 20% more single-aisled churches than the other two regions. There are only two two-aisled churches, both of which are in Hills: Büyük Avaşar Church 3 Double LXII, and Ikizkilise Tepesi LXXVII. Both of the churches with two aisles are ‘double-churches’, as the structures look like two single-aisled churches that share an internal wall. In the case of Ikizkilise Tepesi LXXVII, the church was constructed as a two-aisled church with two apses (Fig. A.38, Altripp 2008, 190), while at Büyük Avaşar Church 3 Double LXII, the North church was added to the south church at a later date, thus creating a two-aisled church (Fig. A.26, Altripp 2008, 179).

As smaller, single-aisled churches are more difficult to locate without comprehensive surveys, the larger number of single-aisled churches in Hills may be explained through intensity bias, as discussed in Section III.i.h.1. There are, however, enough single-aisled churches in both Alaca and Plains to suggest that the pattern of distribution in Hills is different to the other two regions. In Alaca and Plains, the churches are more evenly distributed between one and three aisles. While in Plains the churches are almost evenly split between the two different aisle subsets, this is probably due to the lack of surviving evidence for single-aisled churches in the Demre Plain and Kasaba Valley (see Section III.i.g.2). As can be seen in Fig. IV.44, almost every construction technique is found at churches with one and three aisles. As such, the number of aisles probably does not directly correlate with construction technique. In this case, it is more likely that construction technique is determined by region and nave area than by number of aisles.
When comparing nave area to number of aisles, a distinct pattern emerges. Almost exclusively, single aisle churches have smaller nave areas, and churches with three aisles have larger nave areas (Figs IV.37). The consistency of the median nave areas for each subset when broken down by region is indicative of this strong pattern. Of the seven outliers in the single aisle nave area plot, five are internal churches where the aisles of a three-aisled church have been walled off. This process creates a single aisled church with a nave length that is on average twice as long as the average length width ratio, which provides a good explanation of why these churches show up as outliers on this graph.
V.ii Churches with Synthronons

This section covers the results of the EDA as they pertain to research question two, ‘Do churches with synthronons have a specific, unique function?’ (Section I.iv). First, I provide a discussion of the Distribution and Nave Areas of Churches with Synthronons (V.ii.a), before considering the Absence Presence Traits (V.ii.b) and Categorical Traits (V.ii.c) that both do and do not correlate with Synthronons. The absence presence section is organised as follows: Atrium, Narthex, and Funerary Monuments (V.ii.b.1), Carved Decoration (V.ii.b.2), and finally, Subsidiary Chapels (V.ii.b.3). The categorical traits section is broken down into two sub-sections: External Apse Shape (V.ii.c.1) and Construction Technique (V.ii.c.2). Though there are some traits that do not seem to relate directly to the presence of a synthronon, there is a relationship between the presence of a synthronon and the presence of other conspicuous traits (carved decoration, subsidiary chapels), which mark the churches with synthronons out as distinct. To add to this, the nave areas of churches with synthronons are bimodally distributed within each sub-region, where they make up a similar proportion of churches. These results do mark the synthronon churches out as distinct, which suggests they do have a specific function within the context of Central Lycia.

V.ii.a Distribution and Nave Area of Churches with Synthronons

The similar proportion of churches with synthronons across the sub-regions (Section IV.i.e) may be an indication of purposeful construction. The lower percentage of synthronon churches in Hills (9.9%), in comparison to the 15.2% in Alaca and 14.3% in Plains, can probably be attributed to both intensity and survival bias. The Hills region has been more intensively surveyed, and as such the number of churches recorded in the region overall is higher, which has led to the proportion of churches with synthronons being lower in Hills. In Plains there is a lower archaeological survival rate than the
other two regions, and as such there are a smaller number of churches recorded in the region, which has led to the synthronon churches being a larger proportion of the subset (see Section III.i.h for more discussion on intensity and survival bias). The distribution of nave areas of churches with synthronons, when broken down by sub-region, is also highly consistent in their bimodal distribution (Section IV.ii.f). Once again, this uniformity is notable, as this type of consistent pattern does not exist for any other absence presence data. However, while the previous results for area-based analysis (Section IV.i) often showed clear correlations between the nave area and specific traits (e.g. presence of atria, carved decoration, or subsidiary chapels), the relationship is not as clear with synthronon presence.

V.ii.b Absence Presence Traits

V.ii.b.1 Atrium, Narthex, and Funerary Monuments

It is worth noting which absence presence traits did not correlate with the presence of a synthronon. Considering that over half of the churches with synthronons are in Hills, it might at first seem as though there should be more churches in Hills with both an atrium and a synthronon, however, this discrepancy may be because three of the four churches where absence or presence of an atrium is unknown (Settlement XXVIII by Ürer, Settlement LXXIX Çürüt, and Tristomon Farmhouse Basilica) are in Hills. As churches with both a synthronon and atrium exist across all three regions, and as there is no discernible pattern to their distribution, this is an indication that the correlation may not be between the presence of a synthronon and of an atrium, but rather another trait that was not tested for in the exploratory analysis. The same is likely true for the seven churches with the presence of both a synthronon and a narthex (Section IV.iv.c).

Only three of the 19 churches with the presence of a synthronon also have an association with funerary monuments, and only one of the three churches
have a funerary monument within the church: the Myra Nicholas church. Myra Nicholas has a number of sarcophagi and held the body of St. Nicholas of Myra until it was stolen in the 11th century by pirates from Bari (Harrison 1963, 122). As discussed above (Section V.i.b.5), there are issues with how the funerary monuments trait was defined for this analysis, which have probably affected any analysis of the relationship between these two traits. However, based on this analysis alone, there is no suggested correlation between these two traits.

V.ii.b.2 Carved Decoration

While carved decoration is not present at all 19 churches that have a synthronon, the high proportion of churches with this feature indicates that there is a relationship between the presence of synthronons and this conspicuous trait. Carved decoration is a trait that is associated with a higher level of prestige or funding, as the process of creating these features requires both skilled and time consuming (Harrison 1963, 145). The presence of architectural carvings at these churches, especially in Plains and Hills where they are less common, would have had an impact on churchgoers. Carved decoration could be used as a way of reinforcing the importance of these churches in comparison to other less decorative churches in the region, and could also be an indicator of a church that attracted more patrons. While reused carved decoration may not have been designed specifically for the church it was reused in, the effort required in re-shaping and positioning blocks of reused decoration still marks these churches out as distinct from those with less embellishment.

V.ii.b.3 Subsidiary Chapels

All four of the churches in Plains that have a synthronon also have one or more subsidiary chapels, and in Hills, five of the 10 churches with synthronons have subsidiary chapels. In Alaca, however, none of the churches with synthronons have subsidiary chapels. Proportionally, the Alaca
sub-region has a similar amount of churches with subsidiary chapels to the other two regions, which makes the lack of subsidiary chapels at churches with synthronons stand out.

On average, synthronon churches with larger nave areas are more likely to have subsidiary chapels, and churches with smaller nave areas correlate with the absence of subsidiary chapels (Section IV.iv.d). This is the same pattern as the overall dataset (see Results IV.i.e), though the signal for this correlation between larger churches and presence of subsidiary chapels is less compelling for the synthronon subset, probably due the lack of any subsidiary chapels at synthronon churches in Alaca.

Early Christian subsidiary chapels were often financed by a donation from patrons (Kinney 2016, 41). The only clear example of this in Central Lycia is the inscription on the baptismal font at West Asarçık, which states that the baptistry was funded by Nicholas the sea captain (Foss 1994, 28).

Archaeological evidence from across Central Lycia suggests that subsidiary chapels were not always part of the primary phase of construction. Both Andriake Church A and B (Figs A.6 & A.7) have subsidiary chapels that are not part of the original phase of construction. At Andriake Church A, the triconch chapel has clearly been added at a later date, as evidenced by the way the northern conch is slightly squashed by the main apse of the church, as well as by the abutting masonry (Tekinalp 2000; Grossman & Severin 2003, 4; Fig. A.6). At Andriake Church B, the two chapels to the northeast of the church are not quite aligned to the main basilica, and the southern wall of the chapel complex does not bond with the apse where it intersects, which again suggests a later phase of construction (Tekinalp 2000; Grossman & Severin 2003, 6-7; Çömezoğlu 2013; Fig. A.7). In Plains, the chapel at the Sura Valley church does not bond to the masonry of the basilica, nor is the construction technique the same (Figs A.59 & Fig. B.27). In Hills, the subsidiary chapel at Iştıda presents a similar picture. At present it is still unclear how the south-eastern chapel attaches to the church due to its odd orientation, though the masonry attachments that are visible abut the basilica
walls (Marksteiner & Niewöhner 2004, 32-33; Fig. A.39). As with the Sura Valley church, the southern chapel is constructed differently from the basilica, with smaller squared off blocks of stone (Fig. B.28). This evidence suggests that these chapels were not part of the original construction plan. It is likely that, as with West Asarçık, the financial backing for these chapels came in after the church had been designed and constructed.

The presence of subsidiary chapels at churches with synthronons in Hills and Plains suggests that in these regions, the synthronon churches had a specific importance to the community and patrons. The presence of a synthronon indicates that the church served as a gathering place for the local or regional clergy. If an individual wished to donate money for a chapel, it would follow that they would pick a location that had a distinct role in the religious hierarchy of the region. These chapels may have provided additional services to the community as well. After excavation, it was discovered that one of the two chapels at Andriake Church B was a baptistery (Çömezoğlu 2013, 317). This is the chapel with the modified triconch apse (Fig. A.7). It follows that a church which already functioned as a gathering place for the clergy would have a baptistery, as a member of the clergy would have needed to be present to perform the baptism, a crucial service for the community. By financing these chapels, the community and patrons both would have benefitted from their addition to the church and strengthened their relationship with the local clergy.

This discussion has yet to consider the complete absence of chapels at synthronon churches in the Alaca region, in contrast to the synthronon churches in Plains, all of which have subsidiary chapels. This is likely to have had an effect on how the community interacted with these sites, and potentially a difference in how they interacted with the local clergy as well. Notably, the two churches in Alaca that are known to have baptisteries do not have synthronons: West Asarçık (Fig. A.22), which is a triconch church, and Turant Dağ (Fig. A.65), which is a three-aisled basilica.
V.ii.c Categorical Traits

**V.ii.c.1 External Apse Shape**

Overall, synthronons are distributed across most external apse shapes, except for those shapes that are related to triconch apses. As with the whole dataset, the most common external apse shape is round. The relationship between the presence of a synthronon and externally flat apses is somewhat misleading, as the two churches represent multiple phases of the same site. Externally three-sided apses correlate with larger nave areas, both in the synthronon subset and the overall dataset (Sections IV.ii.i & IV.iv.f). The most notable relationship is between the presence of a synthronon and an externally square apse.

Proportionally, churches with synthronons make up the highest number of churches with externally square apses. There are five synthronon churches with externally square apses, though Aperlae Subscribed Triconch Phase 2 (A.14), which does not have a synthronon, does not quite fit within that subset (Section IV.iv.f). The only other church with an externally square apse and no synthronon is Kekova North Port Church (Fig. A.42). The Turkish survey team that works on Kekova (Aslan 2011, 235) have suggested that the Kekova North Port Church has a *terminus post quem* of the fifth century, as they have argued that before to those dates, the structures built in that area along the harbour that pre-date church would have been under water. As the externally square apse is uncommon in Central Lycia, this dating by the Turkish team may suggest that the externally square apse is a feature of the earlier churches in the region.

**V.ii.c.2 Construction Technique**

The three of the five of churches with synthronons in Alaca are constructed with a method that uses ashlar masonry (ashlar, ashlar and cut stone, or a
combination of mortar and rubble and ashlar masonry, see Fig. IV.38), which is more common in Alaca than in the other two regions. In Hills, the majority of churches with synthronons do not have ashlar masonry in their construction. Instead, the primary construction material is mortar and rubble (mortar and rubble, mortar and rubble with brick inclusions, or a combination of mortar and rubble and cut rock, see Fig. IV.39). As mentioned above (IV.iii.b), the only synthronon churches with any ashlar in their construction, which is uncommon in Hills, are the two Tristomon churches. In Plains, however, ashlar and mortar and rubble is the most common construction method for churches with synthronons. This may indicate that the Tristomon churches are more similar to the churches in towns and cities along the coast of Central Lycia, rather than those in the rest of the Hills region.

Considering that Alaca has a higher percentage of churches constructed of both ashlar and ashlar and cut rock than the other two regions (Section IV.i.i), it is notable that just two of the five churches with a synthronon are built using these two construction techniques. In Alaca, the two synthronon churches constructed of mortar and rubble are the two internal churches: Dikmen Internal Church (Fig. A.32) and Yılanbaşi Internal Church. (Fig. A.69). While there is little concrete evidence for dating in Central Lycia (see Section I.iii.c), it is safe to say that by their nature, internal churches are a second phase of construction on the individual sites they inhabit. In this instance, then, there may be a correlation between construction technique and period of construction, where synthronon churches in Alaca constructed using mortar and rubble masonry alone are part of a second phase of construction.
This section is a discussion of the results of the EDA relating to the third research question, ‘Are churches with a triconch apse related to the Alaca Mountain and St. Nicholas of Holy Sion’ (Section I.iv). First, I consider the Distribution of Triconch Churches (V.iii.a), before discussing the Nave Area and Construction Technique of Triconch Churches (V.iii.b). Finally, I analyse the relationship between triconch churches and relevant Absence Presence Traits (V.iii.c). The absence presence section is organised as follows: Atrium (V.iii.c.1), Carved Decoration (V.iii.c.2), and finally, Subsidiary Chapels (V.iii.c.3). There is undoubtably a relationship between the Alaca Mountain and the triconch apse. The majority of triconch churches are in the Alaca region, and a number of traits associated with triconch churches are also associated with the Alaca region. These triconch traits (large nave areas, ashlar masonry, carved decoration, subsidiary chapels) that mark them out as distinct, not unlike the churches with synthronons (above, Section V.ii).

V.iii.a Distribution of Triconch Churches

There are a total of nine triconch churches in Central Lycia. The triconch churches account for 5.6% of the total dataset. This subset does not include sites that have a triconch chapel but no triconch apse. There are four triconch churches in Hills, where two of the four triconch churches in Hills are internal rebuilds of the original triconch structures, and five triconch churches in Alaca (Fig. V.1). There are no triconch churches in the Plains region.

The plans of Alacahisar, West Asarck, and Devekuyusu are the most similar, down to the placement of windows in the conches. The two modified triconch churches (see Section III.i.b.2 for definition) are both in Hills; these two churches are also the only triconch churches to maintain their original apse through an internal remodelling. The triconch churches in Alaca with second phases do not maintain their original apse in later remodels or rebuilds. At
both Devekuyusu and Dikmen, a single-aisled church with a semi-circular apse is built in the middle of the triconch church nave in a later phase of construction, while at West Asarcık, the church is internally remodelled with a new semi-circular apse that blocks off access to the original triconch apse. There is no evidence for a second phase at Alacahisar or at the Güceyman Triconch, which itself is only identifiable as an apse to the east of the larger and less ruined Güceyman Basilica. None of the churches that have a triconch apse have a synthronon in the apse, though the second phase of Dikmen, which is not a triconch church, has a synthronon in the apse.

The Korba Triconch Basilica (Fig. A.45) is not always considered a triconch church by scholars working in the region, who have in the past suggested it should be considered a ‘transept church’, like Aperlae Lower Church (Fig. A.15). In the Tübingen Lycia Studies publication of the site, Altripp (2006, [Correspondence with Dr. Göçen Kurtuluş Öztaşkı̇n, November 2015].

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11 Correspondence with Dr. Göçen Kurtuluş Öztaşkı̇n, November 2015
85-87) makes the connection between the Korba church and the Alaca triconches, arguing for the typological association with triconch churches over churches with transepts. There is no reason that the church could not fit into both of these ‘types’, but the results of the exploratory analysis have highlighted a number of similarities between these sites that re-enforce both my and Altripp's argument for categorising the Korba church as a triconch church which is associated with the Alaca mountain triconch churches.

V.iii.b Nave Area & Construction Technique of Triconch Churches

Churches with triconch apses on average have larger nave areas (Section IV.ii.h). This can be illustrated by a comparison of median nave areas; the median nave area for the triconch churches is 182.2m$^2$, in comparison to 51.84m$^2$ for the overall dataset. The construction techniques used on the triconch churches re-enforce the findings of the exploratory analysis carried out on nave area. For example, both ashlar, and ashlar and cut rock construction correlate with a larger nave area subset of triconch churches. The same is true for the other nave area and construction technique relationships within the triconch subset; Korba Internal Triconch Church has the smallest nave area, and is constructed of reused ashlar and mortar and rubble, and the two churches constructed of mortar and rubble, Aperlae Subscribed Triconch Church Phase 1 and Aperlae Subscribed Triconch Church Phase 2, have the second and third lowest nave areas of the triconch subset (see Section IV.ii.h). While Dikmen does not have a recorded nave area, I have estimated the nave area would fall between 150m$^2$ to 200m$^2$ (Section IV.ii.h), which is consistent with the results of the exploratory analysis on the relationship between ashlar construction and nave area.

It is worth noting that triconch churches make up 21.1% (four churches) of all ashlar churches, which reinforces the evidence for the correlation between triconch churches and ashlar construction. The style of ashlar, or cut stone
masonry (Krautheimer 1983, 517) used at the four triconch churches (Alacahisar, West Asarçık, Devekuyusu, and Dikmen) would have required precise masonry techniques, likely carried out by experienced masons. No mortar is used in the construction of the ashlar churches in Alaca, and the blocks can be up to one metre long by 50 centimetres wide in size (Figs B.29 & B.30). It is possible, that considering the specialist nature of this construction technique, all of these churches were constructed by the same workshop.

V.iii.c Absence Presence Traits

V.iii.c.1 Atrium

Only three of the nine churches with a triconch apse also have an atrium (Fig. IV.57): Alacahisar (Fig. A.2), Devekuyusu (Fig. A.31), and West Asarçık (Fig. A.22), which are all in Alaca. At Dikmen, the lack of architectural remains again make it difficult to say if there ever could have been an atrium at the site, though once again, for this study, Dikmen has been classified as not having an atrium. The three triconch churches with atria also share the presence of two other traits: carved decoration and subsidiary chapels.

V.iii.c.2 Carved Decoration

Of the nine churches with triconch apses, five have original carved decoration: Alacahisar, West Asarçık, Devekuyusu, Dikmen, and Korba Triconch Basilica. In the second phase, the carved decoration from the Korba Triconch Basilica is re-used in the single-aisled Korba Internal Triconch Church (Fig. IV.55). While the Güceyman Triconch (Fig. A.34) is currently listed as having no carved decoration, fragments of architectural carvings were found across Güceyman Tepesi (Grossman & Severin 2003; see Fig. B.26). Grossman and Severin (2033) have attributed these carvings to the Güceyman Basilica, but the presences of these carvings at this complex suggests that there may have been carved decoration on both of the
Güceyman churches. The only triconch church with no evidence of carved decoration is the Aperlae Subscribed Triconch Church, which, due to its current submerged state, is only preserved at foundation level.

The presence of intricate carved decoration marks out the triconch churches as impressive and important structures, much like the churches with synthronons (see Section V.ii.b.2). Triconch churches would have already stood out in the Central Lycian landscape due to the visual effect of their relatively uncommon construction technique (Section V.i.c.2) and their distinct apse shape. Their decoration with intricate architectural carvings, again an uncommon trait, just adds to this image of the churches as somehow unique within the Christian landscape of Central Lycia.

V.iii.c.3 Subsidiary Chapels

Six of the nine churches with triconch apses have subsidiary chapels, which indicates a definite correlation between these traits. Two of the chapels account for the first and second phase of the Korba Triconch Church (Fig. A.45). Of the three churches that do not have a subsidiary chapel, two are the multiple phases of the Aperlae Subscribed Triconch, and the third is the Güceyman Triconch (Fig. A.34). For ease of discussion, I will refer to the five sites with subsidiary chapels, rather than six, as the access to the subsidiary chapel at Korba stayed consistent through the two triconch phases of the church.

The subsidiary chapels at all five triconch churches are located off of the apex of either the south conch of the triconch (Dikmen: Fig. A.32, Korba Triconch Basilica & Internal Church: Fig. A.45) or north conch of the triconch (Alacahisar: Fig. A.2, West Asarcık: Fig. A.22, Devekuyusu: Fig. A.31). At four of the sites (Alacahisar, West Asarcık, Dikmen, and Korba Triconch Basilica & Internal Church), the chapel takes the form of a single-aisled structure that terminates in an apse in the east, while at Devekuyusu, the chapel is a
squared-off triconch structure, which is oriented perpendicular to the north conch of the main apse (Fig. A.31). Due to the lack of bonding and difference in masonry style, the chapel at Dikmen was likely constructed after the main body of the church had been finished (Harrison 1963, 130). The location of the chapels at these churches, off of either the north or south conch, is a trait that is only associated with the triconch churches within Central Lycia; no other churches in the region have chapels which are accessible through the apse of a church. The majority of the subsidiary chapels at non-triconch churches are placed to the north or south of the apse, and access to the chapels is either through the eastern termination of the corresponding aisle (Andriake Church E: Fig. A.10), or in the outer wall of the corresponding aisle (Sura Valley: Fig. A.59). The subsidiary chapels at both the Ištada Basilica (Fig. A.39) and Aperlæ Lower Church (Fig. A.15) are both located adjacent to the south side of the apse but are still not accessed through the apse.

Unlike the chapels at the four Alaca triconch churches, the southern chapel at Korba would have only been accessible through the southern conch (Altripp 2006, 83-84), rather than through a door in both the southern conch and the western wall of the chapel. Based on a comparison of the ground plan of Korba to the Alaca triconches, Altripp (2006, 85) comments that the Korba triconch shares the most similarities with the Dikmen triconch, predominantly due to the placement of the chapel. However, after a quick assessment of the plan of Korba (Fig. B.31), we can see that the church was bordered to the north by a rock terrace, as well as pre-Christian structures. The structures to the north would have constrained the construction of any subsidiary buildings off of the north conch of the church. Regardless of these limitations, the relationship between Korba and the Alaca triconch churches is still clearly visible in the design and placement of the chapel.

The strong similarities across the construction and placement of the three northern subsidiary chapels at Alacahisar (Fig. A.2), West Asarcık (Fig. A.22), and Devekuyusu (Fig. A.31) are also worth consideration. All three of the
chapels are accessible from the north conch of the main church and an entrance in the western wall of the chapel. The two chapels at Alacahisar and West Asarcık are especially comparable, as they are both single-aisled structures terminating in a single, externally flat apse. The primary difference between the two is the construction technique; the Alacahisar chapel is cut from the rock, while the West Asarcık chapel, like the triconch chapel at Devekuyusu, is constructed of ashlar. The similarities in the chapel placement and construction are one of the many features these three triconch churches have in common.
V.iv Initial Findings

This section covers some of my initial findings as interpreted from the above discussion of the EDA results. I will first discuss the archaeological evidence for monastic settlements in Central Lycia, before considering how the monastic presence on the Alaca Mountain has affected the churches built on the mountain (Section V.iv.a). Then, I will consider what potential evidence is present in the analysis of the results of the EDA for temporal change, before laying out how that evidence can be used to focus the Nearest Neighbour Analysis being carried out in the next chapter (Section V.iv.b).

V.iv.a Monasteries in Lycia, Holy Sion, and the Alaca Mountain

In Section V.i above, I have discussed a number of places where EDA has highlighted some distinct patterns of regional variation in the Alaca Mountain sub-region. I have also detailed the evidence for the relationship between the Alaca Mountain sub-region and the triconch apse trait (Section V.iii). This discussion, however, has yet to address the second part of the research question, ‘Are churches with a triconch apse related to the Alaca Mountain and St. Nicholas of Holy Sion’. Below I will consider this aspect of the question, in relation to the discussion of results detailed above. First, I will summarize the issues with identifying a monastic site from archaeological evidence, and the difficulties with this in scholarship as it pertains to Central Lycia (Section V.iv.a.1). I will then consider how certain traits that correlate to the Alaca Mountain could indicate influence from the Monastery of Holy Sion and provide an analysis of the relationship between triconch churches and the Monastery of Holy Sion (V.iv.a.2).

V.iv.a.1 Evidence for Monasteries in Central Lycia

As mentioned (Section I.ii.a), since Harrison’s identification of West Asarcık as the Holy Sion monastery (Harrison 1963, 150), scholars working in the
region have generally accepted that many of the churches on the Alaca Mountain are monastic. However, there has been little discussion as to how it is possible to identify these church complexes as monastic. When church complexes have been categorised as monastic or secular in this region, it is often based on certain features of the church, such as the church having pillars rather than columns separating the nave from the aisles (Niewöhner 2017a, 125-6, Marksteiner and Niewöhner 2006, 95; also see Section I.iii.b), though Niewöhner (2017a, 126) admits that the evidence from Lycia is inconclusive. While the relationship between the Holy Sion Monastery and the triconch apse will be discussed below (Section V.iv.a.2), it is worth noting that in Lycia these sites are assumed to be monastic as well, as can be exemplified in the recent chapter on Monasteries in The Archaeology of Byzantine Anatolia, ‘Exceptionally, a number of Lycian monastery churches have a triconch sanctuary…’ (Niewöhner 2017a, 125). The question still remains if, without consideration of the absence or presence of a triconch apse, it is possible to identify specific church complexes as monastic, especially on the Alaca Mountain.

This question is made all together more complex by Grossman and Severin’s (2003, 91-95) identification of East Asarcık as a monastic settlement (Fig. A.21, see Fig. V.2 for plan of both East and West Asarcık,), a hypothesis which is re-stated by Niewöhner (2017a, 121-2), though with slightly different evidence backing up his claim. In order to understand why this interpretation can be questioned, we must first consider why these scholars have argued that East Asarcık is monastic. Grossman and Severin’s (2003, 91-5) argument for this identification is based on their interpretation of a number of archaeological and architectural features visible in the remains of the church and settlement, rather than on the textual interpretations presented by Niewöhner (2017a; 2003) and Hild (2003) below. More generally, it is the uniformity of the construction style on the site that Grossman and Severin’s (2003, 91) suggest makes it clear the site is monastic. For example, the wall that encircles the site, and the single-celled houses (Grossman & Severin
Though they accept that those houses were not all built in one period, Grossman and Severin (2003, 92) argue that their layout still shows some planning, as later houses never restrict access to earlier houses. They argue that the first structure constructed on the site was the church, without the atrium, and then the houses to the north and south of the church (Grossman & Severin 2003, 92). At a later date, the atrium was added onto the church, which bisected some of the structures to the north of the church (Grossman & Severin 2003, 93). It is only after the construction of the atrium that Grossman and Severin believe the rest of the single-cell structures and wall around the complex were constructed (Grossman & Severin 2003, 93).

Fig. V.2: Plan of East and West Asarcık showing their proximity and differing complex plans, with east at top of plan. Source: İşler (Plans Emailed 22.08.14)
Niewöhner (2017, 120-1; 2003, 128-9) and Hild (2003, 315-6), focus more on the textual evidence presented in the *Life of St Nicholas of Holy Sion*. Their arguments centre on the identification of Holy Sion as Alacahisar, based on its cut rock construction (more below, see Section V.iv.a.2). Hild (2003, 316) suggests that Asarcık, must have been the Akalissos Monastery where Nicholas of Holy Sion grew up, and that the triconch apse there inspired him to construct a triconch apse at Alacahisar. Niewöhner also advocates for this association (2003, 128-9). Presumably both Hild and Niewöhner consider East and West Asarcık to be part of the same larger complex, even though neither state it in their 2003 publications. In the 2017 chapter on monasteries, however, Niewöhner (121) refers to these sites as, ‘one of two neighboring monasteries may be identified with that of St. John of Akalissos’ at Asarcık. While there seems to be some confusion about the identification of these sites, even if one of them is the Akalissos Monastery, Niewöhner still clearly believes that both East and West Asarcık (Fig. V.2) are both monastic.

There are a number of issues with both these interpretations. For both Niewöhner and Hild, the identification of East Asarcık as monastic is based on the site *not* being the Monastery of Holy Sion, rather than the archaeological evidence for the site being monastic. From an archaeological perspective, Grossman and Severin’s interpretation of why exactly the atrium cuts through pre-existing buildings, and why the building surrounding the church were built in phases rather than all at once, seems overly complex. Perhaps some answers can be found in the work of Bülent İşler, who has been surveying the Alaca Mountain for the last decade. As previously discussed (Section III.i.f.4), İşler’s surveys and reports provide a wealth of information on the architectural remains of the Alaca Mountain, and due to his long-term survey project in the region, he is the pre-eminent scholar of settlements on the mountain. In his 2013 publication, ‘Early Byzantine Settlements and Rural House Architecture in Central Lycia’, İşler provides a detailed argument for the identification of certain sites on the Alaca Mountian as monastic, and others as non-monastic settlements. Many of the villages
in this region were pre-Christian, and existed without much modification up until the addition of large, centrally-located churches in the early Christian period (İşler 2003, 287-8). İşler (2013, 288) identifies East Asarcık, Karabel, Muskar, Alakilise, and Çağman as villages characteristic of Central Lycia, surrounded by agricultural land and with houses focused around centrally located churches.

If the sites listed above are villages rather than monasteries, what marks them out as different from the other settlements? İşler (2013, 289-90), provides evidence for the difference between monastic settlements and villages based on their architectural remains, as well as offering a discussion of house architecture within these sites that helps to differentiate between the two types of settlement. Notably, he suggests that houses in monastic complexes and villages can be of the same style, rather than identifying them as entirely separate typologies (İşler 2013, 289-91). İşler (2013, 289) argues that the monastic sites can be distinguished by their limited number of non-religious buildings, such as housing and workshops. Based on these observations, he identifies West Asarcık, Alacahisar, Devekuyusu, Dikmen, Yılanbaşı, and Danabaşı as monastic (İşler 2013, 289). He also notes that many of the monastic settlements on the Alaca Mountain are built around a Hellenistic tower and farmhouse, which does not occur at the pre-Christian villages where churches were a later addition (İşler 2013, 289). Hellenistic towers are found incorporated into the complexes at Danabaşı, West Asarcık, and Yilanbaşı (İşler 2013, 289).

İşler (2013, 290) defines three house types for the Alaca Mountain, based on previous work in the Upland Hills region. They are: ‘row-room’ houses, which are single-cell houses connected in a row of single-rooms, and two to four room rectangular houses (İşler 2013, 290). Many of the houses on East Asarcık are these ‘row-room’ houses, which İşler (2013, 290) notes are actually connected through doors in the second floor, which could mean a whole row is a single family home, or that these ‘rows’ were made up of
families from an extended kin group. These houses also appear at a settlement near the Günaği church (İşler & İşler 2017, 270; see Fig. V.2). Single-room houses are the most common for Alaca, and are found across a number of settlements, including East Asarcık and at monastic sites like Dikmen (İşler 2013, 290). Two to four room houses are again visible at multiple settlements, including Alakılise and West Asarcık (İşler 2013, 290). Notably, the only house-type that lends itself less to monastic settlements is the ‘row-room’ house, due to the doorways between individual houses on the second level. Still, we should consider the main distinguishing feature not the presence of dwellings, but rather how many houses there are and how they relate to the monastery.

A visual survey of East and West Asarcık (Fig. V.2) demonstrates the distinct nature of the house styles and layout across the two settlements. In line with İşler’s arguments, there are significantly structures which can be defined as non-ecclesiastic at East Asarcık, where at West Asarcık, all of the structures are built directly onto the church and associated chapels. At West Asarcık, the layout of buildings is fairly regular, even where it incorporates the Hellenistic tower. This is not to say that the whole complex was built in one phase, but rather that the buildings at West Asarcık show a level of consistency in construction. The buildings at East Asarcık show a greater variety and the difference, suggesting West Asarcık is monastic. While Grossman and Severin (2003, 91) have had to lay out a convoluted phasing of East Asarcık to explain the lack of uniformity in the layout of the East Asarcık houses they wish to identify as monastic, it seems the simpler solution would be to accept the site as a village, in line with İşler. This would help to explain why, unlike West Asarcık, almost every single building has been built in its own phase at East Asarcık, as the majority of the walls of even the ‘row-room’ houses do not bond with the next house in the row (Fig V.2).
Archaeological evidence from elsewhere in Anatolia can be useful here. The Palamutdüzi Settlement in the Bey Mountains west of Antalya is a good example of a village with an associated monastic settlement (Akyürek 2008). Like East Asarcık, Palamutdüzi was a rural agricultural settlement (Akyürek 2008, 298) mainly dating from the Transitional Period or later. Though Palamutdüzi is not encircled by a wall due to its already defensive position, the houses were built in an unplanned and organic manner, similarly to East Asarcık (Akyürek 2008, 298-9). Akyürek (2008, 300), describes the houses at Palamutdüzi similarly to İşler’s ‘row-room’ houses, ‘where rooms attached to each other constitute long house groups’. While Palamutdüzi does not have its own ‘communal church’ (Akyürek 2008, 302), a monastery is located just to the east of the main settlement. The monastery is encircled by a wall, within which are a church, some monastic cells, and additional auxiliary buildings (Akyürek 2008, 302). To the east of the walled complex is a small chapel. While the monastery is not an exact replica of West Asarcık, the more regular construction of auxiliary buildings, and the central church are analogous.

A similar pattern can be found at the village and monastic settlement Boğazköy in north Anatolia (Böhlerendorf-Arslan 2017). The settlement comprises of a number of smaller houses consisting of one or two rooms, two housing complexes referred to as ‘farmsteads’, and a monastery (Böhlerendorf-Arslan 2017, 362-3), and from finds it can be dated to post-transitional Period. As at Palamutdüzi and West Asarcık, the church and monastic buildings are enclosed, though at Boğazköy the enclosing wall is comprised of conjoined rooms, some of which face outwards rather than inwards (Böhlerendorf-Arslan 2017, 366-7). Significantly, this also occurs at West Asarcık, where a few of the rooms that make up the west wall open to the west (Fig V.2). Though the village at Boğazköy is larger and more complex than those found at Palamutdüzi and East Asarcık, there is still a clear difference in domestic houses and the monastic settlement. And while the complex at West Asarcık has a more compact arrangement of buildings
than the monasteries at Palamutdüzü and Boğazköy, it shares this layout, where the monastery is built to include a Hellenistic tower and farmhouse, with other monasteries on the Alaca Mountain. With this in mind, we should consider West Asarcık, and the other sites with similar organised settlement patterns (Alacahisar, Devekuyusu, Dikmen, Yılanbaşı, and Danabaşı) as monastic, and East Asarcık, and the other sites with more organic settlement patterns and churches as villages (Karabel, Muskar, Alakilise, and Çağman). It is now possible to discuss the implications of the monastic presence on the Alaca Mountain, and the effects it may have had on the construction and design of churches.

V.iv.a.2 The Monastic Presence on the Alaca Mountain

I have already suggested that the complex nature of church construction using ashlar masonry, which was likely carried out by expert masons experienced in the technique (Section V.i.c.2). As the highest number of churches constructed entirely of ashlar are on the Alaca Mountain, there may be some relationship between these churches, such as a shared building workshop. Evidence for a building workshop experienced in ashlar masonry appears in the Life of St Nicholas of Holy Sion. In the Life where, while Nicholas is away, he orders that no construction take place on the Sion monastery. However, his brother decides to ignore this command and calls in the craftsmen who had gone back Arneai to continue working on the site (Ševčenko & Patterson Ševčenko 1984, 69). When the craftsmen attempt to turn over a large block of stone they have cut from the rock, they are unable to move it (Ševčenko & Patterson Ševčenko 1984, 69). This interaction is seen as an indication of Nicholas’ divine power, but it also provides evidence that the Holy Sion monastery was constructed of ashlar (Harrison 1963, 150). At Arneai, Arneai Church C, and the nearby Çamarkası Church, are both constructed of ashlar masonry, which further supports the evidence in the life for an Arneai-based building workshop that specialises in ashlar masonry.
The presence of original carved decoration at a large number of churches on the Alaca Mountain, many of which are also constructed of ashlar (Section V.i.b.2), also comes into play here. In the Christian period, the Alaca mountain was populated with a large number of small villages (İşler 2013; İşler 2016; İşler & İşler 2017), some of which would have been relatively difficult to access. It has been suggested that Holy Sion owned much of the land in its vicinity, which would include the villages on the mountain (Rizos 2019, 55). The Life even documents Nicholas of Holy Sion throwing a feast to commemorate the end of the plague, and providing funds for the rebuilding of a dilapidated church (Ševčenko & Patterson Ševčenko 1984, 85 & 93). This wealth can be further corroborated by the archaeological discovery of the Kumluca hoard, now referred to as the Holy Sion Treasure, which contained numerous silver objects, some of which were donated by one of the bishops of Myra (Foss 1991, 308 – 9; Elton 2019, 98). With the textual and archaeological evidence for the wealth of the Holy Sion monastery in mind, it would follow that Holy Sion would have had the funds to cover the production of such elaborate architectural carvings for the churches of Alaca, which could even mark out other churches as having Holy Sion as their patrons.

The identification by previous scholars (Harrison 1963, 150: note 165; Foss 1991, 309; see Section I.ii.a) of the Monastery of Holy Sion as a triconch church also comes from information presented in the Life of Saint Nicholas of Holy Sion. The Nicholas of Holy Sion’s uncle, also a monk, calls the archbishop of Myra to the Alaca mountain with a request that the archbishop consecrate a site for the construction of a new monastery for his nephew Nicholas of Holy Sion. After consecrating and naming the site of the new monastery, the archbishop, ‘began by tracing the outlines of the apses’ (Ševčenko & Ševčenko 1984, 25, my emphasis). The translation of ‘apses’ versus ‘apse’ has been taken as in indication that the Holy Sion church had more than one apse, thus taking the form of a triconch (Harrison 1963, 150: note 165). The construction type and apse shape of the monastery of Holy Sion itself actually corroborates the correlation between ashlar masonry and
triconch churches. The *Life of St Nicholas of Holy Sion* references how the construction of the Holy Sion monastery itself was inspired by a vision Nicholas’ uncle had of constructing a church entirely of a stone that shone in the sunlight (Ševčenko & Ševčenko 1984, 33). These churches are indeed constructed entirely out of stone, and even in modern times the limestone ashlars are blindingly bright. Considering the similarities between the descriptions laid out in the *Life* of the Sion monastery, and the construction and design of Alacahisar, West Asarcık, Devekuyusu, and Dikmen, it is not unreasonable to suggest all four of these churches were constructed by the same workshop and/or patronage within a limited time frame. This would explain the repetition of specific traits at triconch churches, many of which are mentioned in the *Life* as being features of the Monastery of Holy Sion, especially as it is likely that Holy Sion itself was the benefactor.

As discussed above (Sections V.iii.c.1 & V.iii.c.3), three of the nine triconch churches have more traits in common, and have a very similar layout and design: Alacahisar (Fig. A.2), Devekuyusu (Fig. A.31), and West Asarcık (Fig. A.22). These parallels indicate a correlation beyond just the presence of a triconch apse and other traits associated with the Alaca Mountain. For example, all three of these triconch churches have similar apse window placement; they all have two windows in the apex of the south conch, and Alacahisar and Devekuyusu have a single window in the north conch above the doorway to the chapel, while West Asarcık has two, and finally West Asarcık and Devekuyusu both have two windows in the apex of the east conch, while Alacahisar has three.

Bearing in mind these similarities, it is worth considering the chronology of their construction. Of the three, it is likely that West Asarcık was built first, and was used as a prototype for Alacahisar and Devekuyusu (Harrison 1963, 150: note 163), making West Asarcık the first triconch in Central Lycia. After the construction of the first triconch church, the building workshop responsible would have the experience necessary to construct the triconch
apse again at both Alacahisar and Devekuyusu. If these three triconch churches were all constructed by the building workshop at Arneai, as argued above, they were probably constructed in a fairly limited period of time. The Dikmen triconch church may have also been constructed as part of this programme, though the lack of upstanding remains and the different placement of the subsidiary chapel makes it harder to say definitively. Perhaps Dikmen was a later construction, or was built by a different workshop than the other three churches.

Within this context, it is worth briefly considering the identification of Holy Sion. If we accept that Holy Sion is a triconch church, then the only four options are Alacahisar, West Asarcık, Devekuyusu, and Dikmen, though due to the differences in the construction techniques and geographic location of Dikmen, it is often ruled out (Harrison 1963, 50: note 165). Without Dikmen, we have three options. Harrison (1963, 50: note 165) was the first to argue for West Asarcık as the Sion monastery. His argument is based on the location of the church, the construction technique (ashlar), the triconch apse, and the second southern funerary chapel which was added in a later phase of construction, all of which are referenced in the Life (Harrison 1963, 50: note 165). While some scholars working in the region have avoided taking a strong position on the subject (Ševčenko & Ševčenko 1984; Grossman & Severin 2003; Sweetman 2017), Harrison’s position is still generally agreed upon (Foss 1991, 309; Elton 2019, 98). A number of scholars (Hild 2003, 315-6; Niewöhner 2003, 128-9; Hellenkemper and Hild 2004, 852), however, argue for Alacahisar as Holy Sion using the same evidence as Harrison, with one key difference: the blocks quarried from stone in the Life (Ševčenko & Patterson Ševčenko 1984, 69) were not blocks used in construction, but rather the blocks of stone left over from quarrying out the apse from a pre-existing rock formation. The location of Holy Sion is also debated by two prominent Turkish scholars in the region, Bülent İşler and Mehemet Alkan (Clow 2014, 84-85). İşler, an architectural
historian, agrees with Harrison, while Alkan, an epigrapher, believes the site is Alacahisar (Clow 2014, 84-85).

Some observations made by Grossman and Severin (2003, 104-06) may help to unravel this mystery. They note that there are some irregularities in the inexact geometric rendering of the Alacahisar triconch, as well as in the alignment of the north and south walls of the church (Grossman & Severin, 2003, 104-06). They attribute this to the construction of the church being primarily out of cut rock (Grossman & Severin, 2003, 106, see Fig. B. 31), which is harder to work with than ashlars. The earliest known triconch churches and chapels across the Empire are all constructed using masonry rather than cutting the shape into natural rock formations. The earlier Egyptian triconches, which are often referenced as the possible influence for the Alaca mountain triconches (Harrison 1963, 150), are predominantly constructed of ashlar (Kinney 2016, 42). Indeed, it seems a difficult choice to cut an entire triconch apse from a pre-existing rock formation, without having previously built a triconch apse. This task would have certainly been difficult, even if the building workshop had a mastery of the architectural design of a triconch apse.

Since the earlier recorded triconch churches constructed outside of Central Lycia used ashlar masonry, it is likely that the first triconch church in Central Lycia would have been constructed in this technique too. Equally, the cut-rock construction of Alacahisar would have required masons familiar with the design, which would chronologically place Alacahisar after the construction of the Holy Sion monastery. It is also worth noting the passage in the Life where the archbishop of Myra traces the ‘outlines of the apses’ (Ševčenko & Patterson Ševčenko 1984, 25). It is somewhat improbable that in that moment, the archbishop was attempting to trace the apses into a great, uneven boulder that stuck out approximately 10 metres (Harrison 1963, 136) above what would be the ground level of the rest of the church. Devekuyusu is not generally considered as a potential option for the Holy Sion monastery
for two reasons: it is not in the correct location as referenced in the Life, and it does not have a funerary chapel to the south of the nave. With all of this evidence in mind, West Asarcık is the best candidate for first constructed triconch church in Central Lycia, which, along with the additional traits that Harrison (1963, 150) correlates with the Life, marks it out as the most likely location of Holy Sion.

The Life of Saint Nicholas of Holy Sion also provides textual evidence for a relationship between St Nicholas of Holy Sion and the settlement and triconch church at Korba, in the Upland Hills sub-region. One of the miracle stories presented in the Life tells of Nicholas travelling to the church of the Archangel in ‘Kroba’. Here, he meets a woman whose son who is possessed by a demon, which Nicholas is able to expel by blowing into the boy’s mouth (Ševčenko & Ševčenko 1984, 103-04). It is generally accepted that the ‘Kroba’ in the Life is the modern site ‘Korba’ (Foss 1991, 327; Altripp 2006, 87). Altripp (2006, 87) argues that the plan of the church, i.e. with a triconch apse, and the presence of the southern chapel must indicate that the church was an important shrine, and suggests a dedication to the archangel Michael, due to a preference for his veneration in central and western Anatolia (Altripp 2006. 87). His theory, however, assumes that the primary purpose of the triconch apse was to mark out a site as particularly significant, and does not consider the relationship between the triconch apse, the Alaca Mountain, and the Holy Sion monastery. I have already highlighted the importance of the relationship between Holy Sion and the construction of churches in the Alaca region, with the Monastery of Holy Sion as the potential land-owner and patron. The connection may follow through to Korba as well. The story in the Life tells us that a church was already present at Kroba/Korba when Nicholas arrived to treat the possessed child, but the earliest construction phase currently visible has been dated to the 6th century (Altripp 2006, 79 & 87), which is the same period Nicholas was alive (Ševčenko & Patterson Ševčenko 1984, 11). It is possible that a church existed on the site before the 6th century triconch construction, which would
mean that the original church was rebuilt during the same period as Nicholas was alive. If the triconch apse was already associated with Nicholas during his life, or even immediately after his death, Korba may have been constructed with the intention of referencing the Alaca triconch churches built by the Monastery of Holy Sion. Whether this would have been funded by Holy Sion, or by the community that used the church at Korba is unclear, but perhaps due to the differences in the rendering of the triconch design it can be argued that the Korba Triconch was an imitation of the Alaca triconches, rather than a construction by the same building workshop as Alaca. Additionally, due to the way that the Korba Triconch church is separated from the rest of the settlement (Fig. B.33), and is surrounded by a rectilinear arrangement of buildings, it is even possible that the Korba church was monastic (see Section V.iv.a.1).

**V.iv.b Evidence for Temporal Change**

Thus far, I have yet to discuss how the results of the EDA could help to answer the fourth and final research question, ‘Is there quantitative evidence for a temporal change in the cultural and geographic traits of the churches of Central Lycia?’ This section considers how certain results from the EDA, when viewed together rather than individually, suggest that there are indeed traits that relate to period of construction (Section V.iv.b.1), and then how to use that information to better run the Nearest Neighbour Analysis (Section V.iv.b.2).

**V.iv.b.1 Patterns in the Exploratory Data Analysis**

I have previously discussed the issues with dating churches in current scholarship, where larger churches are dated to the earlier period, and smaller, often single aisled churches are dated to the transitional period or later (Section I.iii.c). By removing the hypothetical dating from the dataset, I was able to see if there was any evidence for traits that correlated
consistently with nave area. This data can then be considered in comparison to churches that are almost certainly from a second phase of construction, internal churches, to see if there is any suggestion that traits may have a relationship to period of construction.

For the absence presence traits, there are a number of correlations between nave area and certain traits. For example, larger churches are more likely to have an atrium, original carved decoration, and funerary monuments (Sections V.i.b.1-2 & V.i.b.5), though the situation is slightly more complex for carved decoration. Reused carved decoration correlates with a smaller nave area than original carved decoration, but a larger nave area than churches without any architectural carvings (Section V.b.2). There was also discernible relationship between three traits that appeared at a number of churches: larger nave area, atria, and carved decoration. In Alaca, all churches with the presence of an atria had either original or reused carved decoration, and in Plains all of the churches with the presence of an atria had carved decoration (Section V.i.b.2). The pattern was less clear in Hills, though four of the six churches with an atrium had either original or re-used carved decoration. The majority of churches with the presence of reused carved decoration, the carved decoration is fairly securely dated to the 5th to 6th century. In order for it to be reused, it must be from after that period, i.e. from the Transitional Period onwards. Additionally, nine of the 19 churches with reused carved decoration are internal churches, which again indicates they are from a later period of construction. The relationship between narthexes and nave areas differs by region. In Alaca, the dataset is distributed bimodally, in Hills, the presence of a narthex is associated with a relatively small nave area, and in Plains, the presence of a narthex correlates with a larger nave area (Section V.i.b.3). Of the triconch presence subset, five of the seven churches have a second phase of construction, which suggests that the building of triconch churches was part of an earlier phase of construction (Section V.iii.a).
For categorical traits, some associations are clearer than others. For example, churches with externally three-sided or squared-off triconch apses on average have larger nave areas, while churches with externally round apses have smaller nave areas (Section V.i.c.). As discussed in Section III.i.c.3, external apse shape is often considered as a trait that can help to date a church. In English-language and German-language scholarship, externally three-sided apses are considered earlier (Sweetman 2015b, 292), while externally round apses are considered a sign of later churches (Altripp 2010e, 358). This would more or less follow the EDA results (Sections V.i.c.1 & V.ii.c.1) However, the Kekova team argue that externally round apses are from the earlier period of construction, while the externally three-sided apses are from the later period of construction (Göçer 2014, 341; Aslan & Kılıç 2016, 33). They also state that externally flat apses are from the later period (Aslan & Kılıç 2016, 33), when Grossman and Severin (2003, 116), have previously argued for the opposite. It is unclear why exactly these suppositions have been made, as there is no discussion in the scholarship as why external apse shapes denote period. At least in the case of the externally three-sided apse, the Turkish team are unlikely to be entirely accurate, due to the correlation between the three-sided apse and larger nave areas. Externally round apses could be associated with the later period of construction due to the large number of churches in this subset with small nave areas, though this interpretation is not clear. In the case of externally flat apses, the bimodal nature of the data suggests that this pattern, too, is more complex. However, there are some instances where churches with these features are highly unlikely to fall into the earlier or later period based on apse shape alone. All six of the Andriake churches, which have comparatively large nave areas all have externally round apses. And the Dereağzi Church, which is consistently dated to the Transitional Period or later (Morganstern 1983, 89), has an externally three-sided apse. The only external apse shape which seems likely to be datable at this stage in the analysis is the externally square apse, which seems to correlate to the earlier period of construction (see Section V.ii.c.1).
Ashlar construction, as well as mortar and rubble and ashlar construction, are associated with larger nave areas, while mortar and rubble masonry is on average associated with a smaller nave area (Section V.i.c.2). How these results could relate to period of construction is perhaps most interesting when considered in relationship to the churches with synthronons in Alaca. Three of the churches in Alaca with synthronons, which have larger nave areas, are constructed of ashlar (East Asarcık, Günağı, and Yılanbaşı Basilica), while the two churches with synthronons constructed of mortar and rubble, and which have smaller nave areas, are internal churches (Dikmen Internal Church and Yılanbaşı Basilica). These churches must be from a later phase of construction, so the traits they exhibit are more significant in terms of trying to determine patters of temporal change.

**V.iv.b.2 Further Analysis**

When properly analyzed, all of the EDA results discussed here indicate that there may be something to the pre-existing position in scholarship that earlier churches are larger and more ornate, while later churches are smaller and less elaborate. These results can be further explored in the Nearest Neighbor Analysis (NNA), which can be targeted to look for potential patterns which will elucidate any evidence for temporal change. While I will always test the geographic distribution of a subset of churches first to provide a baseline, I will then run tests on subsets that are informed by the discussion in this chapter. The first, most obvious way for these results to be considered in the NNA tests is to break the churches into groups by nave area. This will allow us to see any differences in the geographic distribution of churches within these two subsets, which may indicate differing patterns of construction in different time periods. While there will almost certainly be churches that outlie this, ‘larger is earlier’, and ‘smaller is later’ dichotomy, and there are likely to be earlier churches that are still in use in the later period, the results should provide an indication of any general patterns.
As atria and carved decoration have already been seen to be associated with a larger nave area, the results of these subsets alone may help to determine if the patterns of the nave area NNA tests broken down by larger and smaller nave area are consistent, especially as both traits are associated in previous scholarship with the earlier period of discussion. And, as there is the correlation between these two traits (atria, carved decoration), I will also run a test on churches that share these features, as churches with these two traits could be some of the earliest ecclesiastical structures built in Central Lycia. As the pattern differs across the regions in terms of relationship to nave area, I will first test the distribution of the whole narthex subset, to see how the dataset performs individually. Narthex presence is one of the only traits that correlates to a bimodal distribution of nave areas. In order to further understand the relationship between nave area and presence of a narthex, I will divide the churches with the presence of both traits into two sub-groups based on their nave area, similarly to the overall nave area subset. As the nave areas for the synthronon subset were distributed bimodally, and as there is some interesting interplay between certain traits and internal churches in the Alaca synthronon churches, I will also test the geographic distribution of churches with synthronon broken down into two groups by smaller and larger nave area. For subsidiary chapels and triconch churches, I will just be running NNA on their individual datasets to look at geographic distribution.

For the categorical traits, it is worth considering how I can test the different scholarly interpretations of external apse shape with reference to period of construction when running NNA. As noted before, externally three-sided apses are seen as being from the earlier period of construction, while externally round apses are cited as being from the later period. Again, testing this trait has the possibility of showing us evidence for different construction across differing sizes of church, or even different periods of construction. Since construction technique has also often been used by scholars working
in the region as a way of dating the churches (Section III.ii.c.2), and considering the results that show a correlation between construction technique and nave area (Section V.ii.c.2) and internal churches (Section V.iv.b.1), the spatial distribution of churches by construction type is also worth considering. Additionally, each region has a construction technique that is more associated with it than the other two regions. For example, there is a relationship between ashlar masonry and Alaca in both the analysis (Section V.i.c.1) and literature (V.iv.a.2). Ashlar and mortar and rubble is more common in Plains, and mortar and rubble construction makes up the highest proportion of churches in Hills (V.i.c.1). With this in mind, I will test each construction technique individually, and then test by region the construction technique most associated with it. Ideally, the geographic distribution of these features will help to further shed light on the question of temporal change in Central Lycia.
VI. NEAREST NEIGHBOUR ANALYSIS

This chapter discusses the results of the Nearest Neighbour Analysis tests run on the churches of Central Lycia. The rationale behind the testing is outlined in Section V.iv.b, and is based on the discussion of the exploratory data analysis in Chapter V. First, I have carried out tests on the distribution of the overall dataset, and the dataset as broken down into sub-regions (VI.i). Next, I have run tests on the dataset by nave area (VI.ii). Both of these sections then provide a benchmark for the tests run on the other traits that include a focus on nave area or sub-region. For the absence presence traits, I have run tests on Atria and Carved Decoration (VI.iii.a), Narthexes (VI.iii.b), Subsidiary Chapels (VI.iii.c), Churches with Synthronons (VI.iii.d), and finally, Triconch Churches (VI.iii.e). For Categorical traits, I have run tests on two subsets of External Apse Shapes (VI.iv.a), and Construction Technique (VI.iv.b). Construction technique is further broken down into three subsets, Ashlar Masonry (VI.iv.b.1), Mortar and Rubble with Ashlar Masonry (VI.iv.b.2), and Mortar and Rubble Masonry (VI.iv.b.3).

VI.i Distribution of Churches

<table>
<thead>
<tr>
<th>Results for All Churches in Central Lycia</th>
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<tr>
<td>Expected mean distance</td>
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<tr>
<td>Nearest Neighbour Index</td>
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<tr>
<td>Z-Score</td>
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<td>Sample Size</td>
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Table VI.1: Nearest Neighbour Analysis results for the 160 churches in Central Lycia

The overall dataset of the 160 churches in Central Lycia (Fig. VI.1) exhibits a strong pattern of clustering (Table VI.1). This test considers the whole dataset, including multiple phases of construction on the same geographic location, so it is likely that the strong trend towards clustering is at least partially due to this. For example, the Sura Plateau church (Fig. A.60) which
Fig. VI.1: Map showing location of all 160 churches in Central Lycia with recorded GPS points, broken down into sub-regions.

has four architecturally distinct phases (see III.i.g.2 for discussion of internal churches), has likely contributed to the clustered signal. While this might at first seem problematic, as there would have only ever been a single functioning church on the site, it also provides a valuable insight into the use of the site across a long period of time. This significant level of temporal clustering will be considered in more detail in Section VII.i.
In order to double check that the results would not change too much if the internal churches and second phases of construction were removed, I have also run a test on that subset of churches (Fig. VI.2). The results with the 29 internal and second phases of churches are actually remarkably similar to the overall dataset, considering that just over 18% of the database has been removed.

<table>
<thead>
<tr>
<th>Results for Churches in Central Lycia that are not internal churches</th>
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<tr>
<td>Expected mean distance</td>
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<td>Observed mean distance</td>
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<td>Nearest Neighbour Index</td>
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<td>Z-Score</td>
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<td>Sample Size</td>
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Table VI.2: Nearest Neighbour Analysis results for the 131 churches in Central Lycia that are not internal churches or second phases of construction.
The Nearest Neighbour Index (NNI) indicates that the churches are less clustered, which is expected, but they are still more clustered than not (Table VI.2). Additionally, the z-score still indicates that this is a highly significant result. Practically, removing this subset of data is also not good practice. A good way of illustrating the issues with this approach is by looking at a site like Kyaneai. At Kyaneai, there are a number of churches, some of which have evidence of multiple phases of construction (Churches A, B, C, & E) and some of which are dated to the Transitional Period or later (Churches B, F & G). We cannot be sure that Kyaneai Church A Basilica, Kyaneai Church D, and Kyaneai Church E Internal church were not all in use at the same time. By removing all of the internal or second phase churches of Kyaneai, then, we are further complicating the issue of periodisation, and taking out the opportunity for the Nearest Neighbour Analysis to allow us to see evidence of temporal clustering. Because of this, and the relative similarity of the results without the internal and second phase churches, I will not be subsetting data in this manner unless there is a strong reason to, as suggested by the results of the Exploratory Data Analysis.

<table>
<thead>
<tr>
<th>Results for Churches in Alaca</th>
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<tr>
<td>Expected mean distance</td>
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<td>Observed mean distance</td>
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<td>Nearest Neighbour Index</td>
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<td>Z-Score</td>
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*Table VI.3:* Nearest Neighbour Analysis results for the 33 churches in Alaca

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<tr>
<th>Results for Churches in Hills</th>
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<tr>
<td>Expected mean distance</td>
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<td>Z-Score</td>
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*Table VI.4:* Nearest Neighbour Analysis results for the 99 churches in Hills

The NNI for Alaca and Hills is relatively similar (Tables VI.3 & VI.4); they are both in between -1 and 0, indicating that they are halfway in between being
highly clustered and random. While the subsets for Alaca and Hills are clustered, they are less clustered than the overall dataset. In both cases, the z-score indicates that the results are significant. The z-score for Hills is almost twice that of Alaca, which is likely due to the larger sample size providing a stronger signal.

<table>
<thead>
<tr>
<th>Results for Churches in Plains</th>
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<td>Expected mean distance</td>
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Table VI.5: Nearest Neighbour Analysis results for the 28 churches in Plains

The NNI for Plains (Table VI.5) indicate that the data is highly clustered, even more so than the overall dataset. As discussed in Section III.i.h.2, survival bias is likely to have affected the data collected from Plains the most, such that there are fewer non-urban churches recorded. This may be why the sites are so much more clustered than in the other two regions.
VI.ii Nave Area

Fig. VI.3: Map showing location of the 124 churches in Central Lycia with a recorded nave area.

The results of the NNA on the churches with recorded nave areas (Fig. VI.3 & Table VI.6) indicate that the data exhibits a statistically significant, strong pattern of clustering.

<table>
<thead>
<tr>
<th>Results for Churches with Recorded Nave Areas</th>
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<td>Expected mean distance</td>
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*Table VI.6: Nearest Neighbour Analysis results for the 124 churches with a recorded nave area*
These results are similar to those for the whole dataset (Table VI.1), with both the NNI and the z-score being numerically close. This suggests that the subset of churches with a recorded nave area can be considered an accurate representation of the whole dataset, even though there are 36 churches are excluded from this subset. As with the results for the overall dataset, the recorded nave area subset includes multiple phases of churches in the same geographic location, which has likely contributed to strong z-score. The results of this test can now also provide a baseline comparison with any other test only considering churches with a recorded nave area.

Fig. VI.4: Map showing location of the 124 churches in Central Lycia with recorded nave areas in two subsets, one with a nave area over the mean, and one with the nave area under the mean

The simplest method of dividing the dataset in order to test for different patterns of geographic distribution by nave area would be to separate the churches based on the median nave area, which is 51.84m². This, however, misses out a number of churches that are certainly from the later period of
construction, such as Kyaneai Church C Single Aisle, Korba Internal Triconch Church, Korba Internal Church 2, and Aperlae Subscribed Triconch Church Phase 2. All of these churches are second phases or internal churches. To mitigate this issue, I decided to use the mean ($115.36m^2$), rather than median of the nave areas, as this sits more comfortably between what are normally considered smaller and larger nave areas (Fig. VI.4). This division also better mirrors the way the nave areas are distributed, as the break falls between a $27m^2$ from Karakuyu ($90.88m^2$) to Apollonia Theatre Church ($118.66m^2$).

<table>
<thead>
<tr>
<th>Results for Churches with a Nave Area Below 115.36m^2</th>
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<td>Expected mean distance</td>
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*Table VI.7: Nearest Neighbour Analysis results for the 74 churches with a nave area below 115.36m^2.*

The Nearest Neighbour results for the subset of churches with a recorded nave area below 115.36m^2 (Table VI.7) suggests that the churches are slightly clustered.

<table>
<thead>
<tr>
<th>Results for Churches with a Nave Area Above 115.36m^2</th>
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<td>Expected mean distance</td>
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*Table VI.8: Nearest Neighbour Analysis results for the 50 churches with a nave area above 115.36m^2.*

The results for those churches with a nave area above $115.36m^2$ (Table VI.7) is different than those with nave areas below $115.36m^2$ (Table VI.8), as the churches with nave areas above the mean are more geographically clustered. Both results are statistically significant.
VI.iii Absence Presence Traits

VI.iii.a Atria and Carved Decoration

Fig. VI.5: Map showing location of the 21 churches in Central Lycia with an atrium.

I will first run Nearest Neighbour Analysis on the atria and original carved decoration subsets individually. The subset of churches with the presence of an atrium (Fig. VI.5) has a distribution that is slightly clustered (Table VI.9).

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<tr>
<th>Results for Churches with an Atrium</th>
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<td>Expected mean distance</td>
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Table VI.9: Nearest Neighbour Analysis results for the 21 churches with an atrium
The original carved decorations subset (Fig. VI.6) is closer to random distribution (Table VI.10). With both this and the atrium presence subset trending towards random distribution, it is likely that a subset of churches that have the presence of both features will also be randomly distributed.

<table>
<thead>
<tr>
<th>Results for Churches with Original Carved Decoration</th>
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<td>Expected mean distance</td>
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*Table VI.10: Nearest Neighbour Analysis results for the 35 churches with original carved decoration*
Fig. VI.7: Map showing location of the 14 churches in Central Lycia with both original carved decoration and the presence of an atrium.

<table>
<thead>
<tr>
<th>Results for Churches with Presence of both an Atrium and Original Carved Decoration</th>
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<tr>
<td>Expected mean distance</td>
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Table VI.11: Nearest Neighbour Analysis results for the 14 churches with an atrium and original carved decoration.

The NNI (Table VI.11) for the subset of churches with the presence of both an atrium and original carved decoration (Fig. VI.7) is 0.98, indicating that the dataset is randomly distributed, even more so than the subsets when tested individually. The z-score suggests that this result may not be significant; this is likely due to the small sample size.
Fig. VI.8: Map showing location of the 36 churches in Central Lycia with both a recorded nave area and the presence of a narthex.

I will first run Nearest Neighbour Analysis on the overall subset of churches with narthexes (Fig VI.8), before considering how to further subset this dataset based on nave area.

<table>
<thead>
<tr>
<th>Results for Churches with a Narthex and a Recorded Nave Area</th>
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<td>Expected mean distance</td>
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Table VI.12: Nearest Neighbour Analysis results for the 36 churches with a narthex and a recorded nave area.
The results of the NNA on the subset of churches with a recorded nave area and the presence of a narthex (Table VI.12) suggest that the subset is relatively clustered.

Fig. VI.9: Map showing location of the 36 churches in Central Lycia with both a recorded nave area and the presence of a narthex, divided into two subsets: those with nave areas over the median, and those with nave areas under the median.

For this second test, the churches have been split into two subsets by median nave area, which is 81.37m² (Fig VI.9). Dividing a morphometric variable by the median is an easy way to split a dataset without a need for more complex justification for editing the data.
### Results for Churches with a Narthex and a Recorded Nave Area Above 81.37m²

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<tbody>
<tr>
<td>Expected mean distance</td>
<td>2914.8m</td>
</tr>
<tr>
<td>Observed mean distance</td>
<td>1848.68m</td>
</tr>
<tr>
<td>Nearest Neighbour Index</td>
<td>0.63</td>
</tr>
<tr>
<td>Z-Score</td>
<td>-2.97</td>
</tr>
<tr>
<td>Sample Size</td>
<td>18</td>
</tr>
</tbody>
</table>

**Table VI.13: Nearest Neighbour Analysis results for the 18 churches with a narthex and a recorded nave area over 81.37m².**

There are 18 churches with a narthex and nave area above the median of the subset. The nave areas in this subset range from 82.13m² (Aperlae Subscribed Triconch Church Phase 2) to 357.22m² (Sura Plateau Phase 1). The NNI (Table VI.13) for this subset indicate that the churches with the presence of a narthex and a nave area larger than 81.37m² trend slightly more towards a random distribution than a clustered distribution. It is worth considering the potential issue with one of the churches in this subset: the Dereağız Church (Figs VI.9 & A.29), which has a nave area of 310.18m². The construction technique and style of the church both indicate that the site was probably constructed in the late 9ᵗʰ to early 10ᵗʰ century (Morganstern 1983, 89).

### Results for Churches with a Narthex and a Recorded Nave Area Below 81.37m²

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected mean distance</td>
<td>2483.43m</td>
</tr>
<tr>
<td>Observed mean distance</td>
<td>2273.59m</td>
</tr>
<tr>
<td>Nearest Neighbour Index</td>
<td>0.92</td>
</tr>
<tr>
<td>Z-Score</td>
<td>-0.69</td>
</tr>
<tr>
<td>Sample Size</td>
<td>18</td>
</tr>
</tbody>
</table>

**Table VI.14: Nearest Neighbour Analysis results for the 18 churches with a narthex and a recorded nave area under 81.37m².**

There are 18 churches with a narthex and nave area below the median of the subset. The nave areas in this subset range from 9.38m² (İnişdibi Phase 2) to 80.61m² (Korba Internal Triconch Church and Korba Internal Church 2). The results of this test suggest that the churches with a nave area lower than
81.37m² with the presence of a narthex have a random distribution (Table VI.14). As with the other test that came out with an NNI closest to random (Table VI.11), The z-score indicates that this is not necessarily significant, though this will again be discussed in Section V.

In order to account for the Dereağzı Church’s fairly confident dating to the later period of construction, I have also run NNA on the subsets again, but with the Dereağzı Church moved into the group of churches with the nave areas below the median

<table>
<thead>
<tr>
<th>Results for Churches with a Narthex and a Recorded Nave Area Below 81.37m² with the addition of the Dereağzı Church</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Expected mean distance</strong></td>
</tr>
<tr>
<td><strong>Observed mean distance</strong></td>
</tr>
<tr>
<td><strong>Nearest Neighbour Index</strong></td>
</tr>
<tr>
<td><strong>Z-Score</strong></td>
</tr>
<tr>
<td><strong>Sample Size</strong></td>
</tr>
</tbody>
</table>

*Table VI.15: Nearest Neighbour Analysis results for the 18 churches with a narthex and a recorded nave area under 81.37m² as well as the Dereağzı Church.*

The results of the analysis on the 17 churches with a nave area larger than the median, but without the Dereağzı Church, are incredibly similar to the subset with the Dereağzı Church included (NNI:0.61, z-score: -3.07). However, the results of the analysis on the subset of churches with areas below the median, but with the addition of the Dereağzı Church, are different enough to be considered separately (Table VI.15). The NNI indicates that the dataset has a slightly less random distribution, though the churches are still distributed more randomly than clustered. The z-score is much lower, and much closer to -1.96, which would indicate significance.
The correlation between churches with the presence of a subsidiary chapel and a larger nave area (Sections V.i.a.4 & V.iv.b.1), suggests that we should expect the results of the NNA will be more similar to the results from Table VI.8.

**Results for Churches with a Subsidiary Chapel**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected mean distance</td>
<td>2070.02m</td>
</tr>
<tr>
<td>Observed mean distance</td>
<td>1380.51m</td>
</tr>
<tr>
<td>Nearest Neighbour Index</td>
<td>0.66</td>
</tr>
<tr>
<td>Z-Score</td>
<td>-3.88</td>
</tr>
<tr>
<td>Sample Size</td>
<td>37</td>
</tr>
</tbody>
</table>

Table VI.16: Nearest Neighbour Analysis results for the 37 churches with the presence of a subsidiary chapel.
The results from the NNA for the 37 churches with a subsidiary chapel (Fig. VI.10) indicate that the dataset is very slightly clustered (Table VI.15). This is slightly different than the result for the churches with a nave area larger than the mean nave area (Table VI.8), which are less clustered.

**VI.iii.d Churches with Synthronons**

As with the other absence presence traits, I will first run Nearest Neighbour Analysis on the whole subset, before breaking the churches into sub-groups based on nave area.

*Fig. VI.11: Map showing location of the 19 churches in Central Lycia with the presence of a synthronon.*
Results for Churches with a Synthronon

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected mean distance</td>
<td>2301.37m</td>
</tr>
<tr>
<td>Observed mean distance</td>
<td>1709.22m</td>
</tr>
<tr>
<td>Nearest Neighbour Index</td>
<td>0.74</td>
</tr>
<tr>
<td>Z-Score</td>
<td>-2.15</td>
</tr>
<tr>
<td>Sample Size</td>
<td>19</td>
</tr>
</tbody>
</table>

Table VI.17: Nearest Neighbour Analysis results for the 19 churches with the presence of a synthronon

The 19 churches in Central Lycia with the presence of a synthronon (Fig. VI.11) are spatially distributed in a randomised manner (Table VI.17). Unlike the other subsets of data that have had an NNI that indicates a random distribution, the z-score of this dataset indicates that the NNI is accurate.

![Map showing location of churches with the presence of a synthronon in two groups broken down by nave area.](image)

Fig. VI.12: Map showing location of churches with the presence of a synthronon in two groups broken down by nave area.

Breaking the synthronon subset into two groups by nave area presents some problems. Firstly, only 15 of the 19 churches have a recorded nave area.
Secondly, with an odd number of sites, the median nave area of 210.6m$^2$, comes from Yılanbaşı Basilica (Fig. A.69). As Yılanbaşı Basilica has an internal church, the Basilica phase is likely from the earlier period of construction rather than the later. Since the aim of testing nave area sub-groups is to check for different distribution over the earlier and later period of construction, I have decided to include Yılanbaşı Basilica in the larger nave area subset. This, however, causes an issue; the church with the nave area just under Yılanbaşı Basilica is East Asarcık (nave area 201.4m$^2$, Fig. A.21) also has an internal church. Because of the internal church at East Asarcık, I have also placed it in the larger nave area subset (Fig. VI.12). None of the other six churches with synthronons and smaller nave areas have internal churches or second phases.

<table>
<thead>
<tr>
<th>Results for Churches with a Synthronon with a larger nave area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected mean distance</td>
</tr>
<tr>
<td>Observed mean distance</td>
</tr>
<tr>
<td>Nearest Neighbour Index</td>
</tr>
<tr>
<td>Z-Score</td>
</tr>
<tr>
<td>Sample Size</td>
</tr>
</tbody>
</table>

Table VI.18: Nearest Neighbour Analysis results for the 9 churches with a larger nave area

The nine churches with a larger nave area and a synthronon are distributed in a manner that trends more towards randomness than clustering, though the z-score indicates that this result is not significant (Table VI.18).

<table>
<thead>
<tr>
<th>Results for Churches with a Synthronon with a smaller nave area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected mean distance</td>
</tr>
<tr>
<td>Observed mean distance</td>
</tr>
<tr>
<td>Nearest Neighbour Index</td>
</tr>
<tr>
<td>Z-Score</td>
</tr>
<tr>
<td>Sample Size</td>
</tr>
</tbody>
</table>

Table VI.19: Nearest Neighbour Analysis results for the 15 churches with the presence of a synthronon that were in use in the later period of construction
Unlike those with a larger nave area, the six churches with a smaller nave area and a synthronon are distributed in a regular manner, and the results of this test are significant (Table. VI.19).

**VI.iii.d Triconch Churches**

Spatial analysis of the distribution of triconch churches will help to confirm the relationship between triconch churches and the Alaca Mountian and triconch churches discussed in Section V.iv.a.

*Fig. VI.13: Map showing location of the five churches in Alaca with the presence of a triconch apse, and the four churches in Hills with the presence of a triconch apse.*
Results for Churches with a Triconch Apse

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected mean distance</td>
<td>3587.19m</td>
</tr>
<tr>
<td>Observed mean distance</td>
<td>1231.85m</td>
</tr>
<tr>
<td>Nearest Neighbour Index</td>
<td>0.34</td>
</tr>
<tr>
<td>Z-Score</td>
<td>-3.77</td>
</tr>
<tr>
<td>Sample Size</td>
<td>9</td>
</tr>
</tbody>
</table>

Table VI.20: Nearest Neighbour Analysis results for the nine churches with the presence of a triconch apse

The results for the NNA carried out on the nine churches with a triconch apse (Fig. VI.13) indicates that this subset is highly clustered (Table VI.20). It is likely that the multiple phases at the two triconch churches in Hills is strengthening the signal for clustering, so I will also test the triconch distribution by sub-region.

Results for Churches with a Triconch Apse in Alaca

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected mean distance</td>
<td>1439.91m</td>
</tr>
<tr>
<td>Observed mean distance</td>
<td>2217.34m</td>
</tr>
<tr>
<td>Nearest Neighbour Index</td>
<td>1.54</td>
</tr>
<tr>
<td>Z-Score</td>
<td>2.30</td>
</tr>
<tr>
<td>Sample Size</td>
<td>5</td>
</tr>
</tbody>
</table>

Table VI.21: Nearest Neighbour Analysis results for the five churches with the presence of a triconch apse in Alaca.

The five churches in Alaca with a triconch apse (Fig. VI.13) are distributed geographically in a regular manner (Table VI.21). Even with a small sample size, the z-score indicates that the results are significant. This NNA result is distinctly different from that of the whole dataset (Table VI.20).

Results for Churches with a Triconch Apse in Hills

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected mean distance</td>
<td>1392.35m</td>
</tr>
<tr>
<td>Observed mean distance</td>
<td>0.0m</td>
</tr>
<tr>
<td>Nearest Neighbour Index</td>
<td>0.0</td>
</tr>
<tr>
<td>Z-Score</td>
<td>-3.83</td>
</tr>
<tr>
<td>Sample Size</td>
<td>4</td>
</tr>
</tbody>
</table>

Table VI.22: Nearest Neighbour Analysis results for the four churches with the presence of a triconch apse in Hills.
The results of the analysis on the four triconch churches in Hills (Fig. VI.13) suggests that the dataset is entirely randomly distributed (Table VI.22). This unlikely result is due to the nature of the sample: the four churches actually represent two phases of two churches, meaning that the GPS coordinates for two sets of points are the same. This result is again distinctly different from the results of the analysis carried out on the whole subset of churches with triconch apses (Table VI.20), and on the Alaca triconch churches (Table VI.21).
VI.iv Categorical Traits

VI.iv.a External Apse Shape

As discussed in Sections V.i.c.1 and V.iv.b, there is a correlation between churches with externally three-sided apses and a larger nave area, and externally round apses and a smaller nave area. By running Nearest Neighbour Analysis on these two subsets, I can once again check for any evidence of differing distributions over period of construction.

Fig. VI.14: Map showing location of the 23 churches in Central Lycia with an externally three-sided apse, and the 92 churches with an externally round apse.
Results for Churches with Externally Three-sided Apses

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected mean distance</td>
<td>2631.38m</td>
</tr>
<tr>
<td>Observed mean distance</td>
<td>2265.51m</td>
</tr>
<tr>
<td>Nearest Neighbour Index</td>
<td>0.86</td>
</tr>
<tr>
<td>Z-Score</td>
<td>-1.28</td>
</tr>
<tr>
<td>Sample Size</td>
<td>23</td>
</tr>
</tbody>
</table>

Table VI.23: Nearest Neighbour Analysis results for the 23 churches with an externally three-sided apse.

The results for the 23 churches with an externally three-sided apse (Fig. VI.14) indicate that the subset is distributed randomly. As with many of the other results that indicate a random distribution, the z-score suggests that these results cannot be taken to be entirely accurate. The results for the externally three-sided subset are also notably different from the NNI results of the churches with a nave area above the mean.

Results for Churches with Externally Round Apses

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected mean distance</td>
<td>1520.99m</td>
</tr>
<tr>
<td>Observed mean distance</td>
<td>489.81m</td>
</tr>
<tr>
<td>Nearest Neighbour Index</td>
<td>0.32</td>
</tr>
<tr>
<td>Z-Score</td>
<td>-12.44</td>
</tr>
<tr>
<td>Sample Size</td>
<td>92</td>
</tr>
</tbody>
</table>

Table VI.24: Nearest Neighbour Analysis results for the 92 churches with an externally round apse.

The subset of the 92 churches with externally round apses (Fig. VI.14) is highly clustered (Table VI.24). This subset is even more clustered than the subset of churches with a nave area below the mean (see Table VI.8). As with the overall dataset, the high z-score is likely due to the large number of churches within this subset.

**VI.iv.a Construction Technique**

Due to the associations between specific construction techniques and sub-regions (Section V.iv.b), I have run Nearest Neighbour Analysis on both the
whole construction technique subset, and the construction technique by associated region subset.

**VI.iv.b.1 Ashlar Masonry**

![Map showing location of churches constructed with ashlar masonry](image)

*Fig. VI.15: Map showing location of 15 churches constructed of ashlar masonry, and the 19 churches constructed with a combination of ashlar and mortar and rubble masonry across Central Lycia.*

<table>
<thead>
<tr>
<th>Results for Churches Constructed with Ashlar Masonry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected mean distance</td>
</tr>
<tr>
<td>Observed mean distance</td>
</tr>
<tr>
<td>Nearest Neighbour Index</td>
</tr>
<tr>
<td>Z-Score</td>
</tr>
<tr>
<td>Sample Size</td>
</tr>
</tbody>
</table>

*Table VI.25: Nearest Neighbour Analysis results for the 15 churches constructed of ashlar masonry.*

The results for churches constructed of ashlar masonry (Fig VI.15) indicate that this subset is randomly distributed, though the z-score suggests that this
result is not significant (Table VI.25). This has been the case with almost all of nearest neighbour results where the NNI has trended closest to random.

Table VI.26: Nearest Neighbour Analysis results for the nine churches in Alaca constructed of ashlar masonry.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Expected mean distance</strong></td>
<td>1963.14m</td>
</tr>
<tr>
<td><strong>Observed mean distance</strong></td>
<td>2844.33m</td>
</tr>
<tr>
<td><strong>Nearest Neighbour Index</strong></td>
<td>1.44</td>
</tr>
<tr>
<td><strong>Z-Score</strong></td>
<td>2.57</td>
</tr>
<tr>
<td><strong>Sample Size</strong></td>
<td>9</td>
</tr>
</tbody>
</table>

There are nine churches constructed of ashlar masonry in Alaca (Fig. VI.16). The results of analysis show that this subset of churches is regularly distributed (Table VI.26). Even through this is a small sample size, the z-score indicates that the results are reliable.
VI.iv.b.2 Mortar and Rubble with Ashlar Masonry

<table>
<thead>
<tr>
<th>Results for Churches Constructed with a Combination of Ashlar and Mortar and Rubble Masonry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected mean distance</td>
</tr>
<tr>
<td>Observed mean distance</td>
</tr>
<tr>
<td>Nearest Neighbour Index</td>
</tr>
<tr>
<td>Z-Score</td>
</tr>
<tr>
<td>Sample Size</td>
</tr>
</tbody>
</table>

Table VI.27: Nearest Neighbour Analysis results for the 19 churches in Central Lycia constructed of a combination of mortar and rubble and ashlar masonry

Fig. VI.17: Map showing location of the seven churches constructed of a combination of mortar and rubble and ashlar masonry in Plains (Arneai Church A in red), and the 12 churches constructed of ashlar and mortar and rubble masonry in Alaca and Hills.

Analysis of the 19 churches constructed of a combination of mortar and rubble and ashlar masonry (Fig. VI.17) indicates that the churches in this subset are randomly distributed, though the z-score is not within a high confidence range (Table VI.27).
<table>
<thead>
<tr>
<th>Results for Churches Constructed with a Combination of Ashlar and Mortar and Rubble Masonry in Plains</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected mean distance</td>
</tr>
<tr>
<td>Observed mean distance</td>
</tr>
<tr>
<td>Nearest Neighbour Index</td>
</tr>
<tr>
<td>Z-Score</td>
</tr>
<tr>
<td>Sample Size</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Results for Churches Constructed with a Combination of Ashlar and Mortar and Rubble Masonry in Plains without Arneai Church A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected mean distance</td>
</tr>
<tr>
<td>Observed mean distance</td>
</tr>
<tr>
<td>Nearest Neighbour Index</td>
</tr>
<tr>
<td>Z-Score</td>
</tr>
<tr>
<td>Sample Size</td>
</tr>
</tbody>
</table>

Table VI.28: Nearest Neighbour Analysis results for the seven churches in Plains constructed of a combination of mortar and rubble and ashlar masonry

There are seven churches in Plains that are constructed of a combination of mortar and rubble and ashlar masonry (Fig. VI.17). The NNI for this subset suggests that the dataset is tending towards regular distribution (Table VI.28), but the z-score is just shy of significance. For such a small sample size, the expected mean distance is incredibly high, which is likely due to Arneai Church A being part of this subset (see Fig. VI.17). While Arneai Church A is within the Plains subset, the extreme distance from all of the other churches within this subset mark it out as an outlier. In order to account for this, I have also run NNA on the Plains mortar and rubble with ashlar masonry subset without Arneai Church A.

Table VI.29: Nearest Neighbour Analysis results for the churches in Plains constructed of a combination of mortar and rubble and ashlar masonry without Arneai Church A (six churches).

The sample of churches in Plains without Arneai Church A is extremely regularly distributed (Table VI.29). Both the NNI and z-score for this subset without Arneai Church A have a stronger signal, suggesting that the removal of the Arneai Church was useful for the purposes of analysis.
VI.iv.b.3 Mortar and Rubble Masonry

Fig. VI.18: Map showing location of the 90 churches built using mortar and rubble construction in Central Lycia

<table>
<thead>
<tr>
<th>Results for Churches Constructed of Mortar and Rubble Masonry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected mean distance</td>
</tr>
<tr>
<td>Observed mean distance</td>
</tr>
<tr>
<td>Nearest Neighbour Index</td>
</tr>
<tr>
<td>Z-Score</td>
</tr>
<tr>
<td>Sample Size</td>
</tr>
</tbody>
</table>

Table VI.30: Nearest Neighbour Analysis results for the 90 churches built using mortar and rubble construction

There are 90 churches constructed of mortar and rubble with recorded GPS points in Central Lycia (Fig. VI.18). The church at Karakuyu, which does not have a recorded GPS point, is constructed of mortar and rubble but not included in this analysis. The analysis of the entire mortar and rubble subset indicates that the churches are slightly clustered (Table VI.30).
There are 63 churches constructed of mortar and rubble in Hills (Fig. VI.19). This subset is very slightly more clustered than the subset of mortar and rubble churches across Central Lycia, but not by much (Table VI.31), which suggests that there is not a distinct enough difference between the two subsets to provide different results.

Fig. VI.19: Map showing location of the 63 churches built using mortar and rubble construction in Hills, and the 27 mortar and rubble churches in Alaca and Plains

<table>
<thead>
<tr>
<th>Results for Churches Constructed of Mortar and Rubble Masonry in Hills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected mean distance</td>
</tr>
<tr>
<td>Observed mean distance</td>
</tr>
<tr>
<td>Nearest Neighbour Index</td>
</tr>
<tr>
<td>Z-Score</td>
</tr>
<tr>
<td>Sample Size</td>
</tr>
</tbody>
</table>

Table VI.31: Nearest Neighbour Analysis results for the 63 churches built using mortar and rubble construction in Hills
The discussion of the evidence for Temporal Change in Central Lycia is based on the evidence of the Exploratory Data Analysis (EDA) carried out in Chapter IV, and the Nearest Neighbour Analysis (NNA) carried out in Chapter IV. It is broken down into sub-sections by data types. The first section covers the geographic and morphometric variables (VII.i) and provides a discussion of differing spatial distribution by region. The section pertains to Absence Presences Traits (VII.ii), and covers the evidence for temporal association between the presence of certain traits and period of use. The final section provides a discussion of Categorical Traits (VII.iii) and temporal variation, including an analysis of the evidence, or lack thereof, for previous associations between categorical traits and period of construction.

### VII.i Spatial Distribution

The NNA of the dataset as a whole suggests that the churches of Central Lycia are highly clustered (Table VI.1), which is likely to indicate that the dataset has a high level of temporal clustering. With this in mind, we can better interpret the results of other NNA tests; clustering is not just an indication of a large amount of building at one site in a contemporary phase, as it could also be an indication of consistent building in one location over a prolonged period of time. The NNA for the whole of Central Lycia provides a reference for the interpretation of the results of the NNA run in the three regions individually.

The NNA tests run on all three sub-regions have illuminated three distinct patterns of church distribution within Central Lycia: While many of the churches in Hills are clustered around pre-existing settlements, the majority of the sites are randomly distributed across the sub-region (VII.i.a). In Alaca, the trend towards clustering is likely due to a temporal focus on specific sites, with a large portion of the churches having an internal rebuild (VII.i.b).
Finally, in Plains, the churches are highly clustered, especially around pre-existing settlements, without any underlying random distribution (VII.i.c).

**VII.i.a Upland Hills**

The churches in Hills are the least clustered of all three of the sub-regions, as the NNI is almost halfway in between being totally clustered and totally random (Table VI.3, also see Fig. B.21). This means the dataset for Hills is still fairly clustered, but less so than the overall dataset. The larger the dataset, the more likely the data is to be dispersed in either a random or regular manner, so with Hills having the highest sample size (99 churches), the fairly clustered result is more noteworthy.

*Fig. VII.1: Map of 99 churches in Hills, with sites that have a high concentration of churches labelled.*
In this instance, the clustering visible in the NNA result is likely due to this region encompassing few large settlements, such as Kyaneai, Aperlae, and the two settlements on Kekova Island, Kekova North and Tersane (Fig. VII.1). Kyaneai had city status in antiquity and was the seat of a bishopric in the Christian period (Foss 1994, 20). Aperlae was also a designated city and head of a local federation, which included the settlements on Kekova Island as well as a few other inland sites (Foss 1994, 16). In these areas of concentrated settlement, there is a high frequency of churches, most of which have internal remodels or rebuilds recorded as a separate sites. For example, there are 12 GPS points representing the seven Kyaneai churches and all of their internal rebuilds (see database). There are also a few more rural sites that have a similar high concentration of sites in a small area, even though there are less churches at the settlement than at a city like Kyaneai. For example, the settlement at Büyük Avaşar, which has five database entries, and at Nenealanı, which has three database entries (Fig. VII.1). The 37 churches at these six sites make up 37.4% of the total Hills subset (99 churches). By considering the reason behind the clustering result from the NNA, a more nuanced interpretation of the Hills region emerges. The region is better characterised as having a combination of randomly distributed churches interspersed with highly clustered groups of churches at areas of concentrated settlement (Fig. VII.1).

VII.i.b Alaca Mountain

The churches in Alaca are slightly more clustered than Hills, but less so than the overall dataset (Table VI.3), even though visually, the churches in Alaca look much more dispersed (Fig. VII.2) than the Hills subset. There are no settlements in Alaca that have the same concentration of churches as settlements in Hills like Kyaneai or Aperlae. There are, however, quite a few sites that have internal churches, which has probably affected the NNA results. Of the 33 churches in Alaca, eight are internal churches, which
means that 16 of the 33 churches (48.5%) have two phases of construction on a single site.

Fig. VII.2: Map of 33 churches in Alaca, with the Asarcık churches labelled.

There is only one place where there is a visually discernible cluster of sites, which is around the Asarcık settlements: East Asarcık and Internal Church, and West Asarcık and Internal Church (Fig. VII.2). Still, half of the churches recorded here are internal churches, so this cluster still represents a temporal concentration of churches, rather than a concentration of churches around a specific settlement like in Hills.

VII.i.c Coastal Plains

The churches in Plains are noticeably more clustered than those in Hills and Alaca (Table VI.5). As discussed in Section III.i.h.2, the Plains region is the region most likely to have the lowest level of survival of architectural remains, especially within the Demre Plain, which is in part covered by the modern city
of Demre, and the Kasaba Valley, which is used for agricultural purposes today. The majority of the churches currently recorded in those areas are relatively large, such as the Myra Nicholas church and the Dereağzı Church, which suggests that the churches currently missing from the archaeological record would likely be smaller, single-aisled structures. Many of the larger churches are clustered around sites with pre-Christian urban cities and settlements, similarly to those in Hills, which is potentially one of the factors that led to the highly clustered result. Unlike Hills, however, there are far fewer churches that do not fall within these pre-Christian urban cities and settlements, which is why the NNA result trends so much more towards clustering.

Fig. VII.3: Map of 28 churches in Plains, with sites that have a high concentration of churches labelled.
There are four sites within Plains which are urban settlements from the pre-Christian period, and that have more than two churches: the city of Myra, its port Andriake, the nearby town of Sura, and the city of Arneai on the south slope of the Eren Mountain (Fig VII.3). The city of Myra, which was granted the title of metropolis by Theodosios II in the 5th century, served as both the political and ecclesiastical capital of Lycia (Foss 1994. 23). There are four churches (Myra Nicholas, Myra Castle, Myra Castle Ridge, and Myra Alakent) in the general vicinity of the city (Fig V.3), including the Myra Nicholas church which was built outside the city but accessible via a covered portico that linked the city to the church (Foss 1994, 24). From textual sources, we know there is at least one church missing from the current archaeological record of Myra, the cathedral and seat of the archbishop of Myra, dedicated to St. Irene (Foss 1994, 24), which is mentioned in the *Life of St Nicholas of Holy Sion*.

The archaeological evidence from Myra’s port Andriake (Fig V.3) illustrates that the site was thriving in the early Christian period (see Foss 1994, 24-26; Akyürek 2016). This is evidenced by the six churches recorded at Andriake (Andriake Churches A - F), five of which are dated by scholars to the earlier period of construction (Andriake Churches A-E). There are an additional two churches at the nearby town of Sura (Fig. VII.3), which was the location of the well-known fish oracle of Apollo in pre-Christian times (Foss 1994, 26). While there are only two churches at this site (Sura Valley & Sura Plateau), the Sura Plateau church has four distinct phases (Fig. A.60), which are all recorded in the database as individual churches. These four phases are an indication of continuing use, and change in church architecture that occurred throughout the Christian period. The Sura Valley church itself is notable for the synthronon in its apse, a feature which is discussed in more detail in Section VII.iii.

One of the other locations in Plains with a high concentration of sites is the city of Arneai. Like Aperlae, Arneai was the head of a local federation, and
the seat of a bishop (Foss 1991, 318). There are four churches recorded in the direct vicinity of Arneai (Arneai Churches A-D), as well as the Çamarkası church, which is located c. 6.5 kilometres to the west of Arneai. As with Kyaneai and the other urban centres in Hills, the five churches in and around Arneai represent a concentrated pattern of church construction. The 20 churches at Myra, Andriake, Sura, and Arneai discussed above make up 71.4% of the whole dataset for Plains. While this result may at first seem similar to that found in Hills, the distinct difference in Plains is the presence of only eight churches in the dataset that are not in the cities and settlements.

VII.i.d Nave Area

Only 124 of the 162 churches in the study area have a recorded nave area (see Section III.i.a) and a recorded GPS point (see Section III.i.a). The NNA run on the churches with recorded nave areas suggests a similar distribution to that of churches for the whole dataset (see Table VI.1); the churches are highly clustered (Table VI.6). This also indicates that the subset of churches with recorded nave areas is representative of the overall dataset. The results of the NNA on the 50 churches with nave areas above the mean suggested that these churches were distributed in a clustered manner (Table VI.8). The 74 churches with a nave area below the mean were, however, only distributed in a slightly clustered manner (Table VI.7). This result, of a difference in spatial distribution for churches with different nave areas, is the first indication that there may be some temporal variation in how the churches are spatially distributed within Central Lycia. The results for the overall dataset provide a baseline for any other NNA results that relate to nave area. These results also somewhat follow the analysis of regional distribution for the Hills region (Section VII.i.a), where churches cluster around either around pre-Christian urban settlements, smaller and more rural Christian period settlements, or are randomly distributed across the rest of the Hills region.
### VII.ii Absence Presence Traits

**VII.ii.a Atria and Carved Decoration**

<table>
<thead>
<tr>
<th>Period of Construction</th>
<th>Churches with Atria</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Alacahisar</td>
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<tr>
<td></td>
<td>Alakilise</td>
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<tr>
<td></td>
<td>Andriake Church B</td>
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<td></td>
<td>Andriake Church D</td>
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<td></td>
<td>Andriake Church E</td>
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<tr>
<td></td>
<td>Aperlae Lower Church</td>
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<td></td>
<td>East Asarcik</td>
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<td></td>
<td>West Asarcik</td>
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<td></td>
<td>Devekuyusu</td>
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<tr>
<td></td>
<td>Güceyman Basilica</td>
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<td></td>
<td>Günaği</td>
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<tr>
<td></td>
<td>Istdlada Basilica</td>
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<tr>
<td></td>
<td>Kara Adasi Church</td>
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<tr>
<td></td>
<td>Kyaneai Church A Basilica</td>
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<tr>
<td></td>
<td>Myra Nicholas</td>
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<tr>
<td></td>
<td>Turant Dağ</td>
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<tr>
<td>Earlier Period</td>
<td>Alakilise Internal Church</td>
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<tr>
<td></td>
<td>Apollonia Theatre Church</td>
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<tr>
<td></td>
<td>East Asarcik Internal Church</td>
</tr>
<tr>
<td></td>
<td>West Asarcik Internal Church</td>
</tr>
<tr>
<td>Later Period</td>
<td>Kyaneai Church A Internal Church</td>
</tr>
</tbody>
</table>

Table VII.1: The 21 churches with the presence of an atrium, broken down by period of construction as dated by previous scholarship.

The NNA results atria suggests that the atria presence subset is distributed in a slightly clustered manner (Table VI.9), which is more similar to the results for the NNA on churches with nave areas below the mean (Table VI.7), even though churches with atria on average have larger nave areas (Section V.i.b.1). The recorded mean distance between churches with the presence of an atrium is 1656.53m, which is relatively high in comparison to all of the other mean distances for the NNA tests. This high mean distance may have led to any clustering signal being dampened. Equally, such a small number of churches having an atrium (21 churches), it may be a case that trait not being as popular in the design of churches in Central Lycia, which would account for the trend towards randomness in the result. Throughout early
Christian church architecture, atria are more often seen in the earlier period of construction, as atria stop being used during the Transitional Period, and are rarely built at later period churches (Ousterhout 1999, 14).

In order to assess whether or not this is the case, it is worth turning to the dates provided for these churches by previous scholarship in the region. The four internal churches (Table VII.1) are all usually dated to the later period of construction. As discussed above (Section V.iv.b), internal churches are some of the only churches that can be fairly concretely dated to the later period of construction, as the earlier church must have fallen out of use before the internal church is built. At these four internal churches, access to the nave would have been through the atrium, which was part of the earlier church. 16 of the 21 churches with atria are dated to the earlier period of construction including the four sites that have a second phase as an internal church. These dates, when taken with the results of the EDA and NNA suggests there is a correlation between the presence of atria, nave area, and the earlier period of construction. The one exception to this is Apollonia Theatre Church, which is dated stylistically to the later period of construction (see more below, Section VII.v). Why this church was built with an atrium is unclear, but it is certainly an outlier within Central Lycia.

The 35 churches with original carved decoration are distributed in a relatively random manner (Table VI.10). If the presence of carved decoration primarily indicates that more resources went into the church, the randomness of the NNA could suggest that there was no real pattern to the churches focused on by patrons donating funds and resources. This is somewhat unexpected in that wealth is often concentrated in cities along the coast, as the wealth in Central Lycia primarily came from trade (Foss 1994, 30). If this were the case, the NNA result would indicate more of a pattern of clustering around cities, but it does not. While the spatial distribution may be random, the

12 All dates for church construction mentioned in this chapter are based on data collected from published articles, see database for relevant sources for each site. Sources for individual churches are listed under ‘source’ column.
analysis of the distribution of carved decoration by sub-region (V.i.b.2), still suggests that carved decoration is associated with Alaca over the other two regions.

<table>
<thead>
<tr>
<th>Region</th>
<th>Churches with both an Atrium and Original Carved Decoration</th>
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</thead>
<tbody>
<tr>
<td>Alaca</td>
<td>Alacahisar</td>
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<tr>
<td></td>
<td>Alakilise</td>
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<td>East Asarcik</td>
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<td>West Asarcik</td>
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<td>Devekuyusu</td>
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<td>Güceyman Basilica</td>
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<td>Gınaği</td>
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<td></td>
<td>Turant Dağ</td>
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<tr>
<td>Hills</td>
<td>Aperlae Lower Church</td>
</tr>
<tr>
<td></td>
<td>Istlada Basilica</td>
</tr>
<tr>
<td>Plains</td>
<td>Andriake Church B</td>
</tr>
<tr>
<td></td>
<td>Andriake Church D</td>
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<tr>
<td></td>
<td>Andriake Church E</td>
</tr>
<tr>
<td></td>
<td>Myra Nicholas</td>
</tr>
</tbody>
</table>

Table VII.2: The 14 churches with the presence of both an atrium and original carved decoration, by region.

Like the presence of an atrium, carved decoration is often associated with the earlier period of church construction (Niewöhner 2017b). And, based on work by scholars working in the region, 34 of the 35 churches with original carved decoration have been dated to the earlier period of construction. The only church that is dated to the later period but has architectural carvings is Settlement LXXII Üçtepe, west of Trysa, where the carving could be reused, but is considered original by Altripp (2010e, 332). The dating of these sites, considered along with the results of the EDA and NNA, is an indication that there is a correlation between original carved decoration, nave area, and period of construction.

The next test I ran was on the 14 churches with original carved decoration and the presence of an atrium (Table VII.2). The only two churches with atria from the earlier period of construction that do not have carved decoration are: Kyaneai Church A Basilica, and the Kara Adasi Church. There is no carved decoration present at the Kara Adasi Church, but at Kyaneai Church
A Basilica, there is reused carved decoration, which comes from a pre-Christian structure (Altripp 2010a, 108). While the NNA result for churches with both an atrium and original carved decoration was not significant, the results suggested they were randomly distributed (Table VI.11). As the results of this test are similar to the results for the individual carved decoration and atria subsets, we can assume that the result of this test was accurate, even without the z-score indicating significance.

The geographic randomness of churches with the presence of both traits may indicate that spatial distribution was not the primary concern when it came to constructing churches with both of these features, not unlike the individual subsets of atria and carved decoration. Still, the combination of the EDA results, scholarship on the features, and dates ascribed to the churches show that the presence of an atrium and/or carved decoration should be considered an indication that a church is likely to come from the earlier period of construction. And, as the presence of both of these traits correlates with a larger nave area, thus far it seems as though the earlier period of construction does correlate with larger nave areas, which would suggest that smaller nave areas correlate with the later period of construction. This follows previous arguments from the literature on the region, where smaller, single-aisled churches are often considered to be from the later period of construction.

VII.ii.b Narthexes

The subset of 36 churches with a narthex and a recorded nave area are distributed in a slightly clustered manner (Table VI.12). This result falls in between the result for churches with nave areas below the mean (Table VI.7) and churches with nave areas above the mean (Table VI.8). This is to be expected, as the nave areas of churches with narthexes is not consistent across the three sub-regions. Narthexes only appear in Plains at churches with larger nave areas, and in Alaca and Hills at churches with smaller nave
area. This means that if nave area is taken to correlate with period of construction, it would suggest that the preference for the narthex trait changed over time by region.

It is expected that the churches with narthexes and larger nave areas were distributed in a clustered manner (Table VI.13), as the subset of churches in Central Lycia with larger nave areas are clustered as well (Table VI.8). This result did not really change after the removal of the Dereağzı Church. The NNA results for the 18 churches with narthex presence and a lower nave area, plus Dereağzı suggest that the churches are distributed in a slightly less randomised manner than the first test on this subset (Tables VI.14 & VI.15). Though the results are not significant on both tests, the z-score for the second test that includes the Dereağzı Church is much closer to the significance range (see Section V.iii.b).

The results of these tests can be interpreted as follows. Narthex churches with larger nave areas, which are likely from the earlier period of construction, are distributed in a clustered manner. In the later period of construction, churches with narthexes are most likely built in a more randomised manner. The presence of narthexes is usually associated with churches from the earlier period of construction (Ousterhout 1998, 14), however, in Alaca and Hills the opposite is true. This suggests a difference in socially learned behaviour relating to church design and construction, as information regarding the purpose and use of the narthex trait was transmitted differently to Plains than the other two sub-regions. It is, however, clear that narthexes exist in the later period of construction in Central Lycia. Considering the small number of churches with narthexes in the earlier period of construction in both Alaca and Hills, it is likely that the purpose of the narthex shifted to hold a different liturgical function locally, which in turn was more important to the later period liturgy.
Indeed, many of the churches with narthexes and a smaller nave area in Alaca and Hills are internal remodels of earlier sites, where a narthex has been added to the church in the later period (see Dikmen Internal Church: Fig. A.32, Yılanbaşı Internal Church: Fig. A.69, İnişdibi Phase 2: Fig. A.40, Korba Internal Triconch Church: Fig. A.45). Equally, there are a few churches in Plains from the later period of construction, which also have a narthex (see Dereağzı Church: Fig. A.29, and Myra Alakent: Fig. A.56), which suggests that churches with narthexes continue to be important in the Plains region over both periods of construction. Myra, which is in the Plains region, was the centre of ecclesiastical authority in Central Lycia. The presence of the archbishop, and all of the clergy that would have travelled to and from Myra for religious purposes, would have brought with them different learned behaviours of church construction to those found locally in Central Lycia. It is possible that this interaction is behind the construction of narthexes in the early period of construction in Plains.

It is worth briefly considering any interpretation of churches with the presence of both an atrium and a narthex. There are only four churches with both a narthex and an atrium: Alakilise and Alakilise Internal Church (Fig. A.3) in Alaca, and Andriake Church E (Fig. A.10) and the Myra Nicholas Church (Fig. A.55) in Plains. There are no churches with the presence of both traits in Hills. As churches in Plains with narthexes are associated with the earlier period of construction, and as atria are associated with the earlier period of construction, it would follow that these three churches are from the earlier period. The presence of both these traits may indicate that these churches were some of the earliest built in the region, as many of the earliest Christian churches had both a narthex and an atrium (Stewart 2010, 181). The first mention of the Myra Nicholas church in any textual sources comes from the Life (Harrison 1963, 120), though it is likely that the church would have existed in Myra beforehand. Harrison (1963, 150: note 164) argues that of the Alaca churches, Alakilise can be comparatively dated as one of the earliest churches, though it is impossible to subscribe exact dates. Notably,
both the narthex and the atrium at Andriake Church E do not bond to the masonry of the original basilica (Tekinalp 2000, Levha 152 - 163; Grossman & Severin 2003, 12-13). Since these structures are not part of the original construction it may suggest a later date. While the church’s location, outside the main city on the northern side of the harbour, suggests it was one of the earlier churches constructed in the city. Though rather simplified, this paints an interesting picture of the coming of Christianity to Central Lycia: first through the port of Andriake to Myra, and then with the monastic establishment of Alakilise (Foss 1991, 311).

**VII.ii.c Subsidiary Chapels**

Across the dataset, 37 churches with subsidiary chapels are slightly clustered (Table VI.16). This differs from the clustered result for churches with larger nave areas (Table VI.8), which is notable because churches with subsidiary chapels on average have larger nave areas (Section V.i.b.4). The difference in spatial distribution between churches with a larger nave area, and churches with subsidiary chapels, may be down to patronage. As discussed above (Section V.ii.b.3), the funding for subsidiary chapels is likely to have often come from patrons of the church. As the choice to donate the funds for chapel at a specific church would be down to personal preference, this would help to explain why these churches with subsidiary chapels are more randomly distributed. It also may mean that the presence of a subsidiary chapel relates to another trait, such as the synthronon in Plains (Section V.ii.b.3), or the triconch apse in Alaca (V.iii.c.3). As many of the churches with subsidiary chapels have a larger nave area, this suggests a preference for the subsidiary chapel trait in the earlier period of construction. This could be due to the shift in design of churches from the Transitional Period, where donated chapels could be seen as a conspicuous display of wealth (Ousterhout 1998), which was to be avoided.
VII.ii.d Churches with Synthronons

The nearest neighbour analysis suggests that the churches with synthronons are randomly distributed geographically (Table VI.17). This is an unexpected result, as the EDA told us that synthronon churches accounted for a similar proportion of churches in each sub-region (Section V.ii.a). However, just because the trait is randomly distributed across the geographic study area, does not mean that the presence of a church with a synthronon was a 'random' decision by church designers and builders, it just indicates that proximity to another church with a synthronon was not a factor in their construction. Unlike the overall dataset (Section VII.i), or the individual sub-regions, we do not see churches with synthronons clustered at pre-Christian urban settlements, or at rural villages, nor do we see them clustered temporally. This marks churches with synthronons out as distinct, especially in comparison to other absence presence traits.

When the spatial distribution of churches with synthronons is broken down by nave area (Table VII.3), it is possible to further analyse the patterns discussed above. This, again, has the aim of illuminating any differences in spatial distribution over the two main periods of construction (Section V.iv.b). As with the whole synthronon dataset, synthronon churches with larger nave areas are distributed randomly (Table VI.18). Though the result is not significant, it is similar enough to the result of the overall dataset that it can probably be considered an accurate test. All of the synthronon churches with larger nave areas are dated to the earlier period by scholars working in the region. Even though these churches have not clustered around urban settlements, all of the synthronon churches with larger nave areas in Hills and Plains are located at pre-Christian urban settlements and cities: Ištılada, Kekova North, Andriake, Myra, Tersane, and Tristomon. This helps to explain the randomness of the results; churches with synthronons may have intentionally been placed at these urban centres, which themselves are distributed randomly. Building a church with a synthronon in an urban area
would allow for the clergy to establish themselves in a pre-existing structure of a functioning community.

Table VII.3 The 19 churches with synthronons divided by nave area and region. Dating denoted by ‘EP’ for earlier period, and ‘LP’ for later period.

<table>
<thead>
<tr>
<th>Nave Area</th>
<th>Region</th>
<th>Churches with Synthronons</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Plains</td>
<td>Andriake Church A (EP) Andriake Church B (EP)</td>
</tr>
<tr>
<td>Smaller Nave Area</td>
<td>Alaca</td>
<td>Yilanbaşı Internal Church (LP) Dikmen Internal Church (LP)</td>
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<tr>
<td></td>
<td>Hills</td>
<td>Büyük Avaşar Church 2 LXII (LP) Settlement LXX west of Divle (LP)</td>
</tr>
<tr>
<td></td>
<td>Plains</td>
<td>Sura Valley (LP) Myra Nicholas (EP/LP)</td>
</tr>
</tbody>
</table>

The final test I ran was on synthronon churches that had a smaller nave area (Tables VI.19 & VII.3). Unlike the other two tests carried out on the churches with synthronons, the six churches with smaller nave areas are distributed fairly regularly (Table VI.2). The difference in the distribution is striking, as it is evidence for different patterns of building and spatial placement at the churches with smaller nave areas. Five of the six churches with smaller nave areas are dated to the later period of construction. The Myra Nicholas church is an interesting case; while the current church is dated to the eighth century, the eighth century church is built on the foundations of and incorporating parts of an early period basilica (Ousterhout 2019, 251). Due to the way the church was rebuilt, at present it is not clear if the synthronon was original to the earlier or later period, though it certainly still counts as a later period church (Peshlow 1975, 22).
The regular distribution of these churches could be read as an indication that these churches were intentionally placed to fill some kind of need. For example, in Alaca, the synthronon at Yılanbaşı (Fig. A.69) is used in both phases, and at Günağı (Fig. A.35), there is no archaeological evidence that the main basilica goes out of use in the later period. So in Alaca we know there are two geographic locations with synthronons in both periods. At East Asarcık (Fig. A.21), however, the internal church does not have a synthronon, which means that the East Asarcık synthronon is only functional in the earlier period. This is seemingly resolved by the construction of a synthronon at the Dikmen Internal Church (Fig. A.32). This seems to indicate an intentional management of the synthronon trait in Central Lycia. Why the synthronon was moved from East Asarcık to Dikmen is not entirely clear, though the Dikmen Internal Church (39.15m²), is almost four times the size of the East Asarcık Internal Church (10.5m²), which would allow for bigger numbers.

With the small number of churches with synthronons surviving in Plains, it is less easy to estimate a chronology for the synthronon trait. The main addition that stands out is the Sura Valley church, which is the only synthronon church in Plains located outside of the Myra Andriake city and port. Before the Christian period, the Sura valley was the home of an oracle of Apollo (Foss 1994, 26). The oracle interpreted the feeding patterns of fish, who lived in the pool of a natural spring that is still active today (Fig. B.33). The remains of the Temple of Apollo are also still upstanding (Fig. B.34), so they would have been visible in the Christian period as well. While it could be argued that the placement of this church was an attempt to remove the pre-Christian religious association (Bayburtluoğlu 2004), it is more likely that the natural spring had come to have Christian associations, and that the construction of the church was meant to reinforce this association, taking focus away from the decaying Temple of Apollo. The association between Christianity and water, especially springs or wells, is well known and well documented (Trombley 1993, 151-55, Jackson 2015, 44) throughout Asia Minor. In Central
Lycia, at least two of the churches dated to the later period have associations with water collection. İnışdibi, which was built directly adjacent to a natural cave that collects water, which is only accessible through the nave of the church (Niewöhner 2009, 96-97), and Kyaneai Church F, which constructed in between two rock-cut cisterns (Altripp 2010a, 306). A Christian association with water is also evidenced in the *Life of St Nicholas of Holy Sion*, when Nicholas miraculously finds a spring for the people from Arnabanda after their water source becomes unusable (Ševčenko & Patterson Ševčenko 1984, 42 - 45). It would follow, then, that the placement of the Sura Valley church was deliberate. Located just north of the spring and possessing a feature which indicates clerical gatherings (Krautheimer 1986, 520), the construction of the Sura Valley church fulfils a unique, distinct purpose.

In Hills, only one synthronon church from the earlier period that does not continue to be used into the later period: Istlada Basilica (Fig. A.39). At Kekova North Great Church (Fig. B.15), the aisles are walled off to create a single-aisled church that retains the original apse, and thus synthronon (Phase 2). Neither of the synthronon churches built in the later phase in Hills occupy the same geographic area as Istlada. Rather, they occupy the slightly higher hills to the north, either side of Kyaneai, along with a number of other single-aisled churches with small nave areas. The construction of these synthronon churches again may suggest a specific goal, perhaps that of interacting with, or even to maintain authority in this part of Hills in the later period. Both Settlement LXX west of Divle and Büyük Avaşar Church 2 LXII are located near relatively small rural villages, unlike many of the churches from the earlier period of construction, which are located at large urban centres such as Tristomon (modern Uçağız), Istlada, or Kekova North and Tersane. The single-step synthronon at the Settlement LXX west of Divle church does not bond to the apse (Altripp 2010e, 330), which may suggest that it was not part of the original construction plan, but was added later when it was decided there was a need for synthronon churches in this area of Hills.
VII.ii.e Triconch Churches

Overall, even with the small sample size of nine, the triconch churches are distributed in a clustered manner (Table VI.20). This result has been skewed significantly by two main factors. Firstly, by the lack of geographic distance between the two triconch churches in Hills in both of their phases, and secondly, by the amount of geographic distance between the two groups of triconch churches in Hills and those on the Alaca Mountain (see Fig. VII.4). However, the results from Table IV.20 do still indicate that there are three clusters of churches with triconch apses: the regional cluster of churches in Alaca, and the temporal clusters visible in Hills: the two phases of the Korba church, and the two phases of the Aperlae Subscribed Triconch church. When the four triconch churches from Hills are removed, however, the triconch churches of Alaca are distributed in a regular manner (Table VI.21). Considering the association between triconch churches and the Alaca Mountain discussed above (Section V.iv.a.1), where the triconch churches...
are related to the Monastery of Holy Sion, both as additional monastic establishments, and due to Holy Sion’s likely land ownership in the mountain, this regular distribution might be evidence of Holy Sion’s secular and ecclesiastical management of the Alaca Mountain.
VII.iii Categorical Traits

VII.iv.a External Apse Shape

The 23 churches with externally three-sided apses are distributed in a random manner, though this result cannot be taken as significant (Table VI.23). As churches with externally three-sided apses on average have larger nave areas, we would expect the result of the NNA to be similar to that of churches with larger nave areas across Central Lycia (Table VI.8). That the externally three-sided apses are not clustered, and the result not significant, unfortunately means it is hard to provide a further analysis of the geographic distribution. The 92 churches with externally round apses are distributed in a highly clustered manner (Table VI.24). The clustering of the externally round subset may in part be down to 63 (68.5%) churches with externally round apses being in Hills, which is a subset that is already highly clustered (Table VI.3, also see Section VII.i.a). In this instance, the NNA has not necessarily assisted in either confirming or denying the interpretations of apse shape as an indicator of period of construction. While churches with externally round apses have the lowest average nave area, which may suggest they are more common in the later period, they are not exclusive to that period. Externally three-sided apses have the most variation in nave area, at this stage it is impossible to say if they should be associated with one period of construction over the other.

VII.iii.b Construction Technique

VII.iii.1 Nave Area

Generally, in scholarship on Central Lycia, ashlar masonry is associated with the earlier period of construction (Harrison 1963), while mortar and rubble, when employed on a single aisled church, reused ashlar and mortar and rubble, and mortar and rubble with brick inclusions are considered traits of the later period of construction (Marksteiner & Niewöhner 2004; Altripp
Churches constructed of ashlar and cut rock, which only appear in Alaca, are considered to fall within the same category as ashlar construction, while mortar and rubble and ashlar, mortar and rubble and cut rock, and ashlar, mortar and rubble, and cut rock constructions are all not discussed in terms of construction period.

The original boxplot for churches constructed of ashlar suggests that these churches do on average have a larger nave area (Fig. IV.24), however, six of the churches in this subset do not have a recorded nave area and thus were not recorded in the plot. By estimating some of the nave areas of the six missing churches in the ashlar subset, it became clear that the church nave areas are actually distributed in a bimodal manner, with one cluster having nave areas of c. 200 - 300m², and the other having nave areas below c. 100m², though the majority of churches are in the larger cluster. Overall, this follows the expected outcome of ashlar churches correlating with a larger nave area. Churches constructed of a combination of ashlar and cut rock are bimodally distributed (Fig. IV.24); this subset is made up of three three-aisled basilicas (Alacahisar: Fig. A.2, East Asarçık: Fig. A.21, and Güceyman Basilica: Fig. A.34) which have relatively large nave areas, and two small churches (Alakilise N Saraylı (11.94m²): Fig. A.5, Alakilise NE Church (54.64m²)). Alakilise N Saraylı is actually two chapels, which are cut into a sheer cliff face (Harrison 1963, 129). Both of the smaller churches are located in the Alakilise valley. There are two further smaller churches also within the area of the Alakilise valley, Alakilise S Church (16.01m², Fig. A.4), and Alakisle (26.01m², Fig. B.35), that are constructed of mortar and rubble. This small ‘cluster’ provides evidence for a micro-regional trend of smaller church construction in the Alakilise valley. This ‘cluster’ includes the two ashlar and cut rock churches, thus marking them out as different than the three three-aisled basilicas partially constructed of cut rock.

The plot for churches constructed of reused ashlars and mortar and rubble shows that these churches have the lowest average nave area of the whole
dataset (Fig. IV.24), which follows the expected pattern of smaller nave area by period of construction. Mortar and rubble churches have the second smallest median nave area, though there are a number of churches that fall within the upper whisker of the plot. There are also four outliers in this plot: Istlada Basilica (Fig. A.39, 405.37m²), Kyaneai Church A Basilica (Fig. A.46, 395.57m²), Sura Plateau Phase 1 (Fig. A.60, 357.22m²), Aperlae Upper Church Phase 1 (Fig. A.16., 317.9m²). All of these churches have been dated by scholars to the earlier period of construction. While churches constructed of mortar and rubble on average have smaller nave areas and thus are likely from the later period, mortar and rubble construction was also used in the earlier period on churches with larger nave areas. Churches constructed of mortar and rubble with brick inclusions have a slightly higher average nave area than churches constructed of just mortar and rubble, however in comparison to the overall dataset, all of the churches in this plot have a relatively small nave area (Fig. IV.24). There is one outlier in this plot, the Dereałzı Church (Fig. A.29).

Of the three construction techniques which have not been associated with periods of construction in the previous literature on Central Lycia, churches constructed of a combination of mortar and rubble and cut rock have a comparatively high average nave area (Fig. IV.24), even with a small sample size. Four of the five churches constructed in this technique have three aisles. The one church with a single aisle is the Tersane Monastery church, which itself is in a larger monastic complex that is dated to the earlier period of construction (Göcer 2014, 340). The use of this construction technique in the earlier period is likely due to a few possible factors. Cutting into a rock formation to create a foundation would allow for a larger church to be built in an otherwise uneven plot, and the landscape of Central Lycia is full of natural rock formations, which would make the process of constructing a larger church difficult. This complex process of construction into natural rock would have not been necessary for the smaller churches more common in the later period.
Churches constructed of mortar and rubble and ashlar masonry have a relatively high average nave area, though this is primarily due to these churches having the largest amount of variation in nave areas (Fig. IV.24). This stays consistent when the comparison between nave area and construction technique is broken down by regions (Figs IV.25-27). As with the mortar and rubble churches, this suggests that the combination of ashlar and mortar and rubble masonry was used in both periods of construction, though unlike the mortar and rubble churches, in this instance the construction technique was likely used more in the earlier period than in the later. There are only four churches in the final construction technique category, ashlar, mortar and rubble, and cut stone. As discussed in Section IV.i.c.2, this construction categorisation is actually somewhat problematic, as two of the sites, Kyaneai Church F and Kyaneai Church G both have reused ashlar masonry. Indeed, it seems as though this construction technique should be removed in future analysis, and the churches within them redistributed to other subsets.

Overall, churches constructed of ashlar, and the three-aisled basilicas constructed of a combination of ashlar and cut rock have larger nave areas and thus are likely from the earlier period of construction. With the exception of the Dereağzı Church, churches constructed of mortar and rubble with brick inclusions, as well as churches constructed of reused ashlars, mortar, and rubble, all have smaller nave areas, which suggests that as expected, these churches are more likely from the later period of construction. While many of the mortar and rubble churches have relatively small nave areas, and thus are likely from the later period of construction, there are some from the earlier period, which suggests that the use of mortar and rubble masonry is not restricted to the later period. Mortar and rubble and cut rock churches on average have larger nave areas, and thus are likely from the earlier period of construction. Churches constructed of mortar and rubble and ashlar masonry have a range of nave areas, which suggests that this method was used in
both periods of construction, though it was favoured in the earlier period. These results do suggest an association between certain construction techniques and period of construction. In the case of both mortar and rubble and ashlar and mortar and rubble, however, these techniques are used in both periods and as such should not be considered a way of discerning period of construction.

VII.iii.2 Spatial Distribution

Churches constructed of ashlar masonry are randomly distributed, however, the result is not significant (Table VI.18). The result is similar for the subset of churches constructed of a combination of ashlar and mortar and rubble (Table VI.20). The only construction technique with a significant result is mortar and rubble: the churches constructed using this technique are slightly clustered (Table VI.23). The result of the mortar and rubble test is not entirely surprising, considering it is the most common technique, especially in Hills.

The results of the NNA on construction techniques within their associated regions are strikingly different. Even with a small sample size, the results of the NNA for churches in Alaca constructed of ashlar masonry indicates that the churches have a fairly regular distribution (Table VI.19). The presence of a building workshop based in Arneai that specialised in ashlar masonry as referenced in the Life, coupled with the monastic tradition on the Alaca Mountain (see Section V.iv.a.2), may help us to understand the regular distribution of the ashlar churches. Perhaps the regular distribution of ashlar churches can be seen as land and ecclesiastical management by the monastic communities. As discussed above (V.iv.a.1) Holy Sion itself was a wealthy institution (Rizos 2019, 54-56), which was able to fund the building of numerous churches, both on Alaca and in the western Lycian city of Pinara (Ševčenko & Patterson Ševčenko 1984, 103). Whether all ashlar churches were monasteries or were just influenced by the monastic traditions of ashlar masonry is not entirely clear. Still, the relationship between the Arneai masons and Holy Sion indicates that there was a preference for monastic
constructions to be of ashlar, which may also be evidenced in *The Life of St Nicholas of Holy Sion*. The *Life* tells the story of how Nicholas’ uncle, also an abbot, had a vision of the Holy Sion monastery, where he saw, ‘a structure made of all stone’ (Ševčenko & Patterson Ševčenko 1984, 33). This reference could either be considered evidence of the monastic preference towards ashlar masonry, or as the catalyst for the use of ashlars at Holy Sion and other sites. Regardless of the reason behind their construction, the regular distribution of the ashlar churches of Alaca is likely to be associated with the monastic tradition on the mountain.

The seven churches constructed of a combination of ashlar and mortar and rubble masonry in Plains are randomly distributed, but the test was not significant (Table VI.28). This is similar to the NNA results for this construction technique across the whole of Central Lycia (Table VI.27). By removing Arneai Church A (Fig. IV.37), the analysis could then focus on the six churches that fell within the area that was historically within territory of the city of Myra (Foss 1994, 23). The NNA on the subset without Arneai Church A indicated that the churches were extremely regularly distributed (Table VI.29). This also differs significantly from the NNA results for Plains, where the churches across the sub-region are highly clustered (Table VI.5). The distinct difference between the highly clustered Plains subset, and the highly regular subset of churches with mortar and rubble with ashlar construction in Plains, means that there must be something different happening with these churches. Regular distribution rarely happens without intention, so the likely cause of these churches being constructed in a regularly dispersed manner is an indication of an intentional choice to disperse churches of this construction technique across the territory of Myra. It may even be possible that this intention came from the ecclesiastical centre of Myra, which would have held sway over the city and surrounding area.

The results of the NNA on mortar and rubble churches in Hills is incredibly similar to that of the whole dataset of mortar and rubble churches. The only
slight difference is that both the NNI and z-score are slightly higher, which suggests that the churches are very slightly less clustered (Table VI.31). This suggests that the other mortar and rubble churches in Alaca and Plains are also clustered, as their inclusion in the NNA provides a more clustered, and more reliable result. In this instance, the NNA does not provide as much additional information.
VII.iv Internal Churches and Reuse in Central Lycia

Thus far, I have discussed the evidence for temporal change without fully addressing the phenomenon of internal churches that appears across Central Lycia. Though they make up a small percentage of the overall churches in the region, the internal churches have garnered the attention of many scholars working in the region. The internal church is a key part of understanding temporal change, as they indicate a distinct break between one period of use and another. There are three types of internal churches in Central Lycia: remodels of earlier churches that retain the original three aisled structure, three-aisled churches that have been modified to become a single aisle by the walling off of the original aisles, and single-aisled barrel vaulted free-standing structures (Table VII.4). Three churches are remodelled but maintain the tripartite apse structure, 13 are remodelled to a single aisle, and 11 are free-standing structures inside the remains of an earlier church. All these churches make up 16.7% of the total dataset. There are two churches where the internal church classification is not definite. In the case of the Karabol internal church, the source is not entirely clear (Hellenkemper & Hild 2004, 597) on exactly how the internal church is built, and at the Yılanbaşı Internal Church (Fig. A.69), Grossman & Severin (2003, 121) state that the internal church maintains the apse and apse side chambers, which suggests it is a remodel, even though the ground plan is not entirely clear.
<table>
<thead>
<tr>
<th>Internal Church Type</th>
<th>List of Churches</th>
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<tbody>
<tr>
<td>Three-aisle Remodel</td>
<td>Alakilise Internal Church</td>
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<tr>
<td></td>
<td>Aperlae Subscribed Triconch Church Phase 2</td>
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<tr>
<td></td>
<td>West Asarcik Internal Church</td>
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<tr>
<td>‘Single-aisle’ Remodel</td>
<td>Aperlae Upper Church Phase 2</td>
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<tr>
<td></td>
<td>Davazlar Internal Church</td>
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<tr>
<td></td>
<td>Karabol Internal Church (?)</td>
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<td></td>
<td>Kekova North Internal Church</td>
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<td></td>
<td>Kekova North Great Church Phase 2</td>
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<td></td>
<td>Korba Internal Triconch Church</td>
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<tr>
<td></td>
<td>Korba Internal Church 2</td>
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<td></td>
<td>Kozakonaği Tepesi Internal Church</td>
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<td></td>
<td>Kyaneai Church A Internal Church</td>
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<td></td>
<td>Kyaneai Church B Internal Church</td>
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<td></td>
<td>Kyaneai Church C Single Aisle</td>
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<td></td>
<td>Sura Plateau Phase 2</td>
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<td></td>
<td>Yilanbaşı Internal Church (?)</td>
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<tr>
<td>Free-standing</td>
<td>Aperlae Upper Church Phase 3</td>
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<tr>
<td></td>
<td>East Asarcik Internal Church</td>
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<tr>
<td></td>
<td>Devekuyusu Internal Church</td>
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<td>Dikmen Internal Church</td>
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<td>Gürses Internal Church</td>
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<td>İstlada Internal Church</td>
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<td></td>
<td>Kyaneai Church E Internal Church</td>
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<tr>
<td></td>
<td>Sura Plateau Phase 3</td>
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<td></td>
<td>Sura Plateau Phase 4</td>
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<td></td>
<td>Turant Dağ Internal church</td>
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<tr>
<td></td>
<td>Settlement L Kocaboyunuz Internal Church</td>
</tr>
</tbody>
</table>

Table VII.4: The 27 internal churches in Central Lycia, broken up by type. Uncertain classifications are marked with a ‘?’.  

The internal churches of Central Lycia are often seen as a sign of decline (Foss 1994, 49, also see Section I.iii.d), but there is little discussion of why exactly this is the case. Usually it is assumed that the earlier structure would have already collapsed, either due to seismic activity or just decay over time (Marksteiner and Niewöhner 2004, 44). Central Lycia was geologically active in antiquity, indeed the city of Myra was built on top of an active fault (Softa et al. 2016). It would follow that eventually, through both geological activity and weathering, some of the churches from the earlier period would have had structural issues that would have led to the church loosing structural integrity. Evidence for structural issues on the apses of two churches in this
dataset supports this interpretation. Part of the shift at Aperlae Subscribed Triconch Church from Phase 1 to Phase 2 was the construction of a wall and small room that seem to brace the apse (Hohlfelder and Vann 1999, 211). At Kyaneai Church A, a repair was made to the inside of the apse wall which is now visible in the archaeological record (Altripp 2010e, 330: footnote 17). Without archaeological investigation, it is impossible to say whether the earlier churches collapsed, became structurally unsound due to geological activity, or were simply disassembled, though perhaps a combination of the first two options is most likely. While seismic activity in Central Lycia could explain the collapse of the earlier period churches, it does not explain why many of the earlier churches were not rebuilt to the same size as the original structures. In their publication on the Ištala church, Marksteiner and Niewöhner (2004, 45) suggest that these small, internal churches would not be parish churches, but rather just a preservation of the ecclesiastical tradition where only special celebrations took place. This argument, however, does not take into account the shift in liturgical practices and church construction during the Transitional Period and after Iconoclasm. Neither does that of decline.

The liturgical practices from the Transitional Period onwards varied drastically from the Christian rituals of the earlier period. The liturgy became much more closed off from the laity, with the clergy carrying out the process predominantly behind screens and barriers (Ousterhout 1998, 14). This is reflected in the architecture of Transitional Period churches, which themselves became darker, and more closed off (Krautheimer 1986, 284; Ousterhout 1998, 9-15; Stewart 2010, 183). In new, larger constructions, this often took the form of the cross-in-square, or cross-domed basilica. Both the Apollonia Theatre Church (Fig. B.1) and the Dereağzı Church (Fig. A.29) are examples of this style in Central Lycia, it is worth remembering that the Dereağzı Church is approximately three-times the size of the Apollonia Theatre Church.
In the Transitional Period on Cyprus, the roofs on a set of five churches on the Karpas Peninsula are all converted from being wooden to brick barrel vaults (Stewart 2010, 165-68). This process often omitted windows in the clerestory, making the churches darker than they previously were (Stewart 2010, 165-68). In these churches, the liturgy took place in the two-story central nave, while the laity were restricted to the single-story flanking aisles, leaving them in the darkest part of the church (Stewart 2010, 180). The remodels of the Karpas churches re-used the earlier liturgical furnishings, and maintained features such as the apse, the floors, and the earlier footprint of the building (Stewart 2010, 183). As Stewart (2010, 183) points out, the maintaining of these features shows that the ‘builders made an effort to reutilize established sacred spaces and preserve their cultic associations’, rather than building a new church elsewhere. This would not have been an easy task. Nor would have been the construction of an internal church, which would have required the clearing or disassembling remains of the earlier, presumably collapsed basilica.

In terms of the reuse, all of the free-standing internal churches reuse building materials from the earlier church, often including carved decoration. As with the Karpas churches, this should not be seen as a sign of decline, but rather as a purposeful reuse of sacred objects. In his article on the many phases of renews and remodels of the Church of the Holy Sepulchre in Jerusalem, Ousterhout (2003, 13), argues that the ‘awkward’ reuse of aspects of the earlier church are evidence that the stones of the church itself were sacred. This, along with the preservation of older walls within the newer rebuild of the Holy Sepulchre, indicate a certain reverence for these constructions beyond just construction material (Ousterhout 2003, 20-21). This rings true of the Karpas churches as well. When viewed through the lens of both Ousterhout’s work on reuse in the Holy Sepulchre, and Stewart’s analysis of the Karpas churches, the free-standing internal churches of Central Lycia take on a different meaning. The reuse of the sacred stones of the earlier churches, as
well as the maintaining of the earlier church walls can be seen as a purposeful act.

Marksteiner and Niewöhner (2004, 45) ask whether these smaller churches could even function as parish churches, which brings us back to the shift in liturgy during the Transitional Period. The liturgy now needed to take place in a space that was clearly separated from the laity, and the single-aisled barrel-vaulted free-standing internal church could provide just that. While the liturgy took place within the single-aisled church, the laity could attend the service by standing outside the single-aisled church, but within the walls of the earlier period church. This setup is analogous to the Karpas churches, where the laity occupied the aisles of the basilica. This shows that these free-standing internal churches could provide the same function as their earlier period counterparts.

The same interpretation may be true for the remodelled to a single-aisle internal churches; however, it is worth considering these sites in more detail. Little attention is paid to the purpose behind the walling off of the aisles in the scholarship on these sites. Normally, as with the free-standing internal churches, this architectural change is written off as a sign of decline (Hellenkemper & Hild 2004, 445). However, when considered within the context of the remodelling of the Karpas churches, the presence of the single-aisle remodel could be seen as an indication of a different manifestation of the need to modify churches for the shifting liturgy from the Transitional Period onwards. In the Karpas churches, the earlier columns of the basilica are modified to piers, which could better support the weight of the new vaulted roofs (Stewart 2010, 163 - 69). This process could have also been achieved in a less complex manner in Central Lycia by the walling off of the aisles. If the roofs of these sites were modified to barrel vaults in the later period, this would also help to explain the large amount of collapsed building.

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13 This apparently still happens at certain churches in Greece today (conversation with Prof. John Bintliff)
blocks found within these churches, which often seems more volume than expected considering the amount of upstanding remains (see Kyaneai Church A: Fig. B.36, and Aperlae Upper Church: Fig. B.37). The same switch from the wooden to brick or stone barrel-vaulted roof may have also taken place at one of the three-aisled internal rebuilds: West Asarcik Internal Church. At West Asarcik, the amount of rubble filling in the internal church is extreme, especially when compared to the depth of the apse, which has been dug out illegally and thus provides a reference for ground level (Fig. B.38). This, coupled with the fact that the supports for the aisles from the later period are rectangular piers (Fig. A.22), suggests that the West Asarcik Internal Church could have held up a stone vaulted roof.

If the walling off of the aisles at remodelled to a single-aisle internal churches served the purpose of dividing the laity from the liturgy, it would have created an even more extreme division than in the Karpas churches, where the clergy must have at least been partially visible through the piers dividing the nave and aisles (Stewart 2010, 180). While the idea of segregating the laity to the walled off aisles may seem extreme, it would not have been too different to the proposed function of the free-standing internal churches, where the laity would have been completely separated both physically and visibly from the clergy. Going forward, it is worth considering if this scenario is a possibility, both through the re-examination of sources and through the analysis of the extant remains. If the aisles were still in use, it would change the interpretation of many of these sites quite significantly, as they would no longer be considered internal churches, but rather remodels of earlier three-aisled basilicas.

If these churches were indeed reduced to the nave, and the aisles were abandoned, they could have still been remodelled to have a vaulted roof. In this case, the question of how the churches functioned in relationship to the new segregated liturgy of this period needs to be considered. It is possible that the churches still had a traditional screen, which would have partially
blocked the liturgy from the laity’s view. It is also possible that these remodelled internal churches had a different function in this period from that of the free-standing internal church. Notably, both a remodelled internal church and a free-standing internal church both appear in Kyaneai, which perhaps is an indication of a different function rather than an aesthetic choice. Indeed, 10 of the 13 remodelled to a single-aisle internal churches are located in Hills, which may suggest that this method of remodelling a church had a specific purpose within this region. Overall, the results of this analysis indicated that the internal of Central Lycia need to be considered in greater detail, and that assumptions about their presence being an indication of decline need to be reconsidered.
The results of the analysis in this thesis provide a wealth of new information and interpretations that can aid in future studies carried out in both within Central Lycia and across the early Christian world. First and foremost, the database of churches compiled for this study is the first to combine the work done during the Tübingen Lycia Project, the *Tabula Imperii Byzantini* dataset, and the numerous other studies done in the region into a single database. This database of 162 churches can now be used by other scholars working in the region as a reference point for any future analysis in Central Lycia. The database also provides a comprehensive list of the chosen cultural traits present at each of the 162 churches. If additional archaeological data about any church in the study area comes to light, the database entry for the church can be changed, and the quantitative analysis can be carried out once again, to test for similar or differing results. As all of the testing has been done on open source software, and as the processes used have been detailed in this study, the processes can be copied or modified by either myself or other scholars wanting to use the same methodology.
VIII.i Regional Variation

The results of the analysis of regional variation (Sections V.i & VII) shows that there are indeed variations in the traditions of church construction and distribution across the three sub-regions of Central Lycia. Thus far, the literature on Central Lycian churches has focused on the relative uniqueness of the churches on the Alaca mountain (Harrison 1963, 124; Foss 1991, 312; Foss 1994, 28; Altripp 2006, 85-86; İşler 2016, 222; Sweetman 2017; Elton 2019, 98), especially the ashlar masonry and the detailed carved decoration present in the Alaca churches (Niewöhner 2017). The exact reason behind this has often been overlooked, except in the case of the triconch churches. The analysis carried out in this thesis demonstrates that there is a connection between the Monastery of Holy Sion on the Alaca mountain which affected the programme of church construction within its sphere of influence. Most likely, it was the monastery of Holy Sion itself that supported or sponsored the construction of ashlar churches, which has led to the churches being regularly distributed across the settlements on the mountain. Evidence for the Monastery of Holy Sion’s bias towards ashlar masonry and their relationship with craftspeople from Arneai capable of using this construction technique can be found in the Life, along with evidence for the wealth of the monastery overall. The analysis carried out here helps to further the argument for the power, wealth, and influence the Holy Sion monastery had over the Alaca mountain, by providing evidence for their involvement in the creation of the Christian landscape in Alaca.

The focus on the Alaca mountain has often led to a lack of emphasis on the nearby churches in the Myra plain. Archaeological evidence for this region suggests a boom in construction and commerce in the early Christian period (Foss 1994; Akyürek 2016; Rizos 2019, 58). The results of the Nearest Neighbour Analysis (NNA) on the Plains churches corroborates this, with further analysis showing that the churches are clustered around pre-existing urban settlements. However, further testing revealed a pattern of regularly
distributed churches of the combined mortar and rubble and ashlar masonry construction technique, indicating that these churches too were constructed in an intentional, and potentially organised manner. The difference in the relationship between the nave area and presence of the narthex trait in Plains also suggests that the influence for church design and construction was somehow different in Plains. One possible explanation for these results could be the influence held by the Archbishop of Myra over the territory of the city. The Archbishop and other clergy travelling to and from Myra would have had culturally learned ideas about church construction and design that they had acquired during their travels across the Empire. Beyond the clergy, Myra was the ecclesiastical capital of the region and a centre for pilgrimage (Foss 1994, 23), which would have brought in outside influence and patronage to the city (Foss 1994, 29). It would be unsurprising if all of these influences did not lead to patterns in church building and design that differed from the rest of Central Lycia. These differences in the distribution of mortar and rubble with ashlar construction, and the presence of the narthex trait in the earlier period churches have not previously been noticed by scholars. By highlighting them, this thesis has added to a greater understanding of the relationship between the ecclesiastical centre Myra and the churches in the surrounding territory.

While the analysis of construction technique yielded less information about Hills, the results of the analysis of distribution of the region as a whole provided evidence for church distribution being more complex than it at first seemed. Churches in Hills are either clustered around pre-existing, pre-Christian urban centres, early Christian villages, or are more randomly distributed across the surrounding countryside. The Hills region also holds the majority of churches with re-used carved decoration.
VIII.ii Churches with Synthronons

The presence of churches with synthronons do not often receive attention in scholarship on Central Lycia, or indeed in most publications on regional early Christian architecture. Their presence is noted, but how these churches interact with each other, or how they relate with the churches without synthronons, is not considered. The results of the analysis in this thesis indicate that this needs to change. Churches with synthronons were an important element in the landscape of early Christian Lycia (Sections V.ii & VII.ii.d). Across all three regions, the number of churches with synthronons is kept fairly consistent across both periods of construction. While synthronon churches from the earlier period of construction were randomly distributed, new synthronon churches from the later period were regularly distributed, which indicates a need for churches with this feature to be accessible throughout Central Lycia. While in the earlier period synthronon churches were predominantly found at pre-Christian urban centres, the later period churches seem to fill in geographic gaps in each region.

In both periods of construction, the presence of a synthronon is associated with the presence of subsidiary chapels, as well as original or reused carved decoration. Both of these traits are associated with a conspicuous display of wealth or patronage, which again shows the importance of churches with synthronons in comparison to the many churches in the region without these features. The spatial distribution and amount of synthronon churches in Central Lycia may even be unique to the region. In Stephen Hill’s (1996, 22-23) work on Cilicia and Isauria, he comments that synthronons should be seen as a normal feature of churches in these regions, as they have been commonly found in most basilicas, and this is clearly not the case in Central Lycia. Outside of Central Lycia, on the Greek island of Naxos, synthronons are recorded as commonly found in churches from the seventh to eleventh centuries (Aslanidis 2018, 322). Again, this shows a different pattern to Central Lycia, where there are certainly pre-Transitional Period churches with
synthronons. More work on the presence of synthronons in churches in Western and Eastern Lycia needs to be carried out in order to gain a better understanding of how churches with this trait functioned throughout the whole of Lycia. Then, comparison to churches in regions such as Cilicia and Isauria may well demonstrate notable regional differences. Comparisons to other regions may also help to discern the liturgical function of the synthronon, and whether the function varies across the early Christian world, both of which at present are still not entirely clear.
VIII.iii Triconch Churches

There is a clear relationship between Holy Sion and the triconch churches within its direct sphere of influence: the Alaca mountain (Section V.iii & VII.ii.d). This can be seen in the ashlar construction technique and the multiple apses of the triconch, both of which are referenced in the *Life* (Ševčenko & Ševčenko 1984, 25 & 33), as well as the intricate architectural carvings found at the Alaca triconch churches. The Korba church, too, displays association with Nicholas of Holy Sion, as referenced in the *Life* (Ševčenko & Ševčenko 1984, 103-04) This textual evidence provides a motive for the similar design and construction style to that on the Alaca mountain. The only church classified as a triconch for this study that does not seem to be associated with the other six sites is the Aperlae Subscribed Triconch.

Two analogous structures to the Aperlae Subscribed Triconch can be found elsewhere in Lycia: the southernmost northern chapel of Andriake Church B (Fig. A.7) in Plains, and the northern chapel of the Great Basilica at Olympos (Fig. B.11) in Eastern Lycia. Excavations have revealed evidence that suggests the subscribed triconch chapel at Andriake Church B was a baptistery, with the baptismal pool located within the apse (Akyürek 2016, 476). At Olympos, excavators found a clay water pipe within the apse of the subscribed triconch chapel (Gokalp & Yildirim 2008, 185). While they are not yet certain, the excavators have argued that this may suggest that the Olympos subscribed triconch chapel could be a baptistery as well (Gokalp & Yildirim 2008, 185: note 17). Within the apse of the Aperlae Subscribed Triconch church is a ‘small pool’ (Aslan 2010, 187). The presence of this feature could suggest that, like at Andriake Church B’s subscribed triconch chapel, there was a baptismal font in the apse of the Aperlae Subscribed Triconch (Scardina 2018, 692). This feature would mark the Aperlae Subscribed Triconch out as different to the other triconch churches in Central Lycia, as it has an association with baptisms taking place within this style of
apse. While the potential baptismal function of Aperlae Subscribed Triconch Church and the Olympos Great Church northern chapel cannot be confirmed without further excavations, the similarities between these three sites does suggest that the subscribed triconch should be considered as a separate cultural trait to the traditional triconch found on the Alaca mountain when carrying out future studies. This is backed up by the exploratory analysis carried out in this thesis, as the Aperlae Subscribed Triconch consistently did not possess traits that the majority of the other triconch churches possess (carved decoration: Fig. IV.54; construction technique: Fig. IV.41; subsidiary chapel: Fig. IV.55).

We are then left with the question of function for the single southern triconch chapel from Andriake Church A (Fig. A.6). This chapel takes a traditional, rather than modified triconch form. The only other church with a triconch chapel of this style in Central Lycia is Devekuyusu (Fig. A.31), though in Western Lycia, both the Xanthos Acropolis Church (Fig. B.40) and the church at Letoon (Figs B.41 & B.42) have triconch chapels to the south of their apses. The triconch chapel at the Xanthos acropolis church has been interpreted as a potential funerary chapel, under the assumption that the church itself was a pilgrimage site dedicated to a specific saint (des Courtils & Cavalier 2001, 10), though there is no archaeological evidence to support this at present. At Letoon, there is a dedicatory inscription in the triconch chapel, which states that the chapel was founded by a deacon (Hellenkemper & Hild 2004, 671). The Letoon church as a whole has been interpreted as a monastic site (Foss 1994, 13; Hellenkemper & Hild 2004, 671). While it might be tempting to interpret all three of these sites with south-eastern triconch chapels as monastic, it would be unwise to make this assumption without more archaeological evidence. Still, it is notable that the position of the triconch chapel at three sites (Andriake Church A, the Xanthos acropolis church, and Letoon) is very similar, an observation which warrants further archaeological investigation. Overall, the triconch chapels at these three sites seem to stem from a tradition separate from both the triconch
churcs in the Alaca mountain, and the subscribed triconch churches and chapels in Central and Eastern Lycia.
VIII.iv Triconch Churches and the Monastery of Holy Sion

All but one of the triconch churches of Central Lycia have a clear association with both the Alaca mountain and the Monastery of Holy Sion (Section V.iv.b.2). The correlation between the triconch churches and the use of ashlar masonry, a technique that is associated with the Alaca region, indicates that the triconch churches can be interpreted as having been built under the patronage of, or in association with the Holy Sion monastery. Equally, the distribution of triconch churches in Alaca is similar to that of ashlar churches in Alaca, which further supports the association with Holy Sion. The *Life of St Nicholas of Holy Sion* also makes reference to the church at the Holy Sion Monastery having multiple apses, thus suggesting that the Holy Sion church itself is triconch church. While scholars have argued over the identification of the monastery, it is most likely that Harrison (1963), who identified West Asarcık as Holy Sion, is correct. Additionally, the association between the Korba church and a miracle performed by Nicholas of Holy Sion in the *Life*, may provide a motive for the construction of a modified triconch church at that site. Finally, the Subscribed Triconch church at Aperlae should be seen as part of a different tradition than the Alaca triconches, as should the triconch chapel at Andriake Church A. All of this suggests that churches with triconch apses in Central Lycia are associated with St Nicholas of Holy Sion, and the monastery he founded on the Alaca Mountain, whereas the phenomenon elsewhere is part of differing traditions.

Some additional observations can be made about the triconch churches within this context. I have already considered the relationship between the three most similar triconch churches, Alacahisar, West Asarcık and Devekuyusu, and suggested that the similarity in architectural design indicates that the three sites were built within a condensed period of time, i.e. potentially all within the lifetime of Nicholas of Holy Sion. It is worth briefly considering why these three sites are so similar, especially in the context of
their relationship with Holy Sion as laid out in Section V.iv.b.2. When Holy Sion was founded, the only monk at Holy Sion was Nicholas, so he joined ‘to himself his brothers Artemas and Hermaios as disciples, for the ministry and carrying out of the rituals in the holy Church of Sion’ (Ševčenko & Ševčenko 1984, 29). As Rizos (2019, 54) points out, during the short period of Nicholas’s life, the monastery grew in both wealth and influence. Perhaps the foundation and construction of the two additional triconch churches, Alacahisar and Devekuyusu, can be seen as a physical symbol of that fiscal growth. Considering that Nicholas had two brothers, perhaps it would even be possible to suggest that Alacahisar and Devekuyusu were founded either by them, or on their behalf. Regardless of the exact purpose, the similarities between these three sites suggests that at the least, Alacahisar and Devekuyusu were commissioned and constructed by the same individuals who built West Asarcık.

There is also the relationship between Myra and the Monastery of Holy Sion to consider. This relationship is often noted in scholarship (Harrison 1963, 120; Foss 1991, 307; Foss 1994, 23-24; Rizos 2019, 54), especially with reference to the plague episode outlined in the Life. When the Justinianic plague comes to Myra, the farmers from the countryside around Holy Sion decide that they must not go into Myra in order to avoid contracting the plague themselves. This choice left the citizens of Myra without any food or supplies, as the farmers of the surrounding countryside were responsible for providing the city with grain, flour, wine, and wood (Ševčenko & Ševčenko 1984, 83). The Life tells us that the villagers’ avoidance of Myra led to a rumour spreading in the city that it was Nicholas who had told the farmers to avoid Myra. The archbishop then orders the magistrates to send men up to the mountain with the aim of bringing Nicholas back in chains (Ševčenko & Ševčenko 1984, 85). In the end Nicholas is not captured, and as a celebration of the ending of the plague, Nicholas begins a tour of the surrounding countryside, making sacrifices and holding banquets (Ševčenko & Ševčenko 1984, 85-87). This account not only shows that the Alaca
mountain itself was resource wealthy, but also that Nicholas of Holy Sion had considerable influence over the surrounding territory of the monastery. It also shows that the archbishop of Myra was not always pleased with this influence (Foss 1994, 24). The tour of the countryside also provides evidence for Holy Sion’s land ownership and influence over the Alaca Mountain (Rizos 2019, 55), which would further explain the possible tension between the Church in Myra and Holy Sion.

A potential example of the different spheres of influence held by the archbishop of Myra and Nicholas of Holy Sion may be visible in a comparison of the architectural remains of the churches in Plains and Alaca. As discussed above (Section V.ii.c.1), all of the four churches in Plains with synthronons have subsidiary chapels, while none of the three churches in Alaca with synthronons have subsidiary chapels. However, in Alaca, four of the five churches with triconch apses have subsidiary chapels (Alacahisar, West Asarcık, Devekuyusu, and Dikmen). Considering that the funding for subsidiary chapels was often donated by laypeople (Kinney 2016, 41), this difference in subsidiary chapel presence suggests a regional shift in tradition in terms of patronage by the laity. In Plains, the community focused their donations on the churches with synthronons, while in Alaca, they avoided synthronon churches in favour of triconch churches. The best example of this comes when examining the archaeological evidence for baptisteries and baptisms, as this ritual would have been a necessary duty performed by members of the clergy for the Christian community. In this context, it would follow that a baptistery would be preferably placed at a church with a synthronon, as the church would already be a designated gathering place for the clergy (Krautheimer 1986, 520). The only known baptistery in Plains is the subscribed triconch chapel at Andriake Church B (Fig. A.7), a church which also has a synthronon in the apse. There are two identified baptisteries in Alaca, one at Turant Dağ (Fig. A.65), a three-aisled basilica without either a triconch or a synthronon (İsler & İsler 2017, 280), and at the triconch church West Asarcık. The baptismal font at West Asarcık bears an
inscription, which states that the funding for the baptistery came from Nicholas the Sea Captain (Harrison 1963, 134; Foss 1994, 28). As a captain of a ship, it is more likely that the donor Nicholas was based in Myra or Andriake than on the mountain, and yet he chose to be a patron of this church, rather than one in the Myra or its port. This juxtaposition once again indicates the importance and influence of Holy Sion, and the triconch churches associated with it. These monuments must have held a greater importance than those in the major cities, even if they were not perhaps as accessible as those in Myra and Andriake.

The importance of these triconch churches and their connection to the powerful Holy Sion Monastery can also be seen in the presence of internal churches at three of the triconch churches in Alaca (West Asarck, Devekuyusu, and Dikmen), which shows that these churches were still held as important in the later period. While there is not currently any archaeological evidence at Alacahisar for an internal church, it should be noted that modern inhabitants of the mountains have long since dismantled any masonry belonging to the church (Grossman & Severin 2003, 107). This would have erased any evidence for an internal church, which, if it existed, would have most likely been constructed of reused material from the original structure. Both of the triconch churches in Hills also have multiple phases, which again indicates their continuing importance to the local communities. Overall the evidence presented in this thesis suggest that Holy Sion held a significant amount of influence on the Alaca mountain. So much so that the architectural remains of many Alaca churches are marked by their influence through the presence of certain traits that are not often found in the other two sub-regions.
VIII.v Periodisation in Central Lycia

All of the evidence suggests that the early period Christian Landscape of Central Lycia was focused on the pre-Christian cities and urban settlements of the Plains and Hills region (Chapter VI). The churches in Alaca followed a less clustered pattern, as the churches were constructed across the mountain, in a manner that made them more accessible to the many smaller, rural communities in the sub-region (İşler 2013; İşler & İşler 2017, also see Chapter VI). Still, many of the churches attributed to the early period of construction shared similarities across all three regions. The majority were three-aisled basilicas, with many additional, visibly impressive traits, such as carved decoration and subsidiary chapels. In Plains, the churches also often had narthexes, which I have already suggested is related to the city of Myra being a hub of religious activity. Indeed, based on the analysis of certain traits, the three churches with both narthexes and atria, Alakilise (Fig. A.3), Andriake Church E (Fig. A.10) and Myra Nicholas Church (Fig. A.55), could be the earliest churches in Central Lycia. This would suggest that Christianity first came to Central Lycia through Myra and its port Andriake. This conveniently tallies with the textual evidence from the Apocryphal Acts of Paul and Thecla for St. Paul stopping in Andriake and working Miracles in Myra (Harrison 1963, 118: footnote 10).

In the later period of construction, the newer, smaller churches are less clustered and more randomly distributed. In Alaca, the majority of later churches are internal churches, except for those within the Alakilise valley. In Plains, there are a few small, later period churches constructed in more rural settings, such as those located around the Beymelek lagoon (see İşler 2016). Hills has the largest number of smaller, rural, later period churches, and these sites are part of the reason the result of the Nearest Neighbour Analysis for Hills is less clustered than that of the other two sub-regions. This is not to say that all of the earlier churches went out of use, or that only the sites with internal churches were in use in the later period. Rather, in all three
sub-regions, but in Hills especially, the later period churches were built outside of the pre-Christian cities and settlements, unlike the earlier period churches.

While churches are built of mortar and rubble throughout the early Christian period, this technique is used more consistently in the later period. The reuse of earlier architectural carvings correlates with mortar and rubble construction, as well as reused ashlers and mortar and rubble construction, and mortar and rubble with brick inclusions. This suggests that these are all construction techniques that can be associated with the later period as well. Finally, narthexes appear in Alaca and Hills in the later period, which suggest that in this period they perform a specific liturgical function that did not exist in the earlier period. In light of the discussion on internal churches above, it may be that the narthex allowed the laity a different level of access to the liturgy taking place inside these smaller churches, which was closer than standing outside the church, but still separate. That there are so many newly constructed churches from the later period, and that they are so much more randomly distributed, is especially relevant considering the rhetoric of post-7th century decline that surrounds this region. While the construction and style of these churches are much simpler than their earlier period predecessors, the proliferation of these small, mostly single-aisled churches is an indication that we may need to re-assess our pre-conceived notions of what decline looks like in the archaeological record.

Across all three regions, a small portion of churches are rebuilt as free-standing internal churches or remodelled into what have been interpreted as single-aisled structures, where the aisles have been walled off. These internal churches should not be seen as a sign of decline, but rather as an indication of a shift in liturgy in the Transitional Period. This shift led to the liturgy being separated from the laity, and to churches being darker and more closed off than their earlier period counterparts. The earlier three-aisled basilicas without internal churches should not be discounted as abandoned.
either, as many were still likely in use in the later period. Evidence for this comes from churches like Settlement XXXI Basilica by Kilise (Fig. A.78), where a chapel that is stylistically dated to the later period is added to the south aisle of the three-aisled, early period basilica. The presence of so many smaller, single-aisled barrel-vaulted churches from the later period, as well as the many free-standing internal churches that also fit this description would suggest that the most common church design in later period Central Lycia is not a cross in square church, which is generally assumed to be the predominant style from the Transitional Period onwards (Ousterhout 1999, 24-30), but a single-aisle, barrel-vaulted structure. In his publication on the Early Byzantine churches of Cilicia and Isauria, Hill (1996, 64 - 264) notes a number of later ‘inserted chapels’ in his catalogue. This suggests that the internal church phenomenon, and the interpretation of their purpose presented in this thesis, are not necessarily unique to Central Lycia. Further inland, however, Jackson (2017, 6) mentions only a single internal church at Binbirkilise, a Lycaonian site with the standing remains of over 40 churches. This could suggest that the tradition of constructing internal churches is more common on the southern coast of Anatolia. With pre-existing publications such as these, future research should be able to easily adapt the methods used in this thesis to carry out quantitative analysis on datasets such as those mentioned above.

When compared to the urban settlement-focused early period basilicas, the more randomised distribution of the many smaller, later-period churches in rural areas indicate that the traditions around where churches were constructed must have changed from the Transitional Period onwards. These later period churches were built on hilltops, near wells or natural cisterns, or by other locations which would have been of significance to those living in rural settlements at the time (Niewöhner 2009, 92). One such site is İnişdibi (Fig. A.40), which at 4.07m² is the smallest church in the study area. It is located on a hill near the fortified settlement of İnişdibi, next to a holy well or hagiasma (Niewöhner 2009, 93). The church must have held a special
importance, as it was modified over time to cater to larger groups of people. An additional vaulted room to the west, as well as an open-air porch were all added to the church in later phases (Niewöhner 2009, 97-99). Kyaneai Church F may have served a similar function. The church is located between two cisterns, on the highest point of the rocky southern acropolis within the city walls (Altripp 2010d, 307). Kyaneai Church F fits two of the traditions common in this period: it is next to water and is at the highest point in the landscape (Altripp 2010d, 307). The church complex at Nenealanı (Fig. A.57) is located at a high point on a road leading to Tristomon, next to two cisterns which may have been in use since before the Christian period (Altripp 2008, 186). The double-apsed church on Ikizkilise Tepesi LXXVII (Fig. A.38), is also located at a high point on a road between Myra and Trysa (Altripp 2008, 189). All of these smaller, later period churches tend to be more rural than the earlier churches in the region, where their locations would have both been important and accessible to people living in rural settlements across Central Lycia.

This is also the case at the great Dereağzı Church (Fig. A.29), which is located at the opening of the Demre gorge into the Kasaba valley, on a small rise next to the Karadağ river (Morganstern 1983, 24). While not the largest church in Central Lycia, it is the largest church dated to the later period of construction. While both the construction style, and the two octagonal subsidiary chapels at the Dereağzı Church have clear parallels in Constantinople (Morganstern 1983, 169), the church itself still fits within the traditions of Central Lycia, where churches are built at significant, rural geographic locations. It is one of just two cross-domed, or cross-in-square churches in Central Lycia, along with the Apollonia Theatre Church (Fig. B.1). It is worth noting, however, that none of the earlier three-aisled basilicas in Central Lycia are converted into the cross-in-square form, which is common elsewhere in the early Christian period (Stewart 2010). There is evidence for this kind of conversion in Western Lycia, where the three-aisled basilica of Kydnai (Fig. B.43) was converted to a cross-in-square church in the later
period (Adam 1977). Both of the cross-in-square churches of Central Lycia, as well as Kyndnai are likely the result of outside influence, though in the case of Dereąż, the Constantinopolitan influence is most easily recognisable.

All of this evidence points to the later period of Christianity in Lycia being not a period of decline, but rather a period of relative prosperity, where Christianity, and with it, church building flourished. Churches became more accessible as they were located not only in cities and large settlements, but also at crossroads, positions of geographic interest, and in smaller settlements throughout the region. The proliferation of smaller churches at these new places also meant that in this period, churches were more visible across the Central Lycian landscape. To construct churches in the size and styles more common from the earlier period would have required a multitude of craftsmen (Ševčenko & Patterson Ševčenko 1984, 16), as well as the resources to finance and decorate, and then look after these large structures. The shift in liturgy from the Transitional Period onwards brought the focus away from the ornate and conspicuous (Ousterhout 1998, 10). This shift would have permitted for these simpler churches to be built throughout the region, without requiring the resources and patronage needed to finance the earlier churches.

The presence of the church at Dereąż could even be read as a sign of the importance of the religious prosperity in Central Lycia. As many scholars (Krautheimer 1986, 285; Foss 1994, 34) have pointed out, the church seems out of place in the landscape of decline; leading to the question of why such a large and distinct church would be constructed in a region that is supposedly in a withering state. Seen through the lens of a prospering and flourishing later period Christian community, however, the church becomes less incongruous. Perhaps the Dereąż church was constructed precisely because of the religious prosperity, rather than in spite of decline. Archaeological evidence tells us that church construction continued in
Central Lycia up until around the thirteenth century, with the construction of Myra Alakent (Fig. A.56). The church is stylistically dated partially by the windows, which have a characteristic pointed, or 'gothic arch', which can also be found in later churches on Cyprus, as well as in the blind arcades of the 'chapel' behind Church III at Gemile Ada in Western Lycia (Fig. B.44). Myra Alakent also provides us with a terminus ante quem for church use in Central Lycia, as evidence suggests it was eventually abandoned in the fourteenth century due to mudslides in Myra (Akyürek 2017, 251-53). From the beginning of the Transitional Period (mid-seventh century), to the abandonment of Myra Alakent in the fourteenth century, the analysis and interpretations presented in this thesis provide a different perspective on these seven centuries of Christian life in Central Lycia.
The subject of temporal change is vast and complex. While this thesis has provided a number of different interpretations of the evidence for temporal change in Central Lycia, there will always be aspects of this topic that could be investigated further. For example, in terms of internal churches, I have argued for the possibility that the internal remodels where the aisles are walled off are not necessarily an indication that the aisles go out of use. Whether the aisles go out of use or not, the walling off of the arcades also may have been an attempt to strengthen the walls of the church before replacing the wooden roof with a stone barrel vault, as is found at the Karpas churches in Cyprus. Further research into this theory would require a reassessment of the current architectural remains, as there is likely to be some evidence of any attempts to renovate the structure to support a barrel-vaulted roof. For example, this could come in the form of additional buttressing to the aisle-wall, or to the outside of the church. Assessing whether there is evidence for aisle use after the walling off is more difficult without excavation, but if these sites are re-surveyed with an open mind, it is possible that new information will come to light.

There are a few traits that appear in the later period of construction in Central Lycia that have not been discussed in this thesis as they were not part of the original set of databased traits. These are the blind arcade, the ‘gürtelbogen’ (trans: belted arch, a strengthening arch running internally width-wise across a vaulted structure), and side apses which are sometimes referred to as ‘apsidioles’. In the later period, a number of the churches in the dataset have a blind arcade running across the north and south walls. Some examples of this can be found at the Gürses Internal Church (Fig. A.36) and at Myra Alakent (Fig. A.56). It is unclear whether it served a purely decorative function or if it was a practical function of strengthening the church structure, a way of separating the church into distinct sections, or a combination of all three (Akyürek 2017, 65). The gürtelbogen may perform a similar function,
though it would have more clearly divided the interior of the church. Examples of this feature can be found at Alakilise S Church (Fig. A.4), Istdada Internal Church (Fig. A.39), and Kyaneai Church D (Fig. A.50). As both traits show up somewhat similarly on archaeological ground plans, it would be worth visiting the sites in question, or at the least assessing survey photographs of the sites, to assess how exactly the features are rendered.

The side apses, or apsidioles, are not a very common feature in the later period Central Lycian churches, however, they appear at a few sites across all three regions. Apsidioles can be found at Dereağzi Church (Fig. A.29), where they were part of the pastophories (Morganstern 1983, 45), as well as many smaller churches such as Büyük Avaşar Church 3 South LXII (Fig. A.26), the Karabel Church (Fig. A.41), and Razaman's Church (Tindle 2000). As with the other features, the absence or presence of the apsidioles could be easily added to the database and analysed in comparison to the other traits studied in this thesis. The additional analysis of these three traits would hopefully shed further light on the diversity of the later period churches of Central Lycia.
Applying the theory of cultural transmission to the study of architectural remains is an ideal way to tackle the issues posed by the early Christian churches of Central Lycia. The lack of concrete dates in the region, as well as the trend towards typological interpretations, has always made a proper analysis of the relationships between the 162 churches in this region somewhat difficult. The narrative of decline too has often led to sweeping generalisations about the state of later period Central Lycia and its churches. Cultural trait analysis allows for these biases to be eliminated from the analysis to a certain extent, and thus can provide a point of comparison to these oft-repeated theories. Architectural remains do provide some difficulties that are not faced by anthropological studies on still-functioning structures (Jordan & O’Neill 2010), nor on easily reproducible artefacts (O’Brien et al. 2010), such as the lack of evidence for certain traits due to the degradation of upstanding remains. In this study, the biggest downfall in the analysis arises from the lack of data for nave areas. 36 of the 162 churches in this study do not have a recorded nave area. This was especially challenging when analysing the relationship between ashlar masonry and nave areas, though through the given data I was mostly able to estimate nave areas, which then aided in interpretation. As with all quantitative analysis, there are also issues regarding the biases of data collection. In Central Lycia this came in the form of intensity and survival bias. However, as long as these biases are considered in the interpretation of the data, it is still possible to carry out cultural trait analysis effectively.

Over the last five years, a number of researchers have carried out projects that focus on the quantitative analysis of the churches in a specific region during the early Christian period. For example, Tzavella’s (2014) article on the early Christian churches of Attica situates the churches within the context of their landscape by quantifying their size, location in relationship to other
features (roads, settlements, cities), and additional traits such as graves or a baptistery for each church in the region. As with Lycia, it is at present impossible to establish a good chronology for the churches in Attica (Tzavella 2014, 152). With some modifications to the databased used in this initial study, it would be possible to study this dataset in a manner similar to that of this thesis. Conversely, Tzavella’s (2014) study, which gives a context within which the churches of Attica are situated, provides an idea for how to further expand the study of the Central Lycian churches. For example, Tzavella’s characterisation of the church’s relationship to settlements (Tzavella 2014, 131), could provide a framework for future analysis on the Lycian churches. While Sweetman’s (2010) article mainly aims to determine evidence for the Christianisation of the Peloponnese through the study of churches, her database again could be modified for quantitative analysis through the lens of cultural transmission. Currently, Sweetman’s (2010, 248: Table 1) database holds information about the layout of the church, internal features, and setting, all of which could be analysed along with morphometric data. More recently, Seifried and Kalycı (2019) published the results of their quantitative analysis of the churches on the southern Mani Peninsula. Seifried and Kalycı (2019, 526) have quantified three different variables for their study: chronological period, church location in relation to settlement, and planar distance from each church to the nearest settlement. Confusingly, one of the tests they run (two-way ANOVA) does not work when two variables are dependant (church location and planar distance). However, the data they have collected and the other tests they have run would provide a valuable starting point for any analysis of church architecture.

Equally, there are a variety of surveys that have been carried out on other regions which provide a great deal of information about church architecture. I have already mentioned Hill’s (1996) landmark publication of the churches of Cilica and Isauria, which is complete with a multitude of church plans and images that would easily translate into cultural trait analysis. A cursory glance over the plans of these churches shows that apsidioles are much more
common in larger, three-aisled basilicas in Hill’s study area (1996, see Figs 18 - 21, 24, 43, 46, 50, 56, and 59-60), which would make a good point of comparison to the Central Lycian churches, along with the synthonons already mentioned above. Survey work carried out in Pisidia (Vandeput & Köse 2011) which included a number of architectural surveys would provide a good dataset for analysis. In Pisidia, the majority of churches are found within cities (Vandeput & Köse 2011, 212), some of which have been excavated and thus can provide concrete dates. Analysis on this dataset would provide a good comparison to Central Lycia, especially when evaluating the churches of the earlier period. A dataset which would provide a good comparison to more rural sites can be found on the Greek island of Naxos (Aslanidis 2018). The majority of churches on Naxos are single-aisled structures (Aslanidis 2018, 337: Fig. 43), which differs from many of the other study areas mentioned above. Aslanidis (2018, 312-18) breaks down the churches into a detailed typology and chronology, which could be tested in a similar manner to the dating of the Central Lycian churches. Aslanidis (2018, 321-22) has also already characterised traits such as door and window openings, which could easily translate into quantitative analysis. All of these datasets would provide an interesting and necessary comparison to this study, both in order to test the robustness of this method, and to provide evidence for similar or differing trends of church design and construction across the Empire.

While it is important to consider other study areas for comparison to the Central Lycian dataset, it is also worth noting that this analysis is a reminder to look inwards rather than attempting to find analogous sites across the early Christian world. Within the relatively small region of Central Lycia this thesis has identified a variety of sub-regional and temporal patterns which have previously gone undetected. Even with a feature like the triconch church, which is oft referenced in publications on early Christian architecture, the focus seems to be on where the idea for the triconch church came from (Sweetman 2017, 30-2), rather than how the triconch churches relate to the
other churches around them. Equally, without focusing in on regional and sub-regional patterns and variation, we can easily be tricked into thinking that the internal church is purely a sad version of the glorious early period basilica. However, when they are studied in more detail, we realise that their construction is very intentional. Studying the churches through a cultural evolutionary framework, where a church is seen as analogous to an organism (rather than a comparable church in Constantinople), allows us a new, different perspective.

Cultural trait analysis, and cultural evolutionary methods more generally, have great potential for the researcher of archaeological buildings. The methodology can be applied to any set of buildings used for a similar purpose. This leaves the possibilities for research using the methods of this thesis open to all subsets of archaeological research. As this thesis has shown, the use of quantitative analysis can shed new light on old buildings, providing new perspectives from a variety of different angles. The strength of the method is in the ability of the researcher to tailor the traits to suit their specific dataset. In Lycia, this came in the form of considering the churches not only by the physical traits present in the churches themselves, but also by their regional and spatial relationships to one another. While hypothesised date was specifically not included in the database, evidence for temporal variation appeared through the quantitative analysis. There are a variety of other methods of quantitative analysis that have been used in previous cultural evolutionary studies that can easily be woven into any future work on architectural remains using this method. Through the use of cultural trait analysis this thesis has shown that the churches of Central Lycia across the Alaca Mountain, Coastal Plains, and Upland Hills show a more complex development than has previously been hypothesized. From the earlier urban Christian centres and monastic hub in the mountains, to a later landscape covered in smaller, localised, and accessible rural churches, the churches of Central Lycia have a rich architectural history in need of further investigation.
A Quantitative Analysis of the Early Christian Churches of Central Lycia

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University of Edinburgh 2019
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Table C.1: Code for Fig. IV.2. For this plot the averages of the recorded lengths and widths have been calculated in R. These are the subsets, ‘averagedValues’ which is the average of the lengths, and ‘averagedValues2’, which is the average of the widths. All graphs have been created using the ggplot2 package.

```r
ggplot(final_1, aes (x=averagedValues2, y=averagedValues, color=region)) + geom_point(aes(color=region)) + theme_bw() + theme(axis.text.x = element_text(angle = 45, hjust = 1)) + geom_smooth(method=lm, se=FALSE, fullrange=TRUE, aes(fill=region))
```

Table C.2: Code for Fig. IV.3. This is a simple bar plot showing absence / presence of an atrium, as distributed across the three regions using the ‘facet_wrap’ feature.

```r
ggplot(final_1, aes (x=atrium, fill=atrium)) + geom_bar() + theme_bw() + theme(axis.text.x = element_text(angle = 45, hjust = 1)) + scale_fill_manual(values =c('#FF3333', '#0000FF', '#FFCC33')) + facet_wrap(~region)
```

Table C.3: Code for Fig. V.8. This is a stacked bar plot where the absence / presence of carved decoration is represented by the bars (x) and the absence / presence of an atrium is represented by the fill of those bars. The y-axis indicates the number of churches within each bar.

```r
ggplot(area_complete, aes (x=car_deco, y=nave_area)) + geom_bar() + theme_bw() + theme(axis.text.x = element_text(angle = 45, hjust = 1)) + facet_wrap(~region) + geom_jitter(alpha=0.5, color='#3399ff')
```

Table C.4: Code for Fig. IV10. This is a boxplot where the absence / presence of a narthex is represented by separate boxplots (x), and then the nave area in m² is the y-axis. As with the above code (Table C.2), the plot is faceted by region. For this boxplot, I have used the command ‘geom_jitter’ which adds each individual datapoint to the plot, in this case as a blue point. The dataset used for this plot is ‘area_complete’, the creation of which is explained below (Table C.5).

```r
ggplot(area_complete, aes (x=narthex, y=nave_area)) + geom_boxplot() + theme_bw() + theme(axis.text.x = element_text(angle = 45, hjust = 1)) + facet_wrap(~region) + geom_jitter(alpha=0.5, color='#3399ff')
```
area_complete <- subset(final_1, nave_area > 0)

Table C.5: Code for the ‘area_complete’ subset, which is utilised in the code for Fig.IV.10 as well as all other nave area-based graphs. This dataset is made by using the ‘subset’ function, and specifying that the ‘nave_area’ field must have a value above zero to be included in the subset. There are 126 churches in this subset.

ggplot(subatrium, aes (x=SITE, y=narthex)) + geom_point(aes (color=region, size=1)) + theme_bw() + theme(axis.text.x = element_text(angle = 45, hjust = 1))

Table C.6: Code for Fig. IV.12. This is a point graph the individual church is represented on the x-axis, the absence / presence of a narthex is indicated by the points location on the y-axis, and the region the church is located in is indicated by the colour of the point. This graph was created by using a subset of all the churches with the presence of an atrium, seen in the code as ‘subatrium’.
DATABASE FOR CHURCHES OF CENTRAL LYCIA:
ATTACHED