CHANGES IN THE SETTLEMENT PATTERN IN THE ÇUKUROVA REGION (CILICIA) FROM THE MIDDLE BRONZE AGE TO THE LATE BRONZE AGE

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ABSTRACT

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The Çukurova Region (Cilicia) is an alluvial plain enriched by the rivers of Seyhan and Ceyhan, surrounded by the Taurus mountain range in the North and West and the Amanos Mountains in the east; and stretching from the skirts of the Bolkar-Aladağ massif to Mediterranean Sea at its southern most extension. The region is thus an inaccessible marginal zone except only reachable through several mountains passes from the Anatolian Plateau or from the sea through the harbour towns. The research subject of this thesis is to evaluate the region and the changes in the settlement pattern, covering the time period from the Middle Bronze Age (ca. 1900-1650 B.C.) to the end of Late Bronze Age (ca. 1200 B.C.) by using Geographical Information Systems (GIS) to analyse archaeological survey data. Data sets are collected from old and recent archaeological surveys and spatially analysed under a set of parameters (density and proximity) in order to define the habitation patterns throughout the mentioned time periods. An effort was made to challenge the theory that settlement pattern changes were resulted from the impact of the Imperial Hittite policy in the LBA, and some alternative suggestions are presented.

Keywords: Settlement Pattern Changes, Çukurova (Cilicia), Bronze Age.

ÖZ

ÇUKUROVA BÖLGESİ (KİLİKYA) NDE ORTA TUNÇ ÇAĞI DÖNEMİNDEN GEÇ TUNÇ ÇAĞI ZAMAN DİLİMİNE KADAR UZANAN SÜREÇTE YERLEŞİM DÜZENİNDE MEYDANA GELEN DEĞİŞİKLİKLER

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Çukurova bölgesi (Kilikya), Seyhan ve Ceyhan nehirlerinin zenginleştirdiği bir alüvyon ovasıdır; kuzey ve batı bölümleri Toros dağ silsilesi ile çevrelenmiş olup, Amanos dağ yapısı, doğusunda yer almaktadır; ve güneyde Bolkar-Aladağ dağ kütlesinin eteğinden, Akdeniz'e kadar uzanmaktadır. Bu nedenle, bölge Anadolu'dan çeşitli dağ geçiş yolları ve denizden liman kentlerinin dışında, ulaşılamayan aykırı bir yapıya sahiptir. Bu tezin araştırma konusu, bölgede yapılmış olan arkeolojik yüzey araştırmalarının incelenerek, Çukurova Bölgesi'nin Orta Tunç Çağı'ndan (M.Ö. 1900-1650), Geç Tunç Çağı (M.Ö. 1200) döneminin sonuna kadar devam eden süreçte yerleşim düzeninde meydana gelen değişikliklerin, Coğrafi Bilgi Sistemi (CBS) kullanılarak değerlendirmesini yapmaktır. Bahsi geçen zaman aralıklarındaki yerleşim dağılım modelini incelemek amacı ile, eski ve yeni arkeolojik yüzey araştırmalarının sonuçları birleştirerek hazırlanan veri tabanınında, belirli kıstaslar kullanılarak yoğunluk ve uzaklık analizleri yapılmıştır. Geç Tunç Çağı'nda, Hitit İmparatorluğu'nun bölge üzerinde yürütmüş olduğu politikasının sonucunda, yerleşim dağılımı üzerinde bir etkisi olduğuna dair var olan teoriler değerlendirmeye alınmış ve bu analizlerin doğrultusunda yeni öneriler sunulmuştur.

Anahtar Kelimeler: Yerleşim Düzeni Değişiklikleri, Çukurova (Kilikya), Tunç Çağı.

To My Parents

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CHAPTER I

INTRODUCTION

1.1. Purpose of the Thesis:

The shift in the political control of the Çukurova region from the Middle Bronze Age (MBA), ca. 1900-1650 B.C., to the Late Bronze Age (LBA), ca. 1600-1200 B.C., known from historical sources is confirmed by evidence acquired from archaeological material recovered from major excavations and survey projects. The rise of a new ruling authority in the LBA that succeeded in controlling the land and possibly the sea traffic is demonstrable. The extent to which the Hittite State was responsible for these processes of change has been subject to a large number of discussions based on the interpretation of both texts and the material evidence. My attempt is contemplated to evaluate these changes through settlement pattern analyses. The purpose of this thesis is to study settlement patterns in GIS, which provides us with an opportunity to examine the land and its communities not only by considering the ruling authority as the major fact but rather within its local and non-local framework.

Claims of major and significant changes in the settlement pattern in the region of Çukurova were made by Jak Yakar; (Yakar 2005) who states that during the Late Bronze Age the Hittite annexation in the region of Çukurova caused changes in the settlement pattern in the region. His statement was apparently based only on the published reports of Seton-Williams (1951) extensive survey results. Although Yakar's observations are not related to any systematic analysis of the settlement pattern in the Çukurova region, he claims that there is a considerable increase in the numbers of mound sites on the northeast part of the plain which could not simply be a result of a rise in population density: "Such an increase in this region can hardly be explained as resulting from a natural

demographic growth. It must have been the consequences of a state initiated settlement policy; of the kind we have some examples from the neighboring state of Mukis as well as from the more recent past" (Yakar 2005: 41).

The inspiration to investigate the MBA and LBA distribution of settlement pattern in the region of Çukurova was the result of a suggestion from Prof. Dr. M.-H. Gates following my participation the Kinet Höyük excavation seasons. The idea was further developed during field work at the Tell Atchana excavations directed by Prof. Dr. Aslıhan Yener.

The nature of the evidence which is derived from the related survey reports, publications and maps of the MBA and LBA periods in the Çukurova region first requires critical examination and the extraction of usable data. In the second chapter, the regional geography is summarized, including the boundaries of Çukurova, possible coastal changes that might have affected settlement patterning and archaeological visibility for the MBA and LBA periods, and natural routes which were possibly used for trade in these same periods. The third chapter is composed of brief summaries of the related survey reports and discusses the limitations set by the methods of surveys, reliability of analysis (e.g. dating of ceramics from the surveys), quantity of available information about sites and their locations, and other limitations. The following chapter comprises an examination of the statements of Yakar through the application of *Geographic Information System (GIS)* analysis, which combines archeological and other related data to obtain an understanding to settlement pattern theory as cultural and political phenomena in the region of Çukurova.

In order to examine spatial distribution of settlements in the region of Çukurova, both published and unpublished results of surveys were used in creating the settlement database (SD) and data layers. The shape of the SD partially reflects the limitations of the archaeological survey results. Settlement coordinates were taken from the relevant maps of the study area. In order to increase the accuracy of the coordinates, both 1/100.000 and 1/25.000 maps were taken into consideration.

The creation of the data layers and concerned analysis depend on the amount of the information which is available in the SD. The Shuttle Radar

Topographical Mission (SRTM) data was used within the extension of the Digital Elevation Model (DEM), which is explained in the 'Data Preparation and Analysis' chapter.

The major rivers and streams within the ancient routes were digitized using 'Map Info Professional 7.8 SCP' software while 'Micro Images *TNTmips 6.9*' software was used for GIS analysis.

1.2. Chronology:

For the purpose of this thesis only broad chronological divisions of the second millennium into MBA and LBA have been used. Generally the available data does not permit precise dating of site recorded from surface surveys, a problem compounded by recent reassessments of pottery chronologies in the LBA. The chronology and the historical background of the Çukurova region have been extensively discussed by Trevor Bryce (Bryce 1999: 75). Within the region, new evidence on the second millennium, and particularly on Hittite administration, is emerging from ongoing excavations at Kilise Tepe, Kinet Höyük, Mersin-Yümüktepe, Sirkeli, Soli and Tarsus-Gözlükule, which is only available in preliminary reports. It is not yet possible to relate these new results to the evidence of settlement pattern.

CHAPTER II

ENVIRONMENTAL SETTING

"The natural environment provides the physical underpinning of the cultural landscape" (Wilkinson 2003: 15). Referring to Wilkinson's statement, the environmental framework that is an essential factor to understand the settlement pattern distribution is summarized in this chapter. I have chosen to provide a description of the environmental context of the Çukurova region and draw a frame to offer a general background of the Bronze Age setting of the area.

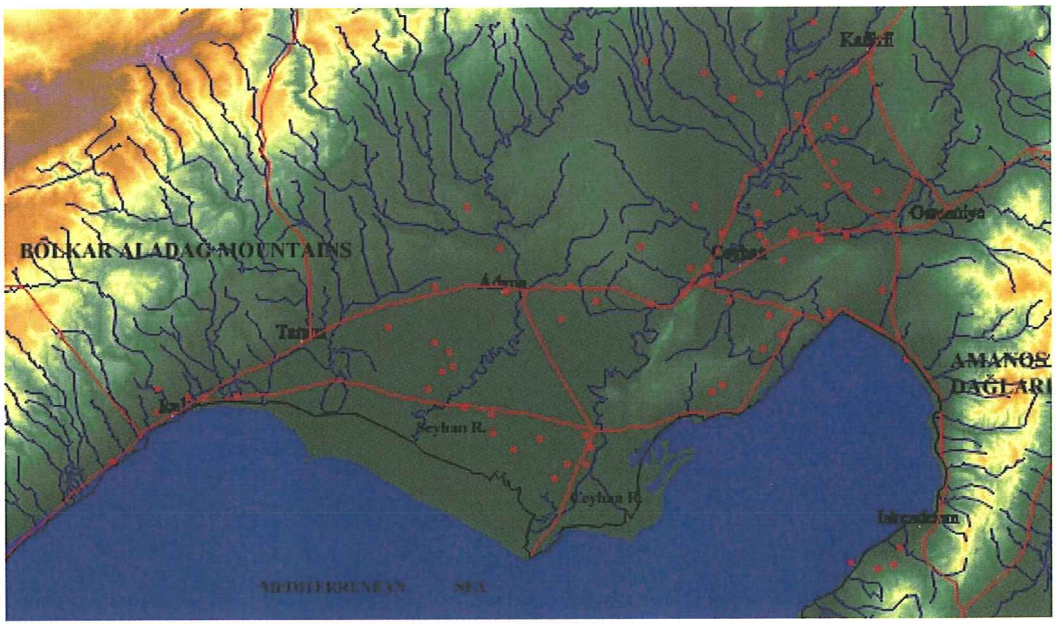
Having trying to argue costal effects on settlement pattern in the region, which is one of the most important reasons. However, the insufficient data formed the limitations for this kind of parameter that is discussed extensively below.

2.1. The Boundaries of the Çukurova Region:

The natural borders of the region of Çukurova are the Taurus mountain range, including the important Bolkar-Aladağ ridge to the north and west and Amanos range to the east. Çukurova itself is, as its name implies, a rich alluvial plain enriched by the Seyhan and Ceyhan Rivers. The southern boundary is the coastline of the Mediterranean.

Access to the region from the Anatolian Plateau is restricted to several mountain passes. There is no land route to North Syria along the coast and communications with the Amuq valley, by the Belen pass, seem always to have been of relatively minor importance (Steadman 1994: 14-16).

Thus the Çukurova region is a natural geographic entity by itself, settlement mounds within this region, from west to east, begin with Viranşehir - Soli Höyük located on the coast and end at Dağılbaz Höyük on the south side of the İskenderun Bay (Map 2.01).



Map 2.01: The Thematic Map Info map showing the Thesis Area

2.2. Physical Environment of the Plain:

In this section the geographical features and topography of Çukurova region are described and the importance of geomorphological changes, particularly along the coastal zone, is outlined.

2.2.1. The Region:

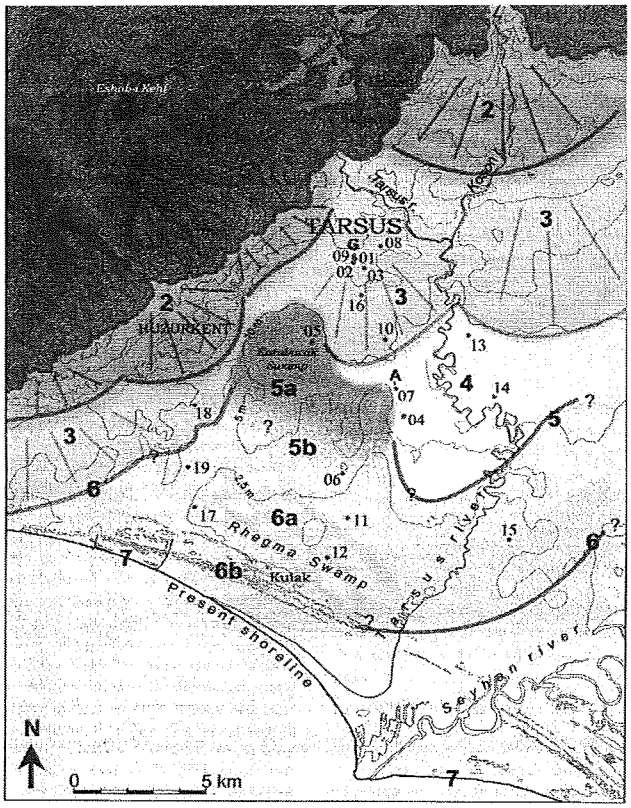
The natural geography of the region of Çukurova is dominated by mountainous and alluvial plains (Wilkinson 2003: 15). The region is traversed by two main rivers which provide fertile soil for the plain and continue to create an alluvial delta up to this day. The Seyhan River which is 515 km. in length is fed by two major streams, the Zamantı and the Göksu as well as by smaller tributaries. The Seyhan River flows into the sea next to Tarsus, at modern Deliburun. The Ceyhan River, 475 km. in length, is formed by three different streams, the Söğütlü, Hurman and Göksün. It runs parallel to the Seyhan River and it flows into the Mediterranean Sea through the İskenderun Bay (Steadman 1994: 16). The soil brought by these two rivers not only formed an alluvial delta but also provided natural fertile soil for agriculture activity in the region.

The Taurus Mountain range is a natural barrier which almost splits the southern part of Anatolia from the Central Plateau. The study area is believed to be traversed by significant trade routes. Most important are the routes leading across the plain from the so-called Harbour Towns, known to include Kinet Höyük, Soli Höyük, Tarsus and perhaps Kerlenderis, to the Central Plateau through the mountain passes. Overland routes to N. Syria via the Cilician Gates and the Belen Pass were perhaps of lesser importance in the MBA and LBA (Özyar 2005: 69-72).

There are some assumptions and predictions about the potential locations of the natural ways of which might have some connections with trade activities in the region. Those most frequently mentioned in the literature are the Gülek and Sertavul Gates, which correspond to the 'Cilician Gates' (Wilkinson 2003: 15), and the Belen Pass which is referred to as the 'Syrian Gates' (Girginer 2000: 79-80). The exact courses of these routes continue to be discussed, but there is a lack of precise archaeological evidence. None of these roads are well-documented as trade routes in the literature, but they are described as natural routes which might contribute the possible trade activities in the Çukurova region (explained in the section 4.2.2. of Chapter IV). If these routes were relatively active in the commercial purposes or they were used by the traders; Özyar stated that the closest settlements to these pathways could be yielded into the possible commercial network between Anatolia and the other cultures (Özyar 2005: 70); so the distance is taken into consideration while evaluating the function of both the settlement and the route. This argument would be discussed with the results of the proximity analyses in the section 4.3.3. of Chapter IV.

2.2.2. Geomorphological Changes in the Region:

Depiction of the last rise of the sea level was eventuated during the Holocene period in the Çukurova plain, while causing a serrated extension of the land. Therefore, the alluvial peninsula began to broaden from Tarsus river to the Seyhan delta (Özyar 2005: 69) (Map 2.02).



Map 2.02: Map showing the Shoreline of Tarsus Plain (Source: Özyar 2005: 76).

The two reasons are demonstrated for the coastline changes for the region of Çukurova: the earth's crust shift and climatic changes. The change in the sea level could have caused a dramatic effect on the formation of the delta plain and settlement pattern hierarchy of the area. It is believed that the Tarsus plain was on a closest distance to the coastline which might had a harbour town, Karabucak, during the Roman period, however, the rapid rise of the sea level and Tarsus River provided to retreat the coastline through the sea. Therefore, in the course of time, the shoreline began to fill with the alluvial deposits which were carried by the rivers (Özyar 2005: 71-72). Today, it is not possible to trace the ancient coastline but some information is left by ancient geographers, such as Ptolemy and Strabo, belonging to the Hellenistic and Roman periods.

2.2.3. Discussion about Limitations for the Geomorphological Changes in the Çukurova Region:

The shifting of river courses and coastline could be determined as significant influences on the settlement pattern history of the Çukurova region during the MBA and LBA periods. However, it seems not possible to detect the certain borders of the changing coastline and also, it is not possible to determine ancient rivers and streams courses but the estimations would be helpful while designating the parameters of this thesis. Due to this reason, the changes in the geomorphology of the area would be taken into consideration insofar as reaching the relevant and related information from the literature sources which are not enough to detect such changes in the Çukurova region. Most of the surveys did not deal with geomorphological changes in the area; even though the region is located on the coast. There are some research projects such as Mopsos and Bakü-Tbilisi-Ceyhan Crude Pipeline, however, they do not provide enough to reflect perspective of geoarchaeology in this thesis (the criticism of the outcomes of survey results is extensively discussed in the section of 3.2.1. of Chapter 3). For example, some researches were done for Aegean coasts indicating that "... coastal settlements being marooned well inland of the present coast" (Wilkinson 2003: 24). This result is a clear indicator that human being is affected by environmental changes and also, human impact is an undeniable fact over natural setting. Thus, this kind of coastal change effects might be analyzed for the Çukurova region while dealing with the spatial distribution of settlements for any period of occupation.

The environmental change is not limited to coastal changes. There might be another discussable topic as alluvial plains, which are formed by accumulation of rivers and the region of Çukurova is described as an alluvial delta plain. The alluvial deposits could be stratified so development of floodplains could be used for dating or interpreting human activity dealing with river catchment. Thus, by using related dating methods for alluvial sequence research in the region of Çukurova, it might be possible to determine relations of rivers and human activity by doing related GIS analysis (Brown 1997: 45; Garrison and Herz 1998: 23).

It is rare, but possible to predict past climate and effect of its changing on human activity. This could be utilized by dealing with pollen and oxygen isotope analysis or microfossils if they are available or if they are surveyed by researches (Wilkinson 2003: 19).

2.3. The Bronze Age Setting of the Çukurova Region:

The region of Çukurova during the MBA and LBA periods is defined by two different geographical entities: Rough and Smooth[1] (Çukurova) Cilicia. These two are divided with a natural pathways and mountains (Yakar 1999: 343). Historically, these two could be evaluated in a different perspective although the historical borders are unclear.

The Rough Cilicia (the western portion) is the mountainous part of the region in which mostly Roman settlements predominate in the archaeological record (Seton-Williams: 1954). Although most of the survey results in this area indicate that Hellenistic and Roman occupation layers are detected in this region. There are some exceptions such as Kilise Tepe, which is located on the Göksu Valley, where has Hittite material (Postgate 2005: 147). It is believed that this valley might have participated the sea trade during the mentioned times and it was placed on the route between the Mediterranean and the Central Anatolian Plateau

The Çukurova (Smooth Cilicia) plain is formed by a flat and marshy region due to thick alluvial deposits accumulated over this area (Yakar 1999: 345). At the end of the MBA period, the kingdom of Kizzuwatna began to emerge in these fertile lands, however, in the LBA period, it is considered that the impact of the Imperial Hittite Empire policy might be observable on the Kizzuwatna kingdom, (Yakar 1999: 350) which is also affected the habitation patterns in the former periods. This particular statement by Yakar is formed the main discussion point of this study, which would be designated by evaluating the consequences of the GIS analyses in the Chapter IV.

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[1] The 'Smooth Cilicia' term is taken from E. Jean's article in the year 2006. This a newly adopted term which is described mainly as the border of the Kizzuwatna Kingdom while the Hittite Empire was in charge of Central Anatolia (Jean 2006: 312).

The topographical and geological characteristics of the Çukurova region could have been one important factor in formation of settlement patterns during the MBA and LBA periods. The natural pathways, which can be perceived as possible trade routes, the courses of the rivers and the change in the coastline have to be taken into account in any study of the settlement history of the region. Therefore, while doing the related analyses for this thesis these issues are considered, and particularly their impact on the quality of the archaeological data is available.

CHAPTER III

ARCHAEOLOGICAL SURVEYS IN THE STUDY AREA

It is an objective of this thesis to not only examine changes in the settlement pattern from the Middle Bronze Age and Late Bronze Age periods, in as far as they can be reconstructed from the published results of survey projects set out in the settlement database, but also to see if it is perhaps possible to identify some impact of Hittite administrative policy in this region through the use of archaeological data and theory. Although the nature and extent of Hittite presence on the Çukurova Plain is still a controversial issue, it is expected that analysis of the available and related archaeological survey data set out in this chapter will further help understanding of both the settlement archaeology and the impact of Hittite control over the region during the MBA and LBA periods.

Without addressing in great detail to problems concerning the chronology of the area, this chapter briefly discusses the related surveys and survey reports and also, addresses the validity and limitations of the available evidence. Although many expeditions and surveys were undertaken in the Çukurova region, only the coherent and relevant data are discussed here.

3.1. The Related Published Surveys:

From the nineteenth century until now archaeological field surveys in the Çukurova region have been conducted from different perspectives and with different approaches. Each survey project was designed according to the type of research question being asked, and this in turn determined the methods employed. The related Çukurova field surveys are briefly described from the 19th century onwards, with emphasis on their aims and perspectives.

3.1.1. Nineteenth Century Expeditions:

The main focus of research in the nineteenth century was to attain knowledge about the southern coast and inland settlements of ancient Çukurova. Initial field surveys were aimed at attaining familiarization with geomorphology and topography of the area against the known historical background.

The earliest systematic research in the Çukurova region was undertaken in the years between 1811 and 1812 by the British Admiral C. F. Beaufort who published the first detailed maps and description of the coast line of the area in a volume entitled *Karamania: A Brief Description of the South Coast of Asia Minor* in 1818. He was appointed as a hydrographer to make nautical charts for the Britain's Royal Navy for intelligence purposes. As he charted the south coast of Asia Minor, he plotted some classical sites (Beaufort 1818: viii). While his main task was mapping the coast, he also made extensive visits into the hinterland. As he stated in the preface, the name of the book referred to the name given to that stretch of the mountainous southern coast of the Asia Minor by Europeans. The name of 'Karamania' was explained by Beaufort in a sentence "... but, however convenient such a general appellation may be as a geographical distinction, nor it is recognized the seat of government. A kingdom of that name – or rather Karaman-ily – did indeed once exist; it comprised the ancient provinces of Lycia, Pamphylia, and two Cilicias, with parts of Caria and Phrygia; and was co called Karaman, the chieftain by whom it was founded" (Beaufort 1818: a2). Due to the strategic position of the southern coast with its key Mediterranean ports, the coastal survey was made to gather detailed information about the shoreline, little of which was provided the ancient geographers, of whom Strabo and Ptolemy were the best known (Beaufort 1818: viii).

Beaufort cited many sites located along the littoral, mostly dating to Hellenistic and Roman times, as well as some inland. However, his principle interests were the historical importance of these sites and their place in Greek mythology. He was concerned with the spread of the Greeks through what was to become Asia Minor and particularly the influence of Greek culture that could be seen in works of art (Beaufort 1818: vi). The archaeological and historical

existence of each site was recorded without detailed descriptions being given. However, his observations can be helpful in figuring out the position of the ancient coastline which indicates the extent of geomorphological change in the area. Beaufort was able to demonstrate that the coastal city of Pompeiopolis / Soli Höyük was now 11 kilometres inland from Mersin. He described that "...and the inner part of the harbour is raised above the level of the sea by the accumulation of sand" (Beaufort 1818: 260).

Travels and Researches in Asia Minor, Mesopotamia, Chaldea and Armenia was published in 1842 by the geographer and geologist W. F. Ainsworth. Following on from the interest that was aroused by the 'Euphrates Expedition' which was undertaken in 1837 (Ainsworth 1888: 2), this expedition was designed in order to reveal the living conditions of the Chaldean Christians who were in a kind of insulated position. The newly designed projects was focused on getting much information through visiting these communities by a team comprising a geographer, a missionary and a mathematician arranged jointly by the Royal Geographical Society and the Society for Promoting Christian Knowledge (Ainsworth 1842: 1). Ainsworth described his experiences at many historical sites in Anatolia together with information about the political and economic situation of the country in those years. He travelled around the region of the Çukurova, writing in some detail about Misis and Adana while giving details from the Greek and Roman background. Although this research did not include any prehistoric material, it is useful in gaining an understanding of the geology and the geomorphology of the Çukurova area; not least because it relates to the last vestiges of the 'Age of Sail' and also predates the establishment of current national borders.

3.1.2. Early Twentieth Century Surveys:

With a new phase of the field survey projects in the Çukurova region there was a change of the emphasis behind the rationale. Now expeditions were to provide information relevant to the archaeological background of the area. Research questions were asked by archaeologists attempting more scientific

responses to their specific queries, most of them were shaped by new discoveries related to Hittites and their political and administrative relations with the Çukurova region, by its ancient name Kizzuwatna. In addition, because of the historical and strategic importance of the Çukurova region, which provides an access through the Mediterranean, Mesopotamian and North-Syrian world by trade connections, and the affinity of the earliest researches, there was a growth of interest in conducting archaeological field surveys. Each project concentrated on a different part of the region, as though trying to put together associated pieces of a research question. However, the results of some projects have remained unpublished.

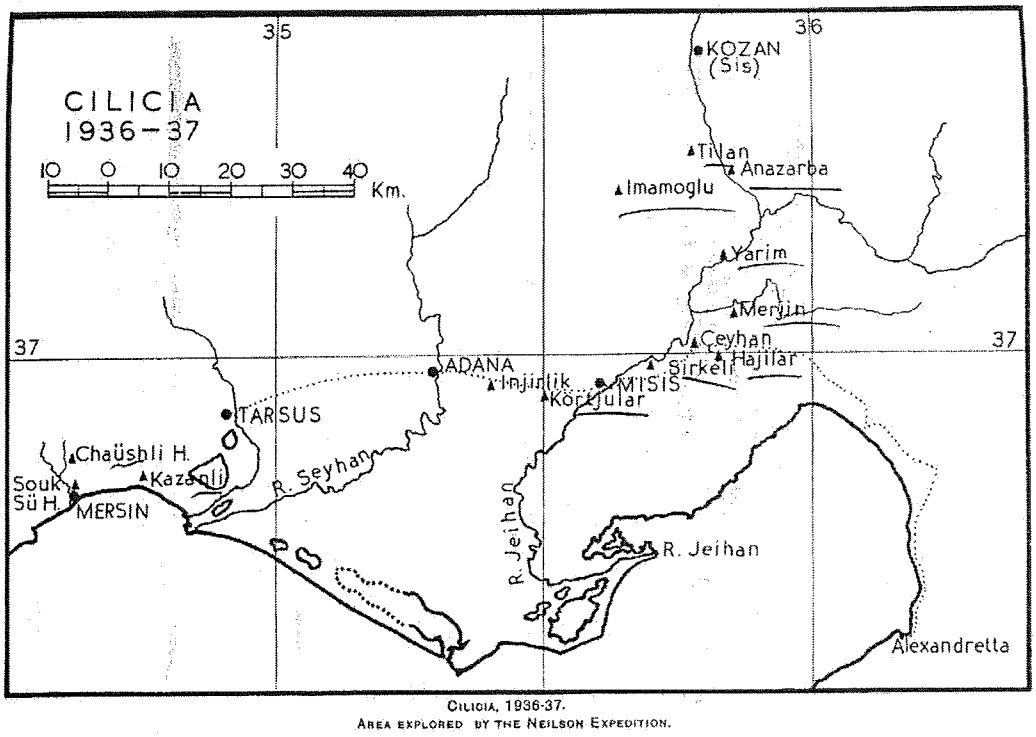
The early twentieth century survey projects were begun by the German scholar H. Grothe who surveyed sites in the Adana region and the Tufanbeyli area in 1906 and 1907. He also carried out a short excavation season at Kültepe in 1906. In the light of this expedition, the survey area chosen for the research was believed to be 'Hittite Kizzuwatna'. Results were published in two volumes (Grothe: 1911 and 1912). The information which is given in the site catalogue includes the name, topography and description of sites.

In the late 1920s, after some years of interruption, H. von der Osten had determined that a large number of mounds lay between the areas of Ulukışla and Misis. Although he did not mention all of the mounds that he had seen, he disseminated their whereabouts in various journals and publications (Von der Osten: 1930).

The first comprehensive surveys dealing particularly with the Bronze and the Iron Ages in the Çukurova region were carried out and later published by Gjerstad in the 1930s. These covered the area between Yakapınar and Anamur. These were, perhaps, the earliest detailed surveys in the region. Gjerstad located 21 settlements dating from the Roman period to the 2nd millennium B.C. within the area. Dating was based on the pottery types, which he presented in his publication in 1930, and that were related to the known pottery sequence of Tarsus and Cyprus. This work is significant because each site was located and, although there was no information about size, height or morphology, archaeological finds were described.

H. Goldman followed him in 1934 with her survey of the Kabarsa, Domuztepe (near Yumurtalık) and Zeytinli areas, which are located on the coast line of the Çukurova region. She discussed some results in different articles. She identified 41 settlements on the plain, but her publications concentrated mostly on the Zeytinli Höyük (Goldman 1935: 530). The aim of this survey was to investigate a possible connection between Greeks and Hittites because of the discovery of Mycenaean pottery in the Çukurova region was recalled a specific question which was related to "Hittite references to Mycenaean Greeks (Achaenas) as Ahhiyawa" (Cohen, Joukowsky 2004: 320). This idea was first declared in the article of Emil Forrer in 1924.

Another prominent scholar, John Garstang, undertook a survey in the province of Mersin in 1936-37 for the Chicago Oriental Institute and his publications were bunched in a series of articles (Map 3.01). The understanding the Hittite Empire pottery assemblages from the Çukurova region and its relations with Central Anatolia had been determined as a goal of this preliminary work by the survey team, Garstang and Seton-Williams. This detailed fieldwork is significant because it mentions some sites on the plain, together with an assessment of their archaeological importance, but it does not provide such detail as size, morphology or height (Garstang: 1953: 54).

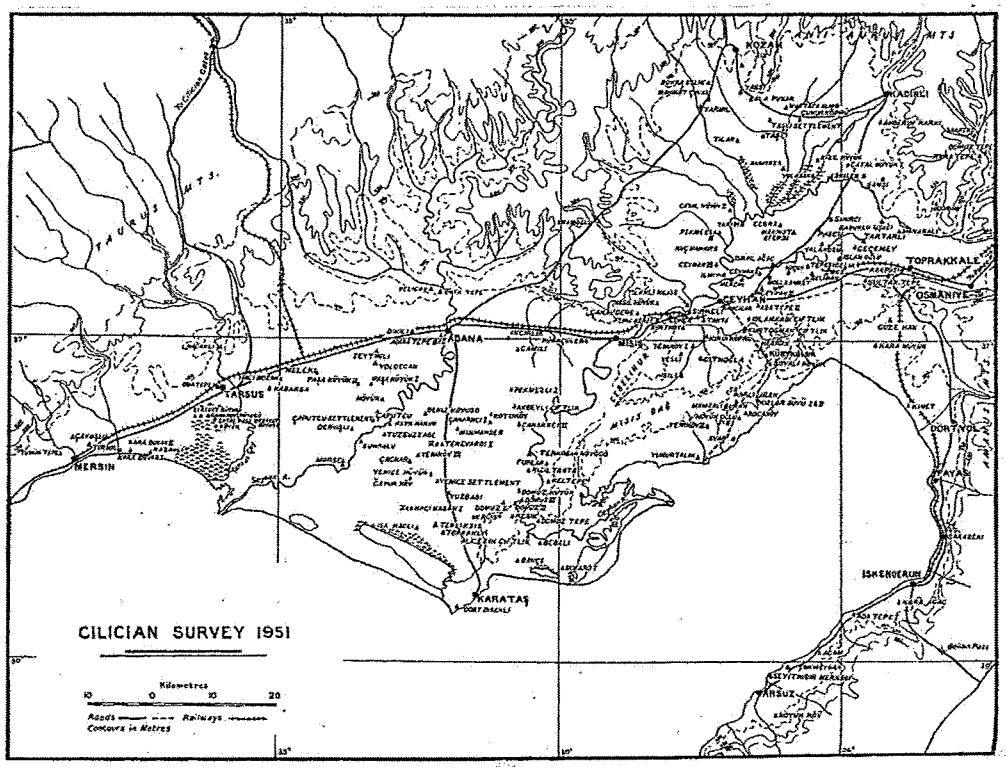


CILICIA, 1936-37.
AREA EXPLORED BY THE NEILSON EXPEDITION.

Map 3.01: Map showing the Garstang's Survey (Source: Garstang: 1953: 69; Plate XI).

In 1945, a team under the supervision of H. Bossert, U. B. Alkım and H. Çambel did a survey focusing on the coastal and mountainous areas of the Çukurova plain, particularly around the area of Karatepe. Selective results were presented in Karatepe preliminary excavations reports (Alkım: 1950).

Following the Gjerstad and Garstang surveys, a third comprehensive and extensive survey of the Çukurova area was carried out by M. V. Seton-Williams in 1951 (Seton-Williams 1954: 121-174) (Map 3.02). She surveyed the whole of the Çukurova Plain except the more recently formed coastal areas. She identified 149 settlements and made an assessment of the periods of occupation at each.



Map 3.02: Map showing the Seton-Williams' Survey Area (Source: Seton-Williams 1954: 122).

Although she prepared a site catalogue with detailed information about site size, type and periods for each settlement, her publication did not include any drawings or photographs of diagnostic pottery (Girginer and Ünal 2007: 307, Jean 2003: 80). Unfortunately, Seton Williams' dating of pottery found on the surface, if often not accurate, as has been shown by some more recent surveys, such as the Mopsos Survey described below.

H. Çambel conducted a survey of the coastal settlements of the Adana, Mersin and Hatay regions with additional research in the province of Adana between 1964-1966 in co-operation with the Adana Museum. These survey results remained unpublished (Girginer and Ünal 2007: 308).

3.1.3. Recent Surveys:

Field surveys in Çukurova have recently been resumed after a long interval. These new projects are conducted with fairly new approaches that seek

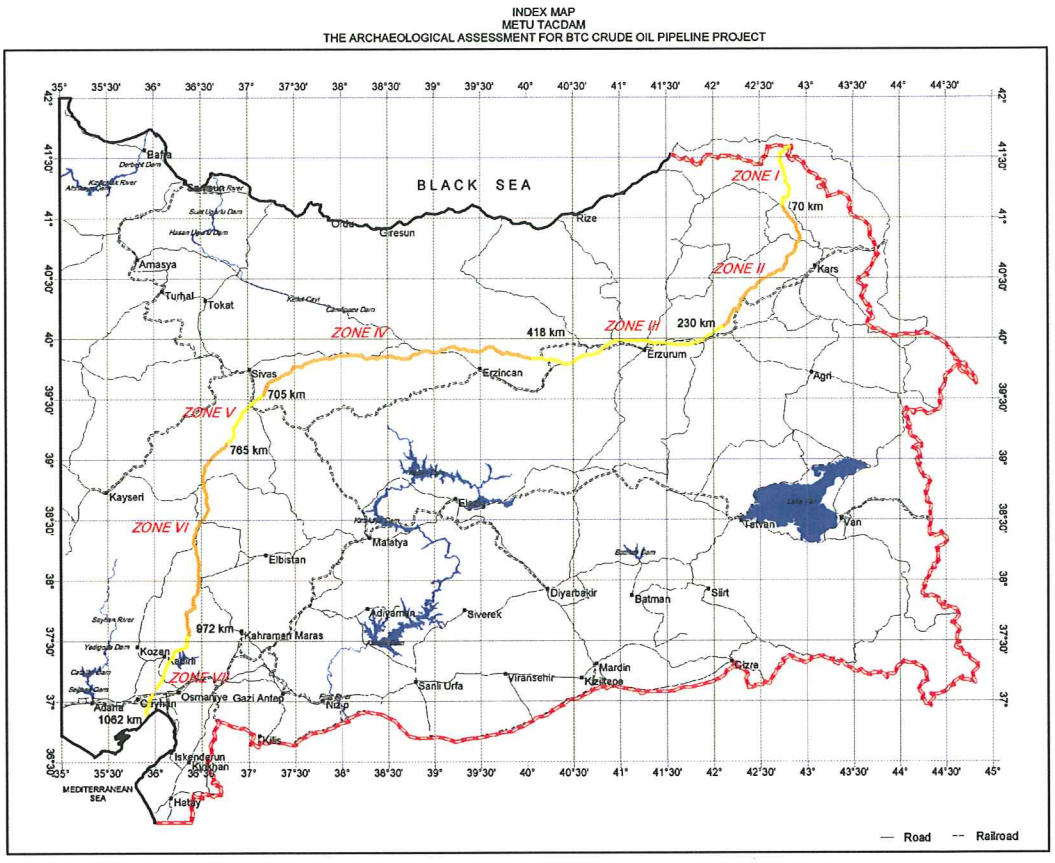
answers to problematic issues. In so doing they examine, as far as possible, the reliability of the earlier surveys.

In 1991, after a gap of more than twenty years, a new survey project in the Çukurova region and Northern Hatay was conducted by M.-H. Gates and İ. Özgen. This survey covered the coastal area between Yumurtalık and İskenderun. It had three purposes. The initial aim was to investigate settlements along the coast which were skipped over by Seton-Williams in her 1938 and 1951 surveys. A second aim was to investigate relationships between settlement locations and geomorphological changes to the coastline. The third aim was to record archaeological sites that are threatened by industrial development. This coastal region comprises of three distinct geomorphological areas: west, east, and a central area (Gates 1993: 38). Twenty-three sites were located during this fieldwork, 17 of which were newly discovered settlements (Gates 1993: 387). This work is significant not only because it described new sites but also because it provided some information about the geology of the plain. Some sites were described in considerable detail.

In 1994, another survey was done under the supervision of B. Hrouda, who then became the head of the Sirkeli project. This covered the area of the Misis and the south portion of the Adana region. The published results comprise details of 27 settlements in the area with their coordinates, height and approximate measurements (Hrouda 1998).

In the Bakü-Tbilisi-Ceyhan Crude Oil Pipeline Project archaeological research—along the Çukurova section was conducted by N. Tuna, with contributions from archaeological experts and geologists and supported by METU Taçdam in 2000 (Map 3.03). The main focus was to locate archaeological sites along the route selected for the Bakü-Tbilisi-Ceyhan Crude Oil Pipeline between Posof and Yumurtalık with a view to selecting sites for salvage excavation or even to alter the route of the pipeline. Site documentation included the name, type of site (Old Settlement, Seasonal Settlement, Flat Settlement, Settlement Mound, Classical Site, Necropolis, Graveyard, Monumental Tomb, Castle, Watchtower, Church, Ruins, Han, Bridge, Old Military Trench, Ancient Road, Aquaduct), periods of occupation, dimensions and coordinates of each settlement within each

of the seven zones between Posof and Yumurtalık (Tuna 2001: 4). The completeness of the survey within the area of the pipeline and the quality of the data make this a model survey with results that can easily be used in GIS analysis.



Map 3.03: Map showing the Bakü-Tbilisi-Ceyhan Crude Oil Pipeline Project (Source: Tuna, 2000: Index map).

The Cilician survey was initiated by G. Salmeri and A. L. D'Agata in 2000 and is ongoing. The main aim of this project is to understand the process of 'Hellenization' in the 4th century B.C but sites of all periods are recorded. The project area is between the Seyhan and Ceyhan rivers, specifically Misis and neighbouring sites (Agata and Salmeri: the results have been published in *Araştırma Sonuçları Toplantısı* from 2000 onwards).

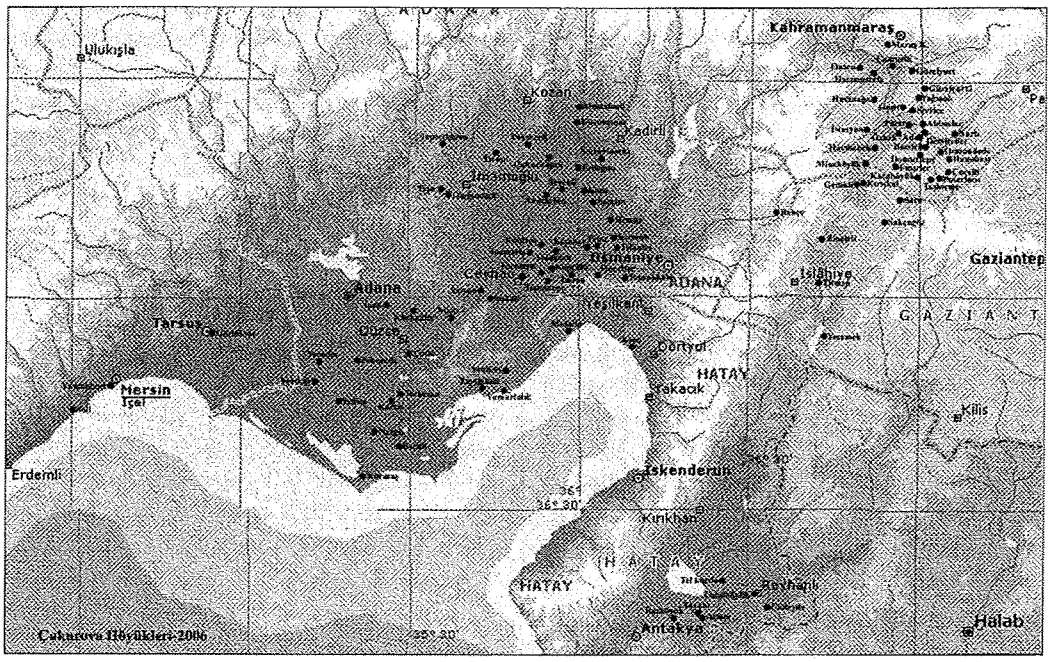
Archaeological surveys in the province of the Adana were started by K. Serdar Girginer in 2002 and continued until 2004. There were two main aims, first to examine settlements dating from prehistoric times down to the Ottoman period in the lesser known areas of the province and, secondly, to document the

archaeological framework of the second millennium B.C. in the province of the Adana and its surrounding plains. The 2002 survey concentrated on the area of Tufanbeyli while a survey of the Saimbeyli area was done in the following year (Girginer 2004: 63). The 2002 survey revisited all of the settlements which were partly described in 1951 Seton-Williams survey of the same area.

In 2004, the survey in the province of the Adana by K. Serdar Girginer and F. Erkan was extended to include the Kozan area. The primary aim of this survey was to register the sites which were surveyed in the 2003 survey. The more specific purpose is to identify the 2nd millennium B.C. settlements northeast of Çukurova and the Adana plains and to provide information about the site name, location and pottery. The results broadly confirmed results of the 1951 Seton-Williams survey (Erkan and Girginer 2005: 93).

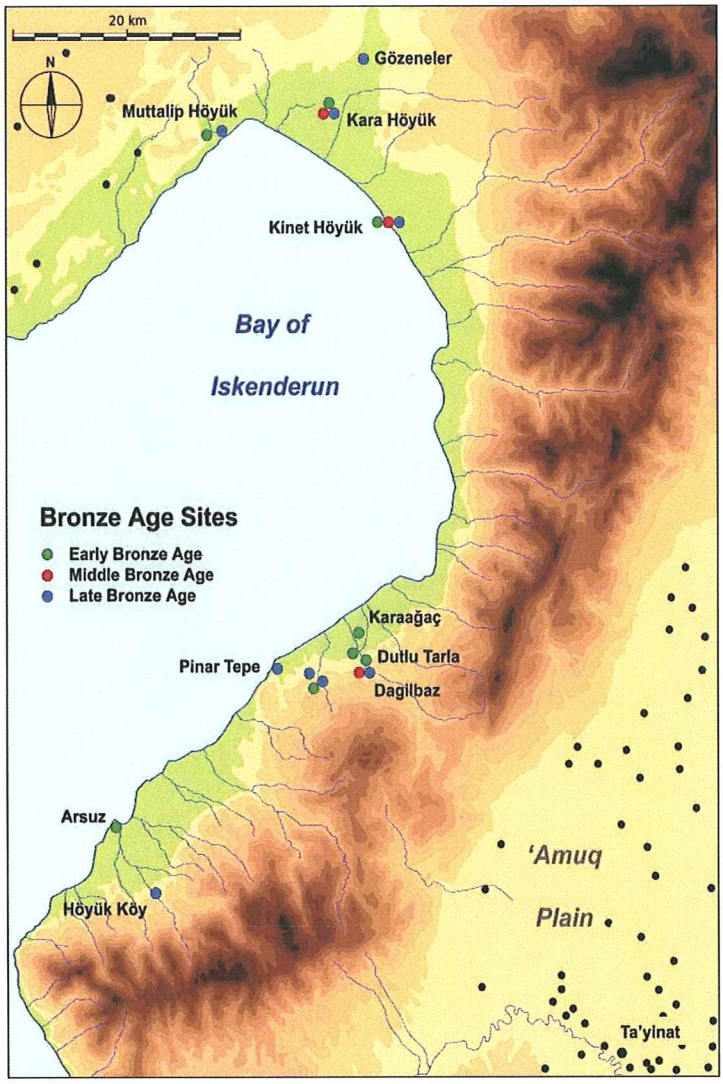
The survey project in the Adana plain in 2005 was made by Erkan Konyar. The survey area covered the regions between Kozan and Yumurtalık. This survey aimed to trace and document the related settlements which were dated to the second millennium B.C. (Konyar 2006: 61). Settlements already mentioned in the Seton-Williams survey report were checked. Some sites were recorded as no longer visible while a few new sites were discovered that had a small amount of the Late Bronze Age pottery.

One year later, E. Konyar (Map 3.04) designed a new survey project to determine the eastern borders of the Kizzuwatna region, particularly in the areas of Osmaniye and Kahramanmaraş. The main goal of this fieldwork is to describe the Hittite presence and to identify the borders of the Kizzuwatna region (Konyar 2007: 86). In general this survey confirmed the results of the 1951 survey.



Map 3.04: Map showing Erkan Konyar's Survey Area (Source: Konyar 2007: 86).

The Mopsos archaeological survey (Map 3.05) is conducted by G. Lehmann, A. Killebrew and B. Halpern from Pennsylvania State University with assistance of M.-H. Gates, the field director of the Kinet Höyük excavation project, in 2004. It is a joint Bilkent-Pennsylvania State-Ben Gurion University of the Negev project. The survey territory covered the area from Erzin to Arsuz (the easternmost part of the Çukurova region). The 2004 season examined the area of the Erzin region. During the survey season 22 sites were located, reregistered and documented. Pottery from the surface was mainly dated to the Early Bronze Age, Roman and Byzantine periods. Both MBA and LBA pottery assemblages were rare, but it is not yet clear whether this was because settlement was sparse or because pre-classical sites are not visible on the surface (Killebrew 2005: 8, Lehmann 2006: 79-88). The most significant result for this thesis is the paucity of evidence for MBA and Hittite Period settlement.



Map 3.05: Map showing the Mopsos Survey Bronze Age Sites (Source: Lehmann 2006: Index Map).

The most extensive and detailed survey which will be used as the primary source in this thesis is the 1951 Seton-Williams survey. She located most of the settlements on the plain and provided a detailed description of their size, type and periods of occupation which has proved to be indispensable. The only draw-back is that she did not publish any drawings or photos of any pottery forms on which her dating was based so that it has not been possible to check the published conclusions. However, recent surveys in general have not only checked and corrected the results of the Seton-Williams survey but they also located new sites which were added to the database. The reasons for checking the 1951 survey

results are to test the comprehensiveness and reliability of Seton-Williams' work because the dating used by her is not totally accurate, which is attested by the new field projects. However, the recent surveys did not add many sites to the site catalogue, possibly because of geomorphological and environmental changes of the Çukurova region. Although they have discovered some new settlements, some of these surveys are unpublished and while others provide little information. Thus the database used in this study is largely based on Seton-Williams survey results in combination with data that is available from more recent work.

3.2. Limitations:

The major limitation for this study is the lack of related data, which can be obtained from the survey results, in order to carry out analyses. The essential problem with the survey projects is that the data made available is not consistent and is thus difficult to use in a statistical way. Because of the limited quantitative data available, it was not possible to prepare a detailed database which was explained in the section 4.1.1. of Chapter IV. The 1951 Seton-Williams survey is the basic research resource for this thesis and for the Çukurova plain. This survey covered the entire area, both coastal and inland sites being visited. The site catalogue includes information on location, their proximity to water sources and main roads; periods of occupation and site type classification. While the Seton Williams survey was a model for its time, it falls short of today's requirements that permit statistical and quantative analyses. More recent surveys are concentrated over limited zones within the study area for logistic reasons. They have mostly concentrated on the Hellenistic and Roman periods. Although most recent surveys are not fully published, what has been published to date permits the checking of the earlier research, particularly that of the Seton-Williams survey.

Only three major excavation projects (Mersin-Yümüktepe, Tarsus-Gözlükule and Kinet Höyük) have been conducted in the Çukurova plain. There are three new and ongoing excavations in the area; Tepebağ Höyük, Soli and Sirkeli Höyük, as well as the resumption of work at Tarsus. All four sites display evidence for a "Hittite" presence with artefacts in context, but the available results

add nothing to this study, of changes in the settlement pattern from the MBA and LBA periods in the region. Full consideration of the expansion of Hittite influence and power into the Çukurova would require a broader and deeper study; one which would bring together the evidence from settlement patterns, excavations, texts, seals and the other sources.

3.2.1. Discussion Based on Survey Limitations:

It would be worth to criticize why survey results can not be fully used to define the settlement pattern in the Çukurova Region.

The quantified approach in terms of making archaeological site and artefact distribution maps for a specific area would be an attempt to establish some theoretical understanding. However, such an effort depends on quality of archaeological information and the way of collecting and interpreting related artefacts, so the discussion of the distribution maps could be a kind of method in order to emphasize the data reliability (Hodder and Orton 1979: 17).

"Archaeological survey, which aims to locate and analyze the distribution of ancient settlements, usually according to period, supplies the basic data framework for the landscape archaeology of a region" (Wilkinson 2003: 37). Referring to Wilkinson's statement, the earliest surveys in the Çukurova region can not be seen as systematic, neither archaeologists nor historians were participated on these missions and the aim was the exploration of this Mediterranean's marginal corner with no specific research oriented approach (Ainsworth and Beaufort surveys; explained in the section 3.1.1. of this chapter).

When we come to 20th century surveys, the overall picture was intended to change by archaeologists who were asking specific research questions and their methods were indicated that the way which these surveys followed was to cover a larger and historically significant area. While measured assessments of pottery sherds which they collected from the surface was noted, no attempt has been given to provide quantified data such as size and height of the settlements and there was no theoretical decision made to carry the interest on the off-site field survey (Adams and Nissen 1972: 8). It might be defined that the research question could

be basic as the determinative factor was concentrated on historical problems particularly orientated around the Hittite Empire Period and its impact on the Çukurova region. While seeking written documents as Tablets and Seals, the necessity of intensive and extensive surveys was neglected.

Another observable criticism can be dictated within the traditional way of doing archaeological field survey in the Near East and Anatolia where the primary data collection was often done for mound sites, easily recognizable in the field. The possibilities of smaller or flat settlements or sites other than mounds were not taken into consideration. However, the occupation period, site, height and morphology of these sites could contribute more critical information and by passing these settlements could be shortage of the survey (Wilkinson 2003: 37).

In recent years surveys are conducted within the frame of theoretical and methodological advancement, designed according to related research questions. The coastal change and alluvial plains (explained in detail in the Chapter II) in the Çukurova region are taken into consideration by archaeological surveys such as Mopsos and Bakü-Tbilisi-Ceyhan Crude Pipeline project. The understanding of the changes in the geomorphology plays an effective role when dealing with the coastal sites and settlements which were located on the delta plain, removed from the surface today. Additionally, to combine the survey strategy with the geomorphological studies could yield an idea about the effect of possible damages of natural events such as erosion (Wilkinson 2003: 40). Since a majority of these sites were buried under alluvial accumulations in the coastal Çukurova, the settlement distribution pattern in the coastal plain are unlikely to be presenting the accurate situation (Taffet 2001: 132).

Majority of the recent archaeological surveys have been carried around the Adana province over the region of Çukurova by S. Girginer and E. Konyar. However, the outcomes of these surveys do not include any information about site size, height or morphology because they are not interested in gathering information about the settlement distribution, hierarchy or population change or interrelations between sites. Therefore, the aim is to collect pottery sherds from the survey and to refer these commenting on 2nd millennium occupation phase of the region. Except one or two surveys which are mentioned above in the section

3.1.3. of this chapter, the recent surveys do not include any information about geomorphological settings and physical attributions about sites in the Çukurova region. This situation does not allow us to establish solid approaches to settlement distribution or pattern for the region.

All these limitations and discussions highlight the tentative state of the survey outcomes of the Çukurova region. Due to some geomorphical changes in the area, most of the sites have been buried under alluvial depositions but by intensified and systematic method and theory, they could be recorded not only by being dependent on quantified pottery shreds as chronological markers but also can be indentified within topography and site distribution as a direction of future improvement (Adams and Nissen 1972: 8).

Might be stated that one survey project could be designed to aim to reveal site distribution patterns depending on occupation phases of settlements, if would be possible. "An archaeological survey supplies the connective fabric and body of comparable data from succeeding periods on which this account ultimately depends" (Adams 1981: 27). However, in order to utilize this kind of survey data to any study of settlement pattern requires an understanding of "archaeological source criticism" so as to define possible limitations and decide a way of using this data (Alcock and Cherry 2004: 5). While establishing this kind of a project, the site coordinates, estimated size, height and the current condition of settlements would be given as a detailed site catalogue data by combining land use, geomorphological changes and topographical characteristic of the Çukurova region. The size of a settlement could be indicated as a fundamental factor in order to analyse the settlement pattern in any region. The hierarchical organizations of settlements depending on their size could be provided a different approach to examine the spatial relations (Hodder and Orton 1979: 17). One of the aims of survey is to determine proportions of site types and even to demonstrate size hierarchy for each time period, if it is possible (Banning 2002: 31). This might be a very first initiative to build ancient settlement systems. An ancient settlement, like the other past human remains, might yield information about the formation of urban hierarchy or give some clues about its cultural character (Adams 1981: 27). The hierarchical ranking of settlements, according to the

criterion of their size, became an interest in 1970 by Salway, Hallam and Bromwich who were defined Fenlands' settlements as larger clusters sites and begin with this trend; different quantative approaches have been developed to understand spatial relations between sites and their size (Hodder and Orton 1979: 18). In that way, as concern of this thesis, the effect of Hittite Empire on the region which is still a debatable issue could be assessed from different perspectives both including archaeological material and spatial approaches in a theoretical base. This thesis is also related a different approach to size, spatial relation and function connection from a perspective of insufficient and somehow unreliable data for the Çukurova region (discussed in detail in the Chapter IV).

Due to the limited number of excavation projects, the role of field surveys is crucial. The distribution or land use patterns are provided a different approach when dealing with related problems of the Çukurova region.

To conclude, this chapter contains all of the information about the MBA and the LBA settlements in Çukurova region, which it has been possible to gather from published sources within the time available. From the survey and the excavation results, the pottery and artefact assemblages are taken into consideration as ocular evidences to validate the MBA and the LBA character of the region. It is argued that the material evidence illustrates a *Hittite* presence on the plain in the LBA, beginning as early as the Hittite Old Kingdom.

CHAPTER IV

DATA PREPARATION, ANALYSES AND RESULTS

This chapter comprises an attempt to designate the parameters used in this thesis which is organized in two parts as the "data preparation" and "data analyses" in *Geographic Information System (GIS).* The "data preparation" section presents the Settlement Database (SD) which covers certain variables that are determined from the literature sources and topographic maps of the Çukurova region. In the "data analyses" part, the SD and the other data layers which contain the Digital Elevation Model (DEM), the ancient routes and the major rivers and streams are evaluated and the results of the GIS analyses are interpreted by applying the hierarchical relation principle of the *Central Place Theory* as a 'Case Study' in order to define the spatial approach for the MBA and LBA periods in the Çukurova region.

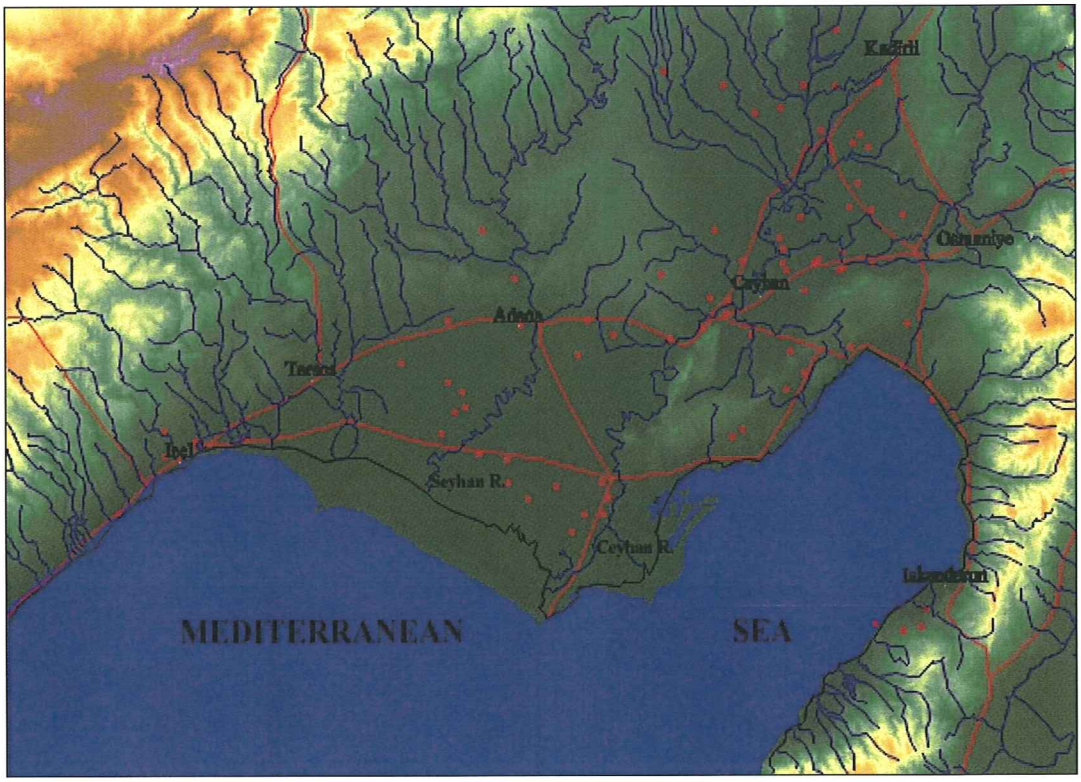
4.1. Data Preparation:

The initial step in this study is to introduce the establishment of the SD (Table 4.01). The SD is composed of definite variables which were drawn from the reviews of various literature and related maps of the study area. The SD brings together various attributes from different sources so as to be able to conduct the GIS analyses involved in studying the habitation pattern in the Çukurova region. Because most of the data is included in the SD, the comments about the outcomes of the analyses could be presented clearly.

4.1.1. Settlement Database (SD):

Based on the related data, which are extracted from relevant survey reports, publications and maps of the Middle Bronze and Late Bronze Ages of the

Çukurova region, the prepared database contains eighty-three settlements which are plotted and their distribution pattern is analyzed. The boundaries of the study area are set out in the section 2.1 of Chapter II (Map 4.02). For each settlement eight variables, explained in detail below, are presented in the SD. These can be divided into Archaeological and Physical attributions parts.



Map 4.02: SRTM Map showing the Boundaries of Thesis Area

The archaeological attributions are based on the information from the related survey results which provide a framework of raw data. As explained in the section 3.2. of Chapter III there are limitations in the quality of this data and these limitations are allowed to illustrate observed biases for the survey projects in the Çukurova region introduced in the section 3.2.1. of Chapter III. The SD is mostly based on the results from Seton-Williams' extensive 1951 survey, supported by findings from other surveys. However, it was not possible to use all of the attributes in every stage of the analysis because the available archaeological data does not specifically refer to occupation in the MBA and LBA periods which are the concern of this thesis.

The physical attributes of the database were obtained from modern topographic maps that show the characteristics of the study area and its hinterland. Particularly, the current maps of the study area yield an idea about the recent topography and land use for each settlement.

The 8 attributes of the database are listed below and then explained in detail:

- Modern Names of the Settlements
- Estimated Settlement Size
- Material Status for the MBA
- Material Status for the LBA
- Occupation Periods for the MBA and LBA
- Concordance of the Database numbers (both for this new database and Seton-Williams' database)
- Three columns for Settlement Coordinates according to 1/25.000 maps (x,y,z)
- Index of settlement names from 1/25.000 maps

4.1.1.1. Modern (Recent) Names of the Settlements:

The classification of the SD begins with identification of the names of each settlement in order to be able to refer to sites by discrete tags. The data is taken from the related survey reports of the Çukurova region. Some of the names given in older records have been changed in recent survey reports. This is possibly because the Government has changed the names of the sites in the region, but also because sites are sometimes given their own name, sometimes the name of the nearest village or the name of the village territory in which they lie. Additionally, the most recent of the available topographic maps, drawn in the 1980s and 90s, sometimes provide the modern name of a settlement.

4.1.1.2. Estimated Settlement Size:

The hierarchical order of sites has been widely demonstrated as a fundamental criterion of rank-size models in which the size of each settlement is assigned as a basic factor (Hodder and Orton 1979: 17). This idea is discussed with the related GIS analysis, particularly Proximity and Point Pattern Analyses, in the second part of this chapter by trying to argue the relationships between the size and function of the settlements.

For this category of the SD, the available data only makes a tripartite division possible for size, *Small* (S), *Medium* (M) or *Large* (L) because the data is insufficient from the related survey reports, explained in the sections of 3.2 and 3.2.1. of the Chapter III. Publications do not provide quantified data for the size of each settlement. As shown in the pie chart below (Figure 4.03), it is observed than more than half of the classified sites are large and the density of these large sites are observed in detail for possible trade routes (Map 4.04), which is discussed in detail in the second part of this chapter.

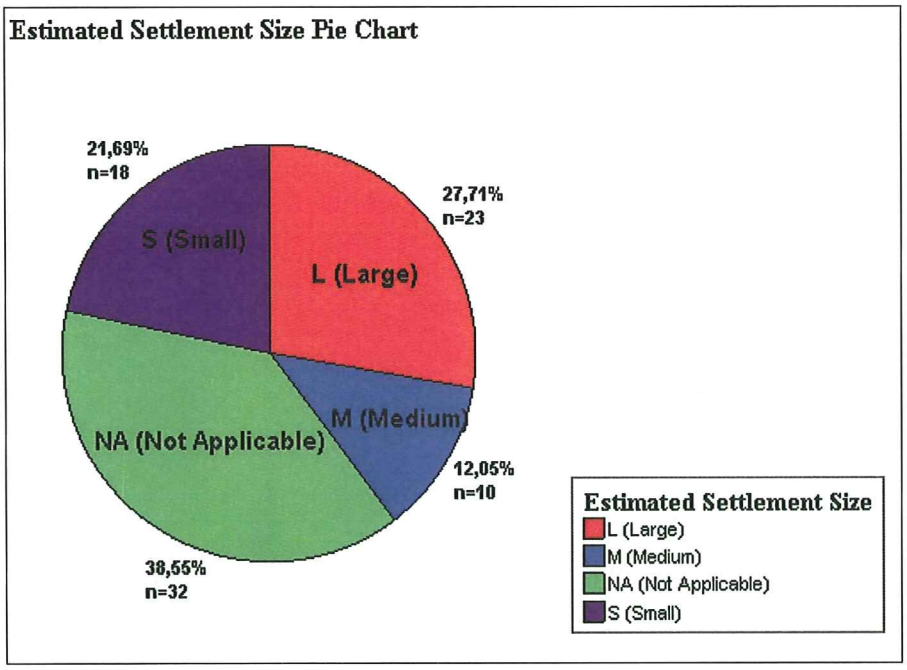
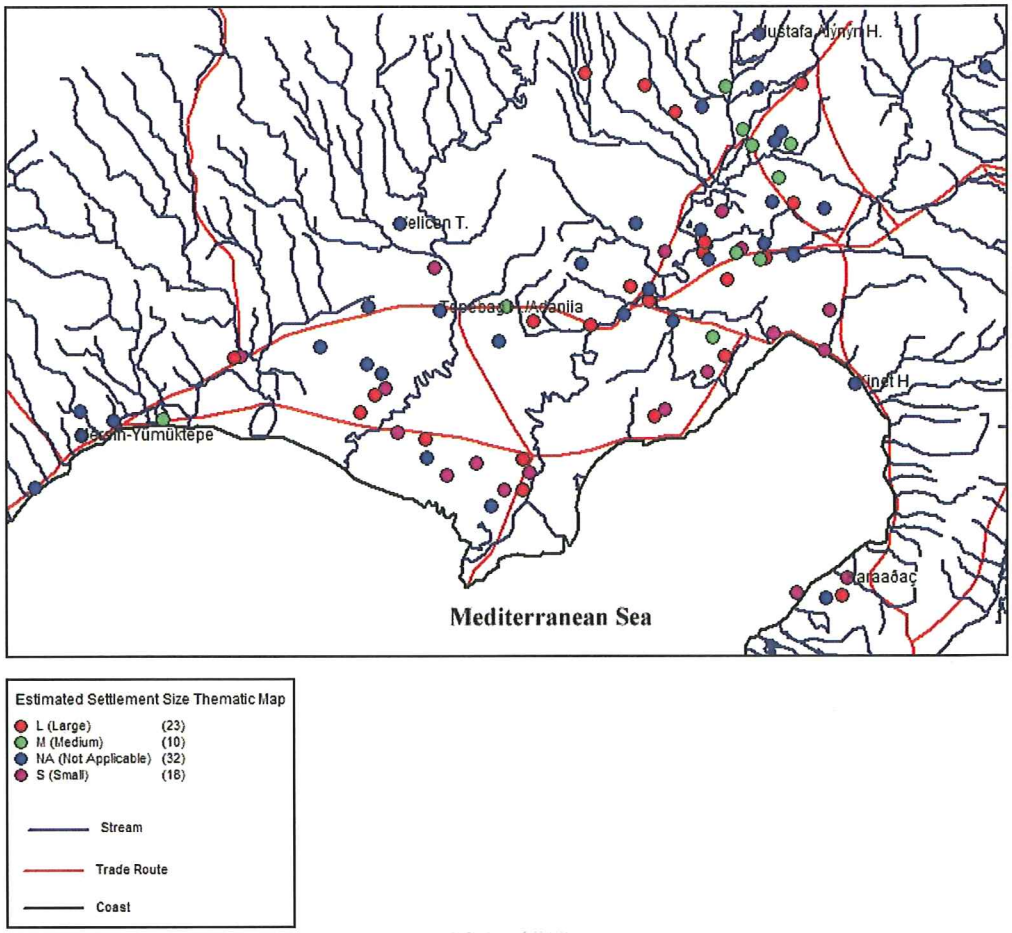


Figure 4.03: Pie Chart showing the Estimated Settlement Size Division



Map 4.04: Thematic map showing the Distribution of the Estimated Settlement Size Category

However, the estimated values are recorded as the maximum visible settlement area, regardless of periods of occupation that have been recorded, and it has not usually been possible to estimate the size in any one period.

4.1.1.3. Material Status of the MBA:

Ideally, the material status of the MBA in the database would be based on the quantities and distribution of pottery of each period collected at each settlement. However, the published data does not allow such assessments to be made. Thus it has only been possible to do *Presence* (PS) and *Absence* (AB) analyses. The *NA* (Not Applicable) category is declared only for one site 'Tepebağ/Adaniia' which has no occupation level in the MBA period.

The Chart (Figure 4.05) shows the AB (62.65%) and PS (36.14%) percentages of the MBA material. About two thirds of the site display evidence for MBA occupation.

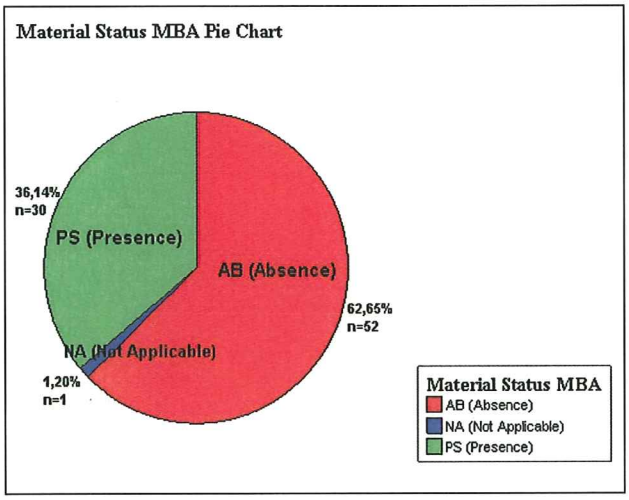
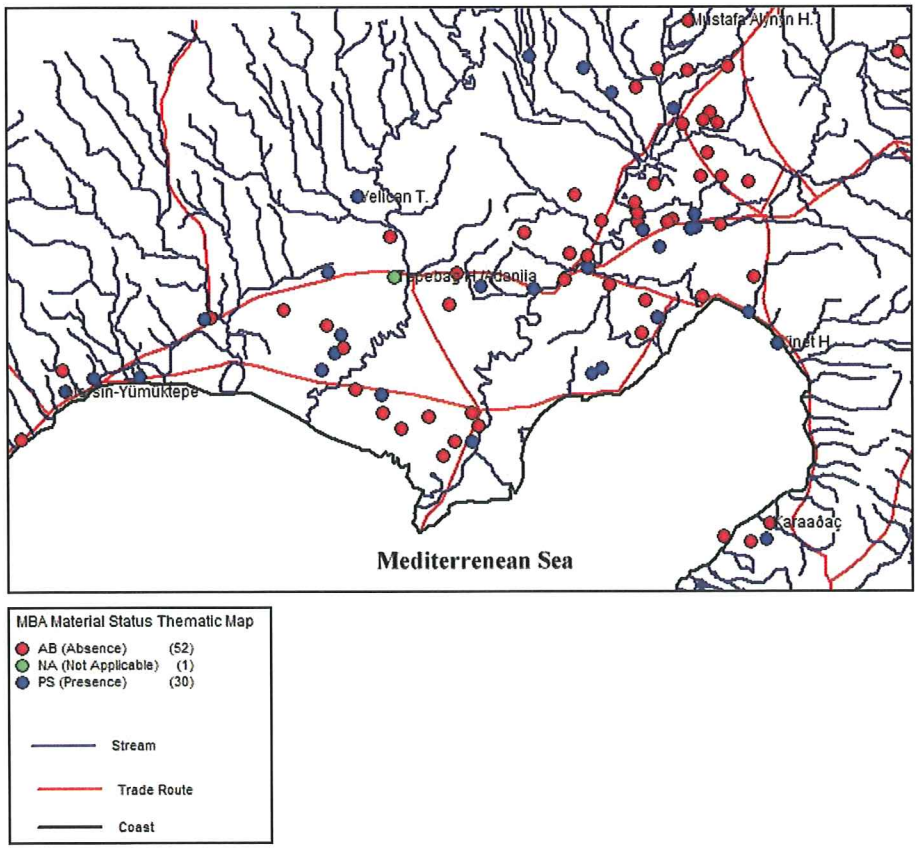


Figure 4.05: Pie Chart showing the MBA Material Status



Map 4.06: Thematic map showing the Distribution of the MBA Material Status Category

The Map 4.06 is indicated where the material status is recorded for the MBA period. The majority of sites, 52, are defined with AB category and the only 30 sites are determined to have the MBA material status.

4.1.1.4. Material Status for the LBA:

The material Status of the LBA period is likewise reduced to *Absence* (AB) and *Presence* (PS). There is only one *NA* (Not Applicable) site which is 'Tepebağ-Adaniia' is a newly excavated site and it is believed that from the textual evidence, it has the LBA occupation phase but it is not supported with any material yet.

Percentages of AB and PS, in the LBA, as shown below (Figure 4.07), are 37.35% and 61.45% respectively. The statistic is also supported by the distribution map (Map 4.08).

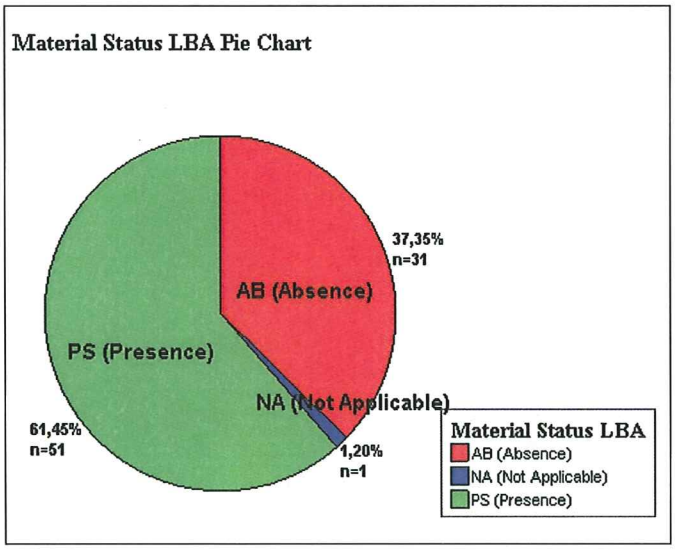
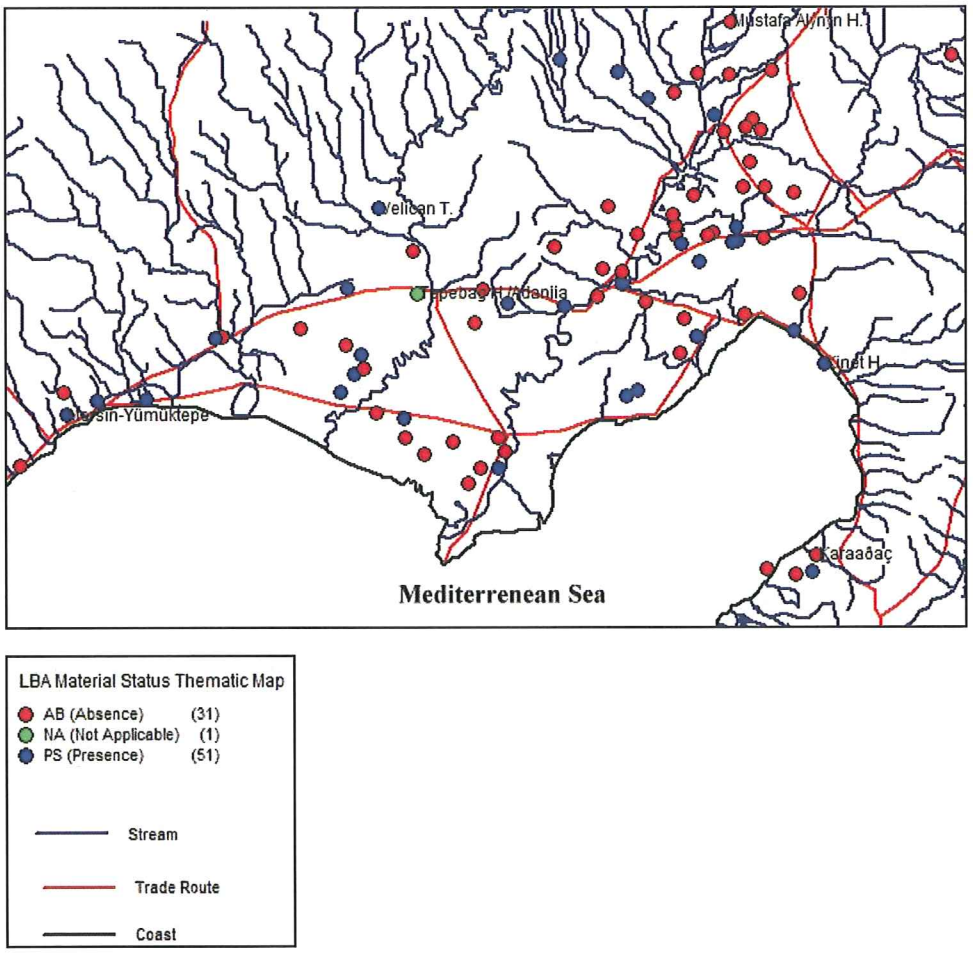


Figure 4.07: Pie Chart showing the LBA Material Status



Map 4.08: Thematic map showing the distribution of the LBA Material Status Category

4.1.1.5. Occupation Period for the MBA and LBA:

Occupation in the *Middle* and *Late Bronze Ages* in the Çukurova region is the concern of this thesis and each settlement are assigned depending on this division. Each period has been assigned a discrete column. The inclusion of all occupation phases at each settlement in the GIS analyses is intended to provide indication trends in settlement pattern as well as to identify any particular anomalies that might be relevant to understanding of the MBA and LBA settlement patterns.

4.1.1.6. Concordance Database Numbers (both for this study and Seton-Williams' survey):

This column is a concordance of site numbers assigned for this study, for which evidence has been drawn from a number of sources, with the Seton Williams survey.

4.1.1.7. Three Columns for Settlement Coordinates according to 1/25.000 Topographic Maps (x, y, and z):

In order to attest the accuracy of coordinates measured from the 1/100.000 topographic maps a second step was taken to scan all related 1/25.000 topographic maps of the study area to get more accurate results. Each site in the database is marked on the relevant maps and coordinates are given as 'x and y' values and as the complementary information to these values 'z' coordinates, that were also determined from these same maps.

4.1.1.8. Index of Site Names from 1/25.000 Topographic Map of the Study Area:

An index was prepared from 1/25.000 maps.

4.2. Data Layers:

The data layers comprise ancillary data utilized in this study, such as Digital Elevation Models (DEM), the Ancient Trade Routes and the Major Rivers and Streams.

4.2.1. Digital Elevation Model (DEM):

The Digital Elevation Model (DEM), also known as a Digital Terrain Model (DTM), is a three-dimensional model of the topography. This model can be created in raster form and it is used in the GIS. Both remote sensing and land surveying techniques can be used to make DEMs (Coolly and Lake 2006: 90).

In this thesis, the DEM is used to describe the topography and as a tool for some of the GIS analyses. The topographic derivatives of slope and aspect values for each settlement were derived from the Shuttle Radar Topographical Mission (SRTM) Turkey data. The SRTM data used for making the DEM was taken from USGS (United States Geological Survey) (http://srtm.usgs.gov/).

4.2.2. The Ancient Trade Routes:

Both the modern roads and predicted ancient routes are used in this study. Significant trade routes which provided for transportation of goods between the Mediterranean and Central Anatolia passed through the study area. For instance, the Cilician Gates are thought to have been on an overland route of some importance between the Amuq and the Cilician Plain whilst there were important harbour towns, such as Kinet Höyük and Mersin, on sea routes from Cyprus, the Levantine Coast and more distant places (Taffet 2001: 133). The possible natural pathways have been identified in the section 2.2. of Chapter II.

However, the discussions about the localities of these trade routes in the Çukurova region are still in a controversial situation due to the lack of archaeological information. Thus, I have chosen to use 'natural Roman pathways' in the region which could be used also before Romans. Roman roads are taken from the *Barrington Atlas of the Greek and Roman World* (Talbert 2000). In order to generate the ancient routes, the roads were digitized from the georeferenced 1/500.000 scale scanned maps of the *Barrington Atlas* using the extension *latlon* in the *Map Info* programme. This programme makes it possible to check the accuracy of the available data when transporting the images to *TNTmips 6.9* software for further GIS analyses.

4.2.3. Major Rivers and Streams:

Major rivers and streams are digitized on using *Map Info* in order to see correlations between settlements and water sources. Courses of major rivers and streams can be indicated tergiversation but not necessarily. However, in this study, the *Barrington Atlas of the Greek and Roman World* (2000) is taken into consideration as a scale of the 1/500.000 maps to digitize the possible ancient and modern courses of the major rivers and streams. The preference to handle this data from the mentioned source because the atlas is formed while compiling ancient geographers references such as Strabo and Ptolemy (Talbert 2000: 1014).

4.3. GIS Analyses and Results:

This second part of this chapter is designed to give a brief description of each analysis which was carried out, together with the results which are presented in the form of histograms and maps. The archaeological material and physical attributions (digital environment) are archived in *TNTmips 6.9* GIS software. *TNTmips 6.9* software was used both for creating the SD and for further analyses and query building operations.

4.3.1. Spatial Questions:

In order to provide a better understanding of the research question, the spatial distribution pattern is represented using *point data* which is designed to describe the placement of the specific points in a specific area (Coolly and Lake 2006: 297). In an initial step all settlement, ancient and modern, were plotted as points on topographic maps at a scale of 1/100.000 and, for more accuracy, on 1/25.000 maps. According to their parameters and variables, the MBA and the LBA settlements are each expressed as a single point of reference which carries a minimum amount of information about each settlement.

The total number of the settlements with occupation in these two periods that have been entered in the SD is 83. Of these, 43 are identified as MBA sites

while 79 were occupied in the LBA period. A total of 39 of these sites were occupied in both periods (Figure 4.09).

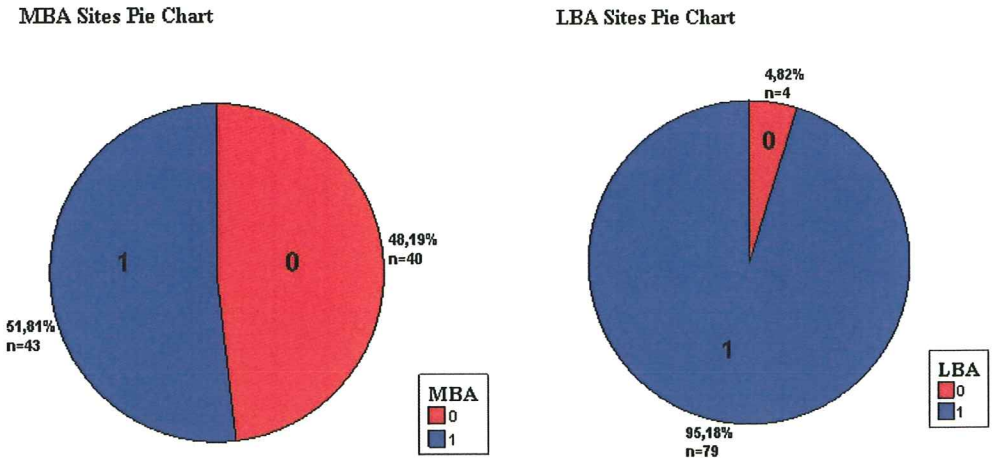
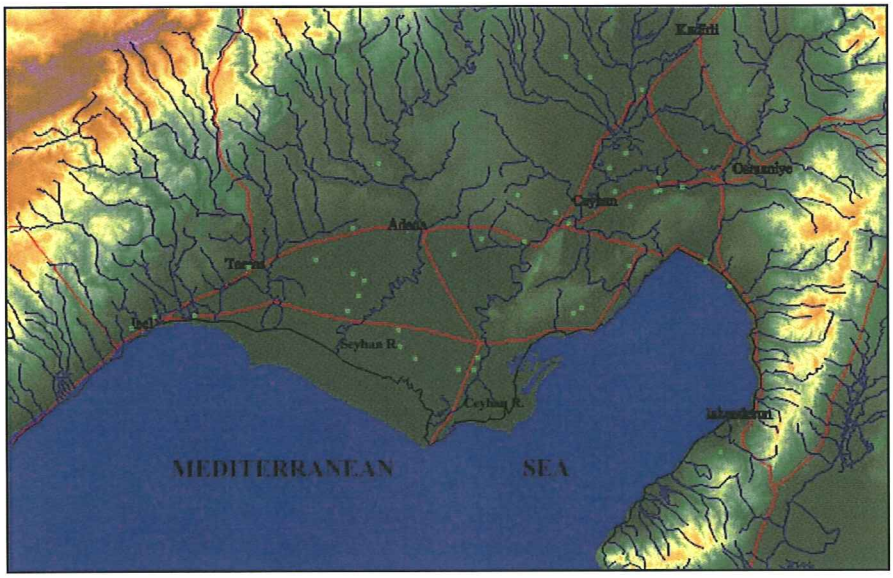
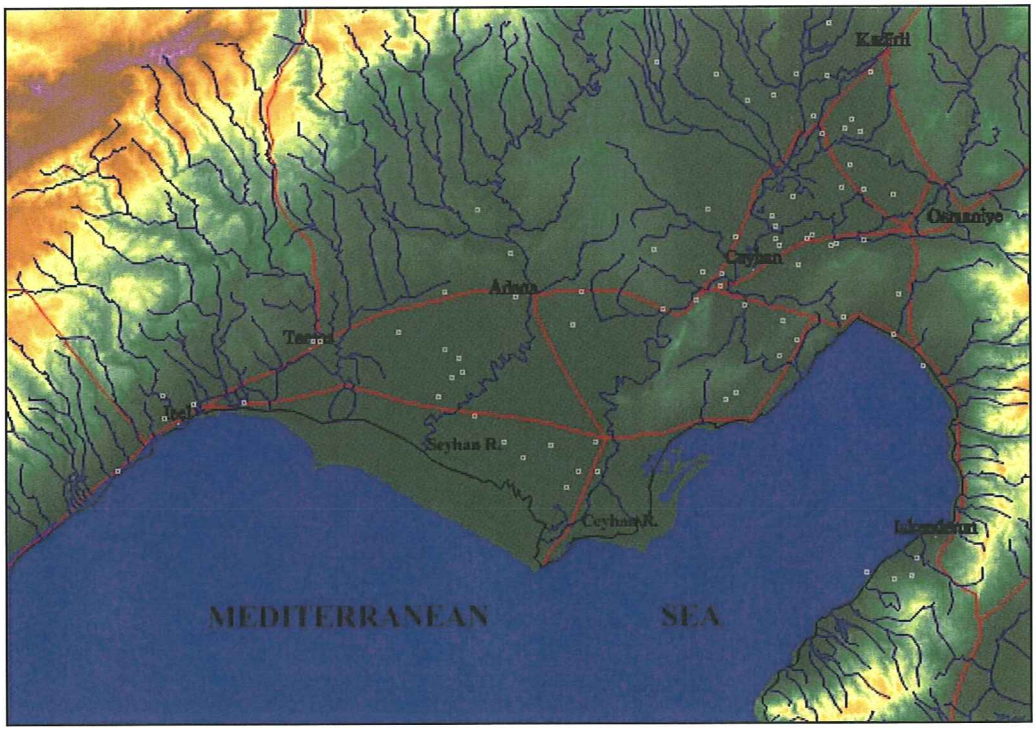


Figure 4.09: Pie Charts showing Percentages of Sites MBA and LBA Periods. The blue color is marked by '1' which relates to the occupied period.



Map 4.10: The map showing the Distribution of the MBA Sites on the Çukurova Region



Map 4.11: The map showing the Distribution of the LBA Sites on the Çukurova Region

The MBA and LBA settlement distribution in the region of Çukurova is shown by two maps (Map 4.10 and 4.11). The digitized trade routes, rivers and streams are also illustrated. The increases in the amount of the LBA sites are also observed from the maps.

Two analyses were carried out using the SD and data layers:

4.3.2. Density Analysis:

This spatial modeling approach provided an opportunity to determine and define the density cluster distributions in a particular area. From an archaeological perspective, creating a density map within a specific area is done by making a comparison between two diverse variables (Coolly and Lake 2006: 174). The density analyses and map creation have been done for both for the MBA and LBA settlements, based on the following assumptions:

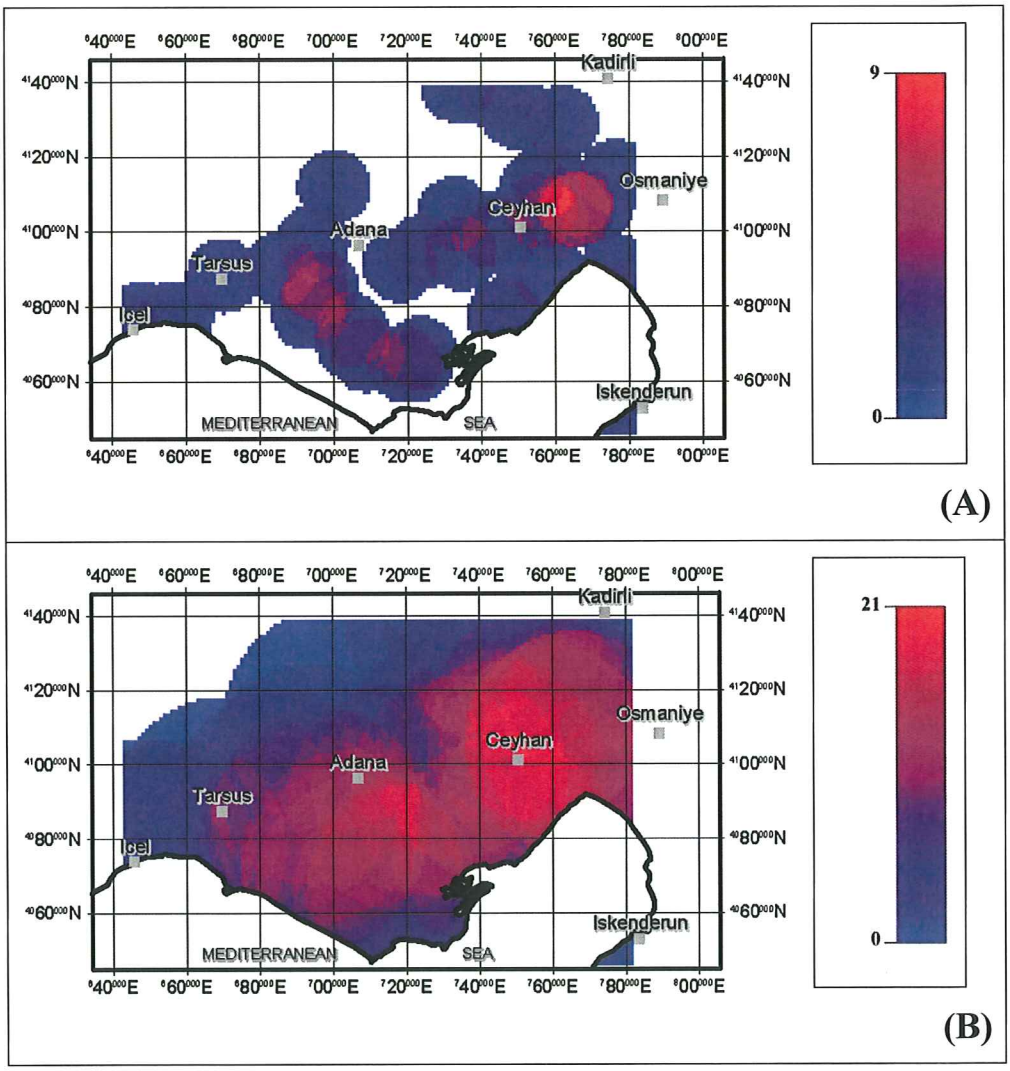
1. The coordinates of each individual site are taken from the database. The *Universal Transverse Mercator (UTM) ED 50 / zone 36 N*, is utilized as a coordinate system.
2. The new *Density Script* was written for this thesis by Dr. Arda Arcasoy and Halil Berkay Oral.
3. Two clusters are identified as MBA and LBA. In order to calculate the best optimum value of the grid node spacing, which is the component of the grid, various tests were carried out. It is considered that when the value of the grid node spacing decreases, the process and the extent of the data file increases. A lesser spacing value directly effects the accuracy of the density maps because they become less detailed. In order to get more detail, the best grid node spacing is set at 1000 m. for each cluster.
4. The given search radius which draw a circle from the point distribution was also set in such a way as to obtain the legitimate value for each cluster. The optimum range was set at 10 km., 30 km. and 50 km. so as to observe the diversity on density maps within different values of the search radii.
5. Because the distribution and density of the spatial point data demonstrates irregularity, surface modeling was chosen as the last step in the creation of the density maps.

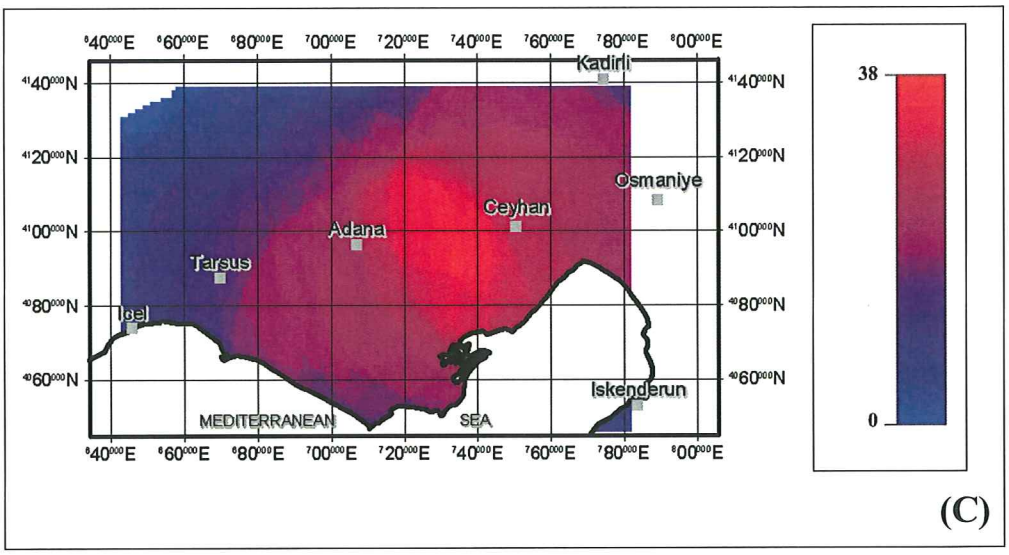
The outcomes of this analysis are discussed below together with the presentation of the clusters on a series of maps.

MBA Sites Density Cluster (Map 4. 12): The same search radii and spacing was used for the MBA settlements as for all settlements and the cluster shows broadly similar results with the LBA density cluster (Map 4.13). One difference is that because the number of MBA settlements is smaller than that of the LBA the density appears thinner.

The density values are given in the table below for each search radii. The density maps are assigned by the capital letters A, B, C and they are ordered by their search radii values as 10 km., 30km. and 50 km. The density in the A is

observed in two different areas; one is determined between Tarsus and Adana whereas the other is observed between Kadirli and Ceyhan districts. However, the red color is stressed the high dense area which are measured as 9, 21 and 38 as values and they are increased depending on the search radii. These numbers are highly measured between the areas of Kadirli and Ceyhan in which agricultural lands are much in number in that area. In the C (50 km.), the red color becomes bigger in that area in order to emphasize the high dense areas which are slightly slithered to the direction of Adana. Therefore, the actual high density could be observed between Kadirli, Adana and Ceyhan triangular.

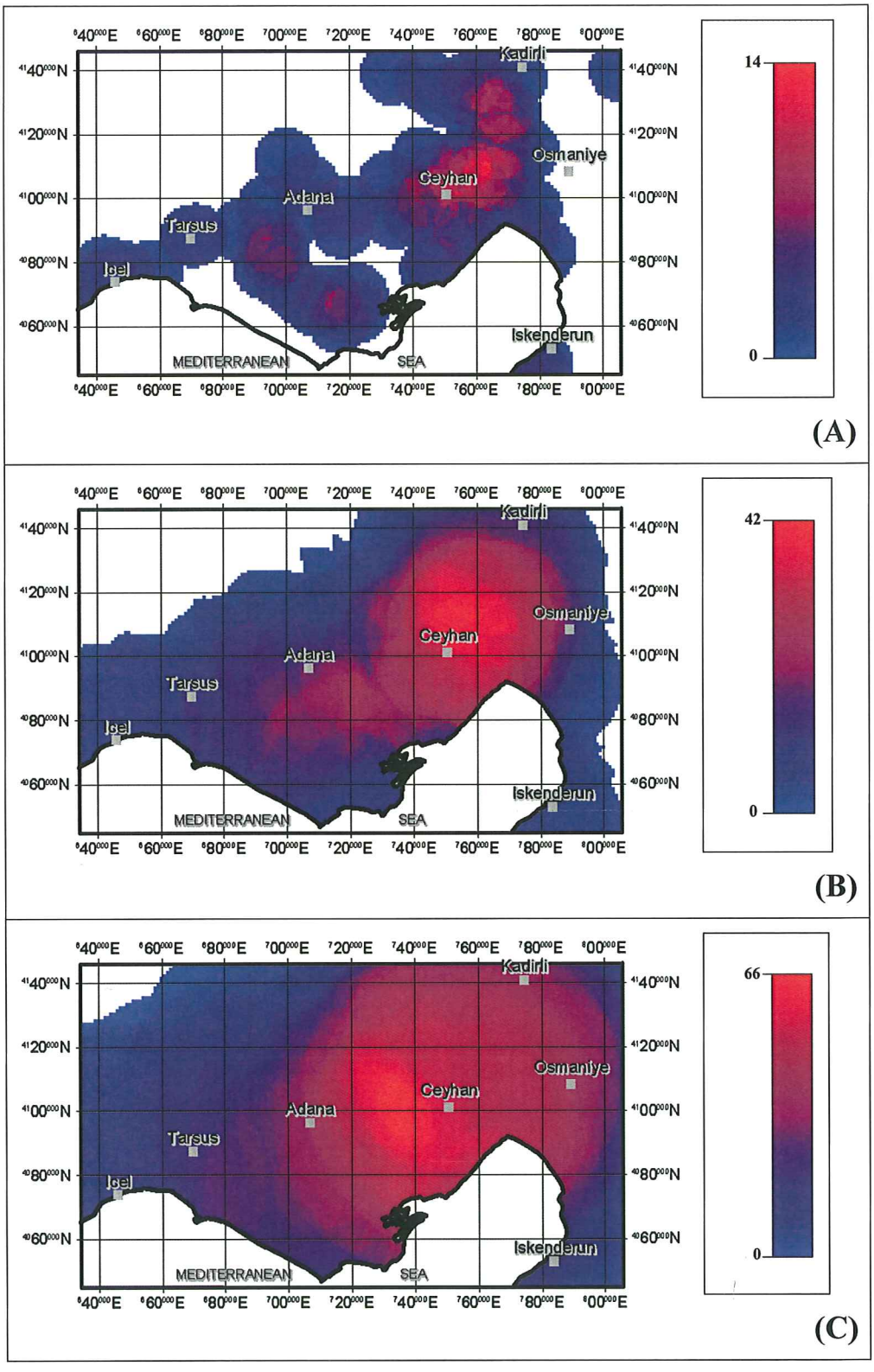




Map 4.12: MBA sites density maps are shown here. Blue designates low density areas while red indicates high density areas. Each search radii value is given at the upper left corner of each map.

LBA Sites Density Cluster (Map 4.13): The same method was used for the LBA. Results show a very high concentration of LBA settlements between Kadirli and Ceyhan areas. This part of the region has good agricultural lands and is also where the possible Roman trade routes intersect which is tested by the 'Trade Route Proximity' in the section 4.3.3. of this chapter.

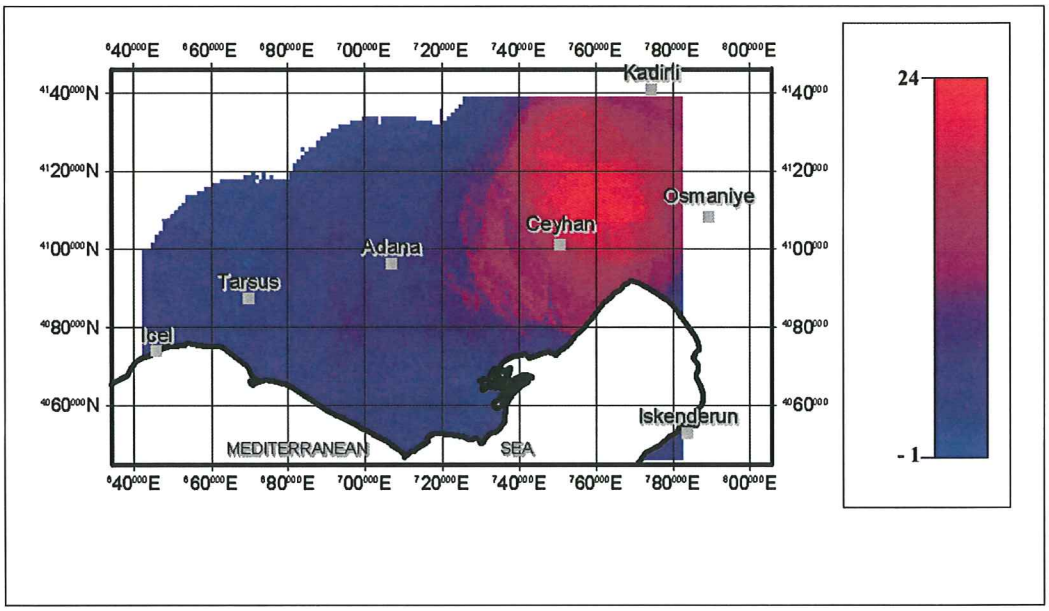
By using same method like the MBA cluster, the maps are ordered as A, B and C depending on their search radius values: 10 km., 30 km. and 50 km. The increases in the settlement number are observed from the density maps. The measured values are demonstrated by legends as 14, 42 and 66. These values are almost double if we compare them with the MBA density maps. Although the settlement number increases considerably, the high dense triangle (Kadirli, Adana and Ceyhan districts) is not changed in the LBA period. It is more observable in the C (50 k), the red color becomes bigger over these areas and the high dense is measured 64 in that part of the region. Therefore, it could be stressed that the preference of the MBA and LBA settler do not show any significance change in terms of settling logic. These high dense areas are believed to be located on the trade routes which are extensively discussed in the section 4.3.3. of this chapter.



Map 4.13: The LBA density cluster is shown by maps. Blue designates low density areas while red indicates high density areas. Each search radii value is given at the upper left corner of each map.

Discussion of Settlement Density Clusters: The overall outcome of the density analysis demonstrates that the site accumulation is observed on the North-east part of the Çukurova region (between Kadirli and Ceyhan districts). This might be because this part of the region is suitable for agricultural activities. It is also observed while doing the distribution maps which is illustrated that the highly used agricultural areas are dense between the Kadirli and Ceyhan districts where possible Roman trade routes are bisected which are extensively discussed in the section 4.3.3. of this chapter.

Density analysis does not show any significant change in the pattern of settlement between the MBA the LBA, and does not, therefore, provide any indications that Hittite domination changed the pattern of settlement in Çukurova. This argument is supported by the distribution minus map which is shown by Map 4.14.



Map 4.14: The Density minus Map showing the Subtraction of LBA and MBA Clusters

This minus density map is shown underlined the differences between the LBA and MBA density maps in order to clarify the spatial distribution of settlements in the area. For this subtraction process, as a midpoint among the density maps from10 km-50 km., 30 km. density maps have chosen both form the

MBA and LBA periods. The high dense are is observed in the same area as if the other density maps if we compare it wit the MBA and LBA density maps.

4.3.3. Proximity Analysis:

Proximity analysis determines both the maximum and the minimum distance values between selected variables. The distance raster is a software term given by *TNTmips 6.9* which is utilized to run this analysis. The distance raster process creates a table which includes the nearest distance between given values. With the calculated distances between variables, the point distribution maps are prepared. (Coolly and Lake 2006: 210). This analysis should reveal any possible regularity in spacing between settlements by comparing the observed pattern with a hypothetical one.

Trade route proximity analysis is applied in order to figure out whether or not there is a meaningful relationship between settlement pattern and trade routes.

In summary, this analysis is used to examine the distance association between;

- All settlements to a trade route,

Each of these two analyses was conducted separately for the MBA and for the LBA settlements. The distances for each were computed on an individual basis which is given as *Excel tables* in the *Appendices.* The results are categorized in two ways: trade routes and settlements distances. In this way, any significant connections between these variables are established.

4.3.3.1. Trade Route Proximity:

The basis of this group was formed by not only computing the closest distance between the routes and each site but also takes into consideration the MBA and LBA settlement proximity. The data is presented in the *Excel tables* in the Appendix as well as in a series of maps and histograms.

MBA Distance Proximity: Figure 4.15 shows trade route distance values for MBA settlements. The detected mean range is 4374 m. indicating that, as stated above, some 70% of the MBA settlements are thought to have been within 5 km of a trade route. The maximum distance is computed as 30.000 m.

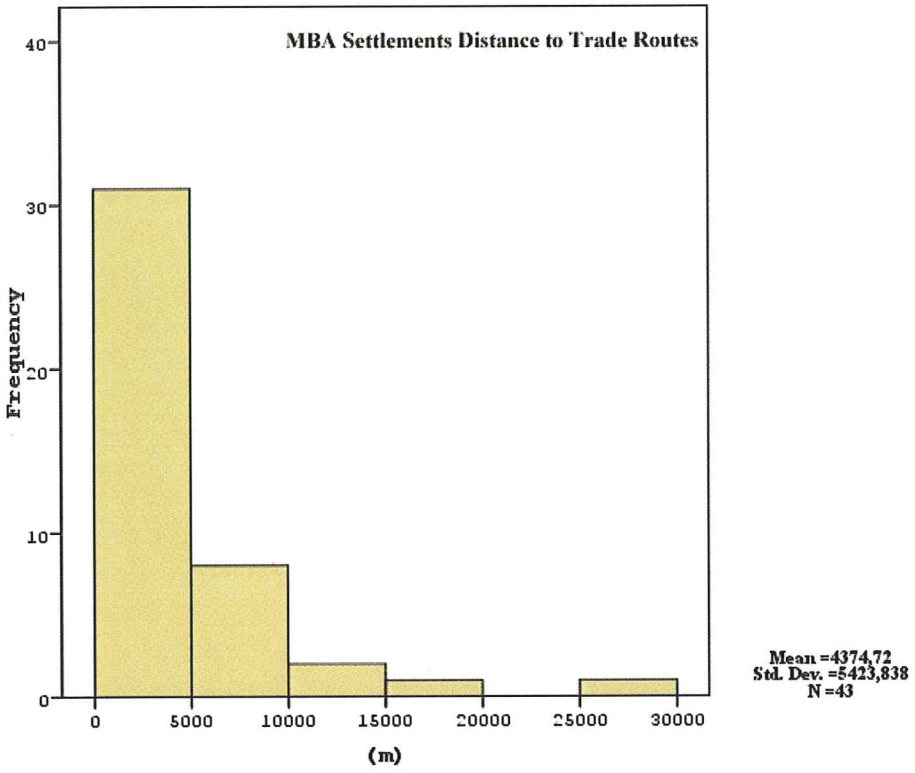


Figure 4.15: Trade Route Proximity for the MBA settlements

Of the 43 sites 30 are near trade routes (Table 4.16). Of these, 25 display both the MBA and LBA occupation. Also, 12 of them are considered large in size, of which 10 were occupied in both periods. The preference in the MBA period thus appears to have been to settle close to a trade route. The majority sites are large in size which raises the question of their function.

LBA Distance Proximity: The histogram (Figure 4.17) shows that while the number of settlements increased, no dramatic change is observed in the distance data. The average distance was determined as 4247 m.; out of 79 sites 67% were within 5 km of a trade route. Thus there is no significant change observed between the two periods.

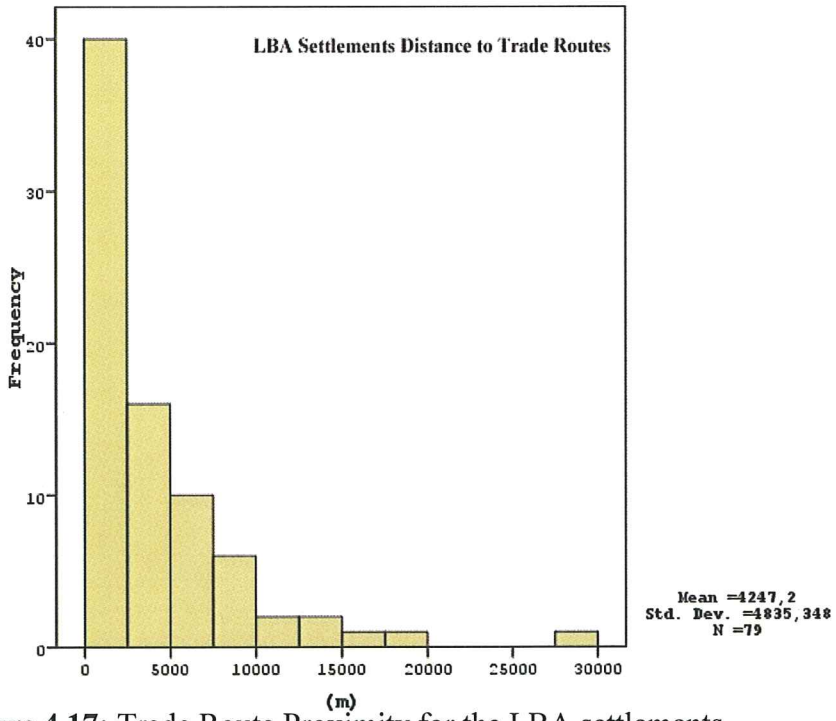
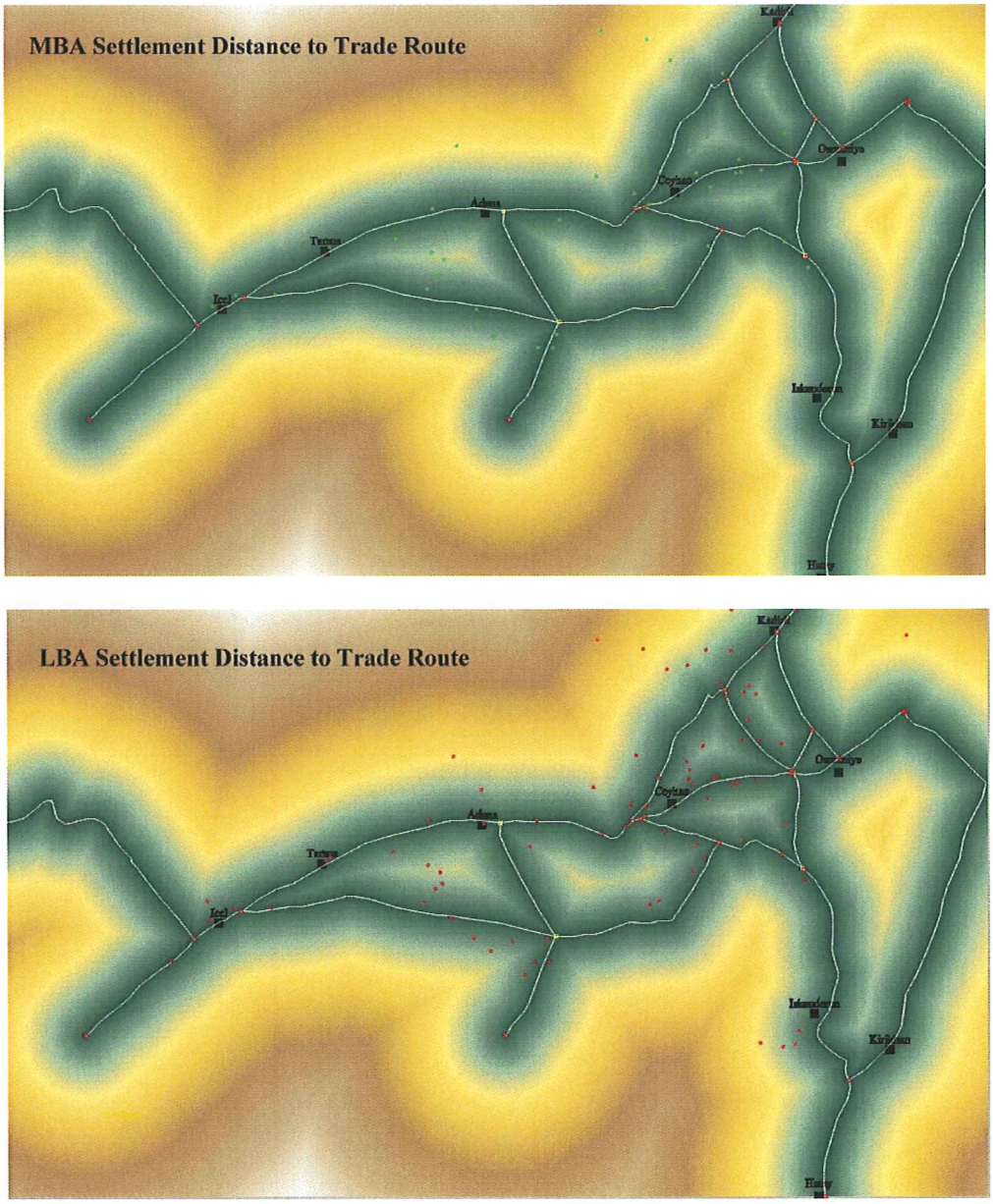


Figure 4.17: Trade Route Proximity for the LBA settlements

In the LBA 52 sites were close to a trade route (Table 4.18). Of these, 25 show both MBA and LBA occupation. Of the 14 large sites10 were determined as having occupation both the MBA and LBA periods.

Discussion of Trade Route Proximity: Therefore, the observable result is that almost half of the large sites occupied in both the MBA and LBA were large in size and located close to routes. There could thus have been some relationship between site size and function, and this relationship could be related to locations and routes. In terms of locality, no radical change in the settlement patterns between the MBA and the LBA sites is observable on the maps (Map 4.19).



Map 4.19: The Distance Maps indicate three trade route proximity clusters. Yellow indicates the farthest distance and green the nearest distance zones to a trade route. Sites in all three clusters fall inside the green area.

However, other characteristics of sites located near trade routes were taken into consideration. Firstly there is the possible relationship between settlement size and the settlement pattern. Here we can note that large sites dominant and that most of them have more than one occupation phase. The tripartite division of the settlement sizes in the databases, small, medium and large, cannot be quantified. Therefore, apart from the Harbour Towns which have definite functions known

from other classes of evidence, it is difficult to demonstrate (rather than assume) a role in trade based only on site size and proximity to routes.

Another issue is that the results of density which is explained above (Figures 4.12 and 4.13) and the routes proximity are parallel to each other. The density analysis is indicated the area between Kadirli and Ceyhan routes where the possible Roman trade routes intersect with the possible agricultural lands of the Çukurova region.

Bearing in mind that Proximity and Density analysis are pointed that the spatial distribution of settlements in the region of Çukurova seem not to show any significant change. Both periods' settlements are close in a considerable distance to trade routes (Figures 4.14-4.16) which collide with high dense areas (Figures 4.12 and 4.13). Most of the settlements are large in size so in terms of defining the hierarchical relations between settlements, to reflect in a better way to their distributions, a case study is designated in the below for the high dense area which is already shown in the density maps (Figures 4.12 and 4.13). In order to argue the settlement pattern for the MBA and LBA periods in the region of Çukurova, the principles of the 'Central Place Theory' will be applied to this densely occupied area by discussing the insufficient data from the survey results and related publications (it is also argued in the section 3.2.1. of the Chapter III).

4.4. Case Study: A Model for Settlement Pattern for the MBA and LBA Periods in the Region of Çukurova:

"Establishing the settlement pattern of a prehistoric human population involves determining the number, size, and spatial distribution of the full range of sites occupied by that population" (Banning 2002: 156). Referring to Banning's statement, settlement pattern is an analytical distribution of archaeological remains, determined by time and space phenomenon (Butzer 1982: 213).

In order to examine the economical, political and social relations between settlements, spatial patterning is a statistical approach for that manner by using the other disciplines such as geology and geography (Banning 2002: 157). As has been suggested by Butzer that (Butzer 1997: 251), human being is in a close

relation with their environment by various ways, so spatial approach to human patterning could be assessed by touching every stage of individual life (Wilkinson 2003: 9). It is critical to understand and shape the past human activities, interacted with artifact remains and environmental issues. In 1970's, spatial approach was implemented by various literature and case study by pioneering name Clarke and followed him by Isaac 1971, Whallon 1973, Sivertsen 1980, Fletcher 1977 and Raper 1977 (Butzer 1982: 213).

While interpreting spatial distribution of archaeological sites and artifacts, some kinds of models are defined to concentrate on the research question and the results of analysis. Settlement pattern models highly depend on a survey strategy which is designed for particular question in a specific area. Therefore, it could be beneficial not only to collect artifacts from the surface but also, to utilize and compare them to the data by the other hypothesis by applying some models of settlement patterns (Banning 2002: 156). This kind of a study is directly related to the way of doing survey in related boundaries.

In the light of this thesis concern, the results of Çukurova region's surveys are reviewed from related reports and publications which are extensively discussed in the Chapter III, dealing with their biases. By using the outcomes of these surveys, SD is prepared but the most important issue in this thesis is insufficient data, which has not allowed reaching solid and more accurate map for the settlement pattern distribution in the region. However, as mentioned in the section 4.3. of this chapter, the available data is only utilized for two analyses: Density and Proximity. The consequences of these two analyses are pointed that the large size settlements are dominant in the region and most of them are located in a considerable distance to trade routes. Therefore, the 'Central Place Model' is evaluated both for the MBA and LBA periods in order to observe settlement pattern regularity in the Çukurova region.

4.4.1. Central Place Theory:

Christaller's formulation of the 'Central Place Theory' (1933) is proposed from the Johann von Thünen's (1826) hypothesis of spatial character of city

territory (Johnson 1972: 775). The hierarchical arrangement of settlements have been extensively illustrated as a fundamental factor while dealing with the rank-size models which is applied by some pioneering archaeologists, (Cavanagh and Laxton 1994, 1995; Falconer 1994; Falconer and Savage 1995; Johnson 1980; Kowalewski 1982; Moore 1959) in which the size of settlements is considered as a main marker (Banning 2002: 160). The Central Place is one of the theories, which is applied by formulating the organization of vertical and horizontal relationships between settlements. As Butzer stated that Christaller's main focus was mainly the site hierarchy and its reflection to economic, political and social aspects of settlements (Butzer 1982: 219). The principle of Central Place theory is pointed that the equally distant large size towns to each other serve as a function of market center which are acted like an economical center while small size settlements (hamlets, villages) are depended on this centered market economy town centers. This kind of centered supplementary market economy system is illustrated by hexagonally shaped formation with hierarchically seated small size settlements (Johnson 1972: 769; Hodder and Orton 1979: 61). In this kind of a networking system between settlements, ordered by size hierarchy, the site location in terms of market economy is based on transportation and administrative factors (Butzer 1982: 221).

This theoretical approach to spatial organization of settlements was attested by G. Johnson in Diyala region for the Early Dynastic I sites and the results were published in an article named as 'A Test the Utility of Central Place Theory in Archaeology' in 1972. According to his settlement, lattice division in terms of size on the basis of site proportions is introduced by ranking the sites from 1 to 5: Large Towns (over 15 ha.); Towns (6-15 ha.); Large Villages (3-5 ha.); Villages (1-3 ha.); Hamlets (less than 1 ha.) (Johnson 1972: 778-779; Akar 2006: 72). He suggested that the principle of Central Place theory presents the spatial distribution of settlements in a regular space in association with the transportation of goods and services and their distributions from large villages to hamlets, depending on their economic, social and hierarchical relations, which might be somehow unreliable ranking (Johnson 1972: 783). Rather than classical method of hexagonal formation of the Central Place theory, Johnson offered 'rhomboidal' distribution pattern which is directly related to the 1 to 5 size

division of settlements and transport principle of these sites, interpreting them in terms of their hierarchical ranking (Hodder and Orton 1979: 61).

The basis of Central Place Model is determined as rank-size and horizontal order of each settlement and their relations, isolated from outside environment, and evaluated them in their own transport and trade network principles. The sizes of each settlement become a significant key determinant while dealing with market economy, which is highly based on trade activities. Trade activities, depending on transportation of goods and raw materials, are assigned with a small settlement in the hexagonal settlement distribution. However, Johnson claimed that this could not be attested in the Diyala region because of written documents and historical sources were pointed that in the mentioned time period, transportation system was not used much actively so the usage of this system was at the minimum amount. Therefore, Johnson discussed the reliability and compatibility of the Central Place model for the Diyala region (Johnson 1972: 783-4; Hodder and Orton 1979: 63).

Some alternative approaches are developed against the Central Place theory and the other related spatial distribution models. The Central Place theory evaluates each settlement in its own environment by assuming "....flat, featureless plain and a stepwise hierarchical structure..." (Butzer 1982: 221) whereas Lösch (1967) proposed another theory incorporating it with geological approaches by pretending that the size of settlement becomes flexible rather than making it depended upon certain rules such as assessing similar size settlements as carrying same function. It is significant to consider some irregularities while dealing with settlement pattern distribution in a way of looking market competition, not only evaluating rank-size models relate them to interpret social, economical and political relations in the network (Butzer 1982: 221-2).

It has been already discussed in the Chapter III but it is also significant to determine surveying techniques from a spatial structure point of view. In that way, the ideal spatial patterning survey might be stressed one more time for the Çukurova region (the sections 3.2. and 3.2.1. are served as this topic in the Chapter III). Surveying by depending on spatial distribution models is possible but it is somewhat difficult. Even it is not expected to apply one spatial model accurately in a specific area but it could be performable to determine specific method in order to investigate settlement pattern in an area or region (Banning

2002: 168).

The Central Place theory; hierarchical organizations; would be taken into consideration for this thesis so it should be enough to describe the survey which can be particularly designed for that model in the region. The initial step is for this kind of survey is to determine the scale of survey area. For example, in the Çukurova region, the regional survey would be possible but it is difficult to pretend any kind of fixed spatial model for that region. Thus, it might be significant to select a specific area where there is accumulation of settlements and they could be well-defined in terms of period of occupation, distances and ranking. In terms of the results of Density and Proximity analysis, introduced in the section of 4.3. of this chapter, the accumulation of settlements are observed both for the MBA and LBA periods between Kadirli and Ceyhan districts, where also Roman trade routes are intersected. The outcomes of surveys in that area are not enough to adopt a spatial model and to analyze the settlement pattern of the region. Thus, it should be possible to design a 'spatial survey' in that high dense settlement area by considering size, and any possible central places which will provide a chain by surrounding small size settlements (Banning 2002: 169).

4.4.2. Applying the Principles of Central Place Theory into the MBA and LBA Settlements in the Region of Çukurova:

If hierarchical relations on the basis of Central Place Model would be applied to the MBA and LBA settlements in the Çukurova region, it could be observed that definite actualities make this model unstable.

In order to examine this model, the outcomes of GIS analyses, introduced in the section of 4.3. of this chapter, are taken into consideration. Most of the settlements are in large size and they are at a close distance to trade routes. Thus, the hierarchical relations could possibly be illustrated to demonstrate the settlement pattern in the region, dealing with selected area between Kadirli and Ceyhan districts where Roman trade routes intersects and high density of settlements are seen both in the MBA and LBA periods (Maps 4.12, 4.13 and 4.14).

In order to demonstrate the hierarchy of settlements in both periods in a compatible area 'Thiessen Polygons' is a useful technique, which is drawn by

perpendiculars on a mid-points between settlements (Hodder and Orton 1979: 59). Having utilizing Thiessen polygon to a specific area in order to determine large size market areas in the hexagonal type distribution has an advantage that this model is remained equal distance between different size of settlements so in that way, large areas are not considerably shown as service or market areas (Hodder and Orton 1979: 60; Butzer 1982: 221).

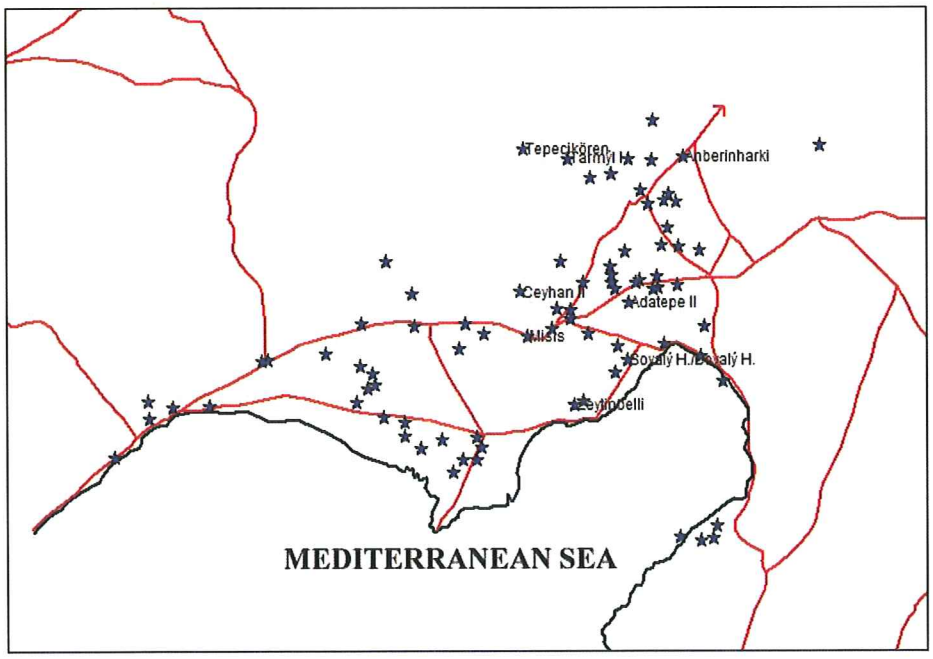
4.4.2.1. MBA and LBA Settlement Hierarchies:

Taking both the MBA and LBA periods in the region of Çukurova, only applying hierarchical relations on a high dense area between the Kadirli and Ceyhan districts (Maps 4.12, 4.13 and 4.14), the settlement pattern distribution of sites could yield an idea about the process of urbanization (Adams and Nissen 1972: 17). To establish a hierarchical order in a specific area provides an understanding of function of some certain activity places while dealing with their social, political and economic network system, as implied by the Central Place Theory (Hodder and Orton 1979: 61).

However, the estimation of site size, according to related periods, is an important prediction, examining the spatial pattern of a specific area. This parameter includes some consistency of the results between different surveys and it highly depends on the boundaries of the area. If a survey is designed according to this kind of a goal, success in this process rely on the background knowledge of the survey team and it is time consuming and costs high (Banning 2002: 203).

The systematic grid survey strategy between the boundaries of a survey area could be helpful while predicting the size of a settlement. However, a complexity would be observed in multi-period settlements; the size of a settlement shows a variety between its periods of occupation layers. In that sense, settlements' current size could be measured and the estimation of size in past for any period could be evaluated by investigating accumulation of artifacts collecting from the surface. The intensive surface survey techniques and distribution of artifact remains by investigating the stratigraphy of site could provide an understanding of settlement size. This could be supported by pollen, microfossils and the other environmental context analyses in order to predict the size of a settlement (Banning 2002: 205; Butzer 1982: 232).

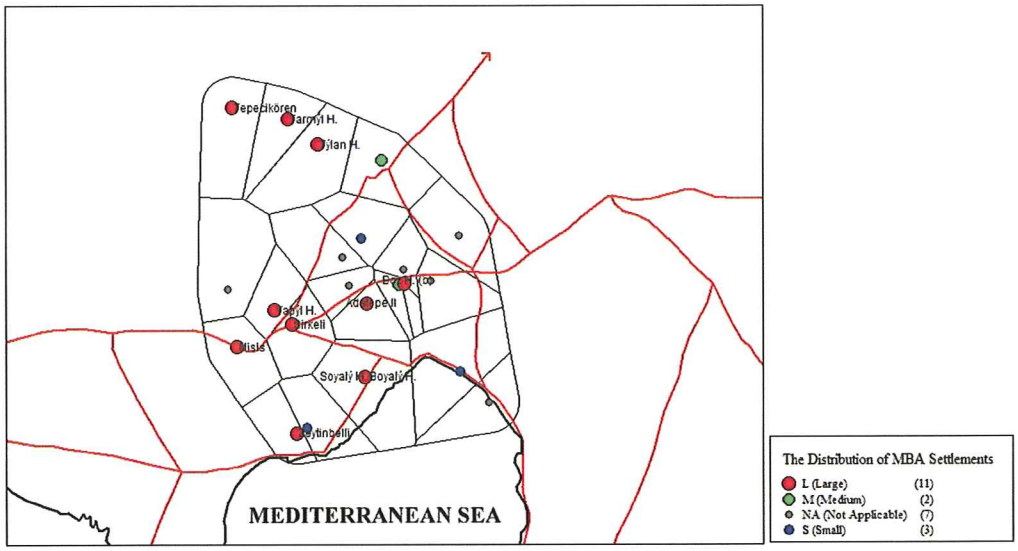
This kind of a survey could be done for the region of Çukurova (discussed in the section 3.2.1. of Chapter III) because such difficulties for determining the size for more than one occupation site are also observed in the area. The survey results and related publications are qualified only to do tripartite division as sizes of each settlement (introduced in the section of 4.1.1.2. of this Chapter): Small, Medium and Large without giving any information about hectares (ha.) of these settlements or whatever measurements they used to determine this tripartite division because not necessarily hectare value is needed as in some cases estimation of size depends on the height of the settlements. As has been suggested by Başgelen (Başgelen 2002: 37), the description of sizes show variety in the Anatolia and the determinant factors are changed region by region, for example, in the Southeast part of Anatolia, the settlement size criteria depends on the height of a settlement and 'Large' size is equaled with the settlements which are located more than 30 m. height but this value drop in the Aegean region to 20 m.



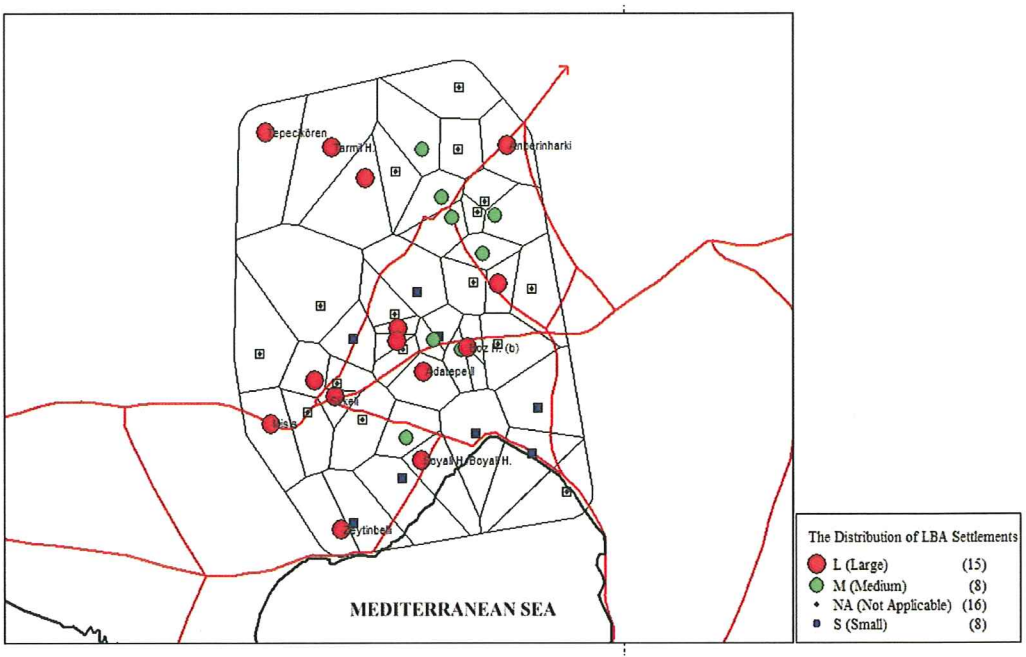
Map 4.20: Map showing the Case Study Area in the Çukurova Region

The settlement hierarchy of the MBA and LBA periods for the region of Çukurova could be achieved if the size of each settlement would be given by related survey reports and publications. However, the most important difficulty is to determine the size of the MBA and LBA periods for each settlement. Thus, the

only possible spatial principle is settlement hierarchy for the Çukurova region without any quantified and sufficient data for the size of the settlements. Trying to argue the overall settlement regularity and pattern of the Kadirli and Ceyhan districts as high dense occupied area (Map 4.20), the applied 'Thiessen Polygon' thematic maps are shown and described in the below section.



Map 4.21: Thiessen Polygon Map showing the Size Distribution of the MBA Sites between the Kadirli and Ceyhan Districts. The red lines are represented the trade routes.



Map 4.22: Thiessen Polygon Map showing the Size Distribution of the LBA Sites between the Kadirli and Ceyhan Districts. The red lines are represented the trade routes.

In the MBA period (Map 4.21), the large size settlements are dominant in number in the area whereas medium and small size sites are really rare in this period. When we compare these two maps, in the LBA periods (Map 4.22), the increase in the mound number is observed which is already mentioned by Jak Yakar (Yakar 2005: 41). The large size settlements from the MBA periods are stayed as in the same size in the LBA periods whereas medium size settlements considerably increase in that period. The only change is observable from these two maps is the increase in the site number in the LBA period, however, it could be noticed that the distribution pattern is not changed significantly.

The common feature which is also supported by the outcomes of 'Trade Route Proximity' and 'Density' analyses (Maps and Figures 4.12-4.19) is that the large size settlements are in close proximity to trade routes. These could lead to the same question which points towards the relations between size and function. These large size settlements could be acted as trade centers and they are controlled the transportation and market economy in the region. However, there is not enough archaeological and spatial evidence in order to discuss this kind of a relation in this region.

"It is a common observation that there are fewer larger places than smaller ones in a region and that the larger centers provide a greater number and variety of goods than small places do" (Hodder and Orton 1979: 60). This observation is evidenced by the hierarchical relations which is a key determinant in the Central Place Theory. However, this approach could not be applied to the Çukurova region until a survey would be designed in terms of spatial approach (that kind of survey design is discussed in the section of 3.2.1. of Chapter III and in the section of 4.3. of this chapter). This kind of approach could be utilized an area which have sufficient data such as size and height of the settlements. A centered base market, administration or transportation type of distributions (Butzer 1982: 221) could not be adoptable to the Çukurova region due to the lack of archaeological data. In terms of regularity arrangement in the MBA and the LBA periods, except considerable increase in the number of sites in the LBA, there is no observable regularity change driven from the maps.

The basic and most important problem is that there is no quantified settlement size data for this kind of settlement pattern research in the area. It is not possible to determine the MBA and LBA size of settlements but it could be possible to estimate size of settlements by any size division.

CHAPTER V

CONCLUSION

This introductory study on settlement history in the region of Çukurova is intended to challenge the theory that the impact of the Imperial Hittite administration policy can be seen in changes in settlement pattern during the MBA and the LBA periods. In a recent paper (Yakar 2005) Jak Yakar claimed that Hittite annexation of the Çukurova caused a dramatic change in the region's settlement pattern which can be observed in a dramatic increase in the number of settlement mounds. This claim by Yakar inspired me to investigate the settlement pattern of the Çukurova region and its particular significance within the Hittite political geography. This was accomplished by examination of the related survey reports, topographical maps and publications of the MBA and LBA periods of the Çukurova region from which a database of settlements and related factors was made. The creation of the database was linked to the related GIS analysis of the settlement patterns of the Çukurova.

When the settlement pattern of the Çukurova plain was analysed in GIS it is seen that there is no significant change in the settlement pattern of the area between the MBA and LBA periods which would not support Yakar's thesis. This was demonstrated by means of "Density and Proximity" analyses both for the MBA and the LBA sites (Maps and Figures 4.12-4.19). Thus the impact of the establishment of the Hittite state and its transition from Kingdom to Empire are not detected in the available archaeological survey data. While the quality of the archaeological data available does not permit fine distinctions to be made, it is argued that there is sufficient information in the published and other sources that were used in this study to support the general conclusion. While it might be expected that the Çukurova region had some strategic importance, with its harbor towns and its active role in trade with the Mediterranean world, the effects of these political and economical relations during the LBA period are not observed in

terms of distribution of the settlement pattern in the region. The results which I set out in the fourth chapter were based on limited archaeological evidence but it is possible to present models of the settlement pattern both for the MBA and LBA periods. Little difference is seen between these models apart from some overall increase in the number of settlement sites during the LBA as reflected in the survey data.

The outcomes of survey results and related publications of the Çukurova region are the only limitations for this study. The insufficient data from the literature is limited the results of GIS analysis' interpretations. As examining and interpreting the spatial arrangement of the settlements in the region, the hierarchical relations as one of the principles of the Central Place theory (Maps 4.20-4.22), is applied but undetermined settlement sizes become a major difficulty in that stage. Thus, in order to establish or apply settlement pattern models in terms of spatial relations in the region, as a recommendation, the biases of survey results and a possible ideal survey strategy are extensively mentioned in the Chapter III and IV.

While presenting the results of the GIS analysis, another point can be stressed is the possible connection between site size and site function. Such a relationship is widely accepted theory in archaeology. For the Çukurova region this relationship was demonstrated by using the distance values of large sites from possible trade routes (Maps and Figures 4.15-4.19) and applying the hierarchical relations as a case study in the section 4.4. of the Chapter IV. The majority of both the MBA and LBA sites are classified as 'Large' and lie close to trade routes. However, while there is a clear set of relationships, and no demonstrable difference in the pattern of distribution between the two periods, the estimated size of each site is given regardless of the periods of occupation. Thus, it is not possible to draw more specific conclusions beyond the clear fact that Hittite domination did not make a significant difference to the settlement pattern.

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Table 4.01 Table showing the Settlement Database (SD)

Settlement Name	Estimated Settlement Size	Material Status MBA	Material Status LBA	MBA	LBA	Ekin Database No	Seton-Williams No	Easting 25K	Northing 25K	z 25K	25 K Index Name
Adatepe II	L	PS	PS	1	1	1	62	758755	4102125	5,38	Kozan N 35c-3
Alapunar	M	PS	PS	1	1	2	54	761600	4128800	20,4	Kozan N35b-3
Alyahanun	L	PS	PS	1	1	3	131	693205	4078500	13,8	Mersin O 34a-3
Anberinharki	L	AB	AB	0	1	4	87	772050	4136800	0	Gaziantep N 36a-4
Arpaderesi M.	NA	AB	PS	0	1	5	0	776250	4045400	0	
Boz H. (a)	L	PS	PS	1	1	6	25	765750	4105800	5,5	Kozan N 35c-3
Boz H. (b)	L	PS	PS	1	1	7	25	765751	4105801	5,5	Kozan N 35c-3
Camili	NA	AB	AB	1	1	8	70	717800	4091200	0	Mersin O 34b-2
Cebra H.	S	AB	AB	1	1	9	30	757700	4114250	0	Kozan N 35c-2
Ceyhan II	NA	AB	AB	1	1	10	24	732500	4104800	2,8	Kozan N 35c-4
Çağnar	L	PS	AB	1	0	11	117	704750	4073800	15,7	Mersin O 34b-4
Çakmak T.	M	PS	PS	1	1	12	0	764690	4105556	0	
Çaputçu H.	L	PS	PS	1	1	13	76	695810	4081700	17,04	Mersin O 34a-3
Çatal H. I	NA	AB	AB	0	1	14	83	768500	4128100	48	Gaziantep N 36a-4
Çavuşlu	NA	AB	AB	0	1	15	81	642908	4078634	0	
Çukur Köprü	M	AB	AB	0	1	16	88	758500	4136250	50	Kozan N 35b-3
Dağılbaz H.	L	PS	PS	1	1	17	0	779250	4046000	0	
Dervişli	NA	AB	PS	0	1	18	135	764200	4136150	43	Kozan N 35b-3
Dikili H.	S	AB	AB	0	1	19	15	706493	4104247	0	
Domuz H.	S	AB	AB	1	1	20	73	718800	4064800	7,8	Mersin O 34c-2
Domuz II	S	AB	AB	0	1	21	101	713800	4069425	6,4	Mersin O 34c-2
Domuz T.	NA	AB	PS	0	1	22	0	804918	4139627	0	
Domuz T.	L	PS	PS	1	1	23	74	722200	4064650	4,3	Mersin O 34c-2
Eşkiler	NA	AB	PS	0	1	24	86	767312	4126607	0	
Fenni Kireç H.	NA	AB	AB	0	1	25	23	740125	4095800	19,8	Mersin O 35a-2
Furlar	S	AB	AB	1	0	26	112	723250	4067750	0	Mersin O 35d-1
Geçemey H.	NA	AB	PS	0	1	27	40	766750	4115800	43	Gaziantep N 36d-1
Gözeneler	S	AB	PS	0	1	28	0	777000	4096500	0	
Hamzalı Buran Ç.	S	AB	PS	0	1	29	95	755291	4085686	0	
Hesigin T./Tülek H.	M	AB	PS	0	1	30	64	756034	4091862	0	
Höyük	S	AB	PS	0	1	31	140	697630	4082700	9,2	Mersin O 34a-3
İncirlik	M	AB	PS	0	1	32	8	719300	4097200	57,9	Mersin O 34b-2
İslamkadı Ç.	NA	AB	PS	0	1	33	60	748936	4094751	0	
Kabarsa	NA	AB	AB	1	1	34	71	685900	4090089	7,5	Mersin O 34a-1
Kara H./Erzin	S	PS	PS	1	1	35	147	776050	4089500	8,9	Antakya O 36a-1
Karaağaç	S	AB	PS	0	1	36	4	780100	4049010	0	
Kazanlı	M	PS	PS	1	1	37	78	657750	4077400	4	Mersin O 33b-4
Kızıl	M	AB	AB	0	1	38	84	763300	4125750	32,63	Kozan N 35c-2
Kızıltahta	L	AB	PS	0	1	39	111	722000	4070150	19,6	Mersin O 34c-2
Kinet H.	NA	PS	PS	1	1	40	6	781518	4083589	0	
Küçük Ç.	S	AB	PS	0	1	41	33	761250	4107500	30,5	Kozan N 35c-3
Küçük Mankıt	S	AB	AB	0	1	42	56	747500	4107050	3,1	Kozan N 35c-4
Kürkçüler	L	PS	PS	1	0	43	9	724000	4094700	81	Mersin O 35a-1
Mercin/Boz H.	L	AB	PS	0	1	44	12	754600	4108800	0	

(Table 4.01 Continued)

Mersin-Yümüktepe	NA	PS	PS	1	1	45	0	643201	4074477	0	
Minareli H.	NA	AB	AB	1	1	46	41	776010	4114750	76	Gaziantep N 36d-1
Misis	L	PS	PS	1	1	47	11	734250	4094050	0	Mersin O 35a-2
Molla Ahmet/Molla	NA	PS	PS	1	1	48	28	755400	4105500	3,7	Kozan N 35c-4
Mustafa Alının H.	NA	AB	AB	0	1	49	0	764500	4145600	76,4	Kozan N 35b-3
Muttalıp H.	S	AB	PS	0	1	50	0	767125	4092500	0	
Nergis H.	NA	AB	PS	0	1	51	104	716500	4061900	7,3	Mersin O 34c-2
Pascu H.	M	AB	AB	0	1	52	35	768125	4120125	44,1	Gaziantep N 36d-1
Paşa H. I	NA	AB	AB	1	1	53	138	694300	4087000	21,7	Mersin O 34a-2
Paşa H. II	NA	PS	PS	1	1	54	139	697000	4085300	21,7	Mersin O 34a-2
Pekmezli H. II	NA	AB	AB	0	1	55	49	742315	4112123	0	Kozan N 35d-3
Pınar T.	S	AB	PS	0	1	56	0	771100	4046380	0	
Sirkeli	L	PS	PS	1	1	57	65	744600	4098250	0	Mersin O 35a-2
Soli H.	NA	AB	PS	0	1	58	0	634800	4065250	0	Silifke O 32c-2
Soyalı H./Boyalı H.	L	PS	PS	1	1	59	63	758340	4088484	0	
Sultan T.	NA	AB	AB	1	1	60	7	770625	4106350	52,3	Gaziantep N 36d-4
Şamşın H.	M	AB	AB	0	1	61	82	770125	4126125	4,6	Gaziantep N 36d-1
Tarmıl H.	L	PS	PS	1	1	62	50	743975	4136500	85,36	Kozan N 35 b-4
Tarsus H.	S	AB	PS	0	1	63	0	671750	4088600	17	Mersin O 33b-2
Tarsus-Gözlükule	L	PS	PS	1	1	64	0	670500	4088350	0	Mersin O 33-b2
Taşlı H.	NA	AB	AB	0	1	65	142	754350	4132750	0	Kozan N 35b-4
Tatarlı H.	L	AB	AB	0	1	66	39	770725	4115600	36,9	Gaziantep N 36d-1
Tenevardı I	S	AB	AB	1	1	67	115	708650	4067350	5,8	Mersin O 34c-1
Tepebaş H./Adaniia	NA	NA	NA	0	1	68	0	707275	4096475	0	Mersin O 34b-1
Tepecikören	L	PS	PS	1	1	69	0	733375	4138735	0	
Tepesidelik	M	AB	AB	0	1	70	34	760400	4106900	4,3	Kozan N 35c-3
Tılan H.	L	PS	PS	1	1	71	141	749500	4131750	54	Kozan N 35b-4
Tırmıl T.	NA	PS	PS	1	1	72	19	648750	4077125	0	Mersin O 33a-3
Velican T.	NA	PS	PS	1	1	73	75	700274	4111982	0	
Yahşi Mehmet H.	NA	PS	AB	1	0	74	0	765493	4108512	0	
Yalaközü H.	L	AB	PS	0	1	75	32	754545	4106800	0	Kozan N 35c-4
Yarım H. I	NA	AB	AB	1	1	76	13	754110	4110800	3,7	Kozan N 35c-4
Yaşıl H.	L	AB	AB	1	1	77	58	741300	4100800	4,34	Kozan N 35 d-3
Yenice H.	NA	AB	AB	1	1	78	118	705000	4070300	16,2	Mersin O 34b-4
Yeniköy II/Yeniköy	S	PS	PS	1	1	79	90	747500	4078852	0	
Yeniköy III	S	AB	PS	0	1	80	133	699800	4074850	11	Mersin O 34a-3
Yılan Kilise	NA	AB	PS	0	1	81	57	744800	4100300	0	Kozan N 35d-3
Zeytinbelli	L	PS	PS	1	1	82	0	745550	4077875	77	Mersin O 35a-3
Zeytinli	NA	PS	PS	1	1	83	14	694500	4097275	35,5	Mersin O 34a-2
				43	79						

Table 4.16 Table showing the Route Distance of MBA Sites

Settlement Name	Distance to Route	Estimated Settlement Size	Material Status MBA	MBA	LBA	Ekin Database No	Seton-Williams No	Easting 25K	Northing 25K	z 25K	25 K Index Name
Çakmak T.	3264	M	PS	1	1	12	0	764690	4105556	0	
Çağnar	1867	L	PS	1	0	11	117	704750	4073800	16	sin O 34b-4
Çapuçu H.	2444	L	PS	1	1	13	76	695810	4081700	17	sin O 34a-3
Adatepe II	1427	L	PS	1	1	1	62	758755	4102125	5	an N 35c-3
Alapunar	1427	M	PS	1	1	2	54	761600	4128800	20	an N35b-3
Alyahanun	5306	L	PS	1	1	4	131	693205	4078500	14	sin O 34a-3
Boz H. (a)	6036	L	PS	1	1	6	25	765750	4105800	6	an N 35c-3
Boz H. (b)	8950	L	PS	1	1	7	25	765751	4105801	6	an N 35c-3
Camili	953	NA	AB	1	1	8	70	717800	4091200	0	sin O 34b-2
Cebra H.	1238	S	AB	1	1	9	30	757700	4114250	0	an N 35c-2
Ceyhan II	6086	NA	AB	1	1	10	24	732500	4104800	3	an N 35c-4
Dağılbaz H.	5299	L	PS	1	1	81	0	779250	4046000	0	
Domuz H.	1834	S	AB	1	1	19	73	718800	4064800	8	sin O 34c-2
Domuz T.	1132	L	PS	1	1	21	74	722200	4064650	4	sin O 34c-2
Furlar	788	S	AB	1	0	25	112	723250	4067750	0	sin O 35d-1
Kürkçüler	3738	L	PS	1	0	41	9	724000	4094700	81	sin O 35a-1
Kabarsa	55	NA	AB	1	1	32	71	685900	4090089	8	sin O 34a-1
Kara H./Erzin	590	S	PS	1	1	34	147	776050	4089500	9	kya O 36a-1
Kazanlı	1506	M	PS	1	1	35	78	657750	4077400	4	sin O 33b-4
Kinet H.	2240	NA	PS	1	1	36	6	781518	4083589	0	
Mersin-Yümüktepe	1629	NA	PS	1	1	43	0	643201	4074477	0	
Minareli H.	4023	NA	AB	1	1	44	41	776010	4114750	76	ntep N 36d-1
Misis	139	L	PS	1	1	45	11	734250	4094050	0	sin O 35a-2
Molla Ahmet/Molla Abdullah'	1927	NA	PS	1	1	46	28	755400	4105500	4	an N 35c-4
Paşa H. I	8858	NA	AB	1	1	49	138	694300	4087000	22	sin O 34a-2
Paşa H. II	9456	NA	PS	1	1	50	139	697000	4085300	22	sin O 34a-2
Sirkeli	34	L	PS	1	1	54	65	744600	4098250	0	sin O 35a-2
Soyalı H./Boyalı H.	779	L	PS	1	1	56	63	758340	4088484	0	
Sultan T.	1237	NA	AB	1	1	57	7	770625	4106350	52	ntep N 36d-4
Tılan H.	18324	L	PS	1	1	65	141	749500	4131750	54	an N 35b-4
Tırmıl T.	966	NA	PS	1	1	66	19	648750	4077125	0	sin O 33a-3
Tarmıl H.	6780	L	PS	1	1	58	50	743975	4136500	85	an N 35 b-4
Tarsus-Gözlükule	28085	L	PS	1	1	59	0	670500	4088350	0	sin O 33-b2
Tenevardı	11161	S	AB	1	1	63	115	708650	4067350	6	sin O 34c-1
Tepecikören	1112	L	PS	1	1	77	0	733375	4138735	0	
Velican T.	14834	NA	PS	1	1	67	75	700274	4111982	0	
Yaşıl H.	1311	L	AB	1	1	70	58	741300	4100800	4	an N 35 d-3
Yahşi Mehmet H.	4214	NA	PS	1	0	78	0	765493	4108512	0	
Yarım H. I	2298	NA	AB	1	1	69	13	754110	4110800	4	an N 35c-4
Yenice H.	4619	NA	AB	1	1	71	118	705000	4070300	16	sin O 34b-4
Yeniköy II/Yeniköy	4367	S	PS	1	1	72	90	747500	4078852	0	
Zeytinbelli	4202	L	PS	1	1	76	0	745550	4077875	77	sin O 35a-3
Zeytinli	1578	NA	PS	1	1	75	14	694500	4097275	36	sin O 34a-2

Table 4.18 Table showing the Route Distance of LBA Sites

Settlement Name	Distance to Route	Estimated Settlement Size	Material Status LBA	MBA	LBA	Ekin Database No	Seton-Williams No	Easting 25K	Northing 25K	z 25K	25 K Index Name
Adatepe II	3264	L	PS	1	1	1	62	758755	4102125	5,38	Kozan N 35c-3
Alapunar	1867	M	PS	1	1	2	54	761600	4128800	20,4	Kozan N35b-3
Alyahanun	2444	L	PS	1	1	3	131	693205	4078500	13,8	Mersin O 34a-3
Anberinharki	267	L	AB	0	1	4	87	772050	4136800	0	Gaziantep N 36a-4
Arpaderesi M.	8546	NA	PS	0	1	5	0	776250	4045400	0	
Boz H. (a)	1427	L	PS	1	1	6	25	765750	4105800	5,5	Kozan N 35c-3
Boz H. (b)	1427	L	PS	1	1	7	25	765751	4105801	5,5	Kozan N 35c-3
Camili	5306	NA	AB	1	1	8	70	717800	4091200	0	Mersin O 34b-2
Cebra H.	6036	S	AB	1	1	9	30	757700	4114250	0	Kozan N 35c-2
Ceyhan II	8950	NA	AB	1	1	10	24	732500	4104800	2,8	Kozan N 35c-4
Çakmak T.	1238	M	PS	1	1	12	0	764690	4105556	0	
Çaputçu H.	6086	L	PS	1	1	13	76	695810	4081700	17,04	Mersin O 34a-3
Çatal H. I	4216	NA	AB	0	1	14	83	768500	4128100	48	Gaziantep N 36a-4
Çavuşlu	5492	NA	AB	0	1	15	81	642908	4078634	0	
Çukur Köprü	8804	M	AB	0	1	16	88	758500	4136250	50	Kozan N 35b-3
Dağılbaz H.	5299	L	PS	1	1	17	0	779250	4046000	0	
Dervişli	4580	NA	PS	0	1	18	135	764200	4136150	43	Kozan N 35b-3
Dikili H.	6687	S	AB	0	1	19	15	706493	4104247	0	
Domuz H.	1834	S	AB	1	1	20	73	718800	4064800	7,8	Mersin O 34c-2
Domuz II	3592	S	AB	0	1	21	101	713800	4069425	6,4	Mersin O 34c-2
Domuz T.	1132	NA	PS	0	1	22	0	804918	4139627	0	
Domuz T.	17387	L	PS	1	1	23	74	722200	4064650	4,3	Mersin O 34c-2
Eşkiler	3665	NA	PS	0	1	24	86	767312	4126607	0	
Fenni Kireç H.	114	NA	AB	0	1	25	23	740125	4095800	19,8	Mersin O 35a-2
Geçemey H.	2133	NA	PS	0	1	27	40	766750	4115800	43	Gaziantep N 36d-1
Gözeneler	2570	S	PS	0	1	28	0	777000	4096500	0	
Hamzalı Buran Ç.	2352	S	PS	0	1	29	95	755291	4085686	0	
Hesigin T./Tülek H.	2329	M	PS	0	1	30	64	756034	4091862	0	
Höyük	6811	S	PS	0	1	31	140	697630	4082700	9,2	Mersin O 34a-3
İncirlik	66	M	PS	0	1	32	8	719300	4097200	57,9	Mersin O 34b-2
İslamkadı Ç.	1153	NA	PS	0	1	33	60	748936	4094751	0	
Kabarsa	3738	NA	AB	1	1	34	71	685900	4090089	7,5	Mersin O 34a-1
Kara H./Erzin	55	S	PS	1	1	35	147	776050	4089500	8,9	Antakya O 36a-1
Karaağaç	4364	S	PS	0	1	36	4	780100	4049010	0	
Kazanlı	590	M	PS	1	1	37	78	657750	4077400	4	Mersin O 33b-4
Kızıl	259	M	AB	0	1	38	84	763300	4125750	32,63	Kozan N 35c-2
Kızıltahta	1154	L	PS	0	1	39	111	722000	4070150	19,6	Mersin O 34c-2
Kinet H.	1506	NA	PS	1	1	40	6	781518	4083589	0	
Küçük Ç.	1005	S	PS	0	1	41	33	761250	4107500	30,5	Kozan N 35c-3

(Table 4.18 Continued)

Küçük Mankıt	274	S	AB	0	1	42	56	747500	4107050	3,1	Kozan N 35c-4
Mercin/Boz H.	4962	L	PS	0	1	44	12	754600	4108800	0	
Mersin-Yümüktepe	1629	NA	PS	1	1	45	0	643201	4074477	0	
Minareli H.	4023	NA	AB	1	1	46	41	776010	4114750	76	Gaziantep N 36d-1
Misis	139	L	PS	1	1	47	11	734250	4094050	0	Mersin O 35a-2
Molla Ahmet/Molla Al	1927	NA	PS	1	1	48	28	755400	4105500	3,7	Kozan N 35c-4
Mustafa Alının H.	11172	NA	AB	0	1	49	0	764500	4145600	76,4	Kozan N 35b-3
Muttalıp H.	1244	S	PS	0	1	50	0	767125	4092500	0	
Nergis H.	3361	NA	PS	0	1	51	104	716500	4061900	7,3	Mersin O 34c-2
Pascu H.	1793	M	AB	0	1	52	35	768125	4120125	44,1	Gaziantep N 36d-1
Paşa H. I	8858	NA	AB	1	1	53	138	694300	4087000	21,7	Mersin O 34a-2
Paşa H. II	9456	NA	PS	1	1	54	139	697000	4085300	21,7	Mersin O 34a-2
Pekmezli H. II	7236	NA	AB	0	1	55	49	742315	4112123	0	Kozan N 35d-3
Pınar T.	13135	S	PS	0	1	56	0	771100	4046380	0	
Sirkeli	34	L	PS	1	1	57	65	744600	4098250	0	Mersin O 35a-2
Soli H.	68	NA	PS	0	1	58	0	634800	4065250	0	Silifke O 32c-2
Soyalı H./Boyalı H.	779	L	PS	1	1	59	63	758340	4088484	0	
Sultan T.	1237	NA	AB	1	1	60	7	770625	4106350	52,3	Gaziantep N 36d-4
Şamşın H.	6583	M	AB	0	1	61	82	770125	4126125	4,6	Gaziantep N 36d-1
Tarmıl H.	18324	L	PS	1	1	62	50	743975	4136500	85,36	Kozan N 35 b-4
Tarsus H.	437	S	PS	0	1	63	0	671750	4088600	17	Mersin O 33b-2
Tarsus-Gözlükule	966	L	PS	1	1	64	0	670500	4088350	0	Mersin O 33-b2
Taşlı H.	8249	NA	AB	0	1	65	142	754350	4132750	0	Kozan N 35b-4
Tatarlı H.	793	L	AB	0	1	66	39	770725	4115600	36,9	Gaziantep N 36d-1
Tenevardı I	6780	S	AB	1	1	67	115	708650	4067350	5,8	Mersin O 34c-1
Tepebag H./Adaniia	765	NA	NA	0	1	68	0	707275	4096475	0	Mersin O 34b-1
Tepecikören	28085	L	PS	1	1	69	0	733375	4138735	0	
Tepesidelik	625	M	AB	0	1	70	34	760400	4106900	4,3	Kozan N 35c-3
Tılan H.	11161	L	PS	1	1	71	141	749500	4131750	54	Kozan N 35b-4
Tırmıl T.	1112	NA	PS	1	1	72	19	648750	4077125	0	Mersin O 33a-3
Velican T.	14834	NA	PS	1	1	73	75	700274	4111982	0	
Yalaközü H.	3128	L	PS	0	1	75	32	754545	4106800	0	Kozan N 35c-4
Yarım H. I	4214	NA	AB	1	1	76	13	754110	4110800	3,7	Kozan N 35c-4
Yaşıl H.	2298	L	AB	1	1	77	58	741300	4100800	4,34	Kozan N 35 d-3
Yenice H.	4619	NA	AB	1	1	78	118	705000	4070300	16,2	Mersin O 34b-4
Yeniköy II/Yeniköy	4367	S	PS	1	1	79	90	747500	4078852	0	
Yeniköy III	606	S	PS	0	1	80	133	699800	4074850	11	Mersin O 34a-3
Yılan Kilise	731	NA	PS	0	1	81	57	744800	4100300	0	Kozan N 35d-3
Zeytinbelli	4202	L	PS	1	1	82	0	745550	4077875	77	Mersin O 35a-3
Zeytinli	1578	NA	PS	1	1	83	14	694500	4097275	35,5	Mersin O 34a-2

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