NEOLITHIC PERIOD, NORTH-WESTERN SAUDI ARABIA

Khalid Fayez Al-Asmari

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Abstract

During the past four decades, the Neolithic period in the Kingdom of Saudi Arabia (KSA) had received little academic study, until recently. This was due to the previous widely held belief that the Arabian Peninsula had no sites dating back to this time period, as well as few local researchers and the scarcity of foreign research teams. The decline in this belief over the past years, however, has led to the realisation of the importance of the Neolithic in this geographical part of the world for understanding the development and spread of early farming. As well as gaining a better understanding of the cultural attribution of the Neolithic in KSA, filling the chronological gaps in this historical era in KSA is vital, as it is not well understood compared to many neighbouring areas. To address this gap in knowledge, this thesis aims to consider whether the Northwest region of KSA was an extension of the Neolithic developments in the Levant or an independent culture, through presenting the excavation of the Neolithic site of AlUyaynah.

Despite surveys and studies that have been conducted in the KSA, this study is the first of its kind, because the site "AlUyaynah", which is the focus of this dissertation, is the first excavation of a site dating back to the pre-pottery Neolithic (PPN). Therefore, the importance of this study lies in developing an understanding of Neolithic characteristics in the North-Western part of the KSA. Initially, the site was surveyed and then three trenches were excavated to study the remaining levels of occupation. The excavations' materials recovered included 967 stone tools (e.g. Core, Flake, Blade, Debitage, etc); the remains of 1659 animal bones; buildings; and 216 unique clay objects, which are the first discovery of their kind from a site that dates back to the Neolithic era in the Arabian Peninsula.

The current study includes a discussion of the findings from AlUyaynah and places them in their regional context. Particular attention is given to the buildings and structures, lithic assemblage and clay objects. To assist in this analysis a series of 21 new radiocarbon dates were produced from the site, with the aim to understand the beginning and end of the occupation in this settlement. This study discusses Neolithic culture and whether or not to support or reject the arguments for the Neolithic spread from other regions or local developments.

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Declaration

I declare that this thesis is a presentation of original work and I am the sole author. This work has not previously been presented for an award at this, or any other, University. All sources are acknowledged as References.

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Chapter One – Introduction

1.1 Project Rationale and Historical Background

The current study focuses on the Neolithic period (late Stone Age) of North-Western Saudi Arabia, which is addressed through the analysis of the PPNB site of AlUyaynah. The present study will help to fill a significant gap in our understanding of the origin of the Neolithic in Saudi Arabia.

In 2016, as part of the project funded by the author, the second season of excavation began at AlUyaynah. The purpose of this excavation, as part of the current study, is to study the site, raw materials, and cultural remains, in addition to investigating the natural and geographical influences from the environment surrounding the site. Additionally, the excavation aims to elucidate the stages of occupation at the site from its establishment until its abandonment; it is expected to reveal the economic and cultural role that the site of AlUyaynah played during the Neolithic period in the North-Western region of Saudi Arabia.

The North-Western region is located at the border between Saudi Arabia and the Levant and remains largely neglected by broader synthesis of the development of the Neolithic, despite a considerable renewal of knowledge during the previous twenty years. Located at the crossroads of many environmental and cultural influences, it is nevertheless important to understanding the dynamics and the early spread of Neolithic culture. For example, the discovery of the site of AlUyaynah, which was occupied as early eighth millennium or the late seventh millennium BC (Al-Asmari, 2012), marked the first discovery of Neolithic architecture in Saudi Arabia (Figure 1.1).

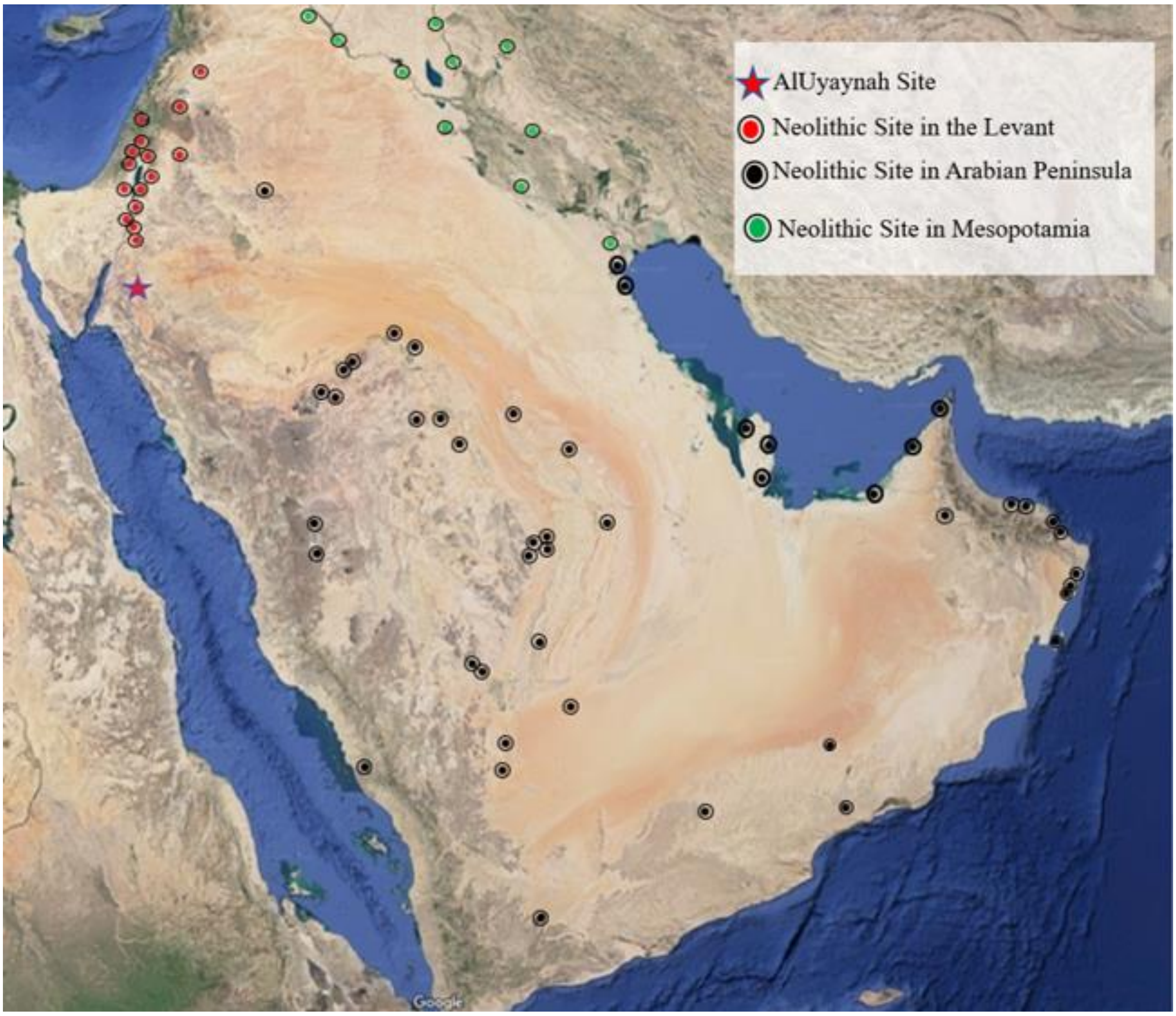

Figure 0.1: Neolithic sites in the (Arabian Peninsula, Levant and Mesopotamia)

Despite the geographical proximity of the Arabian Peninsula to the centre of origin of farming, the Neolithic period, it has received minimal study. Despite this, previous research in the region indicates that cultural transformation during the Neolithic Age was gradual and did not simultaneously represent all known aspects of the so-called 'Neolithic packages' (Çilingiroğlu, 2005). Another dominant idea regarding the Stone Age cultures of Saudi Arabia is that they represent a minimal level of human production, including the creation of lithic tools. For example, discussions of early architecture in Saudi Arabia have tended to focus on Hellenistic remains in major cities, such as Thaj, Al-jahra, Ula, and Madin Salih (Finster, 1996, p. 290). Further reasons for the lack of Stone Age sites discovered in Saudi Arabia may be summarised as follows:

1. The location of the Arabian Peninsula, within a very hot and vast desert that impedes movement and exploration, is not conducive to archaeological excavation.

2. Many scholars believed that the region lacked the requisite conditions for civilisation. This gave rise to the conviction that the region was not inhabited during this prehistoric period (McClure, 1978). Therefore, archaeology, as a science, was not of particular interest to the countries of the Arabian Peninsula for many decades. This belief negatively impacted the emergence of specialists in this field. In turn, foreign researchers' interests were primarily focused on pre-Islamic culture, rock art, and ancient writing in the Saudi Arabian context.

The dearth of information regarding similar sites may be due to the lack of sufficient surveys that were oriented towards prehistoric sites. Indeed, the majority of Saudi Arabia's Stone Age sites are represented by stone tool assemblages and were initially discovered by amateurs or employees of oil companies (e.g., Aramco), as opposed to formal archaeological surveys. Additionally, our knowledge of the prehistoric period in Saudi Arabia is limited to the writings of Western travellers who visited the Arabian Peninsula or to the scientific institutions that were subsequently established. The earliest of these reports comprised observations on inscriptions, rock drawings, and scatters of lithic tools (Thomas, 1932; Cornwall, 1946).

Between the 1920s and the 1970s, isolated studies mentioned many prehistoric sites in Saudi Arabia. Among the first were the works of H. Field, which are characterised by their methodology and academic tendencies. Field (1951; 1955; 1960) published on the Stone Age sites of Saudi Arabia, including descriptions of stone tools discovered in the Rub' Al Khali (the Empty Quarter), Wad AdDawasir and Hafr Al Batin. Philby (1933) also proposed the existence of prehistoric sites in Saudi Arabia based on stone tools collected during his search for inscriptions in the Eastern region of the Empty Quarter (See Figure 2.6; 2.7).

In addition, a Belgian expedition collected extensive information on rock art during the early 1950s, including among its members Ryckmans, Lippens, and Philippe. Numerous rock drawings were documented in Hima, Tathlith, and Southwest Arabian Peninsula sites, and were later published by Anati (1968; 1972 ;1974) in four volumes. Unfortunately, earlier accounts lacked scientific methodologies. Most scholars were amateurs without adequate archaeological training. The sites from which stone tools were collected were selective and the tools themselves were collected for their aesthetic value according to the collectors' tastes. Moreover, the assemblages from many of these sites were not published.

Since the 1970s, studies of prehistoric sites have been based on the geographical and archaeological surveys conducted by the Saudi Commission for Tourism and Antiquities (SCTA). Between 1976 and 1982, the SCTA initiated a comprehensive archaeological survey of Saudi Arabia. This resulted in the discovery of many sites dating back to prehistoric periods in various parts of the country. The results of these surveys reveal the extensive cultural relations between the Arabian Peninsula and neighbouring regions during prehistory, which, in turn, alerted the attention of the scientific community to the importance of the Stone Age in the Saudi Arabian context.

Neolithic remains have been discovered in different locations of Saudi Arabia, and brief reports were published over half a century ago, although they failed to attract much attention among the scientific community. This changed only after the discovery of Ubaid-style pottery in the Eastern Province during the early 1960s. In particular, the discovery of Ubaid-style pottery, which originates from Southern Mesopotamia (5th millennium cal BC) at numerous sites in the Eastern Province of Saudi Arabia, raised many questions, and scholars differed significantly in their attempts to explain the phenomenon of similarity between different types of pottery, while other aspects of culture went overlooked (Masry, 1977). These sites varied in size; some were temporary camps, while others were permanent settlements, as indicated by the successive layers and density of archaeological materials (Masry, 1977).

In the Northern region, many sites were found located in Al-Jawf and the Northern border region with assemblages that included blades that had been polished either on the back or sides, engravings, and pyramidal cores, which were generally similar to finds from the Pre-Pottery Neolithic period in the Levant (al-Sham) dating to around the 8th millennium cal BC (Kafafi, 2005). What is more, many similar sites were found on the hills of al-Nafud, with assemblages comprising blades, small blades, burins, and small quantities of arrowheads. Researchers observed that different types of tools were mixed with those previously mentioned, besides two pieces of pottery. This collection is likely to date to the Chalcolithic (Copper) period (i.e., the 4th millennium cal BC). It has been observed that the sites of the Neolithic period were not connected with buildings, such as the stone circles and ring circles that are found among the remains of the Chalcolithic (Copper) period (Alsharekh, 2002; Kafafi, 2005).

The assemblages from these sites are similar to those from the Levantine sites dating to the same period, and include various scrapers, burins, and axes. These sites spread in large numbers across the region, extending from the north of Wadi al-Sarhan to Hail and south to al-Kehaifiyah; they are also found in Southern Nafud (Parr, 1978, pp.29-49). The date of these settlements is estimated at the fourth or the beginning of the 3th millennium cal BC Furthermore, the examination of prehistoric sites in Tabuk, situated in Northwest Saudi Arabia, reveals the region's significance during the early stages of farming. These sites belong mainly to the Neolithic period and the early phases of the Chalcolithic era. Tabuk represents a confluence between the Arabian Gulf, Mesopotamia, Syria, Palestine, the Nile Valley and the Southern Arabian Peninsula. Furthermore, it is of particular importance for the history of the early man, who moved from Africa to Asia and vice-versa, as archaeological evidence suggests, making the region a meeting place of civilisations where ancient cultures flourished (Kafafi, 2017).

During the comprehensive archaeological survey conducted by the Saudi Antiquities and Museums Service since 1980, many prehistoric sites have been recorded. They range in date, according to the archaeological materials, between the Early Neolithic and Chalcolithic periods and the Bronze Age. One of these sites, labelled AlUyaynah (No. 200-104), is of particular significance, due to the presence of archaeological materials dated to the Early Neolithic that were previously unknown in this part of the Arabian Peninsula. The site was also the subject of visits from the Japanese mission to the Tabuk region in 2013, which also included the sites of Wadi Sharma 1, Wadi Ghubai and Wadi Mohorak (Fujii, 2018).

1.2 Research Aim

The research project aims to evaluate whether the Neolithic emerged in the Arabian Peninsula as a result of cultural influence from the Levant or due to a local development.

1.3 Objectives

1. To examine the main characteristics of the Neolithic landscape in North-Western Saudi Arabia.
2. To analyse and interpret the archaeological remains discovered during the course of excavation at AlUyaynah (such as figurines, shells, lithics, and ornamental items).
3. To specify the chrono-cultural contexts in which the AlUyaynah site evolved.

1.4 Methodology

The methodology used in this study is to analyse the various references in relation to the Neolithic period in the North-western region (Tabuk), in addition to the archaeological surveys and reports resulting from the comprehensive archaeological survey of the KSA, which commenced in 1975, and other surveys conducted by various archaeological teams, to provide a range of information regarding the study area (see chapter Two).

These reports assist the general understanding of the evolution of settlement patterns and the landscape; while they may also provide limited information on the economic, social, and environmental conditions in North-West Saudi Arabia during the Neolithic period (see Chapter Three). What is more, as expected from the first season of excavations at AlUyaynah (Al-Asmari, 2012), the site's importance is further supported by the discovery of more significant archaeological elements. The human group that lived in this part of the Tabuk region left a material and cultural legacy (stone tools, architecture, etc.) that encapsulate their activities and behaviour.

In addition to the limited archaeological excavations undertaken at AlUyaynah (Al-Asmari, 2012), which have revealed the site's importance, a clear plan for the archaeological survey and excavation was developed for the purpose of this study. The survey was undertaken on foot in order to locate as many sites as possible in the area. The field study includes observations regarding the landscape and a description of the site's environment, topography, and geology. Further to this, oral data were collected for the purpose of locating other sites that locals had discovered by chance.

Excavation trenches were dug in order to understand the archaeological sequence of the site. Additionally, samples of charcoal from different depths were collected to perform C14 dating. The excavation was conducted in a selected area located at the centre of the site. The excavation depth sometimes reaches up to 2.8 m, and all archaeological data were recorded and photographed during the excavation, as described in the excavation chapter (see chapter Four).

The clay objects are the most prominent collection of archaeological finds in the site. These were divided and sorted according to shape, the surface treatment, and characteristics, and measurements were taken for each piece (see chapter Five). The analysis includes an assessment of the raw materials, the technology, and the possible shapes of clay objects. The classification of lithic tools comprises two types of artefacts: chipped tools (e.g. points and arrowheads) and grinding tools. The material will be discussed according to the distribution of lithic materials, classification strategy, and data analysis. The latter includes the study of raw materials and the morphology of lithic tools (see chapter Six).

In addition, the animal remains were brought to the Department of Archaeology at York University, and classified according to the strata and trenches found within. They were subsequently given to a Master's degree student (Grothe, 2018) to perform the necessary analyses and to extract the results obtained for incorporation with the results of the analyses of the remaining archaeological finds, as described in Chapter Seven.

1.5 Structure of the Thesis

This thesis is presented in seven chapters.

Chapter One reviews the importance of prehistoric investigation and details the study's general objectives and the methodology used in this study.

Chapter Two presents general definitions of the Neolithic period, its traits and the major questions pertaining to the period. It also discusses the distribution and sequences through this period in the ancient Near East and the Arabian Peninsula. The chapter also re-evaluates the universal definition of the Neolithic, in terms of the Arabian Peninsula and adjacent regions. The results of data analyses from sites in the Arabian Peninsula region also constitute a key part of this chapter.

Chapter Three discusses the issue of climate change and the environment in the context of the Near East and Saudi Arabia.

Chapter Four reviews the fieldwork undertaken to date at AlUyaynah, detailing the completed works, including the methodology implemented in the fieldwork and archaeological survey, and presents the results of the archaeological assemblages.

Chapter Five is dedicated to the study of the clay objects and the importance of their development, as the first examples of this artefact group in Saudi Arabia date to the Neolithic period.

Chapter Six examines stone tools in terms of classification and analysis, including chipped tools and grinders.

Chapter Seven comprises a synthesis and discussion of the most important findings from the excavations. It also presents the results of C14 dating and reflects on the results from the analysis in terms of the Neolithization of the Arabian Peninsula.

Chapter Two – The Neolithic Period

2.1 Aim and Objectives

The present work discusses the Neolithic period, together with the definition, the traits and the major research questions in the Arabian Peninsula. In particular, this focuses on questions of definition pertaining to the Neolithic period and evaluates the nature of cultural and economic data. The chapter also discusses the detailed evidence from the Neolithic period in two major areas; the Fertile Crescent in the north and Arabian Peninsula in the south. Moreover, the chapter will focus on the cultural evolution of these regions during the Neolithic period, which will provide a basis for addressing the questions of the specific case study in the coming chapters; i.e. AlUyaynah site. This will also help the comparison spatially and temporally to archaeological assemblages elsewhere in Saudi Arabia and adjacent regions.

2.2 Structure of the Chapter

The current study, therefore, re-evaluates the universal definition of the Neolithic period in terms of the Arabian Peninsula and adjacent regions. Firstly, the initial definition of the Neolithic will be reviewed, and the cultural and economic aspects will be presented in detail. The evidence from the core historical areas, such as the Levant and Mesopotamia, will be compared to the Neolithic of Saudi Arabia, in order to add to the understanding of the Neolithic period in this region. The results of different surveyed or excavated sites from the Arabian Peninsula regions will also constitute a key part of this chapter.

2.3 Origin and Initial Definition of the Neolithic Period

The Neolithic is a period of prehistory marked by the emergence of the first sedentary agricultural societies. The use of the term “Neolithic” was originally proposed by John Lubbock, who developed the term "New Stone Age", and defined the period as characterised by pottery and ground and polished stone tools (Daniel, 1975). Even though the Neolithic was originally defined with reference to the presence of ground and polished stone tools in lithic assemblages, it quickly became associated with a major set of cultural and economic changes, including the use of pottery, the domestication of animals, agriculture and sedentary living (Jameson and Shaw, 1999). At the present time, however, prehistorians consider the presence of domesticated plants/or animals to be the most important. Thus, the Neolithic period could be defined as a prehistoric culture characterised by the presence of four criteria, which are:

A. Manufacture of pottery;
B. Grinding and polishing of stone tools;
C. Domestication of animals;
D. Agricultural practice.

In the current study, the Neolithic period is to be defined with reference to these criteria altogether, as they are thought to be traditional (Bogucki, 2008; Hayden, 1990; Pearsall, 2008). African archaeologists (Sadig, 2010), however, insist that evidence for all these "Neolithic" elements (which could be called a "Neolithic Package") are not necessarily found at the same site. For example, the presence of pottery and ground stone tools in Early Khartoum sites (traditional term for the Mesolithic in Sudan and other parts of Africa) caused them to be classified as Neolithic, although there was no evidence for domesticates (Arkell, 1953; Sadig, 2010). Early Khartoum sites dated to about 10000-5700 BP (9500-6500 cal BC) (Winchell 2003, p. 86). Thus, the Neolithic in these regions has included both the sites of Early Khartoum and subsequent Neolithic sites, from about 9500-3800 cal BC (Mohammed-Ali, 1982). Nevertheless, this classification is confusing, as these two cultures are quite different in stone tools, ceramics, and economies. The presence of domesticated animals was documented in many sites only after 4000 cal BC (Halland, 1987, p. 187).

The Neolithic period is documented to begin at widely differing dates in varied regions of the world. For example, in the Middle East, the period starts as early as the 10th millennium cal BC, while the onset of the Neolithic is identified across much of Northern and Central Europe with the arrival of the farming, between the 6th millennium cal BC (Linearbandkeramik (LBK) culture, Hungary) and the 4th millennium cal BC (Northwest Europe) (Jameson and Shaw, 1999).

According to the geographical areas considered, these important changes are relatively rapid, and some authors have been able to speak of a "Neolithic revolution" (Childe, 1934). Neolithisation, however, is a progressive phenomenon, occurring at different dates in various regions. In the Near East (Western Asia), the Neolithic period began around the 10th millennium cal BC (Bellwood, 2005). It ends with the development of metallurgy and the invention of writing, about 3300 years before the present era. In Western Europe it starts at around 5,000 cal BC and ends at 2,500 cal BC, although these dates vary with the sites, so the earliest Neolithic "village" that we know of is Jericho at around 8,000 or 7,000 cal BC (Gates, 2003, p. 18).

In this situation one would expect a gradual cultural development to increase systematically with the increasing knowledge of prehistoric people in regard to their environment. Neolithic people learned gradually how to utilise the hardest rocks for making improved implements. They also learned how to re-sharpen the edges of the tools. As a result of all these refinements, modifications and improvements, Neolithic communities started to alter their environment efficiently (Hole, 1984). Hence, polished stone tools at this stage were an inevitable outcome of long-lasting experiences.

One of the issues in the current study of the Neolithic period is to determine the right definition for it, which is controversial among many scholars. For example, Childe (1925; 1929; 1936) argued that the Neolithic period is a new "revolution" that is characterised by the production of food through plant cultivation and animal husbandry. According to Childe (1958, p.41), this revolution spread geographically from the Nile Valley to the Indus Valley and most of Europe as a result of the population's response to climate change from 10,000 cal BC onward. Many subsequent researchers emphasise that the Neolithic represents social and economic development, rather than a technological development (Bahn and Renfrew 1998). There is, however, widespread criticism of Childe's theory that climate was the only cause of this change (Boserup, 2014; Binford, 1968; Flannery, 1969; Braidwood, 1960). These researchers suggested other reasons, such as population growth, population pressure, amongst others to explain this change during the Neolithic period.

2.3.1 The Neolithic Package

In recent years, many researchers (Hodder and Hodder, 1990; Perlès, 2001; Thomas, 1991) argued that the term "Neolithic" has more meanings than mere technological or economic developments. The focus of this debate on the prevailing concept in these studies is the term of “Neolithic package”, which corresponds to technical innovations, domesticated species (sheep, goat, cattle), and material culture as characteristic of the Neolithic period in Europe and West Asia. However, there is still a debate regarding the term and its uses, such as the contents of this "package" that remain debated (Çilingiroğlu, 2005).

There are areas where the "Neolithic package" (agriculture, with grains and legumes; domestication of the five classical species, ox, pig, sheep, goat and dog, settled villages; ceramic presence) spreads simultaneously and within a few centuries, the cultural hegemony of the Neolithic becomes total; and others, in which these elements penetrate individually in a time span significantly longer. In order to take into account this complex situation, in which the coexistence of the different ways of life gave rise to a multitude of specific regional situations, there is a need to address the study of the Neolithic transition in the Arabian Peninsula. In this region, these elements are thought to have occurred individually and sometimes after the end of the Neolithic period (cultivation, for example). In some coastal Mediterranean areas, pottery and perhaps animal domestication, seems to have arrived prior to the full adoption of cereal agriculture. In other areas, hunters and gatherers appear to have evolved sedentary or semi-sedentary settlements before the advent of farming or to have adopted the use of pottery and apparent Neolithic stone industries without developing farming economies (Jameson & Shaw, 1999). An example of the latter is the Central Asian Kelteminar “culture”, which is often described as “Neolithic” in the literature, due to technological developments (particularly the adoption of pottery), even though the economy was entirely based on hunting and gathering (Lamberg-Karlovsky, 1994)

2.3.2 Chronological Setting

There is, however, a fairly broad consensus that one of the earliest Neolithic foci is located within the Fertile Crescent, in the Middle East. Towards the middle of the 9th millennium cal BC, human groups, already partly sedentary, began to domesticate animals (sheep, goats) and plants (wheat, barley and legumes) for food. During the 8th millennium cal BC, the first pottery appeared, and became widespread over the next millennia. Additionally, the new knowledge and the new practices which characterise the Neolithic of the Near East region gradually reached Western Europe and the periphery of the Mediterranean from 7,000 to 6,500 cal BC. They followed different paths, whether it was a dissemination of practices or migration of populations. Other parts of the world experienced a Neolithic process that is totally independent of the Middle East and Europe, for example in East and South-East Asia, Oceania, sub-Saharan Africa and the Americas (see Diamond and Bellwood, 2003).

The late Neolithic dating is also problematic. If one considers only the chronological period, it ends with the development of the technical use of metals and the beginning of the Bronze Age, at approximately 2,100 cal BC in Western Europe. The Chalcolithic is an intermediate period marked by the emergence of certain metals (copper, gold, silver), although it is still attached to the Neolithic period in many aspects (lithic and bone industry, ceramics, megalithism).

2.3.3 Domestication Process

Domestication is a complex evolutionary process in which humans came to manage plants and animals (Zeder, 2015). Domestication led to morphological, physiological and genetic changes in these organisms, which enables the possibility to distinguish domesticated taxa from their wild ancestors. This process is one of the most important economical innovations in human history; indeed, it was the mainstay of the Neolithic revolution. Domestication is one aspect of people's transformation of nature, according to its specific or individual purposes. It is initially part of the general process of a clear relationship between humans and certain animal and plant species, although it is gradually accompanied by a transformation of wild species in a sense that is useful to man.

Fundamentally, domestication has introduced close relations between humans and other living beings through more extensive and complex relations than are established by other degrees of dependence: commensalism, parasitism, symbiosis and even taming. It is highly probable that domestication is only visible in the Neolithic but could be the result of a longer process beginning in earlier periods. It is marked by a massive multiplication of certain plants and certain animals which became the main food source for man. It is difficult to establish with certainty the chronology of domestication, although it is probable that the domestication of animals is posterior to that of plants. The nomadic groups would first have become sedentary, and then would have practised cereal agriculture before beginning to herd animals (Haaland, 1987). For some scholars (e.g. Lees and Bates, 1974) pastoralism was created from mixed farming. They proposed that it was the incorporation of irrigation into farming which led to specialisation. However, there are exceptions to the association of the Neolithic and domestication: it is agreed that the dog was domesticated very early by nomadic hunters, by at least 9500 cal BC (Larson and Bradley, 2014).

Archaeological records show that the first undisputed dog remains were buried beside humans since 16,000 cal BC (Thalmann, 2018), with disputed remains occurring 36,000 years ago (Germonpré et al., 2009). Therefore, these dates imply that the earliest dogs arose in the time of human hunter-gatherers and not agriculturists (Freedman et al., 2014). Various authors have placed the origin of domestication in religious practice (Rodrigue, 1992); they believe that the economic appeared only later in addition to this practice. At the very beginning of the Neolithic, it is often very difficult to determine whether bone remains belong to a wild or domestic animal (Russell, 2016). The dates of domestication of the different species are therefore subject to numerous debates.

The emergence of agriculture is one of the Neolithic innovations with the greatest impact on social organisation. Sedentism has long been regarded as a consequence of agriculture, but it is henceforth, assumed that it has preceded it, especially during the Natufian (Henry, 1985). The particularly favourable climate of the Fertile Crescent made it possible for groups of hunter-gatherers to ensure their subsistence thanks to the abundant wild cereals of the region. Subsequently, it was proposed by Binford (1968) that population pressure led these groups to expand into less favourable areas, where it was necessary to take care of cereals and legumes in order to take full advantage of them.

It is unlikely that there is a single explanation for the adoption of agriculture in the various Neolithic foci around the world: millet is domesticated in the Sahara and probably in East Asia (Lu et al., 2009), with barley and wheat in the Middle East (Hillman et al., 2001). The climatic changes following the end of the Last Glaciation created more favourable conditions for plant growth and the success of this subsistence strategy. Hunting and fishing, however, are still used for a long time alongside crops and livestock.

2.4 The Neolithic in the Fertile Crescent

2.4.1 Regional Differentiations within the Fertile Crescent

Following Childe's publications, many archaeologists and prehistorians were interested in the Neolithic period in the Fertile Crescent. Archaeologists, who until then had been particularly interested in the historical periods of sites they were excavating, began to excavate to the oldest levels. Braidwood (1951), of the Oriental Institute of Chicago, was one of the principal architects of this change. Areas of interest then expanded from the Levant to Kurdistan, the Zagro in Iran, and then in Anatolia. Research became multidisciplinary. Reference sites were then found for these periods in: Jericho, Çatalhöyük, Mureybet, and more recently Göbekli Tepe and Nevalı Çori (Sagona, 2015). The interpretations of the "Neolithic Revolution" have since moved in several directions, which have focused on various different aspects of it.

The Neolithic period presents the domestication of many plants in this region: cereals (wheat, barley, and rye), lentils, peas, chickpeas, vetches or even flax (Gepts, 2014). Agriculture can develop without a process of complete sedentism and can be achieved alongside a semi-nomadic way of life. Nevertheless, only the complete sedentism of populations has allowed the development of substantial agriculture. The earliest evidence of settlements with domesticated plants identified at Abu Hureya (the earliest example of domestication of plants, c. 10,000 cal BC (Moore et al., 2000), Çayönü (Braidwood & Braidwood, 1982), and Jarmo (Braidwood & Braidwood 1950).

This evolution is confirmed by the disappearance of the microlithic tools and the multiplication of sickle blades (Unger-Hamilton, 1985). In addition, significant concentrations of pollen indicate the presence of fields near villages, such as at Mureybet (Bounni, 1977). This was also supported with the study of small tools from late Natufian levels at Mureybet, such as lunates and triangles which might have been used as sickles to cut wild plants, which could be represented in these periods by a small number of tools with traces of lustre, probably "plant gloss", as well as different kinds of pre-agricultural plant utilisation as revealed by the study of pollen (Anderson-Gerfaud, 1983). In the area extending "In the valley of Jordan", some true villages were built, such as Jericho, which was surrounded by an imposing stone wall, dominated by a high tower of more than 8 metres with an internal staircase that accessed the roof (Kafafi, 2005).

The beginnings of the agricultural economy, however, are not limited to the area of the Levant. The material cultures across the wider Near East region were not uniform and one can note regional particularities. For example, to the east, the mountains of Zagros were dotted with small seasonal settlements for the use of mobile hunters (Asouti, 2006). In Northern Mesopotamia, villages of round houses similar to those of the Levant appeared (M'lefaat, Nemrik or Qermez Dere), although the economy there was at the pre-agricultural stage (Kafafi, 2005). The archaeological evidence from such sites provides important insights into subsistence strategies and exploitation of plants for every site. For most of them, there is no secure evidence for domesticated plants, and only questionable evidence for domesticated plants at any site before 9500 cal BC (Nesbitt, 2002, pp. 113-132). Direct evidence of grain is still needed to ensure that agriculture was fully practised in these sites. For this reason, researchers consider such sites to be pre-agrarian (Savard et al., 2003, p. 105).

The domestication of animals, except for the dog, occurs at a later stage. During the Neolithic period, animals with economic functions were domesticated: swine, cattle and sheep. It was suggested that these animals would have been domesticated for the purpose of participation in the first agricultural tasks, as well as for their meat (Larson and Fuller, 2014). It appears that the domestication of animals appear earlier in Western Zagros and Kurdistan, in Zawi Chemi (Solecki, 1981), Jarmo (Braidwood & Braidwood, 1950) or Ganj-i Dareh (Gallego-Llorente et al., 2016), but also farther east to Aq Köprük in Afghanistan (Sarianidi, 1992). There are, therefore, great differences throughout the Near East, and thus, it is not necessary to seek a single focus of domestication of animals.

2.4.2 The Levant

In the Levant, Neolithisation began around 13,000 cal BC (Kafafi, 2005). Characterised by shifting from hunting and gathering to food production, Neolithisation in the Levant includes five periods; during the Natufian period (from 13000 to 9600 cal BC), nomadism declines. The Pre-Pottery Neolithic A (PPNA), from 9600 to 8700 cal BC, marks the first attempts of agriculture, while the Neolithic Pre-Pottery B (PPNB) was from 8700 to 6900 cal BC), and then the pre-Pottery C (PPNC) from 6900 to 6500 cal BC). At the time of the Pottery Neolithic (PN), from 6500 to 5000 cal BC), the technique of the ceramic production developed in the north and was used for the first time in the south (see Figure 2.1).

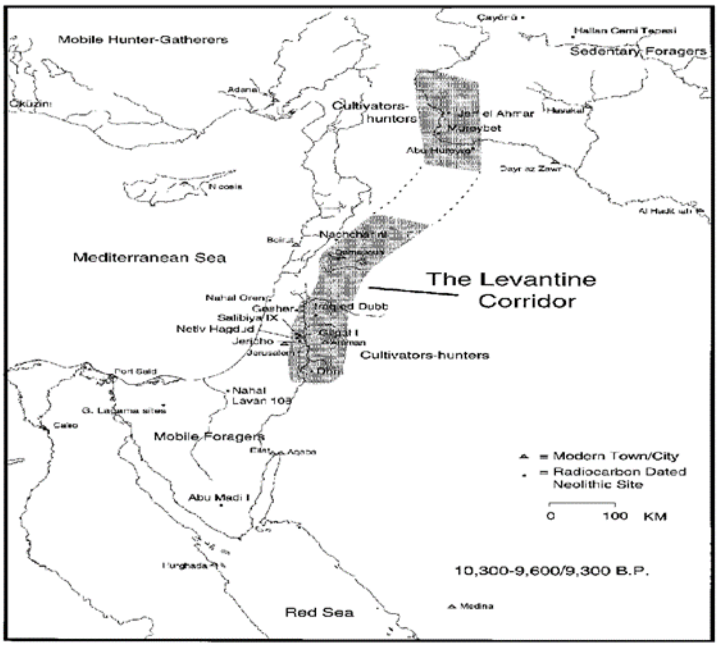

Figure 0.1: Pottery Neolithic A sites- A map of the Levant showing the distribution of known Pre. (Yosef, 1998)

Within the PPNA large residential communities, which were characterised by a small number of sites, the first agricultural villages arose on the ruins of the former villages or new sites became occupied. Examples of these are Maribit and Wadi Al-Falah in Syria, which were built on the ruins of the Natufian villages (Kafafi, 2005). In this period, the pattern of circular and rectangular houses appeared, although the circular houses were the most prevalent. The scientists attributed this to the emergence of the new economic pattern, which was represented by agriculture. There are sites in new areas, such as Sheikh Hassan and the site of Al-Jarf Al-Ahmar in Syria (see Figure 2.2) (Muheisen, 1994, pp. 47-48).

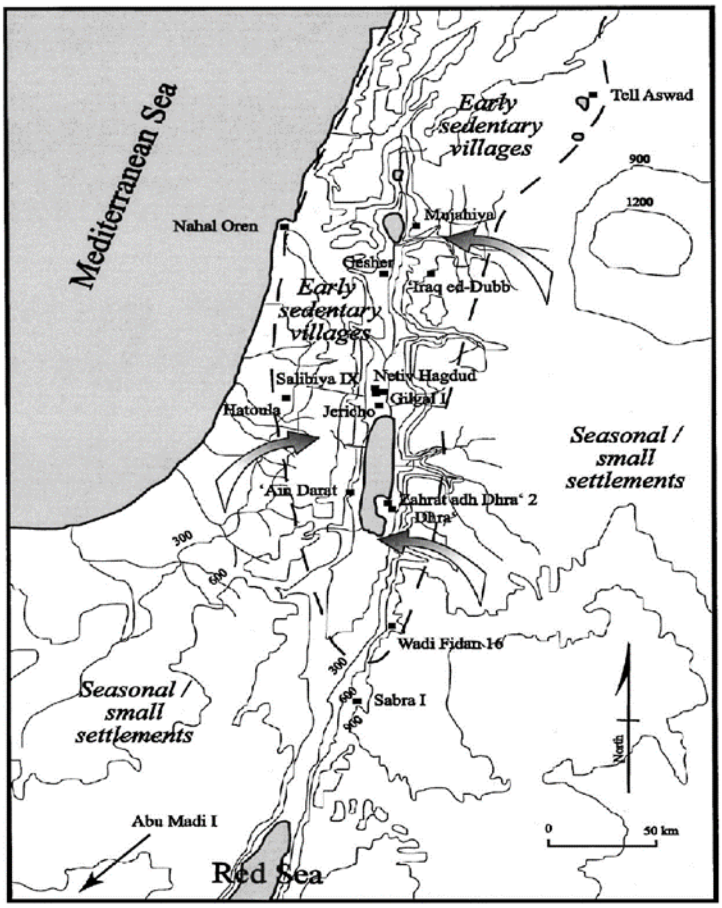

Figure 0.2: Pottery Neolithic A period site distribution in the Southern Levant. Note the Pre 2.2 contraction of communities in to the Levantine Corridor from the preceding Natufian period (Kuijt & Goring-Morris, 2002)

Various material cultures were identified in the Levant throughout the Neolithic period. In the PPNB similarities in the material culture are clear among the sites of the North (Middle Euphrates) and the South (Palestine, Jordan). In terms of shared characteristics, human groups in the northern region, as well as in the southern region, domesticated goats and aurochs, while consolidating their agriculture. Their villages, composed of rectangular dwellings, increased in numbers of inhabitants. Moreover, storage structures are placed in individual dwellings rather than in common spaces (Lebreton, 2003; Byrd, 2002); while, lithic materials used sophisticated techniques to produce large points (Yerkes et al., 2012). Finally, in iconography and symbolism, an increasing importance is given to humans (Stordeur, 2010); as well as masculine attributes throughout different species, such as presenting the image of a bull and showing the penis on some of them.

Apart from these shared characteristics, others are found only in the south and, for some, also in Syria. These include plaster statues, plastered skulls, stone masks, stone and bone-shaped sharp tools, the use of naviform pattering on large blocks of stone among others (Stordeur, 1989a), the persistence of round constructions, as well as animal husbandry mainly oriented towards caprines (Kafafi, 2005). In contrast, painted walls, burials in buildings especially designed for this purpose (Coqueugniot, 2000), "mats" basketwork, polished axes and poles are only observed in the north (Kafafi, 2005).

The people responsible for these two different material cultures were related. The presence of obsidian from Anatolia in the south is the best evidence of this relationship, as it may represent a form of trade (Cauvin, 1994). The relations between the north and the south, which began, in fact, from the end of the Natufian, reach a particular intensity during the PPNB. During this period, many characteristics seemingly appeared in one of the two regions and spread throughout the Levant (Henry, 1985). For a long time, however, archaeologists believed that most of these traits had been transmitted from north to south (Cauvin, 1994). These characteristics included rectangular architecture, and sheep breeding. Several hypotheses concerning the type of relations between the Northern Levant and the Southern Levant were then proposed. According to Cauvin (1994) and Edwards (2004), only the migration of populations from north to south and their establishment in the south during the PPNB could explain the abrupt and sustainable character of the Northern characteristics in the south.

Another hypothesis states the transmission of characters from one region to another would have taken place without migration, but rather through the process of borrowing objects and ideas, contacts and exchanges were intensified. Gopher (1989; 1994), uses the frequency of flint points in space and time, which demonstrates that these points were not all introduced simultaneously into the south with the arrival of a new population, but that they spread gradually, suggesting contacts and transfers of ideas. It should be noted, however, that this spatio-temporal study uses data from Tell Aswad in Syria; the dating of which has recently been corrected (Henri 1974). Subsequently, the PPNA period (9500–8700 cal BC) is now considered to be absent (Helmer et al., pp. 41-67). Supporting Gopher's perspective, anthropologists (Kurth and Röhrer-Ertl, 1981) working on the Jericho skeletons did not note any changes between the PPNA and PPNB populations.

During the last phase of the PPNB, the middle of the 7th millennium cal BC, major changes occurred. The most important of these changes was the spatial and geographic spread of the settlements. In order to cultivate grain, some former villages had been abandoned, such as the sites of Maribit and Sheikh Hassan, and people moved south to drier areas (Muheisen, 1994, pp. 54-56). They were located at the sites of Abu Hurayrah, Bouqras in the Euphrates basin and el-Kom in Syria, as well as forming new settlements in Tell Alramad and Ras Shamra along the Syrian coast, and at Al-laboa in Lebanon, as well as another set of sites in the south of the Levant. Evidence shows that the main reason for this shift was caused by a drier climate (Muheisen, 1994, p. 56), which forced the Neolithic communities to move from the previous areas to other sites with permanent water sources, although some sites demonstrate continued occupation.

In this period, new farming techniques emerged, such as irrigation rather than rain-fed agriculture, which suggests that greater social organisation or hierarchy was present to manage this new technology (Muheisen, 1994, pp. 54-56). In regard to the architecture, there was a new architectural arrangement of the villages, which is represented in the houses. Plaster and mortar were used in the construction of the floors, and the houses were provided with fireplaces for cooking and heating. The village of Bouqras was considered an example of the above developments, where the presence of limestone flooring was built according to an arbitrary scheme (Muheisen, 1994, pp. 54-56). The site of Ain Ghazal in Jordan, which is one of the largest sites of the Neolithic Age, was also a site of this period; the village was walled, and its streets were paved (Grissom, 2000; Al-Nimri, 2002, pp. 39-40).

These sites contained more evidence of domestic cattle and goats, which suggests communities were starting to benefit from regular access to meat, milk and skins, in addition to wheat and barley, which could be considered as "mixed farming" (Muheisen, 1994, p. 56). The most prominent feature at this site is the pottery industry, although the manufacture of bone and stone tools continued. At that site, the majority of the pottery that was manufactured was large-sized vessels, such as saucers and plates (Muheisen, 1994, p. 56).

People had to become more organised than before, and they developed religious and social authority, following an increase in the population and the development of their spiritual and material needs (see Figures 2.3, 2.4); this was clear in sites such as Ain Ghazal. One of the most distinctive features of the Ain Ghazal site is the human sculptures, as well as clay figurines that represent the dominant animals, such as goats and cattle (Abu Ghneima, 2004). The human bodies of Ain Ghazal were buried under the floor of the houses in contracted positions, where the skulls were removed from the body, and they were buried in groups in special burials (Abu Ghneima, 2004, pp.25-86). These traditions might represent a kind of ancestor veneration and religious rites (Kafafi, 2005, pp.142-145).

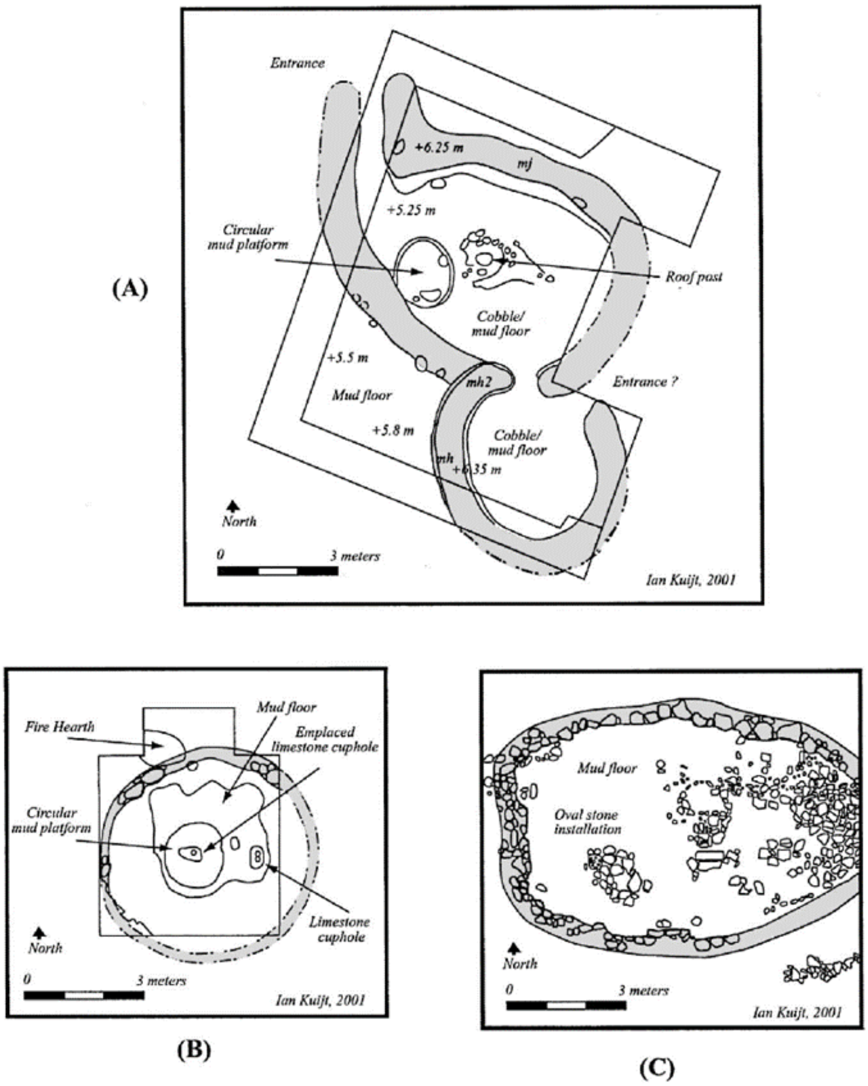

Figure 0.3: Plan view of Pre-Pottery Neolithic A period residential architecture from (a) Jericho Sq M1, stage VIII, phase xxxix; (b) 'Iraq ed-Dubb, Structure I; and (c) Netiv Hagdud, Locus 40 x (based on Bar-Yosef and Gopher 1997)

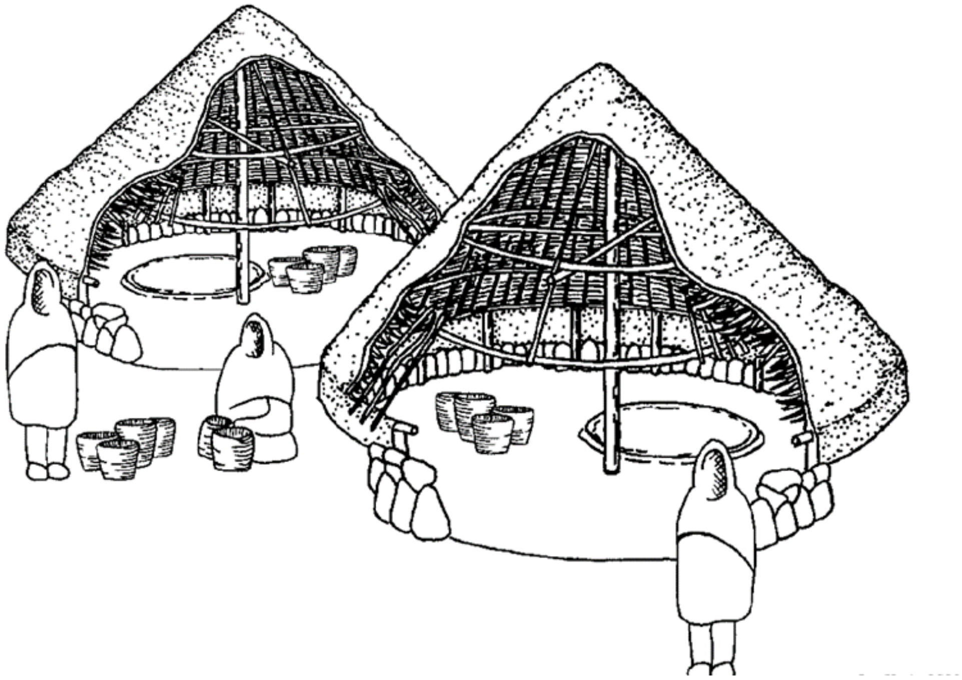

Figure 0.4: Pottery Neolithic A period residential structures- Pre-Reconstruction (after Kuijt, and Goring-Morris. 2002. Fig 3)

2.4.3 Mesopotamia

Throughout the 6th millennium cal BC, full development of the Neolithic phase in different geographic regions of the Near East can be found. This Neolithic phase is divided into several representative areas, contemporaneous in time, around the Upper Mesopotamian area: Umm Dabaghiyah culture (north bank of the Euphrates, c. 6000-5500 cal BC), Hassuna Culture (north bank of the Euphrates, about 5500-5000 cal BC), Samarra Culture (middle course of the Tigris, about 5600-4800 cal BC), and Halaf Culture (present day North-Eastern Syria, approximately 5600-4500 cal BC). Simultaneously, in Lower Mesopotamia the first two sub-phases of the El Obeid/Ubaid period (c. 5000-4500 cal BC) occurred.

2.4.3.1 Umm Dabaghiyah Culture

Umm Al-Dabaghiyah, in the foothills of Sinjar Mount in North-Western Iraq, contains 12 archaeological strata, all inhabited between the end of the 7th millennium cal BC and the beginning of the 6th millennium cal BC, between c. 6,200 and 5750 cal BC (Kirkbride, 1972, pp. 3-15). The site contains houses made of mud with the walls and floors constructed from mortar. The most important feature of this site is the pottery assemblages that consist of vessels such as pitchers, saucers, jars and pots with bases and legs, which were found in different types, some of them primitive, simple and rough, while others were polished and decorated, with geometric decorations in red, or decorations of animal and human forms (wild ass and human faces) (Nishiaki and Le Mière, 2005). Stone vessels and stone tools include arrowheads, small blades made of obsidian, and tools made of basalt, most notably polished axes. Human and animal clay figurines, mostly women in the sitting position, were also noted. Other artefacts include beads made of green stones, marble, shells and sapphires imported from neighbouring regions, both Anatolia in the north and the Arabian Gulf to the south, and bone industries, such as knives, needles, spoons and blades (Kirkbride, 1974). There was evidence of wheat, barley, chickpeas, lentils and domestic animals, especially: goats, sheep, cattle, pigs, and dogs. Specifically, the wild donkey appeared to have had a significant impact on the life of this settlement, as evidenced by its large number of bones. The wild ass also appears on the remains of murals, including a colourful painting on the walls of a house that represents hunting an animal by chasing it into a strong net (see Figure 2.5) (Kirkbride, 1982, pp. 11–21).

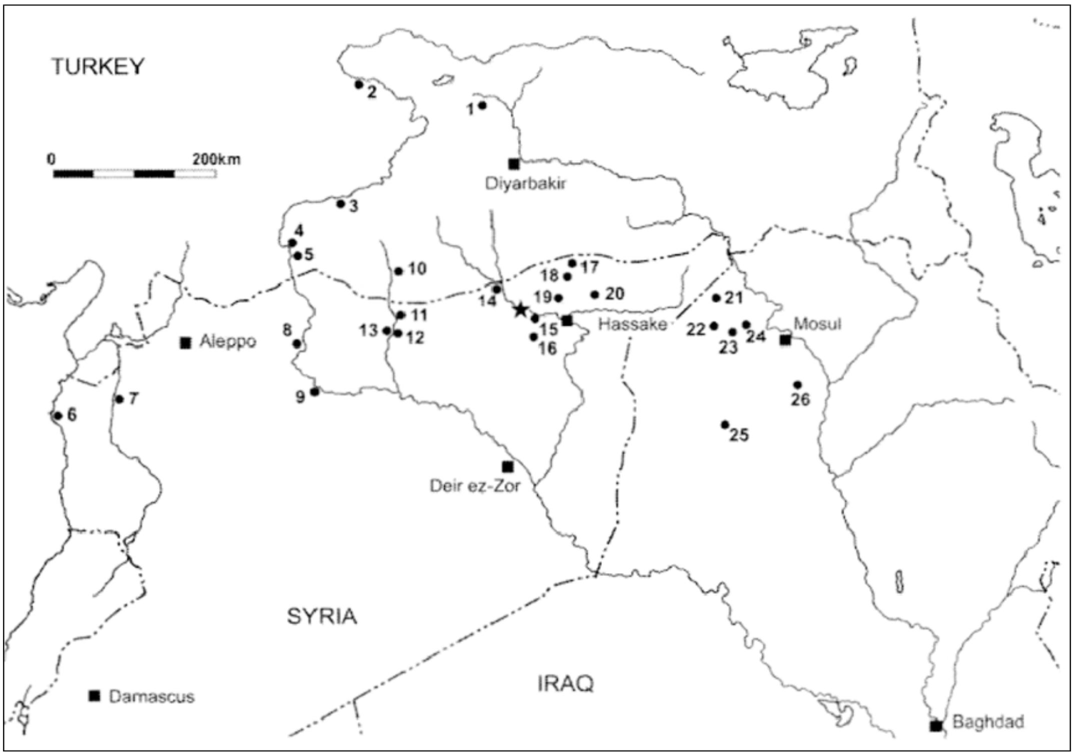

Figure 2.5: Map showing the location of Umm Dabaghiyah (25) and other sites mention in the text. 1 : Cayonti ; 2 : Cafer Hôytik ; 3 : Kumar tepe ; 4 : Mezraa-Teleilat ; 5 : Akarçay ; 6 : Ras Shamra ; 7 : Ain el-Kerkh ; 8: Halula ; 9: Abu Hureyra ; 10: Gù'rcti tepe ; 11 : Assouad ; 12 : Sabi Abyad I ; 13 : Damishliyah ; 14: Halaf; 15: Feyda ; 16: Gharrah (Jabal Abdul Aziz) ; 17: Khaneke ; 18 : Raheke ; 19 : Kashkashok II; 20 : Khazna II; 21 : Ginnig ; 22 : Maghzaliyah ; 23 : Sotto ; 24 : Thalathat II ; 25 : Umm Dabaghiyah ; 26 : Hassuna. (Adopted from Nishiaki and Le Mière 2005)

2.4.3.2 Hassuna Culture

The culture of Hassuna replaced that of Umm Dabaghiyah, in basically the same geographical area, and between 5500 and 5000 cal BC, approximately. The inhabited areas that were found for this culture follow the pattern of its predecessor: rectangular houses of several rooms and of rectangular form, with square warehouses. However, it differs in two aspects: the way of life and pottery. They lived from dry farming (no irrigation evidence has been found), as well as livestock and hunting (Mortensen et al., 1970). Their pottery is still not too colourful, but it becomes more technically advanced as there were different types, such as coarse ware, burnished ware, Archaic painted ware and Hassuna standard ware (Nishiaki and Le Miere, 2005).

The cultural materials from Tell Hassuna include stone tools, especially machetes, and axes. There are beads and some flat stone seals with geometric decorations, and small human figurines (Mortensen et al., 1970). Barley and maize, together with domestic animals, such as sheep, goats, cattle and pigs, indicate that agriculture was practised at the settlement (Lloyd and Safar, 1945; Abdul-Aziz et al., 1966).

2.4.3.3 The Samarra Culture

The ‘Samarra culture’ originated in Northern Mesopotamia and the Zagros region around the middle of the Hassuna period (c.5600 cal BC), continuing until the beginning of the Halaf phase (c.5000 cal BC). The main sites of this culture include Samarra (Herzfeld, 1927), Tell es-Sawwan (El-Wailly and al-Soof, 1965, pp. 17-32), and Tell Songor (Matsumoto, 1987). The evidence found at these sites includes pottery decorated with painted geometrical and figurative motifs, female figurines, and carved marble vessels. Another novel element is that hunting has become a marginal element, as irrigated agriculture has become clear. The Samarra culture is subdivided into Early Samarrra (5600-5400 cal BC), Middle Samarra (5400-5000 cal BC), and Late Samarra (5000-4800 cal BC) (Matsumoto, 1987; Northedge, 1990).

2.4.3.4 The Half Culture

Tell Halaf is the type-site of the Halaf period in Northern and Eastern Mesopotamia (c.5500–4500 cal BC). Typical Halaf artefacts included flint and obsidian tools, female figurines, amulets and pottery (Von Oppenheim, 1933). As with the Samarra culture, the Halaf culture was also sub-divided into three periods: Early Halaf (5600-5300 cal BC), Middle Halaf (5300-4800 cal BC), and Late Halaf (4800-4500 cal BC). The economy of the Halaf culture was characterised by farming based on rainfall, rather than irrigation. The settlements consist of small houses and include small mud-brick beehive-shaped huts or storerooms. The pottery is characterised by geometric decorative motifs and are considered one of the most developed ceramic styles of all the Neolithic of the Near East (Watson, 1983; Roux, 2007).

2.4.3.5 El Ubaid Culture

The site of Eridu (in the southern-most part of Mesopotamia) is the origin of the first phase of this culture (El Ubaid I). There is little evidence, however, relating to the origin of Eridú culture, due to the limited archaeological remains of earlier stage of its development (Hall & Woolly, 1927). The fact is that, even for the oldest sites of the El Ubaid culture, it is possible to already note a fully established knowledge of cereal agriculture: irrigation agriculture, fishing, and refined ceramic technologies. The site of Hajji Muhammad is the major type site for the El Ubaid II phase (Kurt 1996, pp. 22). The culture of Hajji Muhammad extended from Eridu itself to Kish, much further north, reaching Choga Mami (near the Diyala River) and Khuzistán. Both sites (Eridu and Hajji Muhammad) represent the starting point of the culture of El Ubaid, with Mesopotamia as the central focus for the technological and organisational progress of this period, extending into the Eastern Province of Saudi Arabia. El Ubaid's culture in Iraq is divided into successive stages according to the dates of sites and the classification of its material culture, including buildings, artistic finds, stone tools and pottery. This culture began in the 6th millennium cal BC and was rich in the material heritage represented in the economic achievements based on cultivation, animal breeding, sea and land hunting, as well as the exchange of different resources. El Ubaid was famous for its hard well-fired and painted black and dark brown pottery. Some of those pottery productions were pots, dishes, jugs, glasses decorated with lines and geometrical, human, plant, and animal shapes (Davidson & McKerrell, 1980, pp. 155–167). Wheel thrown pottery was also invented during this period; while engravings, drawings and different types of art techniques also flourished (Kurt, 1996, pp. 22). These settlements expanded and developed different "neighbourhoods", which indicates a complicated social organisation. Among the architectural establishments, there were simple religious buildings that developed into very large temples over time, which represented high positions of religion in the society (Masry, 1974).

2.5 The Neolithic Period in the Arabian Peninsula

2.5.1 Yemen

The aforementioned Neolithic package is not found with all its aspects in the Arabian Peninsula. The Neolithic that is referenced in the Yemeni region is generally characterised by the changes that occurred in the patterns and forms of the settlements, not the economic and social transformations. While the prehistoric cultures came to end in Mesopotamia and the Nile Valley with the emergence of cities and the beginning of writing in the second half of the 4th millennium cal BC, they continue in the Arabian Peninsula until the end of the 2th millennium cal BC, when the southwest kingdoms emerged in Yemen.

The term Neolithic in Yemen, however, is related to two major factors (Fedele, 1988, p. 34):

1. The existence of lithic tools without the existence of pottery vessels accompanying them.
2. The appearance of architectural remains (huts) alongside these tools, and most often the shape of these buildings is elliptical and some of the floors are paved with stone.

Hence, the definition of the Neolithic period mentioned above does not take into account different economic and social transformations. Note that some researchers believe that finding grinding tools in Yemen indicates food production (AlMaamary, 2009, pp. 7-38); although such tools are also related to non-Neolithic societies elsewhere (Sadig, 2010, pp. 29-50). Separately, a number of pottery vessels were found in Ramla al Saba'aten and date back to the fifth and 4th millennium cal BC (Doe, 1983, p. 36).

During the archaeological excavations undertaken by the Italian Archaeological Mission between 1984-1986 at the site Wadi Al Taialh 3, the archaeologists identified a settlement from the Neolithic Age (6th and 5th millennium cal BC), whose inhabitants did not manufacture pottery vessels, but were characterised by the production of small flint tools which accompanied simple, most frequently round, stone buildings (Fedele, 2008, pp. 153-171). In addition, the Neolithic people practised a variety of arts, especially rock paintings, in the areas of Northern Yemen and the area around Sa'da city, which featured a number of animal drawings, such as buffaloes and Ibex (Avanzini, 2005). In Hadramout, especially in the southern Jawl heights, a number of large stone-built tombs (Megalithic) were found. These tombs appear isolated or co-located with other structures. They consist of circular tombs, mostly connected to a stone-built tail-like structure some 100 meters long (Bulgarelli, 1989).

Based on the discussion above, we can say that we have no evidence of agricultural villages dating back to the Neolithic period in Yemen, and all the information we have is indicative of the presence of pastoral communities and fishermen, where many shell-midden sites, with some containing fish bones, have been located along the coastal shores (Rashad & Enzan, 2008, pp. 29-51). However, archaeological excavations in the future may challenge this picture.

2.5.2 Oman

As a result of the increased interest in identifying the nature of the coast of the Arabian Sea of Oman and the transformation from the life of mobility based on hunting, gathering and fishing to sedentary food production in the Bronze Age, a French archaeological mission started in 2010 to conduct an archaeological survey in several coastal areas in Oman. A number of archaeological sites, most of which were formed from the accumulation of sea shells, were recorded and dated between the 8th and 1st millennium cal BC; the most important site is the site of Ras al-Jibsh in Al-Khoeimah (Charpentier and Crassard, 2013).

A number of Neolithic sites, dating back to the 7th millennium cal BC, were also found across Oman, where a number of arrowheads were collected. According to Zarins (1999, p. 38), three different stages of the Neolithic period were identified in the Dhofar area of Oman. The oldest was characterised by the presence of arrowhead blades, such as those found in the north of the country in the locations of Fassad, Khabrot, Al-Khasafa, Ramlat al-Sahmah, Shu'aymiyya and 'Amla, similar to those found in Jabal Tuwaiq, Jabal Dibba and the Empty Quarter of the of Saudi Arabia (Zarins, 1999, p.38). During the surveys conducted between 2004 and 2011 in Dhofar/Oman, 300 prehistoric sites were recorded (Hilbert et al., 2012, pp. 101-108). Furthermore, Pullar (1985) reported that a large number of sites were identified in Oman dating to the pre-Pottery Neolithic period. These sites were mostly located near permanent water sources.

Zarins (1999, pp. 78-79) dated the second phase of the Neolithic period in Dhofar to between about 5000 and 3800 cal BC on the basis of available C14 dates from the region. During this phase, the lithic industries were characterised by the presence of bifacial polished arrowheads. Grinding tools were also recorded in the sites belonging to this period. A number of shell-midden sites dating to this Neolithic period (5000-3000 cal BC) were also found in Oman. Following this, the third and final phase is dated between 3500 and 2300 cal BC (Zarins, 1999, pp. 79-80), where the region was dominated by a dry climate; thus, very few sites were located there. At this stage, the stone industries included denticulate sickle blades and scrapers similar to those found in the Shabwa region of Yemen. Large numbers of soapstone pots were also found. In addition, prehistoric pottery vessels dated to pre-dynastic times of Mesopotamia were also recorded.

In addition to the above, Uerpmann (1992), through the study of lithic tools and C14 dates, identified several sub-phases of the Neolithic period in Oman. It was clear that the beginning of the Neolithic era was the beginning of the Holocene climatic period. This is supported by Nasser Al-Jahouri (2008), who demonstrated that during the second quarter of the Holocene, a number of sites dating to what is known as Qatar B, revealed blades and arrowheads both in the inner region of Oman and along the Omani coast. It was replaced in the 5th millennium cal BC by a new lithic technology known as Saruq Facies. However, it appears that the full development of sedentary life on the Omani coast was in the 4th millennium cal BC (Ra's al-Hamra Facies) with a number of sites identified around the cities of Muscat and Sur. The last phase of the late Neolithic period was the presence of coastal sites called Bandar-Jissah Facies, where people used metal as well as stones in the manufacture of their tools (Al-Jahouri, 2008).

Apart from these Neolithic divisions in Dhofar/Oman, researchers have studied a number of sites which contained fish bones located in and around Northern Oman. A number of them were discovered in the area between the cities of Qaryat and Sur, and from there along the coast to Dhofar. Likewise, during the archaeological surveys in Wadi 'Anadam, Bahala and other areas, a considerable number of Neolithic sites were found in the Omani interior (Coppa et al., 1985). The most important of which is the site of "Ra’s al-Hamra" where an Italian mission began working on the site in 1977 (Tosi, 1989). Ra’s Al-Hamra is located 13 km from the capital city of Muscat. Archaeological excavations revealed tombs, marine shells, fishing hooks, and decorative tools (Coppa et al., 1985; Biagi, 1987). The excavation at Ra’s al-Hamra 5 provided information in regard to the burial habits of the Neolithic period in Oman (c. 4100-3300 cal BC), including the oldest symbol of the tortoise, the oldest evidence of burning the remains of the dead, the burial of children with their mothers, and jewellery ornaments (Al-Jahrwari, 2008, pp. 20-21). What is more, in the area between the cities of Muscat and Sur, specifically in the Wadi Shab-Gasi and Wadi Tiwi, the archaeological remains from the 4th millennium cal BC were mostly formed of flint implements, beads and other stone ornaments and hooks (fishing hooks), and fishing net sinkers (Usai, 2006, pp. 275-288).

2.5.3 The United Arab Emirates (UAE)

Most researchers agree that the eastern regions of the Arabian Peninsula, and the western coast of the Arabian Gulf formed a single cultural unit through the different ages. The south-eastern corner of the Arabian Peninsula has played a distinctive role in the cultural construction of the Arab world from prehistoric times to the present day. Indeed, this area is characterised by a geographical location that has made it a link between the civilizations of Central Asia, Iran, Mesopotamia and the Arabian Peninsula.

Between 9,000 and 6000 cal BC, known to the archaeologists working along the Gulf as the Neolithic period, the region experienced a remarkable rise in humidity and heavy rains (Rashad and Enzan, 2008, pp. 61-68). It appears that during this period, people moved towards some parts of the UAE, where they mainly moved from one place to another with no traces of permanent settlements. They also practiced fishing and collected plant food. As a result of this movement, the nature of the archaeological finds from this stage and the nature of the sandy area, the researchers in the UAE have not yet found much archaeological evidence of permanent settlements. However, from the discovery of lithic tools that are scattered over the surface, the pre-Neolithic can be dated generally between the seventh and 4th millennium cal BC. A number of such sites were found, particularly on the foothills and fringes of the Hajar mountain range (Cleuziou, 1982).

Cleuziou (1981, p. 6) suggested that the first signs of the UAE human presence were found on the eastern outskirts of the Emirate of Abu Dhabi, in the Liwa Oasis on the marginal fringes of the Empty Quarter (Cleuziou, 1982). Other sites of the Neolithic period are spread over several parts of the UAE, such as Jebel Hafeet, Mezid, and Jabal Al Huwiya. Further sites were also recorded near Al Ain, above the foothills of the Hajar Mountains and adjacent plains, Jabal al-Faiya, Jabal al-Buhais south of al-Dhaid, Qassimiya, the old airport in Sharjah and the Khat region of Ras al-Khaimah (de Cardi, 1976; 1984). The researchers classified these sites into two types: the first lacked pottery vessels; while the other contained pottery. The oldest of the sites mentioned above is Mezid, where its lithic tools are dated to the seventh and 6th millennium cal BC according to known samples from other parts of the region (Gebel et al., 1989). In Al Ain and several other parts of the UAE, arrowheads and spears made of flint were found.

Archaeological excavations in an area to the south of Abu Dhabi Airport have uncovered archaeological remains dating from approximately 3100 to 2700 cal BC (Beech et al., 2004). On the site there were pottery vessels from a post-Neolithic tradition called Um al-Nar (Beech et al., 2004, pp. 1-15). However, the study of the lithic tools discovered at the site indicates that it dates back to the period between the fifth and 4th millennium cal BC (Kallweit, 2004, pp. 139-145). A collection of pottery vessels found in tomb A at Hili dating from approximately 2700 to 2000 cal BC indicated a great diversity in the forms of these vessels, especially in the forms of jars, which demonstrates evidence of cultural interaction with neighbouring countries, such as Mesopotamia, Iran, and India (Méry, 1997, pp. 171-191).

In addition to the above, archaeological surveys conducted in the Umm al-Zamul area, southeast of Abu Dhabi, revealed two Neolithic sites belonging to pastoral communities in the Empty Quarter. These sites are: Khor al-Manahil, which was dated between the 7th and 5th millennium cal BC, and Kharimat Khor al-Manahil, which dated to c.9000 cal BC. It appears that the region was wetter and more habitable than the present day (Cutter et al. 2007, pp. 61-78). Besides, researchers have argued that the deserts of the Arabian Peninsula had a high rainfall during the period between 9,000 and 6000 cal BC (Parker et al., 2006a).

The archaeological fieldwork that has taken place on some of the islands of the UAE in the Arabian Gulf found evidence of the presence of people during the Neolithic period. In Akab, near the Strait of Hormuz, a settlement of the Neolithic period dates back to approximately 4,700 and 3600 cal BC (Charpentier and Méry, 2008, pp. 117-136). On the Al-Marwah Island, about 100 km west of the city of Abu Dhabi, the remains of elliptical houses that were built of stones, tombs, tools and pottery fragments were recorded. The C14 date from this site is 5630 ± 50 BP = 4550 - 4350 cal BC (Beech et al. 2005, pp. 37-56).

Based on 14 radiocarbon dates, the researchers concluded that the actual start of human activities on the land of the UAE was approximately 5890 cal BC. The large number of archaeological settlements along the coast of the UAE relied on shellfish mainly (Kutter and Beauclair, 2008, pp. 134-143). The oldest pottery sherds found in the UAE so far are of the kind known as the "Ubaid Culture" (Boucharlat et al., 1991). Separately, an important location where such pottery was found is the island of Dalma, west of Abu Dhabi, the Beshgara area in Sharjah (Beech et al. 2000, pp. 41-47), in Jabal al-Buhais south of al-Dhaid, and on sites above Umm al-Quwain beach. A number of tombs were found at the latter site. The discovery of this type of pottery in the UAE indicates that there were trade ties and links with the surrounding areas, especially with the coasts of the Western Arabian Gulf and Southern Mesopotamia.

Archaeological excavations conducted in 2006 and 2010 at the site of Jabal Faya in the Emirate of Sharjah revealed a cemetery dated to the Neolithic period (c. 4200-4900 cal BC). Unfortunately, a number of graves were damaged before the archaeological excavations. In addition to the tombs, round-shaped buildings built of stone, lithic tools, and skeletons with funerary goods, were recorded (Kutter and Beauclair, 2008, pp. 134-143).

2.5.4 Qatar

Archaeological excavations in Qatar were started by a Danish team in 1957, who conducted archaeological surveys covering most of the country. Researchers divided the Stone Age in Qatar into three specific periods: The Stone Age, the Neolithic Age and the Chalcolithic Age. Other missions also identified many other prehistoric sites in Qatar (see Tixier, 1982, pp. 79-80; Muhesen et al., 2012, pp. 223-232).

The Neolithic period in Qatar is characterised by livestock, fishing, pottery, trade, and rock paintings, such as from the site of Jebel Jassassiyeh (Facey, 1987). The lithic tools of this period are characterised by a variety of shapes, and some were polished. The tools include arrowheads, burins, and scrapers. Among the most prominent sites of this period are al Da’asa, Ras Abruq, Al-Wasil, Al-Jassa'iyah, Bir Zekrit, Al-Junib and Shaqra. Additionally, Ubaid culture pottery was recorded (Facey, 1987).

2.5.5 Bahrain

Archaeological evidence of the Neolithic period in Bahrain was found at the sites of al-Markh and Awali, which had been inhabited by people since the 6th millennium cal BC. The way of life depended on fishing, gathering of food, and agriculture. El Ubaid Culture pottery was also found at the Al Markh site, which is known as the site of the Dilmun era and was a traditional centre for canvas and sail making (Al-Tajir, 1987).

2.5.6 Kuwait

Archaeological excavations and surveys have been conducted in Kuwait since 1958 and have revealed human remains dating back to the Stone Age, the oldest of which came from Wadi Al Batin and dated back to the Late Stone Age. Another site was found in a location near the tar ponds in the Burgan basin, which dated back to the period between 13,000 and 8000 cal BC (Al- Dwish et al. 2004). The lithic tools of this period were characterised by their small size and consisted of arrowheads, knives, scrapers and burins. Settlements continued in Kuwait during the Neolithic period (c. 8000-5500 cal BC); Neolithic remains were found at the sites of "Al Gareen" and "Tal Sulibikhat", possibly at the site of "Madera Rock" (Al-Dweish and Al-Mutairi, 2006).

2.6 The Neolithic in Saudi Arabia

The Neolithic Age in the Arabian Peninsula is generally characterised as a mobile pastoral economy, between 6800 and 6200 cal BC, initially based on domesticated animals, such as cattle, goats, and sheep (Drechsler, 2007). However, the cultural and economic characteristics are still unclear, and domesticated animals have only been found on the east coast of the Arabian Peninsula and Yemen.

2.6.1 The origin and Spread of the Neolithic

Nowadays, studies on the Neolithic in the Arabian Peninsula take one of two views on its arrival in the region. The first argues that the migration of pastoralists from the Levant brought farming to the KSA (Drechsler, 2007); while the second, insists on the local development of the Neolithic way of life, especially in Yemen with a clear presence of domestic sheep and goats (Fedele, 2008; McCorriston et al., 2012; Henton et al., 2014). However, the assumption of Levantine migration has not been examined critically, nor have alternative explanations been examined in any depth.

There are good reasons to question the Southern Levantine hypothesis, while other options offer viable alternatives. According to Drechsler (2009) the Levantine origin for the Arabian Neolithic derived from two primary lines of evidence, the presence in Arabia of domesticates (goats, sheep, and cattle) and lithic industries (naviform bipolar cores, some arrowhead types) which have affinities to those of the Levantine PPNB. Both the fauna and the lithics post-date those of the Levant, and thus, suggest dispersal or diffusion lag time. However, critical reviews suggested at the very least a more complex picture. Beginning with fauna, the presence of early cattle c. 6000 cal BC in Southern Arabia, at Manayzah (Köhler-Rollefson, 1992), is problematic for the Levantine origins hypothesis due to two reasons. If cattle dispersed from the Southern Levant at such an early date, then their presence ought to be evident in earlier and geographically intermediate sites in the desert and in the Southern Levant and North Arabia. There is no evidence for domestic cattle in the steppe zone in either PPNB or the next phase (PPNC=Terminal, PPND=Early Late Neolithic) (Martin, 1999). Accordingly, given the absence of cattle in the environmentally favourable PPNB steppe of the Southern Levant, it is hard to imagine cattle crossing the harsher environments of Central Arabia. Thus, there is no Levantine source for Yemenite cattle, and origins must be sought elsewhere.

Given the archaeological difficulties with a single Southern Levantine source for the Arabian Neolithic, two other potential sources are available, Ethiopia and Mesopotamia, including the western flanks of the Zagros. The African hypothesis is acknowledged (although the chronology of domestic goats in Africa seems too late to explain their appearance in Arabia), although this has not been explored in detail. Given the early domestication of goats in the Zagros, and the later ceramic evidence for Neolithic connections between the Gulf and Mesopotamia, it is difficult to understand why the Northern/Eastern source was rejected. Certainly, transmission of cultural traits, and even people, seem easier along the rivers and coasts than across the Arabian Desert, and it is no longer in terms of distance. Furthermore, it would not have required the transformation to mobile herding societies (to offer a mechanism for crossing of the desert), and then their reverse transformation again into farmers (Rosen, 2011).

According to Groucutt and Petraglia (2012), the climatic changes of the early to middle Holocene of Arabia have implications for general patterns of occupation and dispersals in Arabia, as well as the adaptation to arid environments. There are considerably more detailed archaeological and environmental records available for the Holocene than for the Pleistocene. It is clear that this is related mainly to the direction of the archaeological survey in the Arabian Peninsula, which led to a mixed record of sites known only through surface materials. This also led to uniformity in cultural data for the Neolithic period being perhaps wrongly assumed, and the concentration of data in one region rather than another (for example, what is known about the Neolithic for the eastern region of Saudi Arabia cannot be used as a diagnostic feature for other regions).

The Northern and North-western regions seem to witness a different cultural sequence, except for general features related to the production of arrowheads or lunates. While pottery is present in Neolithic sites in the eastern region, most of the Neolithic sites known in the Northern and north-western regions lack any kind of pottery and can be compared mainly to the Pre-Pottery sites situated to the north in Levant and Palestine. The main issue here is the absence of sites bearing Neolithic pottery in this region, which add more questions to the problem of the Neolithic development in the Northern regions of the Arabian Peninsula. This fact, however, may be explained in two ways. The first point relates to the lack of archaeological research and surveys directed to this type of evidence in Saudi Arabia, where the focus is instead placed on conducting excavations at later sites, such as the sites of the early Arab kingdoms. The second reason may be related to the climatic changes in the North of the Arabian Peninsula in the Neolithic period, which reduced the chances of local innovation.

2.6.2 Archaeological Evidence

Remains from the Neolithic age were discovered in different locations within Saudi Arabia; brief reports about them have been published for more than half a century, although they did not attract noticeable attention within the scientific community until the 1980s. Interest developed only when the pottery of the Ubaid culture was discovered in the eastern region in the early 1960s (Masry, 1984). The discovery of the pottery from the Ubaid culture, already known in Southern Mesopotamia (the 5th millennium cal BC) and in the eastern region of Saudi Arabia, raised many questions regarding the relations of the two regions (see Figures 2.6, 2.7).

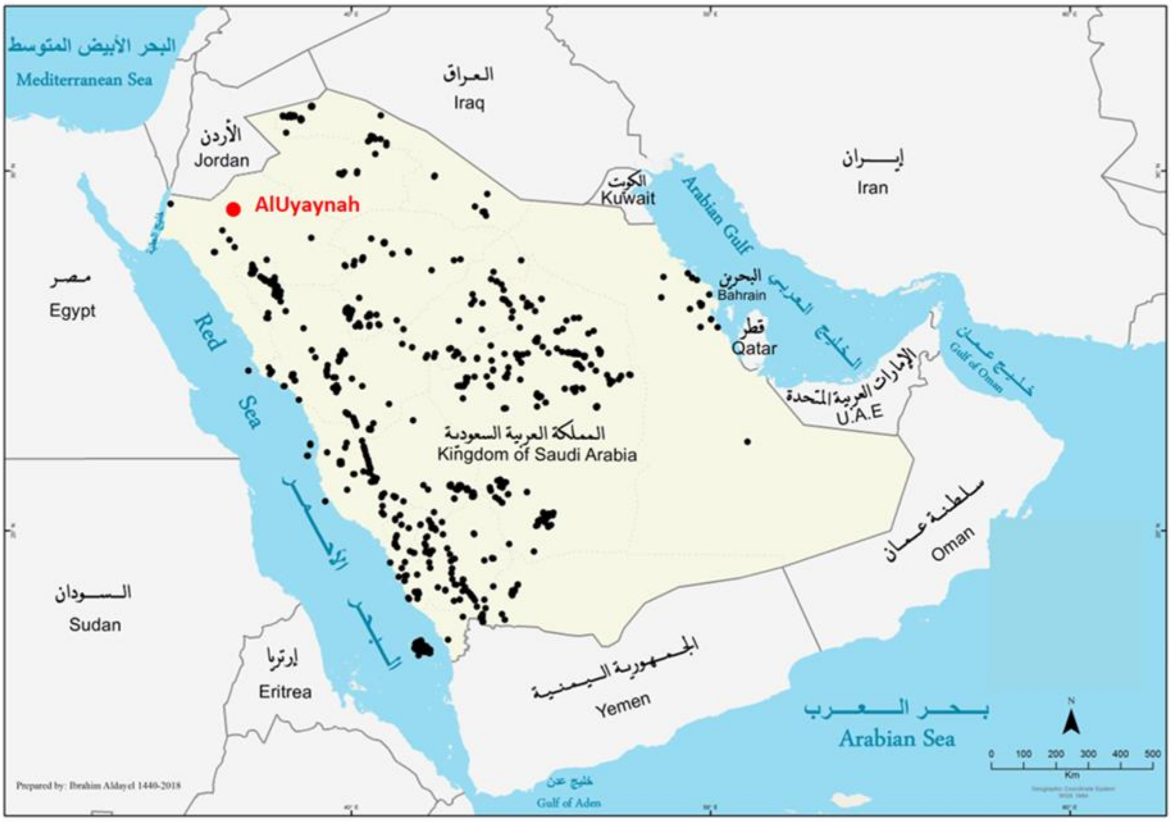

Figure 0.5: All periods of Prehistoric Sites in Saudi Arabia (After Saudi Commission for Tourism and Antiquities (SCTA))

Figure 0.6: Neolithic Sites in Saudi Arabia (After Saudi Commission for Tourism and Antiquities (SCTA))

Numerous sites comprising some types of Ubaid pottery were discovered in the eastern parts of the kingdom. These settlements varied in size; some were temporary camps and others were permanent settlements, as indicated by the succession of layers and the density of the archaeological materials. One of the important sites, where a detailed study was conducted, was al-Dosariah (Masry, 1974). The oldest layers contained stone tools similar to those known in the eastern parts of the kingdom (arrowheads, spears, polished tools and fine blades) (Masry, 1974). In addition to the Ubaid pottery, there were other types of pottery, such as the local rough red coloured types. Among the finds, there were also bones of domesticated animals, such as goats, sheep, cattle and other wild animals. The second site was Ain Qanas, a small settlement located near the al-Loyoun oasis, the lower layers of which contained materials dating back to pre-pottery ages followed by layers comprising types of Ubaid pottery and stone tools, such as arrowheads, leaf shaped scrapers and blades. The third site is Abu Khamis situated to the north of Al-Dosariah, which was the richest in archaeological materials, such as stone tools, Ubaid pottery and other types of coarse pottery. There were also the remains of gazelles, sheep, goats and fish bones, besides large number of seashells. The site dates back to the 4th millennium cal BC (Masry, 1974, pp. 125-42; Drechsler, 2011).

The eastern region sites related to this period were distinguished from other sites in the kingdom by large quantities of materials and their variations, such as pottery and by numerous layers of finds that could be dated back to the Neolithic period. Researchers also had the opportunity to study the moves made by these population groups towards food production and the exploitation of sea and land resources and exchange of materials with other groups of the Arabian Gulf up to the south of Mesopotamia. Nevertheless, if we examine the sites of the Neolithic in the rest of Saudi Arabia’s regions, we find most of them were superficial sites that lack organic materials and pottery, which has sparked many discussions regarding the problem of determining the features of this culture in the kingdom during this period.

Present evidence does not clearly indicate any hints of food production, which some attribute to the environmental conditions in the region and the adoption of living patterns that differ from agricultural societies. However, the geographical distribution of the sites related to this period and its associated stone tools assemblage is very different from the previous period. Its connection with some simple stone constructions and the remains of simple huts no doubt indicates the existence of population groups in settlements with a density of people in some parts of the kingdom. These groups exploited the available resources when inevitable conditions were favourable. Some desert areas, such as the Empty Quarter and al-Nafud were suitable for living because of the good climatic conditions mentioned above. Correspondingly, these areas provided archaeological and faunal data that distinguishes them from the other coastal or Northern areas in the kingdom during this period. McClure (1984) reported fossils of a variety of species, including gazelle, hippopotamus, oryx, ostrich, and buffalo from the area of the Mundafan paleolake, which was recently re-dated to MIS 5[1] (Rosenberg et al., 2011). Many sites preserve Holocene faunal remains (Drechsler, 2009).

Aidens (1982) undertook an analytical study on different collections of stone tools gathered from four sites in the Western Empty Quarter: Jalda, Shroorah, al-Mutbathan and al-Mundafin, which represented a model of the Neolithic all over the Empty Quarter, eastern region and some parts of the central region. The basic technique used in making that collection was the polished bifacial tools with different types; round-headed arrows and other leaf-shaped. Polishing was conducted by pressure or light hammering; a style known in Arabia that distinguishes the techniques of the Neolithic period. The list of tools include numerous types of bifacial and unifacial arrow heads. There was also the category of spears and leaf shapes, which were all sharpened on both edges. Subsequently, there is the scrapers category; front, circular, end and side scrapers; then, the small tools like burins and borers.

The collection also contained fragments of quartzite stone; possibly the remains of grinding stones of which the usage was unknown. Aidens (1982) stated that the multitude of tools in these collections reflected different usages, which means that these sites were hunting camps where people practised varied daily life activities during this period, which extended from the sixth to the 4th millennium cal BC according to the dates obtained from the ancient lake sediments in the area. A few hunted animal bones from goats, gazelles and other unidentified animals were also found. The study showed no evidence of animal domestication or pottery. Researchers concluded that these tools represented a Neolithic tradition that spread in the south east of the Empty Quarter, the eastern region and Qatar through the eastern highlands of the Empty Quarter.

The Neolithic period in the Riyadh region in particular was distinguished by the concentration of the usage of inevitable raw stones, such as flint, chert and volcanic glass

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[1] (Marine Isotope Stage 5 or MIS 5 is a Marine Isotope Stage in the geologic temperature record, between 130,000 and 80,000 years ago)

(obsidian), as it was easy to shape and make these tools according to their individual purpose (AbuDarak et al., 1984, pp. 97-103). The pressure percussion was undertaken by using a stone or an organic material, such as bone or wood, in order to shape the surface of the tool.

The Neolithic tools in Saudi Arabia are characterised by the small size of the stone cores from which they were manufactured, and consequently the smallness of the tool itself. This culture included various types of stone tools; the most famous were leaf-rounded, long-rounded spear heads, scrapers, burins and knives. Some stone pestles were also found that indicated the daily life activities, such as grinding wild grains etc. Moreover, archaeological studies have shown that there is a great similarity between the stone tools found in the Riyadh region and the ones found in other regions both in Arabia (i.e. the Empty Quarter and the eastern region); and outside Arabia (i.e. Mesopotamia and the Levant (AbuDarak et al., 1984, pp. 97-103).

Some reports of the archaeological surveys in the Riyadh region have referred to the possible existence of small hearths and some temporary buildings (AbuDarak et al., 1984, pp. 97-103); although it is difficult to confirm their cultural connection, as excavation has yet to be conducted.

The Department of Archaeology and Museums, and the General Directorate of Antiquities, Ministry of Education in Saudi Arabia, conducted an archaeological survey at certain sites in al-Thumamah dating to the Neolithic period (AbuDarak et al., 1984, pp. 99-102). These sites appear to date back to the period from 5000 to 1000 cal BC. The Neolithic sites are distinguished by stone tools and materials, such as arrowheads; the finds show that the human activity at that time depended on hunting, domesticated animals and primitive cultivation. The stone tools are represented by scrapers, blades, knives, spears and arrowheads. The most important archaeological finds from al-Thumamah were reported by AbuDarak et al. (1984, pp. 99-102) as:

1. Shelters: that can be divided into two types, the first goes back to the Neolithic age (8000 years ago), it is a circle of 12 meters in diameter with stone features inside. The second is a big stone circle built on the surface of the ground using irregular stone blocks and 9 meters in diameter.
2. Religious buildings: that can be divided into five different types of design, but similar in their monumental stone construction, which are mostly directed to the east, perhaps indicating their worship of the sun.

3. Cemeteries: these were characterised by simplicity. The cemetery was mostly in the shape of cairns with a grave, where one or more persons were buried.
4. Stone and flint tools; approximately sixteen spears were found in the site, each was about 15cm in length; this is a unique discovery in the Arabian Peninsula. This was found near to a big black igneous stone piece, which represented a stone tool workshop. The arrows found at the site varied between rounded edges and tripled, and all of them were trimmed on both faces and sharpened, besides sharpened arrowheads. Also, there were sharpened circular scrapers, with some thin and others thick. Leaf shaped tools that were rounded and sharp were found in addition to the smoothed cutters, slices (bladelets), and blades. The stone and granite tools found in al-Thumamah were unique in types; and no similar tools were found at the Neolithic sites at Jubbah, Kilwa, al-Khamaseen, Tarut or the Empty Quarter.

In the Northern region, a number of sites were found in al-Jawf and the Northern border regions, which were comprised of polished blades, engravers and pyramid-like cores, which were generally similar to the pre-pottery Neolithic in the Levant and dated to approximately the 8th millennium cal BC (Al-Asmari, 2012). A number of similar sites were found on the hills of al-Nafud that were comprised of blades, small blades, burins and few arrowheads. Researchers observed that there were different types of tools mixed with those previously mentioned, besides two pieces of pottery. This collection probably dates to the Chalcolithic (Copper) age.

It has been observed that the sites of the Neolithic period in the Northern region were not connected with buildings, such as stone circles and ring circles, which are thought to belong rather to the Chalcolithic (Copper) age (the 4th millennium cal BC) (Alsharekh, 2002). The contents of these sites were similar to the same period sites in the Levant with various scrapers, burins and axes, etc. These sites spread in large numbers across the region extending from the north of Wadi al-Sarhan until Hail and south to al-Kehaifiyah (Alsharekh, 2002). They are also found in Southern Nafud. The date of these constructions is estimated to be during the fourth or the beginning of the 3th millennium cal BC (Parr 1978, pp. 29-49). There are other types of stone constructions in square or rectangular shaped monuments, stone heaps, and tail-like structures (see Figure 2.8). It is possible to divide these constructions into different types according to their architectural details and stone arrangements.

Stone constructions generally raise many questions. They are geographically distributed throughout vast areas and exist in different environments. However, they also vary in shape and architectural types. It is difficult to obtain absolute dates, as they do not contain either materials that can be scientifically analysed or finds that could provide a relative date. They generally cover a long period extending from the Chalcolithic age until a more recent date. Even though a few academic studies were conducted on the subject, there are still debates in relation to the spread, functions and dates (Alsharekh, 2002).

Figure 0.7: Tail-Like structures from Fadk, South-west Hayel (Google Earth)

An archaeological survey in the south west of the kingdom had revealed important sites described as belonging to the late Neolithic, comprising stone tools, such as the bifacial arrowheads and leaf-shaped tools similar to that of the Levant and Iraq that date back to the period between 5000 and 2500 BC (Zarins et al., 1981, pp. 9-34). The Neolithic sites were known in different parts of the south-western region, where these sites were found in Bir Hima west of Towaiq Mountain, North Najran, Wadi Tathleeth, Asir highlands in al-Soda Mountain and the lowlands extending from West Najran. The stone tools comprise blades, bladelets, sharpened flakes, side and end scrapers, and bifacial tools. It is also notable that these tools were made of different types of rocks; white quartzite chert, sandstone, obsidian and flint. Indeed, some of these rocks were brought from distant areas.

Among the finds were remains of ostrich eggshell, animal bones, fragments of grinding stones and soapstone (also known as steatite or soaprock) pots (Zarins et al., 1981). There were also simple constructions in small circle forms and others arranged as fireplaces. The archaeological survey did not reveal similar sites in the area extending from Tihama up to the Red Sea coast except for scattered stone tools over a vast area. According to the types of stone tools found, they dated from the fifth to the 3th millennium cal BC. The style of the formation of the Stone Age tools in Asir represents another technical variant from that period in the kingdom; these sites in the internal regions (such as Riyadh region) lacked pottery, as with the others. In contrast, pottery was found at shell midden sites along the Red Sea coast (Meredith-Williams et al., 2014). Nonetheless, researchers have not been able to identify the historical or cultural relation between these shell middens and the Asirian Neolithic age sites (Meredith-Williams et al., 2014).

One of the biggest sites on the Tihama coast is the Soha site in the Jazan region, where a big quantity of red and orange coloured pottery fragments were found, and the pottery fabric was made with coarse sand granules mixed in (Zarins et al., 1981, pp. 9-36). The excavations undertaken demonstrated that it was a seasonal settlement, inhabited by hunting groups to benefit from the sea resources.

Radiocarbon dating was conducted on three shell samples found on the site. The average dates were between 1540–1200 cal BC (Zarins et al., 1981, pp. 9-36); thus, the pottery described here is one of the oldest pottery types in Southern Arabia. By comparing the types and decoration of pottery, it has been determined that this pottery style was made at more than one site on the Red Sea coast and on Farasan Island. Outside Arabia, Soha pottery can be compared to the known Nubian Kerma civilization in Northern Sudan dating back to circa 2200–1000 cal BC (Zarins et al., 1981, pp. 9-36). As a result, some take this as evidence of the existence of strong relations between Arabia and Northeast Africa during the 2th millennium cal BC. Among the other finds found on the Soha site, there were grinding stones made of volcanic rocks, sandstone and granite, and fragments of soapstone pots. There were also complete copper pieces, such as: chisels, rings, needles, blades, and unknown shapes. What is more, it is noticeable that copper was not known in other locations in the region at that date (Zarins et al., 1981, pp. 20-22).

More recent research has revealed detailed information regarding Neolithic landscapes in Saudi Arabia, especially around ancient lakes (Guagnin et al., 2017).

Excavation at the Jebel Oraf 2 site located near Jubbah Oasis in the southern fringes of the Nafud desert, revealed evidence of at least 170 hearths (Guagnin et al., 2017). Radiocarbon dates place the site to the late 6th millennium cal BC (Guagnin et al., 2017). Neolithic artefacts found at the site included lithic tools, such as ground and chipped stone artefacts, some of which recall the Pottery Neolithic in the Levant. One of the most important finds show fragments of Bos dentition, which represents domestic cattle. With this evidence, the site is very important in our understanding of the Neolithisation process in Saudi Arabia (Guagnin et al., 2017).

The data outlined here concerning the Neolithic period of Saudi Arabia has developed despite shortcomings in the extent of fieldwork undertaken to date. There is also a clear lack of research in the Neolithic field in general in Saudi Arabia, which is instead concentrated upon limited areas and is specific to particular sites and themes, such as rock art and palaeoenvironmental reconstructions. In the later periods, the archaeological research has been carried out for many years. This focus has resulted in the neglect of other cultural periods. Therefore, serious research is required, including further excavations rather than only survey. In addition, a wider range of issues needs to be considered, such as the animal bone assemblages, material culture and stone structures.

2.7 Conclusion

Geological studies indicate that the ice retreated from the Northern hemisphere to the Arctic, ending the so-called Pleistocene era, which was characterised by its dry climate, and the start of a new warm and rainy climatic phase in the early part of the Holocene (Drechsler, 2010, p. 60). Evidence indicates that rainfall increased in some areas of the Arabian Peninsula, resulting in a fertile environment and a denser animal presence (Parker et al. 2006). These climate changes enabled some pastoral communities in the south of the Levant between 8000 and 6000 cal BC to move with their animals to the north of the Arabian Peninsula and establish non-permanent settlements in some areas. The site of AlUyaynah revealed architectural remains, suggesting the permanent nature of such sites (Al-Asmari, 2012).

In spite of the above, it is worth mentioning that the issue of the arrival of communities in the Arabian Peninsula (i.e. the state of food production and sedentary life) and thus, the development of the Neolithic, is still not agreed (Drechsler, 2007). Some argue that the Neolithic is a local development (Cleuziou and Tozi, 1997; Cleuziou et al. 2002), while others perceive it as intrusive, with people coming to the Arabian Peninsula from the Levant (Ürpmann and Uerpmann, 2003).

It is known that the human communities that lived during the 10th millennium cal BC in the Levant took the first steps towards food production and sedentary life. However, hitherto, sites from this advanced Neolithic period have not been identified in the Arabian Peninsula (Drechsler, 2009, p.29), perhaps due to the different environmental conditions. Even though some people in the Arabian Peninsula did not develop agriculture until the end of the 4th millennium cal BC (Steimer-Herbet, 2004), some researchers (e.g. Masry, 1975) believe that the human groups that settled in the region during the Holocene were pastoral groups that had domestic animals. Here, it is possible to note that the Neolithic sites in Saudi Arabia are generally different from those in neighbouring countries. These groups, according to present evidence, did not plant crops, but lived mainly from hunting, and in rare cases, animal breeding.

In this chapter, I reviewed data related to the sites, their physical evidence and dates, especially the PPN, which characterize the Holocene cultural development that covered a wide region of the Levant and extended to the northwest of the Arabian Peninsula. The archaeological remains, and the C14 dates of the AlUyaynah site position it within this diversity as its cultural remains are largely consistent with cultural developments in the Levant. The AlUyaynah site offers a widely relevant model for understanding the PPNB period expansion into the north-western Arabian Peninsula, providing an overview of the major developments in this period within the immediate vicinity of the Levant (Figure 1.1). The material culture of AlUyaynah site, especially buildings, clay objects (or figurines) and stone tools, indicates that the site may be richer than what the limited excavation reflects. In addition, the presence of the clay figurines (see Chapter 5) at the AlUyaynah site is interesting, because it places the site as one of the most southern sites where this type of archaeological material has been found.

Bearing in mind the cultural changes that happened during the pre-pottery Neolithic period “B”, in the middle of the seventh millennium, which includes the spatial and geographical spread of settlements, and the similarities that can be observed through our study of the AlUyaynah site with many of those sites, the tracking of these changes will be our starting point for a comprehensive comparison of this site with similar sites especially in the Levant, which will represent the frame of our analysis of the buildings, clay objects and stone tools in the coming chapters.

Chapter Three – Climate and Environment

3.1 Aim and Objectives

This chapter discusses the palaeoenvironmental conditions in the Arabian Peninsula. It focuses on the current model of Holocene climate and discusses the effects of these conditions on different parts of the region. The chapter also discusses in detail the direct and indirect evidence of palaeoenvironmental conditions. Palaeoenvironmental conditions at the time are thought to have directly affected the movement of human groups during the Holocene period.

In order to achieve these aims, the key objectives of this chapter are:

1. To discuss the direct and indirect evidence of past conditions.
2. To discuss, in detail, the variation in Holocene environments between different parts of the Arabian Peninsula, with a particular focus on Saudi Arabia.
3. To complete a comparative study, when needed, between the paleoenvironmental sequences in Saudi Arabia and adjacent regions.

3.2 Structure of the Chapter

First, the regional characteristics will be reviewed, and the current climatic and environmental conditions will be presented. Then, the detailed evidence of paleoenvironmental conditions during the Holocene, that are at the core of this chapter, will be debated.

3.3 Introduction to Arabian Peninsula

The Arabian Peninsula was a part of the African continent 35 million years ago, and due to plate tectonics, the Arabian-Nubian Shield was subjected to slow lift accompanied with subsidence centered along the Red Sea (Mahmoud, 2005, p. 6). This process led to the separation of the Arabian shield from the Arabian-Nubian shield in the area of Bab al-Mandab five million years ago, and the flow of the Indian Ocean into the Red Sea. It also caused subsidence decline in the eastern part of the Arabian Peninsula and the flow of the Indian Ocean to the Arabian Gulf through the Arabian Sea. As a result of environmental processes during the Ice Ages in the Quaternary Period, the global sea level dropped to about

120 m from the current sea level (Mahmoud, 2005, p. 6). This led to the draining of the Arabian Gulf, while major river systems ran towards the Strait of Hormuz (Mahmoud, 2005, p. 6). By the end of Ice Age and the beginning of the Holocene, the continental ice sheets shrunk in size, causing a rise in sea levels, which led to the re-entry of the Indian Ocean into the Arabian Gulf and disappearance of the ancient river courses leading from the Shatt al-Arab in Mesopotamia, 10,000 years ago (Wailaay, 1997). Throughout the Pleistocene, many climatic processes, such as a change in the Indian Ocean monsoon, caused dramatic oscillations across the interior of the Arabian Peninsula, transforming barren sand seas into fertile grasslands and back again (Fleitmann et al. 2007; Parker and Rose, 2008).

The Arabian Peninsula is bordered on the east by the Arabian Gulf. To the south is the Indian Ocean (the Arabian Sea), and to the east is the Red Sea, which the classical writers call Erythre Thalassa. The Red Sea is a natural extension of the Afro-Asian rift. Therefore, natural harbours are rare. To the far south there is the narrow strait of "Bab al-Mandeb". There is only one island today. When sea level was lower, the strait was narrower and longer, extending to the Hanish Sill in the north, with more intervening islands, which facilitated travel between the continent of Africa and the Arabian Peninsula over the ages (Petraglia, 2003; Lambeck etal 2011; Bailey, 2015).

The Northern and North-western borders of the Arabian Peninsula are an extension of the desert south of the Levant and the Mesopotamia valleys. The section adjacent to the these Wadis is called the "Samawah Desert", and the adjacent area of the Levant is called "Badiat Al Sham" (Kafafi, 2005).

3.4 Topography

The Kingdom of Saudi Arabia, with an area of about 2,000,000 Km^2, accounts for the bulk of the Arabian Peninsula landmass, and lies at the crossroads of three continents, Asia, Europe, and Africa, extending from the Red Sea on the west to the Arabian Gulf in the east. To the north, it is bordered by Iraq, Jordan, and Kuwait, and to the south, by Oman and Yemen. To the east lie the UAE, Qatar, and the island state of Bahrain. The topography of the Arabian Peninsula consists of the coastal plains, mountain ranges, lava fields "Harat", deserts, valleys and oases (Engel et al. 2011; see Figure 3.1).

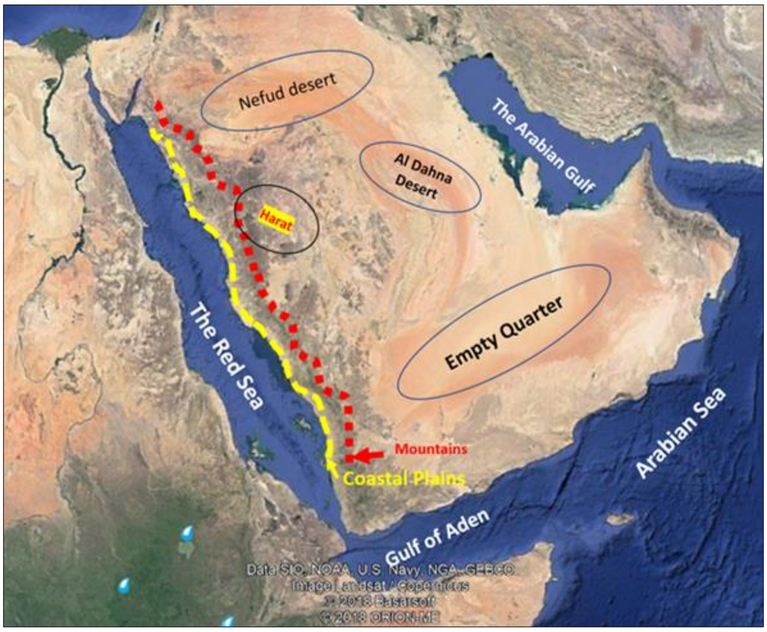


Figure 0.1: Geography of Saudi Arabia

3.4.1 Deserts

The Arabian Peninsula is covered with sandy deserts and sand dunes. The biggest of these are the Nefud desert, Al Dahna, and the Empty Quarter. The Nefud desert is a vast extension covering a large area of Northern Arabia.

The Nefud desert extends to the north and east of the Taima oasis and is about 300 km long and 250 km wide. It is a sandy desert with strong winds which move sand from one area to another. There is no evidence of the existence of life except the desert herbs eaten by camels which sprout after the winter, as well as a kind of grain called Samh, which the people of this area grind to make bread from (Al-Jassir et al., 1995).

The desert of Al Dahna, which means "red land", extends in the form of a large arc from the Nefud desert in the north to the empty quarter in the south, a length of more than 900 kilometers. The western part of these deserts is known as the "Ahqaf", ie. sand dunes. The rainfall is very low and does not exceed 200 mm per year at its maximum (Al-Waila'I, 1994). It appears that there was a river that crossed this region during the Pleistocene period, more than 12,000 years ago, and the Al Batin valley still runs after heavy rainfall (Rose, 2011). Al-Hasa Oasis in the Eastern Province of Saudi Arabia has the highest rate of aquifers. As a result, ground water is abundant in this area, as is the case in the Qatif and Hofuf regions. The region is famous for its palm trees.

Many people believe that the desert of the Empty Quarter is devoid of any sign of life, but on the contrary, some researchers have reported that there are herds of animals, such as deer, camels, ibex and rabbits (Magee, 2014, p. 21). It is clear that the desert of the Empty Quarter is irregular in size, ranging in width between 300 kilometers in the Omani interior and 80 kilometers near Al Ain to a few kilometers in the territory of the United Arab Emirates.

3.4.2 Mountains

There is a mountain range parallel to the eastern Red Sea coast extending from the south of the Levant to Yemen. The most important mountains of this range, "mountains of the Sarra”, are those of the Hijaz. This range has a maximum height of about 2,700 m in the Northern part of it, which drops to 300m in its center in the Hijaz, near the city of Mecca. It is steeply sloped in the west and runs east towards Najd. Interspersed with valleys, plateaus, and evidence for dried up rivers. Among the most famous mountains of the Sarra are Abi Qubais, Taurus, and Hira in Mecca. The narrow area between the Red Sea and the Hejaz Mountains is called Tihama, meaning "low ground".

In the eastern center of Najd, the mountains of Shammar and Tuwaiq are located in this region. The first rises about 760 m above sea level and consists of two series, Agha and Salma, formerly known as the Tae Mountains in Najd.

There are also mountain ranges overlooking the Gulf of Oman. In the south-east are the mountains of Al-Hajar (Stone), and the Indian Ocean in the south, especially the Yemeni highlands. One of the most important heights of the mountains of Al-Hajar is Mount Shams, which is about 3000 m above sea level, and it is clear that this mountain range is extended north to the semi-carrot (Musandam) as well as into the Strait of Hormuz. The Al-Hajar mountain range continues southwards in the Omani territories until Ras Al-Hadd. It is known that this region is rich in copper ore, rock and soft stone (Engel et al. 2011, pp. 41; Al-Yahyai et al 2017, pp. 49). During the Holocene a group of rivers began to flow into marine sediments creating valleys, such as in the Ala'in areas of the United Arab Emirates and in the interior of Oman. It is worth noting that the Omani interior zone consists of the desert from the south and west, called the ‘empty quarter’ (Charpentier, 2008). This desert stretches to Ras Al Khaimah in the United Arab Emirates. It also separates it, the Omani interior areas, from the empty quarter in the south, and is called the sand of Waheiba, where wild animals and plants live, making it a habitable region. On the southern side, the desert is known as the Al-Wosta "Central" adjacent to the Dhofar region.

There are a number of mountain ranges overlooking the Indian Ocean. The most important of which are Mount of Al Gamar "the Moon", Mount Qara and Mount Samhan. This mountain chain continues until it enters Yemen. These mountain ranges and the Indian Ocean are separated by plains ranging from about 12 to 15 kilometers in width, which are covered by grasslands and woodlands (Magee, 2014, pp. 26-27).

In Yemen, the Dhofar mountain range overlooks the Indian Ocean, known as Joul Mountains. This range cuts off a group of valleys, the biggest of which is the Hadramout Valley, which divides the Joul Mountains into Northern and southern parts. This valley starts from the area of Ramlet el-Sabtein and runs south-east until it reaches the coastal area. The exit of this valley in the area of Ramlet el-Sabtein has created a fertile region, which has led people to settle in it through different ages.

To the west of the Joul Mountains is a mountainous plateau set in an intermediate area between it and then the Yemeni mountain ranges. The highest mountain peak in the mountains of Yemen near the capital Sana'a is about 3760 m above sea level. The Yemeni mountain range continues in the Asir region bordering the Red Sea. Rainfall in the Asir Mountains is much higher than in the Joul (Boulos, 1985).

In the Hijaz, although there is a mountain range, to the west there are a number of oases, including Taima. These oases are often the focus for settlement, across many millennia. At Taima some researchers arguing that the groundwater in this oasis does not exceed four meters (Eichmann et al., 2006, pp. 165), and there was a network of irrigation channels feeding nearby fields. In the area of Mada'in Saleh the depth of groundwater is about 17 m (Nehmé et al., 2006, pp. 67).

3.4.3 Coastal Plains

This area includes the Red Sea, the Indian Ocean, the Arabian Sea and the Arabian Gulf (See Figure 3.1). Today, the temperature rises during the summer with maximum daytime temperatures up to 50 °C (Engle, 2011), and the region remains warm in the winter. Rainfall is rare along these coasts and is restricted to the winter months. The average annual precipitation is between 20-80 mm (Kafafi, 2017; see Figure 3.2).

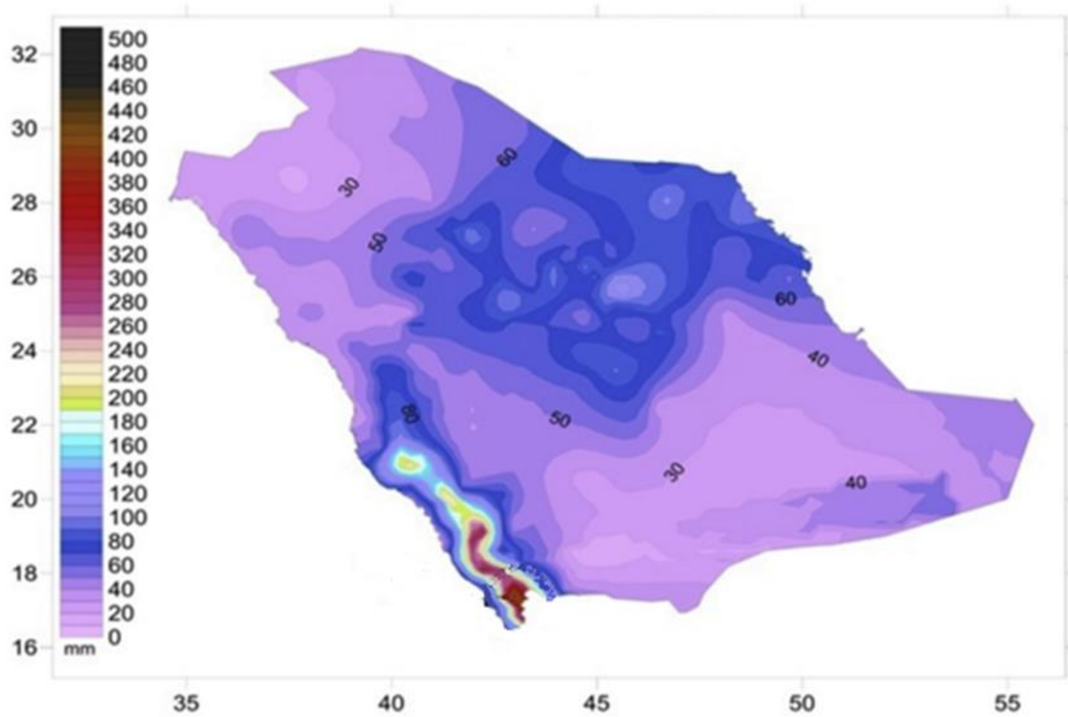


Figure 0.2: Annual precipitation map of Saudi Arabian from 1960 to 2014, showing an average of 500 mm. (based Kucera 2010)

One of the coastal plains of the Arabian Peninsula lies to the east of the Al-Hajar mountain range in Oman, which separates it from the Sea of Oman. It stretches between Dibba in the United Arab Emirates in the north and Muscat in Oman in the south. These plains expand into the Sohar region, where they are made up of foothills. At present, the Batinah plains are the heart of the Omani agricultural region.

3.4.4 Lava fields "Al-Harat"

This region, which consists of solid volcanic rocks with no water, is an extension of lava fields in the Levant, and is located in the western part of the Arabian Peninsula, related to the other lava fields in the Levant. Al-Harat is also present in the central and northwestern regions of the Kingdom of Saudi Arabia. Al-Madinah Al Munawwarah (Waqm and Al-Ubrah), Khaybar, Harat Oweried in Al-Ula, Tabuk and Harat Darwan in Yemen are all examples of this form of landscape.

3.4.5 The plateau of Najd (the central plateau)

The plateau is divided into two parts: Najd al-'Aliyah (its higher western side) and AlDwinyah (the low, eastern side). The surface of the plateau consists of a group of smaller plateaux, penetrated by a number of valleys, for example the valley of Ramh. The Najd plateau separates the mountainous highlands and the deserts and this area was inhabited by people since the stone age (Al-Theeb, 1993). Although rainfall is scarce at present, it appears to have been abundant more than 12,000 years ago.

3.5 Present-Day Climate

According to Barth and Steinkohl (2004), the Arabian Peninsula is subject to two major weather regimes. From the north come Atlantic late-winter Northwesterlies, which move eastward over the Mediterranean Sea, down the Arabian Gulf, and eventually dissipate over the Rub' al Khali desert and Musandam peninsula, bringing cool gentle winds and light precipitation (Parker et al., 2004 in Parker, 2009, pp. 40). There is also another weather system that is responsible for storms coming from the Indian Ocean. These winds lead to a major climate change in the southern part of the Arabian Peninsula from June to September, with heavy rains on the Yemen and Oman heights ranging from 1000 to 200 mm annually on the highlands and about 200 to 100 mm annually in the lowlands (Parker, 2009, p. 40).

The weather of Saudi Arabia is hot and dry in most of its regions. The coastal mountains on the western and eastern sides obstruct the rain-bearing winds from going deep inland. Still, rains fall intensely sometimes in some parts during the rainy seasons, most excessively and frequently in the Asir district because of its elevation.

The Kingdom of Saudi Arabia can be divided into the following climate regions:

A- Coastal Plains: this region contains lands facing the coasts of the Red Sea and the Arabian Gulf. Temperature in this region is hot in the summer and warm in winter, and the decrease of the daily and seasonal temperature ranges happens as an effect of winds coming off seawater.Rains are rare in this region and happen generally in winter. Humidity goes as high as 66 percent in Jazan and 53 percent in Dhahran (Figure 3.3).

B- Southwestern Heights: is represented by the heights of Asir, Baha, and Taif. The temperature varies according to the elevation, i.e., the higher the elevation, the lower the temperature. Most of the heavy rains fall in this region, reaching up to 390 mm in Abha. The rain is more intense in the spring and summer and less intense in autumn and winter.

C- Inner Highlands: This region comprises Najd highland and the eastern highlands. The daily and seasonal temperature is hot in this region, especially during the summer. The average humidity is low, and rain is sparse, with most of it coming during the winter and spring.

D- The North Region: This encompasses the Northern plateaus. The temperature here is low in the winter, sometimes plunging below zero, and moderate during the summer. Rain in this region, which also comprises the districts of Jouf, Northern borders, and north and eastern parts of the Tabuk district, falls in winter.

E- Sandy Desert: This area is extremely hot in the summer and extremely cold in winter. The daily and seasonal temperature rate is very high because of low altitude, remoteness from water surfaces and very rare rain. This region comprises the Empty Quarter Desert in the south, al-Dahnaa Desert in the east and Nafud Desert in the north.

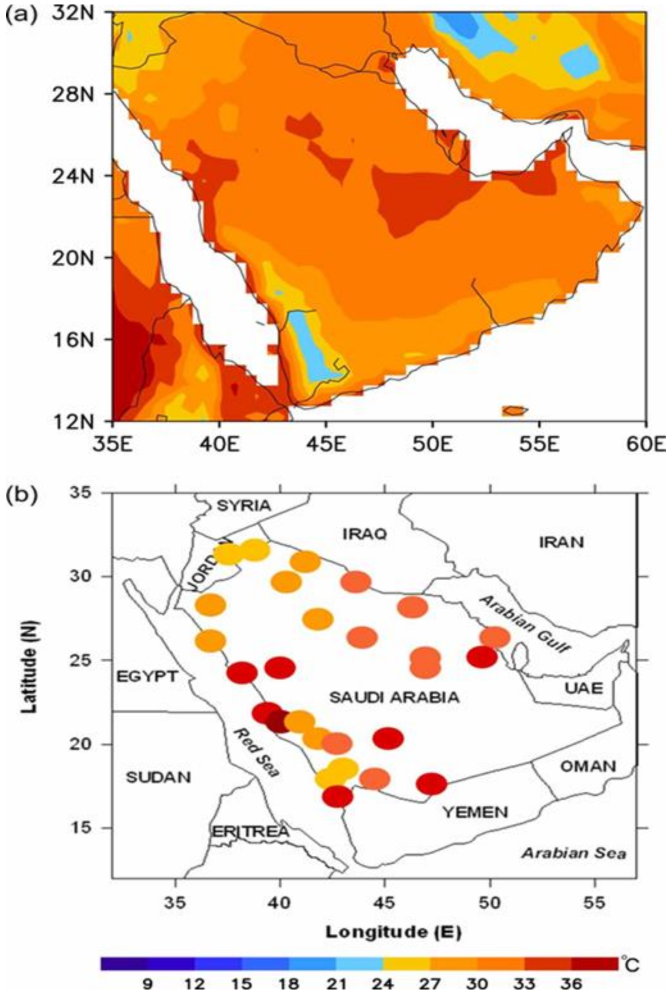


Figure 0.3: The spatial distribution of the mean annual maximum temperature (°C) obtained from the (a) CRU, and (b) observed datasets, averaged over 1979–2009, based (Almazroui 2012)

Climatic records of Northeastern Saudi Arabia are meagre and do not extend earlier than the 1950's. The markedly greater aridity of the central region makes it strikingly different from any other location in the Arabian Peninsula, but the low humidity level in the Northern province makes summer temperatures more tolerable. The Northern region does not experience any marked weather variations, but is characterized by very low rainfall and harsh, intensely arid summers. Levels of humidity are generally low.

Generally, Saudi Arabia climate is affected by several natural factors, the most important is its geographical position, which makes the bulk of its lands within the dry tropical desert region of the world, and within the pressure system of a high orbital winter. This position is also affected by the dry trade winds during winter, and the continental dry winds during the summer. Thus, the climate of Saudi Arabia is dry throughout the year, with increase of high temperature during the summer. The climate is also affected by its geological situation and in coastal regions by the presence of the Red Sea and the Arabian Gulf, as well as by the mountains in the west, which prevent the arrival of marine influences into the interior.

The diversity of the types of land surface found in Saudi Arabia also has an important impact on the climate. In general, the climate is characterized by high temperatures for most of the year, especially in the summer. July represents the hottest period in Saudi Arabia. The temperature drops in the winter by the beginning of January.

Absolute maximum temperature recordings in the region reach over 45^{o}C during the months of July and August, while absolute minimum temperatures below 0^{o}C have been recorded during the months of December, January and February.

The amount of precipitation over the peninsula seems to be affected by the elevation of the area in question. The amount of rainfall in the peninsula is extremely low in desert basins, which receive sporadic rain, sometimes in the form of violent thunderstorms during the winter months. High elevation areas enjoy a wetter climate with about 500 mm a year, particularly during the winter months.

These are the factors that cause the scarcity and rarity of sparse vegetation, except after intense short downpours of rain. Precipitation occurs during the winter months (October-March) when cold air currents from the Mediterranean Sea bring thunder showers. Most rains are unpredictable, and mainly consist of brief showers which affect only small parts of the Northern region. Thus, runoff and infiltration rates vary greatly depending upon the intensity of rainfall and outcrop geology.

The geographical position and geological composition of Saudi Arabia has led to the presence of many natural environments that vary in vegetation. Most of the regions of the Saudi Arabia are located within the dry areas except the Empty Quarter which is classified as within the severe drought region, and Sarwat Mountain areas which are located within the semi-arid areas. Similar vegetation is shared by areas located within this zone, which extends from the African west coast to the Indus Valley. Plants are, generally, small in size and some are only active during the brief rainy season. Inland plant species include arfaj, a small shrub, and rimth, a salt producing bush, which sporadically cover large desert areas. On the other hand, highland areas are in a different botanical zone, characterized by the presence of forests of wild olive trees, juniper, and acacia trees (Nyrop et al., 1977). In general, the plants of Saudi Arabia are innumerable and diverse, according to the environment in which they are grown, whether in hilly, plain or valley lands. Though dates and cereals, (buckwheat, barley and wheat) are the dominant crops today, different types of fruits have also been grown, especially in wetter areas such as Asir heights. Dates and Sidr (buckthorn) are grown in most places, and buckwheat is grown in al-Yamama and al-Taif, Dura in Najran and Jazan, grapes in al-Taif, fig and pomegranate in al-Hijaz and apples and peaches in al-Taif and other places.

The present-day fauna of Arabia is essentially characterised by a mosaic of habitats including semi-tropical and montane regions near the southern and western coastal regions, with an interior dominated by vast hyper-arid sand seas, such as the Nefud, Empty Quarter and Wahiba sands (Stewart et al., 2019, p. 13). There is some research that indicates that Eurasian and African faunal-types were present in Arabia during the Pleistocene (Stewart et al., 2017). The fauna was once more varied and abundant, well within the history of human presence in the peninsula, as indicated by the depiction of various animals on rock drawings scattered throughout the peninsula (Guagnin, et al., 2015; 2016). Other evidence (Stewart et al. 2019; Stimpson et al., 2016) points to the diversity of animal types in different parts of Arbian peninsula. Some of identified fauna from the Nefud deseret dated to c. 500 ka includes extinct or extant mammals such as Palaeoloxodon cf. recki, Panthera cf. gombaszogenis, Equus hemionus, cf. Crocuta crocuta, *Vulpes* sp., Canis anthus, *Oryx* sp. among others (Stimpson et al. 2016, pp. 13-136). However, recent palaeoenvironmental studies have demonstrated that Arabian Peninsula experienced periods of climatic improvement during the Pleistocene, resulting in the establishment of large water sources and open-grasslands. The Middle to Late Pleistocene fossil record indicates the composite nature of the Arabian faunal record, with Eurasian and African intrusions present (Stewart et al., 2019, p. 13).

The limited impact of people on the ecosystem of the Arabian Peninsula during the last few decades has led to the survival of many animal species. With the exception of the Oryx, three Arabian subspecies of gazelle and the ostrich, a variety of animals have been sighted throughout the Arabian Peninsula. These include baboons, hyenas, wolves, jackals, and more rarely the striped cheetah. Small mammals include the ratel, fox mongoose, and porcupine. Flamingos, egrets, hawks, falcons, owls, and ravens abound inland, especially in the highlands. A great variety of fishes exist in both the Red Sea and the Arabian Gulf (Nyrop et al., 1977).

3.5.1 Holocene palaeoclimates

The palaeoclimate of the Arabian Peninsula in general, and Saudi Arabia in particular, has received extensive research during the last ten years. The Holocene records of Saudi Arabia have been inferred from different geo-archives such as paleo-lakes, sand dunes, speleothems or the marine basin (Engel et al., 2012, p. 131). Most of them are located in its southern and southeastern parts of Saudi or the peninsula. The central and Northern parts are relatively unexplored (Engel et al., 2012, p. 131). Quaternary geology, fauna and flora, combined with the archaeological study of prehistoric cultures and historical sources give insight into palaeoclimates. Two factors seem to indicate clearly a climate change in Saudi Arabia; the distribution of carbonate and aeolian deposits, and the weathering profiles associated with the environments where effective precipitation was greater than in present-day arid environments (Whitney, 1982).

Generally, the palaeoclimatic records during the early Holocene reflect the existence of heavy rainfall causing the flooding of seasonal rivers and an abundance of fresh lakes. It has been known that the Arabian desert, along with the Saharan and Thar deserts, were not as arid as we know them today during the Holocene. During the late Pliocene and early Pleistocene, 3.5-1.1 million years BP, a rather humid period prevailed. This period can be detected from the intense chemical weathering of rock outcrops, heavy fluviatile erosion and sedimentation processes (Hötzl et al., 1978, p. 269).

During most of the Pleistocene, a rather warm dry climate appears to have prevailed (McClure 1988, p. 10). This is indicated by the fact that many of the geomorphological features belonging to the Late Pliocene period, such as deep erosion channels and ample gravel fans, have all been affected by aeolian processes. Nevertheless, this period did not entirely lack humid conditions, but not on the scale of the previous period. Evidence for humid intervals of the Pleistocene can be observed in the relatively small fluviatile channel deposits (Hötzl et al 1978; McClure 1988, p. 10). Apparently alternating wet and arid conditions prevailed in the Arabian Peninsula at certain periods during the Pleistocene and Holocene periods. Rosenberg et al. (2011) shows that wet periods occur only at the beginning of Interglacial periods, between about 125,000 and 100,000 and again between about 12,000 and 6000 (early Holocene).

However, research into the association between humans and the environment is still very much in its infancy and the precise relationships between human dispersals into and across Arabia is not fully understood. In other words, much progress has been made in elucidating paleoenvironmental change in Arabia, but many questions remain. Only recently has the chronology of these events begun to be understood (Groucutt and Petraglia, 2012).

In a recent study to review and evaluate the human adaptations to climate change during the pre-Holocene period in the Eastern Mediterranean, stable isotope data implies that climate change was synchronous across the region (Robert et al., 2018). Meanwhile, changes in vegetation, as shown by pollen and charcoal, have shown shifts between wet and humid climatic conditions, although with different effects on vegetation in some elevated and interior regions.

Robert et al.'s (2018) study, however, deals with human adaptations in the Eastern Mediterranean during the period from approximately 16,000-9,000 years ago; the paleoenvironmental data enables a reassessment of the human response to changes in the natural environment in the period preceding the Neolithic period. Archaeological sites in the Eastern Mediterranean region date back in excess of more than 12,000 years ago, most of which belong to the cultures of the Epipalaeolithic period, such as Natufian in the southern Levant. The sites were relatively small and most were seasonally occupied. Many sites have included economies based on harvesting of will grains, while others involve the exploitation of wild herds of sheep, goats and gazelle. In both cases these formed a part of economies on a large scale using a wide range of resources (Rosen & Rivera-Collazo, 2012).

During the early periods of the PPNA (11,700-10,500 years ago) there were direct indications of wild grain harvesting as in the Jerf el Ahmar site in the Euphrates Valley (Willcox & Stordeur, 2012). Moreover, with the advent of the PPNB (10.500-9,000 years ago), farming villages emerged on a large scale throughout the so-called Fertile Crescent which may have spread over a wider area to the Northwest Arabian Peninsula, which would include AlUyaynah. In particular, the sites were much larger, reflecting that societies had a population of hundreds or even thousands, and gradually relied entirely on agriculture (Goring-Morris & Belfer-Cohen, 2008). In addition, climate change played a major role in these economic changes in the Levant region in general. The early Holocene in the Levant region and perhaps further south to the region of AlUyaynah and the Northwest Arabian Peninsula witnessed a clear rise in rainfall, and the majority of subsequent developments in the Holocene are in some way related to climate changes, especially those related to the emergence of agriculture.

Other studies reveal increased aridity in the early Holocene. A study of Holocene vegetation history of the Southern Levant based on a pollen record from Lake Kinneret (Sea of Galilee), Israel (Schiebel & Litt 2018) demonstrate both the natural and human influences upon vegetation alterations throughout the Holocene from (~10 ka cal BP to the modern age). The specific data relates to the period of 9,000 to 7,000 cal BP, which is known as the Pottery Neolithic (PN) period, and presents the prevalence of Poaceae, Chenopodiaceae and Cichorioideae pollen. This highlights the strong influence of steppe vegetation in the area of catchment, and this vegetation zone was located all around Lake Kinneret's shore. It was also clearly part of the open woodland understorey on the mountain slopes within the Irano-Turanian biome. However, no evidence of large-scale woodland clearance during the PN period is revealed, and archaeological findings suggest a low settlement density in the Southern Levant. What is more, the reconstruction at the Dead Sea level demonstrates a low level of water in the period of 9,000 to 7,000 cal BP, which indicates a time period of aridity.

3.5.2 Holocene Climate Change in Arabia

During the early Holocene, the lake water levels rise again. In the Empty Quarter, many lakes emerged, and the wet conditions prevailed for long periods (McMlure, 1978, p. 261). In Nefud, C14 dates demonstrate traces of large lakes were present between approximately 8,400-5,400 cal BC (Whitney et al., 1983, p. 23). It is obvious that these lakes were the last evidence of the wet phases in Saudi Arabia during the Holocene. In southern Arabia, the beginning of wet conditions was much earlier than in the central Arabian desert regions and the Arabian Gulf (Parker et al. 2006). According to investigations by Whitney et al (1983) and Shulz and Whitney (1986), shallow lakes and swamps existed between 8,400-5,400 cal BC (c. 9,500-5,800 cal BP).

There are many indications of human settlements and environmental adaptation to arid and wet environments during the Holocene throughout the Arabian Peninsula. Much of the evidence accumulated in recent years focuses on the Holocene, resulting in a more detailed record for this rather than earlier periods (Drechsler, 2009). Subsequent studies supported by GIS have contributed to a deeper understanding of the natural distribution of sites around lakes and desert margins (Groucutt and Petraglia, 2012, p. 121).

During the early and middle Holocene, strong evidence for a higher amount of precipitation has been confirmed in a number of areas by the finding of accumulation terraces and lacustrine sedimentation. Water was found in the form of smaller wadis, as well as at the margins of sand dunes at Al Hasa and the southwestern parts of the Rub' al Khali. This represents evidence of an increased surface runoff which implies heavier precipitation (Hötzl et al., 1978, p. 301). Rock paintings and the remains of large fauna, such as gazelle, giraffe, etc, are clear indications of the presence of a well-watered land (Roberts 1994, p. 56). Recent sedimentology and faunal analysis from Wadi ad Dawasir fluvial system in central Saudi Arabia reveal the presence of perennial streams and a permanent freshwater lake in the distal reach of the Dawasir system that are synchronous with fluvial accumulation in the headwaters of its major tributary, Wadi Tathlith (Matter et al. 2016, p. 88). In other hands, lakes were absent in Rub' al-Khali during the Holocene, which implies that trans-Arabian rivers were mainly fed by precipitation in the Asir Mountains. Archaeologically, the permanent water sources and subsistence for wildlife provided a favourable environment for human occupation during the Neolithic all along Wadi ad Dawasir (Matter et al., 2016, p. 88).

Engel et al. (2012) studied the sediments and microfossils from deposits collected from the oasis of Tayma in northwestern Saudi Arabia. Tayma is the first site to reveal environmental evidence during the wet period of early Holocene. Although there may have been a possible continuation of the wet climate at that time, there was a contraction in water from 6831-2476 cal BC, with no obvious reason. By the beginning of the 5th millennium the lake turned into a salt marsh (Engel et al., 2012, pp. 139-140).

The most important research into Holocene palaeoenvriomental conditions and cultural assemblages, comes from "The Palaeodeserts Project" which is examining environmental change in the Arabian Desert over the last one million years (e.g: Serri et al., 2018; Petraglia et al., 2018). One of the most important achievements of this project is the discovery of archaeological finds from the Pre-Pottery Neolithic (PPN) around the oasis of Juba, in the area located to the south of the desert of Nafud in the north of the Arabian Peninsula (Crassard, 2013). Evidence suggests that this site experienced a wet climate during the early Holocene with a marked increase in lake water levels. The heavy rains at that time contributed to the availability of prey and vegetation around the lake, which was reflected in many of the rock art paintings discovered in the mountains around the lake. The analysis of animal species in this area showed the existence of animals such as lion and leopard, as well as buffaloes and gazelle, indicating dense vegetation cover along the streams in the valleys that support these animals (Scerri et al., 2018; Guagnin, 2017; 2018).

After 5400-5200 cal BC, there is evidence of gradual increase in arid conditions in the north of Saudi Arabia and the Empty Quarter (Parker, 2009, pp. 39-50). McClure (1978, p. 260) also envisages the presence of a sub-pluvial phase with dates from around 9,000 to 6,000 years BP (c. 8200-4880 cal BC) in the Rub' al Khali, which was dated between two periods of red aeolian sand deposition. A date of 6,685 + 50 years BP, (Garrard, l981, p. 140), which was obtained from a highly-organic sandy-silt deposit in the Jubba Basin, in the Nefud Desert, further supports the assertion made by McClure (1978) concerning the presence of a sub-pluvial phase.

A record of Holocene climatic changes was provided by the animals depicted in the rock art of Shuwaymis site, such as dogs and cattle, which is to the South East of AlUyaynah, and is able to be utilised as evidence of environmental conditions in the region, as well as related to animal species from the time period (Guagnin et al., 2016). Specifically, the rock art indicates evidences of Holocene humidity. This evidence can be attributed to the phase of Holocene humidity, when there was an abundance of vegetation, while lakes also started to form in present day arid locations. There is also the indication from the rock art that the environment was marginal and climatic amelioration could potentially have only been for a short period, even though there is evidence of a Holocene humid phase at Shuwaymis. Meanwhile, domestic cattle were probably introduced approximately 6000BC, as based on earlier dates of domestic herds in the other parts of the Arabian Peninsula, and they may have been there up until severe arid conditions began to take hold around 4000BC.

There is also the major evidence from the region of Tayma, which shows the onset of humidity and lake formation from ca.8000BC, which includes the concentration of lakes in the period of around ca.6500BC (Engel et al., 2012). Pollen from lake sediments, however, shows the formation of a shallow lake approximately 7200BC, with high lake levels only occurring between 6700 to 6000 BC (Dinies et al., 2015). Correspondingly, records of pollen levels from the lake sediments at Tayma provide specific evidence of vegetation alterations and provide insight into how the grasslands expanded following 7000BC, and reached maximum expansion levels between approximately 6600-6000BC. At that time, pollen records highlight how grasslands abruptly retreated and vegetation was replaced with extra drought-resistant shrublands similar to the landscapes in the present day (Dinies et al., 2015). There are also additional data regarding the Holocene environments, which are mainly based on early Holocene lake sediments taken from the Jubbah oasis, together with the extrapolation of the greater climate patterns from the Levant and Arabian Peninsula.

The palaeoenvironmental history of the Arabian Peninsula during the early–mid-Holocene period is complex, with apparent spatial and temporal variability in the timing of climatic changes. Palaeoclimatic evidence for increased humidity is derived from numerous archives, including lacustrine and palustrine deposits, speleothems, fluvial/alluvial deposits and palaeosols, all of which may have responded differently to increased rainfall (Guagnin et al., 2016, p.1824). Even though the site of AlUyaynah is still under study and needs more environmental data through excavation in the future, the records from nearby regions reveal changes in climate and human activity since the beginning of the Holocene, which gives a broad picture about the environmental changes in AlUyaynah region itself.

These varied sources of evidence indicate that generally wetter conditions and more attractive environments and vegetation are likely to have existed in the AlUyaynah region between about 8500 and 6000 cal BC. As shown later, the radiocarbon dates from AlUyaynah show that the site was occupied during this climatic interval.

3.6 Conclusion

Systematic surveys and excavations carried out during the last 50 years in the Arabian Peninsula and surrounding areas, shed new light on the environmental changes and cultural dynamics which occurred during the Pleistocene and Holocene. The data are geological, archaeological and biological; they suggest that there had been significant climatic and ecological changes in the whole region during these past two epochs.

There is evidence from many parts of Saudi Arabia, specially Nefud and the Empty Quarter, of eroded lakes and wadis which were full of water during the Early Holocene. Cultural evidence, mainly lithics and rock drawings, present the most obvious evidence of wet phases in today's sandy regions. During the Holocene the Arabian Peninsula experienced dramatic shifts in climate, in line with those experienced in other areas. The Palaeoclimate of the Arabian Peninsula during the Holocene can be divided into two major phases, the wet phase during the Early Holocene and the current dry phase which started after c. 5400 cal BC.

Our knowledge of the prehistoric conditions around AlUyaynah is so far largely dependent on the archaeological and palaeontological elsewhere in northwest Arabian Peninsula. In the absence of excavated faunal remains, many species that were present in the Levant and North Africa have been assumed to have been absent on the Arabian Peninsula (Guagnin 2018). The rock art from Jubbah and Shuwaymis sites in Ha'il province, north-western Saudi Arabia, indicates the presence of lesser kudu (Tragelaphus imberbis), wild camel and African wild ass (Equus africanus) extended into the north-west of Arabia and that the engravers may have had knowledge of aurochs (Bos primigenius). The animal identified from AlUyaynah reveal a rare evidence of excavated faunal remains from early Neolithic times in northwest Arabian Peninsula. The faunal inventory includes Bos sp. (Cattle), *Capra* sp./ *Ovis* sp. (goat/sheep), *Capra* sp. (goat), *Lepus* sp. (Hare), *Aves* (Bird), and *Vulpes* (Fox). This assemblage provides new information regarding their distribution, as well as the types of habitat and vegetation that were available in AlUyaynah landscapes. Unfortunately, the frequency of the animal bones recovered from the site and its environmental indications is limited to the current data available from the site (See chapter seven). Moreover, as we are dealing with few animal species such as cattle, goat and sheep, we need more data to show that these species were occurred locally elsewhere, which need more investigations in AlUyaynah and other parts of northwest Arabian Peninsula.

Early eighth millennium or the late seventh millennium BC are within the range of Early to Middle Holocene, and thus within the wet phases that continue during the early to middle 8th millennium cal BC (see discussion on C14 dates in chapter seven).

Chapter Four – Excavation at AlUyaynah

4.1 Introduction

The northwest region of the Saudi Arabia is fairly well-known archaeologically. Most of the known archaeological sites are dated to the Arabian Kingdoms or Islamic periods. However, even with the limited studies of PPN sites in the Tabuk region (Al-Asmari, 2012, Fujii, 2018), little is known about that period. The current research expands on the first detailed study of PPN occupation in the northwest of Saudi Arabia at the site of AlUyaynah. The first study (Al-Asmari, 2012) gave us promising results that further excavation may provide insights into the link between the Levant and internal lands of Saudi Arabia. In this chapter, I will review the fieldwork undertaken for this thesis in order to verify the nature of the site.

4.2 Aims and Objectives

The present work places the different aspects of occupation at the site in more detailed temporal context, to discover the development of the economy, technology and architecture over time. In particular, it focuses on questions of site organization and evaluates the nature of its cultural data through excavation. This enables a focus on the settlement period/s indicated by the occupational layers and archaeological remains. This will also help to compare the site spatially and temporally to archaeological assemblages elsewhere in Saudi Arabia and adjacent regions.

In order to achieve these aims, the key objectives of the excavation were:

1. Description and analysis of architectural structures and changes over time.
2. Study and analysis of the site stratigraphy and the temporal and spatial study of the archaeological finds.
3. A comparative study between the site and similar sequences in Saudi Arabia and adjacent regions.

4.3 Structure of the Chapter

My research therefore re-evaluates the nature and timing of the occupation of AlUyaynah. First, the site background will be reviewed, and the results of the new survey and excavation results will be presented in detail. The examination and analysis of the site stratigraphy will help in better understanding of the spatial variability of archaeological materials, the architecture, the lithic tools, artefacts of demonstrable social significance, temporal sequence, and the potential clusters of artefacts within specific layers (such as the clay objects). The results of C14 analysis will also make a key part of this chapter. Lithic materials, architecture, and other archaeological finds found on AlUyaynah will be compared to other sites, especially in the Levant. The chapter will end with a summary of survey and excavation results.

4.4 Survey of AlUyaynah Landscape

4.4.1 Site Background

Tabuk is located in the north western part of the Kingdom of Saudi Arabia, with an area of 116,400 km^2. Tabuk was mentioned in a number of ancient books. For example, Tabuk is described as a place between the valley of the villages and the Sham (Levant) and Abu Zeid called it Tabuk between Al Hijr and the Sham (Levant) (Hamawi, 1979, pp.14-15). Elsewhere its name has been attributed as a land name, and the Tabuki is a drink made of white grapes with little water (Ibn Manzour, 2000, 213) (Figuer 4.1, A-B).


A
AlUyaynah
Tabuk Region
Map Of Tabuk Region
International borders
Motorway
Regions borders
The seas
Tabuk region borders
N
W
E
S
0 20 40 60 80 100
Kilometers

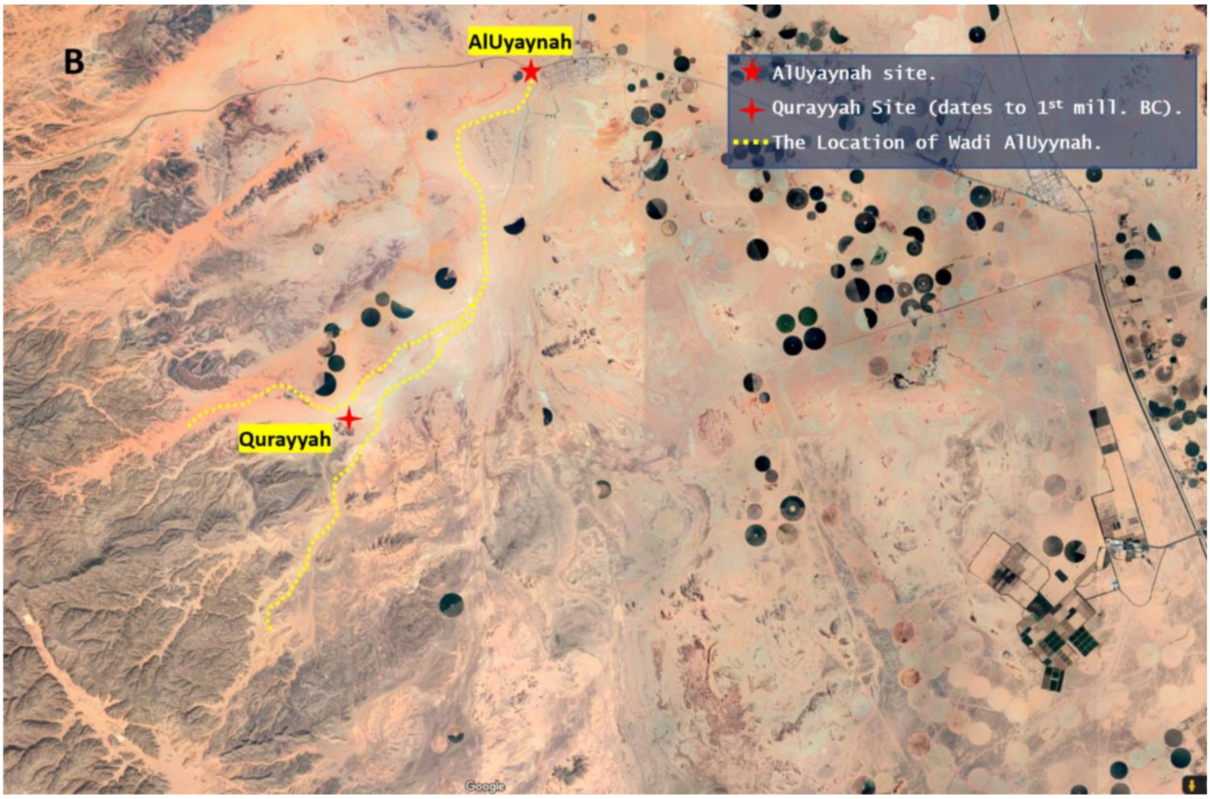


Figure 0.1: A) Map showing the Tabuk region (After: Ministry of Culture), B) AlUyaynah Site (Google Earth).

The Tabuk region is located on a southwestern rim of a large basin with an internal drainage system running from the northwest to the southeast. The city is bordered by the south-west of the Hasmi region, while it is bordered on the north-east by a flat-topped mountain range. The presence of oases and dry ponds confirms the existence of drainage system in the area, and the mountains of the region are distinguished by the rocky cliffs in the form of steep rocky slopes and terraces. The geography of the region contributes to the provision of water to oases in relation to its location in the basin, which in turn withdraws groundwater from a large area (Figure 4.2; Ingraham et al., 1981).

The north western region of Saudi Arabia has tended to be one of the wealthiest parts of the Arabian Peninsula throughout history because of the geographical features that helped to form successive civilizations. Particularly, the fertility of its land is a major factor in its prosperity.

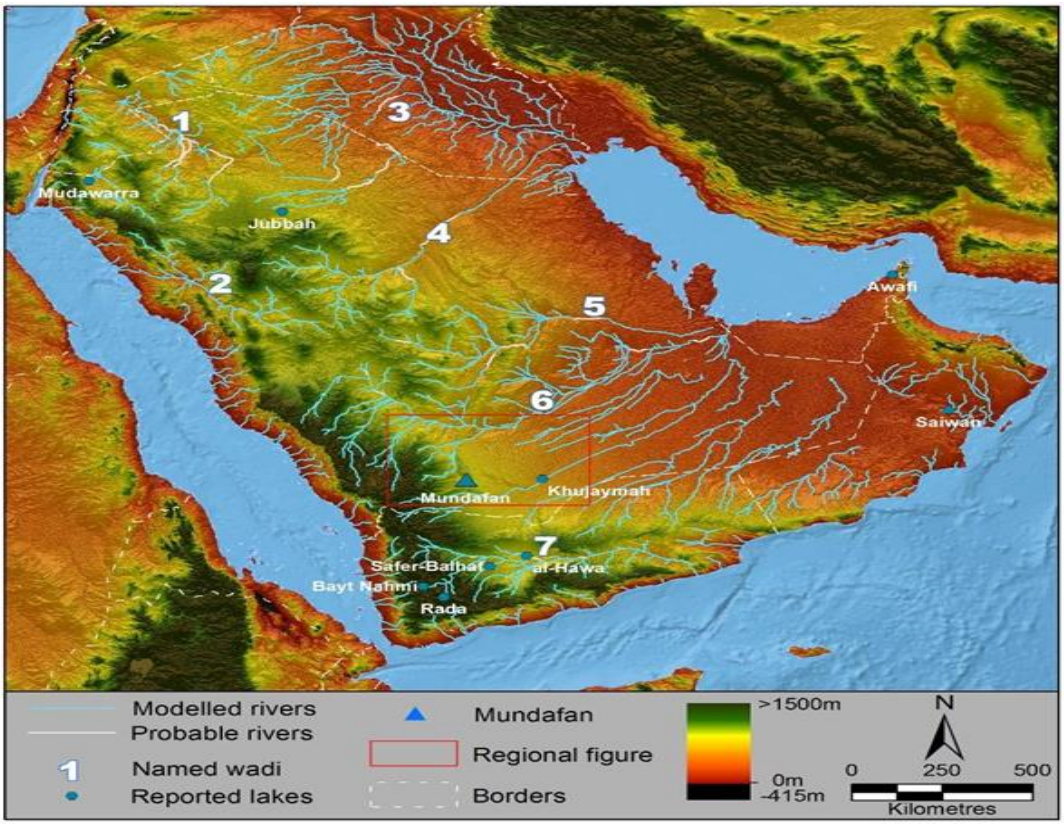


Figure 0.2: Potential Holocene drainage is displayed in blue, with currently severed drainage connections that may have been active during Holocene humid periods interpreted and displayed in grey (Crassard 2013)

The survey area is located within the vicinity of the site of AlUyaynah, 20 kilometers from Zat Al-Haj, one of the abundant railway stations in Tabuk region and about 80 km north-west of Tabuk at 28º 53' 40" N and 36º 04' 24" E. The site is c.744 m above sea level. The site is located four kilometers north of the Qurrayah archaeological site, 200 m south of the highway leading to the provinces of the Hagl and Badaa'. The site is currently surrounded by a fence implemented by the Agency of Antiquities and Museums during the process of a comprehensive archaeological survey of the region.

The site is classified in the preliminary reports of the comprehensive archaeological survey as "a Neolithic site in Saudi Arabia, the most important ... in the Tabuk region" (Ingraham et al., 1981).

4.4.2 Methods

The chief method of investigation used during the survey was field walking. We complemented field walking with other strategies, such as the investigation of scatter sites by using Google Earth to locate the structures and then investigate them during the survey. A study of the previous aerial photographs and maps revealed no obvious sites (see Ingraham et al., 1981, p. 61), but our preliminary survey of AlUyaynah suggested that three zones would be most suitable for an intensive study:

1.AlUyaynah site area: the area around AlUyaynah site (in this case the current Survey Area)

2.Highway: the pass through the Northern part of AlUyaynah toward west

3.The area between AlUyaynah and Qurayyah plain.

The last area, Qurayyah plain, is located c.70 km northwest of Tabuk, capital city of the Province, and well known for the Late Bronze to Early Iron Age fortified town site of the same name. A new survey of this area was recently published by the Saudi-Japan Joint Surveys in the Tabuk Province (Fujii, 2018). Their survey started on December 2012 with a visit to AlUyaynah. The survey focused on the following three areas close to the Jordan border: the Qurayyah plain, the Wadi Sharma drainage basin, and the Wadi Dabi catchment area. The surveys were purposive in nature in the sense that they focused on prehistoric sites related to initial pastoral nomads. It is needless to say, however, that any site encountered in the course of the surveys was registered for future reference. According to their preliminary report (Fujii et al. 2018) the surveys located several new sites in the gorge area which is on the fringes of the southern edge of the Qurayyah plain. They covered the key five millennia spanning from the Pre-Pottery Neolithic B (PPNB) through the Late Neolithic and Chalcolithic periods when pastoral adaptation in arid margins predominated to the Early Bronze Age (Fujii, 2018, p. 182). Their survey started with the visit of al- ‘Aynah (AlUyaynah), which was described as "a small Neolithic settlement located roughly in the centre of the plain” (Fujii, 2018). The site has been known since 1980s as the only PPNB settlement in Saudi Arabia (Ingraham et al. 1981). Test excavations were conducted by Al-Asmari (Al-Asmari, 2012). A Japanese mission (JTAP: Jawf/ Tabuk Archaeological Project) started their work in Tabuk in December 2012 with a view to tracing the process of pastoral nomadization in the Northern half of the Arabian Peninsula. The targets of this comprehensive research project are desert sites varying in date and nature from Neolithic settlements to Early Bronze Age burial fields. The team visited AlUyaynah in December

2012, after my first excavations, and published initial observations about its current condition in 2018 (Fujii, 2018, p. 18).

The rest of their report of AlUyaynah contained no extra information known before (Al-Asmari, 2012). They presented little information about the site beyond a description of the structural complexes, surface finds, and C-14 dates mentioned elsewhere in my previous study (Al-Asmari, 2012).

For our current research, this first area was surveyed extensively in 2016. The survey work was scheduled for three days. The survey was carried out for the following reasons:

1. The AlUyaynah site was re-surveyed, to locate the site and other possible new features; and to inspect the site to determine if there has been any substantial change in its condition since the time of initial description (Ingraham et al., 1981; Al-Asmari, 2012).
2. To draft a full description of each site discovered that can be included in future studies.
3. To take supplementary photographs on-site.
4. To evaluate, with collection, the raw material sources used to manufacture lithic materials in AlUyaynah site.

The survey, which concentrated on a single area within AlUyaynah site, was helpful in understanding the Neolithic period of the area. The results of this survey are presented below.

4.4.3 Survey and Results

The survey activity centered on two primary objectives: first is to explore the area around AlUyaynah; and second to explore the raw material outcrops as potential sources of the knapped stones found at the site (mentioned in chapter six). The survey area extended 500m from the east to west and 1 km from north to west. This is due to modern field boundaries mentioned above, as the east, west and north boundaries of the site are largely disturbed by modern settlements and farms. The site of AlUyaynah is located in the mid of the west-east axis in the Northern limit of the survey area.

The site occupies a flat alluvial terrain where several awdiya (pl. of wadi) converge, forming a small tell c.0.5 ha in total area, in an area of c.160 m N-S×120m E-W (Figure 4.3 and 4.4) and c.5 m in relative height. However, a sandstone bedrock layer is exposed at the edge of the mound, suggesting that anthropogenic deposits are much thinner than they appear. Two distinct structural complexes cover the mound, one on the Northern part of the site, while the other is located in the middle.

The hilltop complex consists of rectangular rooms of various sizes, being oriented to the east or southeast. Some of the masonry walls are preserved to nearly 2 m in height. Meanwhile, the lower half of the hill, especially its eastern and southeastern slopes, is covered with round to oblong enclosures c.5-10 m in diameter. The lower area yielded few PPNB artefacts and, therefore, is thought to be later in date than the hilltop complex. In addition, a few stone-built features are dotted in the flat terrain to the east of the mound, but nothing can be determined about their cultural or temporal attribution at the present stage. They are covered totally by sand and are only known in plan.

The site was chosen as a focal point in the Northern limits of the survey area, because it occupies an area where the main asphalt road heading west and north cut the area north of the site. Recent buildings, farms and other occupational facilities surround the site from the east too, but the fence keeps the site partially intact from these human activities.

Figure 0.3: View showing the archaeological survey area

As the aim of our 2016 survey was to locate other sites and raw material sources, special focus was placed on the eroded wadies and short streams which run during the rainy seasons. This enabled me to address the key survey questions:

- Is there are any evidence for human occupation away from the AlUyaynah tell?

- Are the lithic remains at AlUyaynah produced from raw materials that existed in the vicinity of AlUyaynah?

The survey area was also partially studied in the 1980’s and was a part of the current researcher’s MA thesis (Ingraham et al., 1981; Al-Asmari, 2012) - this needs to be higher up and come before the discussion of the Japanese-Saudi survey Four new sites were discovered during the current survey. These were labelled respectively AS-1 to AS-4 (AS standing for AlUyaynah Survey).

A-S-1: 28° 53.523'N 36° 4.304'E (eroded structure)

AS-2: 28° 53.738'N 36° 4.397'E (eroded structure)

AS-3 28° 53.669'N 36° 4.305'E (eroded structure)

AS-4 28° 53.436'N 36° 4.431'E (eroded structure)

Each site was located spatially using a handheld GPS; the localities were described with systematic criteria, following our site reference code (see Figure 4.4).

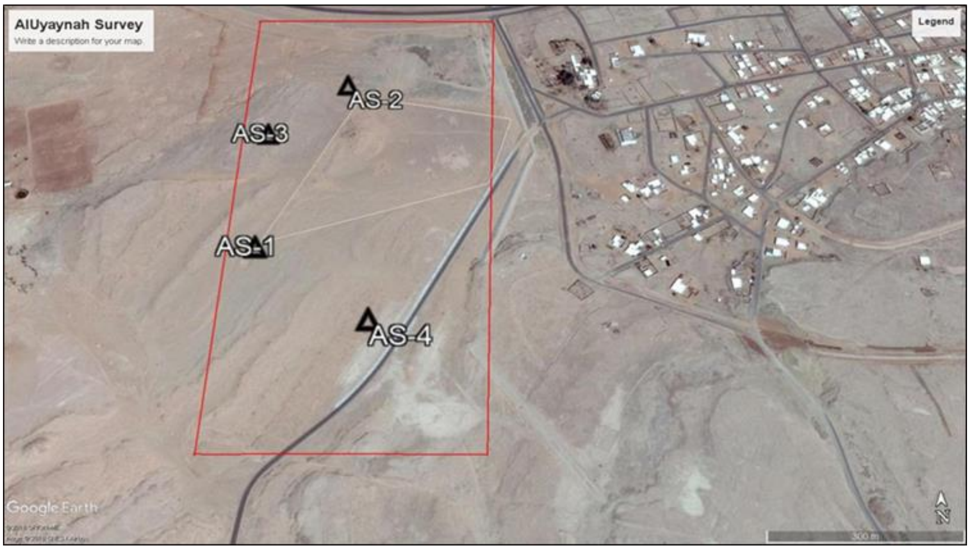


Figure 0.4: Numbers of site found during the survey

Then we recorded its coordinates, altitude, access to the site, site name (when specified), site type, structural remains, and surface finds. Understandably, some of the records, especially the site size and date, are still tentative and will require further verification in the course of future investigation.

The sites discovered in the area of AlUyaynah, outside the site's artificial fence, are surface sites and will not provide any absolute dates. They all featured the remains of structures close to the area of the AlUyaynah site, and might have related to it at one point of its occupation time-span. The only way to place these structures into a comprehensive time-frame is by comparing the techniques used to build them with AlUyaynah, which represents the only definite example of prehistoric sites in the surrounding area. No lithic materials were found on or beside these sites, and nothing was found within the survey area except within AlUyaynah site (inside the fence).

The survey of potential raw material sources was more successful. The surface finds, especially quartz and quartzite, were concentrated along the wadi west of AlUyaynah and therefore might represent one of the raw material sources used in the past. The survey located several loci of quartz and quartzite in forms of small pebbles and eroded outcrops. Unfortunately, no human activity was noted within these raw material areas. In general, the survey attested to the lack of major additional archaeological sites within the survey area, the existence of rough stone structures at AlUyaynah and the potential of the area as raw material source (quartz, quartile and sandstone).

4.5 Fieldwork

4.5.1 Introduction

Even though the archaeological excavation of AlUyaynah covers a limited range of period/s, mainly represented at the site by the PPNB (Al-Asmari, 2012), the possibility of locating earlier traces of inhabitation at the site was one of the main objectives of the 2016 excavations. The settlement remains have been investigated previously (Al-Asmari, 2012), when the author excavated an area of 50×50 m across the site as well as on an isolated structure in the eastern part of the site - down to a depth of 3 meters. Test pits were also conducted on 7 parts of the site where concentrations of archaeological materials exist (c.50m2). The results of these excavations and test pits were extremely positive, demonstrating the existence of Neolithic habitation deposits up to 280cm deep in some places (Figure 4.5 and 4.6).

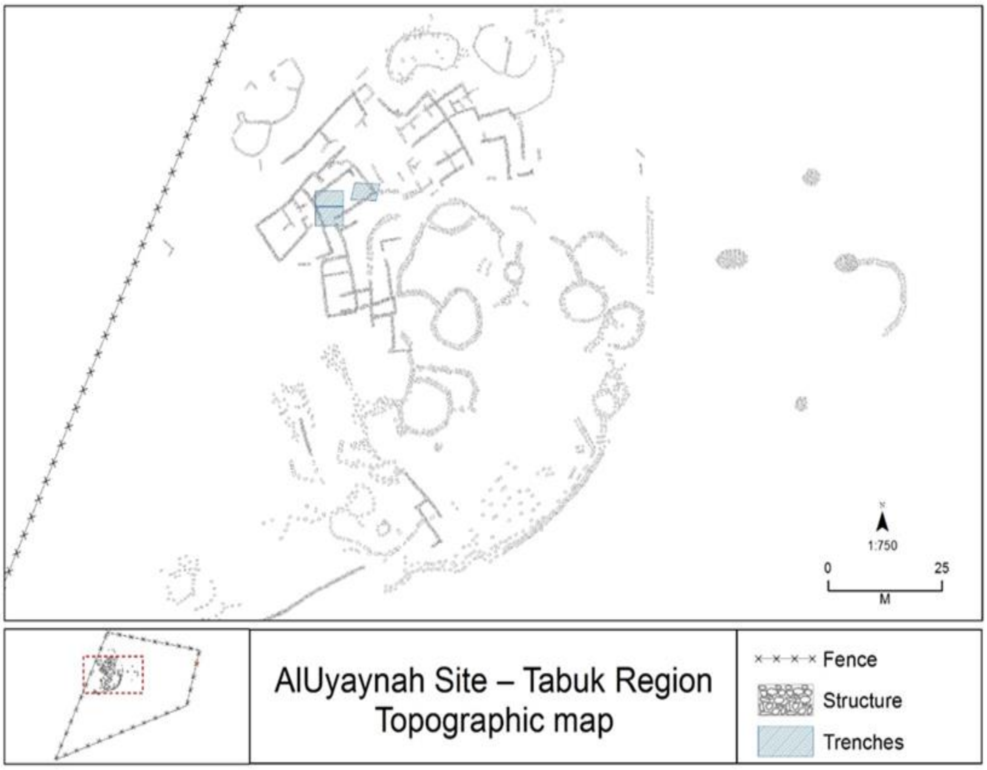


Figure 0.5: Topographic map of AlUyaynh

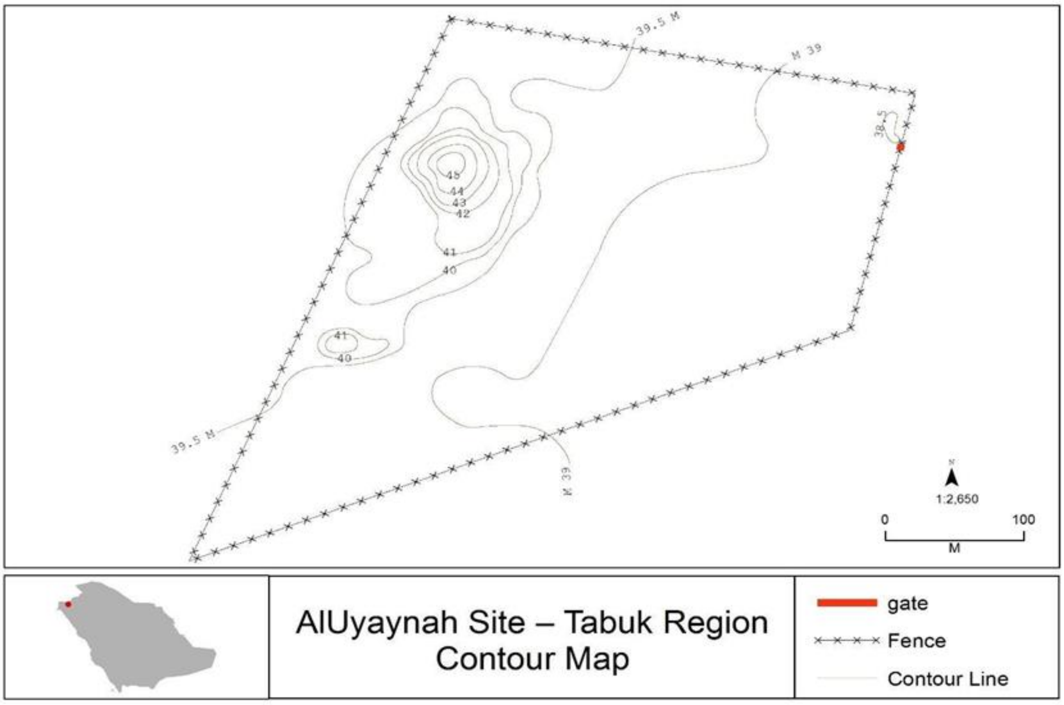


Figure 0.6: Contour map of AlUyaynh

The other major target of the excavation of AlUyaynah, was to determine more about the material culture at the site. The identification of the subsistence resources is also of great importance. More information will be presented later in the thesis.

4.5.2 Methodology

The excavation methodology was carried out as follows:

1. The excavated area was photographed before excavation.
2. Initial observations were made, followed by the collection, recording and numbering of the surface finds.
3. The current excavation continued on the same area as the 2012 season, where the whole 50x50 area was re-examined and three squares (Sq A2-1: 3×4.5m & Sq A2-2: 3×5m & Sq A2-3: 3×5m) were dug as test pits. They are located in the southern, Northern and Western corners respectively. The 2016 field season continued for one month from 1st to 30th August 2016
4. The excavation proceeded according to arbitrary 20 cm levels (each is 20cm).

5. The soil was carefully sieved to recover any organic materials needed for laboratory analysis. Sieving was also carried out to collect any possible micro-organic materials (grains mainly), we used two sieve meshes, A= 4mm; B= 2mm (Figure 4.7).
6. The dimensions of the fixed features (walls) were also taken into consideration in terms of measurements and photographed.

Figure 0.7: Process of sieving, (A) Mesh sieve= 4 mm, (B) Mesh sieve=2 mm.

4.5.3 Trenches

The main results of 2016 excavation are presented here:

4.5.3.1 Sq A-2-1

This square is located in the south-eastern area of the tell mound (3×4.5m) and was a continuation from the first season of excavation carried out in 2012. In 2016, the upper surface was cleaned but no surface collections were noted (Figure 4.8). The excavation continued until the natural subsoil was reached at 3m deep. In the lowest level, a layer of mixed sand and mud, bones and Clay Objects appeared (See chapter five). The architectural features consisted of the remains of the east-south corner of a structure (see-below). Organic materials were collected for C14 dating (See section; Excavation results). A further sounding at the Northern edge of Sq A-2-1 reached a depth of 3m below present surface and revealed parts of the north-east corner of the site. This part was excavated totally in the past (Al-Asmari, 2012).

The layers excavated in Sq A-2-1 consisted of fine-grained light brown to dark brown soil, with patches of light greyish to brownish layers. These patches consisted of charcoal pieces and ash, and higher amounts of burned organic material, mostly small burned animal bones. In some areas, small burned stones were also found and thought to indicate traces of hearths. Towards the lower levels, more blackish and greyish layers were noticed. Within these layers, animal bones were collected. These layers were rich in burned organic material, especially burned animal bones.

The vertical distribution of finds shows an almost even scattering of flint and bones across all parts of the stratigraphic sequence. At a depth between approximately 80cm and 160m below the present surface, a significant increase in finds could be seen, especially in animal bones. They are diffuse through the layer, as well as found in small concentrations where ash and charcoal are dominant which might indicate continuous human activities within these structures. This pattern is also repeated at a depth of 240-270cm and below, where the soil turns to a dark greyish colour and more animal bones and charcoal were found. At the lowest depth of this square, tens of small mud Clay Objects were discovered near the south-east corner. These Clay Objects are of great importance as they represent the earliest evidence of mud Clay Objects discovered in Saudi Arabia so far. More details about these finds are presented in chapter five.

Figure 0.8: The excavation area of the square Sq A2-1

4.5.3.2 Sq A-2-2

Sq A-2-2 is located in the south-west corner of the site. It was located to follow the structures that appeared in the first season of excavation (Al-Asmari, 2012). The excavation started by removing stones and debris from the surface. Stones fallen from the southern and western walls, along with other materials, were removed. This consisted of two rows of stones without the use of mud or plaster, extending from south to north. No further finds were found until the lower part of the structure, where extra fallen stones were found. The square yielded lithic materials and animal bones, but no other materials were present. A niche was located on the western wall near the corner (depth 1.5 m, size 3×5m) (Figure 4.9), but no materials were associated with it. The walls consisted of rows of stones filled with small rocks without any mud plaster. We extended our extraction layer to Sq. A-2-3 to reveal any extra stone structures between the two squares. Another small wall appeared, also consisting of two thin rows of stones and located on the outside face of the southern wall. The excavation revealed no finds in this part of the structure.

The layers excavated in Sq A-2-2 consisted of fine-grained light brown to dark brown soil, with patches of light greyish to brownish layers. These patches also consisted of charcoal, ash and burned organic material, mostly small burned animal bones. The soil also consisted of fine sands which covered the area after the 2012 excavation. Only a few patches of darker grey to brownish sand with higher amounts of animal bones were observed in the eastern side of the square.

Figure 0.9: The excavation area of the square Sq A2-2

4.5.3.3 Sq A-2-3

Sq A-2-3 is located in the north-west corner of the site. The main goal in excavating this square was to determine the extent of the Northern and Western walls of structure Sq A-2-3 was excavated to a total of a depth of 3.2m below the present surface. The square contained no extra walls but fallen stones, lithic materials and animal bones were recovered (Figure 4.10).

As is evident in other parts of the site, the uppermost 30cm of the layers represent a mixture of sands and small stones where archaeological finds accumulated, but their in situ spatial arrangement is generally destroyed. As in the other squares, the layers excavated in Sq A-2-3 consisted of fine-grained light brown to dark brown soil, with patches of light greyish to brownish layers.

Figure 0.10: The excavation area of the square Sq A2-3

4.5.3.4 Clearance of the Walls

The clearance of the walls was carried out after the excavation of the three squares was completed. The structure extends 6m×11m. The wall has been excavated in a total to an overall depth of 30cm below present surface. During excavation, the size of the structure was found to extend outside the main excavation area. Further excavation will be required to explore the whole external parts of the structure. A further clearance at the centre of the structure that reached a depth of 50cm widely, confirmed this (Figure 4.11).

Figure 0.11 Clean the wall, all squares are exuviated

4.5.3.5 Stratigraphy

Sq A-2-1

The stratigraphic information generated from this square is used as a sample of what was expected in other squares and used to determine the general stratigraphic sequences of the excavated structure (Figure 4.12,4.13,4.14). Details of the layers identified in Sq A-2-1 include a summary of deposit characteristics and material types are summarized below:

Layer 1: This topsoil consists of sand, grey soil and charcoal. It is approximately between 20-27cm thick. The layer had been disturbed by animal digging and moving sands. No surface collections were noted. The material types include bone and fragments of charcoal.

Layer 2: Less disturbed loose brown soil mixed with sand. This layer extends on a line from south (10cm) to north (27cm) to a thickness approximately between 20-23cm. Few lithic tools were collected.

Layer 3: Grey soil mixed with fragments of animal bones at the depth of 45cm and 47cm below the surface. The layer is more greyish in its Northern part than the southern brown one. Fragments of bones were noted.

Layer 4: The soil in this layer is more compact and blacker in colour. thin line of burned soil extended below layer 2. The soil colour ranged from grey to black. This layer is only 5-10 cm thick. Bone and fragments of charcoal were noted.

Layer 5: Grey sandy deposit lying between 70-75 cm below the surface. It is approximately between 20-30 cm thick. The deposits contain fragments of bones and a few lithic materials.

Layer 6: Grey sandy deposit lying between 95-103cm below the surface. It is between 18-20cm thick. The soil colour ranged from light grey to brown. Fragments of bones and lithic artefacts were noted.

Layer 7: This layer is about 10cm thick and started from 100-103cm below the surface. It is approximately between 5-10cm thick. The main feature of this layer is its greyish colour and a lot of animal bone fragments. Thus, very few cultural materials were retrieved.

Layer 8: This layer extends from 110-130cm below the surface and is approximately between 20-30-10cm thick. It is a dense layer of grey and brown soil which contains fragments of bones and lithic tools.

Layer 9: Grey soil mixed with ash at the depth of 130cm and 155cm below the surface. It represents a layer of ash similar to that of layer 4 and may represent a burning area too. Fragments of bones and ash were noted.

Layer 10: A thick layer of stone remains mixed with tiny fragments of bones and lithic materials. The deposit was dark brown and was from 145 and 170cm below surface. It is approximately between 55-65cm thick.

Layer 11: Another layer of ashy burned soil extends below layer 10 to a thickness of about 10-15cm. The soil is mixed with ash and tiny fragments of bones.

Layer 12: From 240cm, the deposits become greyer and more mixed with small fragments of stones. This layer is approximately between 18-20cm thick. Small fragments of bones and lithic tools were noted.

Layer 13: Starting from 260cm to the beginning of the virgin soil at a depth of 280cm. The layer contains soil with lots of pieces of sandstone and very few fragments of bones and lithic materials.

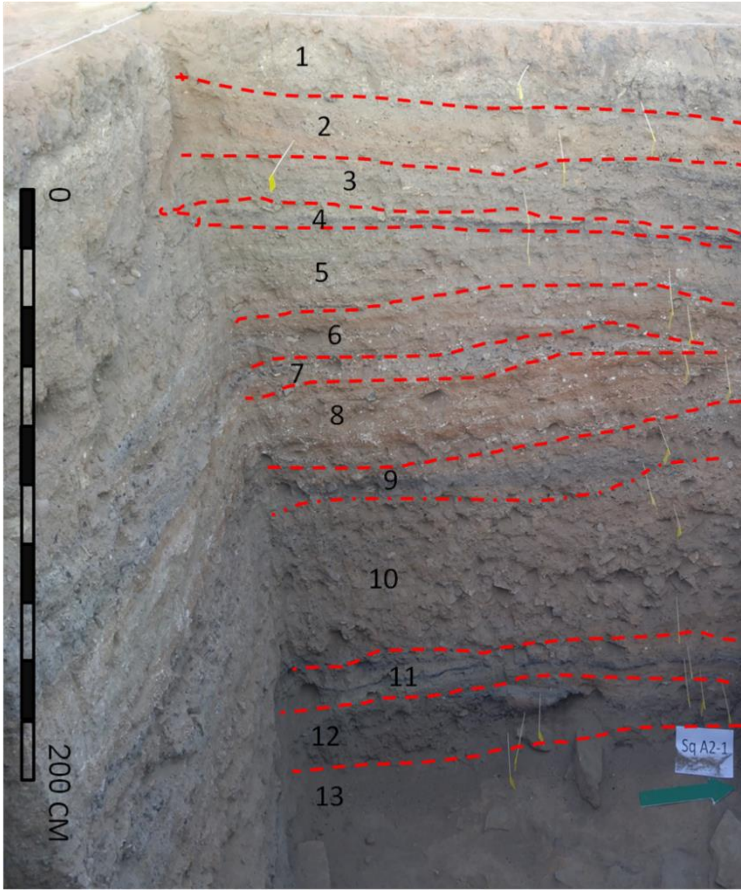


Figure 0.12: Stratigraphic of Sq A2-1

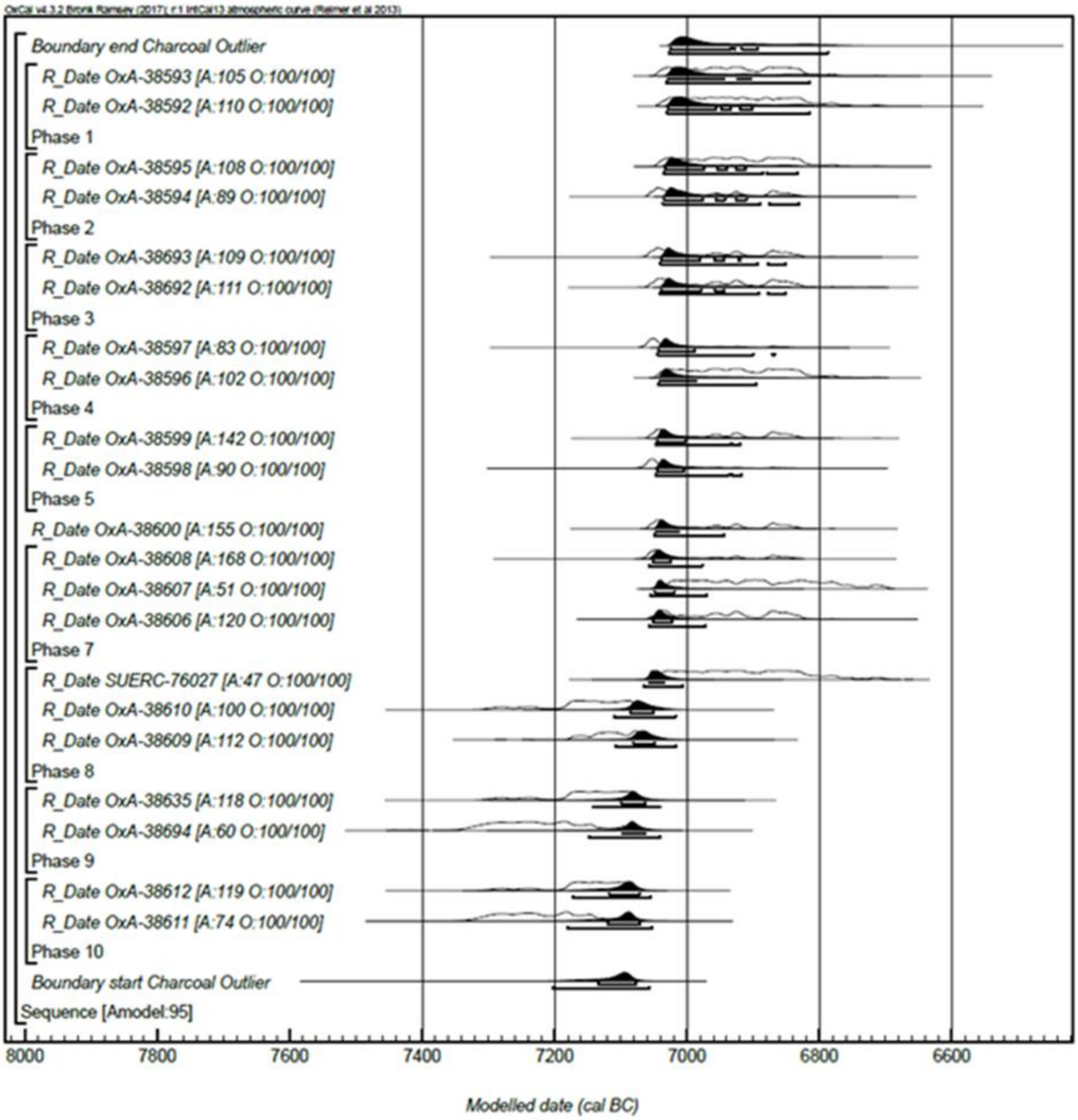


Figure 0.13: Results of C14 (Radiocarbon) from AlUyaynah

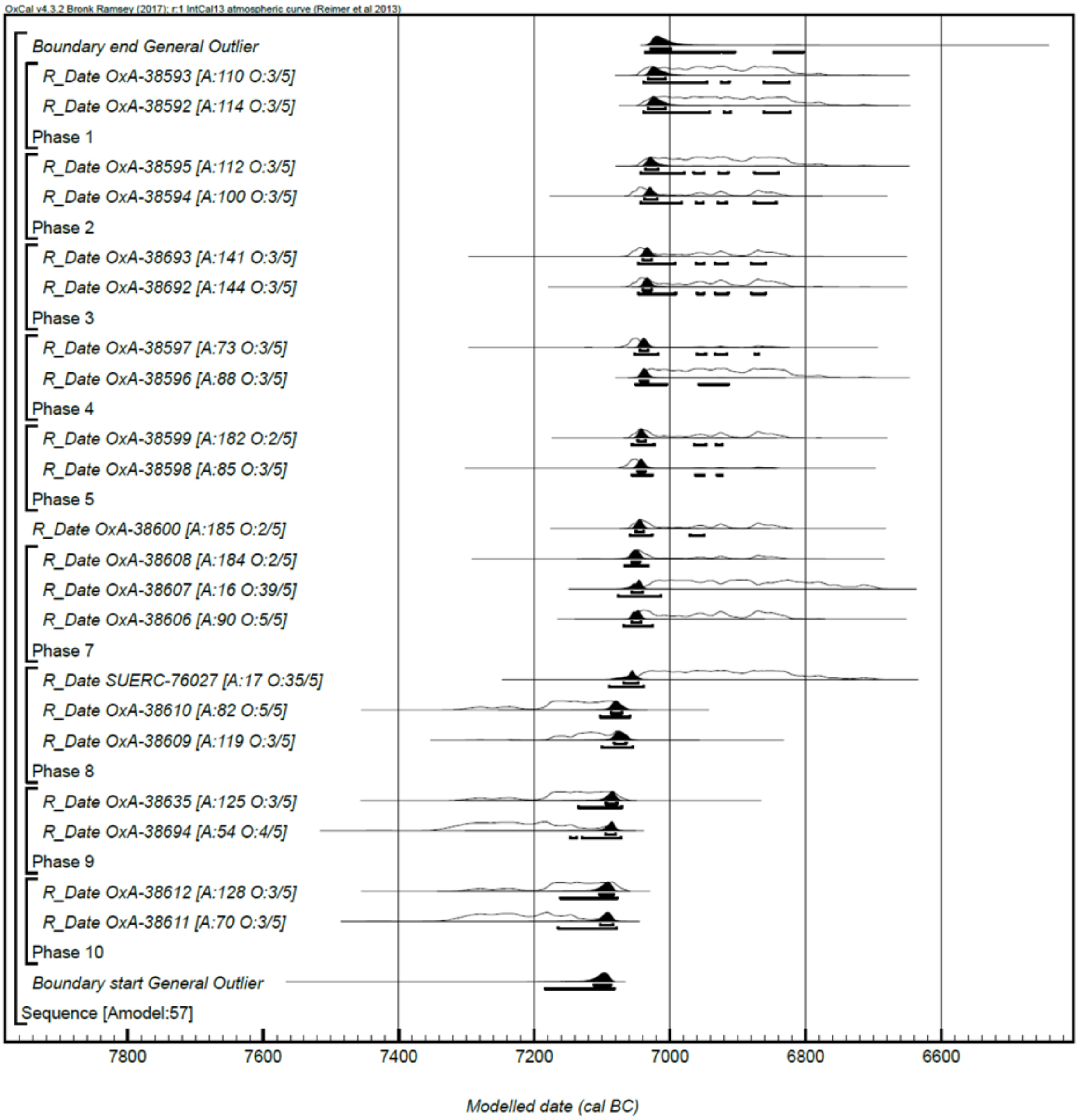


Figure 0.14: Results of C14 (Radiocarbon) from AlUyaynah

4.5.4 Archaeological Material

The spectrum of finds that has been documented from the excavation of the three squares consists of flint and stone artefacts, bones and bone tools, plant remains, mud Clay Objects, and charcoal. The number of single finds was significantly higher in Sq A-2-1. The number of finds from the squares A-2-2 and A-2-3 are significantly lower due to the previous excavation conducted in this corner (Table 4.1).

The vast majority of the excavated lithic assemblage was made up of chipped artefacts. The flint assemblage included various retouched tools such as points, retouched blades, endscrapers, and burins. In addition, debitage, flakes and cores were also present. Overall, the assemblage bears a general similarity to the PPNB flint industry in the southern Levant as will be explored in more detail in (chapter 6).

Other materials from the squares include:

1. Small amounts of land and fresh water shells. These could be a part of the archaeological materials or deposited later on the site. Land and fresh water shells can be found around the site especially within the running streams during winter. It is not clear to what extent these shells were used by the inhabitants of the site, as no manufactured materials were found (Figure 4.15: B, C, F, K, H and 4.16: A).
2. Small amount of oval white beads, some were made of bone & ivory (Figure 4.15:D, G)
3. Small rounded mud artefact in Sq A2-1 with a hole. It might have been used as a pendant. There is also an oval one with a hole found in Sq A2-3 (Figure 4.15: A).
4. Awl-like bone artefact with pointed ends (Figure 4.15: E).
5. A piece of textile (Figure 4.17).
6. The assemblage of animal bones. The assemblage of animal bones was given to a Masters student for examination (Grothe 2018) and the results are discussed more fully in chapter seven (Figure 4.18, 4.19 and 4.20).

Table 0.1: Archaeological Materials in (Sq A2-1, Sq A2-3)

Object Area	Needle of bone	Seashell small size	Seashell medium size	Cylindrical beads	Clay Necklaces	Piece rope
Sq A2-1	1	1	4	5	1	1
Sq A2-3	0	0	5	0	1	0

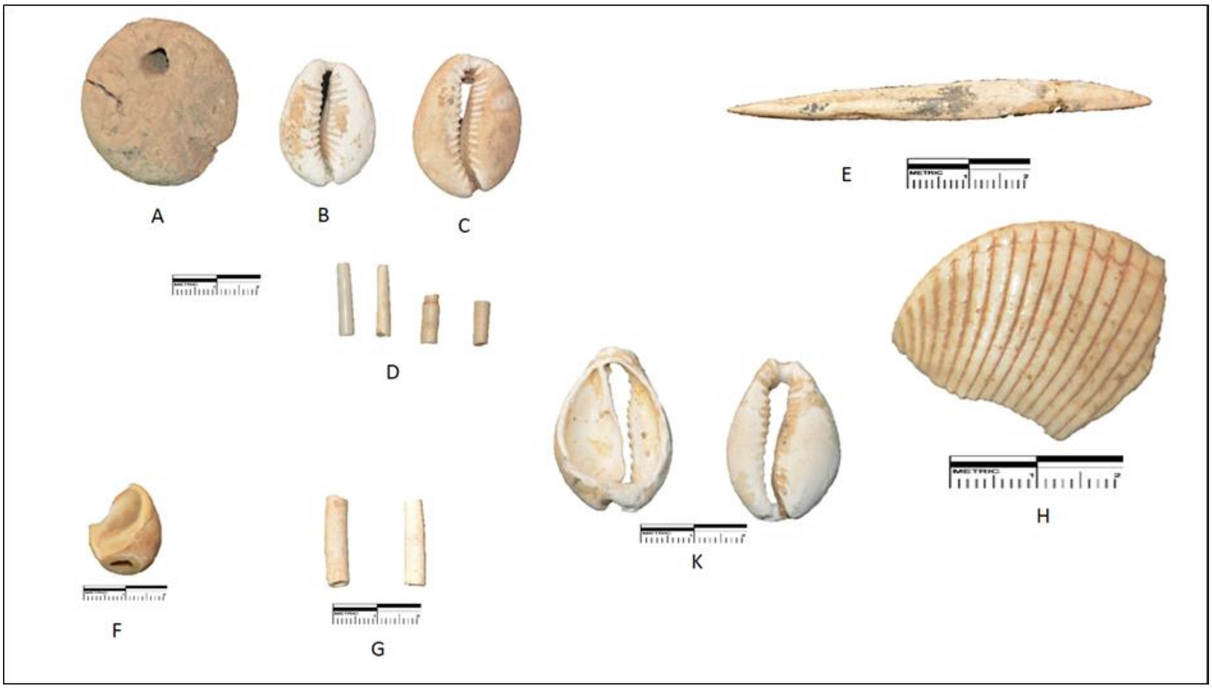


Figure 0.15: (A) Circle Necklace made by Clay (B, C, K, H) shell, (E) Needle of bone (D, G) Cylindrical beads (F) Small shell

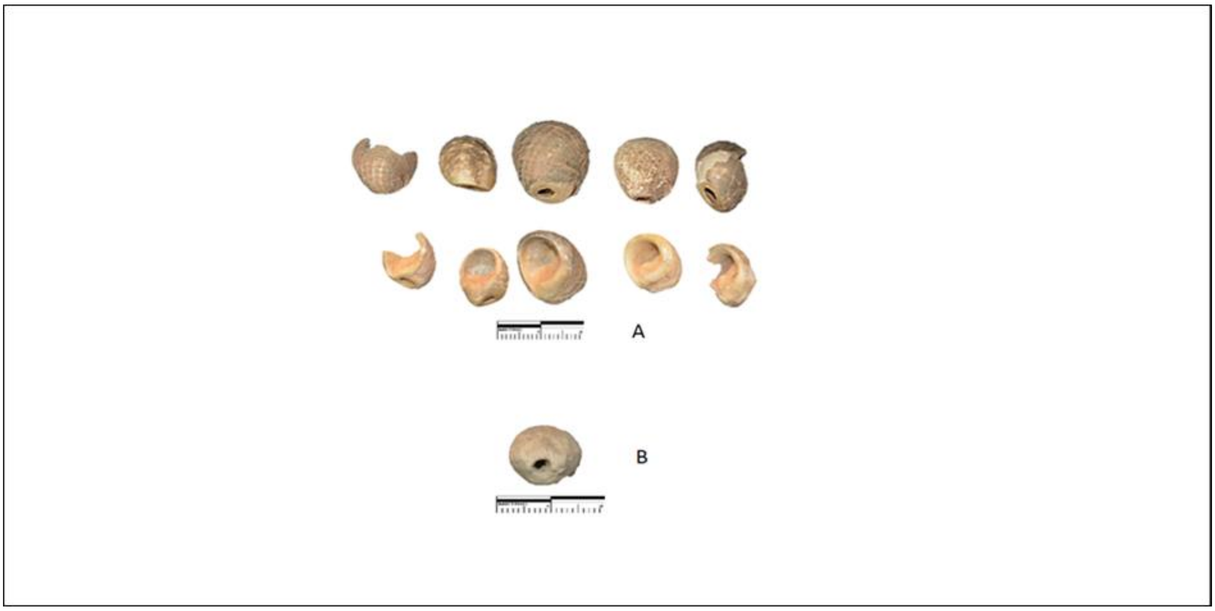


Figure 0.16: (A) Number of Shell, (B) Cylindrical Necklace made by Clay

Figure 0.17: Piece of textile (scale = 1 cm)

Figure 0.18: Assemblage of animal bones (Sq A2-1) (scale = 2 cm)

Figure 0.19: Assemblage of animal bones (Sq A2-2) (scale = 2 cm)

Figure 0.20: Assemblage of animal bones (Sq A2-3) (scale = 2 cm)

4.6 Discussion

4.6.1 Habitation Structures

The stone structures discovered on the site reflect the permanent nature of inhabitation at the site, with a group of houses with regular shapes, built adjacent to each other. Straight walls were built in many parts of the site without use of any kind of mortar, which reflects a unique feature of building which is unknown at other sites in Saudi Arabia. Some of the masonry walls are preserved up to nearly 2m in height and are similar to the two-storied structures at Basta, a Late PPNB settlement in southern Jordan (Gebel et al., 2009).

Many amendments and additions had been made to the buildings, which perhaps the existence of at least two stages of construction structure at the site. While the earliest one could be dated back to the second half of the 7th millennium cal BC, it is difficult to determine the beginning of the second one at the moment as more excavation in the other parts of the site is needed to determine this. It is also very early to give a precise date of the abandonment of the site as many of the archaeological objects, especially the stone tools, do not reflect fundamental differences in their technology or their types. However, it appears through the study of the architecture that the site continued until the 5th millennium cal BC as the previous C14 dates confirmed (Al-Asmari, 2012). Moreover, the estimation of the population who lived in the site and the lengths of their stay will only be possible through a long-term excavation of the site.

Even though no direct evidence of hearths were identified in the current excavation, the 2012 excavation revealed three types of hearths (Al-Asmari, 2012). These are:

1. Constructed hearth: Built of medium stones in square or rectangular-like shape. It is similar to types common in PP Neolithic A and B in the Levant (Figure 4.21).

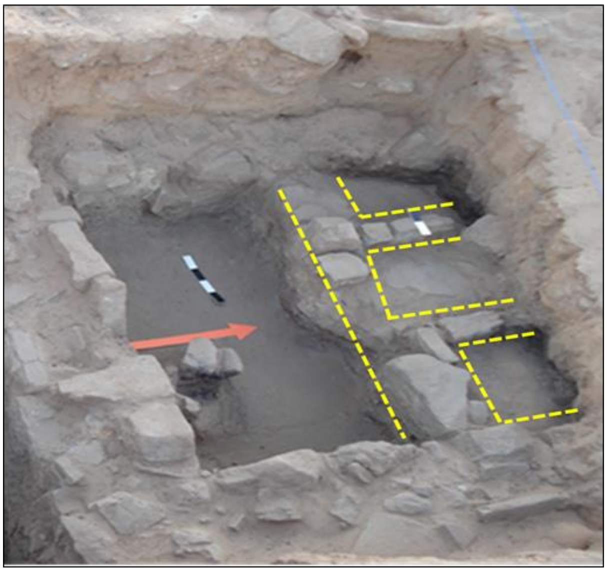


Figure 0.21: Constructed hearth from session 1 (Al-Asmari, 2012)

2. Pit Hearth: This kind of hearth is constructed by making a 50 cm diameter hole in the ground, and always contains a few pieces of charcoal, ash and scorched stones. Similar types have been recorded in sites belonging to the PP Neolithic A and B in the Levant (Figure 4.22).

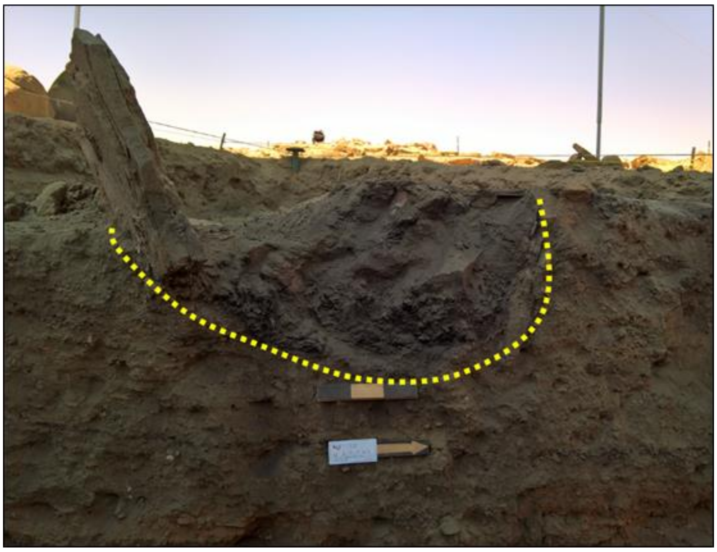


Figure 0.22: Pit Hearth

3. Simple Hearth: a group of medium-sized stones placed in a form of an oval, circular or horseshoe shape. It is also similar to some examples from PP Neolithic A and B in the Levant e.g, Tel Ar Ramad, Syria (De Contenson, 1967) (Figure 4.23).

Figure 0.23: Simple Hearth from season 1 (Al-Asmari, 2012)

4.6.2 Excavation Results and Comparative Remarks

The structures and material culture from AlUyaynah suggest links with the southern Levant, though the strength of those connections is uncertain. Three types of hearths have been revealed during excavations (constructed hearth, pit hearth and simple hearth). The stone structures are interpreted as a group of houses with similar shapes, built adjacent to each other, and as suggestive of permanent occupation. The many amendments and additions that have been made to the buildings confirm the existence of at least two stages of construction at the site. The growth of sediment in between periods of burning is not consistent, and the section indicates an apparent increased frequency in burning events towards the end of the site, before it was abandoned. Therefore, whether the site was continuously occupied may be debated. It is very difficult in the current state of search to explain the connection between increased frequency of burning and the continuity of site occupation. Including the thin layers of sand in the excavated squares, and additions made to the structures, the reasons for these burnings may need more excavation to be carried out in other areas of the site.

Excavations at the site covered an area about 44m^2. They unearthed a succession of distinct archaeological materials, animal bones remain, lithic tools, and ashes, all possibly related to a distinctive PPNB variant of Southern Levant. Some traits, such as the lack of mortar in building structures, might be local ones. This feature was seen even in later periods from the Bronze Age and ancient kingdoms sites. Stone structures found in many places in Saudi Arabia and those attributed mainly to the Bronze Age (Kafafi, 2005) lack any mortar to build them. Some are 5 meters high.

The PPNB sites were varied in many aspects, such as in their internal layout and the duration of occupation. Some sites, such as Taiba in Sahl Hawran, are short lived, not exceeding a size of 100m^2, while others, like Ayn Ghazal, extended over 10–15 hectares (Akkermans, 1993). The habitation structures are also different during the PPNB, and more specifically during the internal cultural divisions of this period (Early "c. 8700-8200 cal BC", Middle "c. 8200-7500 cal BC" and late "c. 7500-7000 cal BC" PPNB). Nevertheless, the rectangular or square houses with square corners and straight walls were diagnostic features of PPNB (Kafafi, 2011, p. 127). The dates from AlUyaynah place the site in early eighth millennium or the late seventh millennium BC, and thus the oldest known examples of the late period of PPNB in Arabian Peninsula.

Even though there is evidence of rectangular buildings during the middle period of PPNB (8200-7500 cal BC) (Kafafi, 2011, 128), the circular ones were still present at many sites such as Al Bayda, Wadi Ram, and other sites in southern Jordan (Kafafi, 2005). During the Late period of the PPNB (7500-7000 cal BC), the sites witnessed an enlarging and diversity of building styles, in some cases more than one floor. There were also many examples of “special” or non-domestic buildings, such as those of Ayn Ghazal (Kafafi and Rollefson, 1995) and Jirecho (Kenyon, 1957).

Even though the excavation of AlUyaynah was limited, the layout of the structures, along with the presence of specific types of lithic tools and mud Clay Objects, place the site in the time span and cultural horizon of Late PPNB. This chronological attribution is also supported by the C14 dates from the site, (for more details see chapter 7).

4.7 Conclusion

The survey and excavation results have revealed AlUyaynah can be definitely linked to the PPN, with some cultural aspects similar to that from other sites in the Levant. Any occupation is likely to have been episodic. Although earlier stages of settlement at the site still need more excavation, the vast majority of the structures excavated during the 2016 excavation season began at or very near the start of PPNB. The dates from AlUyaynah (Al-Asmari, 2012) place the site in early eighth millennium or the late seventh millennium BC, and thus the oldest known examples of the late period of PPNB in Arabian Peninsula.

It is also obvious that the site witnessed two chronological phases, with minor changes. This scenario is potentially corroborated by (a) the layout of the structure, and (b) the C14 dates which place the site in the time span and cultural horizon of Late PPNB (see Chapter Seven). The future excavations in the other sectors of AlUyaynah can reveal more information about the importance of habitation traces and the stratigraphy of the site.

Chapter Five – Clay Objects

5.1 Introduction

According to Lesure (2011, p.1) “Figurines are small statuettes made in clay, stone, and bone by unknown artisans, deep in prehistory; although archaeologists have found vaguely similar figurines at prehistoric sites in different parts of the globe, the objects in question had no straightforward utilitarian purpose but were instead expressive and meaningful; whatever these meanings were, we can be sure that they differed from place to place and from epoch to epoch”.

The known Figurines from Saudi Arabia do not date to the Palaeolithic and Neolithic periods, except those from AlUyaynah. Therefore, they are the earliest known in the country; the rest date from the Bronze Age and later. Even though their emergence among well advanced societies is more obvious in Saudi Arabia, their inventory is less significant in amount than in other regions; the collection from AlUyaynah is the largest known so far from a single Neolithic site in Saudi Arabia. This chapter analyses their use at the site and their significance, as well as arguing that they could be an important aspect in understanding the Neolithic society at AlUyaynah.

More than 200 clay objects have been collected from AlUyaynah. In this chapter, I will discuss several aspects of the figurines: Section I: Description, Section II: Analysis, and Section III: Interpretations. Through the analysis of the data, their importance during the PPN will be traced, especially in the north-west of Saudi Arabia. It will become clear that AlUyaynah has played an important role in the inter-relations between the Arabian Peninsula and the Levant, and this study aims to provide further information regarding the nature of that relationship through the study of clay figurines for anatomical features. This will be discussed in detail during this chapter, although there are no humans or animals featured.

5.2 Typology

5.2.1 The Methodology and the Technique

The collection of clay objects recovered during excavation at AlUyaynah in 2016 amounted to more than 200 pieces. All the clay material will be treated as one assemblage, as most of objects appear to have been made in the initial phase of the site. The analysis will include an assessment of the raw materials, the technology used to work the material, and the possible shape of every clay object. Accordingly, the techniques used to produce the clay objects from AlUyaynah can be divided by two descriptive categories: firstly, the techniques of shaping, and processing the raw materials into objects; and secondly, the composition of different shapes.

The clay objects were classified according to their external features. According to their geometric features, the main group was classified into the following:

- Cylindrical
- Conical
- Spherical
- Unknown or irregular (but has some sub-properties).

The subcategories of these are as follows:

- Number of parts / pieces (some pieces are attached to each other)
- Grooves or incisions
- Holes
- Attached flint tools
- Charcoal traces

The main raw material in shaping and processing the objects manufactured at AlUyaynah is clay. The later was available directly in the vicinity of the site where wadies running from the surrounding mountains bring lots of clay during the rainy seasons. The exact source is difficult to determine, although local people still bring the clay from the wadies. Searching for a source is an important research question for the future, although the current study will focus mainly on the second category: the composition of different shapes.

5.3 Distribution of Shapes

In this section, the assemblage of clay objects will be described in terms of shapes and location of where they were found. The second season of the excavations at AlUyaynah was carried out in 2016. A rectangular structure located at the top of the archaeological mound was chosen as a sample for excavation. The clay objects were found near the eastern corner of square (A2-1) and the western corner of square (A2-3), at a depth of (3 - 3.20 m); i.e. in the first occupation layer of the site (see Figure 5.1).

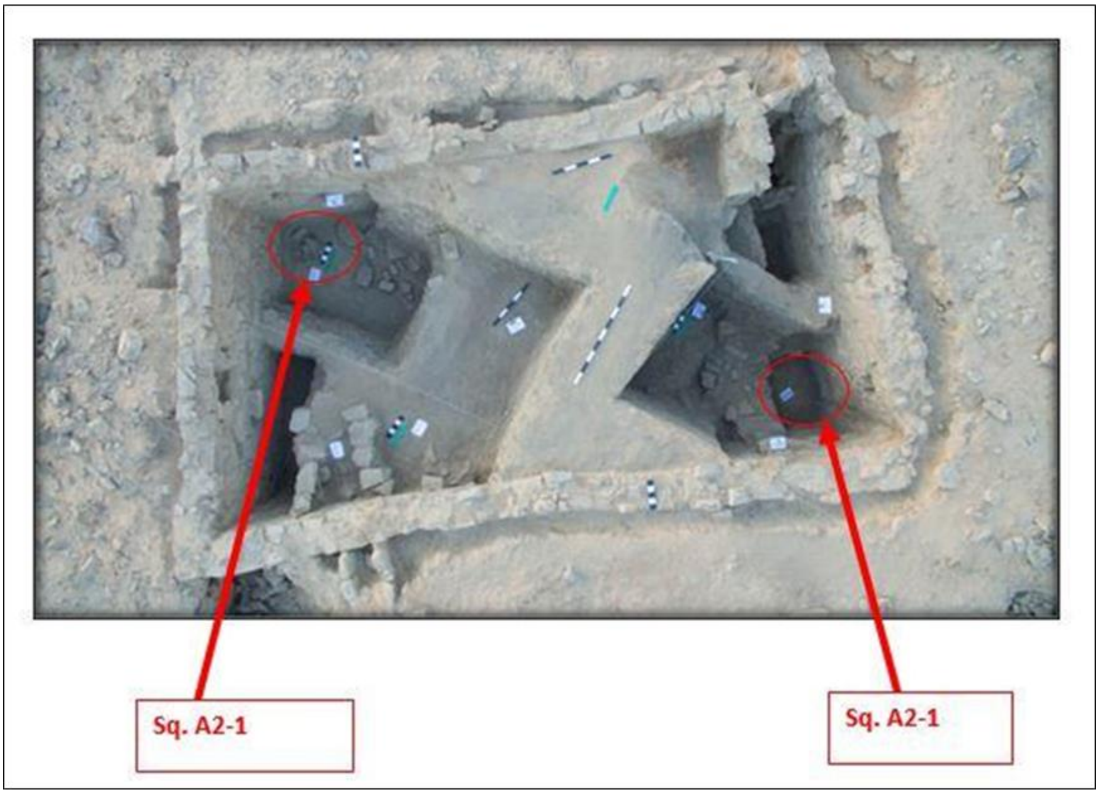


Figure 0.1: Places where clay objects were found

5.3.1 Location (corner - Sq A2-1)

At a depth of 3.20 cm, in the eastern corner area of the rectangular structure, and with an area not exceeding one square meter, the detection of this group of objects began. It should be noted that during the general excavation of the site, the method of soil sieving, which was one of the fundamental methods employed, was of great importance to this discovery.

The most important observations regarding the results of this area of the excavation are as follows:

1. The clay objects are mixed with soil and some organic materials such as small bones, ash and charcoal that appear attached or calcined on some clay objects.
2. Clay objects were found in soil sediments with a thickness of 3-5 cm.
3. The pieces were not distributed in a systematic manner, although they were scattered with no exact order.

5.3.2 Location (w. corner - Sq A2-3)

The deposition of the clay objects in the western corner was not different from that of the eastern corner, as they were scattered in no exact order within an area not exceeding one meter.

Other relevant observations include:

1. The soil in which this group was found was not as thick as its predecessor, as it did not exceed 1 - 3 cm.
2. The quality of the soil in which they were found is mixed with a quantity of ash, which affected the external colour of the clay objects.
3. Most of the clay objects in this corner had flint tools attached. Microliths were also scattered and mixed with the clay objects.

216 pieces have been classified, while others (28 pieces from Sq A2-1 and 31 pieces from Sq A2-3) were not included, as they are too damaged and do not fit with the general aspects of the geometric group.

5.4 Classification Strategy

1. The steps to classify the clay objects are divided into the following stages:
1. The clay objects were sorted for each square separately.
2. Measurements (length and width) were taken for each object, with estimated measurements made for some of those objects that are broken from one side.
3. The profile of each object according to the classification categories was recorded.
4. The objects were then photographed; each piece in a single and several shots to provide a general picture of the objects that are not identical to the classified categories.
5. All data was subsequently entered into Microsoft Excel, in order to assist in the identification of trends in shape, size and additional features.

5.5 Classification Results

The cylindrical, irregular and conical shapes were more common, accounting for 31% (66), 30% (65) and 28% (60) of the assemblage, respectively. In addition, the distribution in the two squares was very close, indicating that these two shapes were most suitable for their functional uses, if any. It is noted that some pieces tend to be cylindrical, although the manufacturer sometimes pressed the top of the piece, which made a hole in that part of the object. Hence, the piece there took a conical shape; some of the objects, however, gained a bottom base due to this technique (see Table 5.1).

Table 0.1: Total shapes in the site

Context	Cylindrical	Circular	Cone	Irregular
Sq A2-1	29	1	28	34
Sq A2-3	37	24	32	31
Total	66	25	60	65
%	31%	12%	28%	30%

This group (cylindrical/conical) of objects have a smooth surface and a light brown colour, while others had dark brown/black colour, due to their presence in a soil filled with ashes and charcoal. Some of these objects have been either broken from one side or a fragment of the body is broken, although the general shape remains prominent for the cylindrical or conical. Overall, the circular shape only represents 12% of the collection, and it is worth noting that there is only one piece in sq. A2-1, compared to 24 pieces in sq. A2-3.

It is likely that the maker used both hands to make the circular / spherical shapes, evidenced by the smooth surface that characterises this type. Moreover, a tool might be used to smooth the surface, mostly with less care, as there are still coarse areas. Meanwhile, as for the unknown or irregular shapes, they represent 30% of the total assemblage, although they bear other features, such as holes, attached flints, etc. It was very difficult to sort them into any of the geometric forms noted above, due to the disappearance of the geometric features completely, even though there were some features that might indicate certain geometric characteristic before they were completely broken.

5.5.1 Perforation

59% of the collection was perforated, which indicates the importance of the functional purpose of this process. 96% of the spherical shapes were also perforated, all of which were in Sq A2-3, while the other shapes were fairly close (cylindrical 55%, conical 57%, unknown or irregular 57%). The holes are made by a technique using small sticks to create the perforations, and it is certain that the holes were made in the clay objects when it was wet and before the clay had been dried out.

The pathways of some holes do not take an exact straight shape, which is likely due to the use of a crooked stick. It is also noted that there were charcoal concentrations inside these holes. This is challenging to explain, although it seems most likely that the sticks had been broken, and left inside the object, and then burnt, as the clay objects themselves are not burnt. Moreover, pre-burnt sticks may have been used to create the holes. A few incisions in these clay objects are also recorded, some of which show the traces of cord/fabric, which suggests that they might have been used as bracelets. Moreover, during the excavations, a piece of small cord/fabric was found, which supports this hypothesis (see Figure 4.15).

The holes varied in terms of their characteristics and types. Specifically, there is a group that was made by drilling; this method is divided into one or two holes, although in some pieces, as many as five holes were made. Some also intersect with others in multiple forms (Tables 5.2, 5.3).

Table 0.2: Perforation Hole, Sq A2-1

	One Perforation Hole	**Two Perforation Hole**	**Three Perforation Hole**	**Four Perforation Hole**	**Five Perforation Hole**
Number of Items	**16**	**7**	**3**	**1**	**1**
Perforation Crossing	**2**	**4**	**2**	**1**	**1**

Table 0.3: Perforation Hole Sq A2-3

	One Perforation Hole	**Two Perforation Hole**	**Three Perforation Hole**	**Four Perforation Hole**	**Five Perforation Hole**
Number of Items	16	7	3	1	1
Perforation Crossing	2	4	2	1	1

There is also another technique for making holes, especially holes that did not go entirely through the clay object. In these cases, the manufacturer deliberately pierced the object to the middle of the body, and then stopped. The number of holes is from one to three holes per piece (Tables 5.4, 5.5).

Table 0.4: Semi-perforated Hole, Sq A2-1

	One imperforation	**Two imperforations**	**Three imperforations**
Number of Items	27	2	4

Table 0.5: Imperforation Hole, Sq A2-3

	One imperforation	**Two imperforations**	**Three imperforations**
Number of Items	27	2	4

5.5.2 Attached Flint Tools

One of the main and unusual features of the clay objects are the attached microliths, which appear to have been stabbed into the objects. This practice was also found at some sites in the Levant, especially at Ain Ghazal (Rollefson, 1992, pp.443-44; Kafafi, 2005, pp.155), and it has many interpretations that can be proposed. This process was undertaken on a small group of the clay objects, which account for only 21% of the total number of the objects. Mostly this process was carried out on the conical forms (28%), followed by the cylindrical (22%) and then the unknown or irregular (21%), while the spherical shapes did not have any stabbed flints. Moreover, 53% of the conical shapes and other forms with stabbed microlithic were found in Sq A2-3, which indicates a distinction between the squares in terms of lithics stabbed into the clay objects. Also, during the discovery of these clay objects, a large amount of flint fragments were found scattered around the objects, which also indicates that they might have been used on the objects.

The lithic tools inside the clay objects are found across the whole body, although the vast majority of them were stabbed into the upper part (see Appendix 3: photos 15, 16); these are only seven pieces out of forty-three pieces. Some of these objects were stabbed with two flint pieces and one is stabbed with four (Tables 5.6, 5.7).

Table 0.6: Features of Flints, Sq A2-1

Number of Photo	Above	Middle	Bottom
23	2	0	0
10	1	0	0
61	1	0	0
39	1	0	0

Table 0.7: Features of Flints, Sq A2-3

Number of items	No. flints	Above	Middle	Bottom
35	1	27	2	5
3	2	3	0	0
1	4	1	0	0

5.5.3 The Grooves

The grooves or incisions could have been carried out on the clay objects in a deliberate way, while others could be signs of rubbing or just scratches on the body. 68% of the incisions were on the conical, and in unknown or irregular forms, followed by the cylindrical forms (71%) and the circular shape (56%).

The incision technique is spread over most of the clay objects, although they vary from one object to another. Four types of incision were recorded: incision by lithics, pressure incision, incision by a cord/fabric, and incision by wooden sticks. The technique was either slight, or profound, with deep incisions. The incision process was made in different parts of the clay objects from the top through the centre to the bottom (Table 5.8, 5.9). Some of these incisions took various forms that cannot be determined as decorations or intended marks on these objects.

Table 0.8: Features of Grooves, Sq A2-1

	Above	Middle	Bottom	Deep	Non-deep
Number of Items	26	37	23	44	27

Table 0.9: Features of Grooves, Sq A2-3

	Above	Middle	Bottom	Deep	Non-deep
Number of Items	37	40	24	41	49

5.5.4 Charcoal Remains

As there is no indication of firing on any of the clay objects, it seems most likely that they were left in the sun until they dried hard. Their concentrated presence in a small space and in the corner of the building may indicate that some of them were left there as waste, especially as the area also contained hearths.

5.6 Data Analysis

In this part of the chapter, the analysis discussed above is brought together to suggest some possible interpretations of the clay objects at AlUyaynah. As mentioned previously, these clay objects were found in two different squares, which formed the eastern corner (of Sq A2-1) and the western corner (of Sq A2-3) from the rectangular structure at the top of the archaeological site mound. It is clear that the highest proportion of shapes is the conical and cylindrical ones, and this may be due to their close similarity in form to each other. The cylindrical shape can be transformed into a conical by pressing with the finger one of the ends of the mud mass while it is still wet, which leads to an increase in the diameter of the compact part that then takes the conical shape at the end of the process.

The recorded measurements of average length of cylindrical clay objects are (see Table 5.10 and Figure 5.2) (see Appendix 2).

Table 0.10: Height and diameter of clay objects

Average of Height	**Average Diameter**
Sq A2-1 = 55.23 mm	Sq A2-1 = 27.40 mm
Sq A2-3 = 51.47 mm	Sq A2-3 = 23.24 mm

As for the conical shapes, measurements were made for all the parts (average length, average diameter of the top part (head), average diameter of the bottom part (base) (see Table 5.11 and Figure 5.3).

Table 0.11: Average height and diameter of clay objects

Average of Height	**Average Diameter (H)**	**Average Diameter (B)**
Sq A2-1 = 51.30 mm	Sq A2-1 = 15.27 mm	Sq A2-1 = 25.67 mm
Sq A2-3 = 50.46 mm	Sq A2-3 = 17.78 mm	Sq A2-3 = 22.17 mm

These measurements indicate that there are no significant differences between the clay objects (conical / cylindrical) in the two squares (see Figure 5.3).

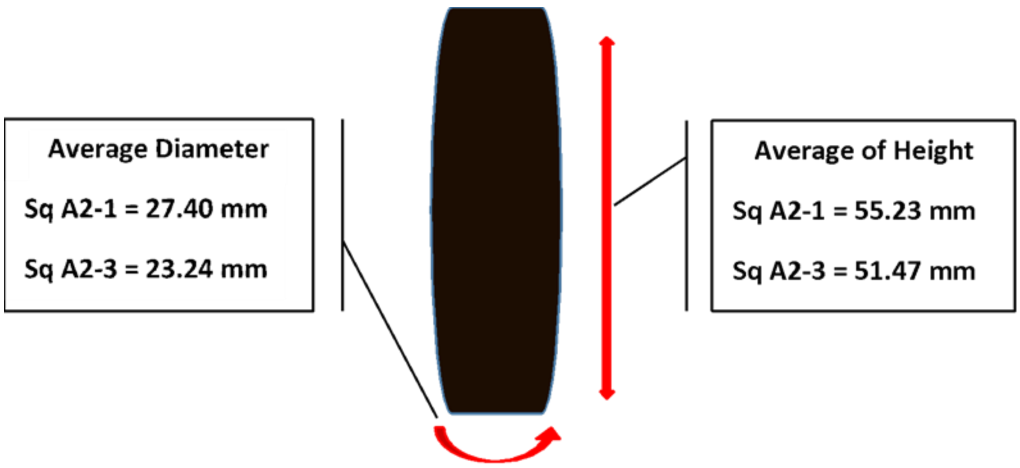


Figure 0.2: Compare the average height and Diameter of cylindrical shapes in the two squares, Sq A2-1 & Sq A2-3

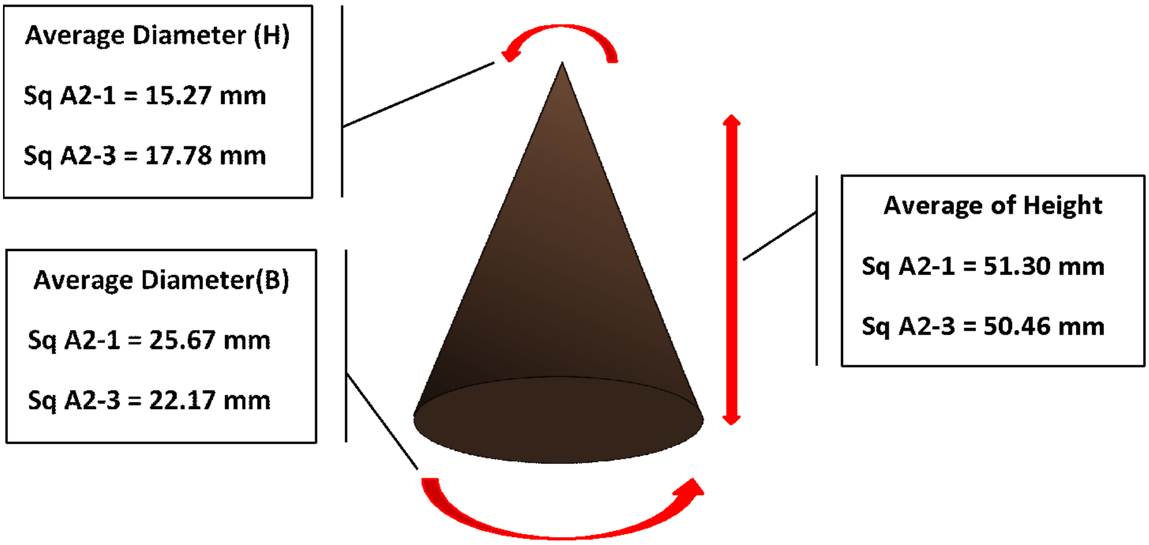


Figure 0.3: Compare the average Height and Diameter (H/B) of Cone shapes in the two squares (Sq A2-1 & Sq A2-3)

5.7 Perforation

Perforation was performed on 78% of the clay objects, equivalent to 166 perforated objects out of 212 objects (see Table 5.12). The Sq A2-3 exceeded 93% of perforated object compared to 59% in Sq A2-1.

Table 0.12: Distribution of perforated and non- perforated pieces, Sq A2-1 & Sq A2-3

Context	Perforation	Without Perforation	Total	% Perforation	% Without Perforation
Sq A2-1	54	37	91	59%	41%
Sq A2-3	112	9	121	93%	7%

For further details of the perforation technique, each form will be discussed separately below.

5.7.1 Cylindrical Objects

32 perforated cylindrical pieces were recorded in each square. The number of perforated pieces per square was even; while the non-perforated pieces were 13 in Sq A2-1 and 21 in Sq A2-3 (see Table 5.13). It is also noted that there is a convergence in the proportions between the perforated pieces which exceeded 48% and non-perforated ones (52%) (see Figures 5.9, 5.10).

Table 0.13: Distribution of perforated and non- perforated on Cylindrical

Cylindrical	Perforation	%	Without Perforation	%
Sq A2-1	16	55%	13	45%
Sq A2-3	16	43%	21	57%
Total	32	48%	34	52%

5.7.2 Conical Objects

63 perforated conical pieces were recorded in both squares, with a total of 19 in Sq A2-1 (66%), versus 34% of non-perforated, representing only 10 pieces. Perforated and non-perforated pieces are equal in Sq A2-3, which represents 17 objects (see Table 5.14).

Table 0.14: Distribution of perforated and non- perforated on Conical objects

Cone	Perforation	%	Without Perforation	%
Sq A2-1	19	66 %	10	34%
Sq A2-3	17	50 %	17	50%
Total	36	57 %	27	43%

As shown in the Table 5.14 above, the ratio between objects is somewhat similar to 57% perforated and 43% non-perforated.

5.7.3 Circular / Spherical Objects

The circular/spherical pieces were not large. It is noted that there was only one piece in Sq A2-1, while 24 pieces were found in A2-3; all except one are perforated (see Table 5.15).

Table 0.15: Distribution of perforated and non- perforated on circular

Circular	Perforation	%	Without Perforation	%
Sq A2-1	1	100%	0	0%
Sq A2-3	23	96%	1	4%
Total	24	96%	1	4%

This is evidenced by the fact that this form was an important one, which had perforation as an essential feature of it.

5.7.4 Unknown or Irregular Pieces

A total of 35 pieces of unknown or irregular shapes were perforated: 18 perforated pieces (56%), and 14 non-perforated pieces (44%) in Sq A2-1; 17 perforated pieces (65%), compared to 9 non-perforated pieces (35%) in Sq A2-3 (see Table 5.16).

Table 0.16: Distribution of perforated and non- perforated on Irregular

Irregular	Perforation	%	Without Perforation	%
Sq A2-1	18	56%	14	44%
Sq A2-3	17	65%	9	35%
Total	35	60%	23	40%

It was also shown that the number of pieces from the process of perforation was also distinguished in the pieces of unknown or irregular shapes, which exceeded the percentage of 60%.

There are two main types of perforation: full perforation and semi-perforation

5.7.4.1 Full Perforation

This is a process that is made by using sticks to make a hole from one end to another. This was performed to allow the suspension of clay objects as personal pendants used by the site residents. This has also been noticed elsewhere in the Levant (Bar-Yosef, 1997). Separately, what is considered distinctive in this collection is that some of the pieces carry more than one hole. Some clay objects have a number of through holes, which do not correspond to their use as objects to be worn as pendants. Rather this could be that it was the action of making the holes that was significant, rather than the function of the hole. It is also noted that the large number of holes deliberately intersected each other (see Figure 5.4).

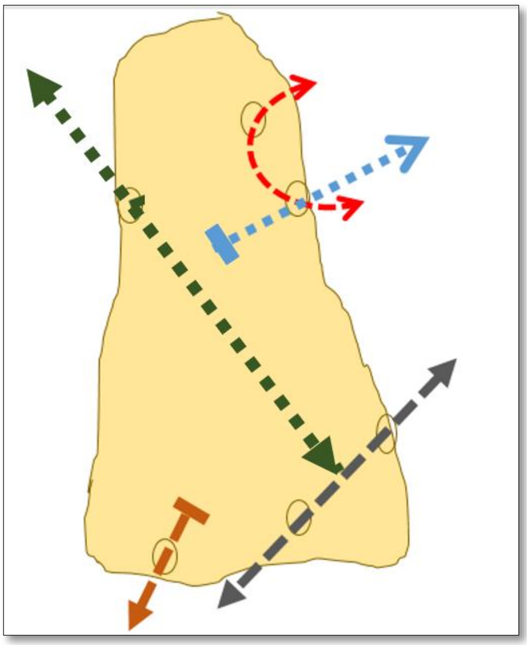


Figure 0.4: Large number of holes are deliberate by intersecting some holes with each other

5.7.4.2 Semi-perforation

Through semi-perforation, the hole is made at the middle of the body and then stops. It is noted that some of these holes were undertaken with a small tool, as the diameter of the hole is also small.

5.8 Clay objects stabbed with flints

The clay stabbing technique is common during the PPN in the Levant. It was found in sites, such as Ain Ghazal in Jordan (Kafafi, 2005); although the difference here is that clay objects in AlUyaynah do not carry any anatomical or animal characteristics. Most of the clay objects stabbed with flint were found in Sq A2-3, with 42 pieces (95%), while only 4 pieces (5%) were collected from Sq A2-1 (see Table 5.17).

Table 0.17: Distribution of Flint into, Sq A2-1& Sq A2-3

Context	With Flint	%	Without Flint	%
Sq A2-1	4	5%	88	95%
Sq A2-3	42	34%	80	66%
Total	46	21%	167	79%

5.8.1 Cylindrical Objects

The number of stabbed cylindrical pieces totalled 15. Only one piece was found in the corner of Sq A2-1 (see Table 5.18). It is noted that it was stabbed with two rows of flint, which were parallel in their position. 14 pieces were found in Sq A2-3.

Table 0.18: Distribution of Flint on Cylindrical pieces

Cylindrical	With Flint	%	Without Flint	%
Sq A2-1	1	3%	28	97%
Sq A2-3	14	38%	23	62%
Total	15	23%	51	77%

5.8.2 Conical Objects

Conical objects are the most common clay objects that were stabbed with flint tools. 1 piece was found in Sq A2-1, while 18 pieces were found in the Sq A2-3 (see Table 5.19).

Table 0.19: Distribution of distribution of Flint on cone

Cone	With Flint	%	Without Flint	%
Sq A2-1	1	3%	27	97%
Sq A2-3	16	50%	16	50%
Total	17	30%	43	70%

The flints were distributed across the upper and lower parts of the body (on the conical objects); some of the pieces also contained two broken flints. In total, the percentage of stabbed conical objects is 70% of the total number of pieces.

5.8.3 Circular / Spherical Objects

This type of clay object did not contain any inserted flints. It may be that the object does not serve the functional purpose required to implement this process (see Table 5.20).

Table 0.20: Distribution of distribution of Flint on Circular

Circular	With Flint	Without Flint
Sq A2-1	0	1
Sq A2-3	0	24
Total	0	25

5.8.4 Unknown or Irregular Objects

Only two pieces were found in Sq A2-1 and 10 pieces in Sq A2-3 (see Table 5.21).

Table 0.21: Distribution of distribution of Flint on Irregular

Irregular	With Flint	%	Without Flint	%
Sq A2-1	2	5%	32	95%
Sq A2-3	12	38%	19	62%
Total	14	21%	51	79%

Through this review of the clay objects, it is clear that most of the stabbed pieces were in Sq A2-3. This may indicate that this corner of the building was dedicated to this type of process.

5.9 The Grooves

The grooves or incisions were made either by using flint, tree branches or perhaps with fingernails. The incision could be deep or superficial. This technique was made on 143 (66%) pieces of the whole collection, while 74 pieces did not bear any grooves and came to approximately 34% (see Table 4.22).

Table 0.22: Distribution of Groove on Sq A2-1 & Sq A2-3

Conte xt	Groov es	%	Without Grooves	%
Sq A2-1	61	66%	31	34%
Sq A2-3	82	66%	42	34%
Total	143	66%	73	34%

5.9.1 Cylindrical Objects

The highest ratio was in Sq A2-1, where 22 pieces (75%) were incised, compared to 7 pieces only (25%) that were not. 25 pieces (67%) in Sq A2-3 were incised, compared to 12 pieces (33%) that were not. 71% of cylindrical objects were incised. (see Table 5.23).

Table 0.23: Distribution of distribution of Groove on Cylindrical

Cylindric al	Groov es	%	Without Grooves	%
Sq A2-1	22	75%	7	25%
Sq A2-3	25	67%	12	33%
Total	47	71%	19	29%

5.9.2 Conical Objects

A large number of conical objects were incised. The total number of pieces that were incised was 41 pieces (68%), while 19 pieces contain no incisions; approximately 32% (see Table 5.24).

Table 0.24: Distribution of distribution of Groove on Cone

Cone	Grooves	%	Without Grooves	%
Sq A2-1	18	62%	10	38%
Sq A2-3	23	73%	9	27%
Total	42	68%	20	32%

23 (73%) pieces were incised in Sq A2-3, and only 9 pieces (27%) contain no incisions. 18 (62%) pieces were incised in Sq A2-3, and only 10 pieces (38%) contain no incisions.

5.9.3 Circular / Spherical Objects

Only one spherical piece was found in Sq A2-1, and the piece was not incised (see Table 5.25). 14 pieces (58%) were incised in Sq A2-3, compared to 11 (42%) un-incised pieces.

Table 0.25: Distribution of Grooves or incisions on Circular

Circular	Grooves	%	Without Grooves	%
Sq A2-1	0	0%	1	100%
Sq A2-3	14	58%	10	42%
Total	14	56%	11	44%

5.9.4 Unknown or Irregular Objects

Incision was an important feature on this type of object. 40 pieces (68%) were incised, compared to 19 (32%) un-incised pieces (see Table 5.26).

Table 0.26: Distribution of Grooves on Irregular

Irregular	Grooves	%	Without Grooves	%
Sq A2-1	21	61%	13	39%
Sq A2-3	20	64%	11	36%
Total	41	63%	24	37%

Most of these pieces were found in Sq A2-1, with 21 pieces comprising 61%, compared to 13 pieces (39%) left without any incision. In Sq A2-3, 10 pieces (64%) were incised, compared to 11 pieces (36%), which were not incised. It is also clear that the incision process was to serve a functional purpose required by the manufacturer or that it indicates a certain ritual. The analysis of these grooves/incisions demonstrates that they are made with more than one method, especially using flint tools or sticks.

The shapes and sizes of these incisions may vary, as they are not more than 1.5 cm in size. The researcher recorded a series of different incision forms, which are:

5.9.5 V-shape Incision

The V-shape incision was made either on the entire body or on a small part of it (see Figure 5.5).

Figure 0.5: V-shape incision

5.9.6 X-shape Incision

This form was performed on two clay objects, one of which (Figure 5.6 A) was performed on a part of the body and is a relatively deep incision. The second piece (Figure 5.6 A and B) was incised on one side of the body, running from the top to bottom of the body.

Figure 0.6: (A, B) X-shape incision

5.9.7 Lines Incisions

This form or technique was the most common on clay objects, in which the manufacturer wanted to make a straight-cut, using a blade of flint or tree branches (see Figure 5.7).

Figure 0.7: Lines Incisions

5.10 Charcoal Remains

Charcoal remains were found either distributed on the entire surfaces of clay objects or concentrated on grooves or holes. The calcification of parts of ashes was noted on one or more surface of the objects. In this section, charcoal is divided into three categories: charcoal in, charcoal on, and without charcoal. I noted that the remains of charcoal might be on the surface, as well as between the incisions and inside the holes (see Table 5.27).

Table 0.27: Distribution of Charcoal, Sq A2-1 & Sq A2-3

Context	Charcoal(in/on)	Without Charcoal
Sq A2-1	92	13
Sq A2-3	121	19
Total	213	32

5.10.1 Cylindrical Objects

85% of the total number of clay objects were from this category that contained charcoal remains (see Table 5.28). Most were in Sq A 2-3.

Table 0.28: Distribution of Charcoal on Cylindrical objects

Cylindrical	Charcoal IN	Charcoal ON	Without charcoal
Sq A2-1	10	18	6
Sq A2-3	3	32	5
Total	13	50	11

5.10.2 Conical Objects

Conical objects also contain a large amount of charcoal remains, which amounted to 87% of the total pieces in both squares, although most in Sq A 2-3 (see Table 5.29).

Table 0.29: Distribution of Charcoal on Conical objects

Cone	Charcoal IN	Charcoal ON	Without charcoal
Sq A2-1	28	64	13
Sq A2-3	19	102	19
Total	47	166	32

5.10.3 Circular / Spherical Objects

It should be noted that there was only one piece in the square Sq A 2-1, which had a solid hole, with small remains of charcoal. Sq A2-3 contains 31 pieces, with all but one containing the remains of charcoal on the surface or inside holes. It covers 97% of pieces (see Table 5.30).

Table 0.30: Distribution of Charcoal on Circular objects

Circular	Charcoal IN	Charcoal ON	Without charcoal
Sq A2-1	1	0	0
Sq A2-3	7	24	1
Total	8	24	1

5.10.4 Irregular Objects

8 pieces of this contain charcoal remains in Sq A2-1; while only 4 pieces were found in Sq A2-3 (see Table 5.31).

Table 0.31: Distribution of Charcoal in Irregular objects

Irregular	Charcoal IN	Charcoal ON	Without charcoal
Sq A2-1	8	24	5
Sq A2-3	4	21	5
Total	12	45	10

By comparing the charcoal remains in both squares and whether there is any significant difference between them, the result of the percentages of all the pieces of the squares showed that there were no significant differences between them (see Appendices 1, 2, and 3).

5.11 Interpretation and Comparative Results

The spatial analysis of the clay objects is important in understanding the ways of using and placing such objects undertaken by the inhabitants of the site. The place where these objects were finally deposited is also important in understanding why they were created and for what purposes. There are few traces of activity areas in the two squares where ash, charcoal and the remains of animal bones were found. The traces in the south-east corner of Sq A2-1 are clearer than in the north-east one. No relation could be found between the position of the clay objects and the traces of fire-places in the two corners; instead the clay objects might have been placed there prior to the existence of the fire-places. This is because they were found a layer below under those fire places. In general, all types of clay objects were found in a single layer. Their stratigraphic and spatial situation is identical in the two corners, although there are more activities in the south-east corner.

Their spatial situation was as a cluster, rather than spread on an open area, suggesting they were intentionally buried in the two corners. Such practice is known elsewhere in the Levant (Kafafi, 2005). These include the two "killed" figurines from MPPNB in 'Ain Ghazal, where they had been buried intentionally in a subfloor pit; and the cache of 24 Figurines at the same site (McAdam, 1997; Rollefson, 1986; 2008; Schmandt-Besserat, 1997). Figurines are also found in a cluster dated to the LPPNB in an area measured 5x5 meters at the es-Sifiya site (Mahasneh & Bienert, 2000); this cluster is attributed as the figurine production area. Nevertheless, the data recovered from AlUyaynah is different in many aspects, especially as it looks more like a waste area than a production one. Still, their place near the corners of the building might prove that they were buried intentionally, rather than placed there as waste.

5.12 Clay Objects and their Archaeological Context

Clay objects can be found in many archaeological contexts, especially in graves. Their importance depends highly on their archaeological context; not just where they have been found, but the soil, the site type, the layer the artefact came from, and what else was in that layer. Moreover, their contexts could serve as a sign of their significance; as examples in graves they serve as "grave goods", although their location in settlement sites could be different and bear many meanings. Their context in the AlUyaynah site can provide the basis to create a possible hypothesis of their social meanings for the inhabitants of the site and why they buried the figurines within their dwellings. It is difficult to establish such hypotheses and the symbolic meaning of AlUyaynah clay objects without the study of other social features reflected from other archaeological data from the site and other sites in Saudi Arabia. Unfortunately, AlUyaynah is one of its kind in Saudi Arabia, and therefore, the hypotheses will be created with the help of other data from neighbouring regions, especially the Levant (for example the data from Ain Ghazal; Kafafi, 2005).

The archaeological material from the Levant indicates that clay objects occur in a Neolithic context within communities that were based on a multi-economy of domestic plants and livestock. They occur from the PPN, but always in contexts that have a multi-resource adaptation. The evidence from AlUyaynah is similar, with a diet based on plants, as well as hunting, as dominant during the PPN period of the site. The clay objects demonstrate that the site appears to have witnessed a different cultural experience to other parts of Saudi Arabia, except for the features related to the production of arrowheads or lunates. While pottery is present in the Neolithic sites in eastern region of Saudi Arabia, most Neolithic sites known in northern and north-western regions lack any kind of pottery and can be compared mainly to the pre-pottery sites situated to the north in Levant and Palestine. Correspondingly, these clay objects will add more information regarding the early stages of dealing with clay in this part of Saudi Arabia. The archaeological context of AlUyaynah itself may play a great role in provisioning a new understanding of the Neolithic Age in Saudi Arabia.

The clay objects from AlUyaynah will be treated as an important change in social organisation, which also occurs in regions to the north. It is difficult at this stage of the study to relate them with specific social behaviour, although the human imagery of some pieces that were modelled after features of the female or male body is of great importance in the analysis of social behaviour.

The main problem in this study's attempt to analyse these clay objects is the use of the modern vision and correlating that with the vision of prehistoric humans and their meanings for the objects they left behind. The other challenge related to the archaeological context of clay objects from AlUyaynah is that it is difficult to trace the changes in their occurrence on the site and their later development, as we are dealing with a single episode of deposition. They might also have multiple meanings for the society within which they were used.

In many other archaeological records, female figurines are primarily found in another archaeological context, namely burials. Hence, they had a different meaning to the similar objects placed within the settlement. Indeed, a key question is to determine whether the main difference that the burial ones had was a funeral meaning while the other did not. In the current study, different levels of meaning of clay objects have been explored according to their archaeological context, and in a situational context in which they were deposited.

5.13 Interpreting the Clay Objects from AlUyaynah

Analysis of the symbolic and social context of prehistoric clay objects and figurines has produced extensive discussion (e.g. Ucko, 1996; Bailey, 1996). Most of these studies focused on the meaning of the "human representation" of the clay objects and figurines. The figurines started as a simple representation of human and animal forms and changed over time to more advanced anatomical features, which involved the creation of the human image in a three-dimensional, durable, and tangible format that extends beyond gesture, voice, and language in portraying certain aspect of humanness (Bailey, 1996).

The main challenge concerning the clay objects from AlUyaynah is that they have no anatomical features represented. Human figurines made in clay were distributed across a wide area of the Near East in PPNA (9500-8700 BC), at the sites of Mureybet (Phase III), Cheikh Hassan and others (Schwartz & Akkermans 2003). Most of these early figurines were analysed as related to ritual and symbolic meaning. For example, the middle PPNB evidence from 'Ain Gazhal were also related to ritual symbolism (Kafafi, 2005).

Understanding the final depositional context of AlUyaynah clay objects is imperative to the understanding of their use and their function. The main interpretation of Pre-Neolithic and Neolithic figurines is that they were used for ritual purposes. The archaeological material indicates that figurines occur in Pre-Neolithic and Neolithic contexts in communities that were based on a multi-resource adaptation based on plants, fish, and livestock. Cattle seem to have played an extraordinary ritual role in the social life of the communities and a Neolithic cattle cult ritual has been proposed by many (Cauvin, 1994; 2000; Kirkbride, 1968; Mellaart, 1967; Rollefson, 1986; Rollefson et al., 1992; Verhoeven, 2002).

In addition, clay objects might have been used for other purposes. The American researcher Schmant-Bassarat (2002) is one of the few scholars to have studied the function of small pieces of stone or clay and interpreted them as tokens. Schmant-Bassarat (2002) argues that these pieces were used as symbolic coins more than ten thousand years ago. She adds that more than 50 years ago, scientists were keen to know the origin of the writing. While visiting a number of international museums, she noted the existence of these small clay pieces, and discovered that these pieces and their various forms represented symbolic coins and numbers, which suggested were origin of the writing (Schmandt-Besserat, 2002, p.6). After an in-depth study, Schmant-Basarat (2002) was able to identify 16 forms of this symbolic money, ranging in size from small to large. She adds that each of these forms must have its own meaning. The form of representation indicates a small amount of grain, while the spherical shape indicates more grain. The cylindrical shape shows one animal. As these pieces are made by hand, they came in different sizes, and vary in size also between different sites. A number of tokens were found in a number of the first agricultural villages dated between approximately 8,500 and 3500 cal BC, which spread in the Levant, Mesopotamia, Anatolia and Iran. Other purposes include cult figurines, vehicles of magic, didactic figurines, toys, or representations of deceased people or animals associated with the deceased (Biton, 2010, p.71).

The interpretation of clay pieces from the site of the AlUyaynah requires more than one approach to deal with, especially as they were found in a cluster and not collected from an open area. The exact position of these objects might differ also according to the interpretation approach that is used to analse them. Furthermore, the collections were both found in the building's corners, and thus, these places may have a specific meaning for the inhabitants of the site. Where they were placed was close to the foundations of the building; especially as they were found on the same surface as the first base-blocks of the stone walls. Even though we cannot find solid evidence to relate these objects with the first steps of building the site, burying figurines is known in the Levant (see Kafafi, 2005). There is no evidence in this Ain Ghazal, however, that figurines were buried with association of foundations of buildings (Rollefson et al., 1998).

Nevertheless, they are found deposited in food-related activity places characterised by bone deposits and ashes. Hence, the final deposition of clay objects along with daily waste may complicate the interpretation and may indicate that they were not treated as ritual items. To make matters even more complicated, the clay objects from the AlUyaynah site did not reflect specific human or animal forms and are closer to mud masses more than to specific forms of daily life items. The raw material does not indicate major additions and it is likely that it was formed from mud deposits close to the site and not brought from elsewhere. Therefore, there is no great effort in the formation of these objects and the purpose of their manufacture remains very complex due to the aforementioned reasons.

The spatial distribution of the clay objects has no specificity other than being placed in the corners of the building. Moreover, they combine with other concentrations of objects (lithics) or near a domestic activity (fire places). No grave has been revealed hitherto in AlUyaynah, and no special ritual areas. What is more, the stratigraphic distribution of the clay objects is absent in this case, which is very unlikely to associate them with any ritual activities. Additionally, it is difficult to find parallels to the AlUyaynah clay objects, as their final depositional context, in other examples of cached and waste deposits of clay objects and figurines, were found elsewhere in southern Levant. One example, noted here, however, are the clay objects of 'Ain Gazhal (Schmandt-Besserat, 1997; summarised in Kuijt & Chesson, 2005).

Some of the AlUyaynah clay objects have holes in them. Perhaps, they would have been amulets intended to gain protection. This is actually similar to other sites in the Levant (Es-Sifiyah for example) (Mahasneh, 1997). However, the items from AlUyaynah do not have any special human or animal features, unlike those from Es-Sifiyah. Even though there are no similar features between AlUyaynah and 'Ain Gazhal clay objects, specifically that the former does not depict any anatomical features, some of the animals from 'Ain Gazhal were apparently stabbed with several small pieces of flint. Some of clay objects from AlUyaynah are also stabbed with small flint tools. In particular, the 'Ain Gazhal ones were interpreted as sacrificed items to living bulls (Kafafi 2005: 155). Although some of the 'Ain Gazhal statues were buried under the floor of abandoned houses, their situation is different to that from AlUyaynah, as they were carefully laid out in the pits for the purpose of disposal. Accordingly, Kafafi (2005) believes that the statues were used for religious purposes.

In tracing the use of clay soils in the Levant, the use of clay soils dates back to the Stone Age (Epipaleolithic), which was used in some architectural parts, such as silos, constructed fireplaces and wall paint. During the discoveries made by the researchers it is possible to find that the use of clay was abundant from The Natufian culture, which dates back to the Late-Epipaleolithic and until the Neolithic in many sites of the Levant.

During the Neolithic period (PPNA) the use of sun-dried bricks was reported to some architectural buildings (Bar-Yosef, 1997, pp.41-69). Meanwhile, technologically, some organic materials, such as straw and barley, are added to strengthen the clay and do not show cracks (Bar-Yosef, 1997, p.69; Hopf, 1983, p.577). At the AlUyaynah site, and through the initial detection of the naked eye, the clay objects may have been made of clay and free from any additives such as straw or barley. Its clay soil quality is also available in the surrounding area of AlUyaynah.

For clay figurines to form the hardness stage, two ways are present; either by firing, or by placing them under the sunlight to dry (Banning, 1998, p.206; Garfinkel, 1995; Mahasneh & Gebel, 1999; McAdam, 1997, p.135; Najjar, 1994; Noy, 1989; Schmandt-Besserat, 1992; Schmandt-Besserat, 1997; Simmons & Najjar, 2000 p.7; Stordeur, 2000). For clay objects in AlUyaynah, they were made in a uniform style, as the eyes, mouth or sex organs were not represented, and were designed from pure clay or coarse clay. It is manufactured by wrapping the clay in the palm of the hand, and during this stage there are two ways to reach the final product, either by equal pressure on the mass of clay until it emerges in the cylindrical form, or light pressure from the top end to produce a conical shape, which is evident by the appearance of the fingers on some clay objects. Indeed, some clay objects demonstrate traces of ash and charcoal, although it is not confirmed that they were burned, but were thrown or mixed with them. This is likely not to harden the clay, which is believed to have been burned for long-lasting hardness.

5.14 Discussion

In summary the most notable features of the AlUyaynah clay objects, after comparison with those known from the Levant are:

1. The clay objects of AlUyaynah have little in common with other Levant sites. Their characteristics are very simple and bear no human or animal features.

2. The use of holes on some of AlUyaynah clay objects may indicate that some of them were used as amulets, although that will remain hypothetical in the current state of research.

3. Few examples of AlUyaynah clay objects were stabbed with small lithic tools, which is similar to other examples from 'Ain Gazhal.

4. The Archaeological context of AlUyaynah itself may play a great role in provisioning a new understanding of the Neolithic in Saudi Arabia.

Chapter Six – Lithics

6.1 Introduction

Studying stone tools is an important method in developing an understanding of the lifestyle of prehistoric societies, and is often at the forefront of researching Neolithic societies. Such studies are often comparative, as lithic typologies enable the patterns of affiliation between different regions to be discerned. In the specific case here, lithic tool assemblages have been used to assess the strength of the relationship between sites in Saudi Arabia and the Levant.

Archaeologists adopted the principles of typology to discover and follow technical and qualitative patterns in sequential clusters that may reflect a shared culture and temporal development, or a change in human habits and activities. Specifically, the excavation was focussed on rectangular structures in three trenches (see chapter three). During the 2016 excavations, AlUyaynah yielded 967 knapped lithic artefacts and 45 Grinding Tools from all trenches.

6.2 Aim and Objectives

In this chapter, the lithic tools recovered from the 2016 excavation season at AlUyaynah will be reviewed and analysed. The distribution of several classes of chipped-stone lithic artefacts is used to address questions of the occupation history of AlUyaynah and the site's function.

6.3 Structure of the Chapter

The current knowledge regarding lithic technology in the Neolithic of Saudi Arabia will be reviewed, which will then present the results of the analysis of the lithic assemblage. As well as the classification of stone tools, the lithics against known typologies for the PPN in Saudi Arabia will be assessed. The chapter will end with a comparative study and discussion, in which I consider the similarities between the assemblage found at AlUyaynah and those of the Levant.

Even though the Neolithic in Saudi Arabia varied between different regions and over time, surveying their different lithic assemblages will help to contextualise that found at AlUyaynah. The Eastern Province of Saudi Arabia was known for its Ubaid culture, which was rich in material culture and based on animal husbandry, hunting and agriculture; the

Ubaid culture is mostly dated to the 4th millennium BC (Masry, 1974). In addition to its well-fired, painted pottery, and architectural buildings, stone tools also witnessed major changes in the eastern province in comparison to previous known tools in the region. Lithics based on blade technology were dominant with different types of arrowheads, scrapers and many other types of blade tools (Masry, 1974).

The area of the "Empty Quarter" included a collection of stone tools in the locations of Sharurah, Mundafin and Jildat Almtbatihat, and the assemblages comprised of pointed heads, bifacial and scrapers. The sites were attributed to hunters who settled during the 6th millennium and the 4th millennium BC (Edens, 1982, pp.109-124; Zairns, 1981, pp.9-42). Separately, most of tools collected from the central region, in close proximately to Riyadh, are arrowheads, blades and different types of flakes. These were mainly in areas of Wadi Al-Dawasir, Aflaj, and Tawaiq. Unfortunately, all of the finds come from surface collections and no detailed studies have been published (Zarins, 1979, pp.9-26; Zarins, 1982, pp.25-30); the most important assemblage among them is Al Thumamh (6800 cal BC). These lithics were associated with the remains of circular stone structures, which are believed to have been used for religious functions or as burial places (Alsharekh, 2004, pp.7-32).

Stone tools were reported at many sites in the western region of Saudi Arabia. These assemblages include microliths, blades, and arrowheads. Other sites, such as Mahd Al Dhahb, contain a number of large stone tools include choppers, cores, large blades, blades, and engraving tools (Zarins, 1980, p.20). Meanwhile, sites in the southern region of the Saudi Arabia contain assemblages with mainly blade technology, such as the site of Wadi Bisha (Hötzl et al, 1978, pp.226-252), where blades and shaft arrowheads were reported (Zarins, 1980, p.20). What is more, many sites with different stone tool assemblages were reported in the northern and north-western regions. These assemblages included blades, borers, scrapers and arrowheads (Adams et al, 1977, pp.21-40; Gilmore et al., 1982).

Other stone technology was reported in other parts of the Arabian Peninsula. In the Arabian Gulf Coast region, the Neolithic sites of Qatar, Kuwait and United Arab Emirates were mostly related to the Ubaid culture. Most of these sites were dated to between the 6th and 5th millennia BC and contain many grinding tools, as well as flint arrowheads and bifacial blades. In Yemen and Oman, more detailed studies were conducted during last recent years. Even though this is still limited in the study of stone technology, sites found in the Mahra region of Yemen date back as far as the mid-7th millennium cal BC. Field studies in south-east Oman revealed a variety of arrowheads arrows and fishing hooks, dating to the sixth millennium BC. According to Groucutt and Petraglia (2012), a number of indigenous developments can clearly be seen in Arabia during the Holocene. These include the development of new lithics techniques, such as the “Wa’sha method” in Yemen, and other forms of projectile points in the Neolithic, including what is called “Fasad points” (Charpentier & Crassard, 2013).

The lack of lithic studies from the Neolithic period in Saudi Arabia makes any analysis challenging. Most of our knowledge of “Neolithic" stone tools in Saudi Arabia comes from field reports of surface finds, rather than detailed studies. This also true, to some extent, for other parts of the Arabian Peninsula. With the beginning of the Neolithic period in the middle of the seventh millennium BC, the stone industry developed, especially in Yemen and on the coast of the Red Sea and the Gulf. Tool assemblages also included bifacial scrapers (Crassard & Drechsler 2013), but most of them were discovered only in the southern parts of the Arabian Peninsula. Indeed, major sites are still fairly rare. Meanwhile, sites such as Oraf 2, and others produced arrowheads that resemble those from the Levant (Guagnin et al., 2017).

6.4 Typology

6.4.1 The Methodology and the Technique

The transition to stone-polishing enabled people in the Neolithic period in most parts of the world to exploit many rare and semi-precious stones, such as shale, jade, white garnet, and others, for tools. Flint, however, continued to be the most frequent material for processing tools. Among the tools that have been found from the Neolithic period are many forms of blades, chisels, sickles, burins, borers, arrowheads and harpoons. Stone tools were also used to build houses and other structures, as well as for processing animal and fur skins. With the emergence of agriculture, people created the necessary tools for the treatment of agricultural products, such as mortars, grinders and millstones, although grinding tools were common tools in pre-Neolithic times in the Nile valley, and from Natufian and Kebaran in the Levant (Sadig, 2010). Many other weapons were also developed, such as daggers, arrowheads, spears and others, as well as the development of the bow and arrow industry as different shapes of arrowheads spread everywhere.

Following the most recent guides in lithic studies (Andrefsky, 2005; Butler, 2012) the analysis of the stone tools will include two types of artefacts: The first type of artefacts are chipped tools, hence, those made by chipping (such as points and arrowheads). The second types are grinding tools.

6.4.2 Distribution of Lithic Materials

In this section, lithic materials will be described in terms of their category (retouched and ground), and the location at Aluyaynah where they were found. This analysis will include the lithics found in the squares: Sq A2-1, Sq A2-2, and Sq A2-3.

6.4.3 Classification Strategy

The following steps were taken to classify the lithic assemblage:

1. The lithic materials were analysed by square.

2. The lithics were photographed.

3. Patterns in the lithic assemblages were assessed, considering variations in tool type, location of deposition, colour, traces of coal and size.

This section of the chapter will include an account of stone tools recovered from the site, with their numbers according to every square and strata.

6.5 Data Analysis

6.5.1 Sources of Raw Materials

There are different sources of raw materials used to produce the lithic tools found at AlUyaynah. These sources include the following:

a. Primary Sources: the place where the stone is found naturally (such as Nubian Sandstone which form the bedrock of the site and is found across and around the site).

b. Secondary sources: when stone is deposited away from the place it formed due to the erosion or other geological processes (See: Butler, 2012) (such as quartz and quartzite).

Only three types of raw material were used in the manufacturing of stone implements. The identification of materials used for artefacts is always difficult and it seems especially challenging for items found in this area. The main issue is trying to differentiate between different types of quartz and quartzite found along the wadies and gravel pits in the area. Generally, the assemblage was made from raw materials available near to the site or in the vicinity. The area is characterised by running wadies, where quartz and quartzite were available. Sandstone was utilised for the ground stone tools, which is common throughout the vicinity. Very fine-grained grey to dull brown quartz pebbles are found locally in large scatters on terraces and eroded areas along the mountain's ridges and seasonal streams. A large number of artefacts were made of soft, light to dark brown pebbles, which were probably collected from the above-mentioned sources. That may indicate that they relied mainly on the local sources for producing their lithic tools. Moreover, certain artefacts were made of a light to dark brown quartz (Alasmari, 2012) (see Tables 6.1, 6.2, 6.3) (see Figures 6.1, 6.2).

Table 6.1: Keys

Keys												
B	L.B	D.B	G	L.G	D.G	BK	L.BK	BG	L.BG	RD	L.RD	WHT
Brown	Light brown	Dark Brown	grey	Light grey	Dark grey	Black	Light Black	Beige	Light Beige	Red	Light Red	White

Table 6.2: Frequency of Blades colours all squares

AREA	TECHNOLOGY	COLOR													TOTAL
		MAJOR													
		B	L.B	D.B	G	L.G	D.G	BK	L.BK	BG	L.BG	RD	L.RD	WHT	
Sq A2-1	BLADE	31	105	69	35	38	29	9	5	9	0	0	1	2	333
Sq A2-2		26	38	10	9	5	4	4	0	4	0	0	2	0	102
Sq A2-3		47	94	38	17	26	11	6	1	6	0	1	0	0	247
SUM		104	237	117	61	69	44	19	6	19	0	1	3	2	682
PERCENTAGE		15 %	35 %	17 %	9%	10 %	6%	3%	1%	3%	0.0 %	0.1 %	0.4 %	0.3 %	100%

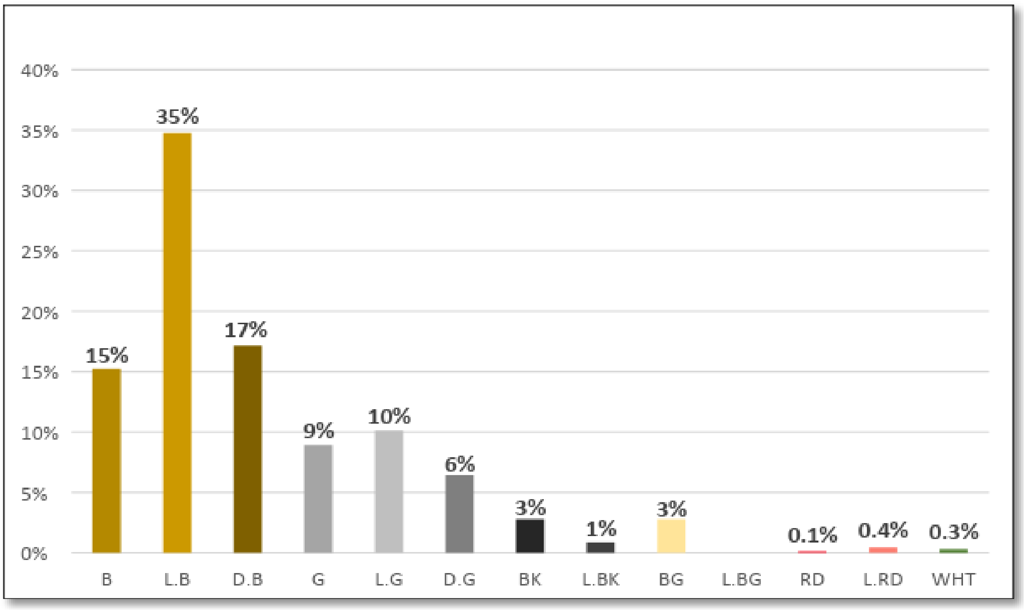


Figure 6.1: Frequency of Blades colour in all squares

Table 6.3: Frequency of Flakes colour in all squares

AREA	TECHNOLOGY	COLOUR													TOTAL
		MAJOR													
		B	L.B	D.B	G	L.G	D.G	BK	L.BK	BG	L.BG	RD	L.RD	WHT	
Sq A2-1	FLAKE	3	0	5	2	0	1	0	2	1	0	0	0	0	14
Sq A2-2		1	2	1	0	0	0	0	1	1	0	0	0	0	6
Sq A2-3		4	0	1	0	0	1	0	1	0	0	0	0	0	7
SUM		8	2	7	2	0	2	0	4	2	0	0	0	0	27
PERCENTAGE		30%	7%	26%	7%	0%	7%	0%	15%	7%	0.0%	0.0%	0.0%	0.0%	100%

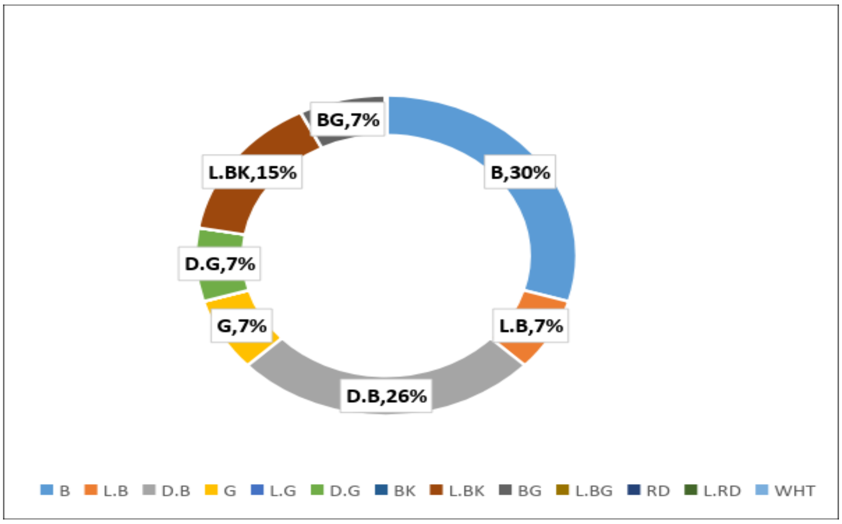


Figure 6.2: Frequency of Flake colour all squares

6.5.2 Morphology of Tools

To summarise the various colours, textures and translucency of lithic materials: the major colour of the assemblage, as a whole, ranges from dark brown to light brown and from dark grey to light grey, while the white colour is dominant in the inner part of the stones. The texture is soft in general. These results were obtained only by the naked eye (see Tables 6.4, 6.5, 6.6, 6.7) (see Figures 6.3, 6.4, 6.5, 6.6).

Table 6.4: Frequency of Texture in all squares

TECHNOLOGY	AREA	TEXTURE		TOTAL
		SOFT	SPECKLED	
BLADE	Sq A2-1	324	9	333
	Sq A2-2	102	0	102
	Sq A2-3	245	2	247
SUM		671	11	682
Percentage		98%	2%	100%

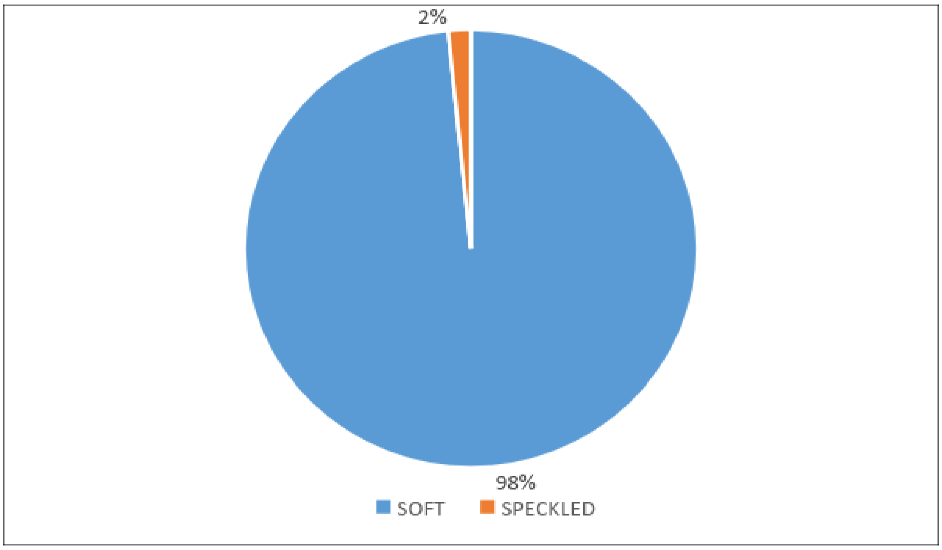


Figure 6.3: Frequency of Texture in all squares

Table 6.5: Frequency of Blade Texture in all squares

TECHNOLOGY	AREA	TEXTURE		TOTAL
		SOFT	SPECKLED	
FLAKE	Sq A2-1	12	2	14
	Sq A2-2	6	0	6
	Sq A2-3	7	0	7
SUM		25	2	27
Percentage		93%	7%	100%

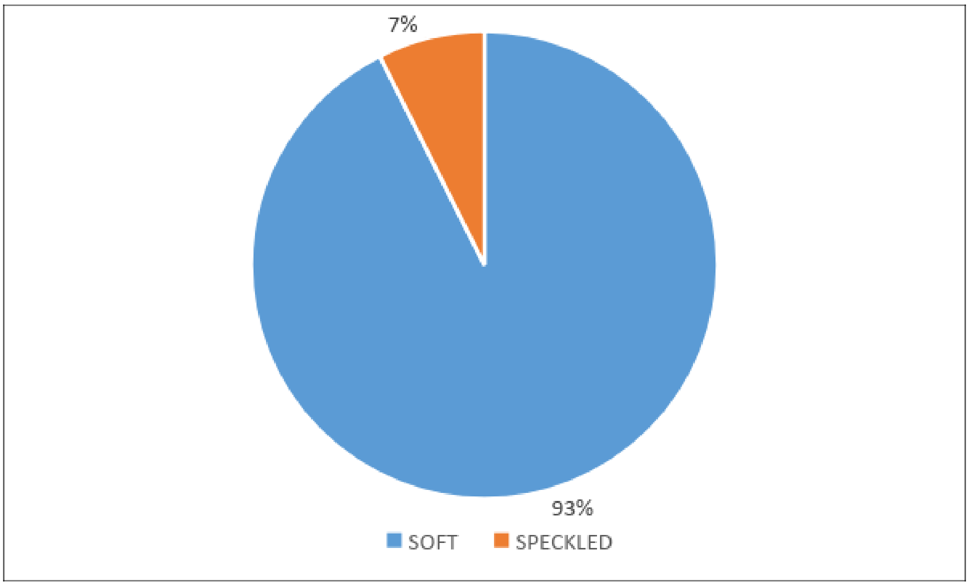


Figure 6.4: Frequency of Flake Texture in all squares

Table 6.0: Frequency of Blade Translucency in all squares

TECHNOLOGY	AREA	TRANSLUCENCY			TOTAL
		T	S - T	D	
BLADE	Sq A2-1	30	77	226	333
	Sq A2-2	16	20	66	102
	Sq A2-3	23	58	166	247
SUM		69	155	458	682
Percentage		10%	23%	67%	100%

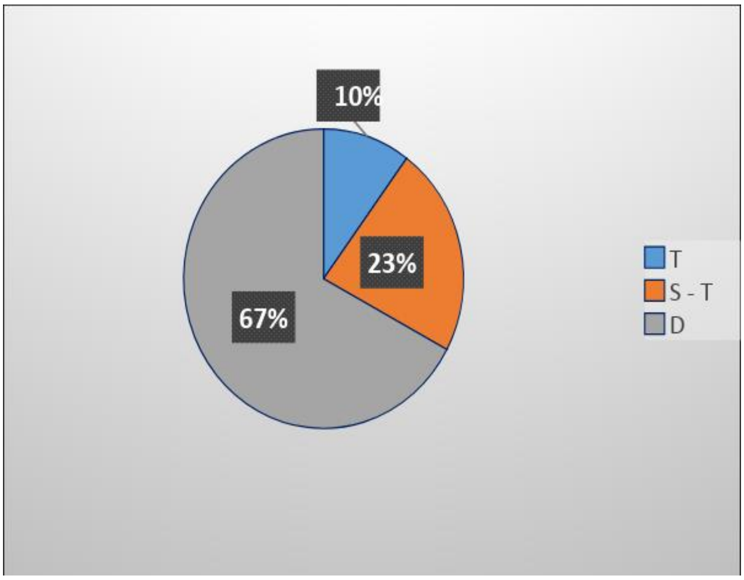


Figure 6.5: Frequency of Blade Translucency in all squares

Table 6.7: Frequency of Flake Translucency in all squares

TECHNOLOGY	AREA	TRANSLUCENCY			TOTAL
		T	S - T	D	
FLAKE	Sq A2-1	0	0	14	14
	Sq A2-2	0	2	4	6
	Sq A2-3	0	2	5	7
SUM		0	4	23	27
Percentage		0%	15%	85%	100%

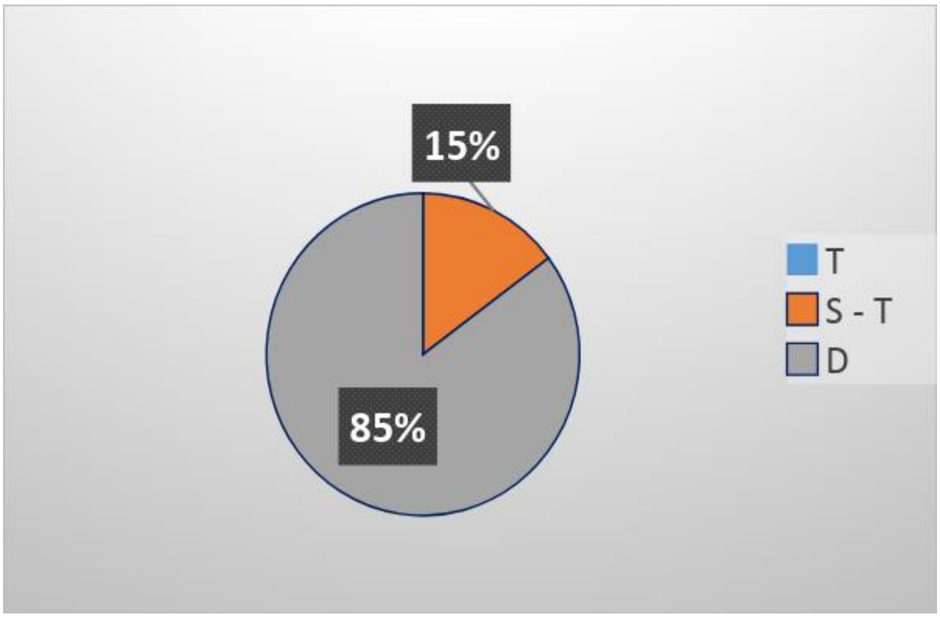


Figure 6.0: Frequency of Flake Translucency in all squares

6.5.3 Technology (Knapping)

This section will discuss the technology used to produce the lithic tools or the knapping strategies. According to the tool types, such as cores, flakes and blade-based ones, the research will attempt to trace the exact technology(ies) used to produce the materials. These will include:

1. Tools produced on cores

2. Tools produced on flakes

3. Tools produced on blades

6.5.4 Debitage

The terminology used with the lithic collections from AlUyaynah relies upon technological attributes from known studied examples. Additionally, the functional aspects of tools, indicated by use, were compared to stone-working studies, especially those related to Arabian ones (e.g. Groucutt & Petraglia, 2012). Overall, very few lithic tools were recovered from the site due to the limited area excavated.

Table 6.8: Frequency of lithic tools according to their type in all squares

Area	Technology					Total
	Core	Flake	Blade	Debitage	Other	
Sq A2-1	3	14	333	2	1	353
Sq A2-2	0	6	102	7	0	115
Sq A2-3	0	7	247	241	4	499
Sum	3	27	682	250	5	967
Percentage	0.30%	2.80%	70.53%	25.85%	0.52%	100%

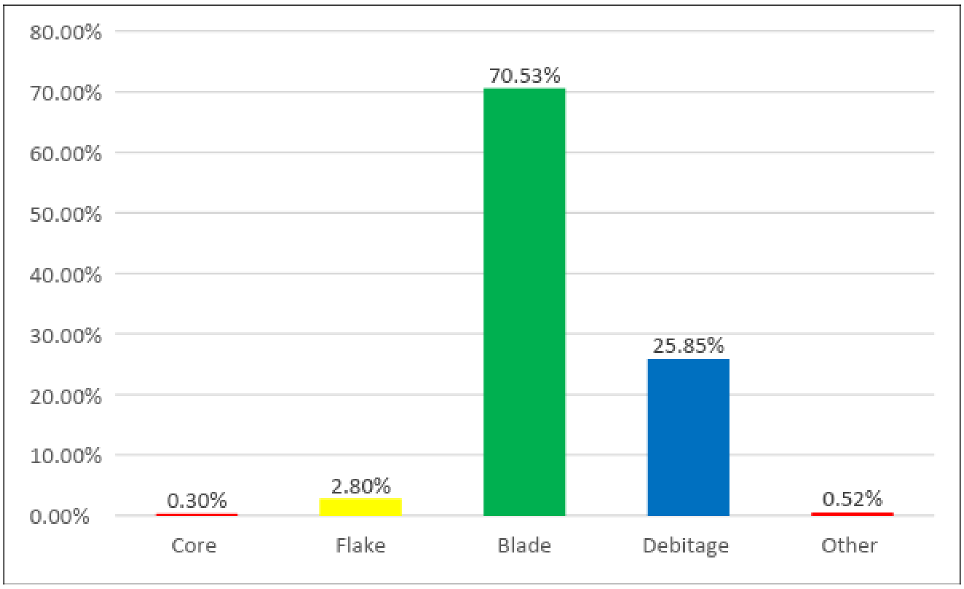


Figure 6.6: Frequency of lithic tools according to their type in all squares

The tools that were collected are not particularly distinctive; hence, they are not easily classified as belonging to defined types. The classifications used here, as mentioned above, are based on terminology commonly used in studies relating to the Neolithic in the Levant and other Middle East regions (see Table 6.8 and Figure 6.7) lists items classified as tools produced on cores, tools produced on flakes, tools produced on blades and debitage.

6.5.5 Cores

These are distinguished here as being stones from which at least one flake has been struck. Only three cores were recovered from the site. Cores are also a class of lithic artefacts that serve as a parent material for the production of flakes and are classified based on core configuration. The number of striking platforms and flaking orientation determine the core configuration. Frequently, the most common determining factor in core configuration is the nature and flaking quality of the raw material, which is limited to a few sources around the site (e.g. Quartz).

6.5.6 Tools Produced on Flakes

A flake is a piece of stone that has been chipped or knapped from a core during the process of manufacturing or sharpening; a total of 27 flakes were recovered from the site. The sizes of flakes differ from small and medium to large. No definite utilisation traces or retouching were identified on the edges of all these flakes. Comparatively, some flakes were modified, by applying certain retouches, into specific tool types. In general, most of these flakes were made of quartz, which may indicate that it was difficult to control flaking and that a large number of flakes were discarded, as they were not found to be suitable for making finished tools. In addition, a few of them were made of quartzite. However, it can still be assumed that they were utilised as secondary cutting tools.

6.5.7 Tools Produced on Blades

A total of 682 blades were recovered from the site (see Tables 6.9, 6.10, 6.11) (see Figures 6.8, 6.9, 6.10). Blade artefacts are lithic tools produced by direct free-hand percussion, indirect percussion, or pressure flaking. Blades are at least twice as long as they are wide and have roughly parallel sides (Jameson and Shaw, 1999, p.119). Most of these blades were made of fine quartz and quartzite.

Table 6.9: Frequency of lithic tools according to their type Sq A2-1

Area	layer	Technology					Total
		Core	Flake	Blade	Debitage	Other	
Sq A2-1	L1	0	0	14	0	0	14
	L2	0	0	0	0	0	0
	L3	0	0	24	2	0	26
	L4	0	3	24	0	0	27
	L5	0	0	33	0	0	33
	L6	0	0	17	0	0	17
	L7	0	2	43	0	0	45
	L8	1	4	50	0	0	55
	L9	0	0	27	0	1	28
	L10	0	2	34	0	0	36
	L11	0	0	5	0	0	5
	L12	1	2	23	0	0	26
	L13	0	0	0	0	0	0
	L14	1	1	23	0	0	25
	L15	0	0	16	0	0	16
Sum		3	14	333	2	1	353
Percentage		0.84%	4.00%	94.30%	0.56%	0.30%	100%

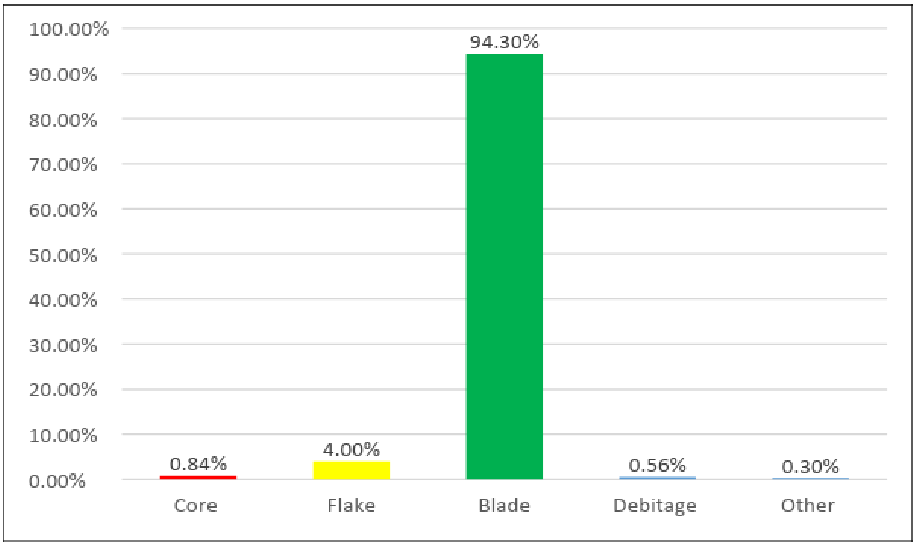


Figure 6.7: Frequency of lithic tools according to their type Sq A2-1

Table 6.10: Frequency of lithic tools according to their type Sq A2-2

Area	layer	Technology					Total
		Core	Flake	Blade	Debitage	Other	
Sq A2-2	L1	0	0	0	0	0	0
	L2	0	1	24	3	0	28
	L3	0	0	10	3	0	13
	L4	0	0	19	1	0	20
	L5	0	2	19	0	0	21
	L6	0	3	20	0	0	23
	L7	0	0	10	0	0	10
Sum		0	6	102	7	0	115
Percentage		0%	5.20%	88.70%	6.10%	0%	100%

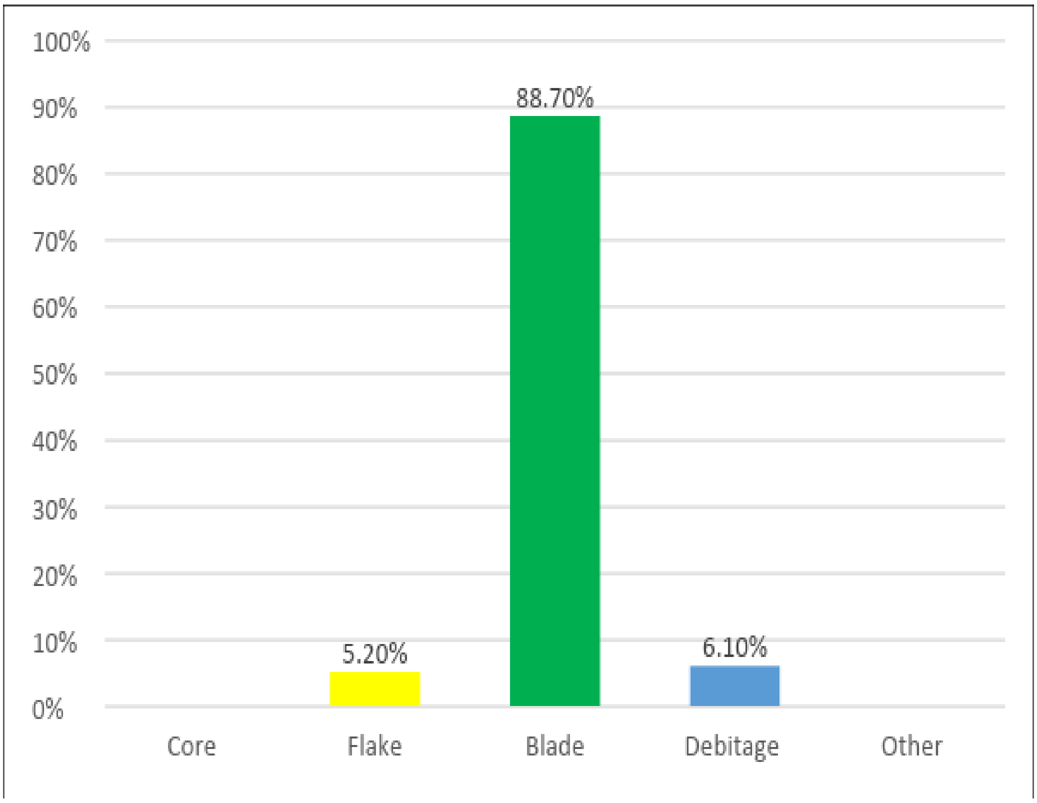


Figure 6.8: Frequency of lithic tools according to their type Sq A2-2

Table 6.11: Frequency of lithic tools according to their type Sq A2-3

Area	Layer	Technology					Total
		Core	Flake	Blade	Debitage	Other	
Sq A2-3	L1	0	0	16	0	0	16
	L2	0	1	19	0	0	20
	L3	0	0	10	0	0	10
	L4	0	0	9	0	0	9
	L5	0	0	32	0	0	32
	L6	0	0	7	0	1	8
	L7	0	2	45	2	3	52
	L8	0	0	3	3	0	6
	L9	0	0	26	1	0	27
	L10	0	2	22	0	0	24
	L11	0	1	10	0	0	11
	L12	0	0	13	0	0	13
	L13	0	1	30	0	0	31
	L13 with clay objects	0	0	5	235	0	240
Sum		0	7	247	241	4	499
Percentage		0%	1.40%	49.50%	48.30%	0.80%	100%

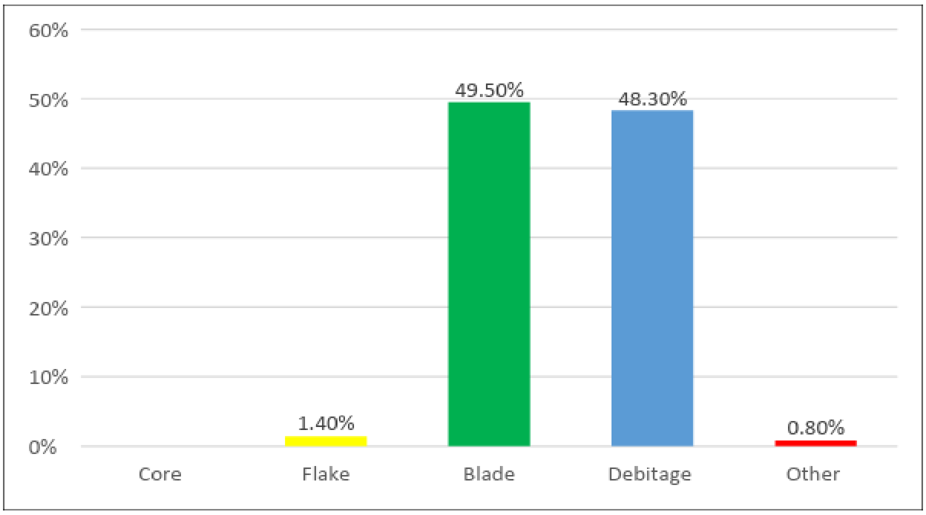


Figure 6.9: Frequency of lithic tools according to their type Sq A2-3

6.5.8 Debitage

In the context of the study of lithic industries, whether prehistoric or not, the term "debitage" refers to, although is not limited to shatter and production debris, and the production rejects. A total of 250 items of debitage were recovered from the site.

6.6 The Classification

6.6.1 Blades

In this section, the different types of lithic materials will be discussed in detail. This includes the tools used for hunting, such as arrowheads and those used for other purposes (e.g. scrapers, burins, borers and others) (see Tables 6.12, 6.13, 6.14, 6.15) (see Figure 6.11). The results of this analysis will be considered square by square in order to compare variations across the site. The tool classes observed in the site include the followings: backed pieces, microlith, bificial pieces, burins, notches, denticulates, arrowheads, points / awls, and scrapers.

Table 6.12: Frequency of lithic tools in all squares

Area	Tools									
	backed piece	microlith	bificial piece	burin	notch	denticulate	arrowhead	point / awl	scrapers	total
Sq A2-1	142	19	23	20	23	53	4	15	34	333
Sq A2-2	53	8	7	7	3	13	2	4	5	102
Sq A2-3	109	7	13	23	8	33	5	9	40	247
Sum	304	34	43	50	34	99	11	28	79	682
Percentage	44.60%	5.00%	6.30%	7.30%	5.00%	14.50%	1.60%	4.10%	11.60%	100%

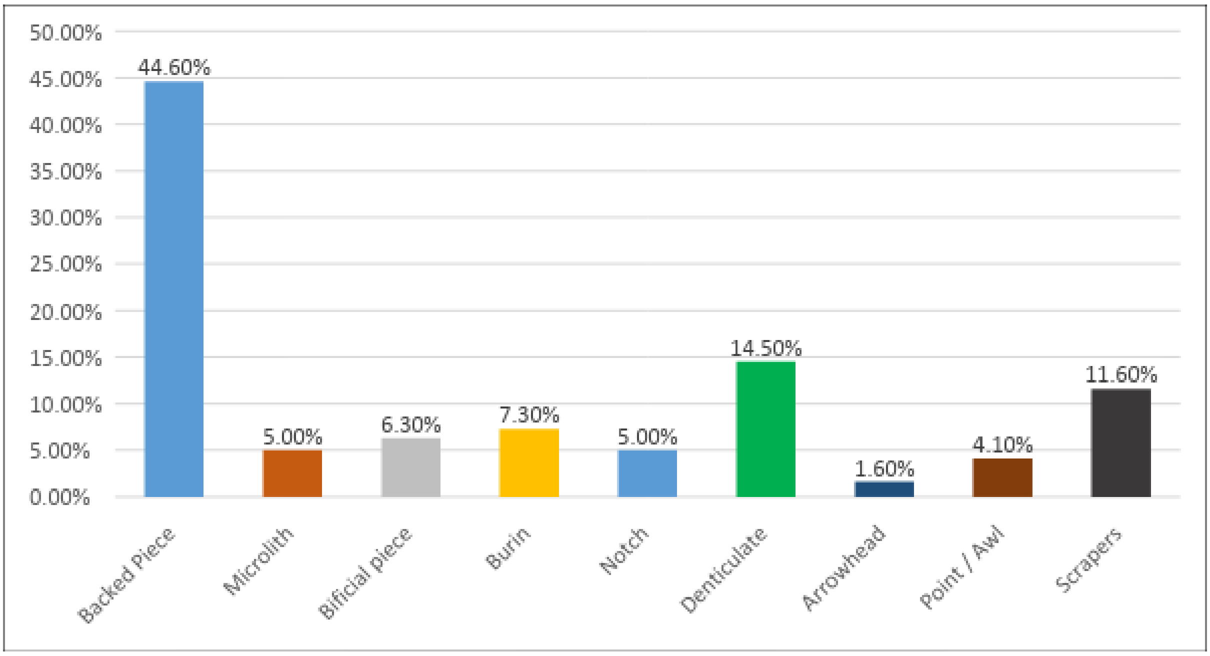


Figure 6.11: Frequency of lithic tools in all squares

The collection from Sq A2-1, Sq A2-2, and Sq A2-3 consists of 967 lithic tools, with 682 blades mentioned in detail here. The latter includes 304 backed pieces, 34 Microliths, 43 bifacial pieces, 50 burins, 34 notches, 99 denticulates, 11 arrowheads, 28 points/awls, and 79 scrapers. The most frequent items are backed tools which yield an average of 44.6% of the collection. Most of the tools are less than 20 millimetres in length, and some are even less than 10 millimetres long (see Figure 6.12). Meanwhile, in some cases, tall blade tools may be found. They have the same general characteristics as the blade, although they exhibit two more features, which are:

a. One edge has steep retouch.

b. The opposite edge should be thin and sharp and untrimmed.

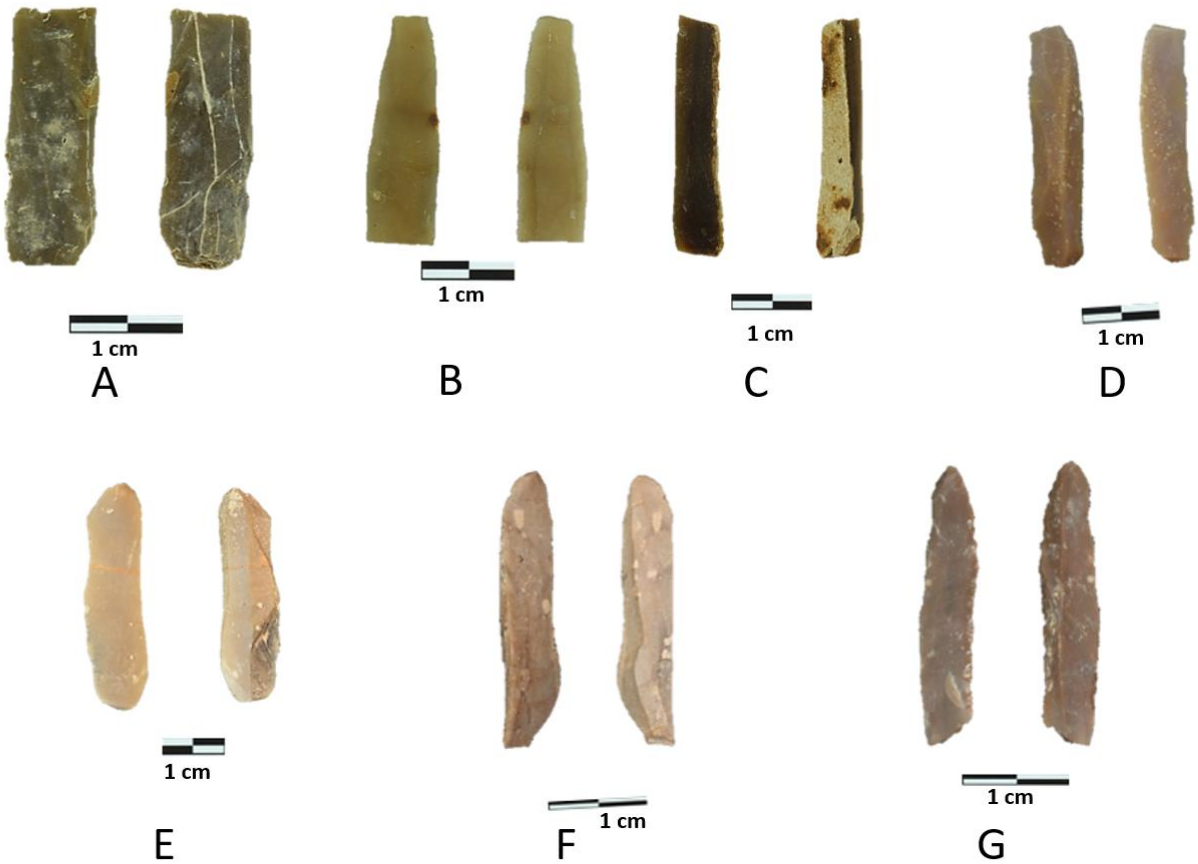


Figure 6.12: Backed Piece (A, B, C, D) from Sq A2-1; (E, F, G) from Sq A2-3

Microliths consist of 34 worked lithic artefacts, which account for an average of 5.0% of the collection; the term literally means "little stone". It designates reinforcing elements, usually geometric shapes, generally less than 40mm in length and less than 4mm thick (see Figure 6.13). The collection consists of very small tools, produced from blades or flakes.

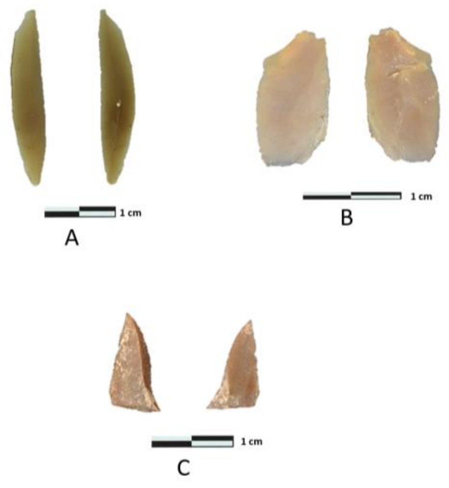


Figure 6.10: Microlith (A, B,) from Sq A2-1; (c) from Sq A2-3

Bifacial pieces accounted for approximately 6.3% of the collection. The specimens were unstandardised in terms of morphology and appeared to have undergone minimal retouching in order to produce the working edge (see Figure 6.14).

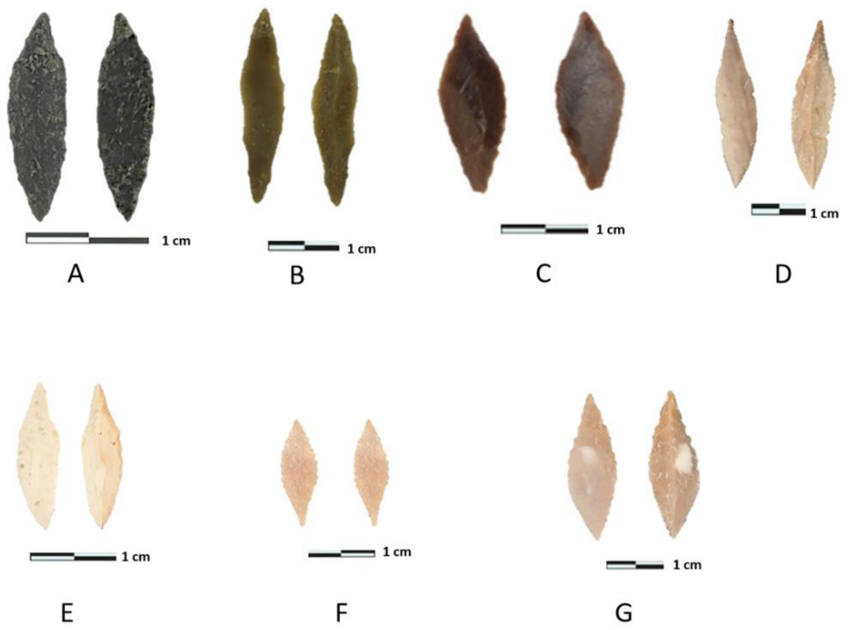


Figure 6.11: Bifacial pieces (A, B, C, D) from Sq A2-1; (E, F, G) from Sq A2-3

50 burins were identified, which are made on flakes with widths of less than 40mm. Except for one specimen, they are all made in a rough manner (see Figure 6.15).

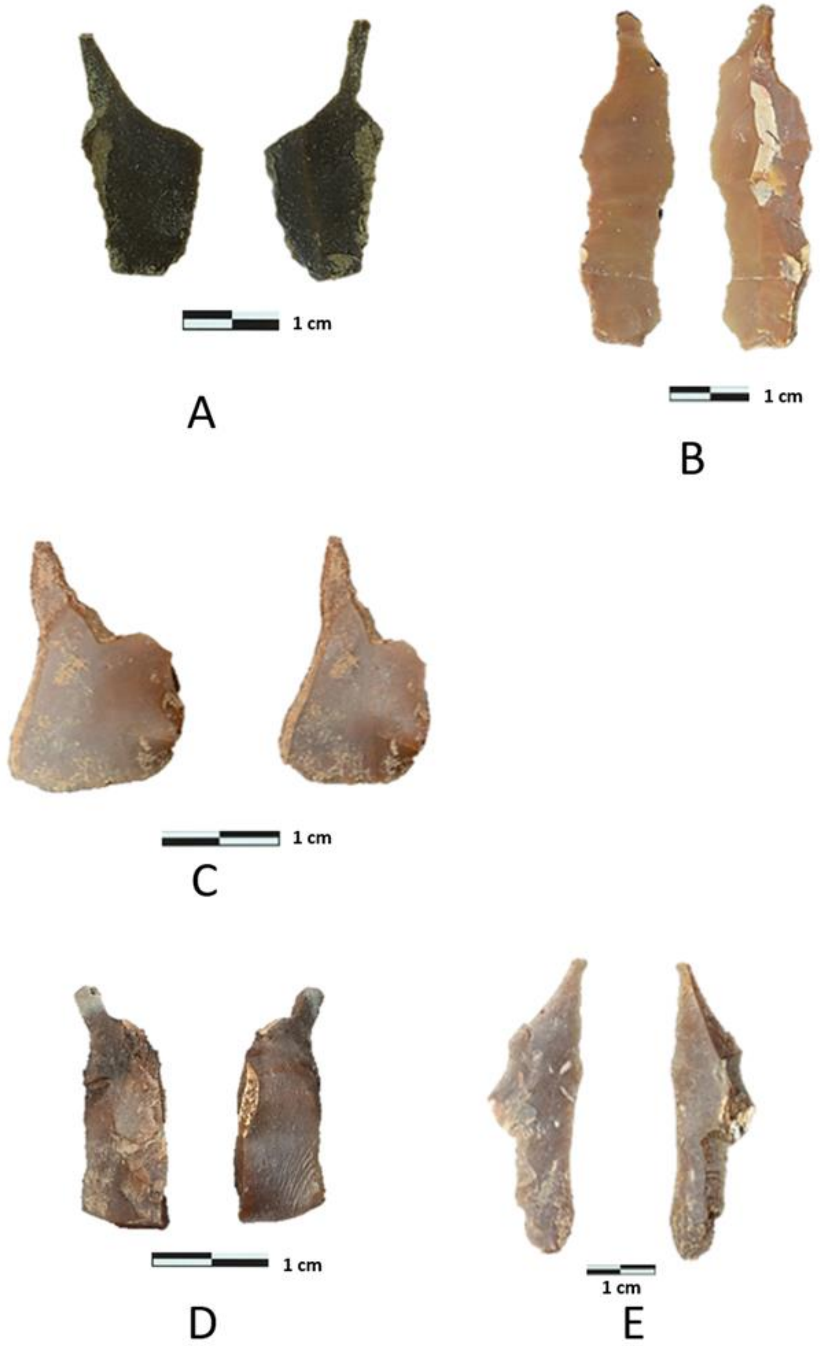


Figure 6.12: Burins (A, B) from Sq A2-1; (C) from Sq A2-2 (D, E) from Sq A2-3

Notches are also represented in the sample (5% of the collection). Some of the pieces were made on large flakes and used as burins. Steep retouching is seen on the dorsal surface along both edges (see Figure 6.16).

Figure 6.13: Notches (A, B, D) from Sq A2-1

Denticulates are the second most frequent category of lithic artefact, with 14.5% denticulates identified among the whole collection. These tools consist of thin blades with teeth-like edges (see Figure 6.17).

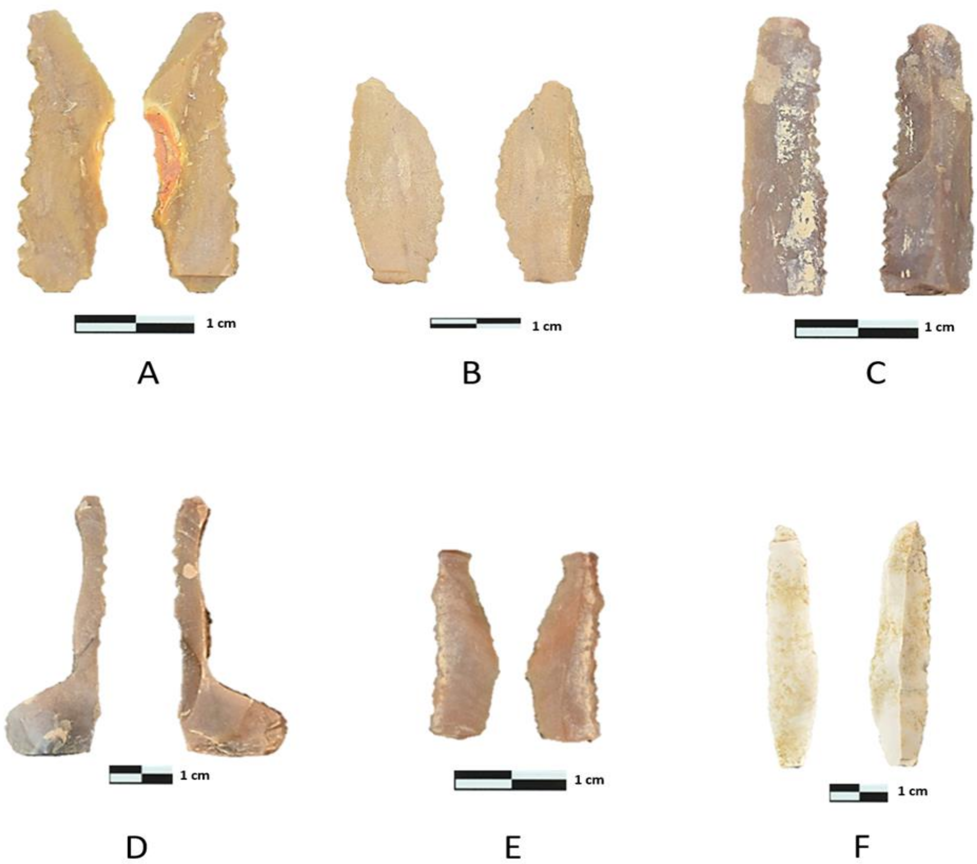


Figure 6.14: Denticulates (A, B, C) from Sq A2-1; (D, E, F) from Sq A2-3

Only 11 arrowheads were identified, which yield only 1.6% of the collection; they are mostly made on fine quartz with finished cutting edges. The arrowheads are fully made on blades and have rather simple retouching and shapes (see Figure 6.18).

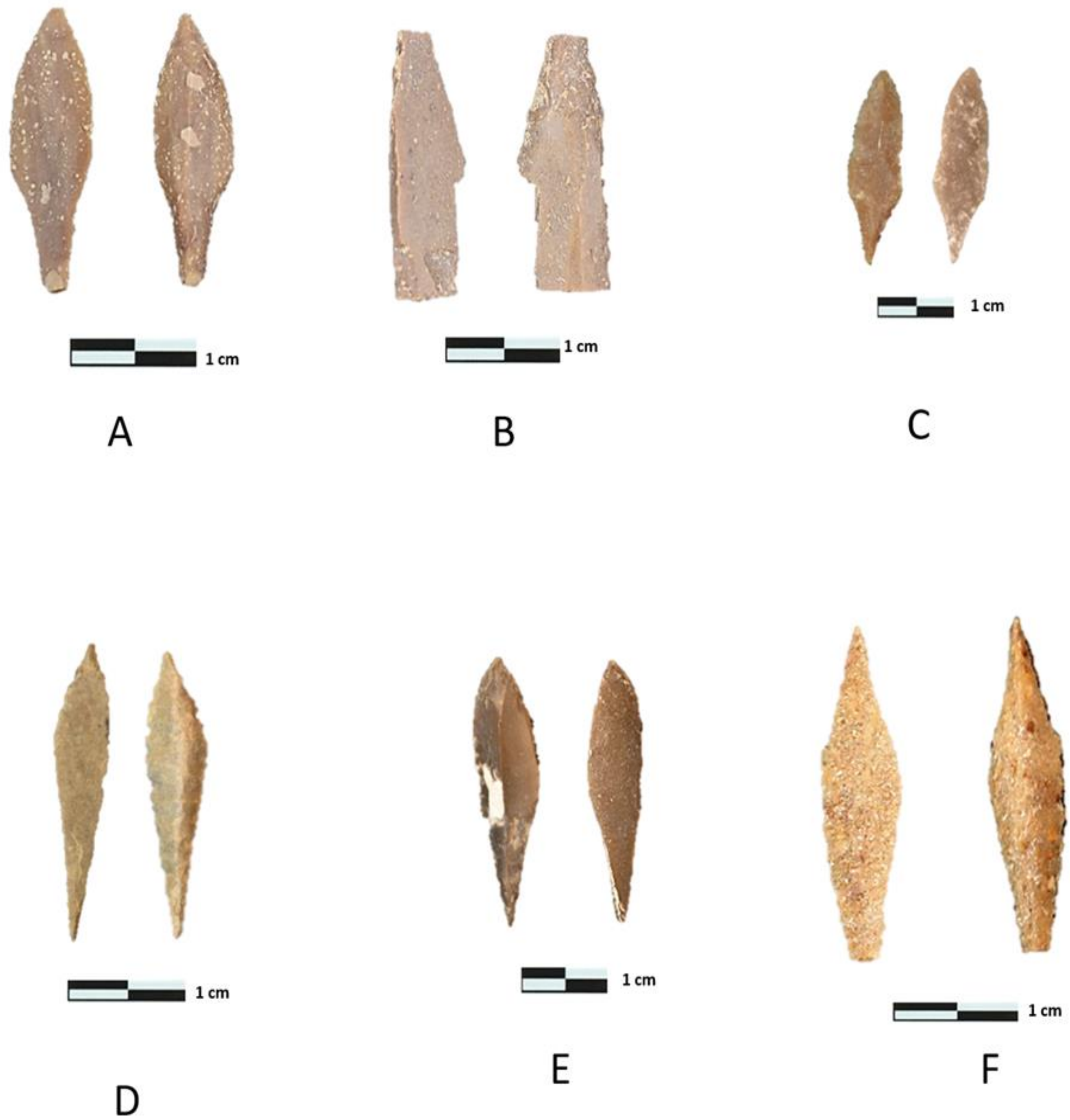


Figure 6.15: Arrowheads (A, B) from Sq A2-1; (C) from Sq A2-2 (D, E, F) from Sq A2-3

The points collected from the site are tools that are roughly constructed. 28 points were collected, which were formed by a series of observations with rather steep edge-retouching along both margins of the proximal part (see Figure 6.19).

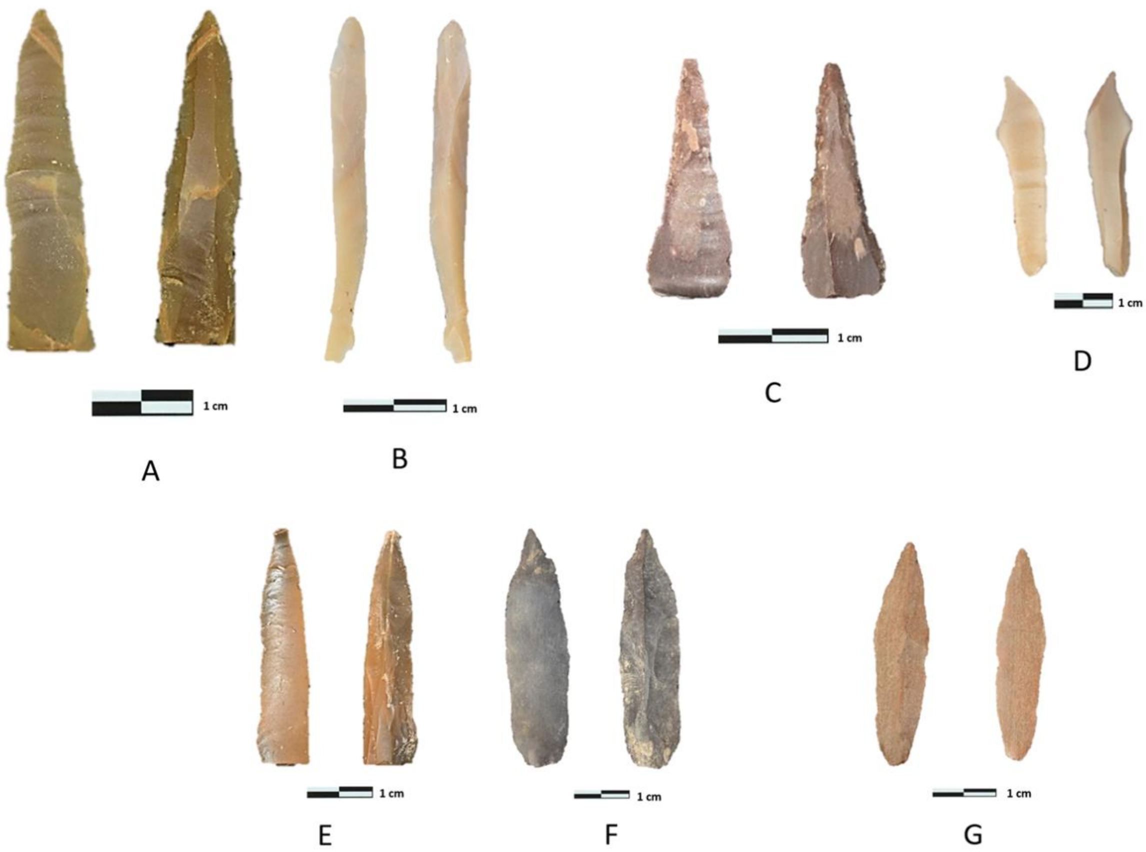


Figure 6.16: Points (A, B) from Sq A2-1; (C, D) from Sq A2-2 (E, F, G) from Sq A2-3

79 scrapers were collected from the three squares, which accounts for 11.5% of the collection. No extra divisions were made on this type of tool, although, according to the longitudinal axis and the orientation of tools, some scrapers are found to be side-scrapers (with parallel retouches to the axis), while others are concave scrapers, and a few are end scrapers. They are all assigned as “scrapers”, which include different variations of multiple edge tools, most of which combine convex and concave scraping edges (see Figure 6.20).

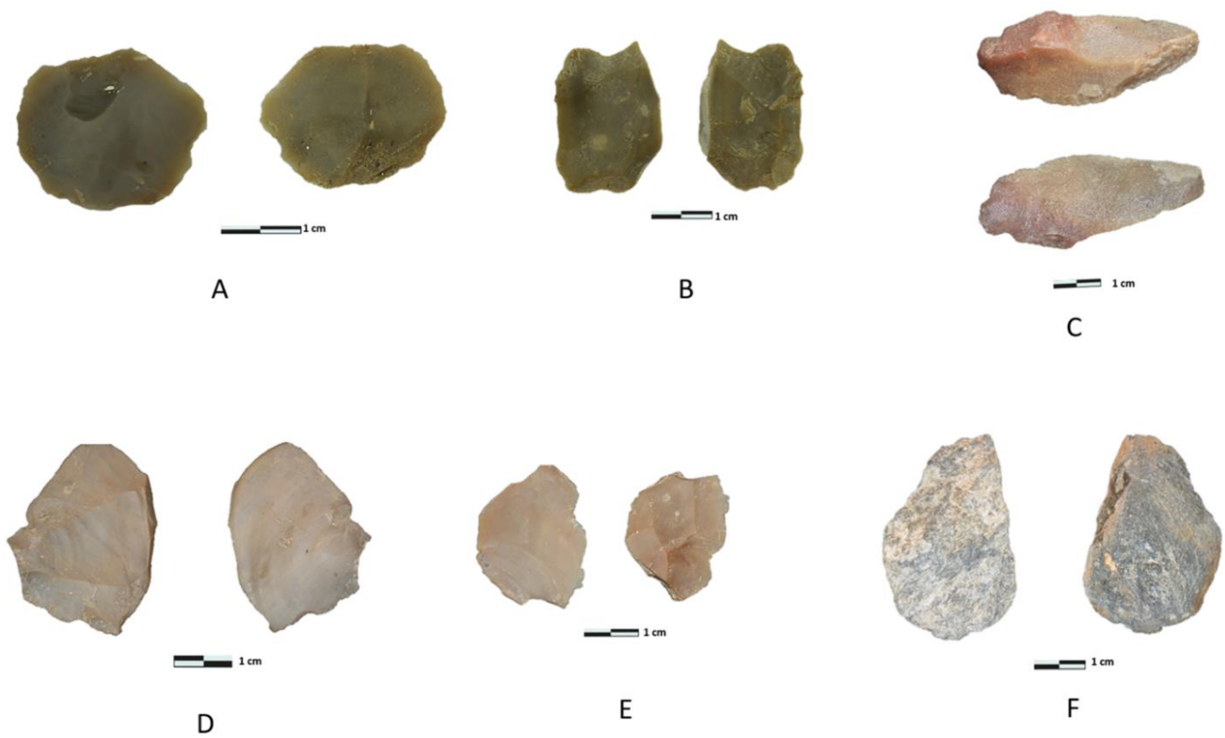


Figure 6.17: Scrapers (A, B, C) from Sq A2-1; (D, E, F) from Sq A2-3

Table 6.13: Frequency of lithic tools types blade Sq A2-1

Area	Layer	Types Tools –Blade									Total
		Backed Piece	Microlith	Bificial piece	Burin	Notch	Denticulate	Arrowhead	Point / Awl	Scrapers	
Sq A 2-1	L1	5	0	2	2	0	0	1	0	4	14
	L2	0	0	0	0	0	0	0	0	0	0
	L3	15	0	1	1	0	0	0	3	4	24
	L4	7	3	2	0	2	6	0	0	4	24
	L5	7	4	4	1	3	10	0	4	0	33
	L6	2	1	1	2	3	3	0	2	3	17
	L7	11	6	2	2	7	11	0	0	4	43
	L8	25	0	6	3	2	7	1	2	4	50
	L9	15	0	0	4	0	5	1	1	1	27

	L10	21	2	3	0	0	4	0	1	3	34
	L11	5	0	0	0	0	0	0	0	0	5
	L12	13	0	0	3	2	4	0	0	1	23
	L13	0	0	0	0	0	0	0	0	0	0
	L14	9	3	1	1	2	1	1	2	3	23
	L15	7	0	1	1	2	2	0	0	3	16
SUM		142	19	23	20	23	53	4	15	34	333
Percentage		43%	6%	7%	6%	7%	16%	1%	5%	10%	100%

Table 6.14: Frequency of lithic tools types blade Sq A2-2

Area	Layer	Types Tools –Blade									Total
		Backed Piece	Microlith	Bificial piece	Burin	Notch	Denticulate	Arrowhead	Point / Awl	Scrapers	
Sq A 2-2	L1	0	0	0	0	0	0	0	0	0	0
	L2	11	1	3	2	2	4	0	1	0	24
	L3	8	0	0	0	0	0	0	0	2	10
	L4	9	4	1	1	0	1	1	0	2	19
	L5	11	0	1	2	0	2	0	2	1	19
	L6	10	3	1	2	0	4	0	0	0	20
	L7	4	0	1	0	1	2	1	1	0	10
Sum		53	8	7	7	3	13	2	4	5	102
Percentage		52%	8%	7%	7%	3%	13%	2%	4%	5%	100%

Table 6.15: Frequency of lithic tools types blade Sq A2-3

Area	Layer	Types Tools –Blade									Total
		Backed Piece	Microlith	Bificial piece	Burin	Notch	Denticulate	Arrowhead	Point / Awl	Scrapers	
Sq A 2-3	L1	11	0	1	1	0	2	0	0	1	16
	L2	12	1	2	0	0	2	0	0	2	19
	L3	7	0	0	3	0	0	0	0	0	10
	L4	4	2	0	1	0	0	0	0	3	10
	L5	16	0	3	2	1	4	2	1	3	32
	L6	0	0	0	0	0	5	1	1	0	7
	L7	12	0	3	4	4	7	1	3	11	45
	L8	3	0	0	0	0	0	0	0	0	3
	L9	13	1	1	0	1	5	0	0	2	23
	L10	10	0	1	2	1	2	0	1	7	24
	L11	5	2	0	1	0	0	0	0	2	10
	L12	8	1	0	1	0	0	1	0	2	13
	L13	7	0	1	6	0	6	0	3	7	30
	L13 with clay objects	1	0	1	2	1	0	0	0	0	5
SUM		109	7	13	23	8	33	5	9	40	247
Percentage		45%	3%	5%	9%	3%	13%	2%	4%	15%	100%

6.6.2 Flakes Tools

People in prehistoric times often preferred flake tools over other tools, as they are often easy to make, they could be extremely strong, and could be repaired easily. Flake tools could be sharpened by retouch to create scrapers or chisels. These tools were either made on flakes or core. Flake tools can be further shaped by lithic reduction, which is the removal of a small flake from a larger stone to achieve the shape of the desired tool and size (see Tables 6.16, 6.17, 6.18) (see Figure 6.21).

Table 6.16 Frequency of Flake tools in Sq A2-1

Area	Layer	No.	Types Tools -Flake									
			Backed Piece	Microlith	Bificial piece	Burin	Notch	Denticulate	Arrowhead	Point / Awl	Scrapers	Other
Sq A2-1	L4	F1	0	0	0	0	0	0	0	0	1	0
		F2	0	0	0	0	0	0	0	0	1	0
		F3	0	0	0	0	0	0	0	0	1	0
	L7	F4	0	0	0	0	0	0	0	0	1	0
		F5	0	0	0	0	0	0	0	0	1	0
	L8	F6	0	0	0	0	0	0	0	0	1	0
		F7	0	0	0	0	0	0	0	0	1	0
		F8	0	0	0	0	0	0	0	0	1	0
		F9	0	0	0	0	0	0	0	0	1	0
	L10	F10	0	0	0	1	0	0	0	0	0	0
		F11	0	0	0	0	0	0	0	0	1	0
	L12	F12	0	0	0	1	0	0	0	0	0	0
		F13	0	0	0	0	0	0	0	0	1	0
	L14	F14	0	0	0	0	0	0	0	0	0	1
Sum		14	0	0	0	2	0	0	0	0	11	1
percentage		100 %	0%	0%	0%	14%	0%	0%	0%	0%	79%	7%

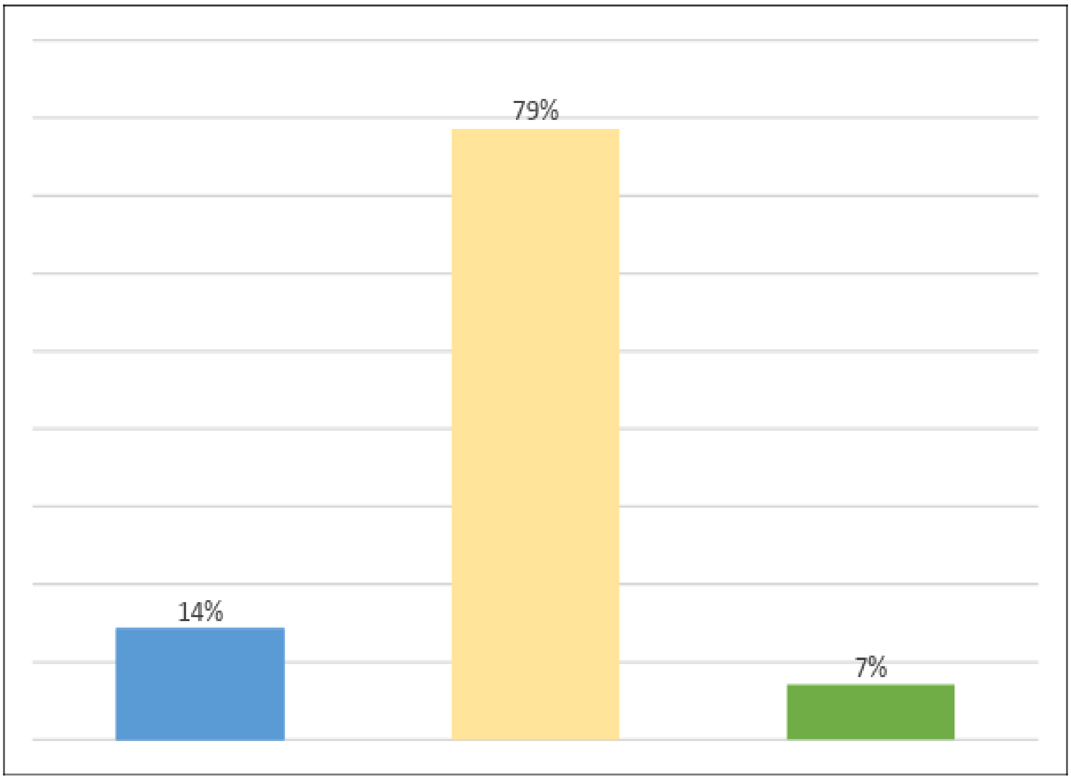


Figure 6.18: Frequency of Flake tools in Sq A2-1

Table 6.17: Frequency of Flake tools in Sq A2-2

Area	Layer	No.	Types Tools -Flake									
			Backed Piece	Microlith	Bificial piec e	Burin	Notch	Denticulate	Arrowhead	Point / Awl	Scrapers	Other
Sq A2-2	L2	F15	0	0	0	0	0	0	0	0	1	0
	L5	F16	0	0	0	0	0	0	0	0	1	0
		F17	0	0	0	0	0	0	0	0	1	0
	L6	F18	0	0	0	0	0	0	0	0	0	1
		F19	0	0	0	0	0	0	0	0	0	1
		F20	0	0	0	0	0	0	0	0	0	1
Sum		6	0	0	0	0	0	0	0	0	3	3
Percentage		100%	0%	0%	0%	0%	0%	0%	0%	0%	50 %	50 %

Table 6.18: Frequency of Flake tools in Sq A2-3

Area	Layer	No.	Types Tools -Flake									
			Backed Piece	Microlith	Bifacial piece	Burin	Notch	Denticulate	Arrowhead	Point / Awl	Scrapers	Other
Sq A2-3	L2	F21	0	0	0	0	0	0	0	0	1	0
	L7	F22	0	0	0	0	0	0	0	0	1	0
		F23	0	0	0	0	0	0	0	0	1	0
	L10	F24	0	0	0	0	0	0	0	0	0	1
		F25	0	0	0	0	0	0	0	0	0	1
	L11	F26	0	0	0	0	0	0	0	0	0	1
	L13	F27	0	0	0	0	0	0	0	0	0	1
Sum		7	0	0	0	0	0	0	0	0	3	4
Percentage		100%	0	0	0	0	0	0	0	0	43 %	57 %

6.6.3 Ground and Grinding Tools

Grinding is a method of stone working employed in the smoothing of an edge or surface by rubbing it with a hammer-stone or other abrader prior to use. Commonly this term is applied to tools that are associated with several prehistoric and historic activities; there are varying types of grinding stones. According to Haaland (1987, p.81), these tools may have been used for two main functions: grinding grain or less frequently other substances, such as ochre.

The smaller grinders were most frequently used for grinding ochre and larger ones for grinding grain.

The grinders are divided into the following types:

a) **Querns:** these are oval, round or semi-rounded stones with very clear traces of scratches. They are divided into:

1. Upper grinders: these only show traces of use on one side, and they are disc-grinders with oval shape. The upper surface displays the natural surface, while the lower surface is smooth and flat (see Figure 6.22).

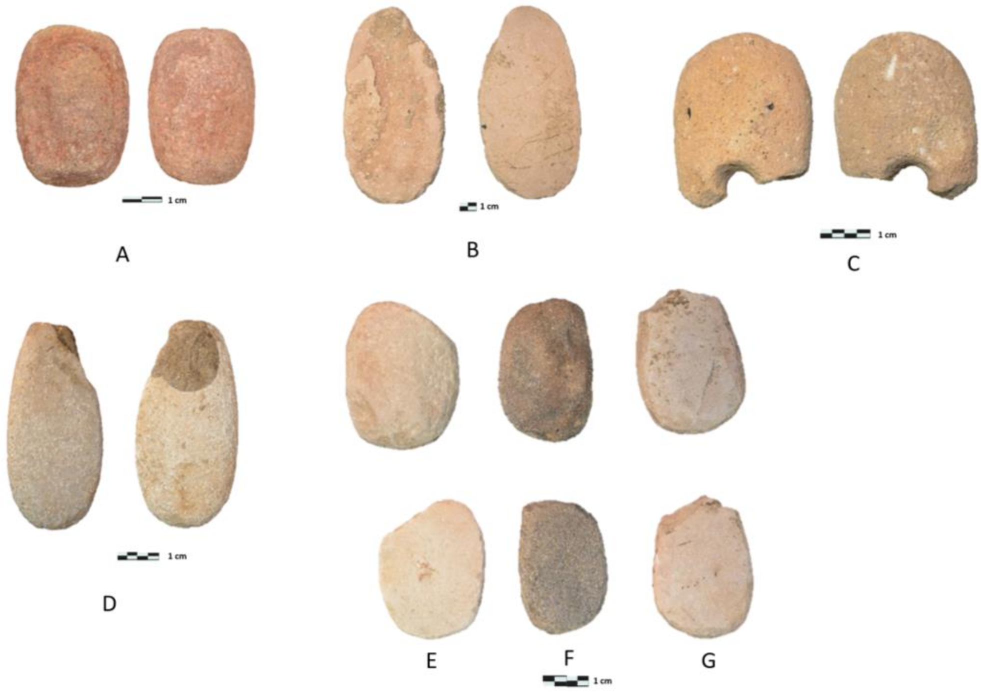


Figure 6.19: Upper grinders (A) from Sq A2-1; (B, C, D, E, F, G) from Sq A2-3

2. Lower grinder: also shows traces of use on one side (see Figure 5.23).

Figure 6.20: Lower grinders from Sq A2-1

b) **Hammers:** Hammers were made by rounding a rock and used with chisels in woodworking or other activities, such as crushing hard plant seeds (see Figure 6.24).

Figure 6.21: Hammers (A, B, C) from Sq A2-1; (D, E, F) from Sq A2-3

c) **Discs:** the discs are rounded stones with a hole in the middle. They were used on one side, where clear signs of use were observed (see Figure 6.25).

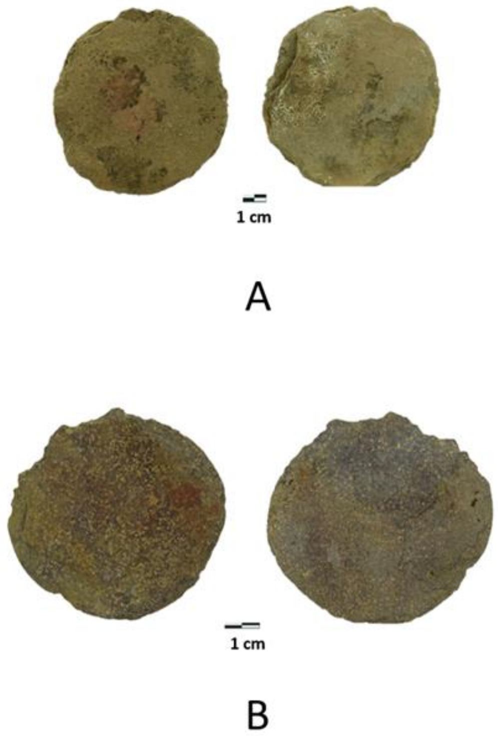


Figure 6.22: Discs (A, B) from Sq A2-1

A total of 45 fragments and complete grinding sandstone tools were collected from this site. All the fragments have two plain and smooth surfaces. Hence, they must have been used as upper grinders, where both faces were utilised (see Tables 6.19, 6.20, 6.21, 6.22) (see Figures 6.26, 6.27).

Table 6.19 Frequency of grinders in all squares

Area	Grinding Tools			
	Querns		Hammers	Discs
	upper	Lower		
Sq A2-1	13	0	13	2
Sq A2-2	1	0	0	0
Sq A2-3	8	3	5	0
Sum	22	3	18	2

Table 6.20: Frequency of grinders in Sq A2-1

Area	layer	Grinding Tools			
		Querns		Hammers	Discs
		upper	Lower		
Sq A2-1	L4	0	0	3	0
	L6	2	0	0	0
	L7	2	0	3	0
	L8	2	0	3	0
	L9	2	0	1	0
	L10	1	0	3	2
	L12	2	0	0	0
	L14	2	0	0	0
SUM		13	0	13	2
Percentage		47%	0%	46%	7%

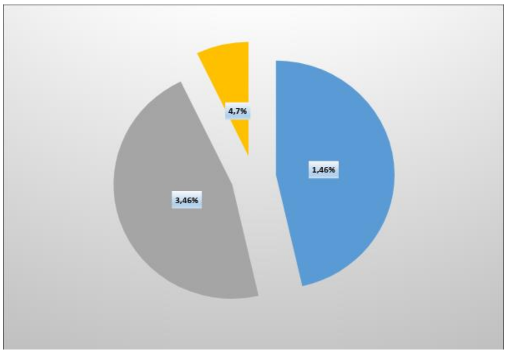


Figure 6.23: Frequency of grinders in Sq A2-1

Table 6.21: Frequency of grinders in Sq A2-2

Area	layer	Grinding Tools			
		Querns		Hammers	Discs
		Upper	Lower		
Sq A2-2	L2	0	0	0	0
	L4	0	0	0	0
	L5	0	0	0	0
	L6	1	0	0	0
	L7	0	0	0	0
Sum		1	0	0	0

Table 6.22: Frequency of grinders in Sq A2-3

Area	Layer	Grinding Tools			
		Querns		Hammers	Discs
		upper	Lower		
Sq A2-3	L1	0	0	0	0
	L2	0	0	0	0
	L5	0	1	0	0
	L6	0	2	0	0
	L7	0	0	1	0
	L9	3	0	1	0
	L10	1	0	0	0
	L12	4	0	2	0
	L13	0	0	1	0
	L13 with clay objects	0	0	0	0
SUM		8	3	5	0
Percentage		50%	31%	19%	0%

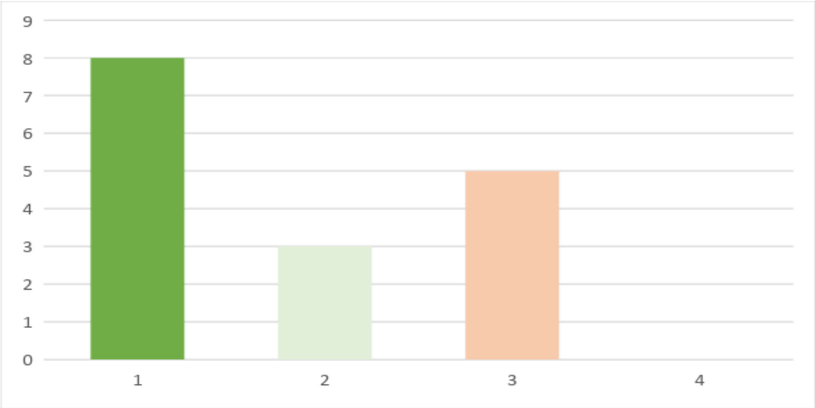


Figure 6.24: Frequency of grinders in Sq A2- 3

6.6.4 Classification of Other Tools

Four lithic tools were located in square A2-3 (see Figure 6.28): the first is a small cylindrical and grooved stone (see Figure 6.28-A); the second is a cup-like stone piece (see Figure 6.28-B); the third is a cylindrical stone implement with a cavity (see Figure 6.28-C); and the fourth is a cylindrical shaped piece of similar size to the third piece, and could be used for grinding or crushing (see Figure 6.28-D).

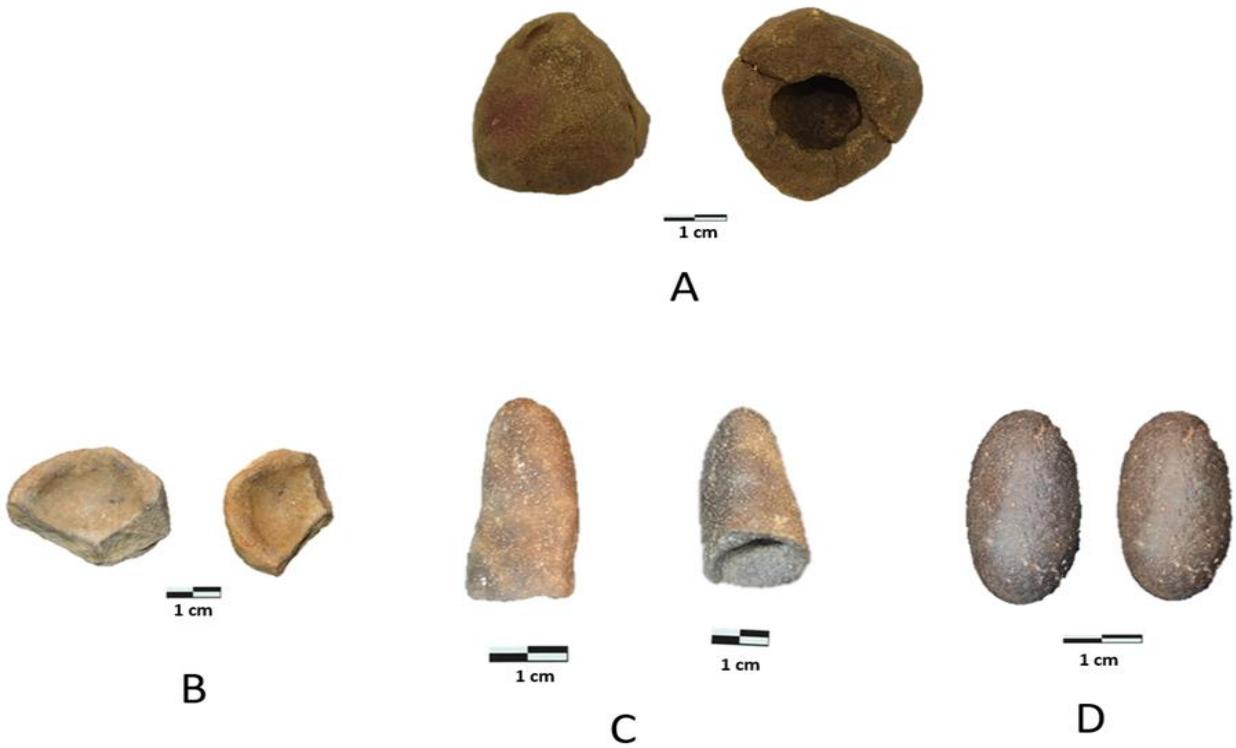


Figure 6.25: Other stone tools

6.7 Comparative Study and Discussion

As mentioned above, the lithic assemblage recovered from AlUyaynah represents the most common item of material culture found at the site. In all cases, the quartzes and quartzite represent the major portion of raw material, although all grinders were made on sandstone. Until further examination of the raw materials occurs, there is no evidence from AlUyaynah that shows how the prehistoric occupants of this area travelled to distant areas or traded with people from other areas for raw materials. The sources of raw materials used for stone technology are all available in the area. Specifically, quartzes and quartzite were used in a high proportion in the manufacture of tools. Furthermore, the presence of the quartzes and quartzite in the vicinity indicates that this raw material was collected from wadi bank terraces close to and around the site, rather than obtained from outcrops or other sources far away. Nevertheless, there was not scope to survey the various rock outcrops in close proximity the site.

Approximately 70% of the collected lithic samples consist of blades, while flakes, cores, while debitage comprises the rest. Nearly all of the assemblage was made from blade technology, which resulted in a high portion of backed pieces (44.60%), microliths (5.0%), bifacial pieces (6.30%), burins (7.3%), notches (5.0%), denticulates (14.5%), arrowheads (1.60%) and points (4.1%). Separately, another unusual aspect of the lithic assemblage at the site, is the appearance of a rather large proportion of scrapers in comparison to other types of lithic tools; these tools comprise approximately 11.6% of lithic artefacts. 79 pieces only were recovered. Of the total number of scrapers recovered from the site, 40 were found in Sq A2-3 and another 34 came from Sq. A2-1. Alternatively, either this number could be explained as reflecting the favouring of these tools at the AlUyaynah site, and perhaps a special focus on, for example, hide working at the site. In addition, this space can be evidence of working with animal skins, which was a frequent activity in this area of the site.

Other noteworthy aspects of the lithic materials at AlUyaynah include the low frequency of arrowheads, as these tools are common in Arabian sites elsewhere. Again, it is not possible to establish a probable "average" frequency of occurrence for these tools in AlUyaynah before more extensive excavation occurs. Moreover, the points collected from the site are roughly constructed tools. More than 4.1% of the collection is classified as points/awls, which were formed by a series of obverse and rather steep edge-retouching along both margins of the proximal part. Separately, the microliths, bifacial pieces, burins, and notches are relatively low in numbers on the site. They represent 5.0, 6.3, 7.3 and 5% of tools, respectively. Denticulates are also represented in the collection, although to a lesser extent than backed tools. Steep retouching on the dorsal surface along both edges is seen in most cases and most distal and proximal ends are snapped off or broken.

The lithic material recovered from the site does not demonstrate any distinct changes between the different layers, suggesting lithic technology was consistent over time, or across different areas of the site, including those excavated previously (Al-Asmari, 2012). The lithic assemblage from the three squares shows no differences in the lithic manufacturing technique, which supports the idea that the layers belong to a relatively short period of time and to some extent to the same group of people. Based on lithic style/assemblage and the C-14 dating, they all belong to the PPNB period and all this assemblage covers that period, as detailed below. That might be a good reason to argue that there was continuity in manufacturing lithic tools in the site across the PPNB period.

6.8 Conclusion

In general, the study of the lithic assemblage from AlUyaynah has permitted the following observations:

1. Lithic materials were not abundant at the site. A total of 967 were collected, consisting mostly of blades. Some PPNA sites (e.g. Wadi Faynan) have a higher number of lithic tools compared to that found at AlUyaynah. Even though only a small sample of chipped stone artefacts has been examined, it is possible to describe the lithic industry at AlUyaynah as a blade based industry.
2. The site is also characterised by a low index of arrowheads and scrapers. This situation is known in sites belonging to Khiamian assemblages of PPNA period. The following traits are considered as common (e.g. Kuijt, 1994):

a. The use of identical raw materials (generally quartz)

b. The use of blade technique

c. Very low index of scrapers

d. Very high index of backed tools

e. The presence of many types of grinders.

Chapter Seven – Discussion

7.1 Introduction

There is an ongoing debate regarding whether the Neolithic of the Arabian Peninsula during the Holocene era represents a population that spread into the region, especially from the Levant, or whether it is primarily an indigenous evolution. The site of AlUyaynah may represent a rare example to provide answers to this debate.

The data from the Neolithic period in the north-western region of Saudi Arabia does not demonstrate all of the characteristics of this period in other regions in the Middle East. For example, the pottery and domestic animals found in later 4th millennium cal BC Ubaid sites in the eastern region (Masry, 1974). Moreover, the sites scattered in this part of Saudi Arabia are characterised mainly by Neolithic stone tool types (arrowheads, scrapers, borers, burns, and retouched and un-retouched blades) (Gilmore, 1982; Sordinas, 1978; Alsharekh, 2004; Zarins, 1981; Adams, 1977). This scarcity of data makes it difficult to form an integrated picture of the Neolithic formulation.

The excavations conducted by the author at the site of AlUyaynah have proved that the site is characterised by a variety of archaeological materials (buildings, clay objects, stone tools, and animal bones) which, to date, are lacking at most Neolithic sites in Saudi Arabia (Al-Asmari, 2012). Two seasons of excavation were undertaken at this site: the first in 2012 (Al-Asmari, 2012); and the second in 2016; with additional visits to collect samples in 2017 as part of the current PhD project.

The site has been dated to the pre-pottery Neolithic period, and it is the earliest site where early clay objects are found throughout the Arabian Peninsula. Hence, the AlUyaynah site is an important addition to the archaeological record of Saudi Arabia and will help to refine our understanding of PPN cultures in this part of Saudi Arabia.

7.2 Aim and Objectives

The discussion is presented in five sections; after this short introduction, a comprehensive picture of the site will be presented, together with the archaeological material. There will also be a comparison between the culture and economy at AlUyaynah to those found in neighbouring regions, such as the Levant, as well as the Arabian Peninsula itself. This discussion will be a summary of the most important results obtained from the excavation, with the main objective of providing a better understanding of the Neolithic period in the region, and to answer the main question of whether the Neolithic of the Arabian Peninsula during the Holocene spread to the region, especially from the Levant, or whether it developed independently of outside influences.

7.3 Structure of the Chapter

In this chapter, the chronology of AlUyaynah will be discussed, as well as the development of the settlement site, the economic activities, the symbolic and social activities, and finally the major cultural traits of AlUyaynah.

7.4 The Chronology of AlUyaynah

The dating of the charcoal layers from AlUyaynah will make a significant contribution to the understanding of the pre-pottery Neolithic in north-west Saudi Arabia, and specifically the dates will indicate the time-span when the site flourished. In total, twenty one radiocarbon results are available from a total of 21 samples, which were taken from 10 different layers of interleaved occupation deposits. Following the utilisation of Brock et al.'s (2010) methods, 20 samples were processed at the Oxford Radiocarbon Accelerator Unit (OxA-) with one sample, through the methods of Dunbar et al. (2016), processed at the Scottish Universities Environmental Research Centre (SUERC). As shown by Stuiver and Polach (1977), the dates are displayed as conventional radiocarbon ages; these were calibrated by utilising the terrestrial calibration curve (IntCal13), which is internationally recognised (Reimer et al., 2013); and, as highlighted by Ramsey (2009a), the OxCal v. 4 computer program was also used.

Through the use of the OxCal software, the radiocarbon dates were sequentially ordered, which developed the Bayesian chronological model. From the individual layers, the dates were placed into different unordered groups (phases), which were set in stratigraphic order. Relatively thick sterile deposits separated the occupation deposit layers; thus, the layers were deemed to be of a secure level and low risk for material reworking. The dates can be utilised to provide an estimation of the period of time that has passed throughout the sequence for each sample; hence, dating is able to be used to show a clear estimation for the period of time required for the accumulation of ~230cm of cultural and natural layers.

In general, there is a low level of agreement between the radiocarbon dates and the sample sequence (Amodel = 57) in the primary model (the acceptable threshold = 60). This is potentially due to the initial model's short time period that demonstrates both the stratigraphic chain's activity and depth. Moreover, incredibly low individual agreements are part of both SUERC-76072 and OxA-38607, which may be a typical characteristic of old wood, residual material, or due to these being statistical outliers. The primary model's findings indicate that dated deposition started in 7190–7080 cal BC, with a 95% probability; and most likely in 7115–7085 cal BC, with a 68% probability rating. The dated activity ended between either 7035–6900 cal BC, with a 90% probability; or 6855–6800 cal BC, with a 5% probability level; and likely to be between 7030 and 6995 cal BC, with a 68% probability. The total span between these periods of dated layer, according to the primary model's estimations, is either 50–235 years (89% probability; span primary), 280–390 years (6% probability), or 60–115 years (68% probability).

The two models were designed to test the data's sensitivity in relation to other factors, and particularly in regards to possible old wood effects in the sample, as well as certain results as statistical outliers. Accordingly, Charcoal and General (Outlier models) were utilised for these stages, as shown by Ramsey (2009b). Specifically, the Charcoal outlier model provided an estimation that the activity commenced in 7205–7055 cal BC, with a 95% probability rating; although this is likely to be between 7135 and 7075 cal BC, with a 68% probability level. The activity finished in 7030–6785 cal BC (95% probability); and most likely in 7030–6890 (68% probability). This model provides an estimation that the total span between the time period of dated layers is between 55 and 395 years, with a 95% probability (span Charcoal Outlier); with a 68% probability of between 60 and 225 years.

Comparatively, the General Outlier model provided an estimation of the activity as beginning between 7185 and 7080 cal BC, with a 95% probability; although probably between 7115 and 7085 cal BC, with 68% level of probability. The activity terminated in one of two periods: between 7040 and 6905 cal BC (probability of 91%) or between 6850 and 6800 cal BC (probability of 4%), and likely to be between 7030 and 6995 (68% probability level). The total span period is estimated through the General Outlier model to be between the earliest and latest dated layers at 50–245 years, with a 91% probability level or between 300 and 384 years, with a probability of 5%, which is likely to be between 60 and 115 years (probability of 68%).

In general, these dates place the site in early eighth millennium or the late seventh millennium BC; thus, these are the oldest known examples of the late period of PPNB in Arabian Peninsula. All dates from the site of AlUyaynah are within the PPNB period and indicate contemporary activities in the excavated area (see Figure 4.13,4.14).

7.5 The Development of the Settlement Site

The stone structures discovered at AlUyaynah consist of a group of adjacent houses of regular shapes that are built adjacent to each other. There is no significant change in the shape of the buildings across the site's duration, as most of them have straight walls that and are rectangular; the excavated structure is about 6×12m, while the rest of the structures appear to be 3×4m on average. These buildings were built in many parts of the site without the use of any kind of mortar, which reflects a unique feature of building unknown at other Neolithic sites in Saudi Arabia. With the lack of any other sites that contain similar buildings in Saudi Arabia, AlUyaynah is the only example of the existence of such features in the Neolithic of the region. The only examples that can be compared to the site are from the Levant and from the PPN cultures found there.

In the first phase of PPNA in the Levant during, the shape of the houses was dominated by a circular unit; the single-room unit was built on foundations below ground level (Finlayson & Mithen, 2007). During the PPN period, archaeological sites varied in their sizes and nature, methods of organisation, and even the length of time the site was inhabited. Accordingly, the architectural styles of this period varied from site to site and from period to period. For example, the buildings dated to the early PPNA (circa 8100-8000 cal BC) were small in size, consisting of a single rounded room built of mud above stone foundations (Coqueugniot 1999). During the middle period of the PPNB (circa 8,200-7500 cal BC), rectangular houses prevailed, although they were with the presence of round buildings as well (Kafafi, 2005). The last phase of the PPNB (circa 7500-7000 cal BC) witnessed types of rectangular houses that consisted of a number of rooms and perhaps more than one floor (Gebel et al., 2009). It is clear from the general outline of the architectural structures at the site of AlUyaynah, which takes the form of straight walls consisting of rooms in square and rectangular shapes, that it followed a pattern characterised by many sites of the Levant dating back to the Late PPNB period, such as: Al Safia (Mahasneh, 1997); Al Basta (Gebel et al., 2009); and Ain Ghazali (Kafafi & Rollefson, 1995) (see Figures 7.1, 7.2).

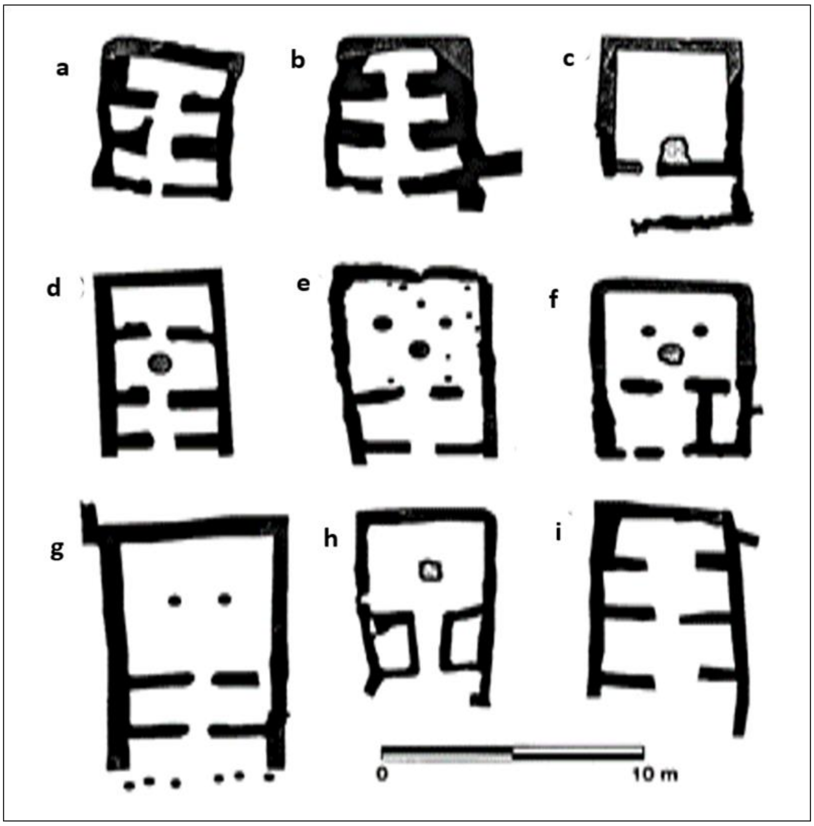


Figure 7.1: Plans of megaron houses from PPNB sites in the southern Levant: Beidha Level II (a-b), Beisamoun (c), Ain Ghazal (d-e), Jericho (f-h), and Yiftahel (i) (after Banning, 2003)

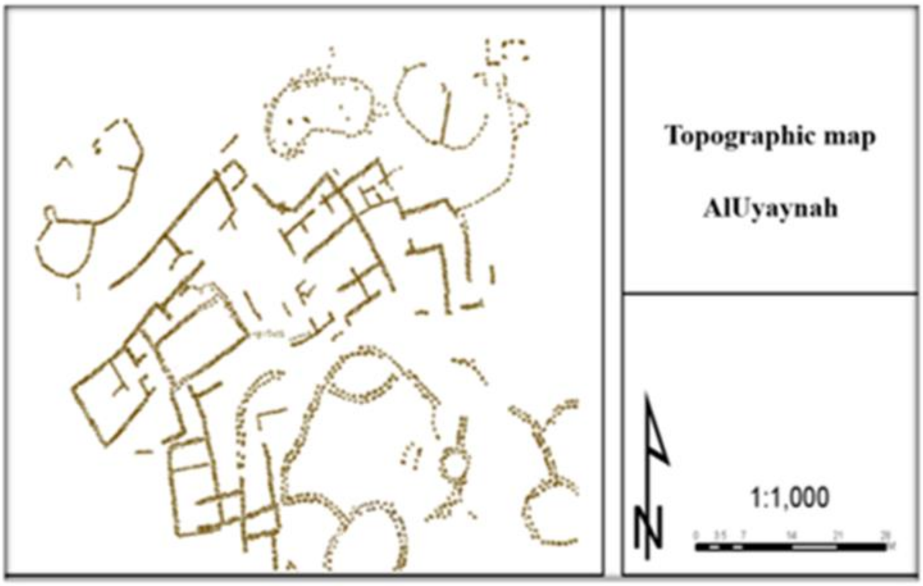


Figure 7.2: Topographic map of AlUyaynah

In general, the stone structures discovered during the excavation indicate two periods of settlement at the site, although both are during the PPNB period. There is no significant change, however, in the shape of the buildings or even the use of other types of stones i.e. sandstone.

1. The first phase seems closer to the second half of the seventh millennium cal BC, with a short gap of an abandonment of the site at some point. This is evident based on the architecture, stone tool assemblage and C14 dates (further detail is shown below). Moreover, some scholars (e.g. Gopher, 1994) have argued that the sites of Tell Al Sultan and Almanhat, as well as other sites in the Jordan Valley, were abandoned during the period between 7500-6500 cal BC, while other sites continue in the Levant. The dates of AlUyaynah (7310–6580 cal BC) are within that range, and thus, within the group of sites that continue during the early to middle 8th millennium cal BC.

2. This second stage is not characterised by a change in settlement or patterns of economy and structures. A thin layer of ash may confirm the abandonment and resettlement of the site perhaps from the same human group. The presence of this layer across the entire section of the excavated unit may indicate one of two possibilities: firstly, the fall and burning of the roof, which is evidenced with few traces of straw that were found in the fill; secondly, the possibility is the intended burning of the site before rebuilding, which indicates continuous occupation.

The northern part of the site represents the highest point of the tell. The buildings that were discovered on the site were constructed over the Nubian sandstone floor without any foundations, and the lowest remains of the excavated squares formed during the initial phases of occupation at the site to date (this included the deposition of the clay objects as well). It is also clear, through the exploration and study of remains from the buildings, that the inhabitants of AlUyaynah utilised the raw materials available in the local environment in their construction. Naturally occurring sandstone slabs were found in many places in close proximity to the site, which are located in the northern part of the site, as well as in small wadies and hills nearby. The walls were built directly above the rocky ground without prior preparation or digging. This pattern is also evident in some PPN sites in the Levant, such as the site of Dja'de-el-Mughara (Northern Syria), and this was found in some Neolithic sites before the arrival of pottery (Coqueugniot, 1998) (see Figure 7.3).

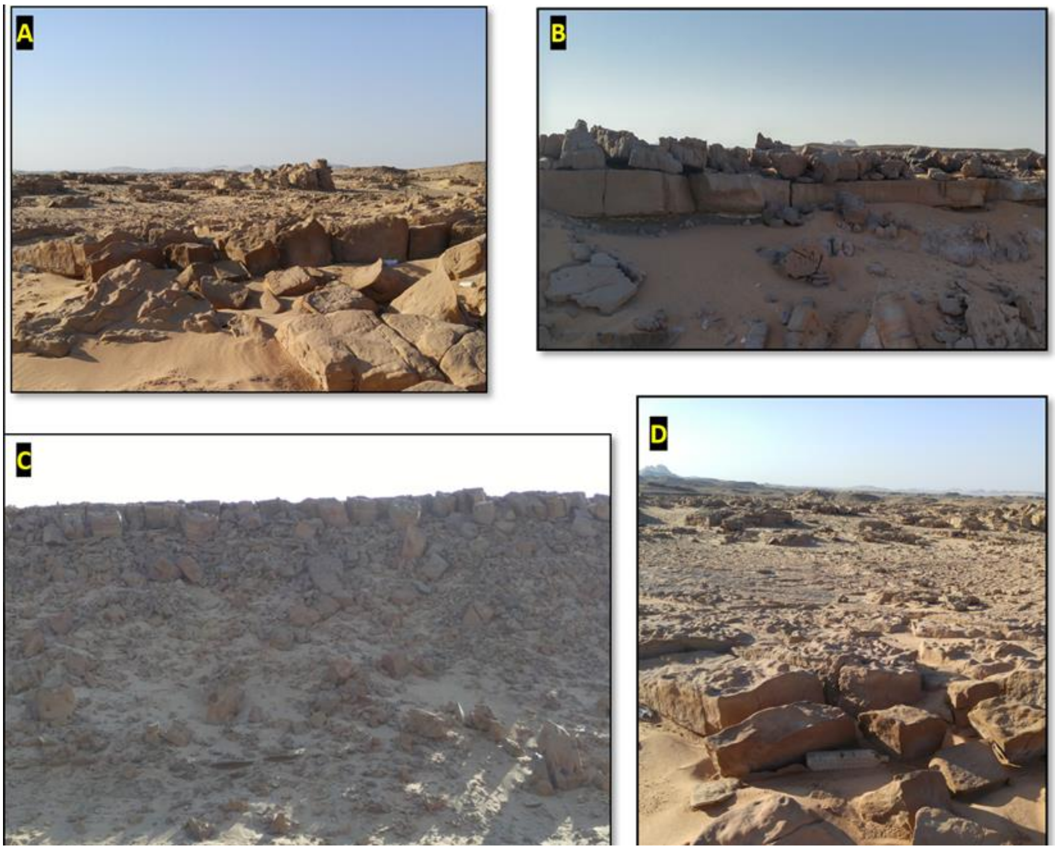


Figure 7.3: Natural sandstone slabs just meters away from the site

The excavations at AlUyaynah did not reveal any archaeological remains other than those dated to the Neolithic period, although some of the circular stone structures at the site may represent a later phase from the beginning of the Chalcolithic Age, not of the Neolithic period, which are designed with a straight wall and a rectangular structure.

The remnants of archaeological remains, bones, and the remains of fireplaces and grinding tools in AlUyaynah indicate that people could use the site for all their daily activities, rather than the site having a specialist function or ritual role. The excavation also demonstrated that they used these buildings to manufacture the stone tools and utilised them for activities related to food preparation. Additionally, some bones revealed traces of cut marks (Grothe, 2018, p.50), which may be evidence of using the stone tools to butcher them inside the buildings. This argument, however, is mainly based on the distribution of the many blade tools in the small rooms, alongside in corners, as well as near and in close proximity to the hearths (see Figure 7.4).

Figure 7.4: Proximal radius of Capra sp./Ovis sp. with several cut marks (Grothe, 2018, p.50)

There are no signs of postholes within these buildings, and thus, the small ones may have been directly roofed without a pillar supporting the centre, while the large ones were left without a special roof; the roof might be slanted and covered with branches or animal skins. In a few sites in the Levant, such as Tell Seker al-Aheimar, stone pillars which supported the roof were found in the debris of rooms (Nishiaki, 2002). At other sites, such as Abu Hurayrah, postholes were found in the middle of the wall, which might have contained wooden postholes or stone pillars (Akkermans, 1983; Moore, 1975) (see Figure 7.5).

Figure 7.5: (Abu Hureyra Site) Slots in the wall were used to install the roof (After Moore, 1975)

The clearance of the outer parts of the buildings also revealed no evidence of stairs, such as those found at Çatal Hüyük (Mellaart, 1967). Moreover, there is no evidence of clay or stone floors in these buildings. The solid sandstone base was often used as a floor for the buildings; this feature was evident in many early PPNA sites (Coqueugniot, 1998), and during the PPNB in Ain Ghazal and Basta and other sites in Jordan (Kafafi, 2005, p.130). Sometimes soil or mud was used to cover specific parts of the site (Kafafi, 2005, p.130). This feature was discovered during both the first season (Asmari, 2012) and the second season of excavation, and it was this layer which contained the clay objects. The excavation proved that these clay objects were covered with soil above the sandstone floor with only a thin layer of soil below them (see Figure 7.6). Indeed, this suggest that they were deposited directly onto the floor.

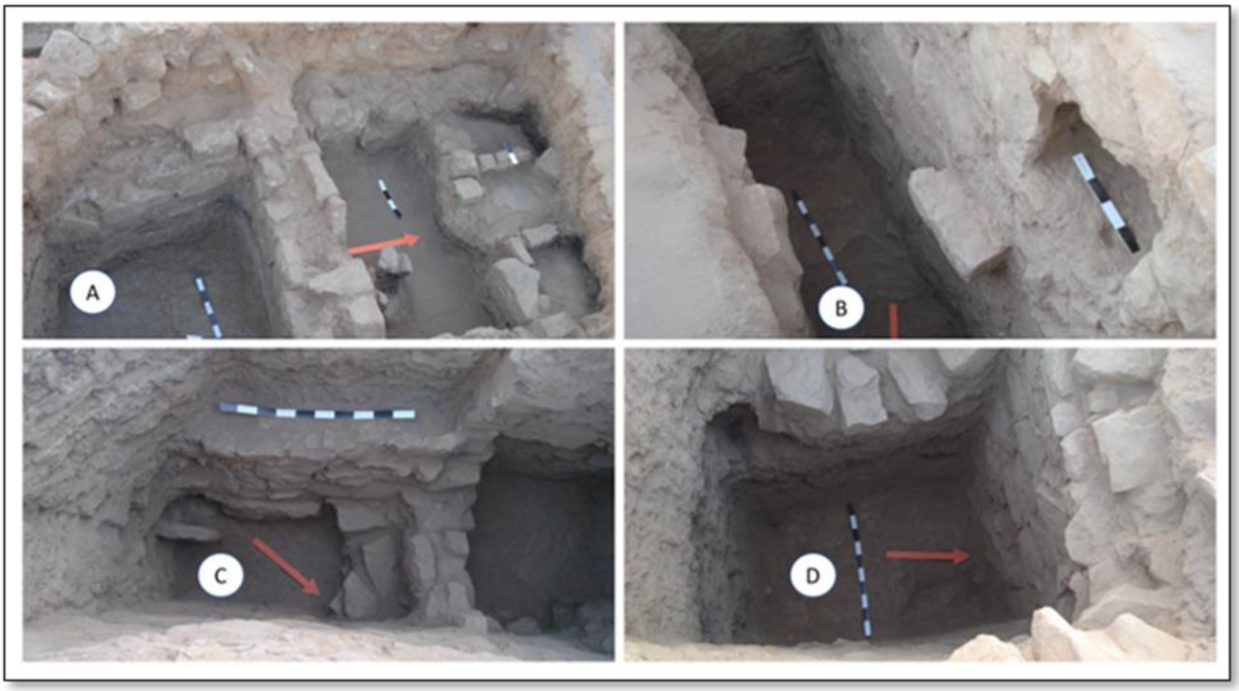


Figure 7.6: Plans of trenches form AlUyaynah show the rocky floor: (A) Trench in the south side, (B, C, D) trenches from the top centre of the site- scales 10cm (Alasmari, 2012)

The study of hearths is important to understand different activities related to them, such as: food preparation, heat and lighting (Binford, 1996; Galanidou, 2000; Gamble, 1991). The different hearth forms suggest different functions, where some may be dedicated to preparing food, while others to heating or to gathering people around them. Even though no direct evidence of hearths was identified in the most recent excavation, the 2012 excavation revealed three types of hearths (Al-Asmari, 2012); they all contained remains of burnt bones and ashes. The hearth type was of medium stones in a square or rectangular shape. Correspondingly, it is similar to types common in PPNA and PPNB in the Levant. This one might be used for preparing food, as well as for light and heat. A similar type is still used in many parts of Saudi Arabia, especially among the Bedouin (Al-Naimi, 2016, pp.5–7). The two other types (pit hearth and simple hearth) were also common in other PPNA and PPNB sites (e.g. Tel Ar Ramad, Syria; De Contenson, 1967; 1971). These types were also used for other activities, such as for preparation of food, light and heat. In the Levant, the sites dated to the period between 7200-7000 cal BC always contained a hearth with a small platform built directly by the entrance of the building (Kafafi, 2005).

The walls of the building were built of two rows of stones similar to those found at other PPN sites, such as Basta (Nissen, 1987) in southern Jordan. No plaster or other materials were used to cover the stones. In some sites in the Levant, the use of plaster and paints were evident, as well as drawing on the plaster to decorate the inner parts of the rooms (e.g. the site of Bouqras; Fokkens, 1981). In AlUyaynah, the walls were constructed without the use of any mortar (including clay and plaster). Small pieces of stones were used to fill gaps between the large slabs (see Figure 7.7).

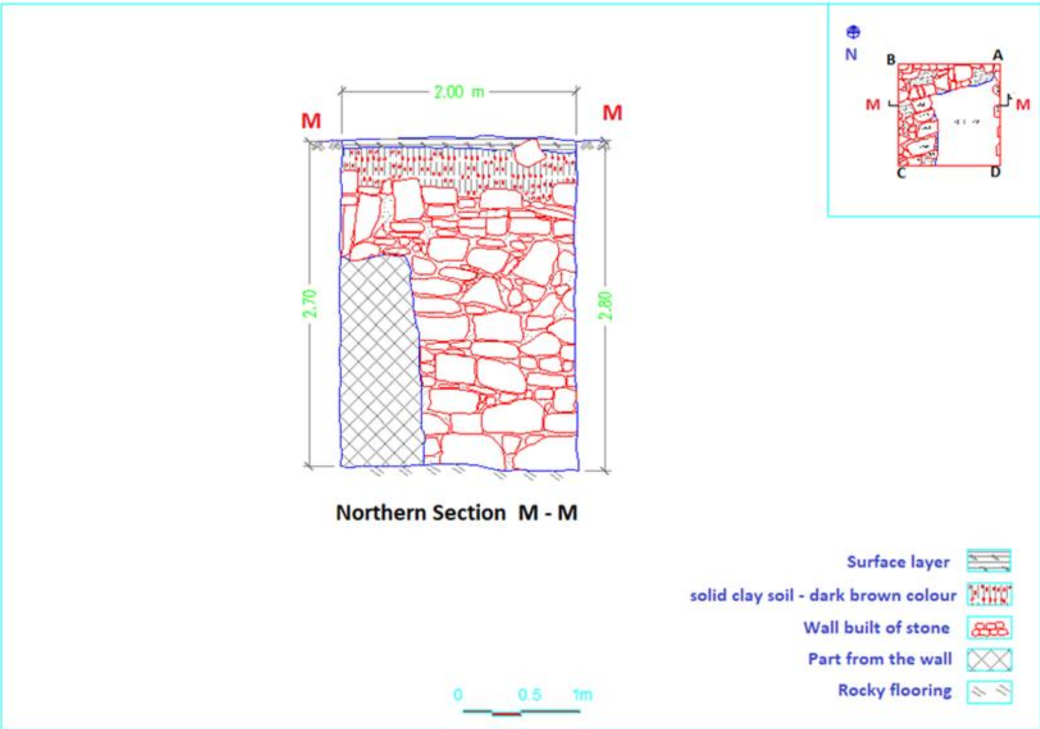


Figure 7.7: Northern section shows the building wall without mortar (clay or plaster)

Excavations at PPNB sites, such as el Kowm 2 (Stordeur, 1989), Abu Hureyra (Moore, 1975) and Seker al-Aheimar (Nishiaki, 2001), reveal the existence of holes or niches in the walls. This structural element was also found at the site of AlUyaynah on the east and west of the building (Al-Asmari, 2012). These niches were places to put valuables or to save food (Stordeur, 2000, pp.1-4) (see Figures 7.8, 7.9).

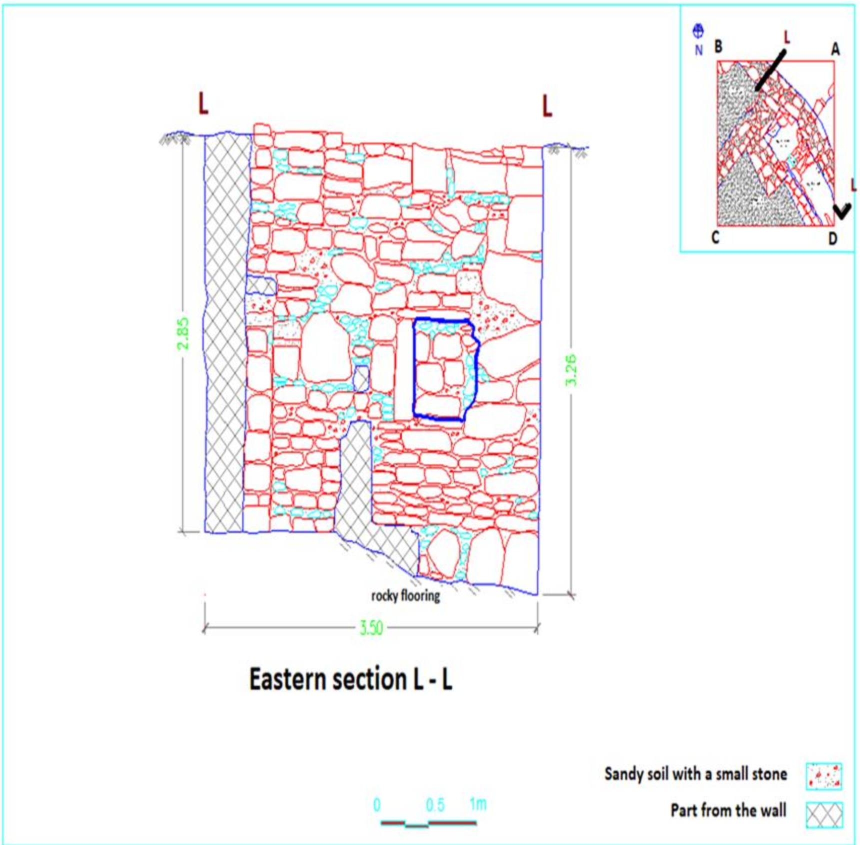


Figure 7.8: Eastern section shows the (hole, niche)

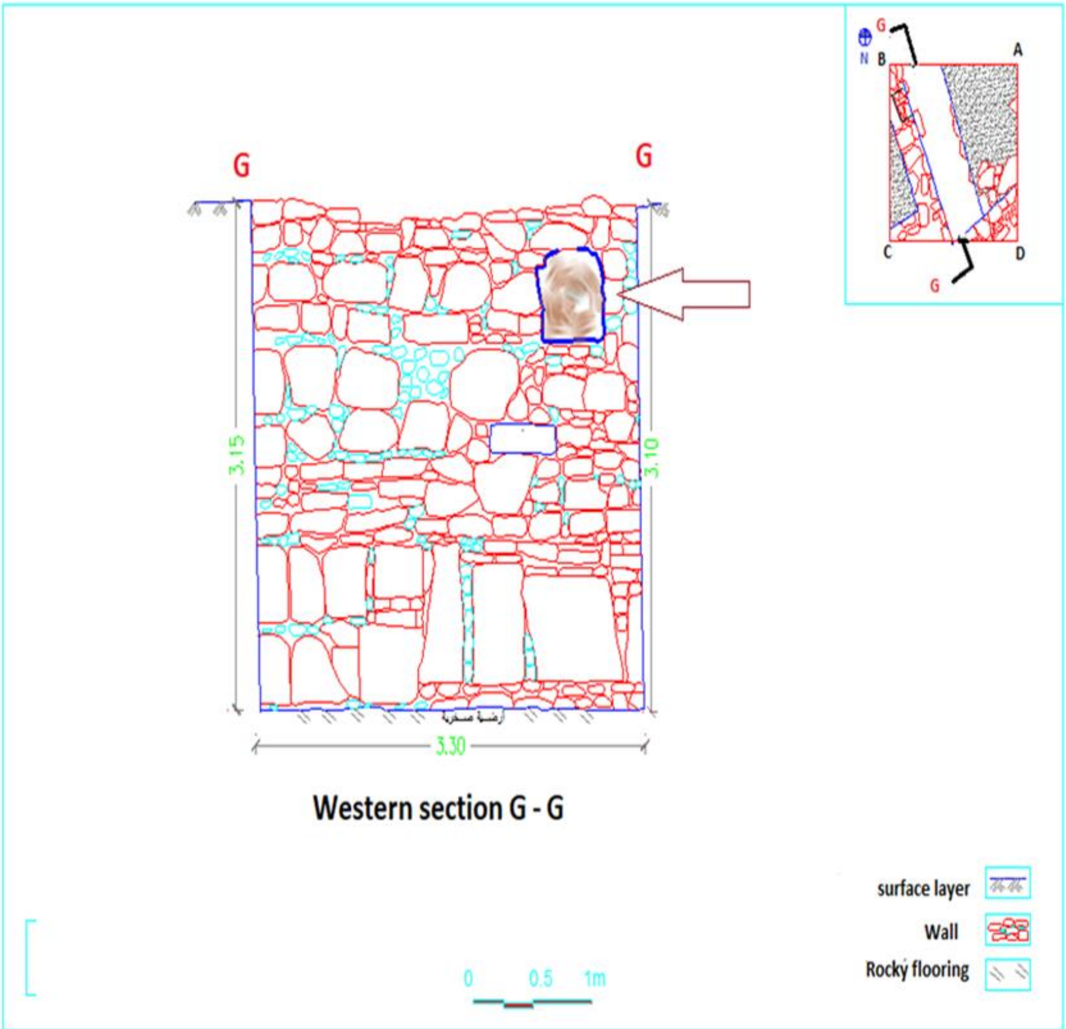


Figure 7.9: Western section shows the (hole, niche)

7.6 Economic Activities

The residents of AlUyaynah were a group of hunters and gatherers who benefited from the presence of animals and trees that were scattered around the AlUyaynah area and on nearby valleys. The study of animal bones recovered from the site did not reveal any evidence of domestic animals. Specifically, the excavation of 2016 provided 1659 bones for analysis, resulting in 1050 unidentifiable bones (Grothe, 2018, p.21). This is due to the poor preservation of the bones, which reduced the quantity of the pieces that could be identified (ibid).

The animals identified are: Bos sp. (Cattle) 3.9%, *Capra* sp./ *Ovis* sp. (goat/sheep) 23.8%, *Capra* sp. (goat) <1%, *Lepus* sp. (Hare) 4.6%, *Aves* (Bird) <1%, and *Vulpes* (Fox) <1%. These can be classified into categories of: small sized mammal (1.6%), medium sized mammal (36.3%), large sized mammal (7%), and others (22.1%). This indicates that sheep/goats, domestic or wild, were the most prominent species in AlUyaynah, followed by hare and cattle.

The data statistics do not suggest any evidence of domestic species among the goat/sheep samples. In general, the caprines at AlUyaynah still demonstrated a strong resemblance to that of their wild ancestors (Grothe, 2018). It was also not possible to determine whether the cattle were domestic or wild. Direct evidence of domestic cattle is rare among the PPNB sites in the Southern Levant (Zeder, 2011). Overall, the current sample of animal bones from Al Uyaynah is too small and complicated to produce a solid conclusion in order to examine the assemblage for the presence of the domestic species (Grothe, 2018).

Hunting, therefore, appears to have been the main economic activity of the site, where the bones of wild animals, freshwater snails and stone tools, especially arrowheads, indicate that hunting continued across the entire duration of the site. The animal bone assemblage suggests that small sized species were the main focus of hunting (see Figures 7.10, 7.11).

Evidence for the increasing exploitation of the steppe and deserts in the late 7th and early 6th millennia comes from the work in Eastern Jordan by Garrard (1988). Even though it is hard to include AlUyaynah in the larger picture that emerges from their research, combined with what was occurring in the more hospitable areas of the southern Levant, it is could be assumed that a growing separation of the mixed farming-and-herding subsistence economy was practised in AlUyaynah. With the lack of domestic animal evidence in AlUyaynah, the economy might have also relied on hunting and gathering that specialised in herd animals, such as sheep/goats.

Chronologically, domestic goats were present at Ain Ghazal from the time of the settlement's establishment at c.9250 BP, while Persian wild goats were hunted in the vicinity of Ain Ghazal until c.8500 BP (Wasse, 2002). Meanwhile, domestic sheep were introduced to Ain Ghazal in small numbers some time prior to c.8500 BP, and their numbers subsequently increased rapidly. The appearance of domestic sheep at Ain Ghazal may have been linked more to a general decline in the importance of hunting than to the emergence of specialised pastoral economies.

All these dates precede the site of AlUyaynah (6820-7050 BC), which indicates that some southern Levant sites during PPNB were still practising hunting and gathering a thousand years after the pastoral economy prevailed. Until more evidence emerges from the animal bones of AlUyaynah, the dominance of sheep/goat in the current sample is striking and certainly provides the impression of a pastoral economy. However, the analysis of animal bones did not reveal a definite result in regards to the domestication at AlUyaynah, although small species, such as sheep/goat, represent the most abundant species followed by hare and cattle. Additionally, it is suggested that the greater part of medium sized mammals belong to sheep/goats and large sized mammals probably refer to cattle.

Among the sheep/goats, none of the samples were identified as sheep and nine were determined to be goat. This data, although based on a small sample, suggests that goats were the prominent species at AlUyaynah, although sheep are thought to have been introduced to the Southern Levant during the MPPNB, which were mainly absent at sites before this period (Horwitz et al., 1999). What is more, the dates of AlUyaynah (7310–6580 BC) are chronologically similar to the PPNB of the Levant (8400-6500 BC) and correspond most to that of the MPPNB and LPPNB. Therefore, concerning the chronology of the Southern Levant, it is likely that some sheep were present among sheep/goat samples, although future research is required to gain clarity.

In addition, cattle (Bos sp.) are presented to a much smaller extent in the assemblage, even if the bones of indeterminate large mammals belong to this species. The small quantity of cattle is similar to trends observed in other PPNB sites of the Near East and Levant (e.g. Ghwair I, Nasta, Khirbet el Hammam, Beidha) with caprines being the main exploited livestock in these assemblages. Nonetheless, there is not much compelling evidence available of domesticated cattle in the Southern Levant during the PPNB (Horwitz et al., 1999; Zeder, 2011).

Further North from AlUyaynah, in the northern parts of Syria and South-Eastern Turkey, Helmer (2005) found evidence of a reduction in the degree of sexual dimorphism relating to the early domestication processes of cattle (Zeder, 2011, p.229). Two skeletal elements from the assemblage of AlUyaynah demonstrate similarities to gazelle species. This extremely low count suggests that most of the Medium Sized Mammal groups belong to caprines. As a result, the quantity of new zooarchaeological data from the past decades has resulted in a generalized characterization of the economic strategies of the PPNA as being primarily dominated by gazelle (Carruthers & Dennis, 2007, p.383). However, the PPNB is regrettably not marked with one fixed trend of gazelle exploitation.

The PPNB site of Basta, (Southern Jordan) shows a strong hunting subsistence on gazelles, following caprine husbandry. Furthermore, PPNA Wadi Faynan (WF16) (Southern Jordan) has a meagre >1% NISP of exploited gazelle and the PPNB village of Ghwair I (Southern Jordan) contained a total of 7% gazelle. The two assumed gazelle remains of AlUyaynah, which were not yet fully determined, point to similar trends in PPNB sites across the Southern Levant, which display a decline in gazelle. This observation differs per locality (as seen in Basta, Wadi Faynan and Ghwair I) as certain sites did not follow this trend until the late PPNB (Horwitz et al., 1999, p.72).

Even though the AlUyaynah site only witnessed a limited excavation, the most acceptable result of archaeological materials from the site is that it was a PPNB village in which daily activities were practiced that combined animal husbandry and hunting and perhaps grain milling as well. With no Saudi Arabian zooarchaeological comparison sites, AlUyaynah is dependent on data from other areas of the Near East. Specifically, the zooarchaeological assemblage of AlUyaynah demonstrates the most similarities in subsistence practices with PPNB sites from the southern Levant (Grothe, 2018). The sample size is not as significant as other sites from the southern Levant, although it is sufficiently large enough to at least note the assumption of early domestication processes. More problematic is the unknown data which is still buried at AlUyaynah.

As mentioned, the animal remains were derived from one single structure. The excavations of 2010-2012 did not yield a significant quantity of bones to analyse, although there is potentially sufficient zooarchaeological material at AlUyaynah which is yet undiscovered. Any assumptions, therefore, based on the current sample size might be altered in the future. However, the current state of research already demonstrates the potential of AlUyaynah in relation to other PPNB sites, as several similarities are observed in taxonomic composition and exploitation (Grothe, 2018).

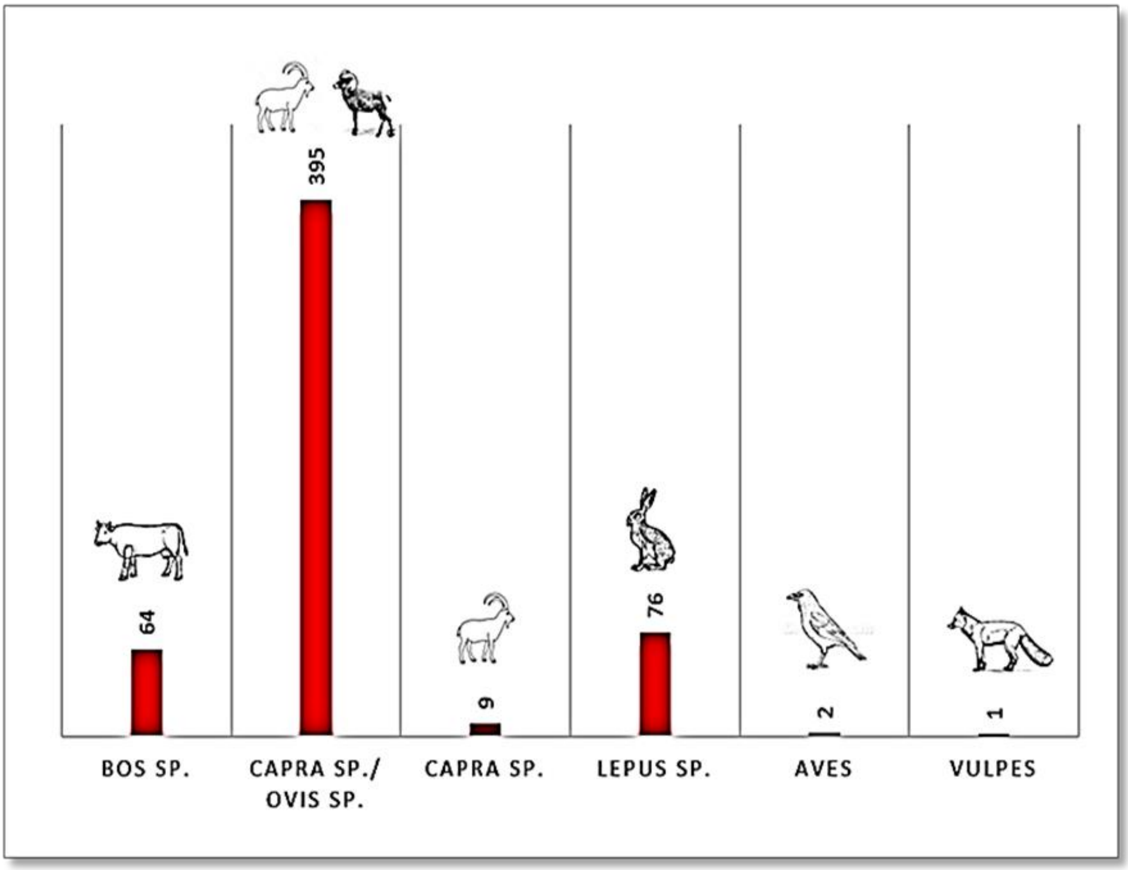


Figure 7.10: Number of identified animals

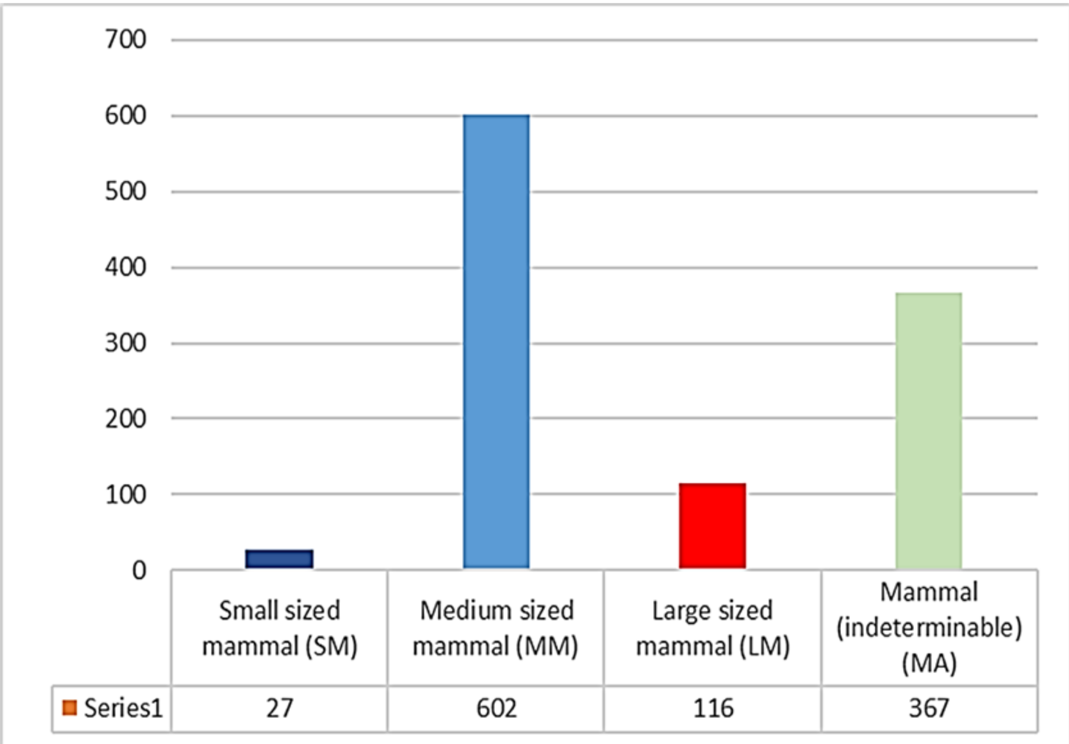


Figure 7.11: Number of mammalian animals by size

7.7 Symbolic and Social Activities

One of the most important artefacts discovered at AlUyaynah are the clay objects. Figurines and statues are one of the most important cultural developments during the PPN of the Levant, such as: Ain Ghazal (McAdam, 1997, p.134; Rollefson, 1983; Rollefson & Simmons, 1986; Rollefson, 2008); Basta (Nissen et al., 1991, p.21; Hermansen, 1997; 2004); Baja (Gebel, Hermanson & Kinzel, 2006); Ain Jammam (Waheeb, 1996; Rollefson, 2005, p.22); Beidha (Kirkbride, 1966); Munhata and Shaar Hagolan, Stordeur (Abdelrahman, 2009). Human figurines are found in almost all Neolithic sites and were more prevalent than any other form of artistic feature. The PPN people used bones, clay and plaster to create these figurines (Schmandt-Basserat, 1998). The finds of the clay objects at the site of AlUyaynah are the oldest evidence of the emergence of these cultural products in the Neolithic of the Arabian Peninsula, and perhaps also the oldest south of the Levant. These innovations and their meanings remain closely linked to the social reality and beliefs that prevailed at that time, even though the AlUyaynah clay object assemblage does not represent specific forms of human or animal forms. Different interpretations of these works of art have been suggested, although there is agreement that they carry symbolic and spiritual connotations that highlight the concepts and beliefs of the Neolithic Age.

Even though most of the pieces studied at the site do not represent a specific person or animal, this also indicates their importance as an artistic product, which was not found in the Neolithic sites along the Arabian Peninsula. This suggests that it is something special for this human group that was not shared with other sites in the Arabian Peninsula, and which has its own local characteristics. However, they also share some characteristics with those from the Levant, such as inserted flints in the upper or middle figurines (Rollefsom, 2000) (see Figure 7.12).

Figure 7.12: Two clay bull figurines pierced with flints from Ain Ghazal. (Photo of C. Blair) (After Banning, 2003)

The representation of persons, or parts of them, is a symbolic theme found at many sites. The oval or rectangular forms represent an expression of the man's penis (Phallus), as in some of the PPNA sites (see Kuijt & Finlayson, 2001). However, there is nothing that can be included in the human or animal forms at the site of AlUyaynah, and thus, the figurines of this site are of great importance in early art studies, not only in the Arabian Peninsula, but in all regions of Southwest Asia.

A few other products include ornaments made of shells, a small number of oval white beads, a small rounded clay artefact with a hole, and an awl-like bone artefact with pointed ends. All these products indicate the exploitation of local raw materials. These products are only found in small quantities in other Neolithic sites in the Levant, and shell ornaments are thought to be related to the status of people within the society (Bar-Yosef & Mayer, 1997; Kafafi, 2005). Unfortunately, the rare examples from AlUyaynah cannot indicate further insight. The awl-like object may have been used as a burin or as a needle. What is more, snails are also widely used in the form of pendants.

7.8 The Major Cultural Traits of AlUyaynah

In general, the site of AlUyaynah can be described as a permanent habitation site for hunters and gatherers during the PPNB period. Our use of the "habitation" term, rather than a village or a settlement, is the result of limited current evidence that requires further results in the future. The use of the term "village" implies a permanent rural community, a lot of houses, and major focus of settlement; determining this will require further excavations. Despite the existence of permanent buildings on this site, the residents of AlUyaynah may have remained hunters and gatherers for a long period of time without becoming farmers. Therefore, there may have been small camps away from the site that were exploited at different times during the year.

The current study of the site of AlUyaynah has provided a rare opportunity to study the Neolithic Age in the Arabian Peninsula. Firstly, AlUyaynah represents the first PPNB site discovered in the Arabian Peninsula. Secondly, the site is the first that contains clay objects in the Arabian Peninsula and probably the oldest in the Southern Levant region. As mentioned earlier in this chapter, the dates from AlUyaynah place the site in the early eighth millennium or the late seventh millennium BC, which represents the oldest known examples of the late period of PPNB in Arabian Peninsula.

In addition, as stated previously, the site shares many aspects, such as building layouts, lithic tools and substance activities, with the Southern Levant PPNB sites, especially during the late PPNB period (Table 7.1). It is located in the same geographical zone as the Southern Levant sites, which make it one of the most southern sites discovered yet. However, when compared to the Arabian Peninsula sites from the same time-span, it stands as a lone example of Neolithic development in the region, which cannot be compared to any other known Neolithic sites in this region. Hence, AlUyaynah is a unique cultural site when compared to the Neolithic sites of the Arabian Peninsula, although it is related to a broad cultural "horizon" (i.e. PPNB) when compared to the Levant sites.

Table 0.1: List of radiocarbon dates for Pre-Pottery Neolithic sites in Levant (After: Edwards, P.C., 2016)

Site	Calibrated date range (2σ) OxCal 4.2 (cal. BC)	The location
Jerf al-Ahmar (PPNA – PPNB)	8491-8811	Levant
Tell Aswad (PPNB)	8295-8607	Levant
‘Ain Ghazal (PPNB)	7606-8201	Levant
Horvat Galil (PPNB)	7721-8420	Levant
Sefunim (PPNB)	8209-8606	Levant
Jilat 7 (PPNB)	7612-8227	Levant
Motza (PPNB)	7968-8527	Levant
Tell Aswad-2004 AMS (PPNB)	7970-8325	Levant
Qarassa North (PPNB)	7971-8417	Levant
Ain el-Kerkh (PPNB)	8309-8605	Levant
Qumran Cave 24 (PPNB)	7751-8253	Levant
Beidha (PPNB)	7554-7938	Levant
AlUyaynah	6820-7050	KSA

The time period between 6820-7050 BC coincides with the PPNB of the southern Levant. The excavations at AlUyaynah did not reveal any human skeletal remains to allow a comparison of burial traditions. The archaeological excavation did not reveal any significant changes in the content of archaeological material in the test-pit squares. Layers refer to short periods of abandonment; they may be in very cold winter periods. As a whole, the settlement period in AlUyaynah site includes activities that can be compared with many sites in the Levant of a similar period such as Tell Aswad, 'Ain Ghazal, and Qarassa North. It is also possible to comparet stone tools, clay figurines and architectural styles to reflect on AlUyaynah as part of the cultural tradition of southern Levant during the PPNB. On the other hand, clay figurines, and the lack of mortar in the architecture are the most distinctive differences, suggestive of indigenous features at AlUyaynah.

It may be the case, therefore, that in this region of the Northwest Arabian Peninsula there were local PPNA groups already developing their own specific cultural traditions. The inhabitants of AlUyaynah had distinctive cultural traditions, such as the buildings and clay figurines, and they settled at this location throughout the PPNB period, with no or little evidence of cultural change. However, whether they represent a local group with ancient roots in the region cannot be proven in the light of current evidence.

On balance, the evidence suggests some connection with sites to the north in the Levant, but also elements of a distinctive local cultural tradition. At present the available evidence does not allow us to tell whether the AlUyaynah tradition developed from a preceding local culture indigenous to the region, which developed in parallel with the Levant to the north, or was brought to the region by movement of people from the Levant into a previously empty region.

Chapter Eight – Conclusion

8.1 Conclusion

This chapter will address the achievements of the current study, followed by the limitations and opportunities for future research. The objectives of this study have been to contribute to the debate of whether the Neolithic emerged in the Arabian Peninsula as a result of direct cultural influence from the Levant or due to local development. It has also presented the study of the main characteristics of the Neolithic landscape in North-Western Saudi Arabia and the archaeological remains discovered during the course of excavation at AlUyaynah (lithics, animal bones, figurines....).

The study has also offered a critical assessment of the use of a general definition of the “Neolithic “period, together with the traits and the major research questions for the Arabian Peninsula. Chapter Two also discusses the evidence from the Neolithic period in the Fertile Crescent and in the Arabian Peninsula in the south. In general, I have concluded that the Neolithic sites in Saudi Arabia are generally different from those in neighbouring countries. Indeed, these differences are concerned with the Neolithic package itself. Neolithic sites in Saudi Arabia, according to present evidence, did not practise agriculture and lived mainly from hunting, and in rare cases, animal husbandry.

The lack of the full “Neolithic package” at Saudi Arabia’s sites may be due to the lack of research into and excavation dating to this period, but environmental factors may have also played a role; these issues were discussed in detail in chapter Three. This chapter discussed the Holocene climate and the effects of these conditions on different parts of the Arabian Peninsula. As a part of the existing Holocene evidence from ancient rivers and lakes, it is clear that Neolithic environments are thought to have directly affected the movement of human groups during that period. In particular, the wet climate in the early to middle Holocene period of Arabia has implications for general patterns of occupation and dispersals in Arabia, as well as adaptation to arid environments. Considerably more detailed archaeological and environmental records are available for the Holocene than for the Pleistocene. It is clear that this is related mainly to the types of archaeological survey carried out to date in the Arabian Peninsula, which has created a mixed record of sites that are known only through surface materials. This restricted range of archaeological exploration also led to a perhaps over-emphasized uniformity in cultural data for the Neolithic period, and the concentration of data in one region at the expense of others (for example, what is known in regards to the Neolithic for the Eastern region of Saudi Arabia cannot be used as a diagnostic feature for other regions). Contrastingly, the northern and north-western regions appear to witness a different cultural experience, except for general features related to the production of arrowheads or lunates. Additionally, while pottery is present in Neolithic sites in the Eastern region, most of the Neolithic sites known in the Northern and North-western regions lack any kind of ceramic technological developments, and can be compared mainly to the Pre-Pottery sites situated to the north in Levant and Palestine.

The dates of AlUyaynah (7310 – 6580 BC) are within the range of the Early to Middle Holocene, and thus, within the wet phase that continued during the early to middle 8th millennium cal BC. A few pieces of evidence from the site itself, such as the animal bones, support this inference. The excavation of AlUyaynah illustrates an example of Neolithic existence in the region. In chapter Four the different aspects of the occupational layers and archaeological remains were discussed. The site represents one of the most important sites in the region of Tabuk, which is located in a region that represents a confluence between the Arabian Gulf, Mesopotamia, Syria, Palestine, the Nile Valley and southern Arabian Peninsula. It also represents the first PPNB site excavated in the Arabian Peninsula. The site was a subject of frequent visits from the current researcher and was chosen for excavation in order to complete the MA in Archaeology at King Saud University, which was then expanded upon for the current PhD thesis.

The survey and excavation results have revealed that AlUyaynah is linked to the PPNB, and shares certain cultural aspects with other sites in the Levant. From this perspective, even though the excavations of AlUyaynah reflected a local development during the PPNB, there remain some uncertainties. The current evidence reflects more local developments, such as buildings and figurines, rather than importation and movement of people from outside. It also helps to reveal more information regarding the importance of habitation traces and the stratigraphy of the site. The stone structures discovered on the site reflect the permanent nature of the site, where a group of houses with regular shapes have been constructed adjacent to each other. Straight walls were built in many parts of the site without the utilisation of any form of mortar, which reflects a unique feature of buildings unknown at that early period in what is now modern day Saudi Arabia. Many amendments and additions have been made to the buildings, which confirm the existence of at least two stages of construction at the site. While the earliest one could be dated back to the second half of the seventh millennium BC, it was difficult to determine the beginning of the second one at the current stage of this current research. It is also too early to provide a precise date for the abandonment of the site, as many of the archaeological findings, especially stone tools, do not reflect fundamental differences in their technology or their types. Indeed, there is also a requirement for further excavations in other parts of the site, particularly to reveal the earlier stages of settlement at the site. However, it appears through the evidence of C14 dates that the site continued until the fifth millennium cal BC. Furthermore, the dating of AlUyaynah can be used to produce a robust estimate for the amount of time necessary for the ~230 cm of cultural and natural layers to accumulate. In general, the deposition of AlUyaynah began at the end of the 8th millennium cal BC and ended after 50–395 years (for details see chapter 7.4).

Chapter Five discussed the clay figurines that were discovered during the course of the more recent excavations at AlUyaynah. The meanings and functions of these figurines were discussed by establishing the symbolic function of them, both in regard to their role in practices within the Neolithic communities in different regions and their use at the site and their significance. The figurines from AlUyaynah are very simple and bear no human or animal features, which have little in common with other PPNB sites. Examples of the similarities with other PPNB sites include the use of holes in some of the AlUyaynah clay objects and stab marks with small lithic tools, which are similar to examples from 'Ain Gazhal.

In chapter Six, the lithic data was analysed in detail. While the overall stone artefact density is quite low, lithic tools are the most distinctive archaeological material at the site. Accordingly, the distribution of several classes of chipped-stone lithic artefacts is used to address questions of the occupation sequence of AlUyaynah. The lithic types and material have been examined to determine relations with existing typological classifications. The similarities, functions of tools, and percentages have been considered during the lithic analysis in order to aid in the determination of the types of activities that occurred at this site. The main feature of the lithic tools related to blade technology, which was used in many finished arrowheads, scrapers, borers, burins, and retouched and un-retouched blades. The ground-stone sample recovered from the site includes querns, disc grinders and pounders.

Other noteworthy aspects of the lithic materials in AlUyaynah include the low index of arrowheads and scrapers. In general, the study of lithic tools at AlUyaynah did not provide a definite conclusion regarding their relation to other “PPNB” assemblages from the Levant. By contrast, arrowheads demonstrate strong affinities to Arabian traditions seen elsewhere.

By the end of the ninth millennium cal BC, the Levant entered the Neolithic period. One of the main features of the PPNB period is the emergence of large residential communities, which were characterised by a small number of architectural units. The first agricultural sites originated on the ruins of the former villages or in new locations, as in the Basta, Al-Murbit and Wadi Al-Falah in Syria, which were built on the ruins of Natufian villages. Circular houses also appeared in this period and become the most prevalent, though rectangular and contiguous houses were also found. Moreover, clay figurines, especially female ones, were also noted at many PPNB sites. Stone tools, such as arrows and blades for sickles, were the main aspects of this period.

The archaeology of AlUyaynah reflected part of these conditions and cultural changes that characterised the period. The first traces of PPNB structures at this site were found, which would have been built without the use of any mortar; and thus present the first evidence of such structures in the Arabian Peninsula. In general, the site of AlUyaynah reflects many PPNB features, such as building layouts, lithic tools and subsistence activities. Despite the existence of permanent buildings on this site, the main economy of AlUyaynah, as reflected from animal bones and other materials, may have remained as hunting and gathering for long periods of time without agriculture.

Comparatively, AlUyaynah stands as a lone example of a "Neolithic" development in the region and it could not be compared to any other known Neolithic sites in the Arabian Peninsula. Indeed, from this study’s perspective, the significance of AlUyaynah is its strong local component, although there may be some connection with other regions. However, this study is not without limitations and has also raised a number of questions which require future research to clarify. The limitations can be described in terms of the lack of use of the wet-sieving flotation in order to look for plant remains, and the need for a wider dating programme including different areas at AlUyaynah.

8.2 Future Research

In order to develop a better understanding, further work is required to address the limitations of the research presented, in particular further excavation at AlUyaynah, as well as locating other Neolithic sites in this part of the Arabian Peninsula. Future research may involve undertaking more excavations at the site. Progress has been made in understanding patterns of spatial organisation at this settlement and its chronology, but it is currently only based on three trenches. If more excavations were conducted, it might be possible to learn more about changes in architecture or chronology. There is also the need for more comprehensive surveys in the region. Furthermore, archaeologically-informed geological investigations can be used; there are many aspects that require further work to study the soil of the sites: whether there is any possibility of the existence of small lakes or river beds in that period; the determination of the types of stones to compare whether it is local or imported.

Depending on the number of bones recovered, the options appear limited, as the full picture of the economy and subsistence at AlUyaynah remains unknown. It is not possible to know whether the animals are wild or domesticated, due to the limited number of bones from the excavated trenches and the excavation within the buildings, which affected the levels of uncertainty, and thus, this requires the work of wider excavations to obtain a significant assemblage of bones, both from inside and outside the buildings. Moreover, further excavations would lead to important findings of whether the animals were domesticated or wild. In addition, this will help to identify the most used species present on the site during each settlement period. In addition, archaeological flotation is one of the methods that should be used in future excavations. The aim is to recover small plant remains from soil samples, which will help in studies of food production, and to understand the climate and the kind of plants which existed during that period.

In summary, AlUyaynah currently represents a unique PPNB site in Northern Saudi Arabia, suggesting a complex spread of the Neolithic in this region. The evidence from the site leads to the postulation that it is possible that many other sites have hitherto not been discovered, and also in other parts of Arabian Peninsula. Therefore, in the future it will be possible to provide more empirical evidence of whether the collective findings (e.g. figurines, shells, and ornamental items) demonstrate whether the Neolithic emerged in the Arabian Peninsula from cultural influences originating in the Levant or from local development in the

Peninsula. This will consequently help to provide a greater level of understanding of the different processes and connections of Neolithisation in regional development between Europe, Africa and the Arabian Peninsula.

Appendix 1: Figures from the analysis of the Clay Objects

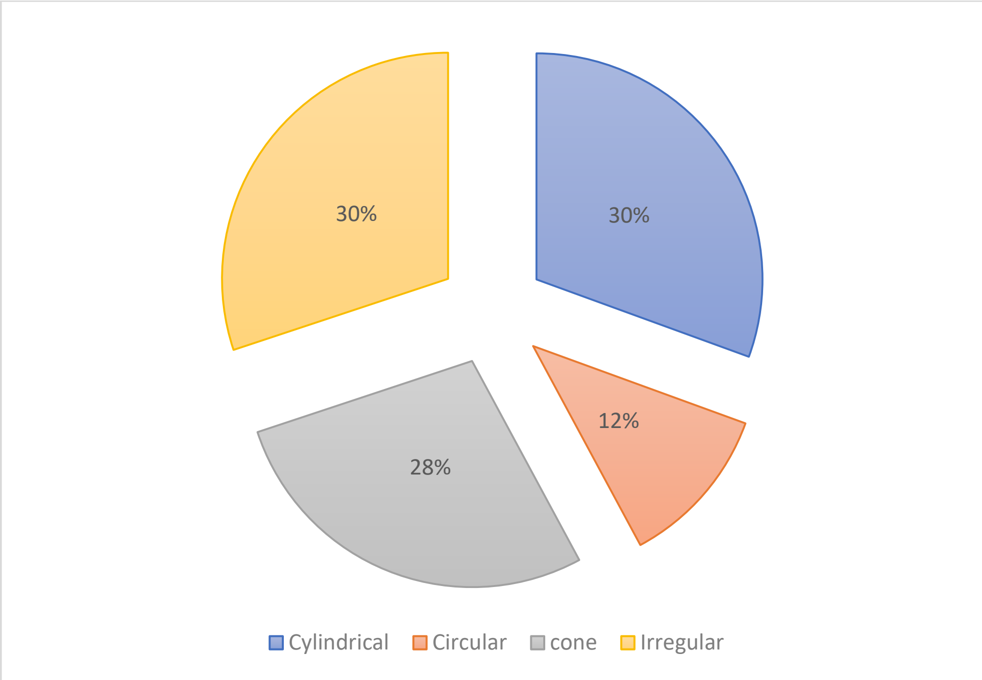


Figure 0.1: Percentage of all piece's Distribution

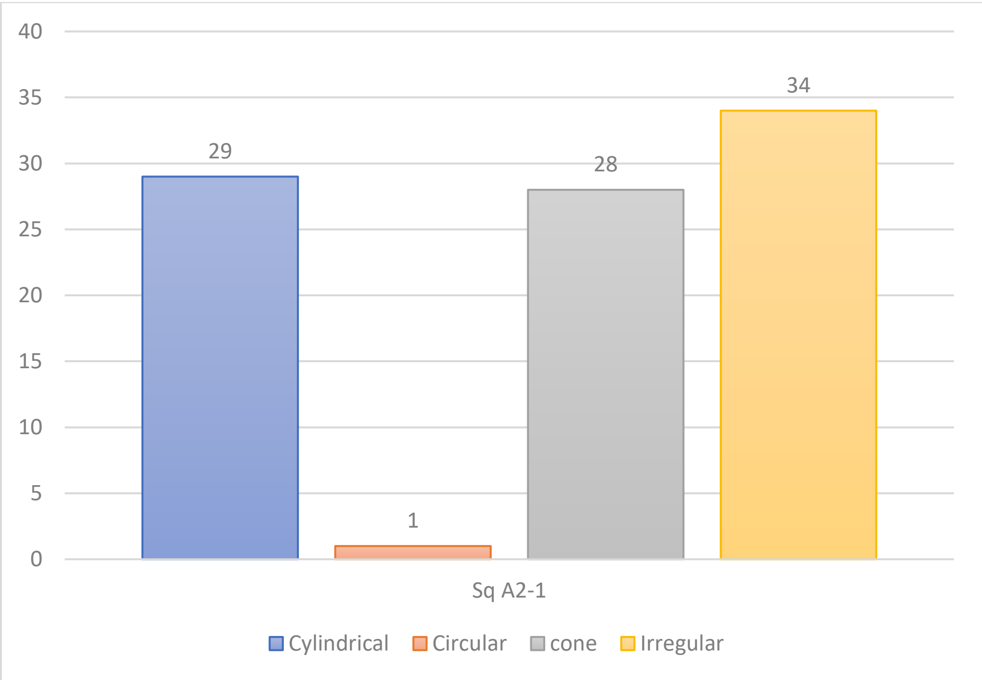


Figure 0.2: Distribution of pieces in Sq. A2-1

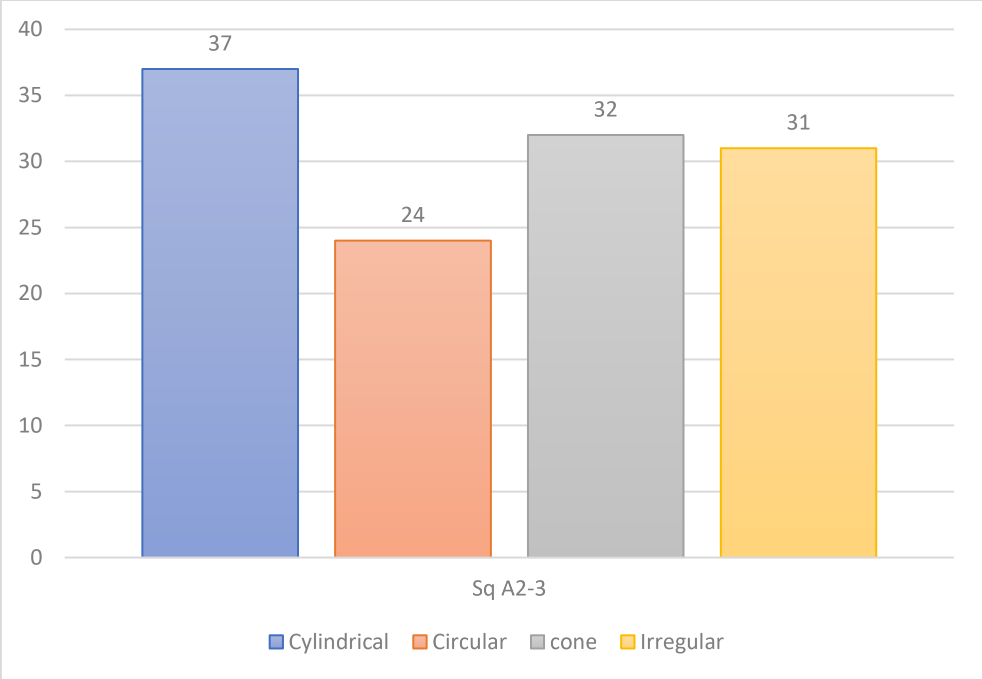


Figure 0.3: Distribution of pieces in Sq A2-3

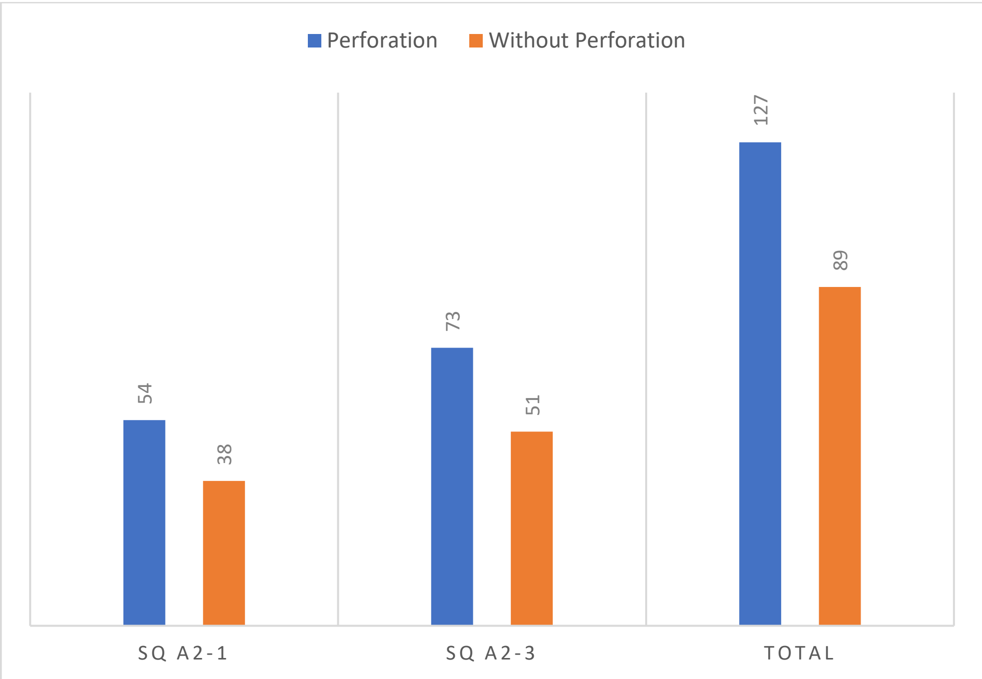


Figure 0.4: Distribution of perforated and non- perforated pieces Sq A2-1 & Sq A2-3

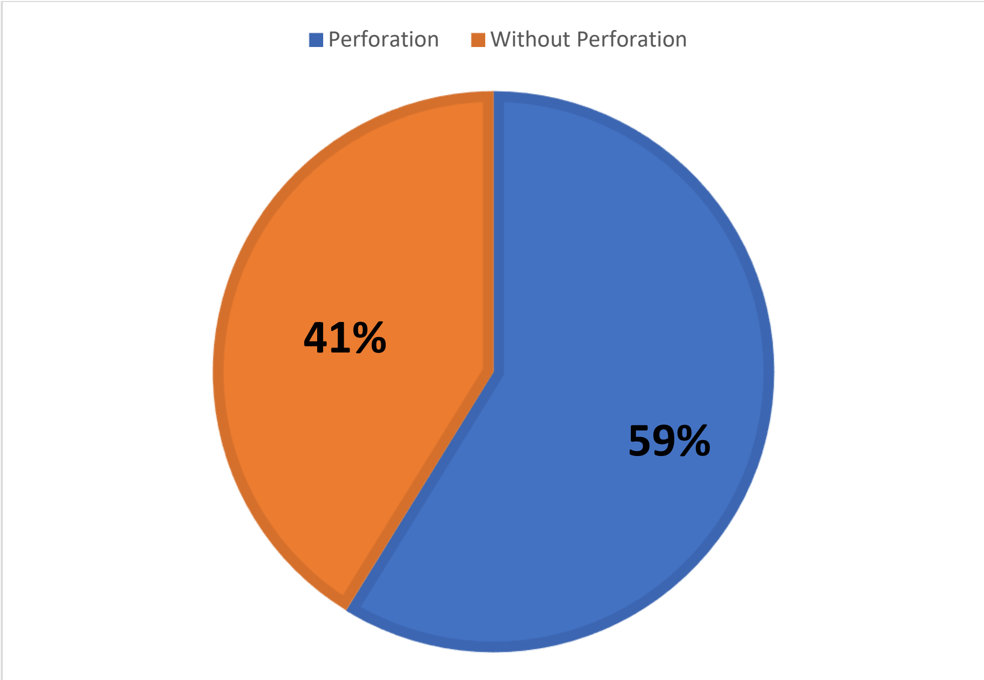


Figure 0.5: Percentage of perforated and non- perforated pieces Sq A2-1 & Sq A2-3

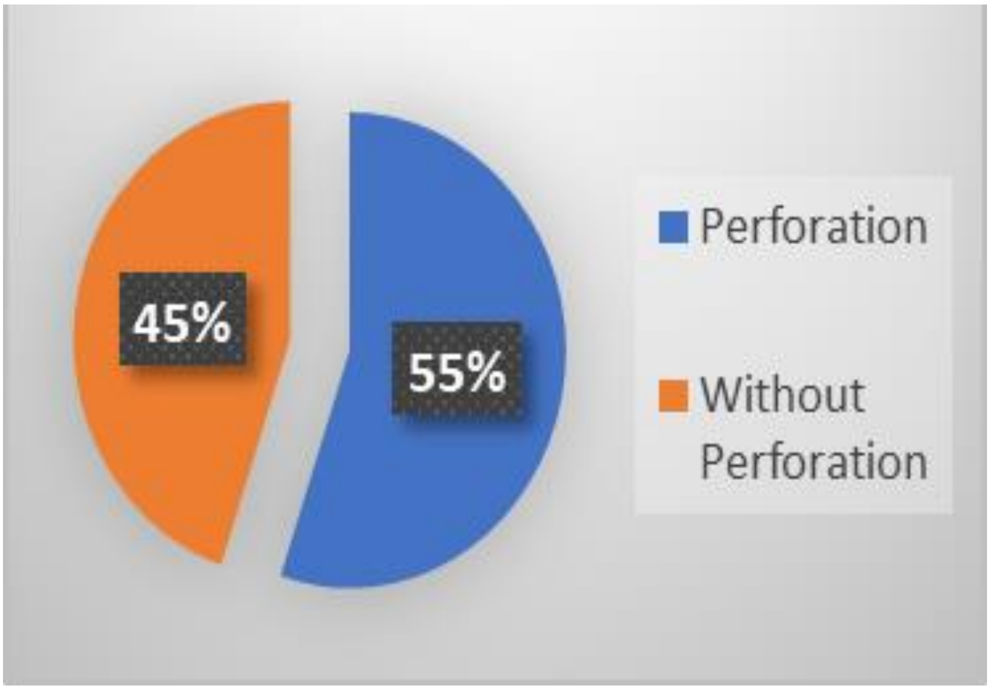


Figure 0.6: Distribution of perforated and non- perforated pieces on cylindrical shape Sq A2-1

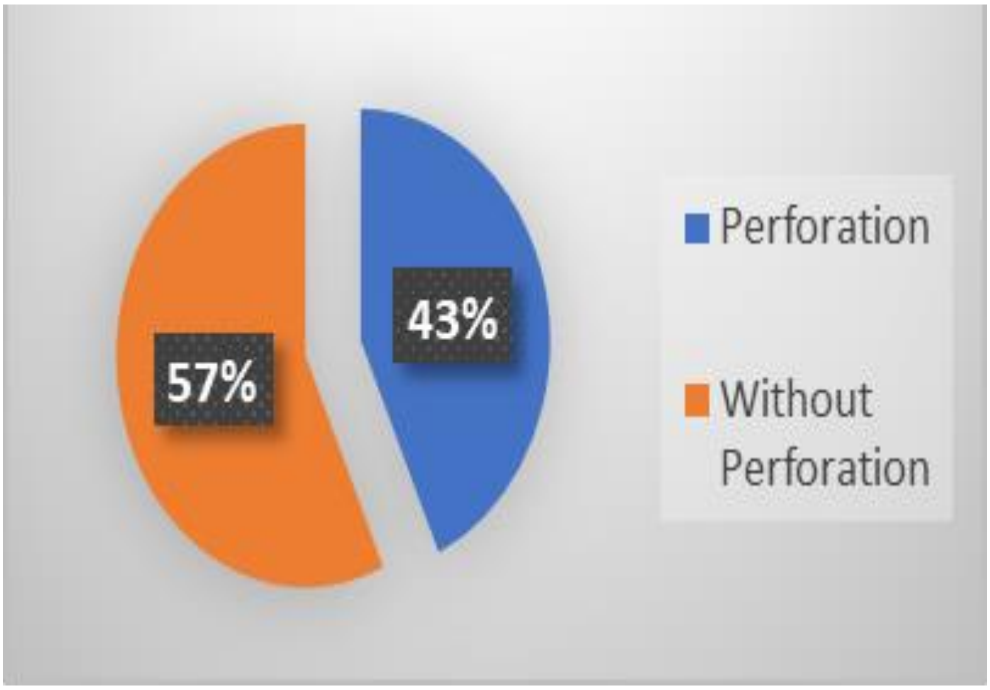


Figure 0.7 Distribution of perforated and non- perforated pieces on cylindrical shape Sq A2-3

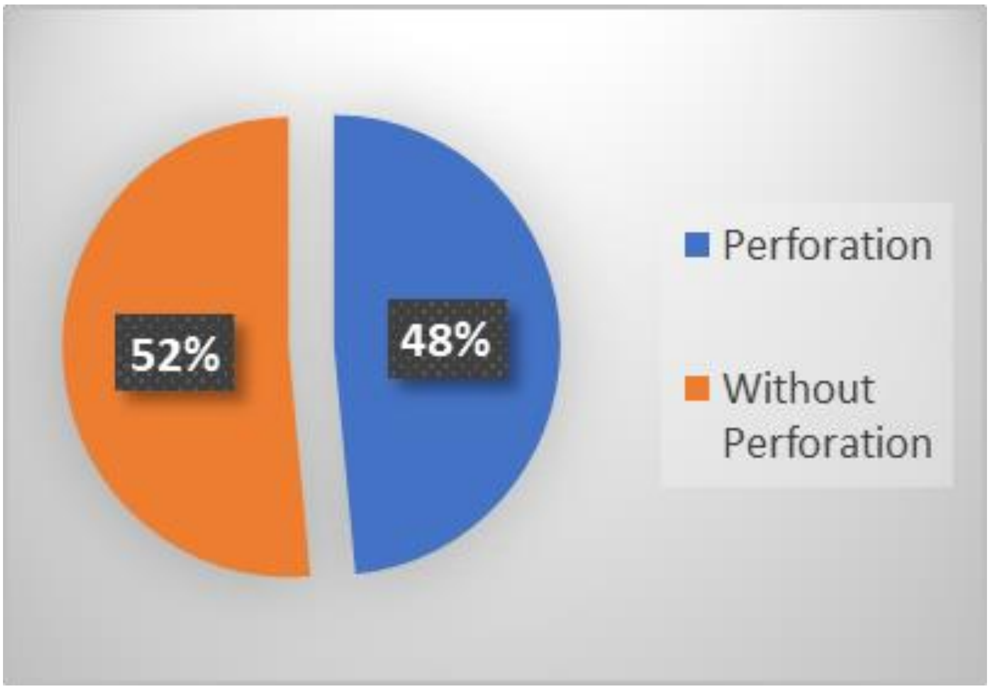


Figure 0.8: Distribution of perforated and non- perforated pieces on cylindrical shape Sq A2-1 & Sq A2-3

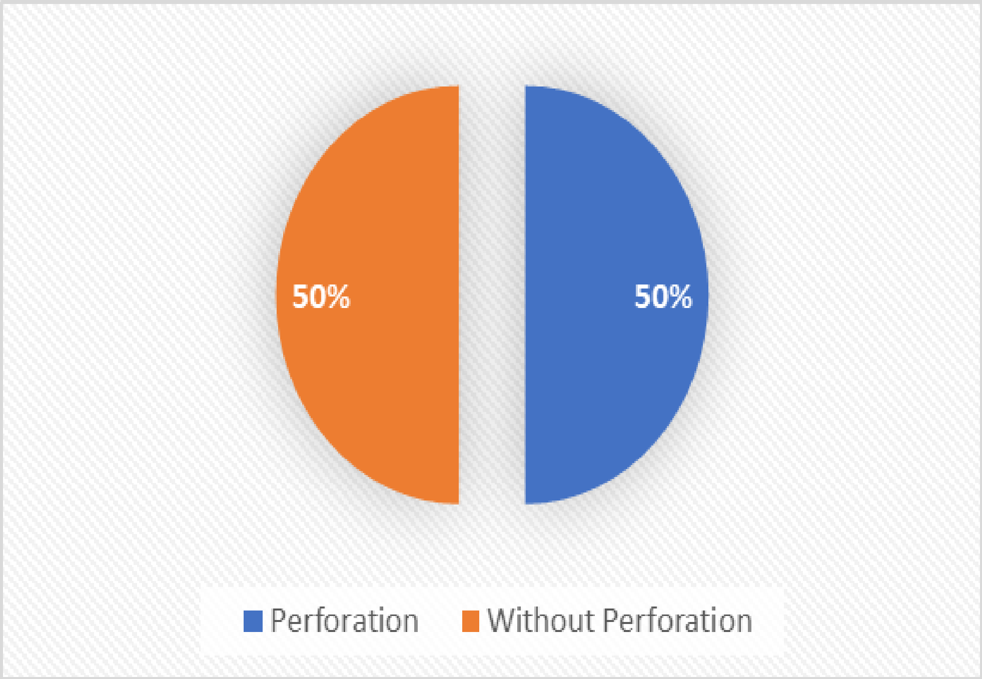


Figure 0.9: Distribution of perforated and non- perforated pieces on cone shape Sq A2-3

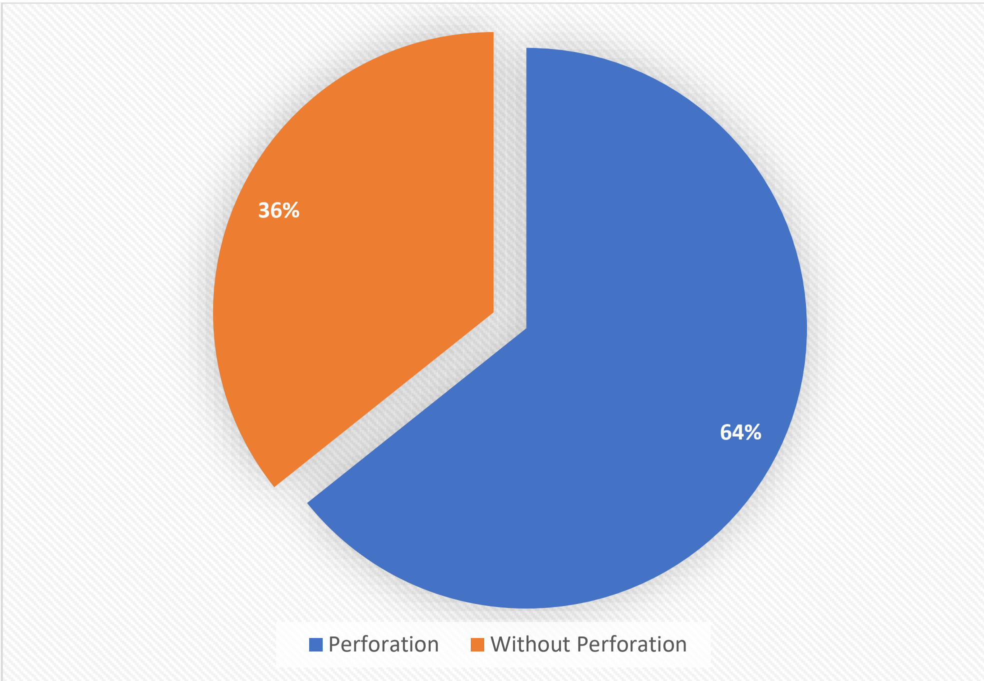


Figure 0.10: Distribution of perforated and non- perforated pieces on cone shape Sq A2-1

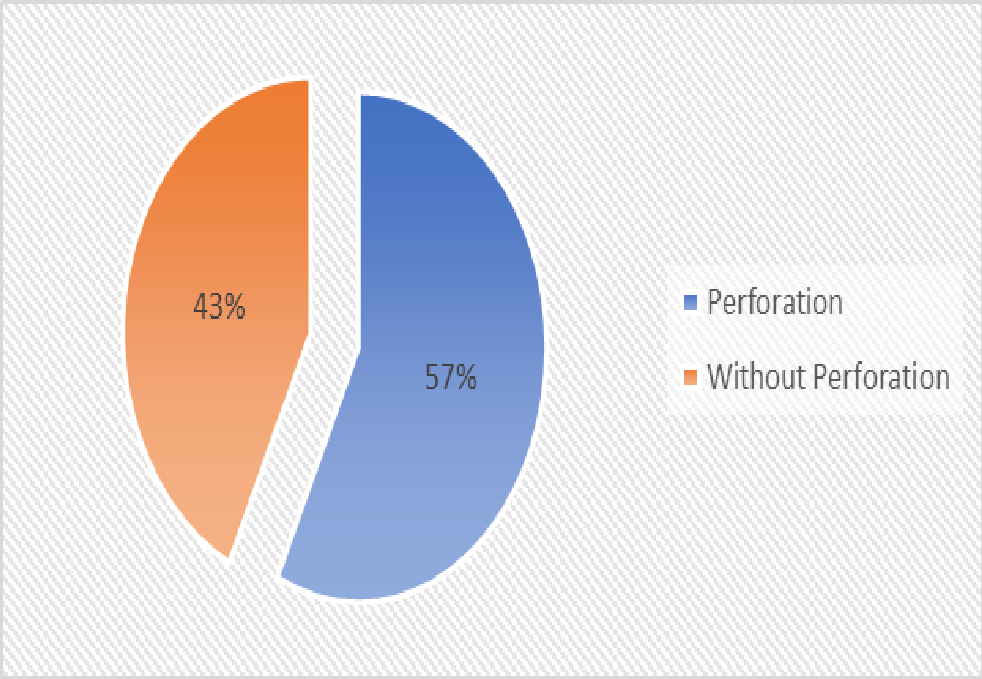


Figure 0.11: Distribution of perforated and non- perforated pieces on cone shape Sq A2-1 & Sq A2-3

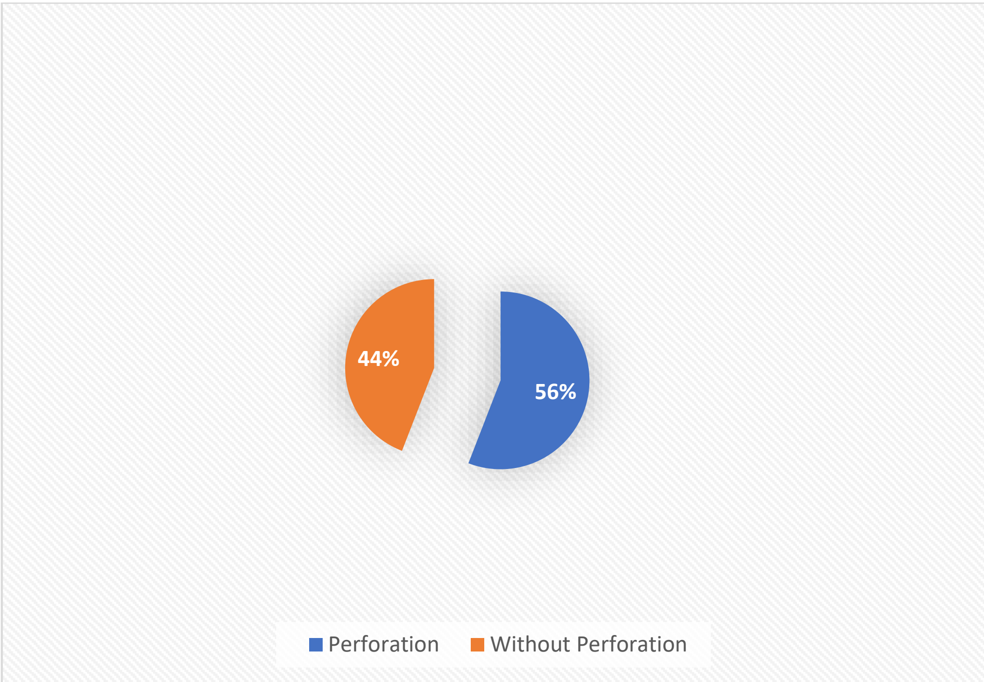


Figure 0.12: Distribution of perforated and non- perforated pieces on Irregular shape Sq A2-1

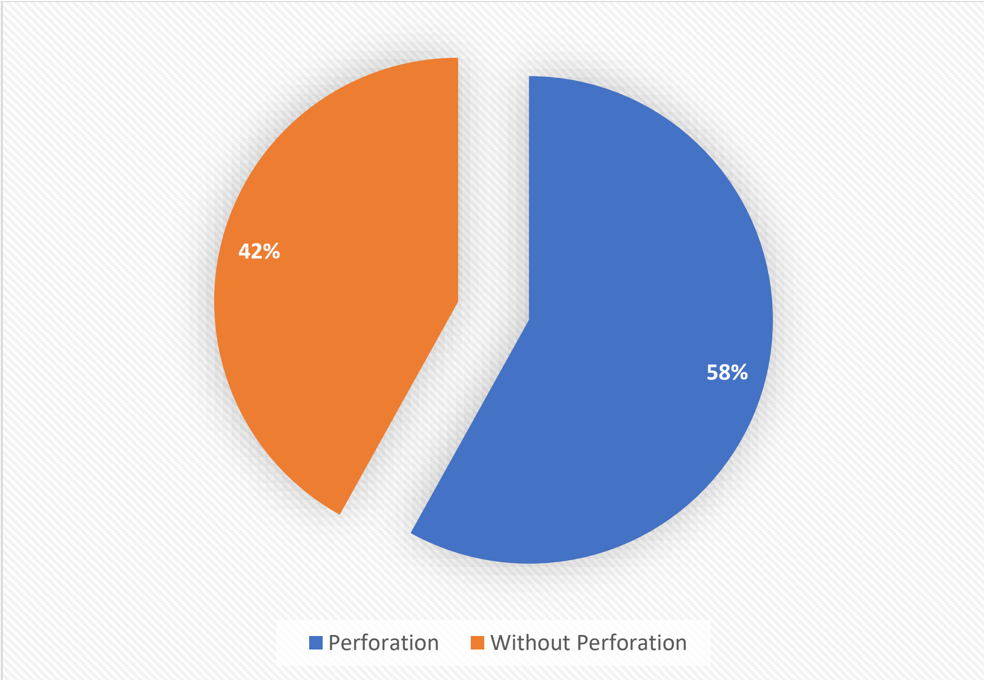


Figure 0.13: Distribution of perforated and non- perforated pieces on Irregular shape Sq A2-3

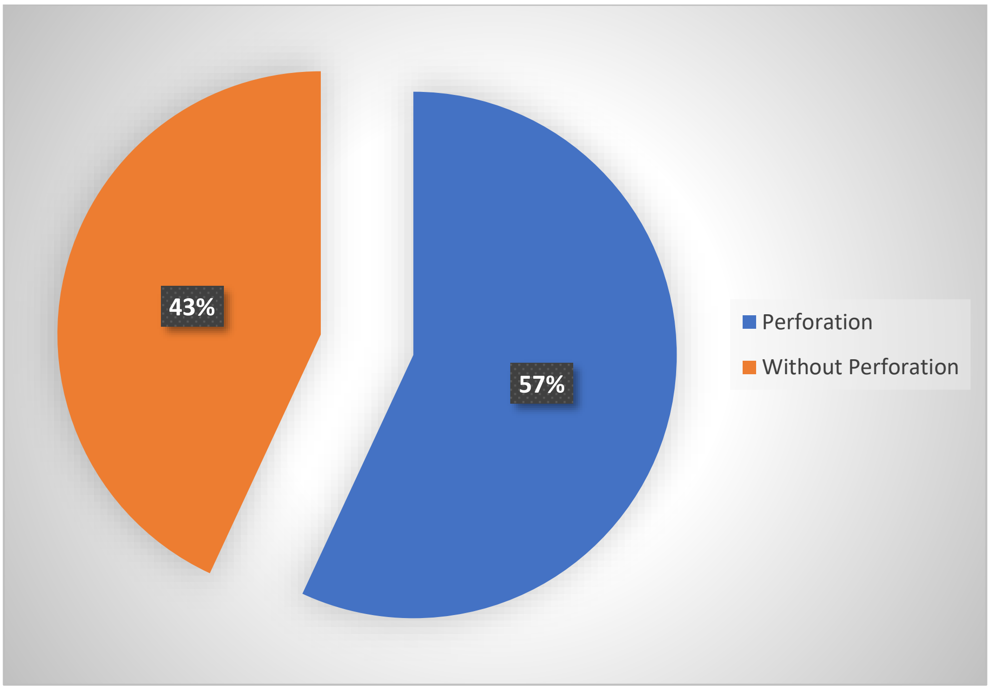


Figure 0.14: Distribution of perforated and non- perforated pieces on Irregular shape Sq A2-1 &Sq A2-3

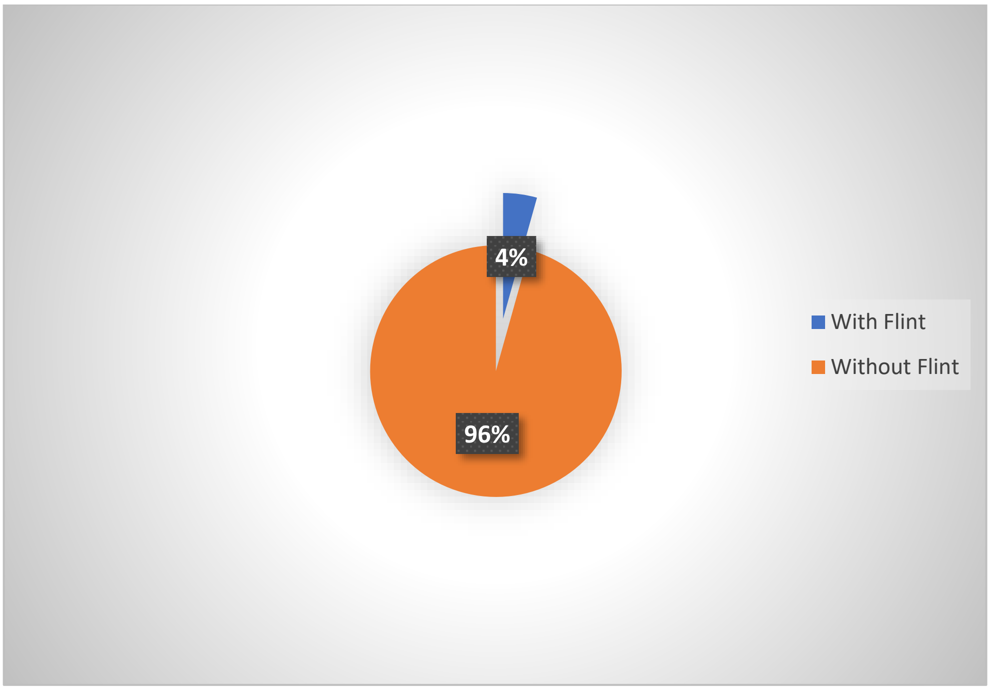


Figure 0.15: Distribution of flint and non- flint pieces on shape Sq A2-1

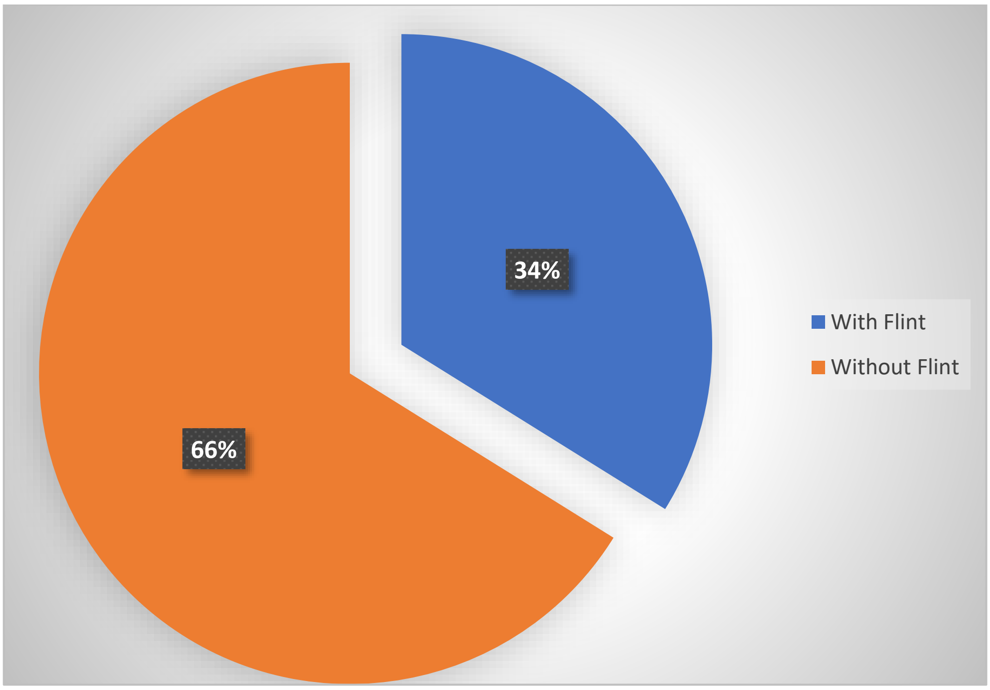


Figure 0.16: Distribution of flint and non- flint pieces on shape Sq A2-3

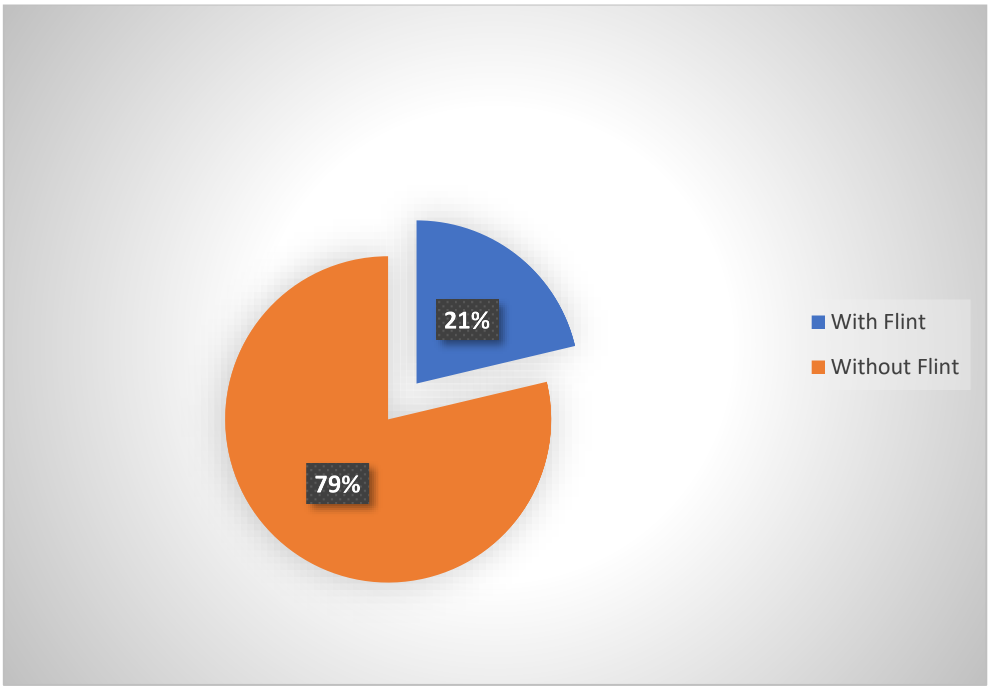


Figure 0.17: Distribution of flint and non- flint pieces on shape Sq A2-1& Sq A2-3

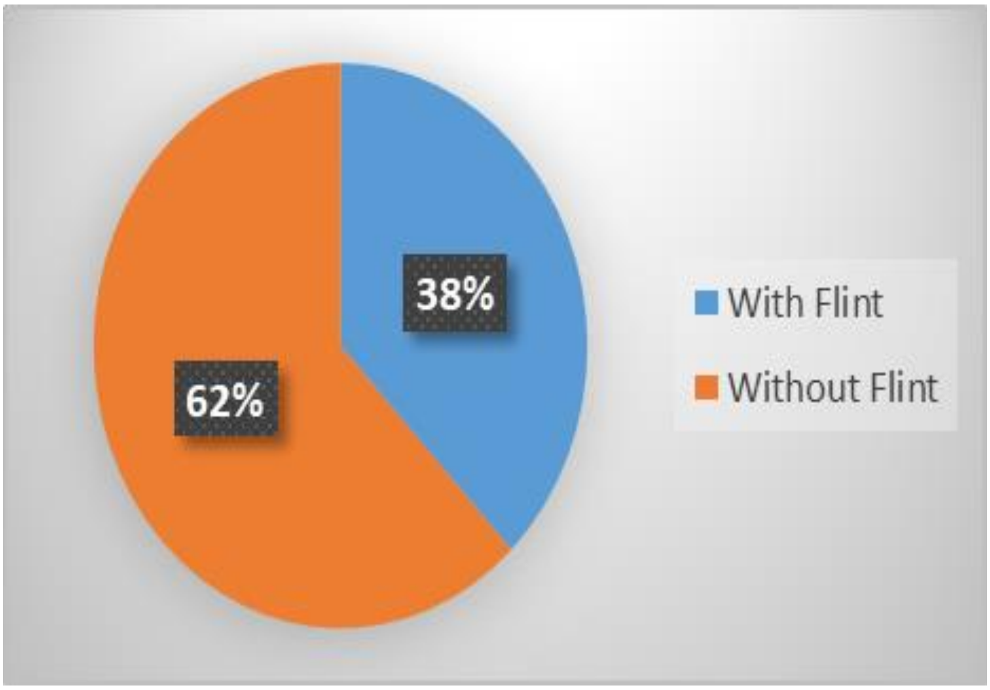


Figure 0.18: Distribution of flint and non- flint pieces on cylindrical shape Sq A2-3

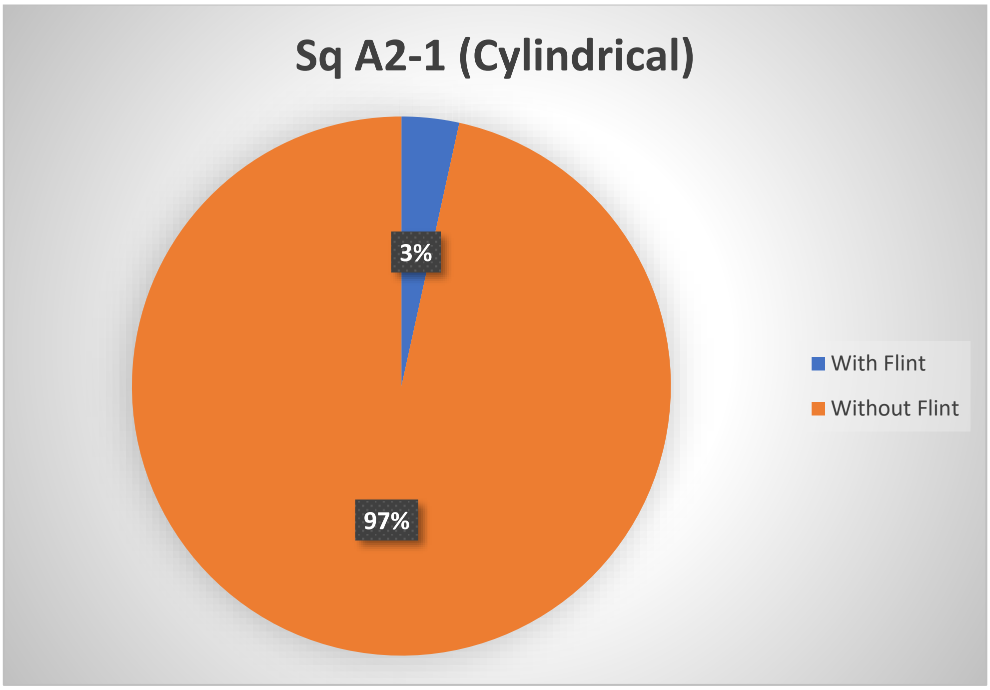


Figure 0.19: Distribution of flint and non- flint pieces on cylindrical shapes A2-1

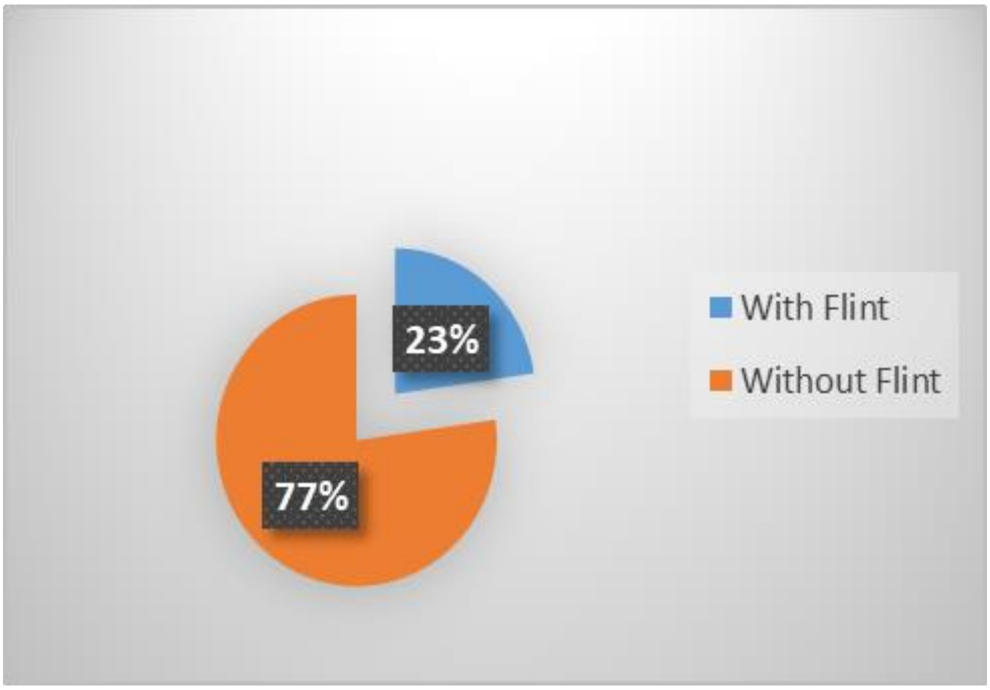


Figure 0.20: Distribution of flint and non- flint pieces on cylindrical shape Sq A2-1& Sq A2-3

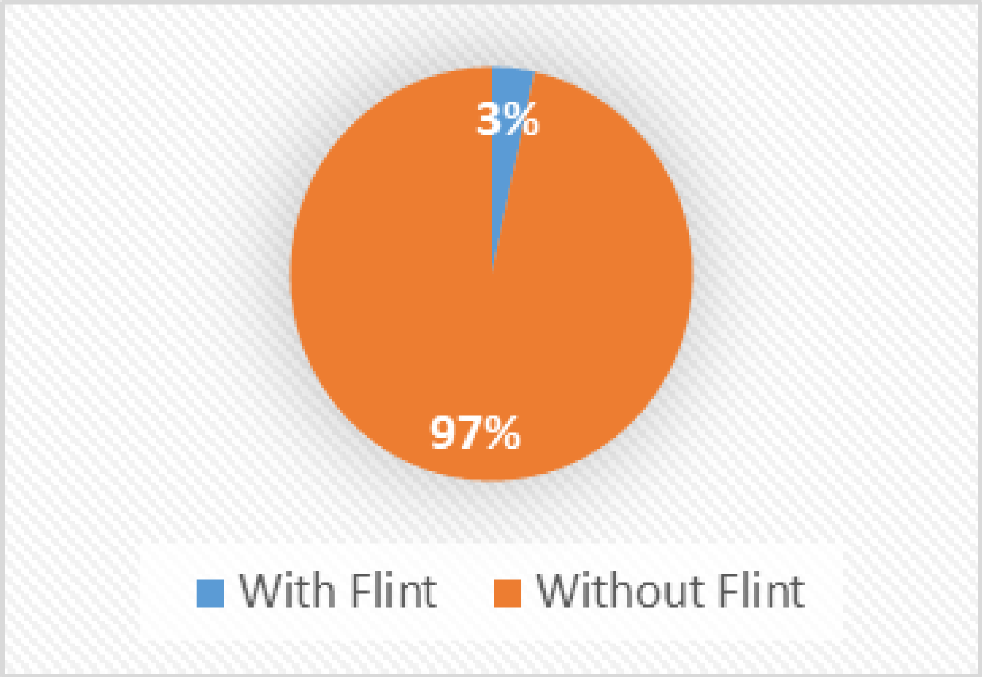


Figure 0.21: Distribution of flint and non- flint pieces on cone shape Sq A2-1

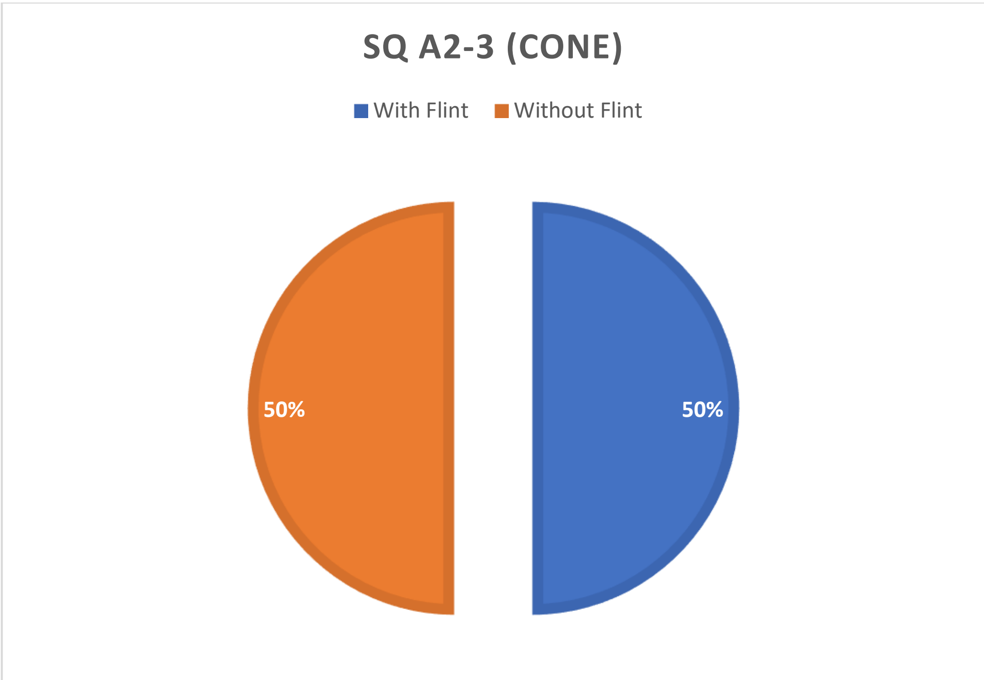


Figure 0.22: Distribution of flint and non- flint pieces on cone shape Sq A2-3

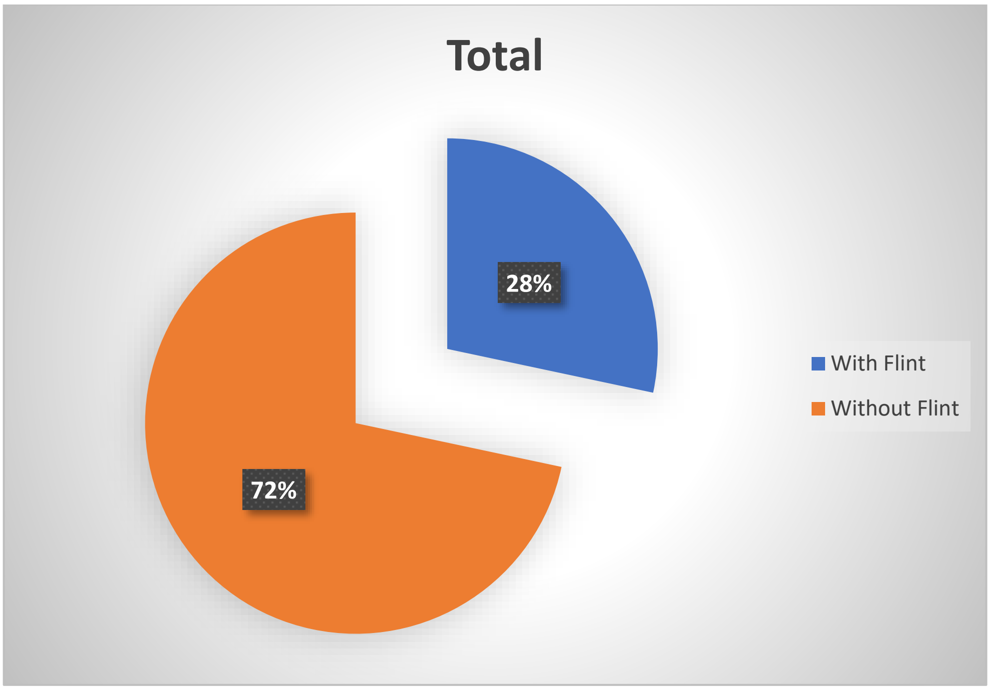


Figure 0.23: Total Distribution of flint and non- flint pieces on cone shape Sq A2-1&Sq A2-3

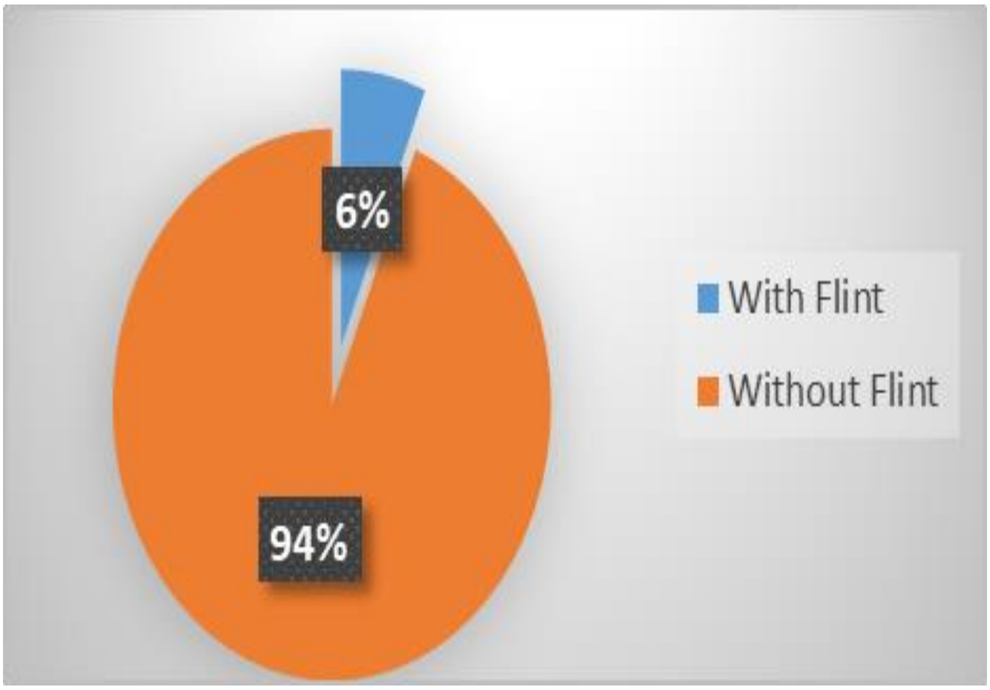


Figure 0.24: Distribution of flint and non- flint pieces on Irregular shape Sq A2-1

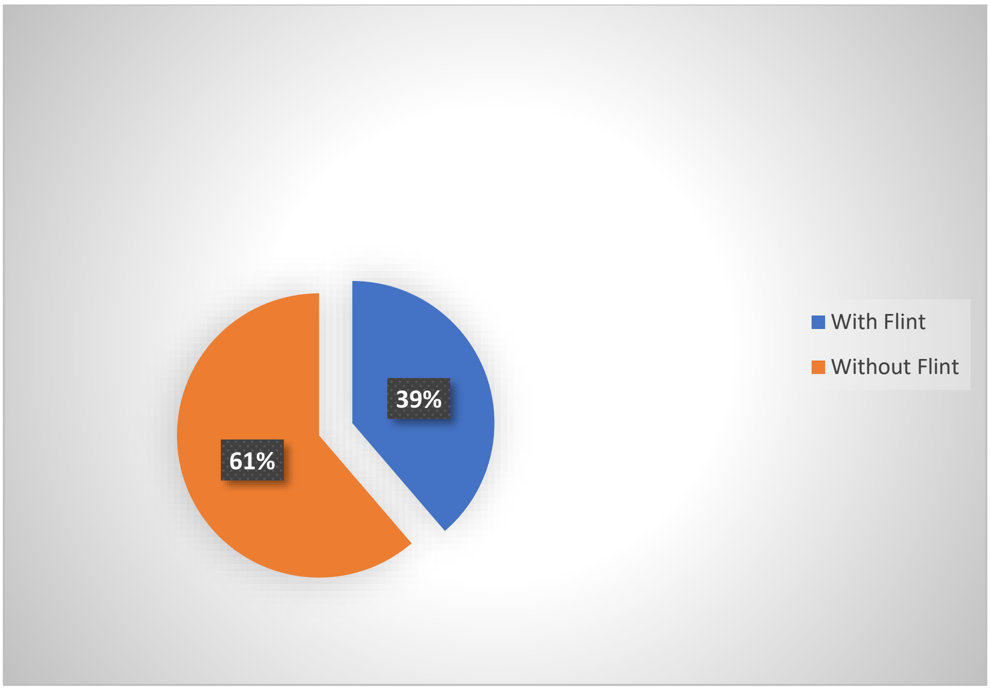


Figure 0.25: Distribution of flint and non- flint pieces on Irregular shape Sq A2-3

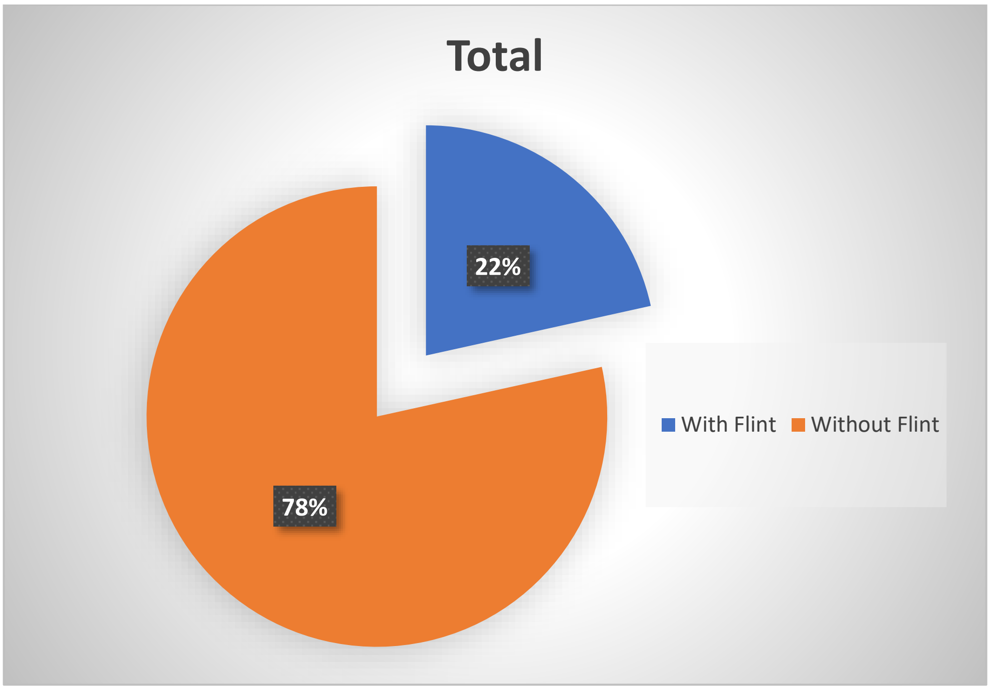


Figure 0.26: Distribution of flint and non- flint pieces on Irregular shape Sq A2-1&Sq A2-3

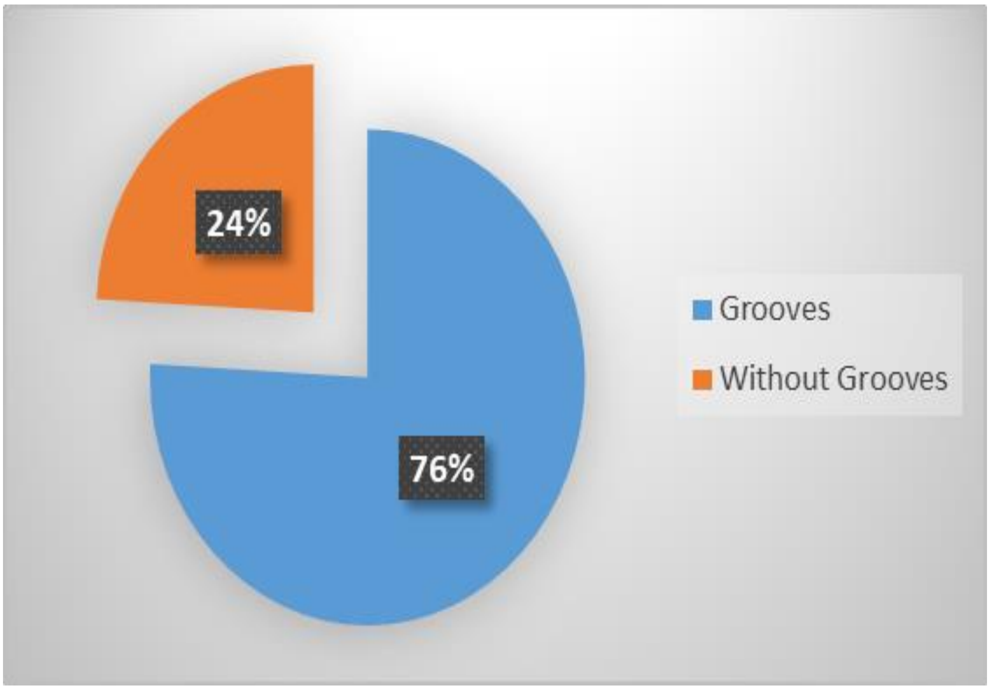


Figure 0.27: Distribution of Groove and non- Groove pieces on cylindrical shape Sq A2-1

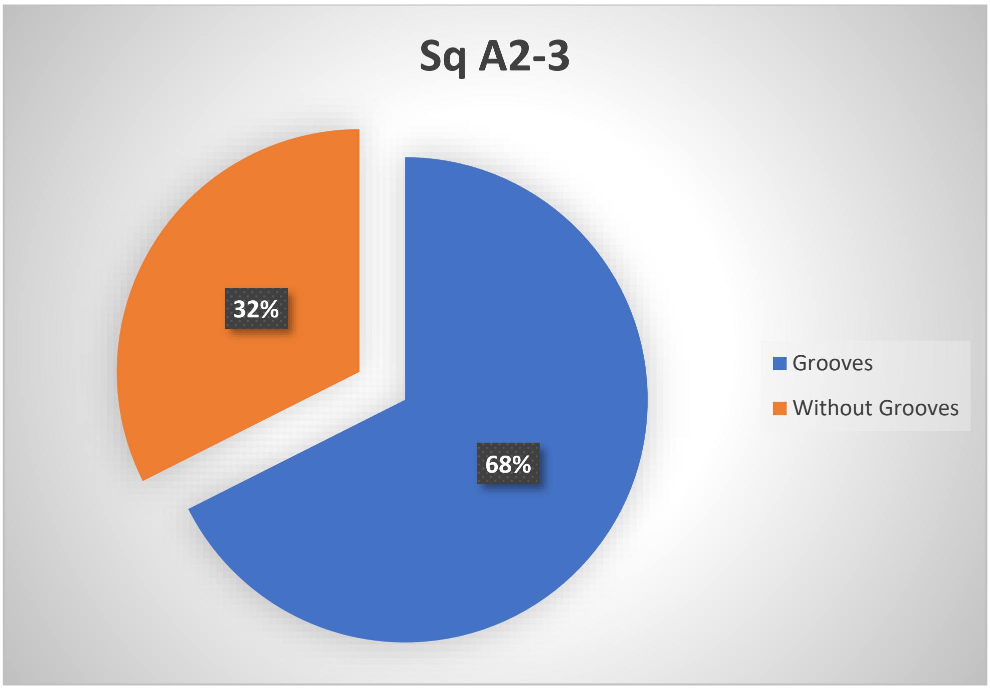


Figure 0.28: Distribution of Groove and non- Groove pieces on cylindrical shape Sq A2-3

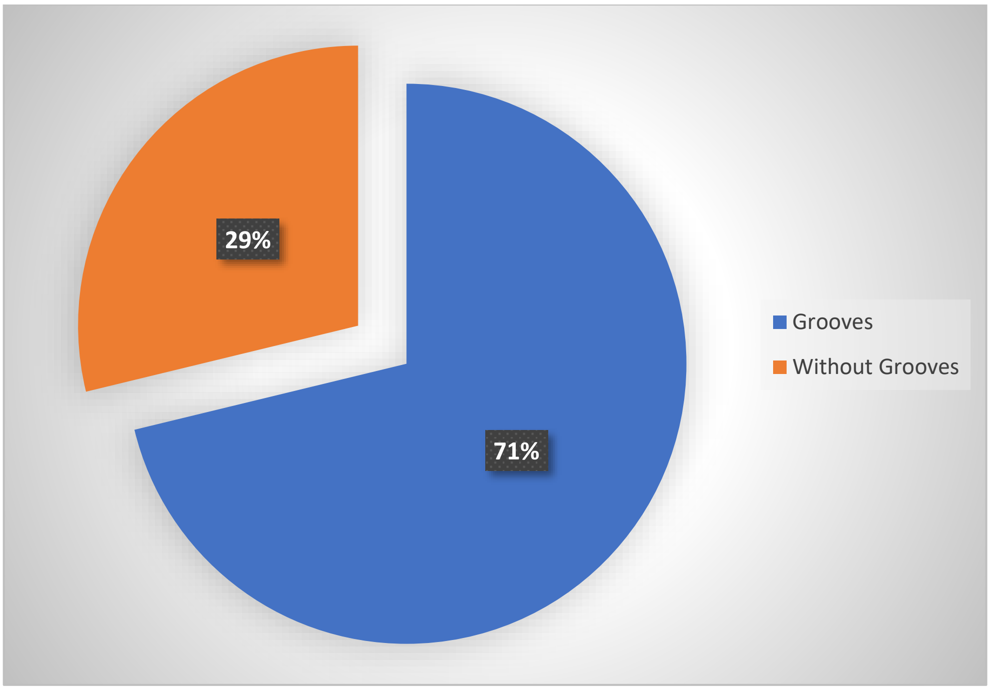


Figure 0.29: Distribution of Groove and non- Groove pieces on cylindrical shape Sq A2-1 & Sq A2-3

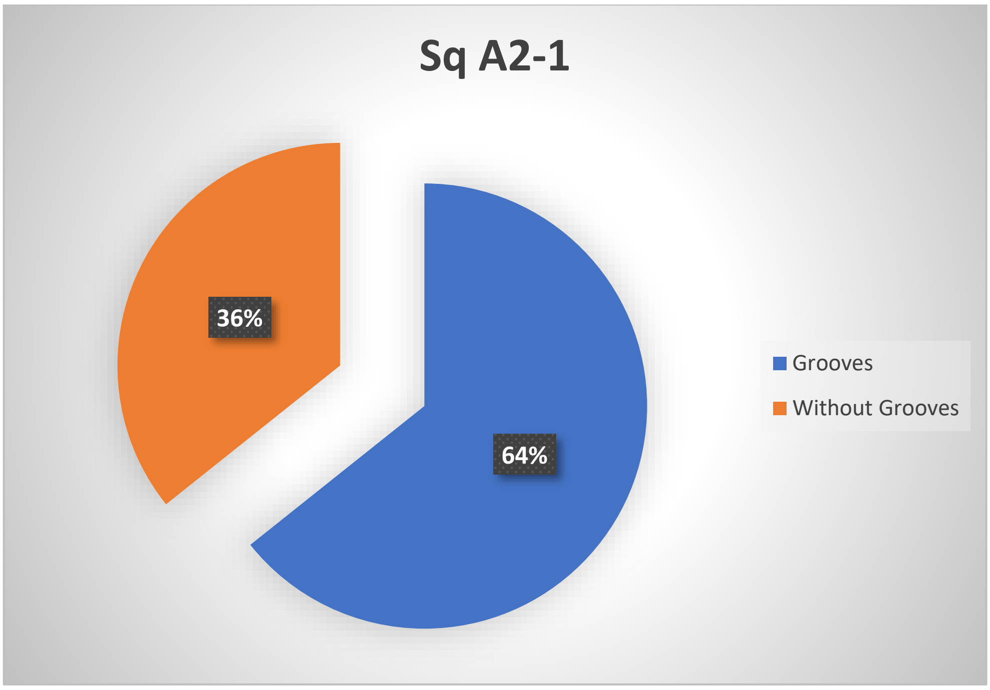


Figure 0.30: Distribution of Groove and non- Groove pieces on cone shape Sq A2-1

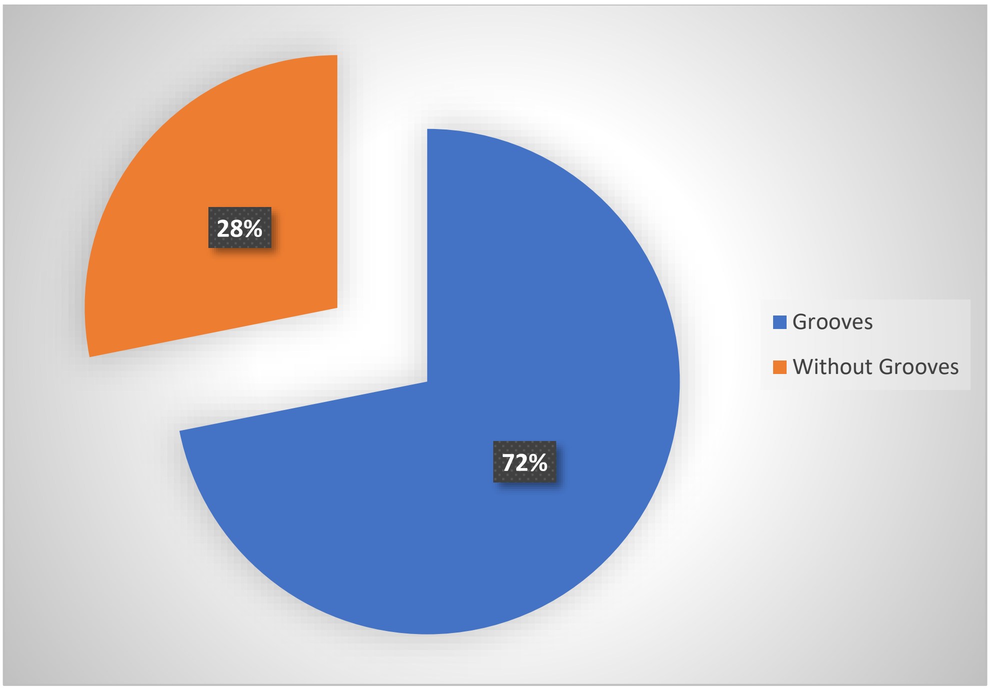


Figure 0.31: Distribution of Groove and non-flint pieces on cone shape Sq A2-3

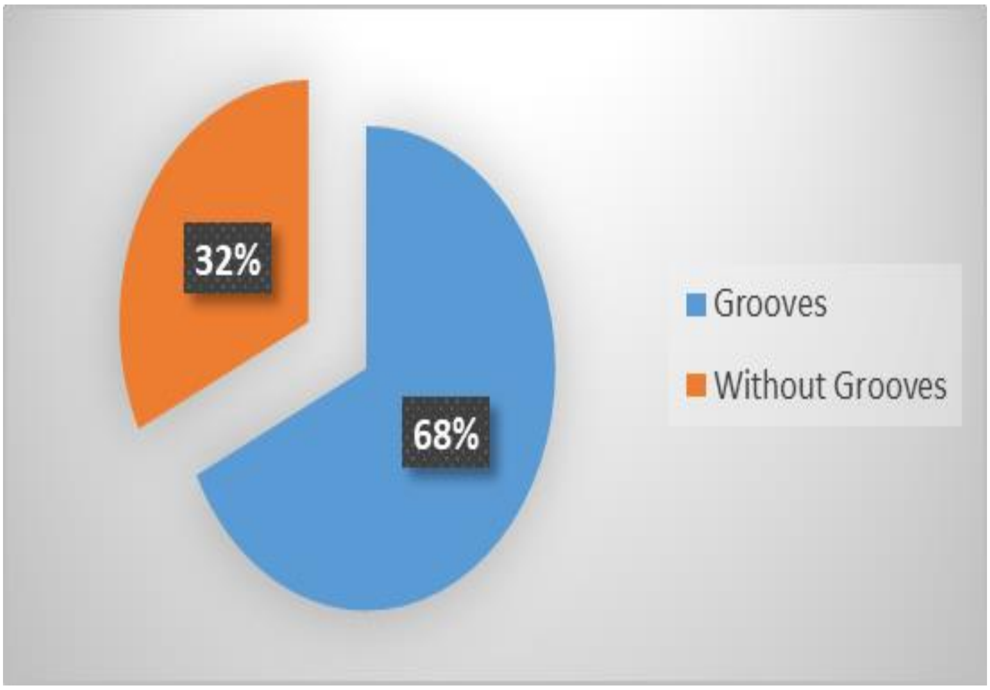


Figure 0.32: Distribution of Groove and non- Groove pieces on cylindrical shape Sq A2-1 & Sq A2-3

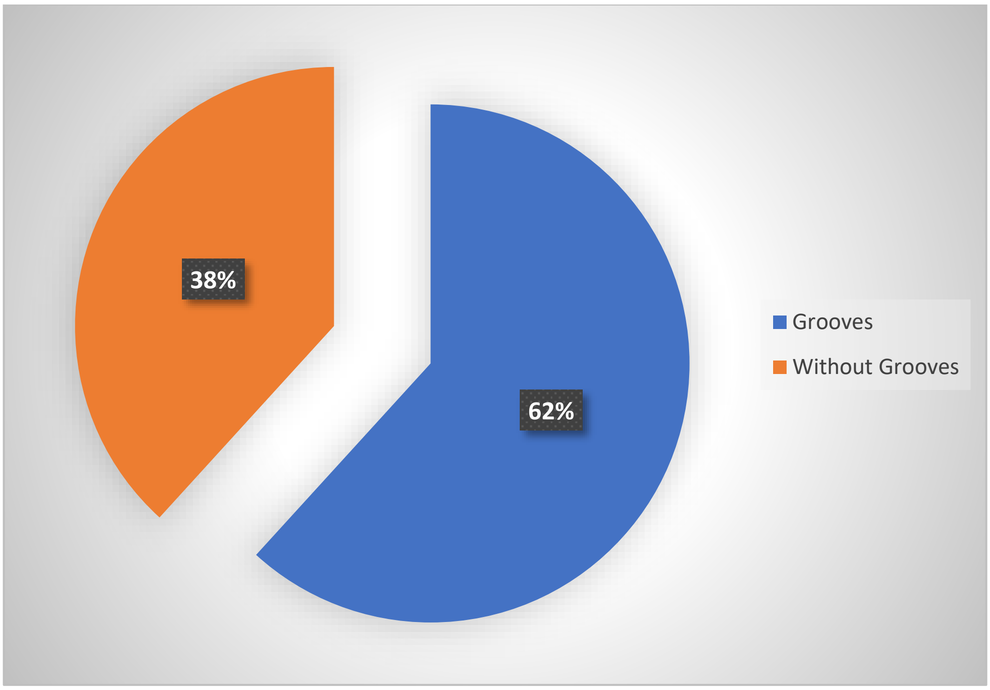


Figure 0.33: Distribution of Groove and non- Groove pieces on Irregular shape Sq A2-1

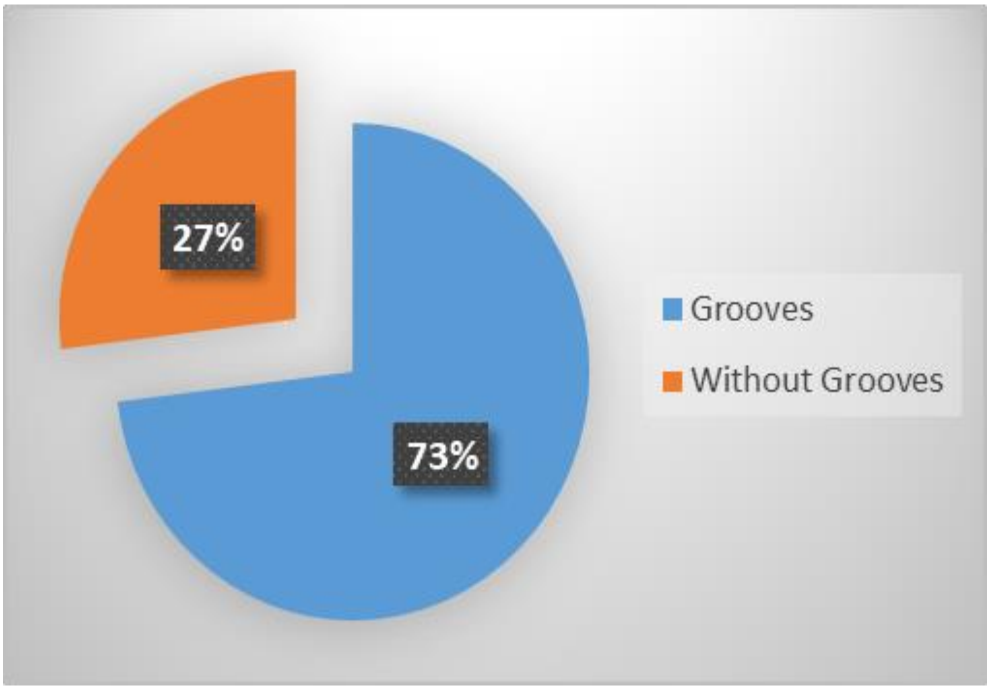


Figure 0.34: Distribution of Groove and non- Groove pieces on Irregular shape Sq A2-3

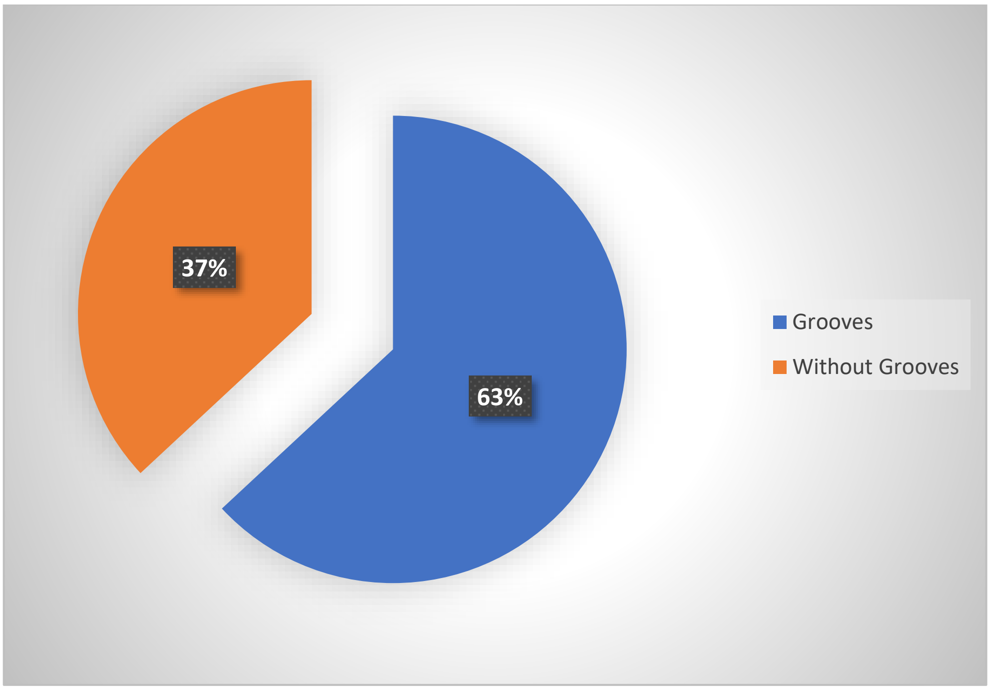


Figure 0.35: Distribution of Groove and non- Groove pieces on Irregular shape Sq A2-1 & Sq A2-3

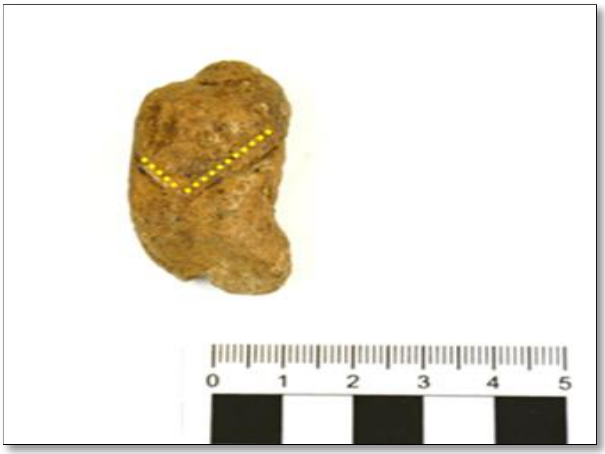


Figure 0.36: V-shape incision

Figure 0.37: V-shape incision

Figure 0.38: Lines Incisions

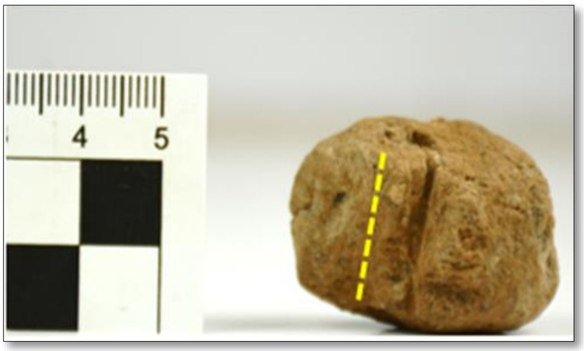


Figure 0.39: Lines Incisions

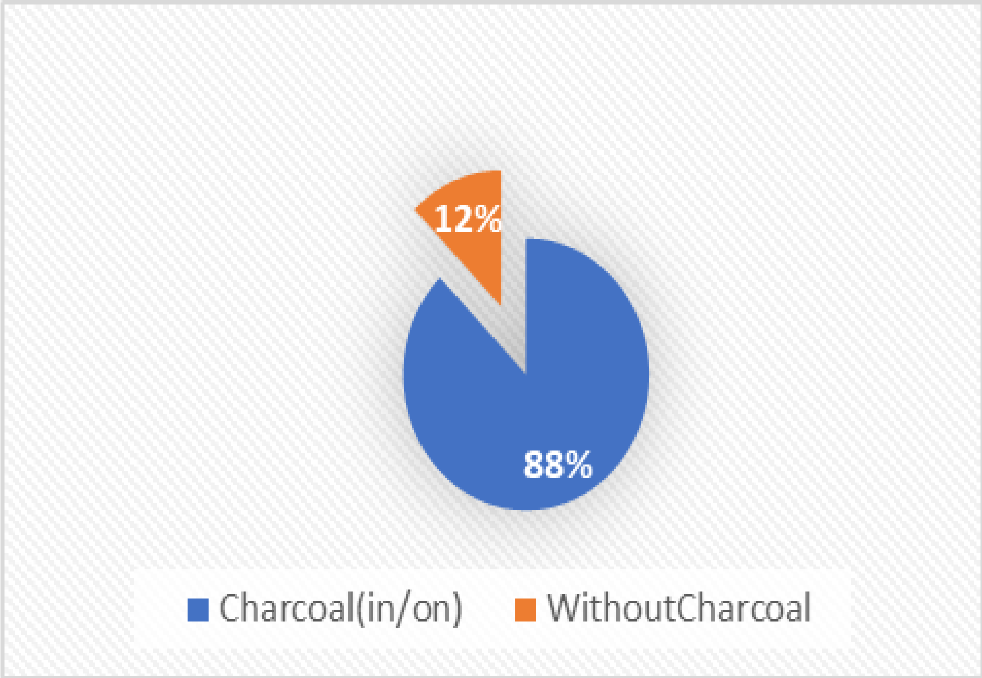


Figure 0.40: Distribution of charcoal and without charcoal pieces on cylindrical shape Sq A2-1

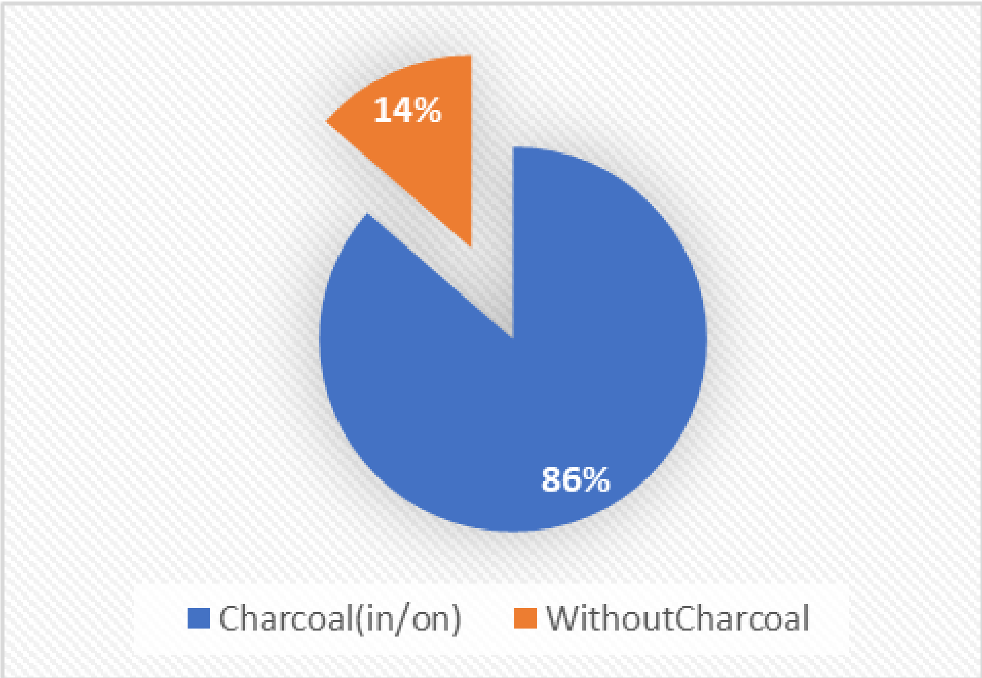


Figure 0.41: Distribution of charcoal and without charcoal pieces on cylindrical shape Sq A2-3

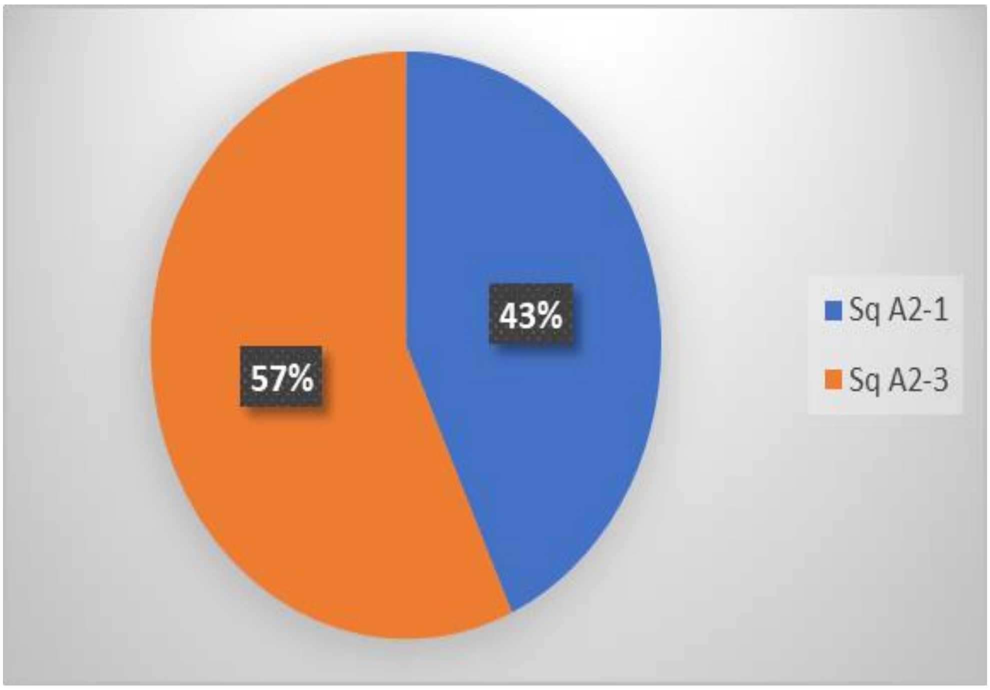


Figure 0.42: Distribution of charcoal and without charcoal pieces on cylindrical shape Sq A2-1 & Sq A2-3

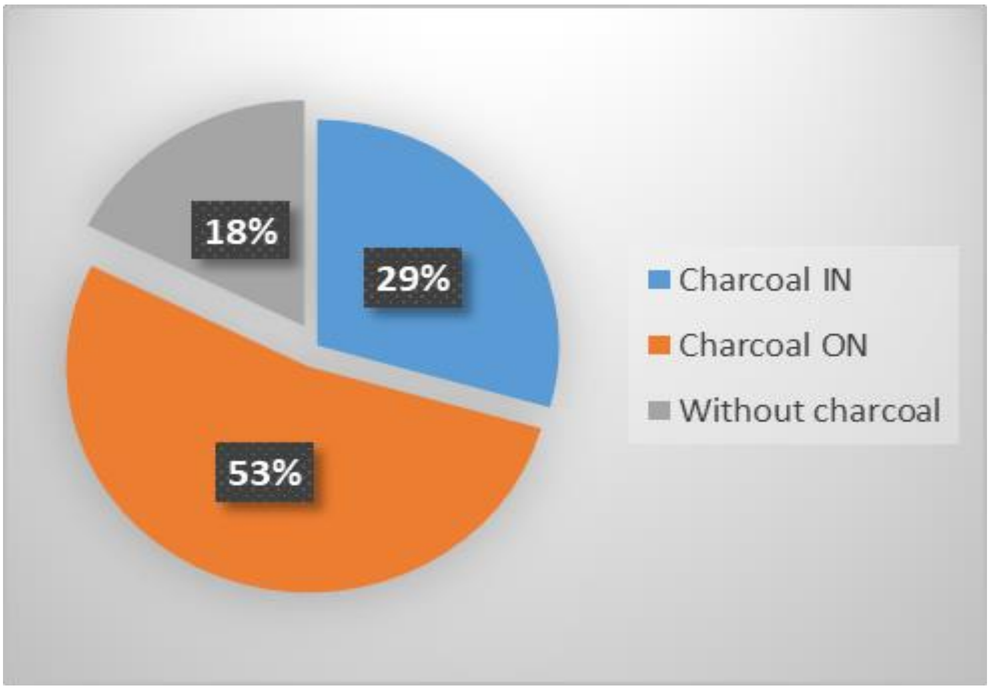


Figure 0.43: Distribution of charcoal and without charcoal pieces on cylindrical shape Sq A2-1

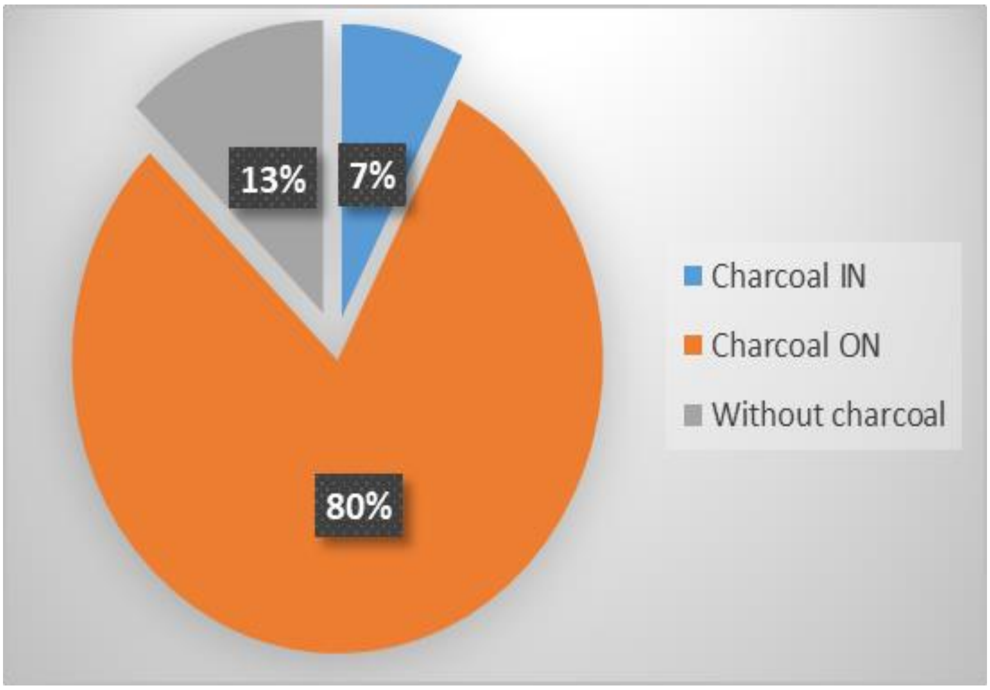


Figure 0.44: Distribution of charcoal and without charcoal pieces on cylindrical shape Sq A2-3

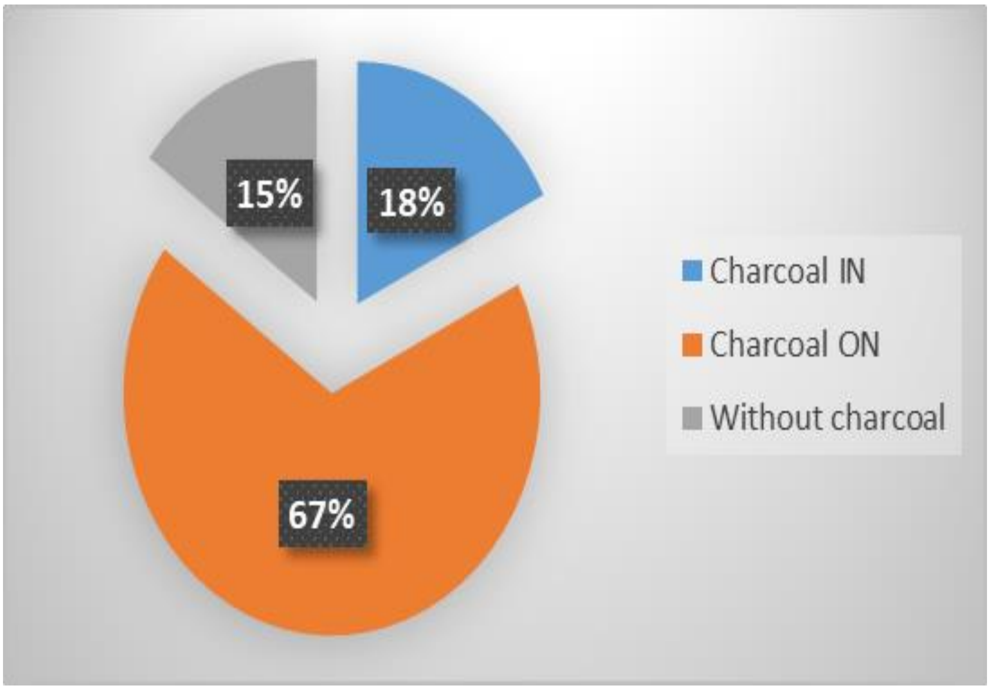


Figure 0.45: Distribution of charcoal and without charcoal pieces on cylindrical shape Sq A2-1 & Sq A2-3

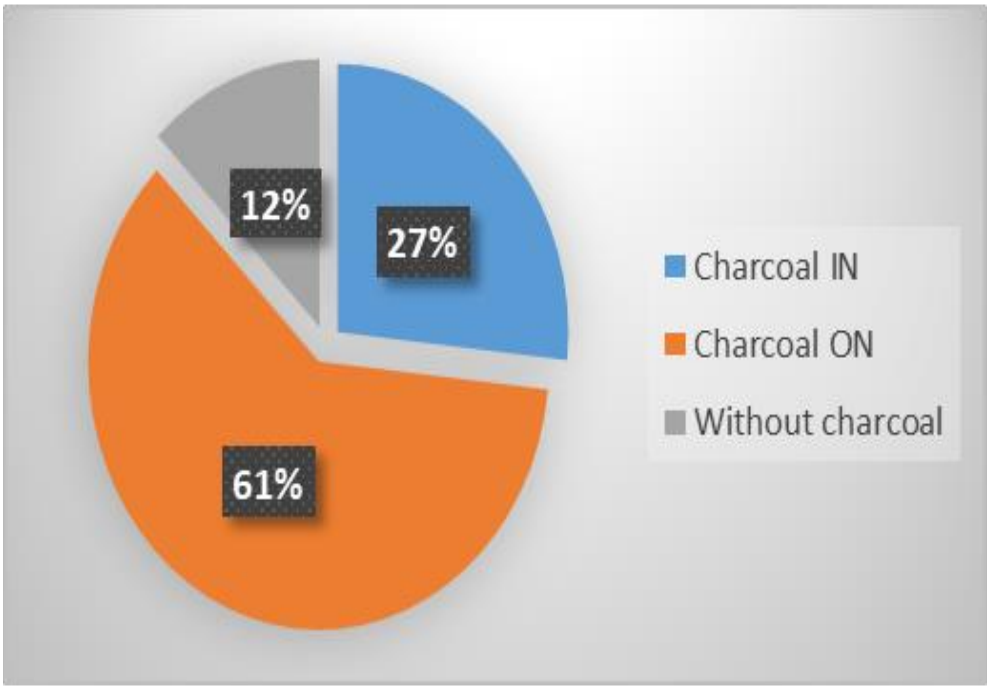


Figure 0.46: Distribution of charcoal and without charcoal pieces on cone shape Sq A2-1

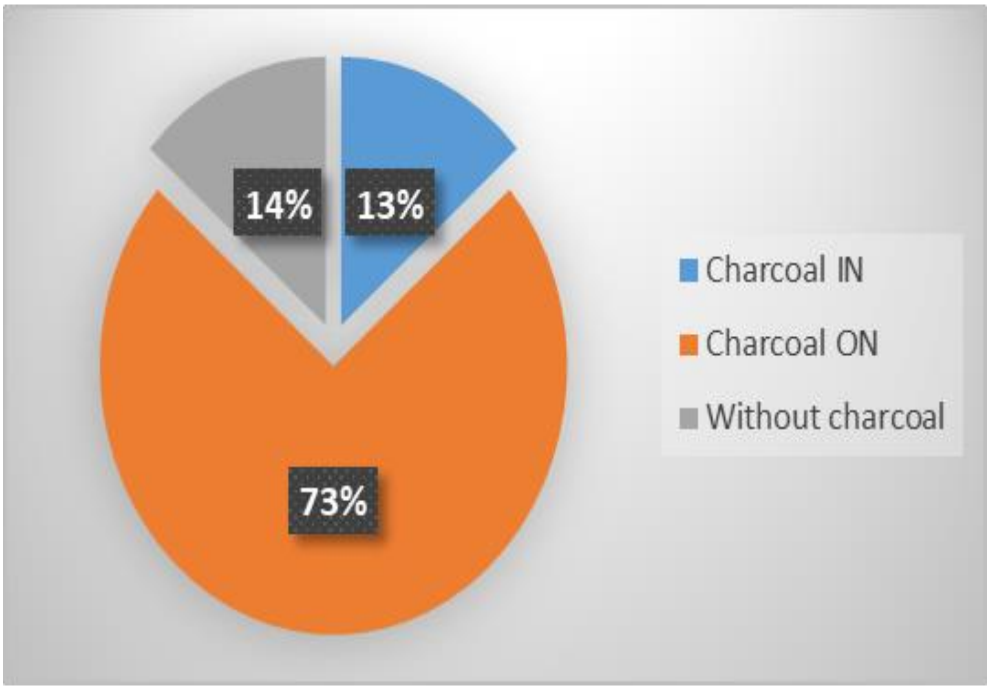


Figure 0.47: Distribution of charcoal and without charcoal pieces on cone shape Sq A2-3

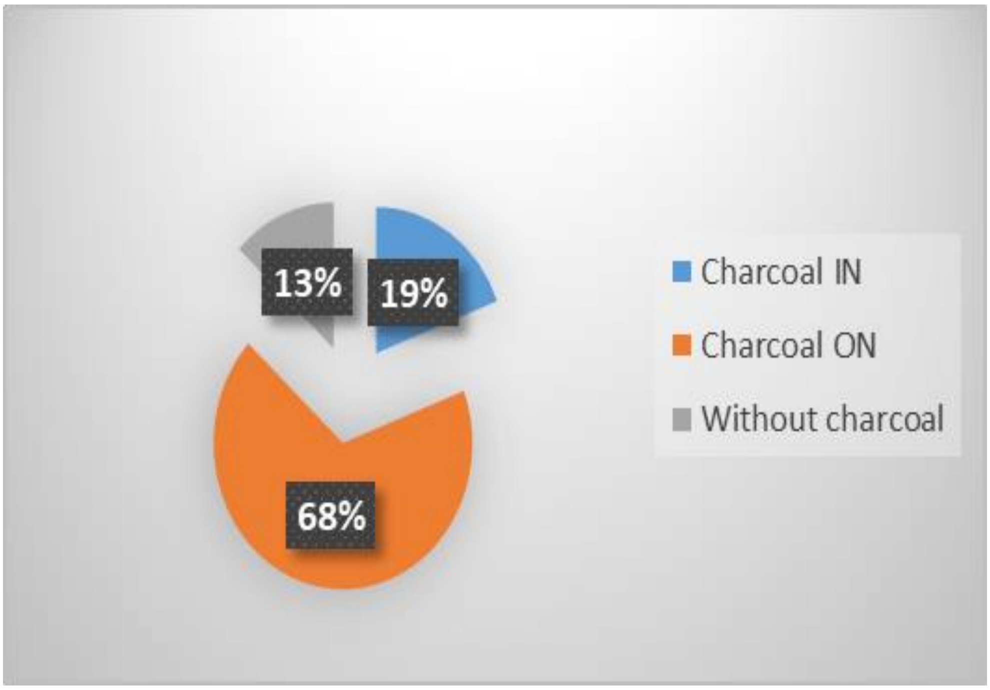


Figure 0.48: Distribution of charcoal and without charcoal pieces on cone shape Sq A2-1 & Sq A2-3

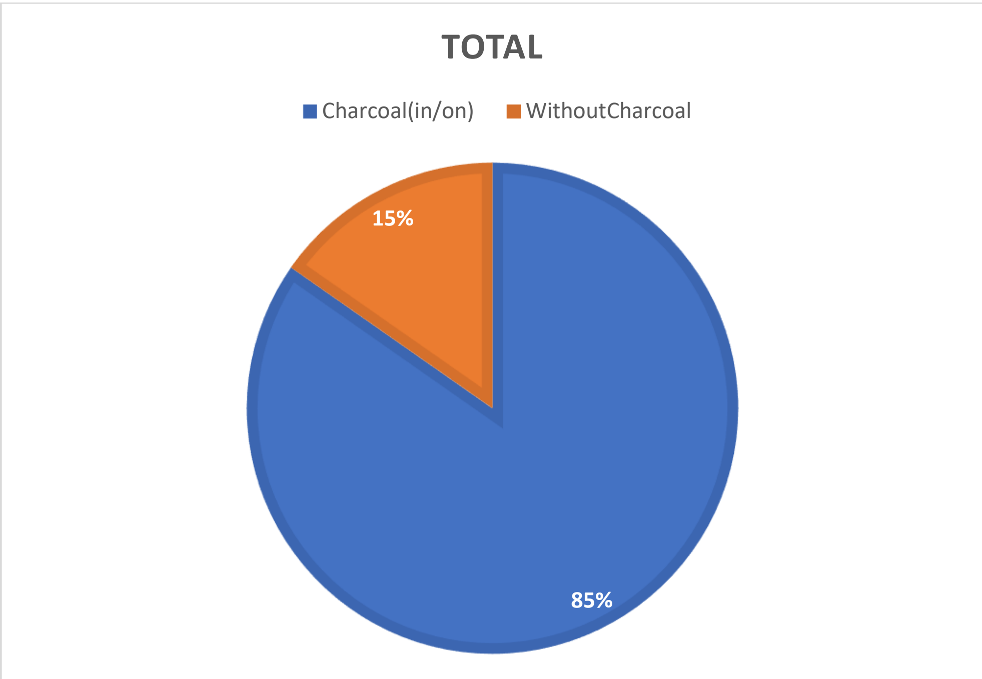


Figure 0.49: Distribution of charcoal and without charcoal pieces on cone shape Sq A2-1 & Sq A2-3

Appendix 2: Table of Clay objects

Table 0.1: Measurements clay objects, Sq A2-1

Photo No.	context	Cylindrical	Circular	cone	Irregular	Strands	Height (mm)	Diameter H (mm)	Diameter B (mm)	Estimate	Perforation	with flints	Grooves	Charcoal IN	Charcoal ON	Without charcoal
1	Sq A2-1	1	0	0	0	1	66.18	75	0	N	0	0	3	0	1	0
2	Sq A2-1	1	0	0	0	2	60.37	40.39	0	N	0	0	0	0	1	0
3	Sq A2-1	1	0	0	0	3	57.41	29.25	0	N	3	0	3	0	1	0
4	Sq A2-1	1	0	0	0	1	81.02	24.06	0	N	2	0	1	0	1	0
5	Sq A2-1	0	0	0	1	1	37.94	18.35	0	N	0	0	1	0	1	0
6	Sq A2-1	0	0	1	0	1	64.79	12.42	19.38	N	2	0	0	0	1	0
7	Sq A2-1	1	0	0	0	1	66.33	15.47	0	N	0	0	0	0	1	0
8	Sq A2-1	1	0	0	0	23	50	30	0	Y	3	0	3	0	1	0
9	Sq A2-1	0	0	0	1	1	45.12	28	0	N	1	0	1	0	0	1
10	Sq A2-1	0	0	1	0	1	53.24	13.97	26.58	N	1	1	1	0	1	0
11	Sq A2-1	0	0	1	0	1	50.69	23.02	26.11	N	1	0	1	0	1	0
12	Sq A2-1	1	0	0	0	1	58.55	24.38	0	N	1	0	1	0	0	1
13	Sq A2-1	1	0	0	0	1	56.16	21.14	0	N	2	0	0	1	0	0
14	Sq A2-1	0	0	1	0	1	65.8	9.23	24.71	N	1	0	4	1	0	0
15	Sq A2-1	1	0	0	0	1	46.95	19.83	0	N	0	0	4	1	0	0
16	Sq A2-1	0	0	1	0	1	51.31	11.66	15.42	N	1	0	1	1	0	0
17	Sq A2-1	0	0	0	1	1	35.03	23.3	0	N	1	0	0	1	0	0
18	Sq A2-1	0	0	0	1	1	39.93	29.22	0	N	3	0	0	0	1	0

Photo No.	context	Cylindrical	Circular	cone	Irregular	Strands	Height (mm)	Diameter H (mm)	Diameter B (mm)	Estimate	Perforation	with flints	Grooves	Charcoal IN	Charcoal ON	Without charcoal
19	Sq A2-1	0	0	1	0	1	48.88	19.72	27.93	N	2	0	2	0	1	0
20	Sq A2-1	0	0	0	1	1	46.63	28.28	0	N	0	0	2	0	1	0
21	Sq A2-1	1	0	0	0	1	66.66	24.7	0	N	0	0	2	0	1	0
22	Sq A2-1	1	0	0	0	1	39.89	15.86	0	N	2	0	1	0	1	0
23	Sq A2-1	1	0	0	0	1	56.37	30.57	0	N	2	2	1	1	0	0
24	Sq A2-1	1	0	0	0	1	45.92	17.25	0	N	0	0	1	0	1	0
25	Sq A2-1	1	0	0	0	1	40.48	25.68	0	N	0	0	1	0	1	0
26	Sq A2-1	1	0	0	0	1	33.48	15.9	0	N	0	0	0	0	0	1
27	Sq A2-1	1	0	0	0	1	41.51	20.38	0	N	0	0	1	0	1	0
28	Sq A2-1	0	0	0	1	1	50.66	24.16	0	N	3	0	1	1	1	0
29	Sq A2-1	0	0	0	1	1	33.66	16.37	0	N	1	0	1	0	1	0
30	Sq A2-1	0	0	1	0	1	43.9	22.96	20.00	Y	1	0	2	1	0	0
31	Sq A2-1	0	0	0	1	1	40.87	26.45	0	N	2	0	1	0	0	1
32	Sq A2-1	1	0	0	0	1	55.07	19.61	0	N	4	0	2	0	0	1
33	Sq A2-1	0	0	0	1	1	50.97	24.45	0	N	3	0	3	0	1	0
34	Sq A2-1	1	0	0	0	6	86.85	69.46	0	Y	3	0	2	1	1	0
35	Sq A2-1	0	0	0	1	1	44.32	20.85	0	N	1	0	3	0	1	0
36	Sq A2-1	0	0	1	0	1	36.24	6.66	11.38	N	1	0	1	1	0	0
37	Sq A2-1	1	0	0	0	1	53.12	20.67	0	N	1	0	2	1	1	0
38	Sq A2-1	0	0	1	0	1	59.36	14.02	23.37	N	6	0	1	0	1	0
39	Sq A2-1	0	0	0	1	1	38.88	20.33	0	N	1	1	0	1	1	0

Photo No.	context	Cylindrical	Circular	cone	Irregular	Strands	Height (mm)	Diameter H (mm)	Diameter B (mm)	Estimate	Perforation	with flints	Grooves	Charcoal IN	Charcoal ON	Without charcoal
40	Sq A2-1	1	0	0	0	1	66.2	21.12	0	N	2	0	2	1	1	0
41	Sq A2-1	1	0	0	0	1	58.8	19.91	0	N	1	0	4	1	1	0
42	Sq A2-1	0	0	1	0	1	55.07	11.5	23.61	N	1	0	0	0	1	0
43	Sq A2-1	0	0	1	0	1	50.35	22.33	30.56	N	1	0	1	0	1	0
44	Sq A2-1	0	0	1	0	1	31.62	14.04	21.14	N	0	0	1	1	1	0
45	Sq A2-1	0	0	1	0	1	61.89	15.05	35.15	N	0	0	1	0	1	0
46	Sq A2-1	0	0	1	0	1	61.02	23.14	43.15	N	1	0	0	1	0	0
47 A	Sq A2-1	0	0	1	0	3	72	13.08	32.6	N	0	0	0	0	1	0
47 B	Sq A2-1	0	0	1	0	3	60.77	18.08	28.5	N	0	0	0	0	1	0
47 C	Sq A2-1	0	0	1	0	3	46.16	21.65	Base broken	N	1	0	0	0	1	0
48	Sq A2-1	0	0	1	0	1	60.95	12.2	30.94	N	0	0	0	1	1	0
49	Sq A2-1	1	0	0	0	1	60.78	25.2	0	N	2	0	0	0	0	1
50	Sq A2-1	0	0	1	0	1	45.2	10.83	24.47	N	3	0	0	0	0	1
51	Sq A2-1	1	0	0	0	1	68.63	23.32	0	N	0	0	2	0	1	0
52	Sq A2-1	0	0	1	0	1	43.08	14.6	26.91	N	1	0	0	0	0	1
53	Sq A2-1	1	0	0	0	1	53.21	30.16	0	N	1	0	1	0	1	0
54	Sq A2-1	0	0	1	0	1	55.59	11.95	26.26	N	0	0	1	1	1	0
55	Sq A2-1	0	0	1	0	1	50.66	11.22	21.88	N	4	0	0	0	1	0
56	Sq A2-1	1	0	0	0	1	49.79	24.55	0	N	0	0	0	0	0	1
57	Sq A2-1	0	0	1	0	1	48.3	17.39	22.29	N	2	0	1	0	1	0

Photo No.	context	Cylindrical	Circular	cone	Irregular	Strands	Height (mm)	Diameter H (mm)	Diameter B (mm)	Estimate	Perforation	with flints	Grooves	Charcoal IN	Charcoal ON	Without charcoal
58	Sq A2-1	0	0	1	0	1	23.55	10.51	23.98	N	2	0	2	0	1	0
59	Sq A2-1	0	0	1	0	1	56.24	17.5	26.57	N	0	0	3	0	1	0
60	Sq A2-1	1	0	0	0	1	52.3	20.45	0	N	1	0	0	0	0	1
61	Sq A2-1	0	0	0	1	1	55.95	33.3	0	N	1	1	1	0	1	0
62	Sq A2-1	0	0	1	0	1	44.55	12.79	26.36	N	0	0	2	0	1	0
63	Sq A2-1	0	0	0	1	1	31.1	23.91	0	N	1	0	0	0	1	0
64	Sq A2-1	0	0	0	1	3	48.14	47.5	0	Y	0	0	0	1	0	0
65 A	Sq A2-1	0	0	1	0	1	44.32	18.79	25.15	Y	0	0	3	0	1	0
65 B	Sq A2-1	0	0	0	1	1	31	15	0	Y	0	0	1	0	0	1
66 A	Sq A2-1	1	0	0	0	1	51.89	35.24	0	Y	0	0	2	1	0	0
66 B	Sq A2-1	1	0	0	0	1	51.89	35.24	0	Y	0	0	1	1	0	0
67	Sq A2-1	0	0	1	0	1	52.6	17.06	34.07	N	0	0	2	1	1	0
68	Sq A2-1	1	0	0	0	1	25.91	19.72	0	N	1	0	1	1	1	0
69	Sq A2-1	0	0	0	1	1	39.59	17.47	0	N	0	0	3	0	0	1
70	Sq A2-1	0	0	0	1	1	44.52	28.91	0	Y	0	0	3	1	1	0
71 A	Sq A2-1	0	0	0	1	1	40.7	30.5	0	Y	2	0	1	0	1	0
71 B	Sq A2-1	0	0	0	1	1	40.7	30.5	0	Y	2	0	0	0	1	0
72 A	Sq A2-1	0	0	0	1	1	60.4	40.8	0	Y	0	0	1	0	1	0
72 B	Sq A2-1	0	0	0	1	1	60.4	40.8	0	Y	0	0	1	0	1	0
73	Sq A2-1	0	0	0	1	1	34.13	31.44	0	N	1	0	2	0	1	0
74	Sq A2-1	0	0	0	1	1	49.44	15.4	20.35	N	2	0	0	0	1	0

Photo No.	context	Cylindrical	Circular	cone	Irregular	Strands	Height (mm)	Diameter H (mm)	Diameter B (mm)	Estimate	Perforation	with flints	Grooves	Charcoal IN	Charcoal ON	Without charcoal
75	Sq A2-1	0	0	0	1	1	34.22	22.92	0	N	0	0	3	0	1	0
76	Sq A2-1	0	1	0	0	1	31.66	0	0	N	2	0	0	1	0	0
77	Sq A2-1	0	0	0	1	1	39.88	20.6	0	N	1	0	2	0	1	0
78	Sq A2-1	0	0	0	1	1	40.89	20.01	0	N	1	0	0	0	1	0
79	Sq A2-1	0	0	0	1	1	38.1	23.26	0	N	1	0	0	0	1	0
80	Sq A2-1	0	0	0	1	1	30.6	20.3	0	N	1	0	0	1	1	0
81	Sq A2-1	0	0	0	1	1	33.84	24.38	0	N	0	0	4	0	1	0
82	Sq A2-1	0	0	0	1	1	46.36	22.16	0	N	0	0	0	1	0	0
83	Sq A2-1	0	0	0	1	1	42.38	15.39	0	N	0	0	5	1	1	0
84	Sq A2-1	0	0	0	1	1	32.86	19.75	0	N	0	0	0	0	1	0
85	Sq A2-1	0	0	0	1	1	50.71	17.04	0	N	0	0	1	0	0	1
86	Sq A2-1	0	0	0	1	28	0	0	0	0	0	0	0	0	0	0
Sum		29	1	28	34	157	4461.43	2042.98	718.82	0	94	5	112	28	64	13

Table 0.2: Measurements clay objects, Sq A2-3

Photo No.	context	Cylindrical	Circular	cone	Irregular	Strands	Height (mm)	Diameter H (mm)	Diameter B (mm)	Estimate	Perforation	with flints	Grooves	Charcoal IN	Charcoal ON	Without charcoal
87	Sq A2-3	0	0	1	0	1	46.03	11.5	22.7	N	0	1	1	0	1	0
88	Sq A2-3	0	0	1	0	1	51.19	20.35	24.25	N	1	1	2	0	1	0
89	Sq A2-3	0	0	1	0	1	57.39	15.8	24.5	N	3	1	0	0	1	0
90	Sq A2-3	0	0	1	0	1	57.99	19.64	23.7	N	5	1	7	0	1	0
91	Sq A2-3	0	0	1	0	1	61.95	13.44	26.02	N	0	1	2	0	1	0
92	Sq A2-3	1	0	0	0	1	52.54	25.4	0	N	4	1	3	0	1	0
93	Sq A2-3	0	0	0	1	1	46.94	27.8	0	Y	4	1	0	0	1	0
94	Sq A2-3	0	0	1	0	1	51.09	15.91	18.27	N	0	1	1	0	0	1
95 A	Sq A2-3	0	0	1	0	1	44.5	15.3	18.9	Y	2	4	2	0	1	0
95 B	Sq A2-3	0	0	1	0	1	44.5	15.3	18.9	Y	1	0	1	0	1	0
96	Sq A2-	0	0	1	0	1	67.17	16.3	19.36	N	0	1	2	0	0	1

Photo No.	context	Cylindrical	Circular	cone	Irregular	Strands	Height (mm)	Diameter H (mm)	Diameter B (mm)	Estimate	Perforation	with flints	Grooves	Charcoal IN	Charcoal ON	Without charcoal
	3															
97	Sq A2-3	1	0	0	0	1	45.55	25.6	0	N	1	1	1	0	1	0
98	Sq A2-3	0	0	1	0	1	49.62	11.16	27.23	N	0	1	0	0	0	1
99	Sq A2-3	1	0	0	0	1	61.8	19.01	0	N	0	1	1	0	1	0
100	Sq A2-3	0	0	1	0	1	49.97	15.95	22.74	N	0	1	3	0	1	0
101	Sq A2-3	0	0	1	0	1	42.66	13.83	20.68	N	0	1	1	0	0	1
102	Sq A2-3	1	0	0	0	1	48.33	14.93	0	N	0	1	5	1	1	0
103	Sq A2-3	1	0	0	0	1	58.3	21.9	0	N	1	1	1	0	1	0
104	Sq A2-3	1	0	0	0	1	46.4	25.53	0	N	0	1	0	0	0	1
105	Sq A2-3	1	0	0	0	1	49.52	20.1	0	N	0	1	1	0	1	0
106	Sq A2-3	0	0	1	0	1	43.38	13.04	18.25	N	0	1	1	0	1	0
107	Sq A2-3	0	0	1	0	1	52.59	13.73	22.3	Y	4	1	0	0	1	0

Photo No.	context	Cylindrical	Circular	cone	Irregular	Strands	Height (mm)	Diameter H (mm)	Diameter B (mm)	Estimate	Perforation	with flints	Grooves	Charcoal IN	Charcoal ON	Without charcoal
108	Sq A2-3	0	0	0	1	1	33.35	18.08	0	N	1	1	1	0	1	0
109	Sq A2-3	1	0	0	0	1	43.12	16.38	0	N	0	1	0	0	1	0
110	Sq A2-3	0	0	1	0	1	38.02	16.03	24.39	N	2	1	0	0	1	0
111	Sq A2-3	0	0	0	1	1	42.88	15.02	0	N	0	1	6	0	0	1
112	Sq A2-3	1	0	0	0	1	48.22	18.48	0	N	0	1	0	0	1	0
113	Sq A2-3	0	0	0	1	1	45.2	18.4	0	N	1	1	1	0	0	1
114	Sq A2-3	0	0	0	1	1	55.57	13.37	23.41	N	0	1	0	0	0	1
115	Sq A2-3	0	0	0	1	1	51.41	12.95	21.91	N	3	1	1	0	1	0
116	Sq A2-3	1	0	0	0	1	56.03	19.98	0	N	0	2	1	0	0	1
117	Sq A2-3	0	0	0	1	1	52.43	18.49	0	N	0	1	3	0	1	0
118	Sq A2-3	0	0	0	1	1	43.73	21.47	0	N	0	1	0	0	0	1
119	Sq A2-	0	0	0	1	1	40.33	19.17	0	N	0	1	0	0	0	1

Photo No.	context	Cylindrical	Circular	cone	Irregular	Strands	Height (mm)	Diameter H (mm)	Diameter B (mm)	Estimate	Perforation	with flints	Grooves	Charcoal IN	Charcoal ON	Without charcoal
	3															
120	Sq A2-3	0	0	0	1	1	48.02	19.19	0	N	0	2	3	0	1	0
121	Sq A2-3	0	0	0	1	1	25.44	18.75	0	N	0	1	1	0	1	0
122 A	Sq A2-3	1	0	0	0	1	55.4	30	0	Y	2	2	0	0	1	0
122 B	Sq A2-3	1	0	0	0	1	55.4	30	0	Y	1	0	0	0	1	0
122 C	Sq A2-3	1	0	0	0	1	55.4	30	0	Y	1	0	0	0	1	0
123 A	Sq A2-3	1	0	0	0	1	60.7	26.6	0	Y	1	0	1	0	1	0
123 B	Sq A2-3	1	0	0	0	1	60.7	26.6	0	Y	0	1	1	0	1	0
124	Sq A2-3	1	0	0	0	1	50.07	19.39	0	N	1	1	0	0	1	0
125 A	Sq A2-3	0	0	1	0	1	65.7	16	23	Y	2	0	2	0	1	0
125 B	Sq A2-3	0	0	1	0	1	65.7	16	23	Y	0	1	1	0	1	0
126	Sq A2-3	1	0	0	0	1	49.73	20.24	0	N	0	1	2	0	1	0

Photo No.	context	Cylindrical	Circular	cone	Irregular	Strands	Height (mm)	Diameter H (mm)	Diameter B (mm)	Estimate	Perforation	with flints	Grooves	Charcoal IN	Charcoal ON	Without charcoal
127	Sq A2-3	0	0	0	1	1	54.48	22.93	0	N	1	1	1	0	1	0
128	Sq A2-3	0	0	1	0	1	27.21	77	19.54	N	1	1	0	0	0	1
129	Sq A2-3	0	0	1	0	1	55.57	14.9	24.35	N	1	0	1	0	1	0
130	Sq A2-3	1	0	0	0	1	55.82	23.88	0	N	0	0	0	0	1	0
131	Sq A2-3	1	0	0	0	1	57.06	25.89	0	N	1	0	3	0	1	0
132	Sq A2-3	0	0	1	0	1	54.31	13.6	19.07	N	3	0	2	0	1	0
133	Sq A2-3	0	0	1	0	1	60.02	12.18	25.3	N	0	0	4	1	1	0
134	Sq A2-3	1	0	0	0	1	47.68	18.12	0	N	1	0	1	0	1	0
135	Sq A2-3	1	0	0	0	1	22.52	24.99	0	N	0	0	0	0	1	0
136	Sq A2-3	0	0	1	0	1	50.56	14.29	22.76	N	0	0	1	0	1	0
137	Sq A2-3	1	0	0	0	1	62.55	22.89	0	N	1	0	0	0	1	0
138	Sq A2-	1	0	0	0	1	52.58	19.67	0	N	0	0	4	0	1	0

Photo No.	context	Cylindrical	Circular	cone	Irregular	Strands	Height (mm)	Diameter H (mm)	Diameter B (mm)	Estimate	Perforation	with flints	Grooves	Charcoal IN	Charcoal ON	Without charcoal
	3															
139	Sq A2-3	1	0	0	0	1	45.44	27.4	0	N	4	0	0	0	0	1
140	Sq A2-3	0	0	1	0	1	49.63	11.32	19.8	N	0	0	1	1	1	0
141	Sq A2-3	1	0	0	0	1	64.62	26.15	0	N	3	0	1	0	1	0
142	Sq A2-3	0	0	1	0	1	61.33	19.98	22.28	N	2	0	0	0	1	0
143	Sq A2-3	1	0	0	0	1	51.37	20.56	0	N	0	0	6	0	1	0
144	Sq A2-3	1	0	0	0	1	51.9	23.3	0	N	2	0	3	0	1	0
145	Sq A2-3	0	0	1	0	1	52.83	16.05	23.39	Y	0	0	7	1	1	0
146	Sq A2-3	1	0	0	0	1	53.07	20.31	0	N	0	0	0	0	1	0
147	Sq A2-3	1	0	0	0	1	56.74	21.22	0	N	0	0	0	0	1	0
148	Sq A2-3	1	0	0	0	1	43.43	22.95	0	N	0	0	2	0	1	0
149	Sq A2-3	0	0	1	0	1	43.21	12.15	25.9	N	0	0	2	0	0	1

Photo No.	context	Cylindrical	Circular	cone	Irregular	Strands	Height (mm)	Diameter H (mm)	Diameter B (mm)	Estimate	Perforation	with flints	Grooves	Charcoal IN	Charcoal ON	Without charcoal
150	Sq A2-3	1	0	0	0	1	54.6	23.94	0	Y	1	0	0	0	0	1
151	Sq A2-3	1	0	0	0	1	46.39	25.02	0	N	0	0	0	0	0	1
152	Sq A2-3	1	0	0	0	1	52.17	25.76	0	N	0	0	2	1	1	0
153	Sq A2-3	0	0	1	0	1	47.84	14.88	23.4	N	2	0	2	1	1	0
154	Sq A2-3	1	0	0	0	1	51.57	31.51	0	N	0	0	0	0	1	0
155	Sq A2-3	1	0	0	0	1	44.47	23.3	0	N	3	0	0	0	1	0
156	Sq A2-3	1	0	0	0	1	47.11	16.94	0	N	0	0	1	1	1	0
157	Sq A2-3	1	0	0	0	1	46.27	26.05	0	N	0	0	12	0	1	0
158	Sq A2-3	0	0	1	0	1	36.38	19.23	25.95	N	0	0	4	0	1	0
159	Sq A2-3	0	0	1	0	1	39.85	14.77	23.51	N	1	0	0	0	1	0
160	Sq A2-3	0	0	1	0	1	46.03	18.95	28.3	N	1	0	0	0	1	0
161	Sq A2-	0	0	1	0	1	37.9	39.13	0	N	0	0	0	0	0	1

Photo No.	context	Cylindrical	Circular	cone	Irregular	Strands	Height (mm)	Diameter H (mm)	Diameter B (mm)	Estimate	Perforation	with flints	Grooves	Charcoal IN	Charcoal ON	Without charcoal
	3															
162	Sq A2-3	0	0	0	1	1	40.27	29.58	0	Y	2	0	1	0	1	0
163	Sq A2-3	0	0	0	1	1	48.3	32.27	0	Y	3	0	1	1	1	0
164	Sq A2-3	0	0	0	1	2	44.49	36.77	0	N	2	0	3	1	1	0
165	Sq A2-3	0	0	0	1	2	58.68	30.33	0	Y	3	0	5	1	1	0
166	Sq A2-3	0	0	0	1	1	43.83	26.16	0	N	2	0	2	0	1	0
167	Sq A2-3	0	0	0	1	1	51.07	25.84	0	N	7	0	0	0	1	0
168	Sq A2-3	0	0	0	1	1	36.93	24.56	0	N	4	0	3	0	1	0
169	Sq A2-3	0	0	0	1	1	24.54	25.31	0	N	1	0	2	0	0	1
170	Sq A2-3	0	0	0	1	1	49.68	23.2	0	N	2	0	1	0	1	0
171	Sq A2-3	0	0	0	1	1	51.42	19.47	0	N	0	0	1	0	1	0
172	Sq A2-3	0	0	1	0	1	56.57	20.43	26.77	N	2	0	4	1	1	0

Photo No.	context	Cylindrical	Circular	cone	Irregular	Strands	Height (mm)	Diameter H (mm)	Diameter B (mm)	Estimate	Perforation	with flints	Grooves	Charcoal IN	Charcoal ON	Without charcoal
173	Sq A2-3	0	0	0	1	1	31.21	25.21	0	N	4	0	0	0	1	0
174	Sq A2-3	0	0	0	1	1	43.52	27.9	0	N	1	0	1	0	1	0
175	Sq A2-3	0	0	0	1	1	33.23	23.02	0	N	1	0	1	0	1	0
176	Sq A2-3	0	0	0	1	1	66.47	27.68	0	Y	0	0	0	1	1	0
177	Sq A2-3	0	0	0	1	1	48.98	26.87	0	N	0	0	1	0	1	0
178	Sq A2-3	0	0	0	1	1	35.01	23.67	0	N	1	0	0	0	1	0
179	Sq A2-3	0	1	0	0	1	0	30.91	0	N	2	0	0	0	1	0
180	Sq A2-3	0	1	0	0	1	0	31.71	0	N	3	0	1	0	1	0
181	Sq A2-3	0	1	0	0	1	0	30.62	0	N	2	0	3	0	1	0
182	Sq A2-3	0	1	0	0	1	0	35.04	0	N	2	0	3	0	0	1
183	Sq A2-3	0	1	0	0	1	0	34.72	0	N	1	0	3	1	1	0
184	Sq A2-	0	1	0	0	1	0	33.9	0	N	2	0	0	1	1	0

Photo No.	context	Cylindrical	Circular	cone	Irregular	Strands	Height (mm)	Diameter H (mm)	Diameter B (mm)	Estimate	Perforation	with flints	Grooves	Charcoal IN	Charcoal ON	Without charcoal
	3															
185	Sq A2-3	0	1	0	0	1	0	36.1	0	N	2	0	0	0	1	0
186	Sq A2-3	0	1	0	0	1	0	30.61	0	N	1	0	2	0	1	0
187	Sq A2-3	0	1	0	0	1	0	43.12	0	N	2	0	1	1	1	0
188	Sq A2-3	0	1	0	0	1	0	35.34	0	N	1	0	1	0	1	0
189	Sq A2-3	0	1	0	0	1	0	36.5	0	N	1	0	2	1	1	0
190	Sq A2-3	0	1	0	0	1	0	32.18	0	N	2	0	0	0	1	0
191	Sq A2-3	0	1	0	0	1	0	30.8	0	N	1	0	1	1	1	0
192	Sq A2-3	0	1	0	0	1	0	35.64	0	N	0	0	0	1	1	0
193	Sq A2-3	0	1	0	0	1	0	32.96	0	N	2	0	1	0	1	0
194	Sq A2-3	0	1	0	0	1	0	37.47	0	N	4	0	3	0	1	0
195	Sq A2-3	0	1	0	0	1	0	31.58	0	N	1	0	2	1	1	0

Photo No.	context	Cylindrical	Circular	cone	Irregular	Strands	Height (mm)	Diameter H (mm)	Diameter B (mm)	Estimate	Perforation	with flints	Grooves	Charcoal IN	Charcoal ON	Without charcoal
196	Sq A2-3	0	1	0	0	1	0	32.97	0	N	3	0	0	0	1	0
197	Sq A2-3	0	1	0	0	1	0	28.71	0	N	4	0	1	0	1	0
198	Sq A2-3	0	1	0	0	1	0	33.14	0	N	2	0	0	0	1	0
199	Sq A2-3	0	1	0	0	1	0	31.36	0	N	1	0	0	0	1	0
200	Sq A2-3	0	1	0	0	1	0	28.35	0	N	1	0	0	0	1	0
201	Sq A2-3	0	1	0	0	1	0	36.01	0	N	1	0	2	0	1	0
202	Sq A2-3	0	1	0	0	1	0	31.35	0	N	1	0	0	0	1	0
203	Sq A2-3	0	0	0	1	8	0	25	0	Y	0	0	0	0	1	0
204	Sq A2-3	0	0	0	1	12	0	30	0	Y	0	0	0	0	1	0
205	Sq A2-3	0	0	0	1	11	0	35	0	Y	0	0	0	0	1	0
Sum		37	24	32	131	154	4760.67	2982.68	753.83	0	146	48	171	19	105	19

Appendix 3: Catalogue of Clay Objects

No	Context	Measurements		Description	Photo
		Height (mm)	Diameter (mm)		
1.	Sq.A2-1	66.18	75	A complete cylindrical shape. 2 grooves appear on the bottom. Small piece of coal stuck into on the top of the body. Brown smoothen surface.	

2.	Sq.A2-1	60.37	40.39	A two complete Cylindrical Shapes Adjacent to each other. No grooves appear. No perforation on the adjacent body. The effects of calcification and charcoal appear above. Brown and dark brown surface.	
3.	Sq.A2-1	57.41	29.25	A three complete Cylindrical Shapes Adjacent to each other. Three perforation, one at the top at the centre. Others in two pieces from the top. All blind perforation. Brown and dark brown surface.	

4.	Sq.A2-1	81.02	24.06	Cylindrical shape, one part of the head is broken. Two perforation, all blind perforation. One grooves appear on the body. Brown smoothen surface with large dark brown stain probably due to the firing process.	
5.	Sq.A2-1	37.94	18.35	An irregular shape. One groove appears on the bottom. Nanoparticles of coal into the body. No any perforation appears on the body. Brown smoothen surface.	

6.	Sq.A2-1	64.79	19.38(Base) 12.42(Head)	A slightly curve cone shape geometric item with a pointed tip. Two perforation, one of them is through perforation, the second is blind perforation. One grooves appear on the body. Light brown smoothen surface.	
7.	Sq.A2-1	66.33	15.47	Cylindrical shape slant. No grooves appears on the body. No perforation appears on the body. Brown smoothen surface.	

8.	Sq.A2-1	50.00 EST	30.00 EST	23 cylindrical pieces adhering to each other. They are four perforations one is blind perforation and three is through perforation. The effects of coal on the surface from the top and bottom, Brown smoothen surface.	
9.	Sq.A2-1	45.12	28.00	An irregular shape. 1 through perforation, there is One groove. Brown with dark brown, smoothen surface	
10.	Sq.A2-1	53..24	13.97 26.58	Nearly cylindrical shape but not exactly Cylindrical shape, with flint into the body. There is one through the perforation. There is one groove. Brown smoothen the surface.	
11.	Sq.A2-1	50.69	23.02 26.11	Cylindrical shape, broken the head, there is one through perforation, and One groove appear on the body ,Brown smoothen surface.	

12.	Sq.A2-1	58.55	24.38	Cylindrical shape, broken the head, there is one blind perforation, two grooves at the base. Brown with chocolate brown smoothen surface.	
13.	Sq.A2-1	56.16	21.14	Cylindrical shape, there are two through perforation. There is a small cavity where a very small coal is observed. There is no groove appears. Smoothen Brown surface.	

14.	Sq.A2-1	65.80	9.23 24.71	cone shape, there is one blind perforation. there are four grooves appear on the body. Brown smooth surface with large dark brown (black) stain probably due to the firing process.	
15.	Sq.A2-1	46.95	19.83	Cylindrical shape, here are four grooves appear on the body. Some Micro points of coal distributed on the body. No grooves appears on the body. Brown and dark brown surface.	
16.	Sq.A2-1	51.31	11.66 15.42	cone shaped, there are two holes, the first from the top and the second from the centre of the body and intersect at a dead point. Brown and Dark brown spots surface	

17.	Sq.A2-1	35.03	23.30	An irregular shape, there is one through perforation. some Micro points of coal distributed on the body. one Groove Hollow. Brown smoothen surface.	
18.	Sq.A2-1	39.93	29.22	An irregular shape, there are two through perforation and one blind perforation. Some Micro points of coal distributed on the body. Brown smoothen surface.	
19.	Sq.A2-1	48.88	19.72 27.93	cone shape, there are two holes, the first is through the perforation, the second in the Base and blind perforation. One of the surfaces corroded. Brown and Dark brown spots surface. Some Micro points of coal distributed on the body. No grooves on the body.	

20.	Sq.A2-1	46.63	28.28	An irregular shape. There is two grooves show is two pieces, Actually, it’s one piece. Some Micro points of coal distributed on the body. No perforations appear on the body. Brown smoothen the surface. Brown and Dark brown surface.	
21.	Sq.A2-1	66.66	24.70	Cylindrical shape, here are two grooves appear on the body. Some Micro points of coal distributed on the body. .Brown and Dark brown spots surface.	
22.	Sq.A2-1	39.89	15.86	Cylindrical shape. There are two perforations, one of them is through the perforation the other is a blind perforation. one groove appears on the body. Brown smoothen the surface.	

23.	Sq.A2-1	56.37	30.57	Cylindrical shape, installed two flint parallel, there are two perforations, one of them is through the perforation the other is a blind perforation. one deep groove appears on the body. two small pieces of coal stuck on the body. Brown smoothen the surface, part of the body is Reddish.	
24.	Sq.A2-1	45.92	17.25	Cylindrical shape Sloping forward slightly, there is one quite groove in the body, Brown and Dark brown spots surface.	
25.	Sq.A2-1	40.48	25.68	Cylindrical shape. There is one groove, Brown and Dark brown spots surface.	

26.	Sq.A2-1	33.48	15.90	Cylindrical shape. Dark brown surface, part of the body is Reddish.		
27.	Sq.A2-1	41.51	20.38	Cylindrical shape. their small pieces of clay add to centre of the body, around this piece there some micro coal. one small groove in the body. Brown and Dark brown spots surface		
28.	Sq.A2-1	50.66	24.16	An irregular shape, there are three perforations, all of them are through the perforation. one deep groove. Brown and Dark brown surface.		
29.	Sq.A2-1	33.66	1637	An irregular shape, there is one through the perforation. one groove. Brown and Dark brown spots surface.		

30.	Sq.A2-1	43.90	22.96	cone shape. Broken in the front, one of the side it's crumbling. there is one through a perforation. two grooves, two small pieces of coal stuck on the grooves.	
31.	Sq.A2-1	40.87	26.45	An irregular shape. There are two perforations, one of them is through the perforation the other is a blind perforation. one deep groove. The large crumble appears on the piece. Brown and Dark brown surface	

32.	Sq.A2-1	55.07	19.61	Cylindrical shape, there are four perforations, Some cross with each other. two grooves. Brown and Dark gray spots surface.	
33.	Sq.A2-1	50.97	24.45	An irregular shape. there are three perforations all of them are through the perforation. three grooves. Brown and Dark brown surface.	
34.	Sq.A2-1	86.85	69.46	6 cylindrical pieces adhering to each other, The base is a single clay mass. there are three perforations all of them are blind the perforation. the coal is stuck between the edges. Three cavities stuck inside the small coal. two grooves one of them is deep. Brown, Dark brown and black spots surface.	
35.	Sq.A2-1	44.32	20.85	An irregular shape. one blind the perforation. there are three grooves, one of them is deep, the other is quite deep. One of the surfaces is brown-black and the other light brown.	

36.	Sq.A2-1	36.24	11.38 6.66	cone shape.one blind the perforation, notes that inside it a fragment of Burning branch. one groove It is perhaps that due to the perforation process. One of the surfaces is brown-black and the other light brown.	
37.	Sq.A2-1	53.12	20.67	Cylindrical shape, broken from one side. There are two blind perforations crossing in the centre of the body. Small pieces of coal stuck in the body. No perforation appear on the body. Brown and Dark brown surface.	
38.	Sq.A2-1	59.36	14.02 23.37	cone shape. Crumbled at the bottom. There are six perforations all of them are through the perforation except one, and some of them are crossing with each other. one deep groove. Brown and light brown.	
39.	Sq.A2-1	38.88	20.33	An irregular shape. Installed one flint. The perforation worked but the process was not completed and the hole became open from the top. One of the surfaces is too small points, lines of coal and the other light brown.	

40.	Sq.A2-1	66.20	21.12	Cylindrical shape, broken from one side. there are two through the perforation. two grooves in the body. Brown surface.	
41.	Sq.A2-1	58.80	19.91	Cylindrical shape.one blind the perforation. there are four grooves. One of them is a wide groove. two micro points of coal in the body. One of the surfaces is brown-black and the other brown.	
42.	Sq.A2-1	55.07	23.61 11.50	cone shape.one through the perforation, Small fracture of coal into the body. Brown and Dark brown surface. No groove appears.	
43.	Sq.A2-1	50.35	22.33 30.56	cone shape Broken from the bottom.one through the perforation. Brown and brown-black surface.	

44.	Sq.A2-1	31.62	14.04 21.14	cone shape. two grooves in the body. Points of coal distributed on the body Brown and brown-black spots surface.	
45.	Sq.A2-1	61.89	15.05 35.15	cone shape. one groove in the body. two micro of coal in the body. Brown surface.	
46.	Sq.A2-1	61.02	23.14 43.15	2 cone pieces adhering to each other.one blind the perforation inside it too small coal. small cavity inside it too small coal. Brown surface.	

47.	Sq.A2-1	72.00 60.77 46.16	13.08 32.60 18.08 28.50 21.65 Base broken	3 cone pieces adhering to each other. two of them is completed and the other it's broken.one blind the perforation in the broken piece. two small cavities inside it too small coal. Four grooves are on the body. Brown surface.	
48.	Sq.A2-1	60.95	12.20 30.94	cone shape. Remains of ash and charcoal at the base of the fragment. Brown and brown-black spots surface.	

49.	Sq.A2-1	60.78	25.20	Cylindrical shape. two through the perforation. Few Points of coal distributed on the body. dark brown surface.	
50.	Sq.A2-1	45.20	10.83 24.47	cone shape. three small blind the perforation. Ash residue its cover almost the piece. Brown and brown-black spots surface.	
51.	Sq.A2-1	68.63	23.32	Cylindrical shape. Almost crushed. two grooves in the body. Light brown surface	

52.	Sq.A2-1	43.08	14.60 26.91	cone shape. Trying a failed perforation. Brown surface part of the body is Reddish.	
53.	Sq.A2-1	53.21	30.16	Cylindrical shape.one groove in the body. Two through the perforation.one small cavity. Few Points of coal distributed on the body. Brown surface.	
54.	Sq.A2-1	55.59	11.95 26.26	cone shape. Two grooves in the body. too small cavity inside it micro coal. Brown and brown-black spots surface.	
55.	Sq.A2-1	50.66	11.22 21.88	cone shape with a base. three through the perforation and one blind the perforation. Brown and brown-black spots surface.	

56.	Sq.A2-1	49.79	24.55	Cylindrical shape. Brown smoothen the surface.	
57.	Sq.A2-1	48.30	17.39 22.29	cone shape. Two blind the perforation, one groove in the body. Brown and brown-black surface.	
58.	Sq.A2-1	23.55	10.51 23.98	cone shape. Two through the perforation. two grooves in the body. Point of coal on the body. Brown smoothen the surface.	

59.	Sq.A2-1	56.24	17.50 26.57	cone shape. three grooves in the body. Few Points of coal distributed on the body. one side brown smoothens on the surface the other is zigzag.	
60.	Sq.A2-1	52.30	20.45	Cylindrical shape. one groove in the body. Brown and Dark brown surface.	
61.	Sq.A2-1	55.95	33.30	An irregular shape. one blind the perforation. Installed one flint broke. there is a groove perhaps for add the flint but Fell off from the piece. Points of coal distributed on the body. Brown and brown-black spots surface.	
62.	Sq.A2-1	44.55	12.79 26.36	cone shape. Two grooves in the body. Points of coal distributed on the body. Dark brown surface.	

63.	Sq.A2-1	31.10	23.91	An irregular shape. one through a perforation. Points of coal distributed on the body. Dark brown surface	
64.	Sq.A2-1	48.14e	47.50e	3 Irregular pieces adhering to each other. two of them have A circular base. point of coal is stuck in the body. Brown and brown-black spots surface.	
65.	Sq.A2-1	44.32	18.79 25.15	2 pieces joined together, the first in a cone shape and the other is an irregular shape. three grooves on the cone shape, and one on the irregular shape. Points of coal distributed on the cone shape. Brown and Dark brown surface.	

66.	Sq.A2-1	51.89	35.24	Cylindrical shape broke from one side. three grooves in the body. prominently points of coal stuck in grooves. Brown smoothen the surface.	
67.	Sq.A2-1	52.60	17.06 34.07	cone shape. there is the cavity perhaps for add the flint but Fell off from the piece. Few the cavity inside it micro coal. one groove next to the cavity. Dark brown surface.	
68.	Sq.A2-1	25.91	19.72	Cylindrical shape.one groove in the body.one blind the perforation, Brown and brown-black spots surface.	
69.	Sq.A2-1	39.59	17.47	An irregular shape. Three grooves in the body. Brown and Dark brown surface.	

70.	Sq.A2-1	44.52	28.91e	An irregular shape. Three grooves in the body. there two cavities all of them are full of coal. Dark brown surface.	
71.	Sq.A2-1	45.70e	35.58e	2 Irregular pieces adhering to each other. two blind the perforation and two through the perforation.one groove in the body. Points of coal distributed on the body. Brown and Dark brown surface.	
72.	Sq.A2-1	62.46	44.88e	2 Irregular pieces adhering to each other. Two grooves in the body. Points of coal distributed on the body. Brown and Dark brown surface.	

73.	Sq.A2- 1	34.13	31.44	An irregular shape. Tow grooves in the body one of them are deep. one through the perforation. Brown and brown-black spots surface.	
74.	Sq.A2- 1	49.44	15.40 20.35	cone shape part of it is broken.one through the perforation, one blind the perforation. Brown smoothen the surface.	

75.	Sq.A2-1	34.22	22.92	An irregular shape. three deep grooves in the body. Brown and Dark brown surface.	
76.	Sq.A2-1	31.66		spherical shape. there two cavities All of them are full of coal. Light brown surface.	

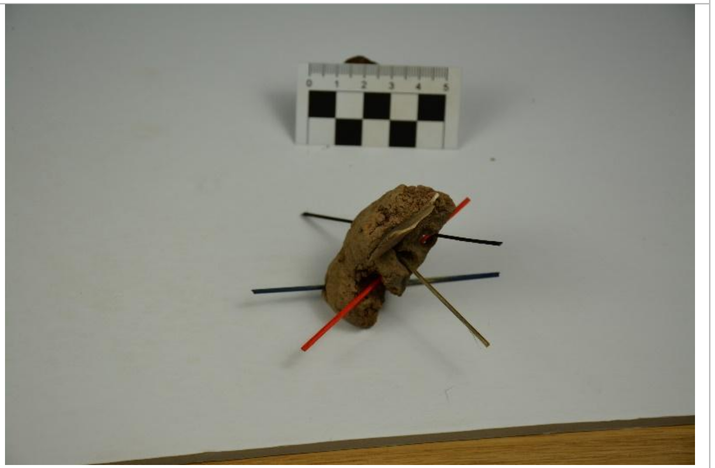
77.	Sq.A2-1	39.88	20.60	An irregular shape. one small blind the perforation. Tow grooves in the body one of them are deep. Brown and Dark brown surface.	
78.	Sq.A2-1	40.89	20.01	An irregular shape. one deep groove in the body. Point of coal on the body. brown surface.	
79.	Sq.A2-1	38.10	23.26	An irregular shape.one blind the perforation. one cavity full of coal. Brown and Dark brown surface.	

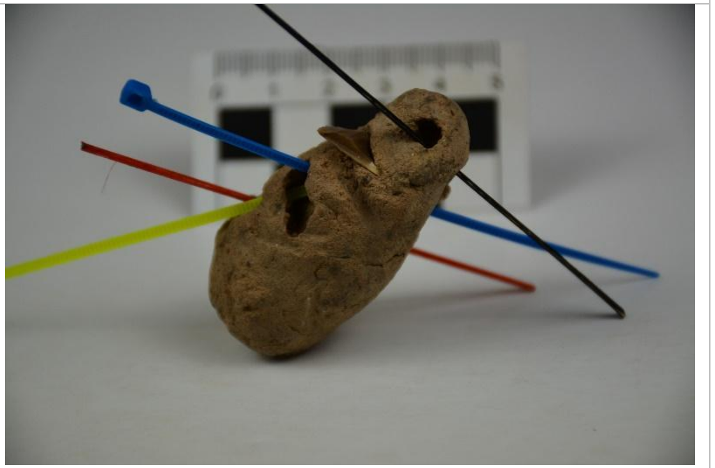
80.	Sq.A2-1	30.60	20.30	An irregular shape.one cavity full of coal. Brown and Dark brown surface.	
81.	Sq.A2-1	33.84	24.38	An irregular shape. four grooves in the body. two points of coal. Brown and Dark brown surface.	
82.	Sq.A2-1	46.36	22.16	An irregular shape. Two pieces of coal in the body. One groove. Brown and Dark brown surface.	

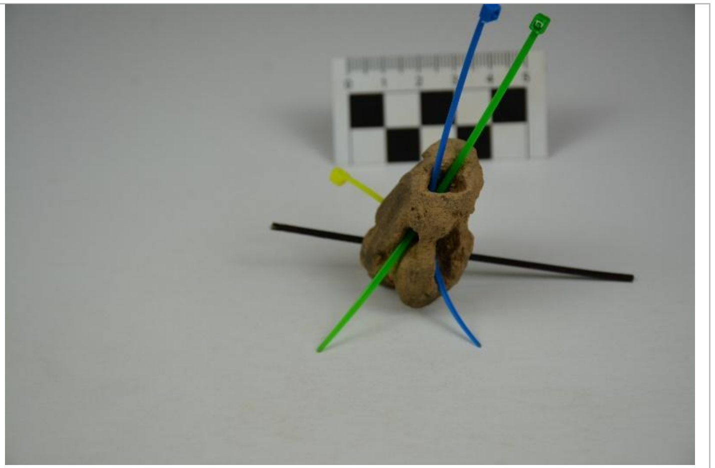
83.	Sq.A2-1	42.38	15.39	An irregular shape. five grooves in the body. two pieces of coal stuck on the body. Brown and Dark brown surface.	
84.	Sq.A2-1	32.86	19.75	An irregular shape.one deep groove in the body. Brown surface.	

85.	Sq.A2-1	50.71	17.04	An irregular shape.one deep groove in the body. Brown smoothen the surface.	
86.	Sq.A2-1			group of irregular shapes (28 pieces)	

87.	Sq A2-3	46.03	11.50 22.70	cone shape. Installed one flint, one deep groove in the body. Brown smooth surface with large black stain probably due to the firing process.	
88.	Sq A2-3	51.19	20.35 24.25	cone shape. Installed one flint, two through the perforation. Two grooves in the body shaped like brown and black spots surface.	

89.	Sq A2-3	57.39	15.80 24.50	cone shape. Installed one flint, two through the perforation, and one blind the perforation. Brown smooth surface with large black stain probably due to the firing process.	
90.	Sq A2-3	57.99	19.64 23.70	cone shape. Installed one flint. five through the perforation, and one blind the perforation. seven small grooves in the body. Points of coal distributed on the body, brown smooth surface.	

91.	Sq A2-3	61.95	13.44 26.02	cone shape slightly curved. two grooves in the body. Brown smoothen the surface.	
92.	Sq A2-3	52.54	25.40	cone shape. Installed one flint, three through the perforation, and one blind the perforation. Three grooves in the body. Brown and Dark brown surface.	

93.	Sq A2-3	46.94	27.80e	An irregular shape. Three through the perforation, and one blind the perforation. One of the surfaces is black stain probably due to the firing process, and the other light brown.	
94.	Sq A2-3	51.09	15.91 18.27	cone shape. Installed one flint, with the broken head. two cavities. one groove in the body. Brown smooth surface.	

95.	Sq A2-3	44.55e	15.30e 18.90e	2 cone pieces adhering to each other, Installed four small flints in one piece. There is one cavity perhaps for add the flint but Fell off from the piece. three through the perforation. three grooves in the body. Brown smooth surface with light black stain probably due to the firing process.	
96.	Sq A2-3	67.17	16.30 19.36	cone shape. Installed one flint. two grooves in the body. Brown and brown-black spots surface.	

97.	Sq A2-3	45.55	25.60	Cylindrical shape. Installed one flint, one through the perforation, one groove in the body. Points of coal distributed on the body. Brown and Dark brown surface	
98.	Sq A2-3	49.62	11.16 27.23	cone shape. Installed one flint, One of the surfaces is Reddish the other light brown with Points of coal distributed on the body.	

99.	Sq A2-3	61.80	19.01	Cylindrical shape. Installed one flint, one small groove in the body. Brown and brown-black spots surface.	
100.	Sq A2-3	49.97	15.95 22.74	cone shape slightly curved. Installed one flint, three small grooves in the body. One of the surfaces is quiet-black and the other brown.	

101.	Sq A2-3	42.66	13.83 20.68	cone shape. Installed one flint, one groove in the body. Brown smoothen the surface.	
102.	Sq A2-3	48.33	14.93	Cylindrical shape. Installed one flint. five grooves in the body, small pieces of coal stuck in one of the grooves. One of the surfaces is quiet-black and the other brown.	

103.	Sq A2-3	58.30	21.90	Cylindrical shape. Installed one flint. one groove in the body, one through perforation. Brown surface.	
104.	Sq A2-3	46.40	25.53	Cylindrical shape. Installed one flint, crossing into the other side. Ash fossilized appears on one of the surfaces. Brown smoothen the surface.	

105.	Sq A2-3	49.52	20.10	Cylindrical shape slightly curved. Installed one flint, one groove in the body. Brown and ash spots surface.	
106.	Sq A2-3	43.38	13.04 18.25	cone shape. Installed one flint, one groove in the body. Brown smoothen the surface.	

107.	Sq A2-3	52.59	13.73 22.30e	cone shape. Installed one flint, four grooves in the body, one of them is through perforation, and the other is a blind perforation. Brown with black spots surface.	
108.	Sq A2-3	33.35	18.08	An irregular shape. Installed one flint, one deep groove in the body, one blind perforation. Brown with black spots surface.	

109.	Sq A2-3	43.12	16.38	Cylindrical shape. Installed one flint, one groove in the body, Brown with black spots surface.	
110.	Sq A2-3	38.02	16.03 24.39	cone shape. Installed one flint, two blind perforations. Brown with black spots surface.	

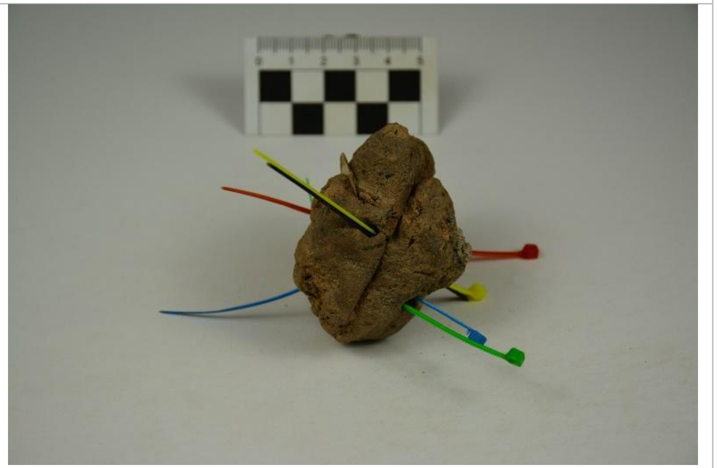
111.	Sq A2-3	42.88	15.02	An irregular shape. Installed one flint, six small grooves in the body, Brown surface.	
112.	Sq A2-3	48.22	18.48	Cylindrical shape with a pointed head. Installed one flint, Brown with black spots surface.	

113.	Sq A2-3	45.20	18.40	An irregular shape. Installed one flint, one blind perforation.one groove in the body, light Brown surface	
114.	Sq A2-3	55.57	13.37 23.41	cone shape. Installed one flint. light Brown surface.	

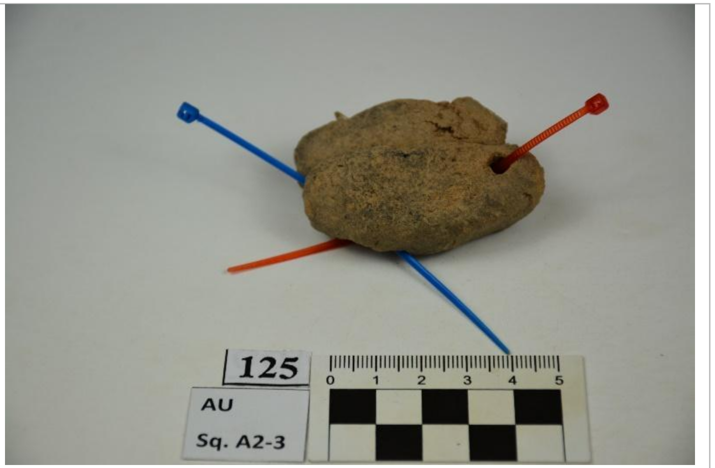
115.	Sq A2-3	51.41	12.95 21.91	cone shape. Installed one broken flint. one through a perforation, and tow blind perforation. point of coal in the body. one tiny groove. Brown with black spots surface.	
116.	Sq A2-3	56.03	19.98	Cylindrical shape broke from one side. Installed two flints, one groove in the body. light Brown surface.	

117.	Sq A2-3	52.43	18.49	An irregular shape. Installed one flint, three grooves in the body, One of the surfaces with large black spots and the other is brown.	
118.	Sq A2-3	43.73	21.47	An irregular shape. Installed one flint, there is the cavity perhaps for add the flint but fell off from the piece. One of the surfaces with large black spots and the other is brown and smash.	

119.	Sq A2-3	40.33	19.17	An irregular shape. Installed one flint, light Brown surface.	
120.	Sq A2-3	48.02	19.19-	An irregular shape. Installed tow flints, three deep grooves in the body. Points of coal distributed on the body. light Brown surface.	

121.	Sq A2-3	25.44	18.75	An irregular shape. Installed one flint.one groove in the body. Brown with black spots surface.	
122.	Sq A2-3	57.48e	30.08e	3 cylindrical pieces adhering to each other, Installed two flints. four grooves in the body. points of coal distributed on the body. brown and brown-black spots surface.	

123.	Sq A2-3	60.70	26.60e	2 cylindrical pieces adhering to each other, Installed one flint. two grooves in the body. points of coal distributed on the body. brown and brown-black spots surface.	
124.	Sq A2-3	50.07	19.39	Cylindrical shape. Installed one broken flint. One perforation and we can note the track are obvious due to the refraction of the upper face. Points of coal distributed on the body. brown and brown-black spots surface.	

125.	Sq A2-3	65.78e	16.00e 23.00	2 cone pieces adhering to each other, Installed one flint. three grooves in the body. points of coal distributed on the body. brown and brown-black spots surface.	
126.	Sq A2-3	49.73	20.24	Cylindrical shape pointed the two heads. Installed one flint. Two grooves in the body. brown and brown-black spots surface.	

127.	Sq A2-3	54.48	22.93	An irregular shape. installed one flint. one groove in the body. one through the perforation. Light brown and reddish in the bottom.	
128.	Sq A2-3	27.21	77.00 19.54	cone shape. Installed one flint, one through perforation, and other perforation and can notes the track are obvious due to the refraction of the upper face. Brown and light brown.	

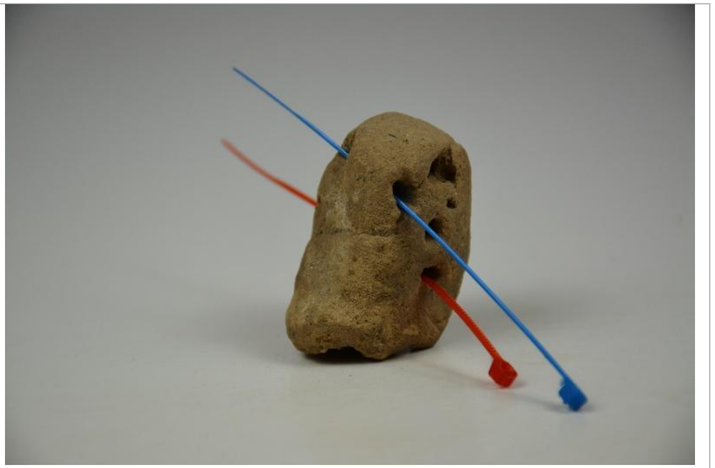
129.	Sq A2-3	55.57	14.90 24.35	cone shape.one through perforation. one deep groove. brown and black spots surface.	
130.	Sq A2-3	55.82	23.88	Cylindrical shape. Brown smooth surface, another side is light black stain probably due to the firing process.	

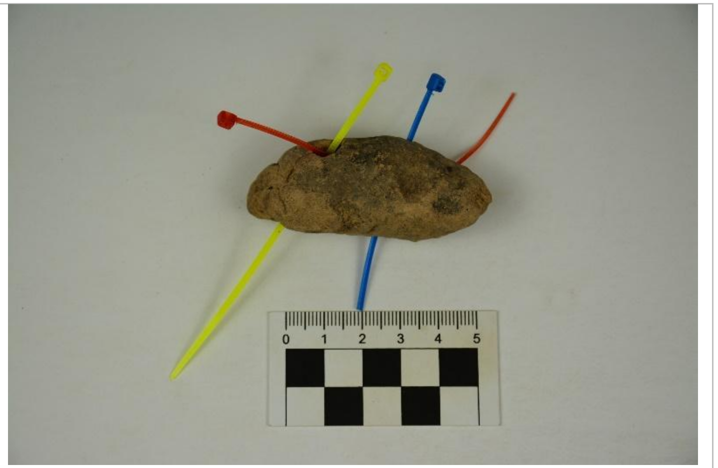
131.	Sq A2-3	57.06	25.89	Cylindrical shape pointed on the one side. three grooves in the body.one small blind the perforation. Light brown and reddish surface, another side is light black stain probably due to the firing process.	
132.	Sq A2-3	54.31	13.60 19.07	cone shape. Two through a perforation, one blind the perforation. two grooves in the body. The surface is smooth has several colours: brownish-red, light brown, spots of black	

133.	Sq A2-3	60.02	12.18 25.30	cone shape. Four grooves in the body, one of them is deep. Points of coal distributed on the body. brown and brown-black spots surface.	
134.	Sq A2-3	47.68	18.12	cone shape.one groove in the body. one blind the perforation. brown and brown-black spots surface.	

135.	Sq A2-3	22.52	24.99	Cylindrical shape. brown and brown-black spots surface.	
136.	Sq A2-3	50.56	14.29 22.76	cone shape. There is the cavity perhaps for add the flint but fell off from the piece. Brown and brown-black spots surface.	

137.	Sq A2-3	62.55	22.89	Cylindrical shape pointed on the one side.one too small blind the perforation. point of coal is stuck in the body. Brown and brown-black spots surface.	
138.	Sq A2-3	52.58	19.67	Cylindrical shape. four grooves in the body. black spots almost cover the surface.	

139.	Sq A2-3	45.44	27.40	Cylindrical shape. two through the perforation, two blind the perforation. Light brown smooth surface.	
140.	Sq A2-3	49.63	11.32 19.80	cone shape.one deep groove in the body. point of coal is stuck in the body. Black spots almost cover the surface.	

141.	Sq A2-3	64.62	26.15	Cylindrical shape pointed on the one side. three through a perforation. one deep groove in the body. Point of coal is stuck in the body. brown and brown-black spots surface.	
142.	Sq A2-3	61.33	19.98 22.28	cone shape.one through the perforation, one blind perforation. Black spots almost cover the surface.	

143.	Sq A2-3	51.37	20.56	Cylindrical shape. six grooves in the body. The surface is smooth has several colours: brownish-red, light brown, spots of black.	
144.	Sq A2-3	51.90	23.30	Cylindrical shape. one through the perforation, one blind perforation. three grooves in the body. point of coal is stuck around the perforation. brown and black spots almost cover the surface.	

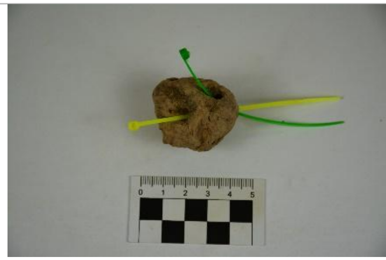
145.	Sq A2-3	52.83	16.05e 23.39e	cone shape, the base, and the head are broken. seven deep grooves in the body. light brown with a lot of coal spots in the body; stuck into grooves.	
146.	Sq A2-3	53.07	20.31	Cylindrical shape pointed on the one side. points of coal on the body. brown and black spots surface.	

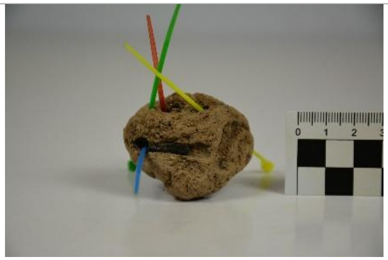
147.	Sq A2-3	56.74	21.22	Cylindrical shape broke on the one side. Brown and brown-black spots surface.	
148.	Sq A2-3	43.43	22.95	Cylindrical shape. two grooves in the body. One of the surfaces is light brown, the other is black spots.	

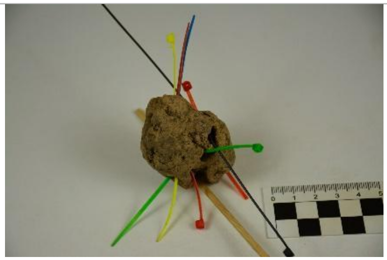
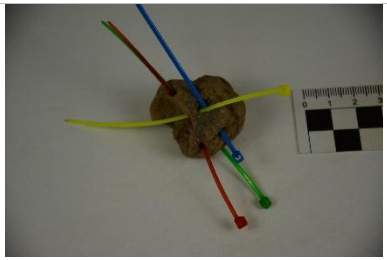
149.	Sq A2-3	43.21	12.15 25.90	cone shape. Two grooves in the body. Brown and brownish-red surface.	
150.	Sq A2-3	54.60	23.94e	Cylindrical shape pointed on the one side, and part of the body is crashed. one through a perforated. light brown smoothens surface.	

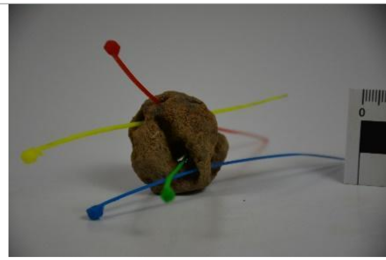
151.	Sq A2-3	46.39	25.02	Cylindrical shape. light brown smoothens the surface.	
152.	Sq A2-3	52.17	25.76	Cylindrical shape. Two grooves in the body. coal stuck on one side of the body. Light brown smoothens the surface.	
153.	Sq A2-3	47.84	14.88 23.40	cone shape broke on the head. Two grooves in the body. Two blind perforation, one of them full inside with coal. points of coal on the body. brown and black spots surface.	
154.	Sq A2-3	51.57	31.51	Cylindrical shape. coal fossilized appears on one of the surfaces, light brown smoothens surface.	

155.	Sq A2-3	44.47	23.30	Cylindrical shape. three through a perforated. Points of coal on the body. Brown and black spots almost cover the surface.		
156.	Sq A2-3	47.11	16.94	Cylindrical shape broke on the one side of the surface. Coal stuck on the body. brown and black spots surface.		
157.	Sq A2-3	46.27	26.05	Cylindrical shape.12 grooves in the body, some of them deep. points of coal, brown and black spots surface.		
158.	Sq A2-3	36.38	19.23 25.95	cone shape broke from the bottom. four grooves in the body with stuck coal. points of coal, brown and black spots surface.		

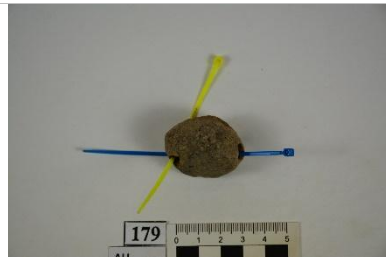
159.	Sq A2-3	39.85	14.77 23.51	cone shape. one through the perforation, small points of coal on the body. brown and black spots surface.		
160.	Sq A2-3	46.03	18.95 28.30	cone shape. one blind perforation, points of coal on the body. Brown and black spots surface.		
161.	Sq A2-3	37.90	39.13	cone shape broke from the head. Round base. light brown smoothens the surface.		
162.	Sq A2-3	40.27	29.58e	An irregular shape. Two through the perforation, one groove in the body. Small points of coal on the body. brown and black spots surface.		

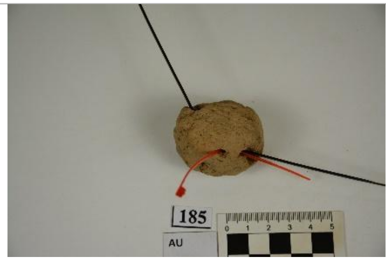
163.	Sq A2-3	48.30e	32.27e	An irregular shape. Part of the body is crashed. Four through the perforation, one groove in the body. three pieces of coal stuck 1 in the groove and 2 in the perforations. points of coal on the body. brown and black spots surface.	
164.	Sq A2-3	44.49	36.77	2 Irregular pieces adhering to each other. Two blind perforation. three deep grooves in the body with stuck coal. brown and black spots surface.	
165.	Sq A2-3	58.68e	30.33e	2 Irregular pieces adhering to each other.one blind the perforation. five grooves in the body. pieces of coal stuck into grooves and the body. Brown and black spots surface.	
166.	Sq A2-3	43.83	26.16	An irregular shape. Two grooves in the body.one through perforation, and one blind the perforation. brown and black spots surface.	

167.	Sq A2-3	51.07	25.84	An irregular shape. Seven through perforations. two small pieces of coal stuck into the body. Brown and black spots surface.		
168.	Sq A2-3	36.93	24.56	An irregular shape. four through perforations. Three deep grooves in the body. Points of coal on the body. brown and black spots surface.		
169.	Sq A2-3	24.54	25.31	An irregular shape. one through perforation. two deep grooves in the body. Points of coal on the body. brown and black spots surface. Light brown smoothens the surface.		
170.	Sq A2-3	49.68	23.20	An irregular shape. two through perforations. one groove in the body. pieces of coal stuck into the body. Brown and black spots surface.		

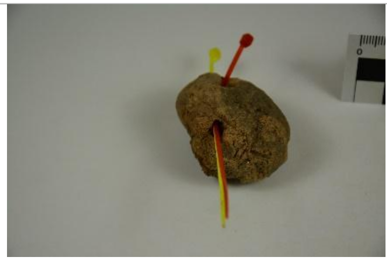
171.	Sq A2-3	51.42	19.47	An irregular shape. one deep groove in the body. with small pieces of coal stuck into the body. Coal fossilized appears on one of the surfaces. brown and black spots surface.		
172.	Sq A2-3	56.57	20.43 26.77	cone shape.one through perforation, and one blind the perforation. Two grooves in the body, one of the groove with stuck pieces of coal. some of them with coal stuck. Coal, ash fossilized appears on one of the surfaces. Brown and black spots surface.		
173.	Sq A2-3	31.21	25.21	An irregular shape. Four through perforations. Brown and black spots surface.		

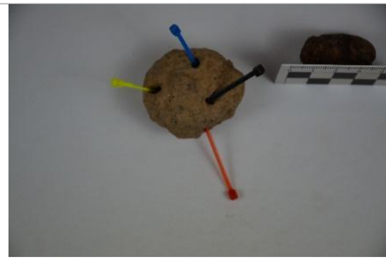
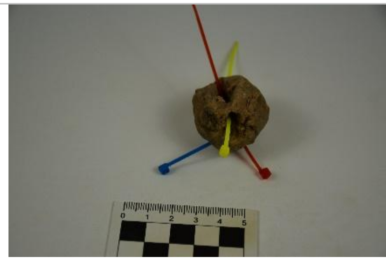
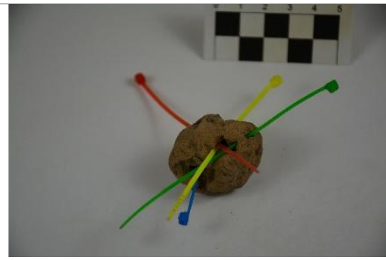
174.	Sq A2-3	43.52	27.90	An irregular shape.one through perforation.one groove in the body. Light brown smoothens the surface.		
175.	Sq A2-3	33.23	23.02	An irregular shape. one blind perforation. one deep groove in the bottom of the body. Light brown smoothens the surface.		
176.	Sq A2-3	66.47e	27.68e	3 Irregular pieces adhering to each other. there is coal stuck into the edges. Brown and black spots surface		
177.	Sq A2-3	48.98	26.87	An irregular shape.one blind perforation.one deep groove divides the shape into two parts. Brown and black spots surface.		

178.	Sq A2-3	35.01	23.67	An irregular shape.one small blind perforation.one deep groove. Pieces of coal stuck into the body. Brown and black spots surface.		
179.	Sq A2-3	30.91		Spherical shape. Two through perforations. points of coal into on the body. brown and brown-black spots surface.		
180.	Sq A2-3	31.71		Spherical shape. Two through perforations.one blind perforation.one groove. points of coal into on the body. brown and brown-black spots surface.		
181.	Sq A2-3	30.62		Spherical shape. Two through perforations. pieces of coal stuck into the body. brown and brown-black spots surface.		

182.	Sq A2-3	35.04		Spherical shape.one through perforation. one of perforation doesn't complete. Three grooves in the body one of them are deep, points of coal into the body. brown and brown-black spots surface.		
183.	Sq A2-3	34.72		Spherical shape.one blind perforation. Three grooves in the body. pieces of coal stuck into the body. Brown and brown-black spots surface.		
184.	Sq A2-3	33.90		Spherical shape. two blind perforations.one of the groove with stuck pieces of coal.one piece of coal into the body. Brown and brown-black spots surface.		
185.	Sq A2-3	36.10		Spherical shape. Two through perforations. Pieces of coal into the body. Brown and brown-black spots surface.		

186.	Sq A2-3	30.61		Spherical shape.one blind perforation. Two grooves in the body. pieces of coal stuck into the body. Brown and brown-black spots surface.		
187.	Sq A2-3	43.12		Spherical shape. Two blind perforations.one deep groove in the body .one of perforation doesn't complete.one cavity full inside with coal. Brown and brown-black spots surface.		
188.	Sq A2-3	35.34		Spherical shape.one deep groove in the body. one cavity points of coal into the body. Brown and brown-black spots surface.		
189.	Sq A2-3	36.50		Spherical shape.one blind perforation.one groove in the body. Pieces of coal stuck into the body. Brown and brown-black spots surface.		

190.	Sq A2-3	32.18		Spherical shape. Two through perforations. Points of coal into on the body. brown and brown-black spots surface.	
191.	Sq A2-3	30.80		Spherical shape.one through perforation.one deep groove in the body. pieces of coal stuck into the body. Brown and black spots surface.	
192.	Sq A2-3	35.64		Spherical shape. one cavity inside with Plenty coal. Brown and brown-black spots surface.	
193.	Sq A2-3	32.96		Spherical shape. Two through perforations.one groove in the body. Brownish-red, brown, spots of the black surface.	

194.	Sq A2-3	37.47		Spherical shape. Four blind perforations. Three grooves in the body. Points of coal into on the body. brown surface.		
195.	Sq A2-3	31.58		Spherical shape.one through perforation. the end perforation their plenty of coal inside. two grooves in the body. brown and brown-black spots surface.		
196.	Sq A2-3	32.97		Spherical shape. Two through perforations.one blind perforation. small points of coal into the body. Brown and brown-black spots surface.		
197.	Sq A2-3	28.71		Spherical shape. Two through perforations.one blind perforation.one deep groove in the body and Connected with one of the perforations. pieces of coal stuck around the perforations. Brown and brown-black spots surface		

198.	Sq A2-3	33.14		Spherical shape. Two through perforations. Light charcoal effects on the surface. brown and brown-black spots surface.		
199.	Sq A2-3	31.36		Spherical shape.one blind perforation. Brown and brown-black spots surface.		
200.	Sq A2-3	28.35		Spherical shape.one through perforation. Small cavity with little coal. brown and brown-black spots surface.		
201.	Sq A2-3	36.01		Spherical shape.one through perforation. Small cavity.one deep groove in the body and one groove connected with one of the perforations. Coal fossilized appears on one of the surfaces. Brownish-red, brown, spots of the black surface.		

202.	Sq A2-3	31.35		Spherical shape.one blind perforation. Small points of coal into the body. brown and brown-black spots surface.	
203.	Sq A2-3	the radius are: 12.5 mm		8 spherical pieces, some showing brown and other Brown smooth surface with large dark brown stain probably due to the firing process	
204.	Sq A2-3	the radius are: 15 mm		12 spherical pieces, some showing brown and other Brown smooth surface with large dark brown stain probably due to the firing process	
205.	Sq A2-3	the radius are: 17.5 mm		11 spherical pieces, some showing brown and other Brown smooth surface with large dark brown stain probably due to the firing process.	

Appendix 4: Photos of Lithics

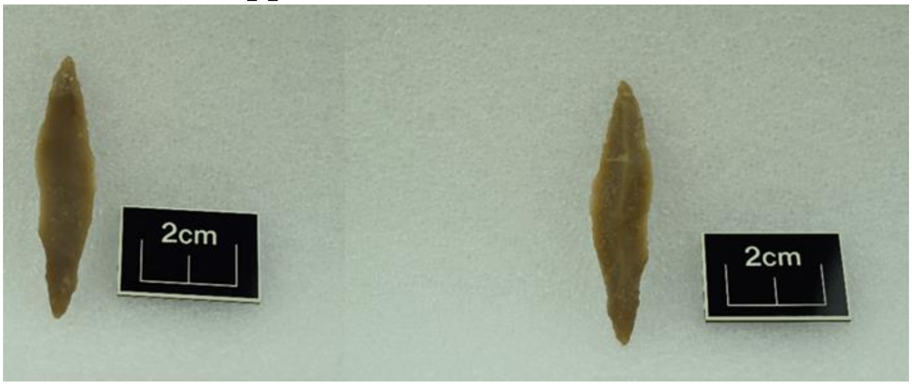


Figure 0.1: Bificial piece from Sq A2-1

Figure 0.2: Bificial piece from Sq A2-1

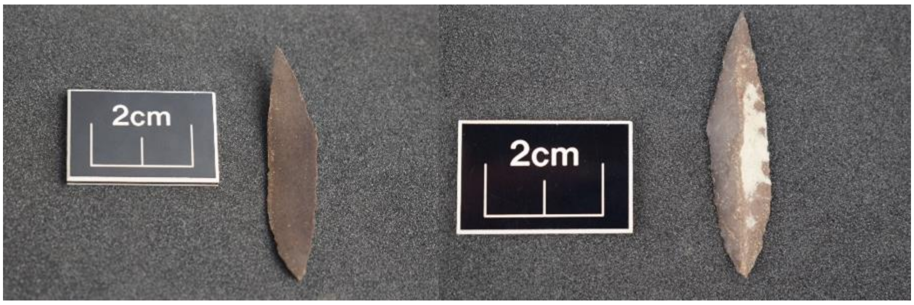


Figure 0.3: Bificial piece from Sq A2-1

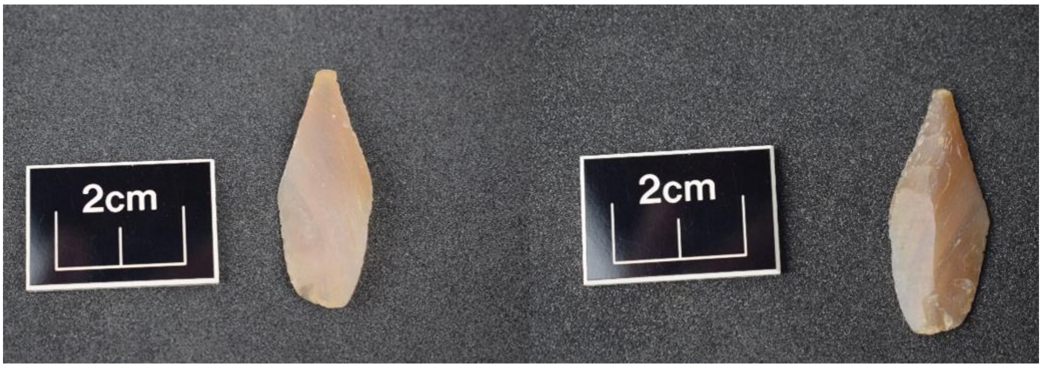


Figure 0.4: Bificial piece from Sq A2-1

Figure 0.5: Bificial piece from Sq A2-1

Figure 0.6: Bificial piece from Sq A2-1

Figure 0.7: Backed Piece from Sq A2-1

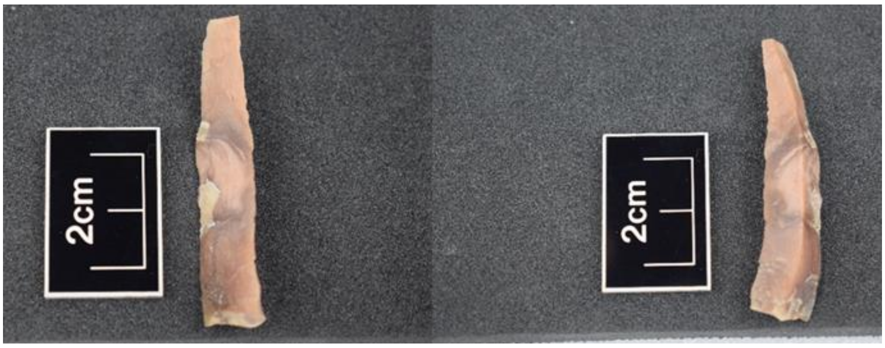


Figure 0.8: Backed Piece from Sq A2-1

Figure 0.9: Backed Piece from Sq A2-1

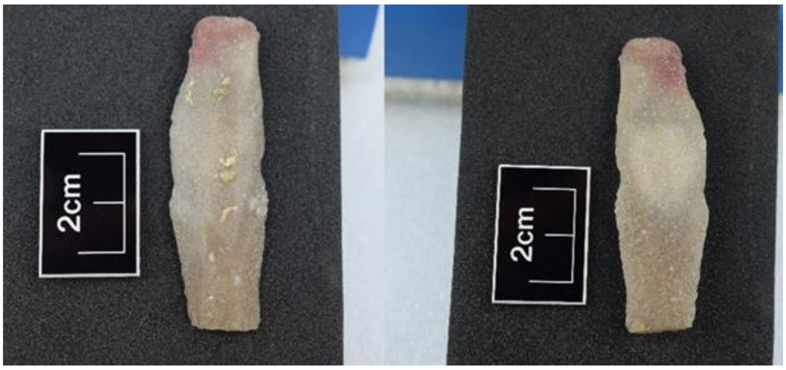


Figure 0.10: Backed Piece from Sq A2-1

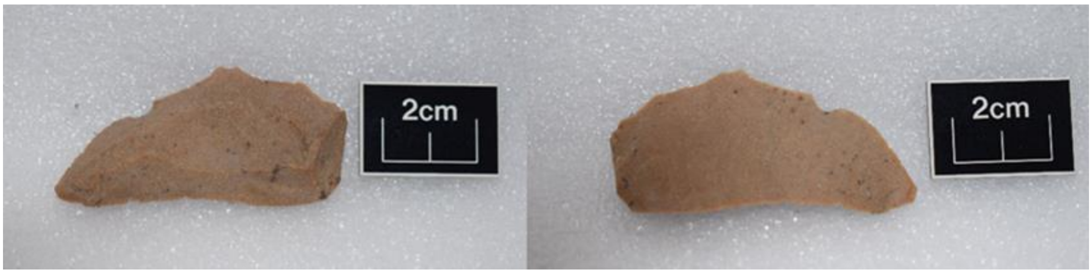


Figure 0.11: Notch Piece from Sq A2-1

Figure 0.12: Denticulate Piece from Sq A2-1

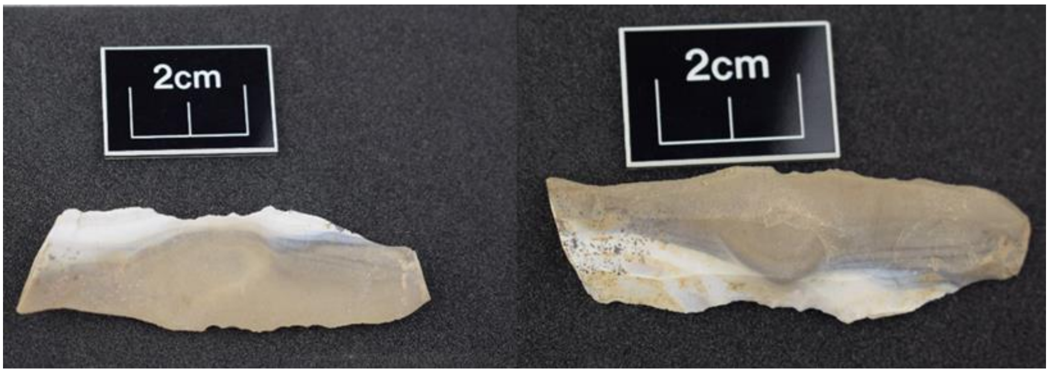


Figure 0.13: Denticulate Piece from Sq A2-1

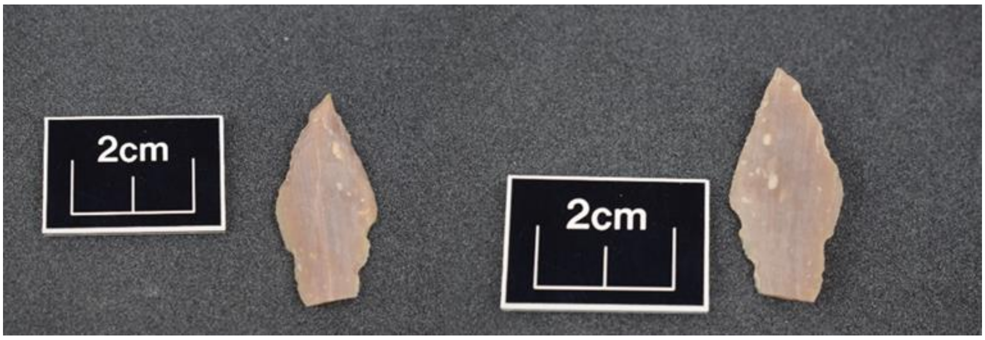


Figure 0.14: Arrowhead Piece from Sq A2-1

Figure 0.15: Burin Piece from Sq A2-1

Figure 0.16: Backed Piece from Sq A2-2

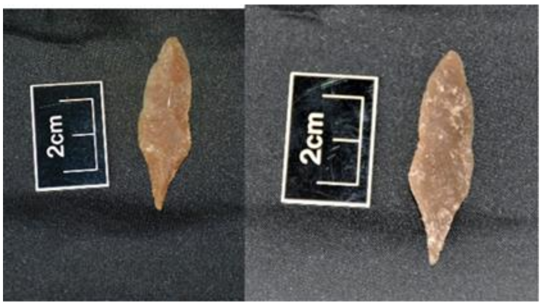


Figure 0.17: Arrowhead from Sq A2-2

Figure 0.18: Bificial piece from Sq A2-3

Figure 0.19: Bificial piece from Sq A2-3

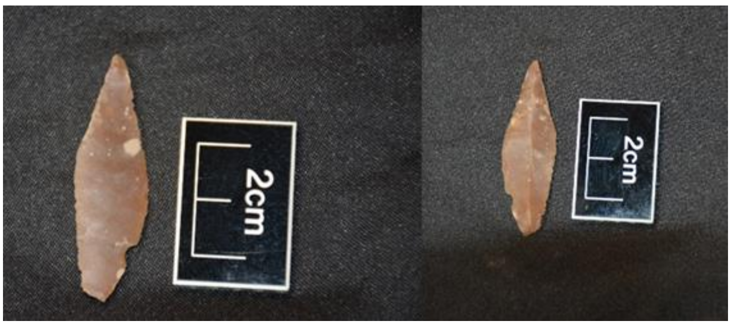


Figure 0.20: Bificial piece from Sq A2-3

Figure 0.21: Backed Piece from Sq A2-3

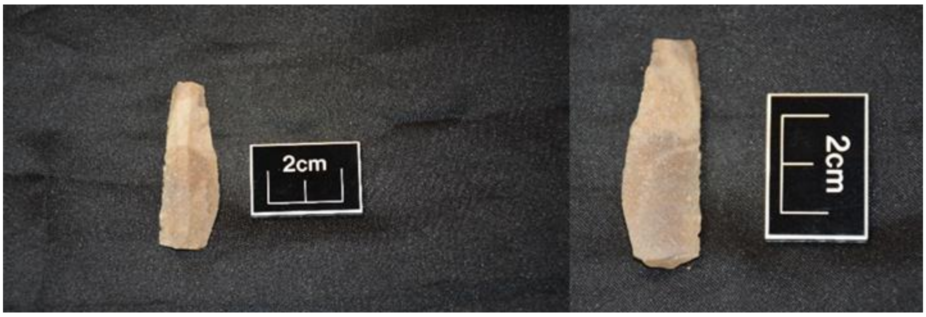


Figure 0.22: Backed Piece from Sq A2-3

Figure 0.23: Backed Piece from Sq A2-3

Figure 0.24: Denticulate Piece from Sq A2-3

Figure 0.25: Denticulate Piece from Sq A2-3

Figure 0.26: Denticulate Piece from Sq A2-3

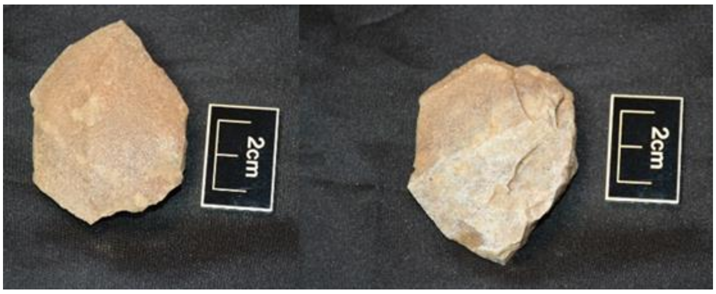


Figure 0.27: Scrapers Piece from Sq A2-3

Figure 0.28: Scrapers Piece from Sq A2-3

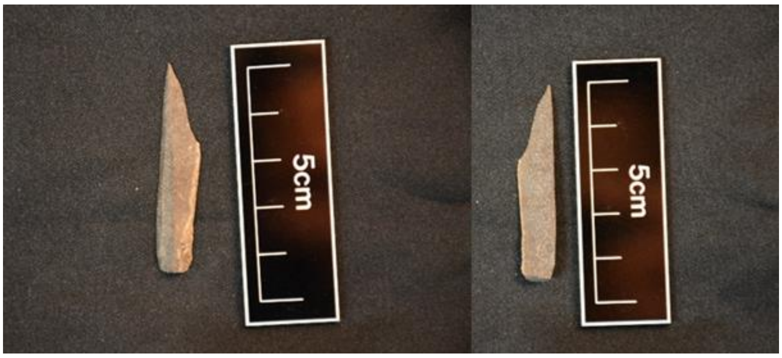


Figure 0.29: Point - Awl from Sq A2-3

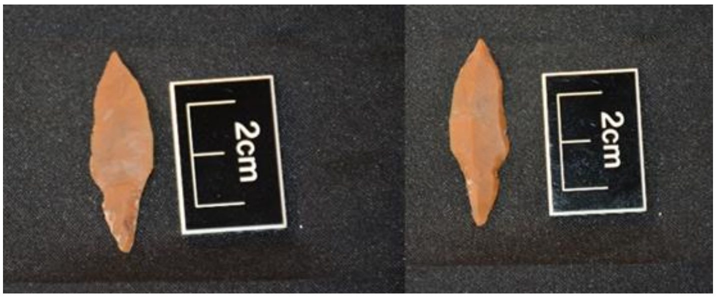


Figure 0.30: Arrowhead from Sq A2-3

Figure 0.31: Hammer from Sq A2-3

Figure 0.32: Hammer from Sq A2-3

Figure 0.33: Querns/Upper from Sq A2-3

Figure 0.34: Querns/Upper from Sq A2-3

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