ROCK ART OF JUBBAH

Exploration into Rock Art and Life at Jubbah, Saudi Arabia: A Cross-Sectional Analysis of the Evolution of the Culture and People as Communicated Through the Artistic Variations

By Mohammed Alghamdi

Master of Archaeology Heritage Management

Flinders University

A thesis submitted in partial requirements for the degree of Master of Archaeology and Heritage Management, Archaeology, College of Humanities, Arts and Social Sciences, Flinders University, August 2023.

DECLARATION

I certify that this thesis does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any university and to the best of my knowledge and belief, does not contain any material previously published or written by another person except where due reference is made in the text.

Name: Mohammed Khalid I Alghamdi

Email: algh0279@flinders.edu.au

Date: 27 August 2023

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ABSTRACT

Rock art is a valuable source of data in archaeology. As a reflection of particular time periods in the past, it allows for the analysis of unique cultural traditions and helps historians examine past events through the perspectives of particular communities. Engravings not only depict certain events and processes but also demonstrate how they were perceived by people, thus offering a valuable account of how people's world views have shifted over time in different locations. The current thesis is dedicated to a critical analysis of 43 motifs engraved on three panels at Jubbah. The author applied the research philosophy of pragmatism, the pedestrian survey design, and the method of thematic analysis to examine relevant features of motifs, investigate the themes of these motifs in light of the relevant historical period, and explore the implications of the motifs and themes for understanding pertinent social, economic, and cultural processes related to Bedouin tribes. It was found that the panels were created during the period between the sixteenth and nineteenth centuries. The themes identified in the study mostly revolve around military issues and camel raiding activities. The motifs provide unique insights into the military tactics used by Bedouin tribes, the role of early firearms in disrupting the nature of warfare, and the involvement of dogs in battles. The thesis offers a critical analysis of the themes in light of the literature review's findings. The study's results made a substantial contribution to academic research by confirming the significance of camel raiding practices for Bedouin tribes, providing new information about the limitations of matchlocks in encounters with cavalry units, and offering new areas for further research, such as the role of dogs in reducing the military advantage of equestrians.

Keywords: Jubbah rock art, pedestrian survey design, historical methodology, matchlocks, Bedouin tribes.

ACKNOWLEDGEMENTS

I would like to express my deepest gratitude to my academic supervisor, Dr Daryl Wesley, for his unwavering support, guidance, and expertise throughout the entire journey of completing this master's thesis. His profound knowledge, insightful feedback, and dedication to my academic growth have been invaluable, and I am genuinely grateful for his mentorship.

I would also like to extend my sincere appreciation to Professor Heather Burke and all the esteemed faculty members of Flinders University Archaeology Department. Their expertise, encouragement, and constructive input have significantly shaped the direction and quality of this research. I am indebted to their commitment to fostering a stimulating academic environment. I would like to thank Ms Iolanthe Sutton for her patience and time in reviewing our draft thesis chapters.

Furthermore, I would like to acknowledge the immense support and assistance provided by the Heritage Authority in the Kingdom of Saudi Arabia, represented by the Director General of the General Department of Antiquities, Dr Abdullah Al-Zahrani, and the dedicated employees of the authority. Their cooperation, guidance, and willingness to share their expertise have been instrumental in facilitating my visits to the city of Jubbah and exploring its rich heritage. I would also like to express my gratitude to the Heritage Authority branch in Hail and Mr Malik Al-Sulaimi for their support and assistance during my time in Hail.

Special recognition goes to Mr Ahmed Ateeq, responsible for the Heritage Authority branch in the city of Jubbah. His invaluable help, insightful suggestions, and facilitation of my access to the region's heritage sites have greatly contributed to the success of this research. I am sincerely thankful for his support.

Additionally, I would like to acknowledge the immeasurable love, encouragement, and understanding of my wife and friends throughout this academic journey. Their unwavering

support has been a constant source of motivation and inspiration, and I am grateful for their belief in my abilities.

Finally, I would like to express my appreciation to all those who have contributed to this research in any way, no matter how small. Your assistance, feedback, and encouragement have played an integral role in shaping this thesis.

In conclusion, I am deeply grateful to the individuals and organizations mentioned above, as well as to everyone else who has supported me along the way. Your contributions have been invaluable, and I am honoured to have had the opportunity to work with such remarkable individuals and benefit from their guidance and support.

CHAPTER 1: INTRODUCTION

1.1. Overview of the Study

Rock art provides archaeologists with an opportunity to explore the unique world views, values, attitudes, and cultural characteristics of communities from different historical periods. Whereas written records of the past are often unreliable and inconclusive, engravings made on rocks serve as a unique avenue for delving into the minds of people from the past in an attempt to understand how they viewed reality. A number of studies illustrate that rock art is an important source of data that could be valuable in many different contexts (Dobrez 2016:143; Guagnin et al. 2017:138-152; Malla 2021:14). For this reason, research papers dedicated to the interpretation of rock art are becoming increasingly popular.

The importance of rock art from an archaeological perspective can be understood by examining its significance in terms of cultural expression, symbolism, preservation of historic heritage, and insights into the connection between different societies. Unlike historical records, engravings on rocks are visual representations of beliefs and ideologies, something that might be hard to capture when trying to interpret past events through modern lenses. The ways in which rock art describes social structures, ceremonies, mythology, and rituals not only provide information about specific activities in which communities engaged but also highlight their significance from the perspective of their authors (Jennings et al. 2013:666). The accurate interpretation of rock art offers an avenue for exploring the cosmological worldview of communities and their cultural fabric. Another critical advantage of rock art within the context of archaeology to its crucial role as a source of data about past societies that have not left any other records of their activities. Jubbah rock art sites, is a prime example, providing valuable information about the lives of communities that resided in the region around 6,000 years ago (Guagnin et al. 2017:138-152). Rock art can also help

archaeologists and historians better understand the ways in which past societies interacted with each other. For instance, similarities in rock art patterns that could be observed in Saudi Arabia, Algeria, Libya, and Egypt show that nomadic tribes apparently covered large territories across the MENA region, which resulted in the process of cultural diffusion (Heide 2011:331-382). These arguments all demonstrate the importance of rock art as a source of archaeological data.

Rock art is one of the most important parts of the country's historical heritage and one of the country's main cultural attractions for people visiting Saudi Arabia. These sites provide unique insights into the life of people from various historical periods and include many different styles ranging from petroglyphs to pictographs. These artworks portray numerous aspects of life in the past, shedding light on fighting and hunting activities as well as the religious rituals of different communities. There are currently many different rock art sites in the Kingdom, which usually can be found in remote regions. Jubbah and Shuwaymis, for instance, are examples of UNESCO World Heritage sites offering many rock art panels with numerous motifs.

The current study is dedicated to a critical analysis of three rock art panels located in Jubbah. This complex is known as one of the world-historic sites of UNESCO (Al-Tokhais and Thapa 2020:103). Panels that could be found in Jubbah describe multiple scenes from different historical periods. This research focuses on three panels involving 43 motifs that the researcher has recorded during field research at the site. Using an inductive research approach, the current study seeks to conduct a critical analysis of these motifs in an attempt to draw meaningful conclusions that could advance scientific knowledge of the relevant historical period. With the help of the pedestrian survey and the paradigm of historical methodology, which requires scholars to determine the context in which the art was made (Dobrez 2016: 143), the researcher examined the significance and meaning of the motifs.

Therefore, the current research revolves around the analysis of 43 motifs from three rock panels at Jubbah within the paradigm of historical methodology.

The motifs examined in this research were created during the period between the sixteenth and nineteenth centuries and raise many important themes. Most of them depict people who are engaged in fighting or hunting activities, with many engravings depicting small-scale or large-scale battles in which horsemen with a lance are trying to defeat the infantry equipped with firearms. The size of the motifs, the number of soldiers, and the outcomes of battles provide unique insights into the military tactics employed by Bedouin tribes living in the region (Lange 2016:45). Some of the motifs could be interpreted in many different ways, as they might show skirmishes between different parties, such as the Saudi dynasties, Bedouin tribes, and even the Ottoman Empire (Almogren 2020:1-15; Rich and MacQueen 2017:111). While all the engravings have been created between the sixteenth and nineteenth centuries, the presence of advanced firearms that could be used while riding a camel in the third panel suggests that the pictures on this panel were created in the eighteenth or nineteenth centuries. In addition to fighting scenes, the motifs also illustrate the process of camel chasing. Similarly, to the pictures of battles, the pictures of chasing scenes also might be interpreted differently, as they could describe the camel raiding rather than camel hunting practice. These activities hardly changed dramatically over time; therefore, unlike fighting scenes, the pictures of camel chasing barely reflect a chronology. The ambiguity of the chosen motifs and the significant number of details that can be retrieved from their analysis make these engravings interesting artefacts for an archaeological study.

1.2. Research Questions and Objectives

This study will answer the following research questions:

1. What are the main features of the motifs from the rock art panels?
2. What are the key themes relevant to the motifs?

3. What is the approximate dates of the engravings?
4. What meaning could the motifs have in light of this historical period?
5. What are the most important insights that the motifs provide on the culture, society, and economy of communities living in the region?

The main research objectives of the study are as follows:

- To conduct a critical analysis of the relevant features of motifs that could be found on the chosen rock art panels;
- To examine the themes of these motifs in light of the relevant historical period;
- To investigate the implications of the motifs and the themes for understanding pertinent social, economic, and cultural processes related to local Bedouin tribes.

1.3. Background Information of Jubbah Rock Art Site

Rock art in the Hail region in Saudi is highly popular as a valuable source of data for archaeological studies. It was included in the UNESCO List of World Heritage Sites owing to the presence of numerous rock art engravings offering unique insights into the lives of different communities (Guagnin et al. 2017:138). It is commonly believed that Lady Anne Blunt and her husband Wilfrid were among the first Westerners to have seen rock art in the oasis of Jubbah. Following a set of archaeological studies dedicated to Jubbah rock art, this site gained a reputation as one of the most important archaeological sites in the world. According to Zarins, “pound for pound and piece for piece, in terms of rock art concentration and importance, Jubbah is the number-one or number-two site in the whole of the Middle East… with the art going back at least to the Pottery Neolithic period 7000 to 9000 years ago, and with paleo-environment and geology showing traces of human activity extending into the Middle Paleolithic period, it’s a treasure trove for answering questions about the Middle East” (Arabian Rock Art Heritage 2023). There is currently a consensus among scientists that Jubbah offers a unique set of artefacts that are of significant historical value.

The preservation of rock art panels with distinctive motifs in Jubbah is connected with its unique geomorphological features. The long-term exposure to high temperatures and aridity led to the exsiccation of a lakebed present and the erosion of rocky landscape features in the region. As rocks became weaker, distinctive morphologies emerged, although it should be noted that some of the towers were destroyed as a result of the weakening lower layer (Rosenberg 2011:1-30). As this lower layer weakened, it apparently started to erode, resulting in the loss of support for upper layers and triggering the collapse and disintegration of the towers. These processes led to the appearance of the symbolic landscape with multiple panels that served as a canvas for numerous authors. The geomorphological features described above are vital for comprehending the uniqueness of Jubbah as a world heritage site.

Many scholars have conducted studies dedicated to its critical analysis. The majority of these research papers focus on the collection of Neolithic rock art providing detailed information about the beliefs, customs, and habits of people living in this region (Guagnin et al. 2017:141; Jennings et al. 2013:666). Rock art objects located at Jubbah could be regarded as a unique source of valuable information allowing historians to close gaps in the knowledge of ancient people by exploring their artistic expressions and interpreting their meaning within the relevant historical context. The absence of written records from that time dramatically increases the value of Neolithic rock art panels as a source of historical data. Multiple engravings describe human activities, uncover some of their beliefs, and even shed some light on the popular fashion styles of communities living in the region in ancient times. Similarities between Jubbah rock art and rock art objects found in Algeria, Egypt, and Libya show the long distances covered by pastoral nomads and the expansion of their customs, traditions, and beliefs across the Middle East and Northern African (MENA) region (Heide 2011:331-382). Neolithic rock art is widely believed to be the most important part of the collection of art objects at Jubbah.

At the same time, Jubbah rock art does not exclusively include Neolithic engravings. Many pictures that could be found in this region were drawn later. In particular, some of them were created after the sixteenth century, which could be assumed based on the fact that they depict fighting scenes that involve firearms (Guagnin et al. 2017:140-150). It seems justified to assert that engravings from other historical periods also could be a valuable source of data in archaeology and history. In particular, engravings from the sixteenth-nineteenth centuries illustrate the process of camel herding, show the adoption of firearms in the region, and offer information about fighting tactics and strategies adopted by Bedouins (Guagnin et al. 2017:148; Jennings et al. 2013:666; Khan 2013:454; Macdonald 1990:24-28). Whereas the history of Saudi dynasties and the Ottoman Empire, which were both active on the Arabian Peninsula, has been documented in numerous historical texts, the activities and customs of Bedouin tribes have not received such a substantial amount of attention in academic research. Therefore, rock art depicting scenes from the lives of these tribes can close certain gaps in the knowledge of these communities and help us to understand their worldview. In general, the available evidence provides a compelling reason to believe that any rock art object found at Jubbah is likely to have a significant historical value regardless of the specific date when it was created.

CHAPTER 2: LITERATURE REVIEW

2.1. Rock Art and Archaeology of the Saudi Arabian Peninsula

Archaeology plays a crucial role in interpreting the life and culture of past societies, offering valuable insights into the identity and characteristics of communities that inhabited a particular region. One form of archaeological evidence that provides unique perspectives is rock art, which refers to human-made markings found on naturally occurring rock surfaces. Its significance is exemplified in the studies conducted by Bednarik and Khan (2017:179), who have explored various rock art sites.

One remarkable example is a rock art complex located in the northern region of Saudi Arabia. This complex, situated between two prominent boulders, has been recognised by UNESCO as a world-historic site since 2015 (Al-Tokhais and Thapa 2020:103). It features a sizable gallery of pictograms that exhibit distinctive characteristics specific to the Arabian Peninsula. Radiocarbon dating estimates the age of this rock art to be approximately 6000 years, further emphasising its historical value (Bednarik 2017:45). Notably, within this expansive rock art complex lies the Shuwaymis Petroglyph, which houses the largest collection of colossal Neolithic rock art. Its discovery in 2015 has significantly contributed to our understanding of ancient artistic expressions prevalent in the region.

Another significant rock art complex was discovered in 2017, as documented by several scholars. Located between Jubbah to the north and Shuwaymis to the south, this site is difficult to access, tucked away in the middle of the desert (Bednarik and Khan 2017:149). Its isolation and limited accessibility have played a role in preserving the art, as it can only be reached by helicopter or camel-drawn desert travel.

In addition to these sites, another notable rock art complex in Saudi Arabia is the Al-Misma rock art at Mount Jabal Fardat Shamous and Mount Jabal Umm Burqa. Bednarik and Khan (2017:179) describe these two mountains as separated by a 4 km long sand desert.

While a smaller rock outcrop remains empty, a flat plateau in the area contains a number of stone buildings. Two sizeable buildings (40m wide x 160m long) have features consistent with pre-Thamudic burial complexes found elsewhere (Charloux et al. 2022:1301). The Al-Misma rock art complex also features numerous grave cairns, some arranged randomly while others are organised mathematically. Additionally, there is a circle and a central grave mound near the tip of one of the largest rectangles.

However, it is important to note that treasure hunters disturbed the graves within the Al-Misma rock art complex sometime after they were established. The main pictograms in this complex consist almost exclusively of petroglyphs, which is a rare pattern for the region's rock art (Bednarik and Khan 2017:149). The Shuwaymis and Al-Misma rock art complexes at the sites of Umm Burqa and Fardat Shamous, respectively, have significantly expanded our understanding of the rich rock art heritage present throughout the Saudi Arabian Peninsula (Bednarik and Khan 2017:149). They feature extensive rock art depictions characterised by cultural diversity and a variety of themes and motifs.

2.2. An Overview of the Main Phases of Human Occupation throughout Saudi Arabian History

Saudi Arabia has a rich history of human occupation. It is believed that the changing climatic conditions in Saudi Arabia during the Paleolithic era played a significant role in regulating human patterns of occupation in the region. While the arid climate of Saudi Arabia generally had a negative impact on human populations, Pleistocene archaeological evidence suggests that humans were drawn to areas experiencing higher monsoon rainfall. Bretzke et al. (2022:1) present data from Jabal Faya in Southeast Arabia, which indicates four distinct stages of human occupation between approximately 210,000 and 120,000 years ago. The evidence of human presence in the region predates any evidence of human occupation in either Australia or the Americas.

This archaeological evidence is further supported by records from Saudi Arabia, Oman, and the United Arab Emirates, as well as the synchronicity of peak humid conditions between approximately 130,000 and 75,000 years ago. Evidence of human occupation during wetter periods has been found between 240,000 and 190,000 years ago, with similar findings reported in Saudi Arabia, Yemen, and Oman between 60,000 and 50,000 years ago. However, there is no evidence from Nefud that the climate influenced human occupancy between 55,000 and 5,000 years ago. Additionally, due to the arid conditions between 190,000 and 130,000 years ago, there is no proof of human occupation in Saudi Arabia during that time.

The lack of substantial archaeological evidence makes the study of the Pleistocene human population in Arabia largely speculative. The abandonment of settlements in Arabia and the decline of the Arabian race can be attributed to human occupation during dry seasons in Saudi Arabia (Bretzke et al. 2022:1). According to some experts, desiccation led to the concentration of the human population in refuge areas such as the Dhofar Mountains, the Gulf Basin, and the Red Sea coastal plains. However, finding concrete evidence of fossils and artworks is challenging as most of these refuge zones are currently submerged.

2.2.1. Pleistocene Occupation

The Arabian Peninsula played a crucial role in the spread of hominins during the Pleistocene era. According to Groucutt et al. (2015:215), the discovery of middle Paleolithic archaeological sites in Saudi Arabia's Nefud Desert provides evidence of hominins venturing deep inland. These populations migrated towards the interior of Arabia, following the network of rivers and lakes. Examining sites from the Middle Palaeolithic, which are located near the temporal and geographic separation between Homo sapiens and Neanderthals, offers insights into the demographic dynamics and behaviour of late Pleistocene hominins. Groucutt et al. (2015:215) report that the hominins eventually settled in the late Pleistocene site of

Jebel Katefeh-1 (JKF-1) in the Nefud Desert near Jubbah, close to a paleolake. However, the assemblage reveals that their occupation of the area was relatively short-lived.

Lithic assemblages serve as the primary source of information regarding the Pleistocene presence in Saudi Arabia. These assemblages can be distinguished by Levantine and Indian components dating to Marine Isotope Stage (MIS) 5 and centripetal Levallois reductions. While fewer than 10 Late Pleistocene archaeological sites have been excavated and chronologically dated with varying degrees of accuracy throughout the expansive Arabian Peninsula, which spans approximately three million square kilometres (Groucutt et al. 2015:220), the majority of middle Paleolithic sites consist of surface assemblages. This suggests that eastern and southern Arabia were densely populated during the Pleistocene. Furthermore, intact Pleistocene deposits can be found in the Mundafan Basin's southwestern margin. The Empty Quarter region establishes a connection between climatic and environmental changes and human habitation in the area. It is plausible that Pleistocene inhabitants focused their activities around water sources.

2.2.2. Holocene Occupation

During the early and middle Holocene, the Arabian Peninsula exhibited significantly higher levels of humidity compared to the present day. This period was characterised by a minimum of 300mm of annual rainfall, creating favourable conditions for agriculture. Various karstic pools, such as those found in Aflaj, Jabrin, and the Al-Hasa oasis in Qatif, contributed to the moist atmosphere that prevailed across the region roughly 6,000 to 1,000 years ago. Parker et al. (2006:243) present evidence from relict lakes scattered throughout the Arabian Peninsula, which were surrounded by people engaged in agricultural activities where the need for water influenced settlement patterns. Examples include the Dhamir region in Yemen, the Al-Hawa area in Yemen, the Mundafan area in southern Saudi Arabia, the Awafi area in Ras al-Khaimah, United Arab Emirates, the Nafud area in northern Saudi Arabia, and

the Mundafan area in Saudi Arabia. However, our knowledge of the Neolithic period in the Arabian Peninsula remains limited.

Towards the end of the Neolithic period, aridification led to the discovery of abandoned sites in Oman and the United Arab Emirates. The aridity forced herders to relocate to coastal areas in search of water and pasture for their animals. While populations in the western, northern, and central parts of Saudi Arabia were relocated after 3000 BC, during the Bronze Age, we still have limited information on how they adapted to the arid environment (Guagnin et al. 2017:140). Notably, places like Mundafan, Jubbah, or Tayma still had access to fresh water during the Early Holocene. The specific timing of dry periods remains uncertain, and the extent to which the large paleolakes in the interior of Saudi Arabia served as refuge hubs at the end of the Neolithic era is yet to be determined.

2.2.3. Bronze Age

The transition from the Umm An Nar period (2700–2000 BC) to the Wadi Suq period (2000 to 1300 BC) during the Bronze Age has been a subject of intense debate among archaeologists. This era was characterised by a shift back to a mobile way of life, the abandonment of villages, and the departure from palm groves. In the latter part of the third millennium, south-eastern Arabia experienced significant changes. By the early second millennium, extreme climatic conditions disrupted regional trade networks and led people to leave the cities of Umm An Nar, forming smaller mobile villages (Zacharias, 2014). However, these communities quickly adapted to the changing climate during the Wadi Suq era.

Dispersal during the Bronze Age was driven by both cultural and climate changes. Professor Gregoricka from the University of South Alabama suggests that the Bronze Age inhabitants of Saudi Arabia successfully adapted to their surroundings (Zacharias 2014). She analysed teeth from 32 individuals found in the Shimal necropolis, located 8 kilometres

northeast of Ras Al Khaimah. Stable isotopes of carbon, oxygen, and strontium in the remains provided insights into migration patterns, trade networks, and dietary practices and suggest that…Around 2200 BC, the Saudi Arabian Peninsula experienced a period of extreme aridity, possibly leading people to abandon Umm An Nar settlements due to scarcity of food and water. It is also plausible that migration occurred to avoid societal unrest and conflicts. Earlier studies suggest that southeastern Arabia lost its trading dominance to Dilmun around 2000 BC due to a decline in copper mining (Zacharias 2014). As a result, the Bronze Age left few traces of daily life but left behind impressive graves.

2.2.4. Iron Age

In the contemporary Saudi Arabian Kingdom of Tyma, an early archaeological complex dating from the eleventh to the ninth century BC was discovered during excavations (Renzi et al. 2016:237). Known as Tayma, this Iron Age complex is situated in a level area of southwest Qraya and is believed to be the site of the first Saudi Arabian settlement. Archaeologists uncovered several inventories belonging to the buildings within the complex, along with a variety of artefacts. Among the findings were unusual ceramic vessels, copper, iron, and gold objects (Renzi et al. 2016:237). The excavation also yielded tokens, combs, faience figurines, ivory, vessels, and amulets, some of which were thought to have originated from Egypt (Guagnin et al. 2015:7). Fragments of miniature engraved bone plaques, inlays, and engraved wooden furniture were also discovered. While the precise purpose of the complex remains unknown, the excavations have revealed its significance during the Iron Age.

Moreover, the excavations in Area O of the complex uncovered over 120 iron-age metal artefacts, of which 74 copper-based artefacts underwent alloy examination (Renzi et al. 2016:239). Among the recorded metal fragments were sheet shards, rivets, melting droplets, and amorphous lumps. However, the corrosion of these twisted metals has obscured any

evidence of their composition. Nonetheless, two major metal groups were identified. The first group consisted of copper artefacts, including lead and tin shards. The second group revealed the presence of nickel, cobalt, lead, tin, iron, and their alloys. Notably, the early Iron Age Tayma displayed a limited presence of bronze (Renzi et al. 2016:239).

2.2.5. Jubbah

Another significant archaeological site, Jubbah in Saudi Arabia's Hail region, was designated as a UNESCO World Heritage Site in 2015 due to its rock art spanning 10,000 years of Saudi Arabian history (ARAB NEWS 2022). Jubbah comprises two distinct areas: "Jabel Umm Sinman" situated 90 kilometres northwest of Hail City and "Raat at Shuwaymis" and "Jabal al-Manjor" located 250 kilometres south of Hail (ARAB NEWS 2022; Ibrahim et al. 2021:3). The rock carvings found at these sites provide valuable insight into ancient Arabian societies and their encounters with natural disasters.

The uniqueness of the rock art in Saudi Arabia's Hail region lies in its recognition by UNESCO and its ability to shed light on the cultural heritage and challenges faced by ancient Arabian civilisations. For instance, the Shuwaymis petroglyphs serve as a comprehensive record of a civilisation that perished, offering exceptional testimony to its existence (ARAB NEWS 2022). Saudi Arabian rock art sites allow for examining the nation's rich cultural past and gaining valuable insights into the country's history.

2.3. Climate Changes and its Effects on People

Over the past 12,000 years, Saudi Arabia has witnessed significant climate shifts, leading to adaptations in economic and cultural practices to cope with changing environmental conditions. Historical evidence reveals that ancient southern Arabian droughts, which happened approximately 5,000 – 6,000 years ago, triggered a decline in inland habitation as people migrated to the cooler coastal regions, resulting in profound social

transformation (Almazroui 2020:1). Furthermore, research from northern Arabia suggests that during the Holocene, people responded to droughts by implementing water resource management strategies, adopting a highly mobile lifestyle, and modifying their economic systems (Almazroui 2020:1).

The impact of climate change on the population of the Saudi Arabian Peninsula during the Holocene was particularly significant. Following the aridity of the last glacial maximum, rainfall increased rapidly 10,000 years ago, leading to enhanced vegetation growth and the formation of paleolakes during the Holocene Humid Period (HHP) (Dinies et al. 2015:300). However, aridity resurfaced around 6,000 years ago, resulting in the prevalence of desert conditions that persist in Saudi Arabia today (Dinies et al. 2015:300). Archaeological evidence indicates that the HHP was notably shorter in northern and southern Arabia compared to the southern section, where it ended abruptly. Consequently, many archaeological studies in Southern Arabia focus on understanding the impact of environmental changes on human demographics and cultural traditions (Almazroui 2020:5). Reconstructing population changes often relies on radiocarbon dating, which provides valuable insights into the transition from the Holocene to the Neolithic period around 8,000 to 8,200 years ago, coinciding with the onset of climate decline. This transition facilitated the shift from hunting and gathering to herding, and the increase in humidity in the Northern Peninsula around 8,000 years ago further stimulated the Neolithic occupation of Southern Arabia (Petraglia et al. 2020:8265). The cooler environment also contributed to the establishment of herder-fisher villages in the Eastern Arabian Peninsula.

Another rapid transition from cold temperatures to drought between 7,500-7,200 and 6,500-6,200 years ago led to a decline in human habitation in the Arabian Peninsula. However, the coastal districts, connected through a maritime commercial network that linked foragers in Arabia with nomadic pastoralists, were less affected by these climate changes

(Guagnin et al. 2018:730). In contrast, the number of agricultural settlements increased in the Mesopotamia region during this period. The dark millennium marks the abrupt end of Arabian dominance, where the population faced prolonged and unfavourable conditions at the beginning of the middle Holocene.

2.4. Paleolakes, Freshwater Lakes in Jubbah

Situated in the middle of the Nefud Desert, Jubbah lies within the basin of a paleolake, located about 400 miles northwest of Riyadh (Petraglia et al. 2011:1556). Over time, climatic changes have rendered the basin incapable of storing water, with the old lakebed now lying several hundred feet below the nearby dunes. However, in the past, Jubbah Lake served as a crucial freshwater source before the Arabian Peninsula transformed into a desert. Its strategic location allowed for groundwater recharge, enabling the lake to retain fresh water even as the surrounding area became increasingly arid. This highlights the dependence of animals and humans on the proximity of the basin for survival.

The northern side of Jubbah was bounded by dunes that formed a highway route once traversed by caravan traders. The presence of the lake facilitated irrigation, which was a primary human activity in the area. The existence of the Jubbah paleolake can be attributed to a peculiar feature of the local terrain. A prominent sandstone formation rises abruptly from the desert floor on the west side of the lake basin, reaching a height of 1,300 feet. This mountain, which guarded the lake in the past, now offers protection to the oasis community. Although the dark rocks are regularly battered by strong westerly winds, the basin remains unaffected. Academic research reveals that the northwest region of Nefud once hosted a 2,000 square Km perennial lake (Rose 2022:57), indicating widespread lake formation during the late Quaternary interglacial period.

The Jubbah paleolake is connected to the Jebel Sataihah Basin, which forms a larger part of the extensive Endorheic Depression. The eastern flanks of Jebel Sataihah are shielded

from the westward flow of sand by the Jebel itself. The paleolake consists of sandstone quartzite pavements that have weathered to an elevated level.

Another significant lake in Saudi Arabia is Dumat Al Jandal Lake, located near Al-Jouf. The lake, covering 2,500 hectares, was drained between 1983 and 1984 and subsequently converted into agricultural land (Petraglia et al. 2020:8267). Petroglyphs depicting hunting scenes provide evidence of the lake's significance as a hub for early human activity. Initially known as Al-Jouf Paleolake, Dumat Al Jandal has yielded bone tools dating back at least 750 years, attesting to the presence of early human settlements in the region.

2.5. Domestication of Goats and Sheep

Sheep were among the earliest animals to be domesticated by humans, with domestication occurring in Asia between 11,000 and 8,000 BC. The domestication of sheep was driven by their non-violent behaviour, sociability, early sexual maturation, manageable size, and high reproductive rates. Both meat and wool played significant roles in the desire to raise sheep and goats in Asia and Europe (Chessa et al. 2009:532). The archaeological record indicates that the deliberate selection and breeding of woolly sheep began in Iran around 6000 BC, with the first woven wool clothing dating back to 5997 BC. Previously, sheep were primarily utilised for meat, milk, and skin. However, the development of wool production proved beneficial for herders in cold climates. Archaeological data reveals the presence of sheep bones and teeth near the Paleolake of Jubbah.

In Saudi Arabia, animal domestication can be traced back to the sixth millennium BC. The local population adopted domesticated goats, sheep, and cattle as part of the transition from food gathering and hunting to food production (Chessa et al. 2009:532). This transition was crucial for subsistence in desert areas characterised by unpredictable pastures and water availability. In Saudi Arabia, inhabitants engaged in gathering, fishing, and hunting activities in the heart of the Arabian Peninsula and along the Arabian Gulf coast. The cattle species

underwent changes over time as they dispersed to different regions and interbred with other fishers and pastoralists. However, it remains uncertain whether Saudi Arabians practised intensive animal husbandry or adopted the complete "Neolithic pastoralist package" involving a mixed goat, sheep, and cattle herds.

2.6. Rock Art Production in Saudi Arabia

Initially, archaeologists did not expect to find remnants of the culture of nomadic pastoralists living in inhospitable deserts until the discovery of archaeological sites in the Saudi Arabian Peninsula. The investigation of rock art by the Saudi Department of Museums challenged earlier theories and revealed additional cultural artefacts in the desert rocks (UNESCO 2015). Most Saudi Arabian art depicted various creatures found in the region, including deer, camels, cattle, gazelles, goats, sheep, snakes, dogs, and reptiles. Notably, due to the predominantly desert landscape, there were no depictions of trees, and the only bird represented in the rock art was the ostrich.

Rock art production in Saudi Arabia was limited, with artists selecting animals they considered relevant to their surroundings, omitting less significant creatures. However, the phenomenon of choosing ecologically and environmentally important animals can be observed in rock art from Africa, Europe, Asia, and Australia, suggesting a shared ideological and psychological perspective among artists worldwide (Khan 2013:461). This pattern also points to the importance of specific animals, such as camels, for the local economy. Petroglyphs, including hand motifs, were also prominent in Arabian rock art, conveying special meanings to the artists and their contemporaries (UNESCO 2015). Some figures, such as handprints created by smearing colours over hands, on flat granite surfaces, might have been easier to interpret, although it is possible that they were part of a complex communication system requiring inside knowledge to understand their meaning. In terms of aesthetics, feminine beauty was often depicted with triangular torsos, long necks, small

waists, and large buttocks, indicating strategic and significant artistic choices (Khan 2013:455). Such a representation of female beauty also could be explained by mythology, cultural ideals, social status, and fertility symbols.

The practice of engraving pictures of deities on rocks has a long history in Saudi Arabia and has influenced the creation of rock art. The desert people constructed open-air temples, some of which still stand today, to represent different human beliefs, concepts, thoughts, and the metaphysical universe of the Arabians (Khan 2019: 79). Prior to the advent of Islam, the desert nomads worshipped idols, and the temples they built were eventually buried by sand. Additionally, artists carved images of their idols on high rock surfaces and constructed open-air temples that could withstand sandstorms and shifting dunes.

The Arabian Peninsula has produced enduring rock art, with symbols carved into rocks using stones and tools, making their removal equivalent to destroying the rocks themselves (Andreae et al. 2021:160). These symbols represented tribal affiliations, origins, symbolic meanings, and animal brands. The rock art from Saudi Arabia demonstrates how the country's illiterate culture employed specific coded characters for communication (Khan 2019: 71-79). Although rock art vanished with the arrival of Islam, certain depictions of camels and non-human figures can still be observed among the Bedouin communities.

2.6.1. The History of Rock Art and Its Significance in Saudi Arabia

Saudi Arabia is home to a diverse range of cultural traditions, despite the presence of desolate areas throughout the nation. With over 1500 rock art sites and more than 4000 archaeological sites, the Kingdom showcases a continuous human presence on the Arabian Peninsula from the Acheulian period to the present (Scerri et al. 2021:9). The rock art in Saudi Arabia specifically represents a period spanning from the early Neolithic to the Early Islamic era, providing glimpses of prehistoric creatures and nomadic tribes that once roamed

the Saudi deserts. Moreover, various cultural aspects and dances of Arabia continue to reflect the enduring nature of long-standing Arabian customs.

The rock art found in Saudi Arabia's Arabian Peninsula features a rich array of human and animal figures, as well as geometric and non-representational elements. While there may be some disagreement regarding the relative chronology of these artworks, the general order of phases is widely acknowledged (Huneburg et al. 2019: 215-225). Throughout the Neolithic era, many human compositions were intertwined with animal depictions, with the human-dog figure often associated with bovid species (Jennings et al. 2014:16). The majority of rock sites depict fighting or hunting scenes that involve the use of primitive weapons (Sabra 2018:1-4; Tebes 2021:9-10).

The indigenous art's distinctive characteristics, such as elongated necks and ambiguous human faces, sometimes blur the lines between humans and animals. Saudi Arabia is home to numerous anthropomorphic and zoomorphic symbols, showcasing the artistic expression of the time. The Neolithic art provides evidence of a shared belief system, where all clans, tribes, and social classes seemed to hold a similar perception of a singular breed of domesticated cattle (HUY). However, as the hot and dry Bronze Age progressed, camels gradually supplanted cattle as the dominant livestock.

2.6.2. Rock Art Chronologies

The chronology of rock art in Saudi Arabia remains relatively uncertain. While every open-air rock site in the country showcases chiselled or pecked petroglyphs, only a few themes have been scientifically dated (Khan 2013:457). The earliest phase, known as phase 1, can be attributed to the Neolithic era, as precise dates for these rock carvings are unavailable. In phase 1, the rocks display recognisable animal and human figurines, rendered in low and bas relief, with realistically defined physical features. However, the faces on these figurines are often indistinct and unclear.

During the subsequent chronological period, significant changes occurred in the style of rock art. Large-sized figures with realistic physical features gave way to smaller, schematised representations. Furthermore, triangular or conical-shaped faces replaced the funnel-shaped faces seen in Phase 1. Based on superimpositions, it is evident that rock art style gradually evolved from non-representational and geometric motifs towards more schematic and simplified figures (Khan 2013:454). This marked a new trend in Saudi rock art, characterised by linear and mostly outlined designs.

Phase IV represents a period that predates the introduction of writing and literacy in Arabia (Khan 2013:454). During this phase, signs and symbols took the place of geometric and non-representational motifs. This shift coincided with changes in the Arabian climate, transitioning from a cooler and more humid environment to an extremely hot and arid one during the Bronze Age. As a result, the camel became the dominant animal depicted in rock assemblages. Phase IV thus represents an important era in Arabia just before the development of writing and literacy (Khan 2013:457).

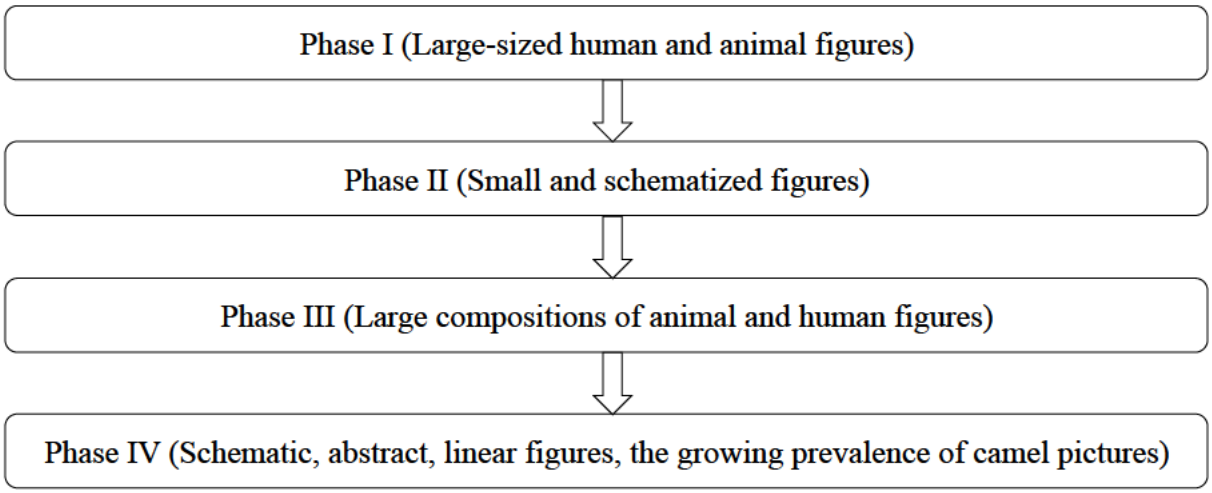

Figure 1. Rock Art Chronologies

2.7. History of Rock Art Research in Saudi Arabia

The extensive rock art research in Saudi Arabia took time to establish. The region's predominantly uninhabited terrain and limited road access throughout the region, make fieldwork logistically challenging, as access to many places is possible only by camel or airplane. Despite this, in 2015, the Saudi Arabian Deputy Minister of Antiquities and Museums initiated a project X to explore the analytical potential of Saudi petroglyphs (Bednarik 2017:45). This study aimed to build upon the earlier work of the Epigraphic Rock Art Survey, seeking to provide a more scientific approach.

Previous investigations conducted by travellers and wanderers, which attempted to decipher the meanings of the rock art, did not use scientific methods making the results questionable, and necessitating further research (Bednarik 2017:45). At the outset of the rock art research project, there was a scarcity of reliable data from the field. Recognising the importance of establishing a chronological framework for Saudi rock art, the Deputy Minister emphasised the need for archaeological development (Bednarik 2017:46). However, most published information about Saudi rock art lacked essential details such as geomorphic surface conditions, site morphology, petrographic descriptions, projected exfoliation rates, weathering rates, and forensic information about the rock art itself (Al-Talhi 2012:92).

The selected sites for investigation and study were organised into three clusters. The first outcrop examined was situated 300 kilometres north of Hail in Saudi Arabia's northern region. The second cluster was located west and southwest of Riyadh in central Saudi Arabia (Macholdt et al. 2018:1497). The third cluster was found in the far north and south of Najran. The majority of the rock locations studied are composed of sandstone. Previous research indicated the presence of rock varnish deposits on the petroglyphs, although the amount varied from site to site (Macholdt et al. 2018:1497). While the study team and deputy

minister collected GPS readings on-site, the precise locations of the Saudi rocks remain unspecified.

2.8. Rock Art Production at Jubbah

Rock art at Jubbah comprises two valuable assets. The first property, Jabel Umm Sinman, is located 90 kilometres northwest of Hail and is surrounded by desert landscapes to the south, north, and west. The eastern edge of the rock art is adjacent to a security fence that lines the Jubbah village. The second property, situated along Wadi al Mukhayet, comprises Jabal Raat and Jabal al-Manjor. It is approximately 250 kilometres south of Hail and 40 kilometres west of Shuwaymis (Bednarik and Khan 2017:180). Both are fortified stone structures situated at the foot of the plateau's escarpments.

These two series of rock features hold significant historical value in Saudi Arabia. The high petroglyph engravings found in the mountains of Jabal Umm Sinman and Jabal al Raat represent distinct rock art traditions dating back 10,000 years (Bednarik and Khan 2017:185). The carvings depict the societal and economic transformations and adaptations made by Saudi Arabians in response to Jubbah's changing climate. Located at the crossroads of Eurasia and Africa, the art depictions provide a pictorial of Jubbah as a hub for the exchange of commerce, technological advancements, cultural values, and beliefs. The earliest rock paintings have endured over time and portray animals such as ibex (Guagnin et al. 2018:730). According to Cleuziou and Tosi (2021:57), the Early Neolithic Arabians held the ibex in high regard, as evidenced by the exaggerated depiction of its horns (Figure 1). However, the Neolithic artefacts have been left behind at campsites near paleolakes for over 6,000 years.

Figure 2. Ibex.

UNESCO designated these properties based on specific criteria. Firstly, the sites feature numerous visually stunning petroglyphs, showcasing human creativity achieved using basic tools like stone hammers (Al-Tokhais and Thapa 2020:103). Moreover, the carvings provide insights into the changing human values within Arabian civilisation over time (Norris and Al-Manaser 2020:450). The monuments in Jubbah depict how ancient communities struggled to survive environmental catastrophes and adapted to them (Bednarik and Khan 2017:180). Ultimately, the carvings depict the intricate relationship between humans and their delicate surroundings within the Saudi site complexes. The vista of rock art in Jubbah is truly spectacular.

Rock art at Jubbah offers valuable insights into the culture of Bedouin tribes. The cultural origins of Bedouins are rooted in prehistory; thus, rock engravings not only show

certain cultural traditions and customs of Bedouin tribes but also illustrate how they have been changing over time. In particular, the practice of group dance that is guided by symmetric movements is an example of a motif that could be found in Ancient and modern rock engravings, thus showing that many cultural traditions of Bedouins were preserved (Khan 2019:73-75). At the same time, most of them underwent significant changes, which allow for examining transformations in their world views.

The gradual change in the engravings' context, content, and style can be examined using the themes of tribal symbols and animal figures. In particular, the depiction of branded camels and tribal names illustrate that rock art played a major role in expressing the social and cultural entities of Bedouin tribes before the Islamic era (Burckhardt 1831:140). Rock art provides insights into the domestication of camels and the development of distinct tribes with unique identities. From this perspective, the presence of brands (wusum) in engravings illustrates an important shift in the world view of Bedouin tribes (Khan 2019:75). The wusum system is important for understanding ways in which Bedouins, including those who continue living in the area near Jubbah, perceived themselves and the surroundings. In particular, it helps comprehend the practice of camel raiding, which will be discussed in detail in this research.

Rock art helps analyse many important traditions and cultural markers of Bedouins. In particular, in accordance with Schiettecate and Zouache (2017), rock art is one of the sources illustrating the role of Islam in increasing the role of horses in Bedouin tribes. Apparently, the advance of Islam led to the praising of noble horses, which not only were highly effective in protecting communities but also indicated the elite status of particular individuals in society. Numerous engravings depicting horses show how important these animals were for Bedouin tribes. At a certain point, they turned into the strongest force on the battlefield (Schiettecatte and Zouache 2017:1-20). Given that only the richest individuals could afford noble horses,

this animal was associated with strength and wealth, which can be observed in a number of rock engravings.

Rock art also provides detailed information about the transformation of warfare tactics. Considering that warfare was a critical issue for the majority of Bedouins, it seems natural that fighting scenes are among the most popular themes in rock art. The depiction of different weapons is one of the most effective factors in determining the age of rock art. In particular, the role of the cavalry on the battlefield, the use of lances, the adoption of firearms, and the replacement of bows and guns are among many issues that provide valuable information about the approximate date of rock engravings (Aksoy 2017:1-17; Guagnin et al. 2017: 149). At the same time, it is important to emphasise that the adoption of certain weapons and military tactics in Bedouin tribes was guided by a set of distinctive factors. In particular, many Bedouins apparently continued to use matchlocks in the nineteenth century despite the availability of more advanced firearms (Guagnin et al. 2017:149). Such issues should be taken into consideration when interpreting rock art.

In general, the existing knowledge of rock art in Jubbah offers a significant amount of information about the meanings of different engravings. Simultaneously, the overwhelming majority of studies focusing on this research object are dedicated to those engravings that were created during the prehistoric period. Little is known about the ways in which rock art represents the activities and customs of Bedouin tribes that inhabited the Arabian Peninsula. The current thesis seeks to address this research gap by conducting a detailed analysis of rock art depicting scenes from the lives of Bedouin tribes in an attempt to gain deeper knowledge of these communities and their worldview.

CHAPTER 3: METHODOLOGY

3.1. Methodological Approaches

The choice of a research philosophy underlying all relevant epistemological and ontological assumptions guiding a study is an important stage of any research. The study was conducted using the philosophy of pragmatism because all other research paradigms had inherent limitations that could prevent the completion of the research objectives.

It is common to distinguish between such popular research paradigms as positivism, interpretivism, pragmatism, and realism (Saunders et al. 2020:12). All of them could be applied in the field of archaeology depending on the specific research objectives of a study. Positivism is a popular research paradigm that seeks to promote objective knowledge based on accurate and verifiable data that do not include any biases (Saunders et al. 2020:12). Its success relies on a detailed presentation of methods and assumptions as well as the use of the reflective practice to ensure that any biases not recognised can be revealed through the research process or the professional scrutiny that follows (Creswell and Creswell 2018:24). However, it would have limited the scope of the study to analysis of a small number of patterns without an attempt to interpret those elements of rock art that are characterised by a high level of uncertainty.

Interpretivism relies on detailed information about the nature of evidence and how it is interpreted. It is a research philosophy that highlights the importance of comprehending and interpreting personal beliefs and motivations of relevant social actors for understanding social reality. Its use in research allows for the incorporation of human interest into a study with the purpose of uncovering multiple aspects of the problem under investigation, something that might be hard to achieve using positivism (Creswell and Creswell 2018:37). The use of interpretivism would have interfered with the establishment of factual knowledge because it invites interpretations beyond what can reasonably be inferred from the

archaeological evidence that is being analysed in a context divorced in both time and space from the period when these remains were created, used and discarded.

Realism can be described as a paradigm asserting that reality exists independently from the human mind and only has application within human cognition. It supports the idea that researchers can access research phenomena by scrutinising available social constructions and carefully analysing them to reduce biases in data (Saunders et al. 2020:104-106). Whilst these three research philosophies have a number of strengths, they also have inherent constraints that limit their applicability. Because of the limitations discussed above, none of these three philosophies was utilised in the study.

Pragmatism is a research philosophy emphasizing the importance of usefulness, practicality, and real-world application in the pursuit of knowledge. Contrary to these philosophies, pragmatism displays the features that were optimal for the current research. It may involve both qualitative and quantitative methods, provided that they help achieve particular objectives (Creswell and Creswell 2018:28). In this research, it was important not only to describe in detail all the art panels and motifs but also to link them to themes relevant to a particular historical period. A comparative and contextual analysis was undertaken by the author to interpret the themes and motifs. Such procedures helped reduce bias risks, which often accompany pragmatism.

The thesis employed a survey research design, a cross-sectional time horizon, and an inductive approach to collect and analyse the data. These are described below. A survey research design is highly popular in archaeology (D'Agostino and Orsi 2015:36-40). The collection of data was conducted within a cross-sectional time horizon, which is characterised by the simultaneous use of all data collection methods (Saunders et al. 2020:148). In order to examine specific elements of rock art to complete all the research objectives of the thesis, it was necessary to employ an inductive research approach. This approach guided a critical

analysis of the empirical data in light of the literature review's findings. The choice of a survey research design, a cross-sectional time horizon, and an inductive approach allowed for the completion of all research objectives.

3.2. Site Selection and Sampling Strategy

3.2.1. Archaeological Survey Strategies

Academic research currently does not present a consistent framework encompassing all possible types of archaeological surveys. In the most general view, an archaeological survey could be defined as a set of different techniques used to systematically gather data about archaeological sites, artefacts, and features within a study area (D'Agostino and Orsi 2015:36-40). Academic research offers many classifications of surveys. Most survey techniques, however, could be divided into aerial, surface, and subsurface testing methods. A broad definition of archaeological surveys and their classification into aerial, surface, and subsurface techniques could be found in many studies. Given the location of the motifs on near vertical rock surfaces, the use of a surface strategy seems to be natural. Nonetheless, it is important to conduct a broad overview of the existing archaeological survey strategies to illustrate the context in which the author selected an appropriate archaeological method to complete the research objectives of this study and illustrate the advantages and limitations of the surface survey strategy.

Aerial reconnaissance represents a type of archaeological survey that is becoming increasingly popular. Traditionally, archaeologists rely on low-altitude aerial photography to map relevant sites. Depending on the different aspects of a particular study, one can use either oblique or straight pictures. The former is typically used for mapping site areas, while the latter are effective in site discovery (D'Agostino and Orsi 2015:61). Aerial surveys can be highly effective in detecting buried sites based on soil marks, crop marks, and other features

visible from above (Lasaponara and Masini 2012:26). Recent evidence indicates the growing popularity of archaeological surveys supported by unmanned aerial vehicles. For instance, Jackisch et al. (2020:1) demonstrated the impressive performance of unmanned aerial systems in conducting geophysical mapping in Finland. Gutierrez et al. (2016:10), in turn, demonstrated the ability of small unmanned aerial vehicles to assist with archaeological topography. Thermography, which involves the utilisation of heat or thermal sensors to detect abnormal temperatures on the land, is another advanced technique used in aerial surveys. The high costs and complexity of such technologies predetermine their low popularity as compared to other techniques used in archaeology. In general, aerial surveys have great coverage and involve a plethora of different techniques supported by modern technologies, but their implementation is challenging because of high costs.

Surface surveys are the most popular form of archaeological survey. They typically do not require the use of expensive equipment. The procedure of a surface survey involves traversing the land surface, of an archaeological site, observing artefacts and various surface features and then recording the data in a systematic or unsystematic manner (D'Agostino and Orsi 2015:36-40). It is common to distinguish between pedestrian, transect, and grid variations of surface surveys. A pedestrian survey entails walking across a site observing and sometimes recording all artefacts and features. Transect and grid surveys, in turn, involve conducting the same operations but using specific transects or grid cells to ensure the coverage of relevant areas (D'Agostino and Orsi 2015:36-40). Academic research offers numerous variations of surface surveys; therefore, their conceptualisation and classification are ongoing processes.

Finally, subsurface methods focus on analysing subsurface features. They could be carried out using multiple techniques. In particular, shovel testing allows for the examination of artefacts in shovel test pits but might damage the context of the site. Magnetic surveying

and many other technologies could be instrumental in conducting subsurface testing remotely (Fedi et al. 2017:203). The study by Fernandez-Alvarez (2016:10) illustrates the successful use of a ground penetration radar to discover a mass grave from the Spanish Civil War. Fassbinder (2011:5), in turn, showed the impressive performance of the Bavarian magnetometer system to conduct subsurface testing in Pomeiopolis, Demirchiuyuk, and Troy. The number of technologies available for subsurface testing continues to grow, but they are rarely used compared to surface and aerial surveys because of their limited scope.

All the variations of archaeological surveys discussed above share a set of common features. They require a clear definition of a sampling site and archaeologists' deep knowledge of the natural and human-altered features of the site. Furthermore, specialists must have a robust protocol for recording archaeological data and using the information for particular purposes. Surface, subsurface, and aerial surveys are characterised by a set of advantages and disadvantages. Aerial surveys have broad coverage and enhanced visualisation features, especially if supported by unmanned aerial vehicles; however, they are often criticised for limited subsurface details, interpretation difficulties, weather-related limitations, and high costs (Gutierrez et al. 2016:10-13). Surface surveys are efficient and have rapid coverage; moreover, they might assist with the identification of surface materials in a swift and non-invasive manner. Surface surveys are commonly used in studying rock art in Saudi Arabia. In the study by Guagnin et al. (2017:141), the authors conducted three systematic rock art surveys in Jubbah in 2011, 2013, and 2015. Similarly, Andreae et al. (2021:153) also performed a surface survey to examine rock art at Musayqira, Al-Quwaiyah Governorate of Saudi Arabia. Despite the advantages of surface surveys, they are characterised by a limited scope and problems with identifying small-scale materials. Finally, subsurface surveys are highly effective in specific circumstances, but their implementation requires high level technical expertise and significant costs. Moreover, limited coverage and

technical challenges predetermine the use of subsurface testing only in some cases when archaeologists target sites with a high likelihood of buried artefacts.

Given that the current study focuses on the examination of specific rock art artefacts, it seems justified to use a surface survey. The site investigated in the research is well-known, making additional testing procedures to identify buried artefacts unnecessary. The key objectives of this study revolved around the interpretation of themes and motifs and their relationship to the subject relevant historical context. Thus, the choice of a surface survey method was natural.

3.2.2. Rock Art Research Approaches

Dobrez (2016:143) argues that "in rock art studies a historical methodology, borrowed from the discipline of archaeology — usually with substantial input from anthropology to provide some the cultural context — has as its aim, to reconstruct past cultures". The paradigm of historical methodology requires dating to provide clear answers to the question "who made the art – when and in what context?" (Dobrez 2016:143). This methodology involves the identification and interpretation of motifs to construct a sequence, thus putting rock art into a relevant context. According to Dobrez (2011:71-83), the historical methodology is limited because of the unwillingness of archaeologists to deal with biases, something that inevitably accompanies an attempt to interpret motifs and themes beyond the observation of evident features. For this reason, some scholars advocate for the incorporation of ethnographic approaches into the historical methodology so that dialogues with representatives of indigenous cultures and other techniques can enrich an analysis of rock art (McDonald and Veth 2012:4-8). Owing to the unique features of rock art in the Hail region, it is common to apply the traditional historical paradigm to investigate Jubbah rock art (Guagnin et al. 2017:138-152). Therefore, the use of a historical methodology was a natural choice for the study.

The available evidence provides a compelling reason to believe that the interaction of historical methodology and ethnography defines the evolution of rock art research approaches. Malla (2021:14) states that the ethnographic approach shifts the emphasis to "people's ways of thinking, feelings, and sentiments". While it mostly involves certain interactions with contemporary representatives of indigenous cultures, scientists also can apply ethnographic methods to delve into people's "ways of thinking" based on secondary data. Ethnographic methods can enrich the findings of a study conducted using the historical methodology.

In this study, it was decided to apply the traditional historical methodology. Jubbah rock art has received a substantial amount of attention in academic research (Guagnin et al. 2017:138; Jennings et al. 2013:666). By identifying relevant motifs and themes and matching them with the pertinent historical context, this project will achieve all research objectives while minimising costs. However, elements of ethnographic methods based on secondary evidence were applied as well, in comparative and contextual analysis to examine relevant scenes in light of the historical context. Thus, the historical methodology implemented in this study was supported by ethnographic methods related to comparative and contextual analysis.

3.3. Fieldwork Methods: Data Collection and Recording

3.3.1. The Site and Rock Art Panels

The data were collected in the study from three rock art panels located at Jubbah. Figures 1 and 2 provide the location and site maps, respectively. The images of these panels could be found in Figures 5, 6, and 7. These panels are part of the Rock Art in the Hail region in Saudi Arabia, which is on the UNESCO List of World Heritage Sites (Guagnin et al. 2017:138). The research data were collected from three rock art panels comprising 43 motifs.

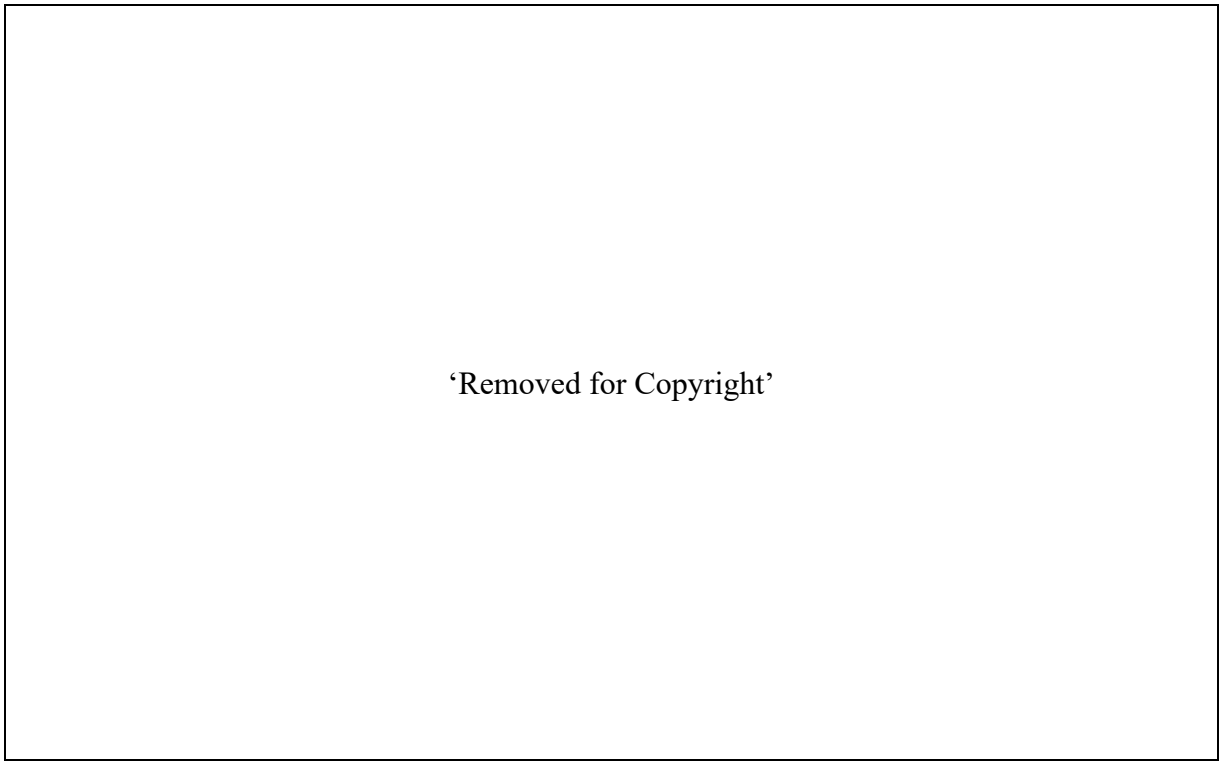

Figure 3. Location Map (Saudi Geological Survey Gov).

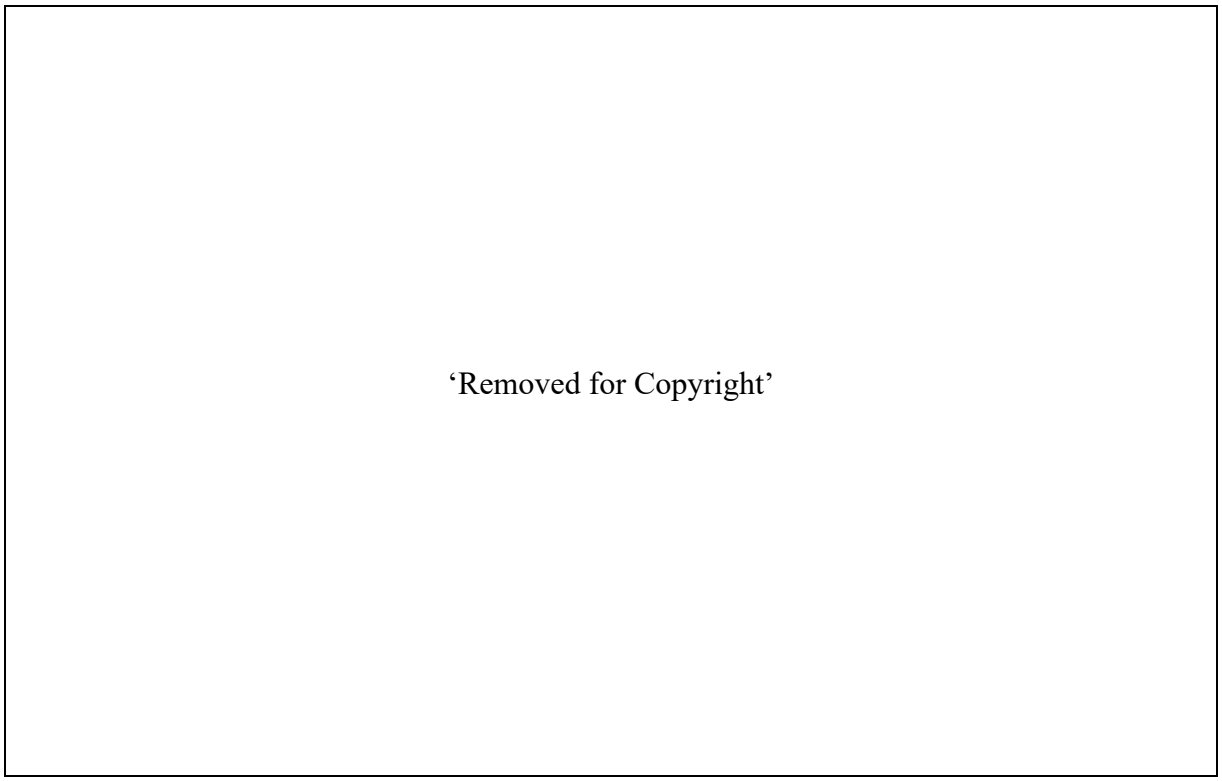

Figure 4. Site Map (Saudi Geological Survey. Gov)

The images of these panels are presented below - Figures 1, 2, and 3.

Figure 5. The First Rock Art Panel (27 Artefacts).

Figure 6. The Second Rock Art Panel (8 Artefacts).

Figure 7. The Third Rock Art Panel (8 Artefacts).

3.3.2. Surveying and Recording Methods

As stated above, the study applied the surface survey method. Scholars distinguish between numerous types of surface surveys and offer different classifications of such methods. In this study, a simple pedestrian survey would suffice to collect any remaining artefacts on the ground surface below. Unlike in many other studies, this archaeological research was concerned with examining the existing data rather than finding new artefacts that had not been examined previously. Owing to the focus on the existing artefacts, the choice of a specific fieldwork method was not a challenging task. Through a pedestrian survey, high-quality images of the panels could be made and interpreted within the paradigm of historical methodology. A similar methodology was successfully used in the study by Guagnin et al. (2017:141-142), who were also examining rock art in the Jubbah oasis making the choice of a pedestrian surface survey logical.

The process of recording plays a major role in rock art research. Sanz (2014: 6352) asserts that rock art recording is "any form of visual documentation of the works of art and their spatial location, by means of photographs (analogical or digital), illustrations (drawings and/or tracings, traditional, or digital), and 3D real or virtual models". The choice of a particular recording technique is crucial because it addresses the problem of perspective distortion and ensures the detailed analysis of each individual drawing. Direct tracing involves the use of transparent paper and a pen with permanent ink to identify and trace motifs (Pires et al. 2015:416). This tool, however, is controversial because of potential damage to the rock surfaces and motifs. (Pires et al. 2015:416). Indirect recording methods involve the creation of tracings with the help of a frame or an analogue photograph (Sanz 2014:6353). Moreover, recent evidence points to the growing popularity of digital tracing, which entails applying colour selection tools to individualise the pigment from the rock surface (Sanz 2014:6353). For these reasons, indirect tracing methods have significant advantages over direct tracing techniques.

It was decided to use the digital tracing method in the current study. Three panels chosen for the research include clear images of distinct motifs. Surface features do not inhibit their interpretation. By making them brighter and more distinct using digital imaging tools, the author sought to simplify the process of data analysis by highlighting relevant motifs. In such a situation, a digital tracing method was justified.

The process of recording was conducted with the help of photogrammetry and MS Excel. Photogrammetry is an instrument that helps create accurate measurements, models, and reconstructions of environments and objects using photographs (Magnani et al. 2020:737-742). Photogrammetry software, such as Agisoft Metashape or RealityCapture, can be highly effective in creating 3D models. In this study, photogrammetry was utilised exclusively with the purpose of calculating the height and length of motifs, which were

believed to be important factors in interpreting the meaning of rock art. Considering that many images in the panels are located close to each other, the information about their length and height could produce valuable insights into the perceived significance of various issues from the perspective of the authors of rock art. The researcher recorded the data on motifs in a file in MS Excel. In addition to the length and height of each motif, the author also inserted their text descriptions into the file and recorded the data on their aspects (facing right or left), and the recurrence of different topics (human, standing, kneeling, riding, shot/killed, arms raised, horse, camel, dog, firearm, lance/spear, sword, bow/arrow, waistband, and saddle). A simple two-point scale was used to indicate the presence or absence of specific themes in each motif. All the results of the recording process conducted with the help of photogrammetry and observations could be found in the Excel file.

The identification of themes was based on relative size and context. For instance, camels were identified based on their humps and upward tails, while horses were identified by their downward tails and relative size. Firearms were identified based on the ways in which humans handle them and aim at enemies. Moreover, bows have distinctive design features, which make them fundamentally different from firearms. At the same time, the author analysed shooting poses to make assumptions concerning particular types of firearms used by humans on the panels. For instance, the use of firearms by the cavalry indicated the use of more advanced firearms.

3.4. Laboratory Methods: Analysis and Interpretation

The first stage of data analysis involved digital image processing and enhancement, geometric and spatial analysis, and iconographic and stylistic analysis. The images were first analysed using digital image processing and enhancement tools available in Adobe Photoshop 25.3.1. This program is popular in archaeological studies and is praised by scientists for its simplicity and effectiveness (HUY). The process of digital image processing and

enhancement helped make the motifs more distinct, thus simplifying their analysis. Digital image processing and enhancement is a vital component of laboratory methods that are used in archaeology, particularly in rock art research. Therefore, its use in the current study was justified (Lasaponara and Masini 2012:17). They also were used extensively in studies focusing on rock art in Saudi Arabia (Andreae et al. 2021:157; Guagnin et al. 2017:141-142). At this point, it also was important to conduct geometric and spatial analysis to analyse the data on the motifs' height and length. The next stage of data analysis involved iconographic and stylistic analysis. The term "iconography", in archaeology, refers to the study of the meaning of elements in various art objects, whereas stylistic analysis is concerned with the examination of formal resemblances and variations between objects (Andreae et al. 2021:153-160). In this research, the author applied iconographic and stylistic analysis to gain insights into the meaning of motifs, their resemblances and variations, and their significance in the relevant historical context. All the procedures involved in iconographic and stylistic analysis were carried out in light of the literature review's findings. The processes described above prepared the data for the comparative and contextual analysis.

Following the completion of the iconographic and stylistic analysis, the researcher proceeded with comparative and contextual analysis. Comparative analysis is highly effective in linking archaeological artefacts to the unique cultural features of human societies to analyse artefacts through the prism of the world view of their original authors. According to Smith and Peregrine (2012:4), "comparative analysis is the only way to identify regularities [patterns] in human behaviour [sic], and it is also the only way to identify unique features of human societies". Contextual analysis, in turn, focuses on the analysis of contextual meanings. The decision to apply contextual analysis in this study was intended to delve into the contextual meanings embedded in rock art and to examine them within the relevant

historical context. Comparative and contextual analysis was the final stage of data analysis conducted in this study.

3.5. Chronology and Dating Methods

The selection of appropriate dating techniques is an important factor driving the success of archaeological research. The academic literature distinguishes between relative and absolute dating techniques as two possible dating methods (Ruiz and Rowe 2020:2036-2038). Absolute dating tools allow for the measurement of objects' physical properties, which could provide an estimated age. Their implementation is supported by novel technologies, such as radio isotopic methods (Balme and Paterson 2014:85). Relative dating, in turn, involves determining the date of artefacts on the basis of their relationship with other artefacts (Ruiz and Rowe 2020:2036). Resource constraints of this study and the many previous studies conducted on the rock art at Jubbah predetermined the use of relative dating techniques in this study. Furthermore, Guagnin et al. (2017:141-142), who studied rock art in Saudi Arabia, successfully applied relative dating methods in their research. The law of superimposition guided the implementation of the relative dating technique in this study. This principle states that archaeologists can group artefacts found in the same soil level and assume that they are of the same time period. This law helped establish the relative time period for panels when using the relative dating technique.

3.6. Limitations and Challenges

The study was subject to a set of challenges and limitations. The Heritage Authority in the Kingdom of Saudi Arabia granted access to all facilities of the site. Therefore, the current study was conducted with official approval from the relevant authority. Reaching certain sites could be challenging since the land is desert and rugged. However, assistance was provided by staff from the Jubbah Centre of the Heritage Authority, who drove me to these remote

areas. Overall, the research project progressed with minimal problems. Sufficient data quality and reliability were ensured by implementing reliable techniques validated in other studies and applying consistent surveying strategies. The most important limitation related to the research is the risk of interpretive ambiguity and uncertainty. In archaeological research, biased interpretation is a risk. For this research, this risk was minimised by the use of historical methodology and a review of appropriate literature and comparisons. The discussion above shows that the research did not face critical challenges.

CHAPTER 4: RESULTS

4.1. Overview of the Rock Art Engravings at Jubbah

4.1.1. Description of the Jubbah Rock Art Site

An understanding of the unique geomorphological features of Jubbah is crucial for understanding the reason why the area hosts rocks with unique engravings dating back to the Neolithic period. Jubbah lies on a paleolake, whose area that is more susceptible to erosion because of facing prevailing winds could be found downwind of Jebel Umm Samnman. The presence of the large integrated lakebed is a geomorphological anomaly of the area. As a result of high temperatures and aridity, the lake dried up, while rocks were eroded. The weakening of the rocks translated into the establishment of distinctive morphologies; however, some of the towers were destroyed because the deterioration of the lower layer was no longer capable of supporting the upper layer (Rosenberg 2011:1-30). This process resulted in the dramatic and symbolic landscape of the area. Such geomorphological characteristics translated into the emergence of panels on which numerous artists created engravings.

Jubbah rock art incorporates engravings and paintings found on sandstone outcrops and boulders. Most of them depict human figures, animals, geometric patterns, and illustrations of daily activities. These images provide valuable insights into an understanding of the cultures, lifestyles, and systems of the worldview of people living in the area during different historical periods. The presence of multiple styles and themes indicates the importance of different cultural influences shaping rock art at Jubbah. In general, the Jubbah rock art site is an area with a substantial number of different panels that include images of significant historical value.

4.1.2. Overview of the Rock Art Engravings

The current study was conducted based on the analysis of engravings from three panels. The first panel includes 27 paintings that represent different hunting and fighting scenes. The second panel shows a scene in which the figure of a person riding a horse is surrounded by other paintings, which apparently represent his enemies. Finally, the last panel depicts a set of people riding camels and horses in an advanced mode. It is important to point out that whereas the first panel seems to include a set of images that present multiple scenes that are not connected to each other, both the second and the third panels introduce consistent narratives. The images from the three panels were the main source of data for the current research.

Table 1. Description of the Panels.

Panel Number	**Determined motif count**	**Description**
Panel J001_1	27	The panel comprises several battle and hunting scenes. All the battle scenes portray the fighting between different types of units, including riders and infantry. Most infantrymen are seen with firearms, whereas people riding horses or camels typically use lances. Infantrymen usually take a kneeling position before shooting, while riders apparently try to get close to their enemies as quickly as possible. The pictures were likely created between the sixteenth and nineteenth centuries. The panel comprises a diverse set of pictures that were likely created during the same historical period. The motifs of camel raiding and fighting seem to be the only themes related to the panel.
Panel J002_1	8	The panel includes a single battle scene in which a horseman with a lance is surrounded by six gunmen and a dog. Infantrymen assumed kneeling positions and are shooting at the enemy. The motifs on this panel resemble the ones from panel 1 in terms of stylistic features and the description of weapons. Panels 1 and 2 seem to have come from the same historical period.
Panel J002_3	8	The panel depicts the final stage of the battle in which one of the sides clearly prevails over the other one. Such an assumption was made because one of the sides has only one soldier left, while all others apparently have been already killed. Four soldiers, including a horseman with a lance, two gunmen riding camels, and an infantryman with a sword, are about to kill a single swordsman, who seems to be the last adversary. The images of a dead/injured man and a camel without a rider indicate that both sides have taken casualties. The presence of advanced firearms that can be used while riding a horse or camel (possibly flintlocks) suggests that the motifs were created later than those depicted on panels 1 and 2.

4.1.3. A Description of Each Rock Panel

As a result of image processing and enhancement, the author created enhanced images of each panel, which allow for more accentuated images of motifs.

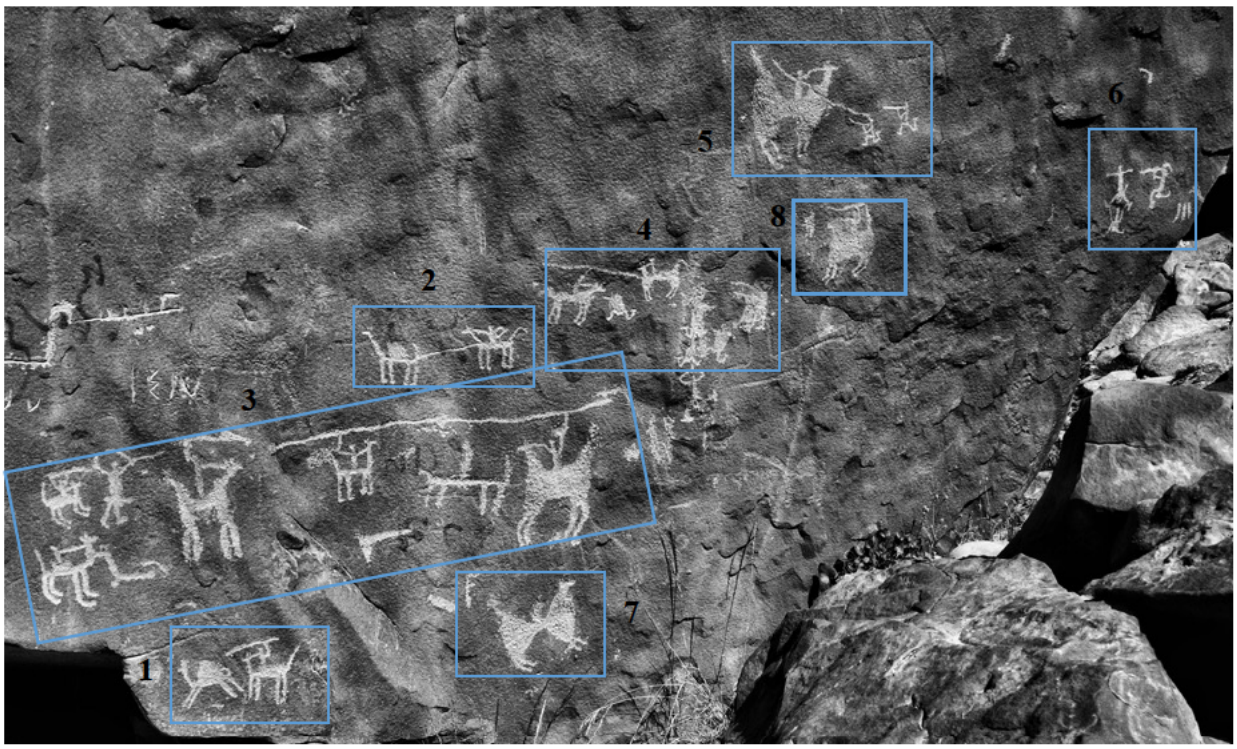

Figure 8. Enhanced Image of the First Panel.

The first panel includes a series of different scenes. As the table below indicates, there are two hunting scenes in which horsemen are hunting camels (1 and 2).

Table 2. Description of the Motifs from the First Panel.

Scenes	Motifs	Description
1	5, 6	A horseman with a lance is hunting a camel
2	8, 10	A horseman with a lance is hunting a camel
3	1, 2, 3, 4, 7, 9, 11, 19	A battle in which two horsemen and a gunman are fighting five enemy soldiers
4	13, 14, 15, 16, 17, 18, 20, 21	A battle in which both sides are represented by four soldiers, including horsemen and gunmen
5	22, 23, 24	A lancer riding a camel is fighting against two infantrymen with firearms

6	26, 27	A scene with an unclear meaning in which a gunman is aiming at a person who is running in front of him
7	12	The image of a horse with saddle that does not seem to be involved in any other scenes
8	25	The image of a horseman with a sword that does not seem to be involved in any other scenes

It seems justified to assume that there are two hunting/raiding scenes (1 and 2) in which horsemen are hunting or raiding camels. There are also three battles on the panel. The first one (3) involves eight motifs and presents an unequal battle in which two horsemen and a gunman are trying to defeat five enemies. Another one (4) has an unclear outcome, as the forces of the two sides are relatively equal. Two other fighting scenes that could be found on the panel are of a lower scale. In one of them (5), two gunmen are shooting at a lancer riding a camel, while another one (6) describes a person with firearms who is aiming at the man who is running in front of him. The remaining scenes (7 and 8) apparently present single images that are not involved with any other motifs. To sum up, panel 1 comprises 8 scenes, including two camel hunting/raiding scenes, three battles, one scene with an unclear meaning, and two separate images.

Figure 9. Enhanced Image of the Second Panel.

The second panel has eight motifs that all are involved in a fighting scene. In this scene, six individuals and a dog have surrounded a horseman. The inscriptions emphasise that soldiers and a dog staying beside the horseman are attacking him from behind. Therefore, it would be difficult for him to survive the attack. Unlike panel 1, the second panel has only one scene engaging all the motifs.

Figure 10. Enhanced Image of the Third Panel.

The third panel also presents an uneven battle. Two individuals are being attacked by a superior force that includes the infantry, horsemen, two men riding a camel, and a dog. One of the men is either dead or injured. The death of the last soldier seems inevitable. Similarly, to panel 2, the third panel has a single scene combining all the motifs. All the motifs will be discussed in detail in sections 4.2 and 4.3 of this chapter.

4.1.4. List of the Motifs

The three panels examined in this study include 43 motifs. The author has reported the data on all of them in MS Excel. The table containing detailed information about all motifs could be found in the List of Appendices. The mean length of an average motif in the panels is around 120.93 mm (±61.89). A high standard deviation indicates a significant difference between the lengths of motifs. The distribution has a positive excess kurtosis (2.53), thus indicating the presence of heavy tails and a sharp peak. The distribution is positively skewed (skewness = 1.48). Similar observations can be made in regard to the panels' height (mean = 104.04, SD = 43.95), although their kurtosis and skewness are much close to the ones of the

normal distribution. The same patterns were found for motifs from all three panels. Higher standard deviations for motifs from panel 2 and panel 3 could be explained by the lower number of motifs. A significant difference between the images' sizes is because of the fact that most of them depict either infantrymen or horses, camels, or riders. The latter are taller and longer than the former, thus explaining a high standard deviation. Differences between the length and width of the images are a relevant factor in data analysis.

Table 3. Motifs' Sizes.

	All Panels		**Panel 1**		**Panel 2**		**Panel 3**	
	Length	*Height*	*Length*	*Height*	*Length*	*Height*	*Length*	*Height*
Mean	120.93	119.42	104.04	110.56	125.75	114.38	173.13	154.38
Std Error	9.44	9.46	8.46	10.23	27.09	32.33	26.68	17.73
Median	114	106	94	106	104	78.5	147.5	158
Std Deviation	61.89	62.05	43.95	53.16	76.64	91.44	75.48	50.15
Kurtosis	2.53	2.15	-0.57	0.42	6.23	6.62	0.70	-0.75
Skewness	1.48	1.30	0.62	0.87	2.41	2.53	0.80	-0.23
Minimum	50	42	50	42	74	53	72	85
Maximum	315	334	207	232	308	334	315	228
Count	43	43	27	27	8	8	8	8

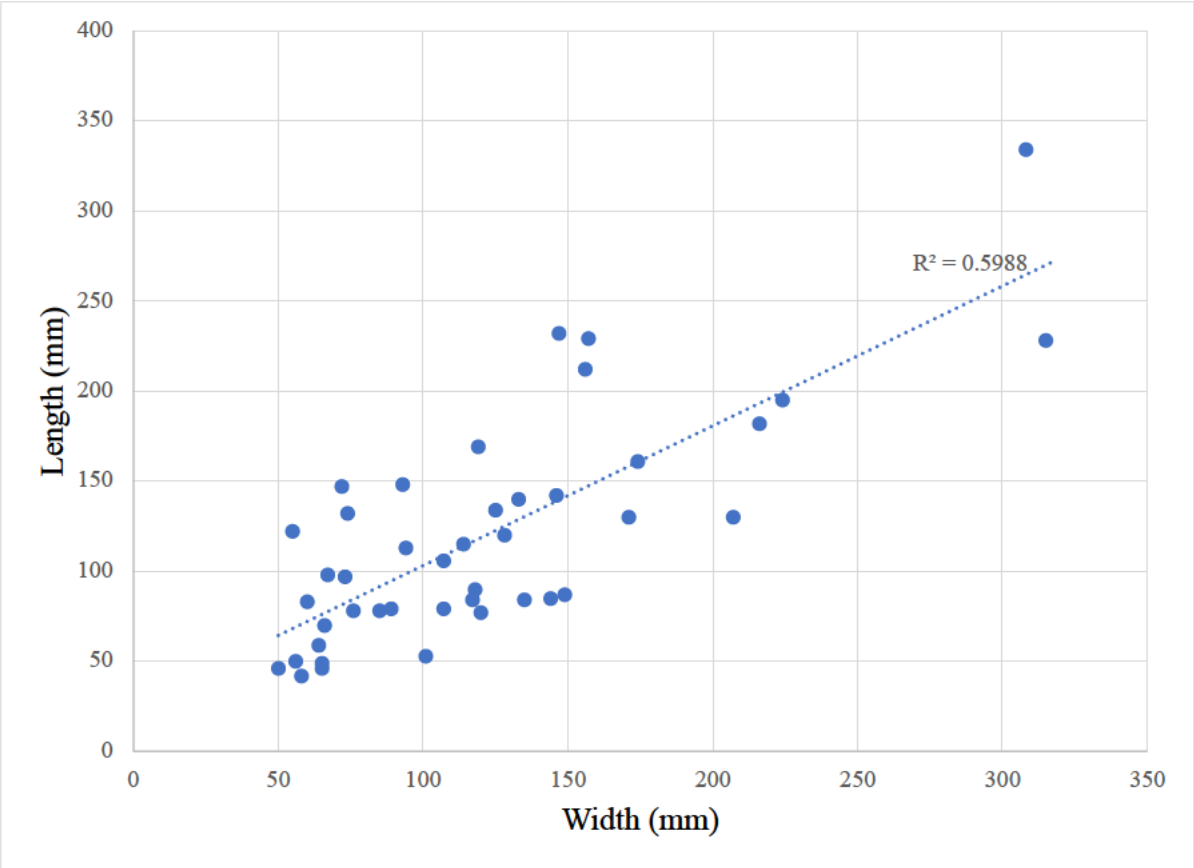

Figure 11. Motif Size Distribution.

Figure 8 shows that 24 out of 27 motifs on panel 1 include images of humans. 13 of them are riding a horse or a camel, 8 are kneeling, and 3 others are standing. The number of horsemen (10) is much higher than the number of soldiers riding camels (3). Only two persons who ride horses do not use saddles. Firearms are the most popular weapon (9) among infantrymen. Riders, at the same time, prefer lances (6) or swords (5). One of the soldiers is seen using a bow and arrows. Almost all the motifs depict humans who are trying to defeat enemies or hunt a prey. In general, humans are the most popular type of motif on panel 1.

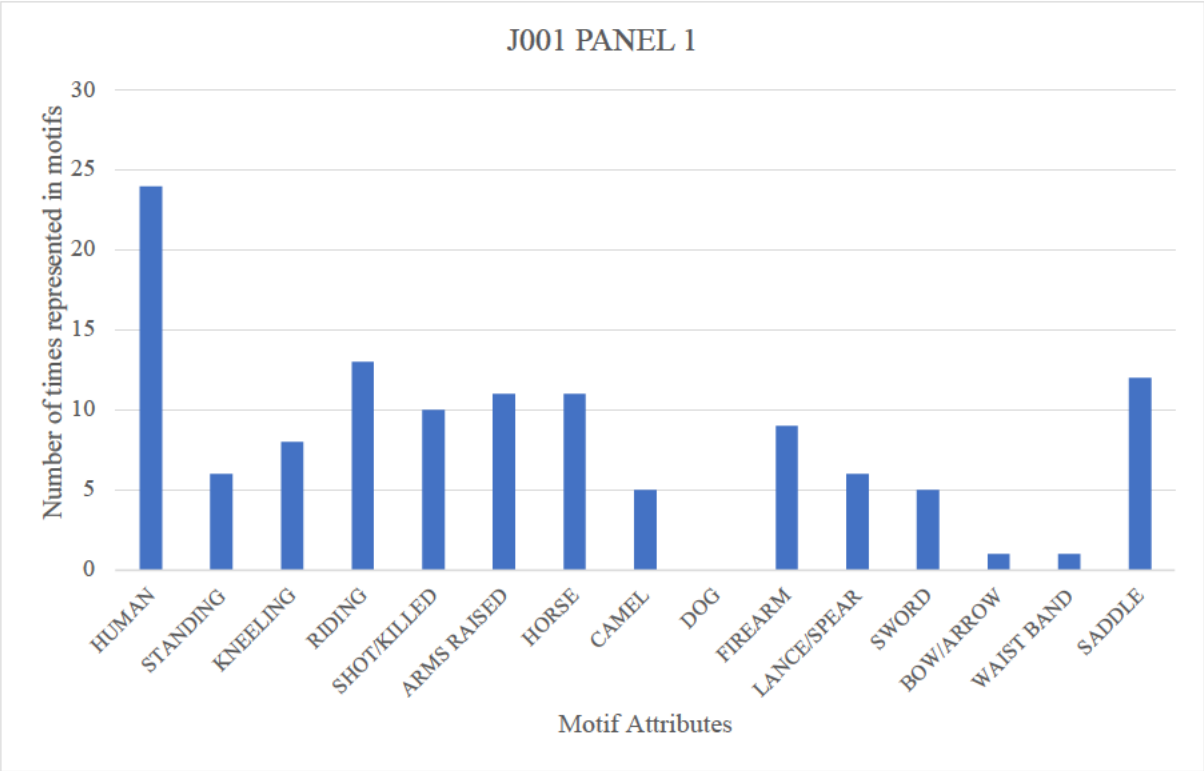

Figure 12. Distribution of Motif Attributes (Panel 1).

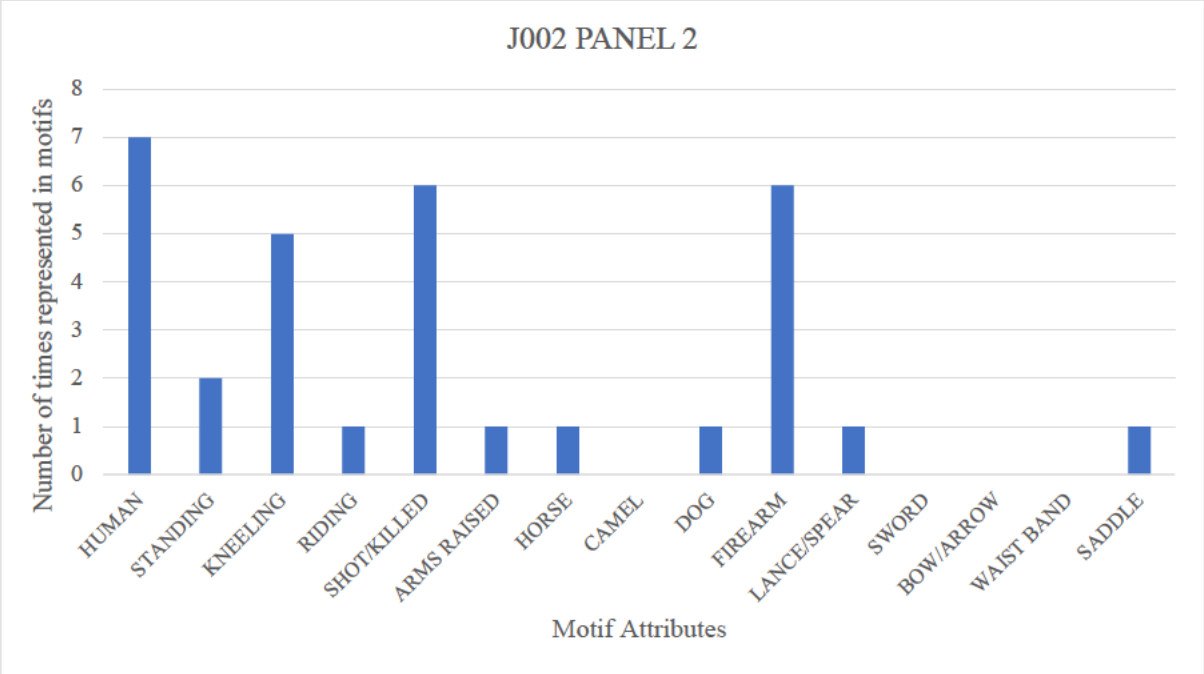

Figure 13. Distribution of Motif Attributes (Panel 2).

Figure 9 illustrates that 7 out of 8 motifs describe humans. 6 of them are shooting or are being shot at. Almost all these people (5 out of 7) use firearms; furthermore, five

individuals assumed kneeling positions. The panel also provides one image of a dog, something that was not present in the first panel. All the motifs are engaged in a battle.

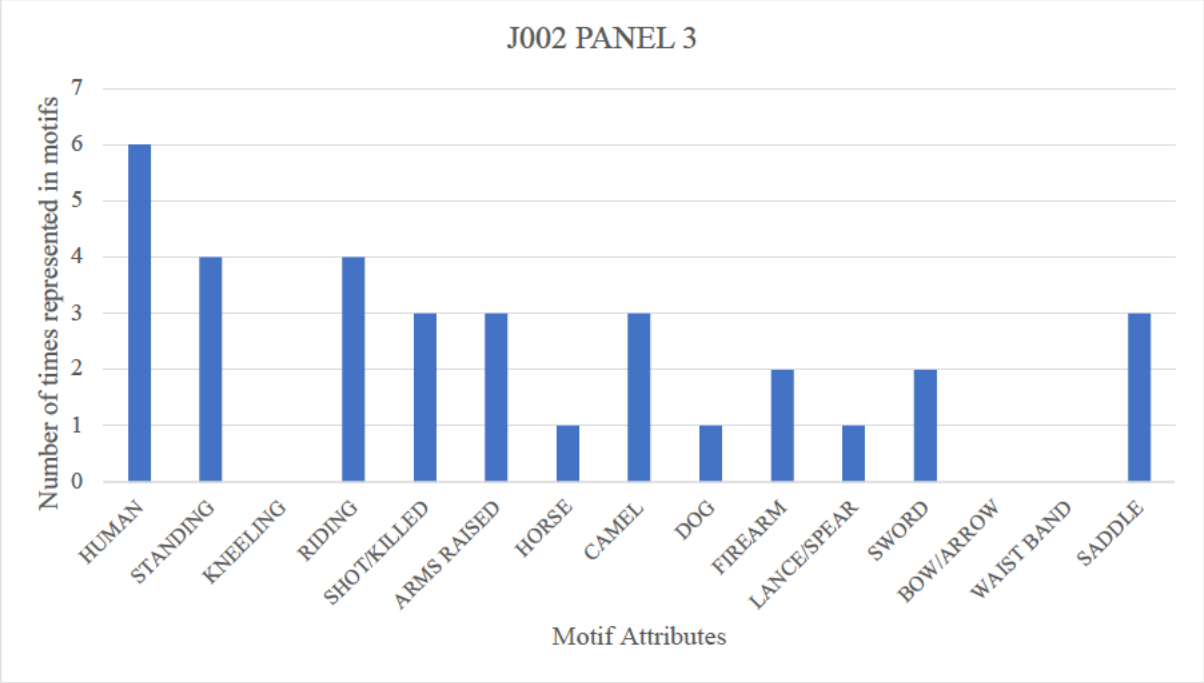

Figure 14. Distribution of Motif Attributes (Panel 3).

The last panel includes 8 motifs. Most of them are humans (6), while others include a dog and a camel. The soldiers depicted in the scene are diverse in terms of their type (infantrymen, horsemen, and camel riders) and the use of weapons (firearms, swords, and lances). The third panel includes some unique motifs that could not be found in the previous panels. First, it shows two camel riders who use firearms, while all the riders on panels 1 and 2 used either lances or swords. Second, it shows a picture of a dead/injured man. Like in the case of the second panel, all the motifs depicted in panel 3 are engaged in a battle.

In general, almost all the motifs from the three panels that involve people depict them in a fighting mode. 14 individuals have been shot or killed, and 15 are attacking enemies with a lance or a sword. Interestingly, only those riding a horse or a camel have lances or spears, whereas the sword is used by all types of soldiers. All the camels and horses on which people ride have a saddle. Dogs are used in two large battles. Except for the third panel, firearms are

the weapon of the infantry, while soldiers riding camels and horses prefer a lance or a sword. The panels describe diverse soldiers using different types of weapons.

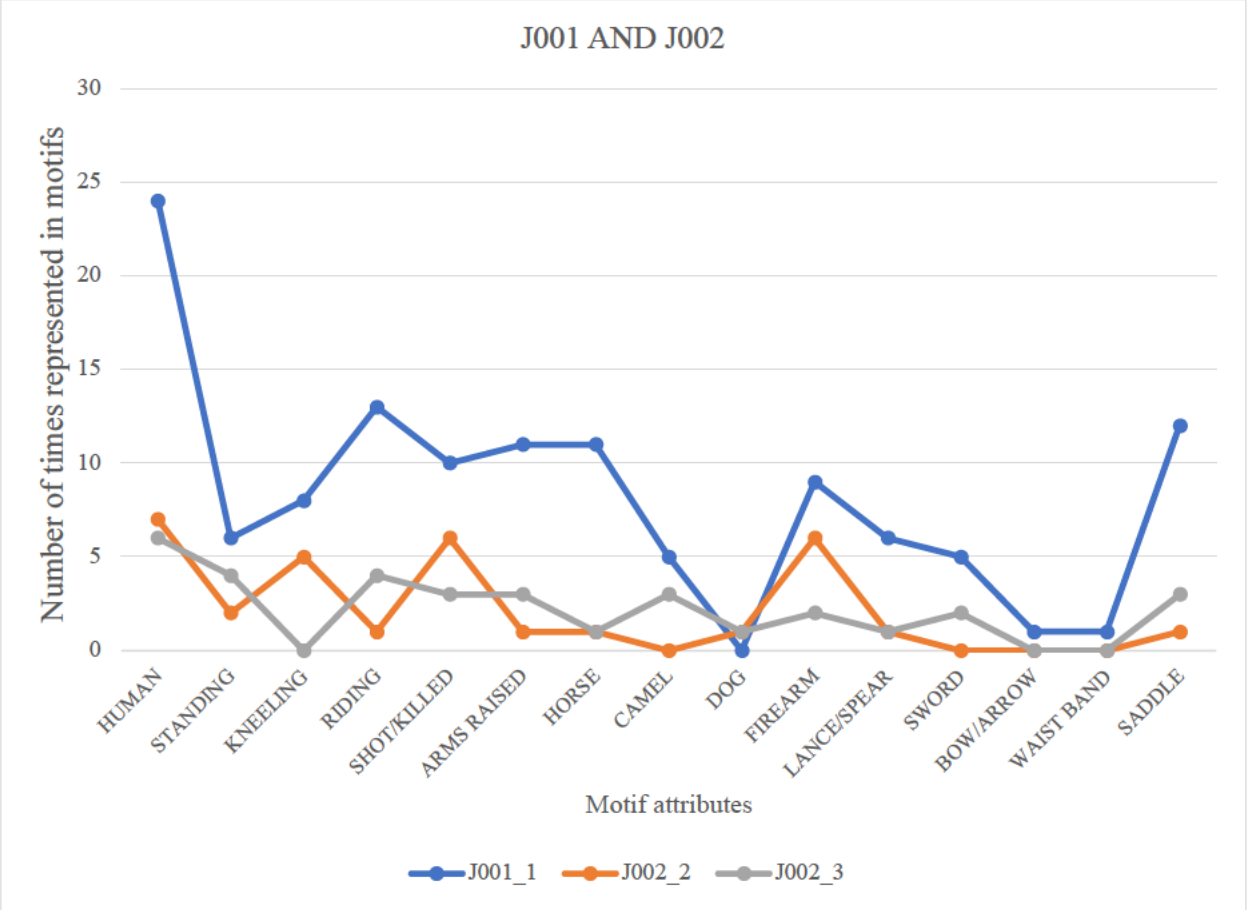

Figure 15. Motif Attributes in the Three Panels.

4.2. Description of the Historical Period of Rock Art Engravings

Jubbah rock art includes engravings from different historical periods spanning between prehistoric periods and recent times. The presence of firearms on all three panels is the most important factor supporting the relative dating procedure conducted in this research. As it is known, the first guns were introduced to the region at the beginning of the sixteenth century (Guagnin et al. 2017). Tribesmen living in the region were skilled in using matchlocks. They continued to use these weapons even when more advanced alternatives, such as flintlocks, became available (Guagnin et al. 2017:149). A thorough analysis of the motifs from the first and second panels depicting people with guns leads to an assumption

that some of these pictures might depict the matchlock mechanism, which is a distinctive feature of matchlocks (Aksoy 2017:1-17). If the engravings describe people with matchlocks, it means that the pictures were drawn during the period between the sixteenth and the twentieth centuries. However, the use of matchlocks was no longer widespread in the region in the nineteenth century (Guagnin et al. 2017:149). At the same time, the pictures also cannot be older than the sixteenth century. Thus, it seems justified to conclude that the engravings were created during the period between the sixteenth and nineteenth centuries.

Another important argument in favour of this date is the fact that only the infantry uses firearms in the pictures on the first and second panels. The complexity and restrictions related to primitive guns predetermined their use by infantry. At the same time, it is important to note that the third panel depicts people who use guns while riding camels. Such a possibility did not exist in the region until 1883, which is widely regarded as the year in which the region first saw modern cartridge rifles (Guagnin et al. 2017:149). The fact that the third panel depicts people who managed to shoot at enemies while riding camels provides a compelling reason to assume that the engravings from the third panel were created in the nineteenth century. There are two possible reasons why the first and second panels do not depict the same shooting pattern. First, one might assume that their engravings are older than the engravings from the third panel. In such a case, one could assume that they were created during the period between the sixteenth and eighteenth centuries. Second, there is a possibility that they describe battles involving those tribes that continued to rely on more primitive weapons. Based on the evidence presented above, it seems justified to conclude that the engravings from the third panel were created in the nineteenth century, while engravings from the first and second panels could have been created during the period between the sixteenth and nineteenth centuries.

4.3. Analysis of Themes and Motifs

The first panel is diverse in terms of motifs and themes. Some motifs, such as 12 and 25, seem to present separate themes, as they are not connected to any others. Scene 7 presents the picture of a horse. It is facing right; therefore, it is hardly connected to the battle involving most other motifs. Scene 8 refers to a horseman in attack mode; however, he does not take part in the battle taking place on the left. This engraving was made earlier than most others. An analysis of the colour shows that motif 25 was apparently drawn along with motifs 22, 23, and 24. Therefore, this picture is not connected with motifs 20, 21, and other engravings in the centre of the panel. Unlike panels 2 and 3, the first panel has many separate pictures that are not connected with any scenes.

The rest of the motifs on the first panel are involved in different scenes with varied themes. Scene 3 presents a battle in which four people riding horses and camels as well as one bowman are fighting against one gunman and two horsemen. Considering that they are outmatched, one might assume that an unusually long lance of the person in motif 11 was used to give this side an advantage so that the chances would be more even. This unusually long lance also draws a connection between motifs 7, 9, and 11 and motifs 1, 2, 3, and 4. Without this lance, it would be possible to interpret the motifs as the ones representing two different fighting scenes. Considering that the left side relies on primitive weapons, including a bow (Sabra 2018: 1-4; Tebes 2021: 9-10), it seems that the soldiers on the right side represent a more advanced tribe. Scene 3, therefore, shows the picture of a battle in which one of the sides has advanced weapons.

Scenes 1 and 2 describe a camel hunting or raiding experience in which a horseman is chasing a camel. Scene 4, at the same time, illustrates a large battle occurring between two groups. The first side includes a horseman with a lance (13). The first one includes a horseman with a lance (13) and three gunmen (16, 17, and 18), while the second one has two

horsemen with a lance (15) and a sword (21) and two gunmen (14-20). Another fight is described in Scene 5. Two people with matchlocks (23 and 24) are trying to defeat a lancer who is riding a camel (22). The last scene of the panel includes a gunman (27) and a man who is standing (26). It is unclear whether a gunman is trying to kill this man or he is aiming at someone on the left. Scenes 1, 2, 4, and 5 describe common activities for Bedouin tribes.

The second panel apparently presents a fighting scene involving seven individuals and a dog. There are several possible interpretations of the order of the battle. At the same time, given the way in which the motifs are depicted, it seems justified to assume that six individuals and a dog are fighting against a horseman with a lance. While the horseman's attention is fully focused on the person who is standing in front of him, others are trying to kill him by attacking the man simultaneously from different directions. The engravings show how they are shooting at the horseman. The panel describes a common battle in which a numerically superior force comprising infantrymen is trying to defeat horsemen.

The third panel also presents the inscriptions of men fighting with each other. However, it seems that this battle could be described as a massacre. Four soldiers, including one horseman with a lance (3), two gunmen riding camels (6 and 7), and one man with a sword (5), are attacking one swordsman (1). They also are supported by a dog (4). The picture of a camel (8) does not seem to fit into the context. One could assume that a man who was riding this camel got killed by an enemy; however, this assumption would not explain the absence of a saddle in the camel. There is a possibility that this picture was created earlier than other motifs that could be found on the third panel. Motif 2 represents a dead or injured soldier, who used to fight alongside the man in 1. The outcome of the battle seems inevitable, as one soldier will not be able to defend himself against a superior force. The engravings of the third panel, therefore, show an uneven battle in which a large force of diverse soldiers is annihilating an enemy.

CHAPTER 5: DISCUSSION

5.1. Interpretation of the Historical Period of Rock Art Engravings

5.1.1. General Characteristics of the Historical Period

As stated above, the images on the panels have been created during the period between the sixteenth and nineteenth centuries. Jubbah has a rich history dating back thousands of years, at the same time, its history during the period between the sixteenth and nineteenth centuries is not as well-documented as earlier periods, which are usually of interest to historians and archaeologists (Clark-Balzan et al. 2018:55; Groucutt et al. 2017:49; Petraglia 2015:34-35; Petraglia et al. 2020:8266). It is known that before the sixteenth century, the area around Jubbah was inhabited by different Bedouin tribes, such as ‘Anizzah and Shammar (Ingham 2016:10-100). These tribes led a nomadic lifestyle and heavily relied on came herding (Maisel 2014:102-108). Historical records of their culture, lifestyle, and activities are limited. ‘Anizah Bedouins often were at war with different dynasties, such as Rashids (Cicek 2017:120). Later, however, they adopted a positive attitude towards the rising power of the First Saudi State (Cronin 2013:6-8). Shammar and ‘Anizah Bedouins often were at war with the Ottoman Empire and each other (Cicek 2021:286-288). This limited information illustrates how little is known about the historical events that took place in the Jubbah region during the period between the sixteenth and nineteenth centuries.

Camels and horses played a major role in maintaining the unique economic and cultural dynamics of the region. Camel caravans traditionally connected the Arabian Peninsula with the rest of the world through multiple routes, such as the Incense Route (Orlando 2016:6588). Some of them passed through Jubbah. Local tribes had both horses and camels; however, horses were mostly used for military, transportation, and mobility purposes,

whereas camels were one of the main sources of livelihood and economy (Macdonald 2015:43-56). It is important to emphasise that whereas the ownership of camels used to be a common practice, the ownership of horses often was a sign of high status and prestige (Lange 2016:45). The number of horses in the region, therefore, was relatively low compared to the number of camels. In general, both horses and camels played an important role in the social, economic, and military aspects of the lives of people inhabiting the Arabian Peninsula during the period under investigation.

From a military standpoint, the region witnessed a set of conflicts. Different Bedouin tribes have been engaging in skirmishes over resources and grazing lands throughout their history (Sweet 1965:1139-1142). In particular, as stated above, ‘Anizzah and Shammar tribes were frequently at war with each other. The rise and fall of Arabian dynasties also were of paramount importance for the region given that tribes played a major role in supporting or opposing new dynasties. Jubbah was close to the borders of the First Saudi State (Almogren 2020:1-15); therefore, it is possible that some of its soldiers engaged in certain conflicts near the oasis. Furthermore, the region also saw the military presence of the Ottoman Empire, which often engaged in conflicts both with local tribes and with Arabian dynasties (Rich and MacQueen 2017:111). Given the absence of centralised authority in the area during a large part of the period between the sixteenth and nineteenth centuries, it seems justified to state that people inhabiting areas around Jubbah could witness numerous large and small military conflicts.

5.1.2. Analysis of Hunting/Raiding Scenes

Scenes 1 and 2 from panel 1 might seem surprising because they apparently portray camel hunting experiences. Bedouin tribes relied on camels as one of the main sources of their livelihood and herded rather than hunted them. The ownership of camels was one of the most important drivers of wealth and one of the key constituents of the basis of sustenance

(Barfield 2020: 27; Quinn 2022:3). Rock art reviewed by Khan (2013:466) even includes specific inscriptions on the images of camels indicating the names of their owners. Alwahaibi et al. (2022:3) emphasise the crucial role of camels not only in Bedouins' economic activities but also in their self-identity. Specialists argue that following a transition from hunting to herding, domesticated camels became one of the key features of the economy of various tribes and nations living in the Arab world (Guagnin et al. 2015:5; Heide 2011:339; Houland 2002:65; Zarins 1978:44). Therefore, it might be hard to determine why panel 1 includes two hunting scenes involving camels.

There are some reasons that could explain the presence of hunting scenes. Guagnin et al. (2017:150) make an assumption in their study that the decision to hunt cattle or camels instead of herding could be explained by the abundance of wild animals in the region. Another possible reason is that it was hard to transport wild camels into the Jubbah oasis owing to the large sand dunes (Guagnin et al. 2017:150). However, none of these reasons seems to apply to the engravings on panel 1. Large sand dunes used to be a relevant barrier for ancient tribes, but technological advancements during the period between the sixteenth and nineteenth centuries have likely reduced the significance of this obstacle. Thus, a Bedouin would hardly decide to kill a camel for food because of difficulties with transporting the animal back home. An argument regarding the abundance of camels also barely is justified. Historical evidence shows that the number of camels was not enough to support all the tribes in the region; as a result, Bedouins started integrating other animals, such as sheep and goats, into their herds (Degen et al. 2019:194). Given such a pattern, the decision to kill a camel becomes even more surprising. Barfield (2020:27-28) argue that Bedouins mainly valued camels for their milk and, therefore, rarely slaughtered these animals for meat. In light of the arguments laid out above, it becomes clear that Bedouin tribes living in the region were unlikely to hunt camels.

A detailed analysis of academic literature provides information that likely explains these panels suggesting that Scenes 1 and 2 depicted in panel 1 describe camel raiding rather than camel hunting experiences. Some scientists, such as Khan (2013:454), are willing to acknowledge the presence of camel hunting engravings in Saudi rock art. However, such a conclusion contradicts the common logic and the historical records reported by many scientists, such as Barfield (2020:27-28). The study by Macdonald (1990:24-28) offers an explanation of this unexpected pattern. According to this scientist, the images that might look like hunting scenes actually depict so-called camel raiding practices. Such a practice was documented in detail by several scientists in the nineteenth and twentieth centuries. In particular, Burckhardt noted that when Arabs took a successful expedition in which they could secure valuable resources, these people could either divide the resources equally or "plunder for themselves" (1831:139). If they decided to plunder for themselves, then "whatever an Arab first touches with his lance is regarded as his sole property" (Burckhardt 1831:140). In another source, the author described a scene in which Arabs "throw themselves on the herds", as "everyone tries to reach an animal with his spear, calling at the same time on his comrades to witness that it was he who captured it; he then drives it before him to a second and third, which he also makes his own" (Sweet 1965:1139-1142). In light of the evidence reviewed above, it becomes evident that Scenes 1 and 2 are likely to depict camel raiding rather than camel hunting practices. There is a slight possibility that at least one of them actually is a hunting scene occurring in some unique context, such as in the case of a very rich Bedouin who this is likely the exception rather than the rule.

5.1.3. Analysis of the Nature of Warfare

The motifs and themes provide valuable insights into the nature of warfare in the region. They show that the introduction of firearms led to the abolishment of more primitive ranged weapons, even though one of the persons depicted in the first panel still uses a bow.

The introduction of firearms has revolutionised the nature of warfare in the region (Halevi 2023:401-405); at the same time, it is difficult to interpret one specific tribe or nation depicted in rock art solely based on the fact that soldiers are seen using firearms. All the parties that can be described in rock art, including soldiers of the Ottoman Empire, local tribes, and Arab dynasties, have used the firearms depicted on weapons 1, 2, and 3. A detailed analysis of the engravings provides a substantial amount of valuable data on the specifics of warfare in the area.

Scenes 1, 2, and 3 illustrate that gunmen replaced bowmen in the sixteenth and seventeenth centuries; at the same time, they did not eliminate the need for the cavalry. Apparently, early firearms used by Bedouin tribes, which can be seen on the panels, had a number of shortcomings. Scientists argue that such weapons had a set of critical flaws, including slow ignition, safety hazards, weather sensitivity, a high reloading time, and a dependence on the external flame (Duan 2017:80-90; Goldman 2020:3; Sadler 2018:3-5). For this reason, while a gunman was more valuable than a bowman, he was apparently regarded as a weaker soldier than a competent horseman. Battles typically involved the infantry, which was equipped with firearms, and soldiers riding camels or horses. Both of them mostly had short-distance weapons, such as swords or lances (Aksoy 2017). Apparently, cavalry was stronger than infantry at that time, even though the latter used firearms. Such a pattern could be explained by the fact that matchlocks often backfired and had other shortcomings (Guagnin et al., 2017). Because of this reason, paintings depict several people surrounding riders to even the odds. It is important to emphasise that the battles described on all the panels show that a horseman is fighting against two or more adversaries. Panel 2 portrays an uneven battle in which one horseman with a lance is opposed by six gunmen and a dog. Scene 5 from Panel 1 shows how two gunmen are fighting against a horseman. In general, the engravings illustrate that the cavalry continued to be a strong force even in the presence of firearms

(Schiettecatte and Zouache 2017:1-20). Apparently, while early firearms were slow and unreliable, a competent horseman could quickly approach gunmen and defeat them in a close battle. By pitting the cavalry against a numerically superior force, authors of the engravings apparently were trying to ensure even odds for the two sides of the battle. Despite the advance of firearms, a horseman apparently still was considered to be stronger than a gunman.

The motifs analysed in this study include people riding both horses and camels. Historical records show that Bedouins indeed used both these animals for fighting purposes (Berelovich and Kark 2023:370; Dempsey 1989:13: Eden 2018:8). Horses were typically chosen for swift engagements since they were praised for their speed and manoeuvrability (Macdonald 2019:156). Camels, at the same time, were valued for endurance and resilience (Dempsey 1989:13). While Bedouins could have used camels to travel long distances, a horse typically was a superior choice in battle. It also is important to emphasise that ownership of horses was regarded as a sign of elite status in Bedouin tribes; thus, a horseman was likely to have superior military training experience compared to a soldier riding a camel. In light of such a background, it becomes evident that the average horseman was more valuable in battle than a soldier riding a camel.

The fact that horsemen were more effective in battle seems to be the main reason why the motifs describing horses are longer and taller than the ones describing camels. Adult dromedaries usually are around 1.8 and 2.1 meters, while a horse is unlikely to be taller than 1.8 meters. However, the size of the horseman motif on panel 3 (315 mm and 228 mm) is greater than the two motifs describing gunmen who ride camels (224 mm and 195 mm for motif 6 and 216 mm and 182 mm for motif 7). Furthermore, some images of horsemen are gigantic, such as motifs 4 and 11 on panel 1 and motif 5 on panel 2. One might assume that unrealistically large figures of horsemen were drawn to illustrate their effectiveness in battle.

One of the conclusions that could be made in regard to the significance of the motifs from a military standpoint is that not all the tribes were able to take advantage of modern technologies. Scene 3 of panel 1 shows a battle in which one side is much more advanced in terms of the use of effective weapons. One of the horsemen (11) has an extremely long spear, while another person (19) has firearms. The other side, at the same time, continues to rely on primitive weapons, including a bow and arrows. Some evidence shows that while some local tribes took advantage of matchlocks and then flintlocks, quickly adapting to new realities of warfare, others remained committed to primitive weapons (Kordas et al. 2020: 17). Scene 3 of panel 1 might describe one of the skirmishes in which a more advanced tribe uses advanced weapons to fight another tribe, which still relies on a bow and arrows. A side with superior weapons also can be represented by the Ottoman Empire. There is, however, not enough evidence to support or reject this assumption. In general, the region witnessed a set of conflicts in which some tribesmen relying on old weapons were annihilated by their adversaries.

The available evidence provides a compelling reason to believe that panel 3 describes a battle that has a fundamentally different context. Panels 1 and 2 depict conflicts in which horsemen with a lance are seen as superior soldiers and are fighting against gunmen. However, panel 3 introduces a scene in which a diverse group of soldiers is annihilating an enemy. One might assume that these people use advanced weapons compared to their adversaries. In particular, the last remaining soldier on the left has a sword, while some of the fighters on the right are using firearms while riding camels. As explained above, the fact that these people use firearms while riding camels illustrates that they use later versions of flintlocks or even percussion cap firearms. These people could not have used matchlocks or early flintlocks while riding camels. Based on this evidence, it seems justified to state that panel 3 illustrates a conflict involving a superior force with access to advanced technologies,

such as the Ottoman Empire, and a local tribe that was unable to match the superior power of the enemy.

5.1.4. Analysis of the Role of Dogs

The pictures illustrate the importance of dogs for tribes living in the region during the period between the sixteenth and nineteenth centuries. Despite the essential limitations imposed on dog ownership in Islam, especially in regard to being in close living quarters with humans, many tribes used these animals for guarding and hunting purposes (Andreae 2021:160-165; Rahman 2017:306-308). The picture on the second panel is especially important from this perspective. Even though the dog obviously does not have a gun, the picture shows that it is "shooting" at the horseman. Such a drawing might point to the ability of dogs to frighten horses, thus aiding in fighting against the cavalry. In general, the pictures that could be found on the second and third panels provide valuable information about the historical context pertaining to the use of dogs for military purposes.

The direct engagement of dogs in battles and skirmishes is a surprising pattern observed in this study. There is no direct evidence that Bedouin tribes directly used dogs in military engagements. It is known that the Ottoman Empire employed dogs as guard dogs and sentries; moreover, they also sometimes used them for scouting and messaging purposes (Gundogdu 2020:3-7). Bedouin tribes extensively used dogs for hunting and guarding purposes (Andreae 160-165; Rahman 2017:309). Nonetheless, there is limited evidence that such dogs have ever been used in battle in the region. From this perspective, the engravings analysed in the study provide a new account of the military strategies employed by different powers during the period between the sixteenth and nineteenth centuries in the area around Jubbah. In panel 2, in particular, the dog is described as a crucial part of the battle since it "shoots" at the horseman. The significance of dogs from a military standpoint, therefore, is one of the important findings of the current research that provides an opportunity to deepen

an understanding of the role of this animal in the lives of different tribes and nations that were active in areas around Jubbah.

5.2. Comparison with Other Rock Art Sites in Saudi Arabia

The engravings analysed in this study were created much later than most other engravings in Saudi rock art. Petroglyphs in Shuwaymis, which mostly depict hunting scenes, human figures, and animals, were created during the Neolithic, Bronze, and Iron Ages (Guagnin et al. 2018:735-737). Rock art at Quarayyah provides a number of engravings that are more recent; nonetheless, they also were created during the prehistoric period (Huneburg et al. 2019:215-225). The same observation also can be made in relation to most other rock art sites located in the country. Therefore, it seems justified to state that the dating of the motifs from panels 1, 2, and 3 is unique to Saudi rock art.

Such uniqueness has profound implications for the nature of the motifs. Whereas most Saudi rock sites depict hunting or fighting scenes that involve primitive weapons (Sabra 2018:1-4; Tebes 2021:9-10), the motifs examined in the study introduce complex battle scenes involving multiple individuals using diverse weapons. Furthermore, they also provide evidence for camel raiding, which, as stated above, was a unique custom among Bedouin tribes. In general, it seems justified to state that the motifs examined in this study are fundamentally different from the motifs that could be usually found in Saudi rock art since they provide information about a relatively recent historical period and depict certain activities that did not exist in Neolithic, Bronze, and Iron Age.

5.3. Significance of the Rock Art for Understanding the Historical Context

The themes identified in the research are closely connected with the relevant historical context. The themes of the engravings mostly revolve around two activities: fighting and camel raiding. These activities were critical for tribes living in the area during the period

between the sixteenth and nineteenth centuries. An emphasis on these activities provides rare insights into the worldviews governing Bedouin tribes. The importance of these themes points to the harsh conditions in which the tribes lived and the obstacles that they had to overcome to survive. In a challenging environment characterised by the lack of resources and the abundance of enemies, Bedouin tribes were forced to compete with other tribes, Arab dynasties, and even soldiers of the Ottoman Empire for the right to govern the area and take advantage of its limited resources (Cicek 2017:105-120). Constant fighting used to be a critical aspect of the lives of these people. Ownership of horses and camels, in this situation, was one of the few factors providing individuals with the desirable social status and wealth. In general, the panels examined in the research point to the harsh conditions in which Bedouin tribes lived.

Rock art analysed in the study also sheds some light on the military strategies and tactics employed by different parties in the area around Jubbah. In particular, it provides evidence for the slow adoption of firearms in the region. While some tribes and dynasties willingly embraced matchlocks, others continued to rely on primitive weapons, such as a bow and arrows, thus making themselves helpless when fighting against a superior force. It also demonstrates the intricacies of fighting involving horsemen and gunmen. The scenes depicted in panels 1 and 2 provide a compelling reason to assert that horsemen kept their status as an elite force during the period between the sixteenth and nineteenth centuries, which could be explained by the limitations and drawbacks of early matchlocks. Panel 3 illustrates the transition to late flintlocks and percussion cap firearms that resulted in an evident imbalance, as these weapons helped soldiers easily annihilate their enemies. These new technologies allowed fighters to stay on camels while shooting at adversaries. The examples above illustrate the significance of rock art for understanding the emerging military strategies and

tactics utilised by Bedouin tribes and other powers that were active in the Jubbah region during the period between the sixteenth and nineteenth centuries.

While the motifs from the panels confirm many patterns that were documented in other studies, some of them introduce new topics that did not receive a significant amount of attention in the past. In particular, panels 2 and 3 point to the use of dogs for military purposes, something that is not a well-known fact. Apparently, some soldiers trained dogs specifically for military engagements besides employing them as scouts and guards. The scene depicted on the second panel shows the effectiveness of dogs against the cavalry, which might be indicative of the use of a cunning military tactic against horsemen. Another new topic discovered in this study is the occurrence of battles between soldiers equipped with modern firearms and tribesmen who used primitive weapons. Whereas the fact that such skirmishes took place is not surprising, academic research does not provide a substantial amount of evidence on this matter. Therefore, military conflicts between gunmen and tribesmen relying on primitive weapons and the use of dogs in military engagements are among the important results of this study that point to the significance of rock art for understanding the historical context.

CHAPTER 6: CONCLUSION

6.1. Summary of the Study's Findings

The current research was dedicated to a critical analysis of 43 motifs engraved on three panels at Jubbah. It was found that the motifs were likely to be made during the period between the sixteenth and nineteenth centuries. They could not have been created earlier since all the panels have images of firearms. At the same time, they also were unlikely to

have been drawn in the twentieth century since soldiers depicted on the panels used matchlocks, which were mostly replaced with more advanced weapons in the twentieth century. Because of the fact that the third panel includes the images of two soldiers who are shooting at enemies while riding camels, supports the conclusion that these motifs reflected the use of more advanced firearms, which were not used in the region before the nineteenth century. Therefore, using the relative dating technique, the researcher established the period between the sixteenth and nineteenth centuries as the time when the motifs were created.

An analysis of the motifs using thematic analysis helped identify a set of themes pertaining to the problem under investigation. Most motifs describe humans who are involved in fighting scenes. The pictures provide a substantial amount of information about the types of weapons used by soldiers, the tactics employed by them, and the perceived strength of different military units. The motifs also offer valuable insights into the use of dogs for military purposes and the practice of camel raiding. In general, the themes of all the 43 motifs examined in this study mostly revolve around fighting and camel raiding.

The main findings of this research pertain to the advancement of the scientific knowledge of the nature of warfare, the practice of camel raiding, and the use of dogs by Bedouin tribes that inhabited the region during the period between the sixteenth and nineteenth centuries. It might seem that some of the scenes from the first panel involve the hunting of camels; however, a detailed analysis of academic research showed that such an interpretation is likely to be erroneous. Given that camels used to be one of the main sources of wealth for Bedouin tribes, these people were unlikely to hunt them. Two scenes from the first panel were found to describe the process of camel raiding, which is a unique practice illustrating the competition between Bedouins for acquiring new camels. An analysis of this practice in the current study highlights the critical role of camels in the lives of Bedouin tribes. Therefore, one of the most important contributions of the current thesis to academic

research is that it provided additional evidence for the importance of camels for Bedouins and advanced scientific knowledge of the camel raiding practice.

Uncommon patterns related to the role of dogs in battles are another important finding of this research. Whereas many historical records point to the use of dogs for hunting and guarding purposes, little is known about ways in which Bedouin tribes and other military forces operating in the region around Jubbah employed dogs for fighting purposes during the period between the sixteenth and nineteenth centuries. This study shows that dogs apparently were used as an important military unit. In particular, evidence from one of the panels shows that dogs could have been used against equestrians. Valuable insights related to the military functions of dogs, which were produced in this study, offer promising avenues for further research,

Most findings of this research are related to military topics. They show that battles were one of the most important topics for Bedouin tribes. These people apparently quickly adopted early firearms, which rapidly disrupted military tactics in the region. At the same time, due to the limitations of matchlocks, a horseman equipped with a lance used to be stronger than a soldier with firearms. A typical battle in the region involved lancers or swordsmen who rode camels and horses and the infantry equipped with firearms and swords. In some situations, however, soldiers equipped with advanced weapons apparently opposed tribes that continued to rely on primitive weapons, such as a bow and arrows. In general, the study's results illustrate that a horseman with a lance used to be the strongest military unit at the time. However, at a certain point, technological advancements provided equestrians with a chance to use firearms, which dramatically changed the battlefield. The findings described above illustrate the most important military trends that could be observed in the region of Jubbah during the period between the sixteenth and nineteenth centuries.

6.2. Recommendations for Further Research

The current study provided a set of promising directions for further research that other scientists might pursue. First, they can consider exploring the role of dogs in military engagements of Bedouin tribes. Contrary to the existing knowledge of the role of dogs in Bedouin tribes, the current study revealed that these animals could be employed not only as guards and hunters but also as military units. Several scenes examined in the current study portray dogs as participants of skirmishers. It could be inferred from the context of these scenes that dogs apparently played an important supportive role in battles. In one of the scenes, a dog is seen to "shoot" at a horseman. One could assume based on this picture that an artist used the "shooting" effect to illustrate the effectiveness of these animals in a fight against an equestrian. There is a possibility that some Bedouin tribes could have used dogs against equestrians, which seems to be an important pattern given that horsemen equipped with lances apparently used to be a superior force in most battles that took place in the region. The academic literature does not provide compelling evidence for the use of dogs in military engagements. However, some engravings from panels 1 and 2 show that dogs not only were involved in certain skirmishers but also played a major role in defeating horsemen. The evidence provided in this study allows for an assumption that some Bedouin tribes might have followed the famous Roman tactic of using dogs to scare horses on the battlefield. A critical analysis of this military manoeuvre could enrich an understanding of the role of dogs in Bedouin tribes, while also advancing an understanding of the military tactics employed by different forces in northern Saudi Arabia.

Second, scholars are recommended to explore the practice of camel raiding. The existing information about Bedouin tribes provides a compelling reason to assert that camels used to be an important source of wealth for these individuals; therefore, these communities valued camels. Despite this knowledge, some scientists tend to interpret rock art engravings

featuring horsemen with lances who are chasing camels as hunting scenes. In light of the historical context examined in this research, it seems justified to assume that most of these scenes are likely to portray camel herding rather than camel hunting experiences. The author chose to agree with the assumptions of Burckhardt (1831:139), Macdonald (1990:24-28), and Sweet (1965:1139-1142) stating that camel chasing scenes describe camel raiding practices. To further confirm this assumption, scientists should collect additional information on camel raiding practices, examine relevant engravings, and analyse historical accounts of this practice based on secondary data. An analysis of camel raiding could resolve certain inconsistencies and contradictions that could be observed in contemporary research on Saudi rock art. Unfortunately, the number of studies describing camel herding practices in this region is slight; furthermore, most of them were published in the previous century. Further research would benefit from incorporating new insights into the significance of camel herding practices for Bedouin tribes living in the region around Jubbah during the period between the sixteenth and nineteenth centuries.

The third recommendation for further research is to examine a set of military topics suggested in this study besides the ones related to the use of dogs. Rock art objects at Jubbah point to many interesting themes related to military tactics, such as the effectiveness of matchlocks against the cavalry, the comparable value of lancers who rode camels and horses as military units, and the transition from matchlocks to more advanced weapons as the process that disrupted common military schemes in the region. The study's results also show that the area witnessed occasional skirmishers between forces equipped with modern firearms and tribes that continued to rely on primitive weapons. A critical analysis of all these topics could help scientists enrich the existing knowledge of the region's history during the period between the sixteenth and nineteenth centuries.

Fourth, scientists might consider analysing the transition from matchlocks to flintlocks and then to percussion cap firearms. It is known that many tribes in the region remained committed to matchlocks in spite of their drawbacks. Such a commitment apparently made them vulnerable and predetermined their military inferiority. Scholars could conduct a detailed analysis of the process of transitioning from matchlocks to flintlocks and percussion cap firearms to illustrate the evolution of the military capabilities of local tribes. Such an investigation could be valuable for better comprehending the phenomenon of technological advancement in the Jubbah region.

Finally, the last recommendation is to examine rock art panels located in different sites, such as the ones at Shuwaymis, to show whether they show similar patterns. Scientists also might explore rock art from Libya, Algeria, Egypt, and other countries in the MENA region. A comparison between the panels explored in this research and large collections of rock art from other sites could put the findings of this study into a broader context. Such a comparison would be instrumental in confirming or rejecting some of the interpretations offered in this thesis.

6.3. Limitations

Several important limitations have to be taken into account when analysing the findings of this research. First, it should be noted that this study was carried out on the basis of only three rock art panels. Despite the large number of motifs analysed in the thesis, the fact that only three art panels were explored in the research could be regarded as a relevant limitation of the study. This limitation is not critical since it in no way diminishes the value of the findings outlined above. Nonetheless, it points to the importance of confirming the study's results using a larger sample of rock art engravings. Therefore, a relatively small amount of data analysed in this study is a pertinent limitation of the thesis.

Second, many conclusions made in the discussion chapter are based on the author's personal assumptions and opinions. The researcher tried to minimise these biases; nevertheless, it is still possible that some of them have affected the assumptions. In many cases, the author was forced to rely on common sense and the personal account as a scholar in an attempt to find an accurate interpretation of a particular engraving. For instance, the images portraying horsemen who are chasing camels are labelled by different researchers as either camel hunting or camel raiding activities. The decision to assume that the scenes from the first panel depicted the process of camel raiding was made to a large extent based on the own interpretations of both primary and secondary data. Therefore, a relatively high bias risk remained an essential limitation of the thesis.

Third, many engravings chosen for the study were ambiguous. For instance, one of the scenes in the first panel showed an individual who was shooting at someone with a gun and an individual who was running in front of him. On the one hand, it is possible to assume that these people were running to take part in a battle. On the other hand, the person with the gun could be caught trying to shoot at an unsuspecting soldier from behind as an act of treachery. The picture of a dog "shooting" at a horseman also is an example of a motif that has a controversial meaning. The presence of such ambiguous motifs predetermined a high level of uncertainty in the study, which could be regarded as another limitation of the thesis. Despite these limitations, the current thesis succeeded in making a significant contribution to scholarly literature and offering a set of promising avenues for further research on rock art engravings in Saudi Arabia.

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LIST OF APPENDICES

Appendix A. Detailed Information about All Motifs

Motif ID	Text description	Length (mm)	Height (mm)	Aspect	Human	Horse	Camel	Dog
J001_1_001	Man riding camel with saddle using sword	94	113	Facing right	1	0	1	0
J001_1_002	Man riding camel with saddle	207	130	Facing right	1	0	1	0
J001_1_003	Man standing using bow and arrow	133	140	Facing right	1	0	0	0
J001_1_004	Man riding horse with saddle using sword	157	229	Facing right	1	1	0	0
J001_1_005	Camel running	118	90	Facing left	0	0	1	0
J001_1_006	Man riding horse with saddle using sword to hunting camel	128	120	Facing right	1	1	0	0
J001_1_007	Man riding horse with saddle using lance	125	134	Facing right	1	1	0	0
J001_1_008	Camel	107	106	Facing left	0	0	1	0
J001_1_009	Man riding horse	171	130	Facing left	1	1	0	0
J001_1_010	Man riding horse using lance to hunting camel	117	84	Facing left	1	1	0	0
J001_1_011	Man riding horse with saddle using lance	147	232	Facing left	1	1	0	0
J001_1_012	Horse with saddle	174	161	Facing right	0	1	0	0
J001_1_013	Man riding horse with saddle using lance	114	115	Facing right	1	1	0	0
J001_1_014	Man kneeling using firearm	65	49	Facing left	1	0	0	0
J001_1_015	Man riding horse with saddle using lance	89	79	Facing left	1	1	0	0
J001_1_016	Man kneeling using firearm	65	46	Facing right	1	0	0	0
J001_1_017	Man kneeling using firearm	50	46	Facing right	1	0	0	0
J001_1_018	Man kneeling using firearm	58	42	Facing right	1	0	0	0
J001_1_019	Man kneeling using firearm	67	98	Facing left	1	0	0	0
J001_1_020	Man kneeling using firearm	66	70	Facing left	1	0	0	0

J001_1_021	Man riding horse with saddle using sword	73	97	Facing left	1	1	0	0
J001_1_022	Man riding camel with saddle using lance	156	212	Facing right	1	0	1	0
J001_1_023	Man kneeling using firearm	56	50	Facing left	1	0	0	0
J001_1_024	Man kneeling using firearm	64	59	Facing left	1	0	0	0
J001_1_025	Man riding horse with saddle using sword	93	148	Facing left	1	1	0	0
J001_1_026	Man standing	55	122	Facing left	1	0	0	0
J001_1_027	Man standing using firearm	60	83	Facing left	1	0	0	0
J002_2_001	Man kneeling using firearm	135	84	Facing right	1	0	0	0
J002_2_002	Man kneeling using firearm	107	79	Facing right	1	0	0	0
J002_2_003	Dog	85	78	Facing right	0	0	0	1
J002_2_004	Man kneeling using firearm	76	78	Facing right	1	0	0	0
J002_2_005	Man riding horse with saddle using lance	308	334	Facing right	1	1	0	0
J002_2_006	Man standing using firearm	74	132	Facing left	1	0	0	0
J002_2_007	Man kneeling using firearm	101	53	Facing left	1	0	0	0
J002_2_008	Man kneeling using firearm	120	77	Facing left	1	0	0	0
J002_3_001	Man standing using sword	119	169	Facing right	1	0	0	0
J002_3_002	Dead/injured man	144	85	Facing right	1	0	0	0
J002_3_003	Man riding horse with saddle using lance	315	228	Facing left	1	1	0	0
J002_3_004	Dog	149	87	Facing left	0	0	0	1
J002_3_005	Man standing using sword	72	147	Facing left	1	0	0	0
J002_3_006	Man riding camel with saddle using firearm	224	195	Facing left	1	0	1	0
J002_3_007	Man riding camel with saddle using firearm	216	182	Facing left	1	0	1	0
J002_3_008	Camel	146	142	Facing left	0	0	1	0

Appendix B. Descriptions of the Actions Depicted on the Panels

Motif ID	Riding	Shot/ Killed	Arms Raised	Firearm	Lance/ Spear	Sword	Bow/ Arrow	Waist Band	Saddle
J001_1_001	1	0	1	0	0	1	0	0	1
J001_1_002	1	0	0	0	0	0	0	0	1
J001_1_003	0	1	0	0	0	0	1	1	0
J001_1_004	1	0	1	0	0	1	0	0	1
J001_1_005	0	0	0	0	0	0	0	0	0
J001_1_006	1	0	1	0	0	1	0	0	1
J001_1_007	1	0	1	0	1	0	0	0	1
J001_1_008	0	0	0	0	0	0	0	0	0
J001_1_009	1	0	0	0	0	0	0	0	0
J001_1_010	1	0	1	0	1	0	0	0	0
J001_1_011	1	0	1	0	1	0	0	0	1
J001_1_012	0	0	0	0	0	0	0	0	1
J001_1_013	1	0	1	0	1	0	0	0	1
J001_1_014	0	1	0	1	0	0	0	0	0
J001_1_015	1	0	1	0	1	0	0	0	1
J001_1_016	0	1	0	1	0	0	0	0	0
J001_1_017	0	1	0	1	0	0	0	0	0
J001_1_018	0	1	0	1	0	0	0	0	0
J001_1_019	0	1	0	1	0	0	0	0	0
J001_1_020	0	1	0	1	0	0	0	0	0
J001_1_021	1	0	1	0	0	1	0	0	1
J001_1_022	1	0	1	0	1	0	0	0	1
J001_1_023	0	1	0	1	0	0	0	0	0
J001_1_024	0	1	0	1	0	0	0	0	0
J001_1_025	1	0	1	0	0	1	0	0	1
J001_1_026	0	0	0	0	0	0	0	0	0
J001_1_027	0	1	0	1	0	0	0	0	0
J002_2_001	0	1	0	1	0	0	0	0	0
J002_2_002	0	1	0	1	0	0	0	0	0
J002_2_003	0	0	0	0	0	0	0	0	0
J002_2_004	0	1	0	1	0	0	0	0	0
J002_2_005	1	0	1	0	1	0	0	0	1
J002_2_006	0	1	0	1	0	0	0	0	0
J002_2_007	0	1	0	1	0	0	0	0	0
J002_2_008	0	1	0	1	0	0	0	0	0
J002_3_001	0	0	1	0	0	1	0	0	0
J002_3_002	1	1	0	0	0	0	0	0	0
J002_3_003	1	0	1	0	1	0	0	0	1
J002_3_004	0	0	0	0	0	0	0	0	0
J002_3_005	0	0	1	0	0	1	0	0	0
J002_3_006	1	1	0	1	0	0	0	0	1
J002_3_007	1	1	0	1	0	0	0	0	1
J002_3_008	0	0	0	0	0	0	0	0	0