Critical inquiry on the use and value of 19th and 20th century travel diaries for environmental history reconstructions in general and South Sinai in specific

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To

Cedric,

Celientje & Sibylle

"Empty spaces - what are we living for

Abandoned places - I guess we know the score

On and on, does anybody know what we are looking for..."

(Fragment from Queen's "The show must go on")

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Abstract

The Sinai Peninsula (Egypt), which connects the African and Eurasian continents, has a rich history. However, the environmental history of this arid to hyper-arid area, which has been very isolated even until recent decades, has not been described yet. In absence of (longterm) quantitative measurements for the area, this thesis explores predominantly 19th and 20th century West-European travel writing as a possible source for environmental history reconstruction.

Pre-19th-century, South Sinai attracted mainly pilgrims, who visited what is traditionally believed to be the landscape of the Biblical Exodus; a visit to Mount Sinai, where Moses received the Ten Commandments, and the Monastery of St Katherine formed the climax. In the late 18th- and 19th-century, the area saw an enormous increase in systematic travel writing as a result of European political interest in the strategically positioned Peninsula, growing criticism on the reliability of the Bible, and growing mass-tourism. This has resulted in very abundant but little explored travel writing, in which travellers described their daily life in the desert, the daily weather, the places they visited, their geographical imaginations, and their socio-political and economic interactions.

The data extracted from these diaries were extremely rich in detail and highly useful for environmental history reconstruction of South Sinai. Furthermore, they may help understand climatic and environmental trends on local as well as global levels. At this point it is not clear to what extent information from travel writing is interesting for environmental reconstructions of other than arid areas, where the environment and inhabitants are less directly depending on the weather for survival.

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Preface

I wanted to start this preface with an expression about Moses and the mountain that I remembered from my childhood. I recalled it as "if Moses cannot go to the mountain, the mountain has to come to Moses". The meaning of this expression is that if things do not work in one direction, try it the other way around. In order to translate it correctly into English, I checked on the internet, where to my surprise, I found whole discussions about it being the wrong translation, and that Moses should have been Mohammed, and the expression should have been the other way round (if the mountain cannot come to Mohammed, Mohammed has to come to the mountain). Confused and disillusioned after this exercise, I thought it was better to leave it out of my thesis altogether to prevent any discussions. However, it seemed to capture my thesis and personal trip during my PhD extremely well. On the one hand, I always imagined that this expression was about Moses and Mount Sinai, and because I could not go to Mount Sinai as was planned, the mountain had to come to me. On the other hand, as mountains do not move but travellers do, I was taken on a trip through the Sinai by reading the diaries of 19th-century travellers. I had to cross that desert to reach the Mountain, albeit not physically, but mentally. And like a real desert trip, the route has been rough, with many valleys and mountains. I have passed colourful and lively oases, dreary paths, and places where nothing seemed to grow. I have been flooded by information, though at times my imagination and words dried up. I have battled with silence and loneliness, overcome challenges and periods of hibernation, and I have been on my knees begging God for mercy. However, I have also blossomed as opportunistically and magically as the precious and fragile desert flowers. But above all, I have reached and climbed the Mountain, and experienced the ecstasy of deliverance.

"On any map of the Middle East, the Sinai Peninsula sits dead center, an almost perfect inverted isosceles triangle, a sharp wedge that seems to cleave Africa from Arab Asia. Depending on one's political persuasion, it can be seen in several other contexts: as an eastern arm of Egypt, holy Egyptian soil, severed from its motherland only a little more than a century ago by the Suez Canal; as a natural and logical southern extension of Israel, a massive broadening of the Negev desert; as a northern adjunct of Saudi Arabia, separated from that immensity by the narrow Gulf of Akaba; or, simply, as an ancient land bridge connecting East and West, a handy route for caravans and invading armies...Every Sunday School student knows it as the 'great and terrible wilderness' of the Exodus and, in Judeo-Christian tradition, as the earthly home of Jehovah, a birthplace of monotheism and Western law. Scholars know it as a setting for the development of our alphabet and as a land trampled by history. Yet, geographically, the Sinai evokes an image of vague, uninhabited desert, a lunar wasteland of sand and rock that, by accident of location, has come to hold great significance for many cultures. The Sinai is more a wilderness than a desert." (Bernstein 1980: 1)

Introduction

The "Great Acceleration", which is "...the sharp increase in human population, economic activity, resource use, transport, communication and knowledge-science-technology" (Costanza *et al.* 2007: 9), has been most prominent from the mid-20th century onwards in the economically strongest countries, and forms currently a growing problem in the countries with strong economic growth (e.g. Hibbard *et al.* 2007; Steffen *et al.* 2015). Human pressure on the environment and climate has increased to unprecedented heights, and this is thought to have contributed to climate change and the "increasing frequency and scale of disastrous events" (Butzer 2012: 3639). This has raised the question of whether humanity has entered a new era, the Anthropocene, and if so, since when exactly? Other questions concern the extent to which environmental and climatic fluctuations are natural or caused by humanity, at what pace changes are taking place, how it will impact humanity over time, if there will be a point of irreversible change and collapse, and how humanity can deal with change and potential crisis in a sustainable way (e.g. Oldfield 2005; Costanza *et al.* 2007; Butzer 2012; Steffen *et al.* 2015). Economically vulnerable societies, especially those which depend on land use for their survival and those in (hyper)arid areas, will first be affected by increased frequency of high-impact disasters such as floods and prolonged drought. Effective and sustainable coping mechanisms based on traditional and scientific knowledge are needed for these areas to adapt to disasters, and to prevent disaster-linked migration, which may lead to conflict (e.g. Reuveny 2007; Nautiyal *et al.* 2013).

Environmental histories describe transitions, dynamic "push and pull", impact-response interactions between humans and their environment in a particular place and over a particular period, in which environmental change and human response form the continuum through the context of temporary political, economic, ecological, cultural, social and climatic events (Mikhail 2013; Isenberg 2014; Hughes 2016). They also describe to what extent response strategies have, or have not, proven effective and sustainable in time (e.g. Costanza *et al.* 2007; Mauch & Pfister 2009). Climate history is a branch of environmental history, which describes the interactions between climate and society, and often includes historical weather reconstructions (Carey 2014-1); both can feed into climate models and predictions (e.g. Edwards 2011). Climate histories are thought to be especially important in arid and hyperarid regions[1] where climate, environment and society are extremely closely linked.

Although the MENA is almost completely arid and hyperarid, the role of the environmental history of the MENA has been largely ignored (McNeill 2003: 30; Davis 2007: 172), and relatively few environmental histories of this area have been published (e.g. Davis 2007; Davis & Burke III 2011; White 2011; Mikhail 2011, 2013). Little is known about the MENA's 19th-century environmental history, even though this was a period of important changes, most notably, the overturning of the pastoralists, who had dominated this area for centuries, and the arrival of European colonisers (e.g. Davis 2007; McNeill 2013). However, the MENA has plenty (European) historical written sources, which can be used for environmental history reconstruction (Mikhail 2013-1: 7); the 19th-century material is particularly rich, because the region formed an important battleground of France and Britain.

[1] There are many different definitions of aridity based on several parametres. UNESCO uses the terms "arid" and "hyperarid" based on the ratio between precipitation and Potential Evapotranspiration (PET), and applies "arid" to the areas with values between 0.03-0.2, and "hyperarid" to the areas with values lower than 0.03 (Greenwood 1997: 60).

Historical written sources of South Sinai

The Sinai Peninsula is a triangular (hyper-)arid area that connects the African and Asian continent and roughly covers 60.000 km^2 (Fig. 1).

North Sinai has been trodden for millennia by military, traders and Muslim pilgrims as it forms the only land-bridge between the two continents. South Sinai has exclusively sea-boundaries, and its highly mountainous inlands (up to 2629 m above sea level) are extremely isolated. In the past it was difficult to enter South Sinai due to limited geographical access and tribal boundaries. However, from the early centuries A.D., the area has attracted numerous (European) pilgrims and travellers[2], who regarded it as the Christian landscape of the Biblical Exodus; many kept diaries. The oldest surviving diary, from the female Spanish pilgrim Etheria (also spelled Egeria)[3], dates back to the second half of the 4th century A.D. (McClure & Feltoe 1919).

Over the centuries, the stream of pilgrims was more or less continuous but fluctuated in number and composition. Between the 16th and 19th-century, the number of European pilgrims decreased. This was most likely the result of several factors, such as social and political unrests both in Europe and in Sinai, religious shifts related to the Reformation including decreased interest for Saints such as St Catherine (Labib 1961), and worldwide climate fluctuations during the Little Ice Age (LIA)[4]. Napoleon's invasion of Egypt in 1798 formed a climax and permanent turning-point in the relation between the "West" and "East". When Europeans resumed travelling in the early 19th-century, it was more sophisticated and in larger numbers than ever before as a result of new technologies such as steam ships and railways, the development of travel agents such as Cook & Son, and

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[2] Travellers are defined in this thesis as everybody who passed through South Sinai.

[3] http://www.egeriaproject.net

[4] The Little Ice Age was a period between the 16th and 19th century of lower than normal temperatures.

the publications of the first travel guidebooks by Baedeker and Murray (Hunter 2004; Buzard 2006; Carr 2006). The 19th-century saw a rich and steady flow of European travellers, who discovered and re-imagined the Orient (e.g. Tietze 1995: 34); they described their experiences and opinions in their diaries.

The aim of this thesis

Until now, South Sinai's environmental and climatic history has not been described. Yet, the Sinai Peninsula, which forms part of the Saharo-Arabian deserts and is among the warmest and driest deserts in the world (Perevolotsky 1981: 333; Danin 1973, 1983; Warner 2004: 79/80), can provide important insights into local and global processes of climate and environmental change due to the close link between life and water availability.

South Sinai's yearly precipitation averages have been estimated between 50-300 mm above 1500 m (Eichler & Scheuerbrandt 1983: 196; Greenwood 1997: 59; Dadamouny & Schnittler 2015), on average 65 mm around the Monastery of StK (Eichler & Scheuerbrandt 1983: 196), and barely 13-30 mm along South Sinai's southwestern coast (Eichler & Scheuerbrandt 1983: 196; Greenwood 1997: 57). Biodiversity in South Sinai is directly linked to water availability from precipitation. The greatest biodiversity and most gardens can therefore be found in the high mountains, in the wadies[5] that drain the high mountains, and in the relatively water- and nutrient-rich wady mouths (where wadies reach the sea). Since the 1980s, a large part of these biodiversity-rich areas are Protected Areas, Protectorates or National Parks: four are situated along South Sinai's east coast, while the fifth covers the high mountains.

It is thought that climate change may lead to prolonged periods of drought and increased extreme weather events in (hyper)arid areas.

[5] Wady (pl. wadies) is the Arabic name for valley.

In South Sinai, this would predominantly affect the most water- and biodiversity-rich areas, which are prone both to destructive flashflood events and prolonged drought. Simulation programs and models have been developed to predict extreme weather events such as flashfloods (e.g. Cools *et al.* 2012; El Afandi *et al.* 2013), and species distribution under climate change (e.g. Newbold *et al.* 2009; Leach *et al.* 2013). However, these models are simplifications of the reality. Since there are no comparative historical data available for South Sinai, and only very sparse current data (e.g. Dadamouny & Schnittler 2015), it is unknown if, and if so how, the frequency of flashflood and prolonged droughts has changed over time, and how climate change is affecting South Sinai. Data collection is problematic, because precipitation events are relatively rare and often very local in time and space. Furthermore, urban development, tourism, overgrazing, mining, over-collecting and hunting, which are considered the most important anthropogenic threats for the biodiversity in South Sinai (Kamel *et al.* 2001; White *et al.* 2008; Basuony *et al.* 2010; Ghazanfar & Elshafaey in prep.) are generally not included in these models. Current population changes may therefore get incorrectly linked to climate change, and future predictions may not be realistic.

In absence of other longterm (measured) data for the area, this thesis aims to investigate critically the value of data extracted from 19th and 20th century South Sinai traveller diaries for the reconstruction of the area's environmental and climatic history.

Data sources & context

Said's highly influential work, *Orientalism*, first published in 1978 but used here in its 2003 edition, "was the first work of contemporary criticism to take travel writing as a major part of its corpus, seeing it as a body of work which offered particular insight into the operation of colonial discourses", and it has been regarded "as the beginning text for postcolonial studies" (Hulme & Youngs 2006-1: 8). The use of travel writing for environmental and climatic history construction is not new, but it has been mainly restricted to data from travellers who resided in a particular area for a certain period of time. South Sinai travellers wrote their diaries while moving along the main access routes between Cairo and Mount Sinai/the Monastery of StK, and between the Monastery and ‘Aqaba/Gaza. Generally, travellers did not spend more than a few weeks in the area, and their diaries contained a mix of observations, expectations based on the Bible, and contemporary ideas. Explorers, researchers, artists, trophy-hunters and travellers who wanted to experience ‘walking in the footsteps of Moses and the Israelites’ explored, described, measured, mapped, drew, and photographed South Sinai in the 19th and 20th century.

This thesis explored 19th and early 20th century travel writing from South Sinai. The data extracted from this material are highly variable in focus, detail, time and space. In combination with South Sinai’s equally variable environmental and climatic conditions in space and time, it is questionable to what extent the data from traveller diaries can provide information about the environmental and climatic history of the area. However, given the importance of the area’s recent environmental history at a local and global scale, and the fact that environmental changes pre-WW-I are thought to have been mainly the result of the weather and Bedouin activity, these traveller data are a unique and important topic to explore.

Thesis structure

This thesis gives an overview of environmental and climatic events and their contemporary interpretations along South Sinai’s main travel routes. Chapter 1 is a review of environmental and climatic history reconstruction methods, specifically from literature sources, and 19th-century interpretations of arid regions. Chapter 2, the methodology, deals with the data collection and analysis used for this thesis, and it contains a map with the traveller routes. Chapter 3 forms a detailed description of the main traveller routes, which form the red line through this thesis. Chapter 4 is a reconstruction of the 19th/20th century landscape, based on the imaginations of the Biblical route. Chapter 5 discusses the 19th-century environmental narratives and the representation of South Sinai in writing, art and on maps. Chapter 6 consists of a reconstruction of 19th- and 20th-century weather events along the routes, and chapter 7 discusses the climatic imaginations of travellers and Bedouin. This is followed by a discussion of the value of travel writing for the reconstruction of environmental and climatic history in general and of South Sinai specifically. The thesis finishes with a conclusion and recommendations for future research.

"...there is good reason to conceive of the last millennium of Middle Eastern history along the lines of climate and weather patterns rather than political states. Indeed, it would seem that periods of cooling or climatic fluctuations often had greater impact on rural peoples in the MENA [Middle East & North Africa] than did the political powers ostensibly ruling over them." (Mikhail 2013-1: 13)

Chapter 1 Literature review

1.1. Introduction

Although the idea of environmental history has existed for a long time and across many disciplines (e.g. Williams 1994), the interdisciplinary field of environmental history is a relatively young academic field, which has developed since the 1970s/80s (McNeill 2003; Richards 2003; Isenberg 2014-1: 3). Until the second half of the 20th century, most studies focussed on the history of humans *or* their environment and the permanent struggle and collapse of societies as a result of harsh environmental conditions, while climate was considered more or less constant in time (Richards 2003; Costanza *et al.* 2007). In the late 1960s and 1970s, key publications of Le Roy Ladurie (1971) and Lamb (1995) emphasised the role of climate fluctuations in human history, e.g. the Little Ice Age (LIA), while Worster (1979) highlighted the active role of humans in environmental disasters. Together with the growing awareness of climate and environmental change, this has led to the development of the fields of environmental and climatic history, which study the interactions between societies and their environment/climate (e.g. Bradley & Jones 1995; Pfister *et al.* 1999).

This chapter discusses the current topics in environmental history, the climatic, environmental and human challenges of the MENA in general and South Sinai in specific, and the necessity to understand the environmental and climatic history of these regions. It then addresses the methods and data that are used for the reconstruction of environmental and climatic histories, and it discusses the value of travel writing in specific. Lastly, it focusses on what is known already about the environmental and climatic history of the MENA, the gaps and how this thesis addresses these gaps.

1.2. The topics and the importance of environmental history

1.2.1. Current topics in environmental history

Whereas earlier environmental history research focussed mainly on society collapse[6], current topics in environmental history are: 1. environmental change, why it happened and to what extent societies are vulnerable[7] or resilient[8] to environmental and climatic stress; 2. political and institutional control over the environment, and to what extent societal responses to events increase vulnerability or mitigate the impact; and 3. human perception of the environment (Young *et al.* 2007; Mauch & Pfister 2009; Butzer 2012; McNeill 2013: 28; Isenberg 2014; Hughes 2016). Together, these topics cover information about the dynamic interaction between societies and their environment/climate, political and institutional power constructions through regulation of the environment, and human strategies to deal psychologically with the restraints of their environment.

Whereas in the past the focus was on societal collapse as a result of disastrous climatic events, climate is now considered as an important, but not a core shaping factor in environmental histories (Costanza *et al.* 2007; Young *et al.* 2007; Liverman 2009; Butzer 2012: 3638; Butzer & Endfield 2012). How disasters, short term and longer term fluctuations patterns, and (recurrent) extreme events affect societies depends on the "amplitude", "frequency", and "duration" of events, and the local, social, political and economic setting (Diaz & Stahle 2007; Endfield 2012). The vulnerability and resilience of a society

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[6] According to Tainter (1988: 4) "a society has collapsed when it displays a rapid, significant loss of an established level of sociopolitical complexity".

[7] Vulnerability can be described as the sensitivity of societies and environments to stress, and the potential damage from stress due to a lack in capacity to react (e.g. Adger 2006; Gallopin 2006).

[8] Resilience has been defined as "the degree to which a complex adaptive system is capable of self-organization...and...can build capacity for learning and adaptation" (Adger *et al.* 2005: 1036). Apart from the capability and flexibility of a society to react to stress, it also requires socio-economic means and political freedom to react.

are, therefore, not static in time, but fluctuate as a result of mitigation through, for instance, social capital[9], human capital[10] (e.g. Adger 2003; Pfister 2009; Endfield 2012), adaptation and cultural and religious interpretation. These different factors mean that the impact of an event in an area is often stratified, often affecting vulnerable societies first (Endfield 2012).

Societies which are exposed on a regular basis to disasters are thought to invest more in adaptation (Pfister 2009), for instance through technical innovations (e.g. Mauelshagen 2009), back-up systems (e.g. Liverman 1990; Puri 2007; Damodaran 2009; Kuruppu & Liverman 2011: 662; Endfield 2012; Jarvis *et al.* 2012), (temporary) migration (e.g. Reuveny 2007), and careful resource management (e.g. Bridges & McClatchey 2009). Cultural-religious interpretation of an event, such as accepting it as part of life on a rational or religious basis (e.g. Bankoff 2009; Mauelshagen 2009; Weintritt 2009; Mikhail 2013-2: 111), and cultural/religious "prevention" methods, such as rituals, confessions, or sacrifices (e.g. Mouthaan, Garza-Merodia, Bauer Coleman and Romero in Mauch 2004) can also be part of mitigation. Learning about how societies in a range of spatial and temporal contexts dealt with disaster through ethnoclimatological data and stories of disaster experience (e.g. Orlove *et al.* 2002; Marin 2010; Carbonell 2012) can help to improve coping strategies and may limit the effects of an event on a society (Pfister 2009; Endfield *et al.* 2009).

Indigenous coping, adaptation and mitigation techniques have often been misinterpreted and disturbed by European missionaries and colonisers (Damodaran 2009; Rosario Prieto 2009; Davis 2007), especially in arid regions (e.g. Davis 2007), although some of it

[9] Social capital is the way the society cooperates through social networks and support in case of disaster.

[10] Human capital is the accumulated knowledge to recognise natural signs of approaching disaster (e.g. Gregg *et al.* 2006) and how to react to it.

continued (e.g. Endfield 2012). Much of it was suppressed on the basis of contemporary ideas of evolution, hierarchy and classification of nature and societies (Livingstone 2003), which got incorporated into science and led to false environmental narratives. For instance, in the 18th and 19th-century, it was incorrectly suggested that North African deserts were the results of environmental degradation caused by local inhabitants and their animals, and that these effects could be countered by re-planting and active (European/Christian) management (Davis 2007 & 2016). These ideas became "facts", some of which still influence political decisions today (e.g. Livingstone 2003; Davis 2007; Carey & Garone 2014).

1.2.2. Environmental and climatic strengths and challenges of the MENA

Proxy data show that the most recent drought (1998-2012) over the Eastern Mediterranean was the severest of the past 500-900 years (Cook *et al.* 2016); a similar pattern has also been described for the Mediterranean (Alpert *et al.* 2002), which suggests widespread drought. The Arabian Peninsula experienced a "significant decrease of rainfall" and a significant increase of temperature of "0.72°C per decade" for most of the Peninsula over the period 1979-2009 (Almazroui *et al.* 2012: 44). The drought over the Arabian Peninsula was most severe during the period 1994-2009 (Almazroui *et al.* 2012), which may suggest that this drought arrived from southeastern direction and moved afterwards further northeastwards over the Mediterranean. It has been suggested that South Sinai also suffered from drought, increased temperatures, and increased frequency of flash-flood events between the late 1990s and the 2010s (Dadamouny & Schnittler 2015); it is not clear though how the field data were collected and to what extent the authors have (in my opinion, unjustly) extrapolated data from Egypt to the abundant variety of microclimates of South Sinai.

Cook *et al.* (2007) and White (2013) suggested that prolonged droughts have a devastating effect on societies; recent long-term droughts in the Eastern Mediterranean have shown that rural regions are particularly vulnerable (Sowers & Weinthal 2010). Droughts are very difficult to recognise and to predict, because dry spells may be short or long, the amount of rainfall is difficult to measure due to irregularity of rainfall in space and time, and due to the "the slow initiation and undefined end of a drought...it [is] very difficult to take defensive actions" (Maliva & Missimer 2012: 31). Drought is now considered a "temporary" and "recurring" worldwide event (Smakhtin & Schipper 2008), an "environmental vulnerability" and "periodic ecological crises" (White 2013: 80).

In the past, communities developed techniques to deal with the "temporary" and "recurring" nature of the events, which has resulted in strong co-adaptation with the fluctuating environment (Mikhail 2013). According to McNeill (2013: 28), the environmental history of the MENA has been mainly shaped by "water, grass, and energy". Due to irregular rainfall and limited access to potable water, the MENA has a highly mosaic environment. Domestic animals played an essential (but often little recognised) role in dealing with these climatic and environmental limitations, because they provided flexibility to make optimal use of irregular rainfall and availability of vegetation (White 2011, 2014; Khazeni 2013; McNeill 2013). In the past, strong interactions between pastoralists, who controlled the overland caravan routes to the (mainly coastal) cities, and agrarians, who controlled the oases, cities and sea-trade formed the basis of the invincible economic and political rule in the area between the western parts of the MENA and India (Bulliet 2013; Khazeni 2013: 133; McNeill 2013: 34).

This strength and power-balance was based on, but at the same time vulnerable to, (strong) climate and environmental fluctuations. For instance, the LIA which took place between the late 16th and early 18^{th}-century, led to increased pastoralist movement, raids on agrarian settlements, and agrarian movement towards the urbanised areas, where they were confronted with famine and disease (White 2013). Ottoman attempts to settle the "uncivilized, primitive, and savage" pastoralists in the 18th- and 19th-century, by claiming that "pastoralists' animals damaged agriculture and degraded environments" (McNeill 2013: 38), had a destructive influence on the pastoralist societies. As a result of the political and socio-economic chaos and degradation, the Ottoman Empire took much more time to recover from the LIA than, for instance, Europe, which had gone through a socio-political turmoil and rapid developments in science and technology during this same period (Faroqhi 2013; White 2013). All together, it eventually led to the collapse of the Ottoman Empire in the second half of the 19th-century.

Today, increased pressure on water availability due to larger fluctuations in rainfall, human influx from outside (e.g. Warner 2004), narrow margins of water availability, little or no financial resources and the prolonged rather than intensive droughts cause real challenges worldwide (Maliva & Missimer 2012).

1.2.3. Climatic and environmental challenges in South Sinai

South Sinai suffers from recurrent drought and flashfloods, and the region is likely to be among the first to be hit by projected climate change. However, very little is known about the climatic and environmental fluctuations and cycles in this area, how it may have changed over time, how the inhabitants dealt with drought and flashflood events or how it may have affected their socio-economic and political structures. The potential effects of climate change on the species rich area and its inhabitants are very little understood.

The Sinai Peninsula forms a biogeographical transition zone between Africa and Eurasia, and it has a mixed flora and fauna from both continents (e.g. Danin 1983; Grainger & Gilbert 2008). The number of plant species in Sinai has been estimated between approximately 300 and 1300 species, of which 30 to 40 species have been considered endemic (Kamel *et al.* 2001); this is approximately 50% of the total number of endemic plant species in Egypt (Radford *et al.* 2011: 43). The high granite mountains in South Sinai are especially rich in species, because of the variety of microclimates caused by higher precipitation, cooler temperatures and different geological strata (Perevolotsky 1981). The run-off from these mountains contains a lot of clay particles and fertilises the wadis and slopes, which permits richer floral diversity in these areas than, for instance, on flats or ridges (Perevolotsky 1981; Ayyad *et al.* 2000).

Most of the Bedouin mountain gardens are situated between 1800 and 2000 metres above sea level, where the temperature is 10-15 degrees lower than in the coastal areas, and the precipitation 4-10 times higher (Perevolotsky 1981); the extensive gardens of the Monastery of StK are situated at a slightly lower altitude, around 1600 m. At these altitudes, the monks and Bedouin grow plants and trees, such as cypresses, olive trees, fruit trees (e.g. almonds, apples, pears, apricots and citrus), which cannot grow in other parts of the Sinai Peninsula. South Sinai's western coast is dominated by low plains, which run parallel to the coast, interrupted by relatively vegetation-rich wadies and oases. The eastern coast is rockier, interrupted by fewer vegetation-rich wadies, but along the coast there are mangrove swamps (Zahran & Willis 2009).

South Sinai's fauna is mainly present in areas with permanent access to water and vegetation, such as in some of the wadies, the high mountains, and in the coastal areas. Two of Egypt's five main hotspots for mammal diversity are situated in South Sinai: around "Ras Sidr", which is situated along South Sinai's west coast, and the St Katherine Protectorate (Basuony *et al.* 2010: 1). South Sinai is also noteworthy for "breeding and migratory birds" (White *et al.* 2008), aquatic fauna and coral reefs; three of the six Marine Protected Areas in Egypt are situated along Sinai's eastern coast (Samy *et al.* 2011: 167).

In total, there are five Protected Areas in South Sinai, which cover the high mountains around StK and most of the (coastal) area situated south and east of that. Ras Mohammed (836 km²), became the first National Park of Egypt in 1989 (Latzke *et al.* 1995: 179; Semsek 2008: 405) and has IUCN category II status (Salm *et al.* 2000: 305; Samy *et al.* 2011: 168). The Nabq Protected Area

(586.5 km²) covers the area between Sharm el Sheikh and Dahab, and the Abu Galum Protected area (458 km²), which stretches from Dahab to Nuweiba, have both received the "Managed Resource Protected Area (IUCN Protected Area management category VI)" status in 1992 (Samy *et al.* 2011: 168/169): the natural environment is protected and development is prohibited, but recreation and traditional Bedouin land and sea use are allowed outside the "no-take zones" (Salm *et al.* 2000: 305; Samy *et al.* 2011: 169). The Taba Protectorate (3590 km²), between Nuweiba and Taba, is rich in landscape formations and animal species, and the coastal area is a national park (Salm *et al.* 2000: 306). The largest protected area of South Sinai, and one of the largest protected areas in Egypt (Grainger & Gilbert 2008), is the St Katherine Protectorate covering 4350 km² (IUCN 2003), which became a Protectorate in 1986 (Paleczny *et al.* 2007): it is rich in vascular plants (Radford *et al.* 2011), and is an Important Bird Area (White *et al.* 2008).

A major complication in understanding Sinai's climate is its position on the edge of two atmospheric systems, the Hadley and Ferrell Cells which meet at 30° latitude. In the Hadley Cell, an atmospheric circulation between the Equator (low pressure) and approximately 30° latitude (high pressure), the predominant wind direction is a northeastern wind, also called the Eastern Trade Winds. The Ferrell Cell, which circulates between 30-60°, is characterised by Westerlies, southwestern winds. In general, Sinai weather is characterised all year round by high pressure, cloudless blue skies, dry weather, and northern, northeastern, and northwestern winds (Zahran & Willis 2009: 219). However, with the seasonal movement of the sun, the Hadley and Ferrell Cells can sometimes cross the 30° latitude between early October until late April/May, causing variable winds which can bring humidity or precipitation, generally as rain or hail, or (limited to the high mountains) snow (Greenwood 1997: 56, 59).

Precipitation events are highly variable in amount, time and place (e.g. Greenwood 1997: 59), and can be very powerful and destructive as the water forces its way with great speed through the steep wadies of relatively impermeable rock, which drain the high mountains and run down to the lower plains and the sea. Consecutive years of drought are also common. However, the underlying climate systems are little understood, which complicates predictions of events and detection of changes in frequency. Furthermore, the hydrology of wadies is still poorly understood (e.g. Wheater & Al-Weshah 2002; Sen 2008). In the UN classification, the high mountains are considered "arid" in contrast with the hyperarid lower areas (Greenwood 1997: 61). However, in years with very limited or no precipitation, and beside the important drainage wadies which receive generally more water and are at least partly inhabited and cultivated by Bedouin, the area may actually be considered hyper-arid. Some climate models have been developed for the area (e.g. Maslin & Austin 2012; Tozer *et al.* 2012), but the highly local climatic variability and the gaps in knowledge about Sinai's climate and environment complicate the understanding of, for instance, (climate-related) population dynamics and how to protect "critically endangered" species such as the endemic Sinai Baton Blue butterfly (Gilbert *et al.* 2010: 18; Thompson & Gilbert 2013).

Another threat for the environment is the change in lifestyle of the Bedouin and increased tourism. Until the mid-20th century, South Sinai was mainly inhabited by a few thousand Bedouin and a handful of monks who adjusted their livelihoods to the variability in weather in space and time. The Jebeliya, who inhabit the area around the Monastery, lived a semi-nomadic life, migrating both horizontally and vertically (Perevolotsky *et al.* 1989; Doughty 1995). In the summer they live and work in their mountain gardens, and in the winter they lived in the lower, warmer areas (Perevolotsky 1981). To decrease the grazing pressure on the pastures they developed a rotation system, al-hilf (Hobbs 1995;

Rashad *et al.* 2002). Between February and May, they prevent herds from grazing the pastures above 1800 metres, or from particular wadies, in order to allow the vegetation to regenerate and finish their reproduction cycle (Hobbs 2006). They also shared pastures with other Bedouin tribes, because limited rainfall in space and time forces them to depend on each other for survival (Rabinowitz 1985; Perevolotsky 1987). However, in recent years both the Monastery and Bedouin are now largely dependent on income from tourism (Bentley 1985: 14). This dependence not only has consequences for the environment, but has also proven fragile with the political unrests of the past few years (The Guardian, 5 September 2013[11]).

The current number of permanent inhabitants in South Sinai has increased dramatically since the withdrawal of the Israelis in the 1980s, and is estimated at 170.453[12]. The Bedouin and the monks of StK are now just a very small portion of the inhabitants. Before the current unrests, the Monastery attracted an average of 300,000 visitors per year between 2002-2007 (Paleczny *et al.* 2007), and the popular coastal areas and beaches many more. Field data collected in 2009/2010 suggest that some thirty plant species, including several endemics, are threatened over-collecting and habitat destruction (Ghazanfar & Elshafaey *in prep.*). Furthermore, desiccation and salinization of the soil due to increased water use, and species and seeds which have (intentionally or not) been introduced from outside South Sinai, for example, *Casuarina* sp. and *Eucalyptus* sp. (Abd El-Ghani & Fahmy 1998) are threatening the South Sinai environment. Environmental and climatic histories could improve understanding of the dynamics in the area before development of cities and large scale tourism, and help to

[11] http://www.theguardian.com/world/2013/sep/05/mount-sinai-monastery-egypt-closure

[12] http://www.capmas.gov.eg/Pages/populationClock.aspx# [21 Jan. 2016]

distinguish natural (climate-related) fluctuations from human impacts. In the next section, the data available to reconstruct environmental and climatic histories is considered in more detail.

1.3. Reconstruction of environmental and climatic histories

1.3.1. Data used for the reconstruction of environmental and climatic histories

Environmental history forms a bridge between science and social science, and makes use of data and concepts from a wide range of disciplines (e.g. ecology, botany, climatology, environmental studies, history, economy, politics, geology, geography, anthropology, and literature) to describe dynamic interactions and multi-causal events (e.g. Richards 2003; Isenberg 2014). The idea of "using science, as well as studying it" allows environmental historians to study environmental history, science and the interaction between both within their contemporary context (Lewis 2014: 207/208).

Both quantitative and qualitative historical data have been used for the reconstruction of environmental and climatic histories. Quantitative data provide information about e.g. presence of flora and fauna species, the amount of precipitation, temperature, frequency of events, such as floods, earthquakes, or volcano eruptions. However, reliable data over a long timespan are scarce. Rare examples of reliable long-term climate records are the logbooks of the Hudson's Bay Company (Catchpole 1995), the Chinese Qing Yu Lu, Clear and Rain Records (Wang & Zhang 1995; Wang *et al.* 1995), and military reports (Landsberg 1980). However, for most countries outside Europe, there are no quantitative meteorological data available prior to the 1870s, when Meteorological Services came into existence (e.g. Luterbacher *et al.* 2012). However, amateur observations and qualitative data are often very rich.

In the absence of long-term quantitative weather data or direct weather observations, proxy data, such as tree-rings, ice cores, lake sediments, and pollen records can be used for climate reconstructions (e.g. Kaniewski *et al.* 2010; Rimbu & Lohmann 2011). Although these data can be extremely informative, they come with issues such as different levels of resolution and disturbances in the samples: the interpretation of the data is not straightforward and therefore becomes most useful when combined with other data sources (Moberg *et al.* 2005; Oldfield 2005; Jones *et al.* 2009; Carey 2014-1: 28). For instance, tree-ring width may be a function of more than one factor, e.g. temperature and rainfall, and trees may have been watered by humans so that the ring width does not reflect climatic circumstances (Liphschitz *et al.* 1987; Trouet *et al.* 2012; Touchan *et al.* 2014).

Indirect observations of climate variability and extreme events, including famine, disease, plant phenology, harvest dates, crop production, water level indications, and composition of diet cannot be monocausally linked to the weather, because the systems underlying these phenomena are generally complex (e.g. Smakhtin & Schipper 2008; Faroqhi 2013; Meena 2015). For instance, 1791 was an extreme plague year in Cairo preceded by an exceedingly wet winter, floods, destruction of agricultural land, famine, and enormous numbers of rats which are vectors for the plague (Mikhail 2013-2: 116). However, a year with high numbers of plague victims cannot directly be linked to excessive rainfall, and famine, and large numbers of vectors can result of other factors. However, regularly returning epidemic diseases such as the plague, which "visited Egypt once every nine years on average for the entire period from 1347-1894" (Mikhail 2013-2: 112), should be taken into account as an important "ecological force" (Mikhail 2013-2: 115) which shaped the environmental history through natural selection and political, economic and social destabilisation. Understanding of the context is therefore essential for the correct interpretation of environmental and climatic data, and this can only be found in qualitative data sources.

Qualitative data sources are myriad and include (traveller) diaries, journals, (missionary) letters, annals, logbooks, official communications, newspaper articles, letters written to family and friends, and oral histories. Although these documents may focus on topics other than the environment and weather, they can contain unique information about the daily weather, environment, disease outbreaks, social interactions, experiences and interpretations of daily life and (extreme) events, and memories linked to earlier events (e.g. Latham 2010; White 2010; Mikhail 2013). Qualitative data pose challenges such as discontinuous data records, overrepresentation of extreme events and specific places, underrepresentation of the "normal" situation, and confidence issues concerning the originality and accuracy of the data.

Quantification and classification of qualitative data can help to interpret the data, and confidence rating can be applied to increase the reliability (e.g. Nash & Grab 2010). In recent years, qualitative data have been used to understand climate teleconnections, e.g. the links between wind direction, strength of wind, oscillation and weather events such as droughts, floods, and storms (e.g. Santoro *et al.* 2015; Dominguez-Castro & Garcia-Herrera 2016). Researchers have emphasised the importance of multi-disciplinary research and data from different sources in order to improve understanding of the interactions between environment, climate and society (e.g. Haldon *et al.* 2014).

1.3.2. Available data records from the MENA

Apart from the Nile records, which reflect the amount of rainfall in the highlands of Ethiopia and Uganda (East African Monsoon) and have been used for climate history reconstructions of floods and droughts (e.g. Conway 2000; Johnson 1992; Quinn 1992; Hassan 2007), there are few other quantitative long-term climatic records in the MENA; short-term records are more common (e.g. Brunet *et al.* 2014). A small number of climatic histories of the Middle East have been reconstructed on the basis of proxy data (Nicholson 2011), e.g. tree-rings (e.g. Liphschitz *et al.* 1987; Tarawneh & Hadadin 2009), and data from lake levels (e.g. Klein & Flohn 1987). The main problem with tree-ring reconstructions and lake deposits in the MENA is that there are not many old trees with clear tree-rings that have not been cultivated and watered over time, and there are almost no lakes (McNeill 2013). Absence of long-term climate data from a specific location, such tree-rings, lake sediments, and accurately noted data, such as the Nile level data from the Nilometer in Cairo, complicate research in the MENA, because data from surrounding areas cannot be extrapolated in its mosaic environment. Most of the environmental and climatic research in the MENA is therefore limited to (relatively) well-documented specific historical events, e.g. the LIA, and more recent 20th/21st-century data. However, little has been written about the 19th-century (e.g. Davis 2007), even though this was a period of great changes in human impact on the environment, often influenced by colonialism.

1.3.3. The value of travel writing for the reconstruction of South Sinai's environmental history

The main, and possibly only tool, to study South Sinai's pre-20th century environmental history is travel writing. The late 18th and early 19th-century (1790s-1815) saw an interruption of travel in Europe as a result of the French Revolution (1789-1799) and the Napoleonic Wars. When travel resumed in the early 19th-century, it had shifted from what had earlier been an aristocratic privilege, to mass tourism (Hunter 2004; Buzard 2006). The Middle East and North Africa were Europe's main interests (Bridges 2006: 63), as they formed the (potentially dangerous) meeting place between "East" and "West" (Said 2003), the "contact zone" (Mikhail 2013-1: 1; Melman 2006: 105), "the space of colonial encounters, the space in which peoples geographically and historically separated come into contact with each other and establish ongoing [inequal] relations..." (Pratt 2003: 6).

South Sinai has a long tradition as contact zone. It goes back to the early centuries A.D., when it became a refuge for Christians who escaped Roman persecution (Grainger & Gilbert 2008), and a place for European pilgrimage as it was believed to be the landscape of the Exodus of the Bible. Said suggested that the "West" recreated the

Orient through "text" by defining what the "West" was not (Gregory 1999: 115; Said 2003). Travel writing projected imagined realities onto the landscape ("scripting") and in that way brought them to life (Duncan & Gregory 1999; Gregory 1999: 115). The stylizing and reinforcement of narratives, roles and routes "shape...the expectations and experiences of subsequent travellers" (Gregory 1999: 117) and add to the travellers' experience of "authenticity" (Gregory 1999: 199; see also Gregory 2001). South Sinai formed the arena where European Christians were led by "Eastern" guides along the (Judeo-Christian) "route of Moses and the Israelites", in order to meet local Christians in a "Christian landscape". DeSilvey (2007: 43) has described this kind of mimicking as a way to get access to the past and "the creation of a new understanding of material and place".

It has been argued by some that the projection of the Exodus on South Sinai was created by early Christians in the first centuries A.D. to break away from Judaism and establish Christian identity, as the area had not been a place of veneration before (for detailed discussion see Ward 2008). The embodiment of Christianity, in constructions such as the Monastery of StK, in the relicts of Saint Catherine of Alexandria, in the bodies of hermits living around Mount Sinai, and in Christian mythical figures such as Constantin the Great and his mother Helena, and Emperor Justinian and his wife Theodora who spread and protected Christianity in the early centuries, added to the creation of this "holy" place (Elsner & Wolf 2010). However, it has also been suggested that the "scripting" of South Sinai was "a tool in the service of ideologies, both religious and political" (Meshel 2000: 152), and that pilgrimage was actually a form of Western control (Wharton 2006). Possibly for similar reasons, some researchers have suggested that Mount Sinai and the route of the Israelites were actually geographically differently positioned (e.g. Anati 2001, 2013).

The interest in South Sinai as a Christian and politically strategic landscape has produced a rich and abundant travel literature (Bridges 2006), especially in the 19th-century. There has been some research on pilgrims who visited South Sinai (e.g. Labib 1961; Kraack 1997), and early Biblical projections (Ward 2008), but until now it has not been explored for the reconstruction of the area's environmental history and geographical imaginations. There has been some recent work on 19th-century travel writing of Palestine (Suwaed 2016). However, Suwaed (2016) mainly focussed on the interactions between the travellers and Bedouin and seems to have ignored the Orientalist aspect of the travel writing he investigated, and climatic circumstances that are likely to have fed interpretations of the local environment and human interactions/tensions.

Although it may be argued that travel writing has been shaped and edited in many ways (e.g. Ogborn & Withers 2010; Withers & Keighren 2011; Keighren *et al.* 2015), it is also the main aspect that makes it a very interesting source of information. Sponsored studies (Bridges 2006), the focus and interest of newspapers and journals, the goal and public of the publications, and credibility of the authors, all played a role in whether a book or article was published or not. In the 19th-century, well-established editors, such as John Murray and Stanford (Bridges 2006), could provide authors with this credibility (Withers & Keighren 2011). However, Murray edited the books for the aimed goal or public, reorganised the chronology of the text to improve the readability, asked authors to change the content of their text, and in this way only published and "re-created" geographical areas that interested his public (Mayhew 2007; Withers & Keighren 2011). Maps and other graphic materials, such as paintings, photographs and film, show similar partiality and underlying power constructions and interests through the centre of the projection, colours, texts and symbols, and what is being show and what not (e.g. Harley 1989; Schwartz & Ryan 2003; Cosgrove 2008).

This has raised the question if there is any way to ever reveal environmental reality (Gregory 1999: 146). Duncan & Gregory (1999-1: 5) pointed out that "all geographies are imaginative geographies", realities within a cultural context, what Said called the "distorted mirror" (Said 2003; Gregory 1999: 146). As a result, science and travel writing are always "local" or embodied "knowledge" (Livingstone 2003: 81) and limited by the background of a researcher or traveller (Culver 2014). On the other hand, it is exactly these contemporary and personal realities that provide information about how Europeans interpreted desert environments, climates and the role of local inhabitants in areas such as South Sinai and other parts of the MENA (e.g. Davis 2007; Winchester & Rofe 2010; Suwaed 2016).

In this light, this thesis questions how useful travel writing is for environmental and climatic history reconstructions. The rich 19th-century documentation of South Sinai travellers, and the fact that South Sinai was travelled both by males and females, may provide a unique insight into the dynamics between its societies, climate and environment, and the contemporary European environmental narratives (Bassnett 2006). For instance, although the website of the Monastery of StK[13] claims otherwise, some pre-19th-century literature sources and stories of eye-witnesses suggest that at times the relation between the Bedouin of South Sinai and the monks of StK has been not peaceful. Tensions between the monks and Bedouin, and incidents of actual aggression towards the monks were reported in the 15th century (Morin 1862: 9), the early 16th-century (Baumgarten 1732: 404), the end of the 16th-century (De Laborde 1838: 243), in 1762 (Niebuhr 1792-1: 207) and in the 1770s (Volney 1788: 352/353): in about 1796, the Bedouin seem actually to have killed a monk (Burckhardt 1816: 555/556). It is not clear if these aggressions were linked to weather, nor whether they continued in the 19th/20th century.

[13] The Holy Monastery of the Mount Sinai: http://www.sinaimonastery.com/ [accessed 19/05/2016]

Some events which affected the weather at a larger scale			Nile level			Treering data Jordan		Dead Sea level		Euphrate River (Iraq)		(Treering) data S.W. and Central Turkey			Treering data of the Northern Mediterranean		Treering data of the south-eastern Mediterranean		Width treerings cypresses near StK South Sinai		Width treerings Pistacia & Juniper S. & N. Sinai	
1790-1830: Dalton Minimum: lower temperatures worldwide	1808/9	Cold peak worldwide due to volcanic activity at an unknown location		1800-1830	Very low	1800	Extreme drought	1800-35	Extremely low										1800-50	Wide	1805-1812	Wide
	1816	"The year without summer" worldwide linked to the outbreak of the Tambora volcano in East Asia				1827	Extreme drought														1814-1827	Narrow
				1844-1845	Very low			1835-mid-1880s	Fluctuations												1844-1850	Narrow
			1850-1900: Mostly high							1850-1950	Increasingly wetter conditions	1850-1900		Dry period					1850-1900	Narrow		
				1855	Low										1856-1881	Drought	1856-1881	Relatively wet				
	1864	Extreme wet year in the Mediterranean		1867-68	Very low																1868-1873	Wide on J. Hallal (NS) & in South Sinai; narrow on J. Maara (NS)
				1877	Very low	1870-71	2-year drought						1873-74	"Catastrophic drought" in southwestern Turkey								
	Winter 1891	Colder than normal in southern Europe		1880-90	Very low			1880s onwards	Gradually rising					Dry period							1883-1890	Wide on J. Hallal (NS) & in South Sinai; narrow on J. Maara (NS)
			1900-50: Relatively low	1899-1921	Very low	1895	Extreme drought															
				1903	High/very high																	
				1914-19	High/very high	1914-15	2-year drought														1913-1922	Wide, but narrow on parts of Mount Serbal (SS)
				1931-33	High/very high	1933	Extreme drought															
				1944	High/very high																	
				mid-1960s-late 1980s	Relatively low								1960-late 1980s	Very wet conditions in Central Turkey								
	Source: Brewer 2007; Cook et al. 2012; Raible et al. 2016			Source: Johnson 1992; Conway 2000		Source: Tarawneh & Hadadin 2009		Source: Klein & Flohn 1987		Source: Heinrich *et al.* 2011: 38		Source: Jones *et al.* 2006; Heinrich *et al.* 2011: 37			Source: Cook *et al.* 2016: 2065		Source: Cook *et al.* 2016: 2065		Source: Liphschitz *et al.* 1987			

Table 1 *An overview of 19th and 20th century data that are available from climate reconstructions of the MENA.*

1.4. What is known about the environmental and climatic history of the MENA and South Sinai

1.4.1. Available information about the climatic history of the MENA

Table 1 (p. 27) gives an overview of the available climate-related data of the MENA. Several things stand out in this overview. The "Dalton Minimum (1790-1830), a period of lower-than-normal temperatures resulting from lower solar activity (Raible *et al.* 2016: 575), seems to have been a period of lower-than-normal rainfall and/or water availability throughout the MENA: between 1800 and 1830/5, the level of the Nile and Dead Sea were much lower than normal (Klein & Flohn 1987; Johnson 1992; Conway 2000), and tree-ring data from Jordan show extreme drought in 1800 and 1827 (Tarawneh & Hadadin 2009). Tree-ring data from Sinai seem to reflect, at least partly, contradictory conditions because tree-rings of the cypresses near the Monastery of StK have wide rings throughout the first half of the 19th-century, while tree-ring data from Mount Serbal (a few miles west of the Monastery) and North Sinai both showed wide rings from 1805-1812 and narrow rings from 1814-1827 (Liphschitz *et al.* 1987). However, at intra-specific level, *Pistacia* from different locations on a single mountain, Mount Serbal, showed variation in sensitivity to temperature and precipitation in specific months: one group of trees, sensitive to November temperature but not to precipitation, showed wide rings for the period 1805-1824, while another group, sensitive to January precipitation and mainly April temperatures, had narrow rings from 1813-1827 (Liphschitz *et al.* 1987). This may be explained by drought in the precipitation-sensitive trees with narrow rings, and lower temperatures (less evaporation and wider tree-rings) for the temperature sensitive trees. The authors did not report whether the links with temperature were positive or negative. Furthermore, the position of the sun and wind may have played a role, as well as evaporation and the wind direction from which the rain arrived. It is therefore not straightforward to interpret and compare Sinai's tree-ring data with the (mainly drought) events during this period in other parts of the MENA. Other data sources from Sinai may actually help to interpret the available tree-ring data.

Volcanic activity in 1808/9 at a unknown location (Raible *et al.* 2016) and the 1815 Tambora volcano eruption in East Asia (Cook *et al.* 2012; Raible *et al.* 2016), led to cold peaks in East Asia and Western Europe in the following year. The Tambora eruption led to relatively low summer temperatures and increased winter temperatures in 1816-17, and a higher frequency but not intensity of rainfall over Central Europe and drought over South-east Asia (Raible *et al.* 2016). It is not clear how these events manifested themselves in the MENA in general and specifically in Sinai.

Nile levels increased from the 1830s/1840s onwards, and were mostly high in the second half of the 19th-century, with exceptions in 1844-45, 1855, 1867-68, 1877, 1880-90, and 1899-1900 (Johnson 1992). The Euphrates River (Iraq) also showed increasingly wetter conditions "between 1850 and 1950" (Heinrich *et al.* 2011: 38). The water level of the Dead Sea fluctuated between 1835 and the mid-1880s, and then rose gradually from the mid-1880s onwards, but in general the 19th-century water level was considered lower than normal (Klein & Flohn 1987). However, tree-ring data from southwestern Turkey and the northern Mediterranean show exactly the opposite: a dry period in the second half of the 19th-century (Heinrich *et al.* 2011: 37). The summers until 1880 seem to have been colder than normal in East Asia (Cook *et al.* 2012). Extremely wet weather was reported in 1864 in the Mediterranean (Brewer *et al.* 2007). In 1873/1874, there was a "catastrophic drought" in southwestern Turkey (Heinrich *et al.* 2011: 37). The winter of 1891 was colder than normal in southern Europe (Brewer *et al.* 2007). In Sinai, narrow tree-rings were reported between 1844-50, but in the second half of the 19th-century tree-ring widths showed variability in different parts of the Peninsula. On Jebel Hallal[14], in North Sinai, tree-rings were wide throughout the second half of the 19th-century and the first two decades of the 20th century. However, on Jebel Maara, situated elsewhere in North Sinai, and in South Sinai, tree-rings were narrow throughout the second half of the 19th-century; for parts of Mount Serbal in South Sinai this continued during the first two decades of the 20th-century, while tree-rings of other parts of Sinai were all wide.

In the 20th-century, in Central Turkey lake records suggest drier than normal conditions until 1960, but very wet conditions "between 1960 and the late 1980s" (Jones *et al.* 2006); rainfall was relatively low during this last period in the Ethiopian Highlands (Conway 2000: 49). It is not clear if, and how, these events may have influenced (South) Sinai's weather.

1.4.2. The weather systems of the MENA

There is still little known about the connection between weather events and systems in the MENA, and how these link to global-scale systems. Tree-ring reconstructions for the whole Mediterranean over a timespan of 900 years (Cook *et al.* 2016) showed anti-phasing in droughts between the north-eastern Mediterranean and the south-eastern Mediterranean/Middle East. Concretely this would mean that in periods when the area of Turkey, Greece and the Balkans experienced wetter weather, north-eastern Africa and the Middle East (including the Sinai Peninsula) experienced drought, and visa versa. For instance, from 1856-1881 there was drought over the northern Mediterranean, while the south-eastern Mediterranean seems to have been in anti-phase, in other words relatively wet (Cook *et al.* 2016: 2065). However, as discussed in §1.4.1., tree-ring data from the

[14] Jebel Hallal: lat. 30° 39' 10.8" north, long. 34° 1' 43.9" east (http://mapcarta.com/13057528)

Sinai Peninsula show much local variation, which may suggest that the weather systems in this area are more complicated.

Ziv *et al.* (2004: 1859) suggested that in the summer the Eastern Mediterranean "is connected at the lower troposphere with Europe, at the mid-troposphere with eastern North Africa, and at the higher troposphere with the Asian Monsoon". If so, the lower troposphere seems to be mainly dominated by the North Atlantic Oscillation (NAO). Hassan (2007) and Cook *et al.* (2016) suggested a link between drought in the MENA and the NAO; Hassan (2007) connected increased rainfall over the North Atlantic with drought over the Sahel, causing low Nile levels. However, Hassan (2007) warns that the link between the NAO and Nile level are sometimes in phase, and sometimes in anti-phase, meaning that there must be other mechanisms involved. The NAO is thought to cause low pressure, southerlies (wind from southern direction), warming of the air and excessive rainfall over the Eastern Mediterranean if there is high pressure over Greenland; cool and dry northerlies are linked to low pressure over Greenland and drought over the Eastern Mediterranean (Eshel & Farrell 2000). Dominguez-Castro & Garcia-Herrera (2016) suggested that the "Westerly Index (WI), the monthly frequency of westerly winds over the English Channel", is also involved in this process. Summer temperatures in northwestern Europe and the Eastern Mediterranean are thought to be in anti-phase as a result of the NAO (Trouet *et al.* 2012). In Europe the winters were very cold in the first half of the 19^{th}-century, and relatively warm in the second half (Landsberg 1980: 639); this may explain the widespread drought in the first half of the 19^{th}-century and relatively wetter weather in the second half of the 19^{th}-century in the MENA.

The Nile level, which is defined by the intensity of the East African Monsoon, has also been linked to the El Niño/Southern Oscillation (ENSO), Sea Surface Temperature in the Pacific, and the Pacific Decadal Oscillation (Eltahir & Wang 1999; Santoro *et al.* 2015). NAO and the Southern Oscillation Index are "strongly correlated to the extremes" (Santoro *et al.* 2015: 876); a positive NAO, strong El Niño and high Sea Surface Temperature in the Pacific have been linked to low Nile levels (Eltahir & Wang 1999; Santoro *et al.* 2015). However, in the Northern Mediterranean, extreme rainfall events have been linked to El Niño years (e.g. Alpert *et al.* 2002). During the last two decades of the 20th century, El Niño frequency is thought to have been relatively high (Eltahir & Wang 1999). Jones *et al.* (2006) suggested also a positive link between increased Indian Monsoon rainfall and drought over the Eastern Mediterranean, and a positive link between positive values of the North Sea-Caspian Pattern Index and drought in the Eastern Mediterranean (Jones *et al.* 2006). 19th-century data suggest that the relation between the Indian Monsoon and the south-eastern Mediterranean may also work the other way around, because from 1856-1881 the south-eastern Mediterranean was relatively wet, while there were some severe droughts in India during this period (Cook *et al.* 2016). The periods of drought in India in 1868-70, 1876-78, 1896-1897, and 1899-1900, due to lower rainfall than normal during the Indian Monsoon (e.g. Meena 2015), were partly in-phase with droughts in the MENA, and at least during 1876-78 and 1899-1900 also in-phase with other parts of East Asia (e.g. Davis 2000). These events have been linked to strong El Niño/Southern Oscillation (ENSO) and higher than normal Sea Surface Temperature (SST) (Davis 2000; Ihara *et al.* 2008).

The Sinai Peninsula seems to be influenced by a mix of weather systems, given the differences in tree-ring width and the climatic variability in time and space, but until now it is not known which systems are involved and how they influence Sinai's weather. Yet it is important to understand Sinai weather in order to predict droughts and flash-flood events, given the severe and life-threatening nature of these events. Wind direction is likely to play a role in the arrival of weather events. The 13th century scholar, Al-Baghdadi observed that "years of low Nile are characterized by eastern and southern winds, whereas a north-westerly wind denotes a good flood" (Hassan 2007: 103/104). Ibrahim & Ibrahim (2003: 52) mentioned that the most common winds in Egypt are the "north-eastern trade winds", with occasionally west-north-western winds in winter. Sinai is influenced by winds from both eastern North Africa and Asia. Both pass over the Red Sea area (see Ziv *et al.* 2004: 1867, Fig. 10), and lower rainfall is thought to be linked to "fewer than usual weather systems entering the region from the south" (Black *et al.* 2010); presumably this is linked to the Red Sea Trough (a low pressure band), which moves from the Red Sea area into the Eastern Mediterranean (Tsvieli & Zangvil 2007). Other rain systems cause cyclones to move in from the west (Tsvieli & Zangvil 2007). Rain caused by the Red Sea Trough takes place in a narrow band with the centre of the trough situated just north of Sinai (Tsvieli & Zangvil 2007: 139, Fig. 3). This may explain why rains over Sinai are often intensive and local.

1.4.3. Environmental imaginations of the MENA

Napoleon's invasion of Egypt in 1798 has been considered as the start of Western geographical imaginations, which Said (2003) defined as a discourse called "Orientalism": "the corporate institution for dealing with the Orient...by making statements about it, authorizing views of it, describing it, by teaching it, settling it, ruling over it: in short, Orientalism as a Western style for dominating, restructuring, and having authority over the Orient" (Said 2003: 3). Whereas pre-19th-century literature sources had been nuanced about the MENA's environment and local inhabitants, 19th-century official and unofficial (travel) writings increasingly expressed colonial environmental narratives which eventually developed into ideologies (e.g. Davis 2007). Up to the end of WW-II, Orientalism was mainly "a British and French cultural enterprise" (Said 2003: 4). Both powers considered themselves as the "heirs of Rome", respectively in the fields of technology and civilisation (Davis 2007; Buzard 2006). Davis (2007) claimed that these narratives started in the Maghreb (north-western Africa) and spread from there to other arid countries; they appeared in scientific as well as travel writing about the MENA.

Most popular was the "declensionist" narrative, which accused especially nomadic pastoralists of "deforestation, overgrazing, or environmentally destructive habits" (Davis 2007: 22/21). In the Magreb, this narrative was initially based on the 19th-century habit of comparing work of Ancient writers, such as "Pliny...Strabo and Ptolemy" with the actual state of the 19th-century environment; the 19th-century vegetation was considered "relict vegetation" of what had originally been forest (Davis 2007). The idea of increased desiccation and desertification was based on suggestions from Ancient writers such as Theophrastus that a decrease in vegetation caused a decline in rainfall (Grove 1989; Davis 2007). This then got combined with very selected parts of Ibn Khaldun's work, a 14th century A.D. Arabic writer, who had considered the consequences of the 11th century invasion of the Beni Hillal (Arabs) destructive for the North African civilisation as well as the environment (Davis 2007: 55/56). The idea of linking environmental destruction and societal collapse to "moral decay and barbarian invasions" (Butzer 2012: 3632) stayed very influential throughout the 19th and part of the 20th century. Remnants of Roman constructions and tree stumps were considered further proof of former fertility, forests and civilisation (Grove 1989; Davis 2007).

Europeans held the local populations in arid regions responsible for the recurring droughts in two ways. On the one hand droughts were considered a punishment for the sin of the non-Christian local population (e.g. Endfield & Nash 2002: 38). On the other hand, the local population and their pastoral nomadic lifestyle were held responsible for deforestation and environmental degradation (e.g. Davis 2007). Local populations, on the other hand suggested that the arrival of Europeans had led to an increase in drought (Endfield & Nash 2002: 38). Whereas in the early 19th-century, arid environments were still described as fertile but degraded as a result of passiveness and ignorance on the part of the indigenous inhabitants (Davis 2007; Trumbull IV 2011: 91), they were increasingly described and depicted towards the second half of the 19th-century as dry, barren and actively destroyed by the indigenous inhabitants (Endfield & Nash 2002; Davis 2007: 4; Trumbull IV 2011: 91).

The declensionist narrative gave rise to ideas of environmental redemption, which had two main themes. The first, Biblical redemption, referred to the restoration of pre-Islamic conditions and the "garden of Eden" (Grove 1995; Davis 2007; Davis 2011; Satia 2011) in Biblical countries, such as Egypt (including Sinai), Syria, Palestine, Iraq, which were regarded as the "cradle of civilisation" (e.g. Bridges 2006; Davis 2007; Derr 2011; Satia 2011; Davis 2013). Travellers literally travelled with the Bible in their hand to "read the terrain" (Melman 2006: 109) to conclude that the environment was drier and less vegetated than in at the time of the Exodus. The second was the restoration of civilisation, which referred to pre-Arabic conditions, what Davis (2007) called "resurrecting the granary of Rome". The 19th and 20th century European attempts to show that the MENA could be restored to a fertile, forested and productive area included the introduction of (non-indigenous) tree plantations, "green walls" to stop the expansion of the desert, more highly productive animals, better pastures, improved fodder, modifications of agricultural techniques and crops, and the construction of dams and increased irrigation. However, while all these forms of "redemption" led to temporary improvements, in the end they all failed, because they did not have the flexibility to counter the irregular and unpredictable rainfall, and in fact intensified local pressure on the environment (Davis 2007; Derr 2011; Barnes 2013).

The idea of European, Christian, agrarian successful environmental management versus nomadic pastoral, Islamic, Arab environmental destruction dominated the 19th and part of the 20th century (Davis 2007, 2013, 2016), while in reality pastoralists had actively managed the environment for centuries through their flexible and drought-mitigating lifestyles (Khazeni 2013; Mikhail 2013). The effects of European "redemption" measures were far-reaching, e.g. reduced numbers of grazing herds, fewer animals for trading and loss of income, increasing urbanisation and pollution (Davis 2007). In the Magreb, environmental laws, national parks, and land confiscation by the French disturbed pastoralists in their horizontal and vertical migrations, prohibited the use of common lands and forests for grazing, gathering, burning and clipping, and in this way destroyed the coping and adaptation strategies of the local people against unpredictable rainfall, drought, and large seasonal temperature differences (e.g. Davis 2007). Davis suggested that the declensionist narrative was developed for three reasons: "the appropriation of land and resources...social control...and the transformation of subsistence production into commodity production...", mainly in the interest of European powers (Davis 2007: 165/166).

Like environmental narratives, deterministic climate narratives still play an important role at a global level. They emphasise the increasingly fast warming-up of the earth and the disastrous environmental effects this may have in the future. However, on a smaller scale the situation can turn out less gloomy and more resilient when interactions between the environment, climate, and society are carefully analysed (e.g. Carey 2014-2; Endfield 2014). For instance, in South Sinai, overgrazing by Bedouin herds is much discussed, but the actual definition of overgrazing and its effect on the vegetation is not clear (for a detailed discussion see Gilbert 2010).

1.4.4. The environmental & climate history of South Sinai

There have been several attempts to describe the history of Sinai (e.g. Shuqair 1916; Eckenstein 1921; Rothenberg 1979; Shams 2011), but little is known about its environmental and climatic history. Bailey (1974) recorded some ethnoclimatological information from the Bedouin linked to the visibility of certain stars. Hobbs (1995) referred to several historical weather events which were reported by the Bedouin and monks. However, long-term systematic weather records are absent for the whole peninsula pre-20th century (Liphschitz *et al.* 1987; Greenwood 1997: 59). In the second half of the 20th century, some weather data were collected during the Israeli occupation in weather stations scattered throughout North Sinai (Port Said, El 'Arish, Ismailia, Nakhl), and to a lesser extent in South Sinai (Abu Rudeis, Tor) (Greenwood 1997: 62). Some data have been collected within the StK Protectorate in the 21st century, but they have not been published. For other places, such as El ʽArish, Port Said and Nakhl, there seem to be longer datasets of around 100 years, but this period is still quite short and has gaps (Liphschitz *et al.* 1987).

The main, and as far as is known only, attempts at the reconstruction of climatic history have been the tree-ring reconstructions from a few rare old trees (Liphschitz *et al.* 1987), and a reconstruction of roughly the last 30 years (Dadamouny & Schnittler 2015). However, as discussed in section 1.2.3., the tree-ring reconstruction is not straightforward to interpret due to local climate variability and the sensitivity of the trees to climatological factors other than just precipitation, while the more recent reconstruction may (at least partly) be based on doubtful extrapolations.

Little is known about South Sinai's pre-20th century environment, apart from the little-studied descriptions given by pilgrims and travellers. What is known is that until the 19th-century, South Sinai was under the control of the Towara Bedouin[15] and the monks of StK, whose knowledge about how to deal with the limitations of Sinai's environment allowed them to survive in this area. Both had gardens in different parts of the Peninsula. According to a manuscript in the monastery, the monks gave part of their gardens, probably in Wady Feiran, to a branch of the Sowalha Bedouin in return for protecting the Jebeliya, who lived around and in close connection with the Monastery, against other Bedouin tribes (Bailey 1985: 39).

Until the early 19th-century, Suez, at the time an important harbour due to political conflicts between Upper and Lower Egypt, had also been under South Sinai Bedouin control. The inhabitants of Suez were obliged to have a ghafir, or protector, selected from among one of the three Towara tribes that were allowed by the monks to be ghafirs:

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[15] "Towara" is the name for the Bedouin tribes of South Sinai, and refers to the mountains of Tor, the oldest city of South Sinai.

the ‘Aleiqat, and two subtribes of the Sowalha, the ‘Awârimeh and the Dhuheiry, more specifically the ‘Awlad Said branch (Porter 1858; Nandris 1991: 51). The inhabitants had to pay “presents”, a kind of yearly tax, to their ghafir, which consisted of money (the Bedouin decided on the amount) and goods, in return for “...safe passage of his goods and person through the desert…recovery of whatever was plundered by the others” (Burckhardt 1816: 466), and access to Bir Suez (mainland Egypt) and Bir Naba (Sinai Peninsula, situated north of ‘Ayn Musa), the main water sources for Suez (Burckhardt 1816: 466/467; Renouard de Bussiere 1829: 226/227). At times of conflicts between the Bedouin and the Egyptian rulers, the Bedouin denied the inhabitants of Suez access to these two wells, the only sweet water sources in the area (Burckhardt 1816: 466/467). This put the ghafirs in a powerful position to negotiate with the Egyptian government and the inhabitants of Suez in case of disagreements. Inhabitants of Suez continued to rely on these sources and water brought in from the (presumably Sinai) mountains (El Abbassi 1814-1: 266/267) and Tor (Salame 1819: xix/xx), also regulated by the Bedouin, at least until the 1850s (Bartlett 1854: 16; Graul 1854: 191). Afterwards, they received Nile water (Bauerman 1869: 19/20).

However, after the French occupation of Egypt and other parts of the Middle East, which took place between 1798 and 1801, Mohammed Ali became the new Pasha of Egypt in 1805. His first goal was to control those who could potentially undermine his political power, which included the Bedouin (Thompson 2008). Soon afterwards, in 1807, Suez lost its important trade position due to pillaging (George 1811: 341) and the blockage of the Red Sea by Britain and the Ottomans. The Bedouin lost their power and tools for political manipulation to Mohammed Ali, who became the ghafir of the inhabitants of Suez (Burckhardt 1816: 467).

According to Reuveny (2007), the interaction between Mohammed Ali and the Bedouin was a kind of push-and-pull mechanism, in which disputes over space formed the biggest issue: the government wanted to decrease Bedouin movements, while the Bedouin wanted to keep their spatial freedom. South Sinai was situated in the periphery, and therefore not easily state-controlled (Reuveny 2007), but was more systematically marginalised over time. Cities like Cairo, El ‘Arish and Gaza, where the Bedouin traded and bought goods (Marx 2013), formed the contact zones between the South Sinai Bedouin and the governments of Egypt and Syria.

This thesis aims to analyse South Sinai travel writing, both from male and female travellers, in order to find out to what extent these sources can provide data for the reconstruction of environmental and climatic histories in general and South Sinai in specific.

Chapter 2 Methodology

2.1. Introduction

This research is based on primary data collected from published and unpublished diaries, journals and letters of 19th and early 20th century English, American, French and German male and female pilgrims, travellers and researchers who visited South Sinai. Primary data have been defined as "...raw data in an unprinted or unpublished form, usually located in a record office or archive" (Black 2010: 468). However, in this thesis published diaries, journals and letters have also been considered as primary data, even though they may have been edited, because the editing process by itself emphasised the most important 19th-century ideas and environmental narratives. The term "archive", which originally referred to an exclusive place where government records were kept and guarded (Featherstone 2006; Steedman 2001), has been applied in this thesis in a much broader way. Archives (places) are no longer limited to a place. Nor are archives (the materials) limited to 'official' material, such as written text, photographs, maps, audio, and film, as archival material is nowadays available on internet. Philosophers such as Derrida (1998) and Foucault (2002) defined "archive" as an idea: the compulsion to conserve out of the fear of losing something (Derrida 1998), an unending process of ideas being shaped by and reshaping history (Foucault 2002). In this thesis, archives have taken more or less all the described shapes. Archives in this thesis are also the era-related ideas and behaviour that people developed as specific Orientalist ideas about (hyper)arid environments and climates.

Different from other environmental history reconstructions, which are generally based on archival data from a specific place or area collected over a particular period of time, this thesis is a reconstruction of data reported by many different travellers "en route" through South Sinai. The data are therefore momentary and limited by the spatial linearity of the routes.

2.2. Locating information sources

The starting point of this thesis was an extensive collection of (electronic) books (e.g. from Google Books, JSTOR, Internet Archive), pamphlets, diaries and journals, and a list with names of travellers who were known to have visited South Sinai through the work of other travellers, but whose diaries had not been located yet. This collection has been assembled from the 1990s onwards by Prof. Gilbert, who has performed ecological research in South Sinai for over 30 years. He developed the idea of reconstructing South Sinai's climatic history inspired by the rich weather descriptions in pilgrim and traveller accounts. His collection contained mainly 19th-century material of English travellers, but also earlier works and some diaries of German and French travellers.

Initially, I picked some diaries from this collection, and started off reading well-known 19th-century travellers, such as Burckhardt, Henniker, Palmer, guidebooks such as Baedeker, and some randomly picked travellers, who travelled through South Sinai in different periods of the 19th-century in order to familiarise myself with South Sinai's environment, the traveller routes, and to check for any major environmental changes in the 19th-century. With grounded theory in mind, in other words collecting as much data as possible and working from data to theory, the plan was to track as many diaries as possible for the reconstruction of environmental and climatic narratives, and in order to search for links between weather, environmental events and human reactions to these events. Initially the focus was on English travellers, and via the online catalogue of the National Archives, original handwritten diaries, letters, maps, photos, drawing and paintings were located in large archives such as the National Archives, but also local archives, such as the Walsall Local History Centre and the Wiltshire & Swindon History Centre.

Furthermore, the catalogues of specific libraries were searched, such as the School of Oriental and African Studies (SOAS), the British Library, the Royal Geographical Society, the Middle East Centre in

Oxford, National Records of Scotland, Repository National Library of Scotland, Pitts River Museum in Oxford, National Collection of Aerial Photography, National Library of Wales, as well as some of the university libraries and archives (the Universities of Nottingham, Cambridge, Birmingham, Edinburgh, Durham, Manchester, Bangor, and Leeds). The choice of these universities was slightly arbitrary, partly triggered by the fact that the Manuscripts and Special Collections of the University of Nottingham held an original diary, and partly because academics from several universities had carried out theological research in South Sinai. The search term "Sinai" was combined with other terms such as "Egypt", "map", "pilgrim", "monastery"/"monasteries", "Catherine", "orthodox", "convent", "Greek", "weather", "Bedouin". Broader terms such as "Egypt" and "pilgrims", "Egypt" and "Greek", and more specific terms such as "Suez" and "El Tor" were also used.

Said's (2003) and Davis' (2007) work on Orientalism and environmental imaginations, and more specifically the criticism on Said's work (e.g. Warraq 2007), in which he is accused of ignoring North Africa, female travellers, the German non-Orientalist tradition, and Western writers who showed tolerance or even supported Islam and the Arab culture, led to the search for diaries of female, German and French travellers. In the 19th-century, the Monastery of StK had attracted travellers from all these backgrounds, and therefore it seemed to be the perfect area to test the claims of Said, Warraq and Davis. The existing collection of Prof. Gilbert was checked for female travellers, and their diaries were included for data collection. Furthermore, the online catalogues of some of the largest German and French libraries were searched, and those which held the most interesting and numerous material were selected: the Berlin State Library, the Saxon State and University Library Dresden (SLUB), the Bavarian State Library in Munich, several libraries of the University of Heidelberg, and the National Library of France, Paris. The material in these libraries was studied in May and early June 2013, during a period of five consecutive weeks. Kalliope[16], a database from the State Library in Berlin, revealed some new handwritten material kept in various archives: the Landesamt für Kultur und Denkmalpflege Mecklenburg-Vorpommern, the Universität Leipzig and the State Library of Berlin. Copies of these materials were ordered by email.

The result was a compilation of different kinds of sources from male and female travellers of different countries: original handwritten material such as diaries and letters; diaries which were cleaned up, rephrased, typed and published as books; articles and pamphlets from people who summarised or commented on other travellers' trips or books; (scientific) maps; rough sketches of the peninsula or the landscape; photos; drawings; and paintings. Table 2 (p. 257) gives an overview of the sources consulted in these libraries.

2.3. Data collection

2.3.1. Textual data

At the start of any research, it is difficult to know which data will be relevant, and what format is most practical for data storage. Therefore, quotations on weather and environment, proxy data (possible indicators for the weather), geographical indications, routes of travellers, and additional data which provided information, amongst others, about the political, economic and social context were collected in the broadest sense. The extraction of the textual data from the material was a time-consuming and painstaking process. Reading in such detail was very time consuming, and in most cases copying had to be done manually; in very few cases was it possible to cut-and-paste pieces of digitized documents. The data were stored in three Excel documents. Each had a theme: "climate and environmental data", "routes", and "additional information". The first document contained data of direct weather indicators, such as

[16] http://kalliope.staatsbibliothek-berlin.de/ [Accessed 2013].

precipitation, drought, wind, temperature, extreme weather, indirect weather indicators such as vegetation, water levels in wells, absence or availability of drinking water, and descriptions of the landscape, flora and fauna. The second file was to keep track of traveller routes as minutely as possible. The third file contained metadata about the political, social and economic context and interactions between the Bedouin, travellers, monks and the Pasha, but also Bedouin trade products, information about diseases, food, geographical names and synonyms, strategic places and their connections e.g. cities, ruins, roads, and harbours. Keywords were added the last file in order to keep an overview of the widely diverse information. Although I did not succeed in coding everything systematically, as words and interests changed a bit during the project, the main themes were highlighted. Some data overlapped two or all three Excel files, and were added to both or all files.

Apart from the three Excel files, a Word document contained the data of all three Excel files plus personal annotations and remarks. Although this method seems laborious, the advantage was that the line of all the diaries and personal temporary thoughts were respected in the Word document, which was useful for the analysis, while the Excel documents gave a clearer overview, and could be exported to a database, if necessary, for the analysis. Archival and library material was collected in separate Word files. Table 3 (p. 263) gives an overview of the travellers whose diaries have been included in this research, and their co-travellers.

2.3.2. Non-textual data: maps, photographs and art-works

Whereas it had been relatively easy to read and hand-copy the relevant parts of texts for detailed study afterwards, interpretation of non-textual sources such as historical maps, photos, drawings and paintings, was much more complicated. The claim that "since everything can be decoded, everything is a text" (Doel 2010: 489) sounds great in theory, but finding the right words to describe maps and photos, and distinguishing and collecting relevant information required experience. What I considered relevant changed over time as my research and ideas developed and matured, but due to financial and time limitation there were several libraries which I could only visit once, such as those on mainland Europe, Manchester and Birmingham. I did not have the chance to revisit these libraries with new knowledge or ideas in mind. In the diaries that were available online, maps were often missing, partly scanned, or scanned at a very low resolution. In the National Library of France, many maps were digitised and online available, but in most other libraries, maps, photos, paintings had to be studied on the spot. The reproduction of these materials was generally expensive and limited by copyright regulations (e.g. Cornish 2004): only 10 percent of a map or written material in copyright could be legally copied. In theory, maps had a copyright of 70 years, but for photographs, it was 70 years after the death of the photographer: worldwide there are many differences in copyright regulations.

Some diaries and special collections, e.g. at the Royal Geographical Society, contained photos, drawing and paintings of South Sinai. The descriptions with these materials were various in details. A wonderful lanternslide collection at the Royal Geographical Society (Walsh, rgs241345) gave little detail about where the pictures were taken. The photobooks of the Ordinance Survey of 1868-9 (McDonald 1869) were in this respect much more informative as they illustrated the diaries and notes of the researchers Palmer and Holland. In general, pictures taken in a particular wady of several kilometres long do not give much information, or require much detailed background knowledge. Photographs are often not dated and it is not always clear who the photographer was. Apart from that, in a desert like South Sinai photos can be very misleading, because they can just as easily depict the “emptiness” next to a vegetation rich area, as the vegetation rich area in close up. Paintings and drawings are even more flexible as some elements may have been intentionally added or left out by the artist (e.g. Fig. 2). Therefore, graphic material is used here as illustration instead of a basis to work from.

2.3.3. Methodological and data issues

This compilation of diaries and data is certainly incomplete. Due to time restrictions, I managed to read only a small part of Prof. Gilbert's collection. However, the diaries that I discovered in the German and French libraries formed an interesting addition to this collection, and the data from these diaries gave insight in how European travellers other than Britons, described South Sinai.

Working with archival material is not without hurdles as Roche (2010) has already pointed out. There were restrictions of access to the archives and maprooms and their materials, and sometimes it required membership and special appointments in order to enter. Most of the libraries had online catalogues, but for the archives this was not always the case. Some still worked with the old alphabetical card system, with issues such as missing or misplaced cards and limited or very specific keywords. Search terms were often very restricted, and in some archives there was limited or no access to certain (private) collections: some documents were in a bad state, and in some Germany libraries items were missing or destroyed as a result of WW-II. There were many names of travellers whose diaries or journals have yet to be located. It is likely that not all the travellers published their diaries, and some diaries may have been destroyed, not donated to libraries or archives, or possibly they have not been catalogued (yet).

Some of the handwritten texts (e.g. Fisk 1842), especially some handwritten materials ordered from German libraries, and German texts typed in an old-fashioned font were without doubt the most difficult to decipher, and I literally had to give up. Other travellers (e.g. William Money-Kyrle, Wiltshire and Swindon Archives 1720/843), wrote their letters horizontally and vertically on top of each other to save paper. It was very time-consuming to decipher these, and it is possible that misreadings occurred.

The initial idea was to respect a timeline in studying the diaries, but it soon worked out that this was too complicated and time-consuming. The publication date often did not correspond with the year in which the traveller(s) visited South Sinai. Some travellers did not mention at all in which year they travelled through South Sinai (e.g. Henniker 1824; Carne 1826; Clifton 1900; Schneller 1910). In other diaries, which were generally several hundreds of pages thick, there were only indications of the year somewhere halfway through. Therefore it was necessary to read the whole diary or book.

Other date issues included travellers who wrote that they arrived in Sinai in the 'spring' or 'autumn' of a particular year, others mentioned the month but forgot to write down which day, or just wrote that it was on a 'Sunday'. Sometimes travellers gave a date of leaving Cairo and continued in terms of 'the first day', 'second day', 'third day' after leaving Cairo, and when they eventually gave a date and I calculated back to the start of the trip, it worked out that it was not the same date. Some days had 'disappeared', because they had actually travelled more days than they had described or did not mention how many days they had stayed in the Monastery of St Katherine, and sometimes they mixed up the dates (e.g. Carne 1826; Bartlett 1879; Buxton *et al.* 1895). Some travellers also talked about the first, second or third day and it was not clear whether they refer to the day of the month or the day of the journey (e.g. Horneman 1802: 45). Date issues may have been the result of typographical errors while copying the diaries for publication (e.g. Brocklebank 1865: 179/180), or mistakes in the original diaries. In some cases, it was possible to verify dates or events using the diaries of co-travellers, so called cross-checking (Kitchin & Tate 2000), or to find more detailed dates in the original diary (e.g. Palmer 1868) than in the published diaries (Palmer 1871-1 & 2). Any confusions in year, month, or day have been described in the results.

One of the challenges was to keep track of all the textual and non-textual sources and references. Word and Adobe documents were organised according to archive or topic. In Endnote, I attached the documents to the references, so they were easier to find with keywords; this was not easy or even impossible in Word and Adobe.

2.4. Data analysis

2.4.1. Analysis of the routes

The first step in the analysis process was to define the routes of the 19th-century travellers and clarify the wady names. These routes formed the methodology of this thesis, as most of the environmental and weather observations were described along them. Even though the number of common 19th-century traveller routes through South Sinai was very limited, the reconstruction was challenging. The main issues were, first, that I initially did not have any detailed maps with all the wadies, mountains, or traveller routes on it; and second, that there were many different spellings for the geographical features, resulting from the transliteration of Arabic sounds into English, French and German, the three main languages of the material. The combination of letters/characters used in these languages to transliterate the Arabic sounds were variable, especially for the sounds that do not exist in these European languages. The resulting spellings of the names sometimes looked quite similar, and sometimes very different. Simple words like "wady" were written in English and German with a "w", but in French with a "ou", and the "y" at the end was sometimes written as "i" or "ee". At the start of the project, when I was still unfamiliar with the names and positions of the wadies, it was just not clear whether different spellings were referring to the same wady or to different wadies. Pronouncing the names out loud according to the language of the text helped to overcome part of the problem. Appendix 1 (p. 317) gives an overview of some of the commonly described geographical features and their spelling variations. Spelling variants of the wadies, mountains and places along the main routes through South Sinai are summarised in Appendix 2 (p. 319).

The choice of a standard spelling for the geographical features was most difficult, because it was not clear which spelling was closest to Arabic. Although it was suggested to use the spelling of Daumas (1951), because it was a more recent transliteration, it did not really work for this thesis: most of the names of the geographical features needed were not there, and it was a French transliteration, which was unsuitable for this English thesis. The Arabic spelling mentioned in Burckhardt (1816), in combination with the Survey of Egypt map of 1943 (no. 6), and the transliterations used by English travellers, reflected the pronunciation the Arabic pronunciation best in English and was therefore considered more suitable. Although the transliterations of Burckhardt are from the early 19th-century and therefore quite old, he was fluent in Arabic and (one of) the only travellers who added the Arabic spellings in his diary. Together with the 20th century Survey of Egypt map, it covered almost all the names.

For the sounds that exist in Arabic but not in English, the letter combinations and signs most commonly used to transliterate these sounds were applied. Simplified, Arabic characters are pronounced in the front or middle of the mouth, or guttural. Those pronounced in the middle of the mouth are often pronounced as if the mouth is filled with something. To distinguish the different sounds I used:

- an apostrophe for the guttural sound ‘ayn (ع);
- a capital letter “H” for the guttural H (ح), and a small “h” for the non-gutteral h (ه);
- the letter combination “gh” for a soft sounding r (غ), and an “r” for the rolling r (ر);
- “d” for the English sounding d (د), “dh” for the a d (ذ) that sounds like the English “th” combination but softer with a d sound instead of a t sound, and “D” for the D that is pronounced with a full mouth (ض);
- “z” for the z (ز) that sounds like an English z, and a capital “Z” for the z (ظ) that is pronounced with a full mouth;
- “t” for a English sounding t (ت), “th” for what the t (ث) which is pronounced in English as th, and capital “T” for t which is pronounced with a full mouth (ط);
- “kh” for the guttural “g” (خ);
- “j” for the j as it is pronounced in English;

- "el" for the article (ال), which pronunciation normally depends on the first character of the word that follows; for instance if the word that follows starts with an "n", "z", "s", "el" will be pronounced as "en", "ez", "es". However, here it was easier to transliterate them all like "el".

This resulted in table 4 (p. 276). Not all the wadies and mountains were mentioned in Burckhardt and on the Survey of Egypt map. Therefore, there were some gaps in the transliteration, such as Wady Maghara that was not mentioned in these two sources. There are also spelling issues in Arabic, such as Wady Sa'al, which was written as Saal and as Sa'l, so it is not clear which one was correct. I corrected the spelling of Wady Mukatteb, which was misspelled on the Survey of Egypt map where they used a ط instead of a ت. Furthermore, it is likely that there are misspellings in the Arabic, because the guttural "g" (خ) and "H" (ح), and the "j" (ج) are often not pronounced the same in South Sinai and Egypt, as in standard Arabic. Furthermore, the Bedouin of South Sinai do not have a written history, which rules out direct transliteration from written Arabic.

The routes were reconstructed with the use of the dates and movements of the travellers, with the help of 19th-century handbooks for travellers, such as Wilkinson (1847), Porter (1858), and Baedeker (1885), with the itineraries of Thomas Cook who started to offer trips through Egypt and Palestine from 1869 onwards (e.g. Cook 1880), and several (detailed) maps from the Department of Survey and Mines (1934), Kiepert (1859), the War Office (1907) and the Survey of Egypt map (1943, map 6). The main routes through western Sinai (north-central, south-central and southern route), central Sinai (eastern and western route), and eastern Sinai (north-central, south-central and southern route), which connected Mount Sinai and the Monastery of StK with Egypt, North Sinai, and Syria/Palestine, were identified. The visual reconstruction of the traveller routes is based on the reconstruction of a series of 12 detailed maps produced by the Department of Survey and Mines (1934), which covered the area between the two red lines in Fig. 3. Although not ideal, as it did not cover the whole of the Sinai Peninsula, it was the most detailed series of maps available according to my knowledge. As these maps did not all have the same grid size, the maps were scanned, reduced and printed at the same grid size, and reconstructed with scissors and glue. The outlines of South Sinai, some geographical features such as the Tih Plateau, some important mountains, the traveller routes and some coastal places, which developed in the 20th and 21st centuries into cities and tourist attractions, were hand-copied unto transparent paper; this resulted in Fig. 4.

2.4.2. Qualitative analysis of the environmental and climatic data

Qualitative data are much used in human geography (Winchester & Rofe 2010), but there are no clear protocols for the analysis of this type of data. The idea is that a "geographical analysis of cultural texts and competing discourses needs to follow as rigorously as possible the spatial, temporal and social traces of both real and imagined signifying structures: representations and practices" (Doel 2010: 491). In South Sinai, the traveller routes served as the spatial guide along which the temporal flora and fauna, weather events, Biblical and contemporary imaginations, and social interactions were reconstructed.

The Biblical landscape data were analysed first, using analytical codes (Cope 2010) and (truncated) word analysis (La Pelle 2004; Peace & Van Hoven 2010). It was important to analyse these first, because travellers often compared the Biblical vegetation with the factual flora along these routes, which they associated with the route of the Biblical Exodus. After that, the flora, fauna and weather data were analysed with word analysis. Travellers generally used a limited number of words, including scientific, common, and local Arabic names, but the difficulty was to track all the different spellings and synonyms. Travellers sometimes described places in little or no detail and used many different spellings for these places, so it safer to work with the names of flora and fauna present in the quotes and cross-check with the description of places.

Of the flora, the presence of the most important trees (acacia, palm, tamarisk, zizyphus, fig, cypress and poplar), shrubs (broom and *Nitraria* (Ghurkud)), and low vegetation (grass, rushes and reeds) was tracked with word analysis; presence was coded in an additional column. After all the keywords were added in the extra column, the file was copied and the column with the keywords was moved to the front and sorted A to Z; all the entrees with the keyword 'Acacia', 'broom', 'palm', 'tamarisk', and so on, were grouped together. Each keyword group was copied then into a new Excel sheet, after which the entries were ordered according to date. The fauna was analysed in the same way. The advantage with the fauna was that there were very few synonyms. Data entries were checked for the presence of insects (ant, beetle, mosquito, locust, grasshopper, flea, flies), reptiles (snake, lizard), birds (quail, partridge, stork, crane, dove, pigeon, hawk, vulture, eagle, owl, raven, crow, ostrich, swallow), and wild mammals (gazelle, antelope, jerboa, rat, mouse, coney, hyrax, hare, hyaena, jackal, leopard, wolf), and domesticated mammals (camel, dromedary, dog, goat, sheep). French and German entries were analysed through re-reading and selecting, because I was less familiar with the specific vegetation and fauna words and synonyms in these languages.

The weather data were analysed with word analysis. Keywords were placed in four columns. The first column contained keywords connected to windspeed (e.g. wind, gale, hurricane, breeze, blew, blowing), wind direction (north, west, south, east), storms (storm, thunder, lightning) and sand (Khamseen, Siroc, sand, dust); the second contained keywords related to humidity and precipitation (rain, snow, hail, mist, fog, dew, torrent, shower, drop, haze/hazy, dry, wet, drought); the third column contained keywords concerning temperature (cold, cool, warm, hot, heat, thermometer, freez*, oppressive); and the fourth column contained keywords for the clearness of the sky and the colour of the clouds (clear, cloud, white, dark). Apart from giving an investigation of links between specific events, such as sandstorms, flashflood, rain, and snow, and possible indicators such as wind direction, temperature (changes), and the presence and colour of clouds. This interest was triggered by the fact that there is hardly anything known about South Sinai's weather and weather systems, but also because travellers regularly wrote about wind directions, sudden temperature changes and clouds. These links could potentially be useful for forecasting certain weather events. After coding, the coded events were grouped (e.g. rain, snow, wind directions, sandstorms), and then each group copied and organised according to date. Four different colours were used to mark the data from mainland Egypt, Sinai, Syria/Palestine and other areas of the Mediterranean. Special attention was paid to the entries about drought, as this phenomenon led to imaginations among the travellers as well as the Bedouin.

Precipitation indicators, such as the taste of water from wells, the level of wells, presence of grass and manna and data on weather imaginations were also collected, but only served as supporting data.

2.4.3. Quantitative analysis of the climatic data

Precipitation, drought and (sand)storm data were analysed quantitatively, because these data are most interesting in connection to climate change. Precipitation events were coded with scores based on Nash & Endfield (2002), but instead of relative precipitation per rain-year, the amount of rain indicated by the travellers was coded per precipitation event. The reasons for this were, first, that the available data were instantaneous observations rather than overviews of years, and second, that in (hyper)arid areas like South Sinai, where precipitation is episodic, averages are not very meaningful. Precipitation scores were divided in five categories: 0 (no rain/snow), 1 (little rain/snow/wind), 2 ("good" rain/snow/wind), 3 (heavy rain/snow/wind), and 4 (flood/very heavy snow/storm). Other weather events, such as thunderstorms, hail, flashflood, khamseen, and sandstorm were coded in binary form: 0 (absent) or 1 (present).

These data were transformed into a chart where the rain, snow and khamseen events are shown, and the thunderstorm, hail, and flashflood events are placed in a different colour on top of the rain and snow events (Fig. 15). Data were not statistically analysed, because the number of observations per event was generally restricted to one. Quotations from travellers describing these extreme events were summarised in a table with a column for the year, month, day, place, quote, author and extreme event (table 5, p. 280).

2.5. Data interpretation and the role of the researcher

Data collection, interpretation, and environmental history reconstruction, is a process of simplification and interpretation of the reality in which the researcher plays a prominent role (Field 2010; Mansvelt & Berg 2010). As discussed by Said and others, archival material, such as traveller writing, maps and photos are cultural data sources, which have been produced and edited within a cultural context and with a goal in mind, representing a "socially constructed" reality (e.g. Doel 2010: 490). Burton (2005: 9) pointed out that archives are a subjective collection of material with issues concerning inaccuracies, authenticity, and representativeness, as well as "…personal, structural, and political pressures which the archive places on the histories they end up writing – as well as those they do not". Fortunately, some researchers have questioned the distinctions between 'right' and 'wrong', 'real' and 'unreal', 'truth' and 'lies', etc. as dictated to readers in the past, and have included the history of minority groups (e.g. Davis 2007).

This thesis is a simplification of the reality in many ways. Firstly, the number of diaries which were read was limited to around 120. The data collection and analysis was very time-consuming. I had (wrongly) assumed that the framework necessary for the interpretation of the data, such as the history of South Sinai and detailed maps of the area, were already known or easy to find. Apart from that, traveller data were limited in time and space. Potential patterns in collected environmental and weather records should therefore be interpreted very cautiously, because the combination between important data and data gaps may create an incorrect impression of reality. Furthermore, data should be interpreted within the political, economic and social context and the environmental imaginations of the European travellers. The voices of the Bedouin and monks of StK have a very limited place in this thesis, because the only available information was included in the stories of the travellers.

The broad range of data which was collected was based on my background in biology and anthropology, and initially not on theories and insights which are obvious to geographers. Possibly, details may have been picked up that geographers would not have collected. Knowledge of multiple languages (Dutch, English, German, French, and basic Arabic) enabled access to all kinds of different sources of information. My interest in inter-cultural and inter-religious communication, and my earlier work with people from the MENA, definitely helped to understand the religious and cultural aspects. It is likely though that as a European who grew up in a society subconsciously soaked with Orientalist ideas, I considered certain behaviour of the travellers and monks as 'normal', while I am sure that researchers from other religious or political backgrounds may have performed and interpreted this research in a completely different way. As a woman, I may have interpreted the diaries and other information, mainly written by men, in a different way from that which a male researcher would have done.

Chapter 3 Traveller routes

3.1. Introduction

In chapter 2, it has already been discussed how the traveller routes were reconstructed and the geographical names standardised, and Fig. 4 shows the routes of the travellers. In this chapter, the traveller routes are discussed in more detail, as they form the central spine, the methodological basis, but also the spatial limitation of this regional environmental history reconstruction (chapters 5-8); Deleuze and Guattari (2005) referred to this as the "lines of flight", or linear geographical limitations, that demarcate what they called the "multiplicity"[17], the multitude of events and interactions. In contrast with the heavily criticised binary and hierarchical approach to travel writing applied by Said and his followers (see e.g. Warraq 2007 for criticisms), multiplicity refers to a rhizomic, non-hierarchical approach; in this thesis this means that observations and interactions of all kinds mentioned along the routes through South Sinai in the investigated 19th and 20th travel writing have been included. This method of data gathering and analysis links in with Foucault's idea of archival research that constantly unfolds and reshapes history. It also allows, for instance, oral and written histories, geographic imaginations and realities, and the fact that both Western visitors and local guides were actual travellers (e.g. Clifford 1997), to exist next to each other. In a culturally important, but little explored (from an

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[17] "Multiplicities are rhizomatic, and expose arborescent pseudomultiplicities for what they are. There is no unity to serve as a pivot in the object, or to divide in the subject. There is not even the unity to abort in the object or 'return' in the subject. A multiplicity has neither subject nor object, only determinations, magnitudes, and dimensions that cannot increase in number without the multiplicity changing in nature (the laws of combination therefore increase in number as the multiplicity grows)" (Deleuze & Guattari 2005: 8). Although the concept multiplicity cannot easily be defined, it can more or less abstractly be summarised as all the interactions (real or imagined) within a demarcated system.

environmental historical viewpoint) area as South Sinai, this flexibility was absolutely essential, given the variety of available data.

3.2. Biblically inspired routes

Bible projections on South Sinai have existed from the early centuries A.D. (Ward 2008). Until the 15th century, the route from Gaza to the Monastery of StK seems to have formed the main route to reach the Monastery, after which travellers continued to Cairo and Alexandria (Labib 1961: 83). This changed in the 16th-century, when pilgrims used the shorter route between Cairo and StK; in Cairo they had to pay tax and get letters of recommendation (Labib 1961: 84). It is possible that these were taxations of the Ottoman Empire or safety measures of the Monastery as a result of the overthrowing of the Christian-orientated Byzantine Empire by the Muslim Ottoman Empire in 1453. This may explain why names such as Paran (Feiran), Wady Musa, Wady Ghurundel appeared in the region south of the Dead Sea as well as in (western) Sinai.

In the late 18th and throughout the 19th-century, with geography moving into the academic sphere, scientists looked with renewed interest at Bible texts and its possible geographical projections on the "Biblical" countries. Until the early 19th-century, the most logical and shortest routes through North Sinai were considered as possible routes of Moses and the Israelites (e.g. Bruce 1790: 230/231; Madden 1829-2: 169). In the later 19th-century literature, the routes through South Sinai were thought to match the detour described in the Bible to get from Egypt to the Holy Land. However, the exact route continued to be a point of discussion. Travellers compared 19th-century landscape features, distances between places, and linguistic similarities (e.g. Burckhardt [1819: lxviii] used linguistics) with Biblical descriptions; they literarily went with the Bible in their hand through the landscape, pre-assuming that Sinai's landscape had not changed since Moses and the Israelites had passed there. Remnants of early Christianity, ruins of a Christian village in Wady Feiran and several monasteries around Mt Sinai, the Monastery of StK, and geographical features, such as the highest mountains, oases and water sources, all played an important role in the geographical imaginations. However, travellers generally only explored one or two routes per trip and automatically assumed that the Israelites had taken the same route as the travellers themselves had taken (Stanley 1857: 35).

A more critical and systematic approach was needed, and travellers started to compare different potential routes; explorers such as Palmer and his colleagues were specifically hired to identify the places mentioned in the Bible and the potential routes of the Israelites (Palmer 1871-1: 3/4). The southern route[18] via Tor was considered too long and too steep (Stanley 1857; Bartlett 1879: 259/260), but the descent to the water (Golf of Suez) through Wady Tayiba fitted with the Biblical text (Palmer 1871-1: 239). While the south-central route was shorter, it opened a discussion about whether Mt Serbal instead of Mt Sinai might have been the actual Mt Sinai of Scriptures (Stanley 1857: 39). Tyrwhitt (1864: 334/335) suggested that the north-central route had been the route of the Israelites. Cook & Son assumed in their travellers' catalogue that Moses and the Israelites had not stayed around Mt Sinai in South Sinai for forty years, but in wady Sih (western Sinai) and in the Tih Mountains south of Nakhl (Cook 1880: 31), as Seetzen (1855: 47) had assumed in 1807.

However, the choice for these specific routes and preferences continued to be based on practical rather than religious reasons. First, the number of access points to cross the mountain ranges was restricted, and wadies had to be wide enough for luggage camels to pass. Apart from that, reliable sources of potable water, such as wells, and access to rainwater were very limited. Furthermore, all 19th-century travellers were obliged to travel under Bedouin protection,

[18] I applied the same names to the different routes as mentioned in the text and on the maps of chapter 4.

who respected each other's territories and for practical reasons always used the same routes. Cook & Son may have adopted their route to avoid eastern Sinai for safety reasons, to keep most of the trip under Towara (South Sinai Bedouin) guidance, who did not ask such high prices as the more northern tribes, or to include the most touristically interesting places.

3.3. Starting point for most of the travellers: Cairo

In the 19th-century, European travellers rarely entered South Sinai from Syria/Palestine (e.g. Seetzen 1855), but generally started in Cairo and travelled overland to Suez. Of the at least seven routes which have been described between Cairo and Suez, three were the most frequently used (Burckhardt 1816; Wilkinson 1847; Porter 1858): the most northern route was the Hajj route, mainly used by pilgrims going to Mecca and Medina for the Islamic pilgrimage, the Hajj; the central route, used most frequently by the Towara Bedouin from South Sinai; and the southern route, used by the Terabin Bedouin, who lived in North Sinai and the Negev, and "other Syrian Bedouin" (Burckhardt 1816: 459). Before the opening of the railway from Cairo to Suez in 1858, the route from Cairo to Suez was traversed on foot, by camel, or rarely in a carriage (e.g. Hindley 1850), but the area was generally described as very dry and hot, monotonous and with extremely little or no vegetation. The earliest water source was Bir Suez, just before arriving in Suez. In and around Suez, there was no vegetation and no water (El Abbassi 1814-1: 266/267; Fazakerley 1820: 364; De Laborde 1838: 64/65; Günnel 1847: 18; Bartlett 1854: 17; Ballantine 1866: 115). After the opening of the railway between Cairo and Suez in 1858, many travellers chose to send the Bedouin and dragoman ahead from Cairo with their camels, dromedaries and luggage, to join them two or three days later in Suez, or on the Sinai Peninsula opposite Suez (e.g. Tyrwhitt 1864: 328; Raboisson 1866; Wallace 1868: 68; Bartlett 1879: 139/140; Liebenau 1896: 11; Scott 1927).

From Suez, travellers entered South Sinai. Before the opening of the Suez Canal in 1869, travellers were guided around the Head of the Gulf of Suez to get to the other side, or they crossed the Gulf by boat; after 1869, the Peninsula could only be reached by boat. Throughout the 19th-century, travellers sailed from Suez to places along Sinai's west coast, such as just north of ʽAyn Musa and occasionally Tor. The time necessary to cross depended completely on the strength and the direction of the wind (e.g. Turner 1820: 410, 461; Hindley 1850: 9; Anderson 1853: 71; Buxton *et al.* 1895: 159/160; Liebenau 1896; Geramb 1899: 166; Scott 1927: 5/6). Boat trips between Suez and Tor were less popular because they were expensive (e.g. Smith Lewis 1898: 20/21), and not without danger due to the shallow and sharp coral reefs (e.g. Plowden & Plowden 1868). The return trip from Tor to Suez was especially time-consuming, taking up to eight to ten days due to the predominantly strong northern wind (Baedeker 1885: 474). In the late 19th-century, small steam ships were occasionally used to get from Suez to Tor, but they seem to have been privately owned, and for the more fortunate travellers (e.g. Buxton 1895; Österreich 1895).

From the landing place on the Sinai Peninsula, the actual trip through South Sinai started. Both in western and eastern Sinai, there were three main routes, which I have named the north-central, the south-central, and the southern route. In central Sinai, there were two main routes running between the Monastery and Nakhl (a place halfway between Suez and ʽAqaba), which I have named the eastern and the western central route. Suez, Nakhl and ʽAqaba are situated on the edges of (South) Sinai. There were travellers who did not go all the way through South Sinai before going to Nakhl and Gaza, but went directly from Cairo along the northern coast of the Sinai Peninsula, via a route north of the Hajj route, or the Hajj route to Nakhl, El ʽArish and Gaza (e.g. Wolff 1824; Irby & Mangles 1823), and from there to other places such as Hebron and Jerusalem. There were also researchers and explorers, such as Burckhardt (1816), De Laborde (1838), Palmer (1871-1/2) and Holland (1867; 1869-2), and travellers on hunting expeditions (e.g. Österreich 1895; Buxton 1895), who travelled off the beaten track. However, in South Sinai, travellers were sooner or later led back to the main routes, simply because of the geographical limitations of the landscape.

3.4. Routes to the Monastery of St Katherine through western Sinai

In western Sinai there were three main routes: the north-central, the south-central, and the southern route. The north-central and south-central route started near ʽAyn Musa, while the southern route could be reached overland from ʽAyn Musa or by sea via Tor.

3.4.1. The western north-central route

Both the north-central and the south-central route started from ʽAyn Musa and initially followed a similar trajectory until Wady Humr/Wady Tayiba. Between ʽAyn Musa and Wady Humr/Tayiba, the route initially ran southwards with views of the Ataqa Mountains on mainland Egypt, and Mount Rahah in North Sinai (Baedeker 1885: 485), until it reached a plain, which Burckhardt called "El Kordhye" (Burckhardt 1816: 470). Here, the route split into a coastal route, and a more inland route (Baedeker 1885). The coastal route, the "Derb Far'im (or ʽroad of the Pharaohs')" (Baedeker 1885: 485) passed Wady Ahtha and the well of Abu Suweira in the lower part of Wady Wardan, crossed Wady Gharandel, passed Jebel Hammam Fara'un (hot springs), and went through Wady Useit into Wady Shubeiqeh; from there it continued to the point where Wady Shubeiqeh, Wady Humr and Wady Tayiba meet (Porter 1858). The more inland route seems to have been a "camel track" (Baedeker 1885: 485), and ran across a plain called "El Ahtha" (Burckhardt 1816: 470), crossed the wadies Sidr, Wardan, ʽAmara and howara, passed ʽAyn howara, crossed Wady Gharandel (Baedeker 1885), and merged with the coastal route in Wady Shubeiqeh. Occasionally travellers shifted route, for instance from the inland route to the coastal route for an excursion to Hammam Fara'un (e.g. Burckhardt 1816; De Laborde 1838).

At the point where Wady Tayiba, Wady Shubeiqeh and Wady Humr meet, the north-central and south-central route split. In the travel descriptions, the wadies Shubeiqeh, Humr and Tayiba seem to have occasionally been mixed up, which will be discussed in more detail later in this chapter. Here, Wady Shubeikeh is defined as running northwest to southeast, where it meets with Wady Humr (which runs east-west), and Wady Tayiba (running north-south and ending in the Gulf of Suez).

The western north-central route (Fig. 5) continued through Wady Humr, passing a mountain called "Sarbut el-Jemel", and crossing the plain of "Debbet en-Nusb" (Porter 1858), which was also called "Debbet el Qerai" (Department of Survey and Mines 1934), or the "plain of Ramleh" (Bauerman 1869: 25). Some travellers made a little detour either from Wady Humr or a little further down the route from Wady Khamila to visit Serabit el Qadim, an archaeological site with rock inscriptions and ruins, situated south of Wady Humr and west of Wady Khamila. Although the descriptions and maps were generally very confusing, "Wady Nusb", also called "Wady Nasib" (Department of Survey and Mines 1934) seems to have connected Wady Humr and Serabit el Qadim, while Wady Suwiq connected Wady Khamila and Serabit el Qadim (Porter 1858: 27).

From Wady Khamila, the rest of the north-central route was quite straightforward. It continued through Wady Baraq, Wady Lebwa, Wady Soleif (Department of Survey and Mines 1934), not to be confused with Wady Solaf further to the south, and Wady BerraH (Porter 1858: 28) through Wady el Sheikh all the way to the Monastery of StK. Travellers such as Niebuhr (1792-1), Burckhardt (1816), Graul (1854), Tyrwhitt (1864), Brocklebank (1865), Palmer (1871-1/2), and Hull (1885) were led along this route to Mount Sinai and the Monastery of StK. The north-central route was slightly longer than the south-central route.

3.4.2. The western south-central route

At the point where Wady Shubeiqeh, Wady Humr, and Wady Tayiba connect, and the north-central route turned eastwards, the south-central route (Fig. 6) continued southwards through Wady Tayiba to Abu Zenima, situated at the Gulf of Suez.

From there, the route ran next to the sea, and occasionally through the sea at times of high tide, until the mountains gave way to the Plain of el Murkha. Here, the route turned landwards across the Plain of el Murkha, until it reached the mountains, where it entered Lagham Ba'ba' and Wady Ba'ba' (Department of Survey and Mines 1934). This point is slightly confusing, as travellers sometimes named it Wady Shellal (e.g. Anon. 1848-2: 359; Bartlett 1849: 216; Porter 1858: 15) or "Nakb-el-Leghum..." (Bonar 1857: 140). From there, the route was straightforward. The travellers travelled a short period through Wady Ba'ba' and Wady Shellal, crossed the Naqb Baderah, and then continued through Wady Baderah, Wady Mukatteb, and Wady Feiran. At the end of Wady Feiran the route split into a northern branch, Wady el Sheikh, and a southern branch, Wady Solaf, both of which led to the Monastery of St Katherine. Although the route through Wady Solaf and over the steep Naqb Hawy was shorter than the route via Wady el Sheikh, the first route was too narrow and too steep for heavy loaded camels to pass (e.g. Bartlett 1854: 72; Wallace 1868: 113; Maughan 1873; Field 1888: 102/103; Brockbank 1914: 24/25). Therefore, the Bedouin and their camels had to take the relatively broad and flat Wady el Sheikh, whereas the travellers went with them, or were led through Wady Solaf and over the Naqb Hawy, and the Plain of el RaHah in order to reach the Monastery.

Hindley (1850) and Anderson (1853), Bartlett (1854), Bonar (1857), Stanley (1857), Wallace (1868), Maughan (1873), Bartlett (1879), Raboisson (1886), Schoenfeld (1907), Schneller (1910), Sutton (1913), Brockbank (1914), Scott (1927), Plowden (1940) took this route to reach the Monastery. Graul (1854) took this route on the way back to Suez (Graul 1854).

3.4.3. The western southern route

Between the Plain of el Murkha and Tor, there were two turn-off points to enter the mountains and join the main routes: Wady Sidri and Wady Feiran. Wady Sidri connected with Wady Baderah. The entrance to Wady Feiran was further south, and it split into two branches after passing the first mountain chain: the northern branch fell in with the Wady Mukatteb and the south-central route; the southern branch ran down the Plain of El Qa'a, and formed part of the western southern route, which continued from Tor to the Monastery of StK. The Bedouin normally did not guide travellers along these alternative routes, apart from the western southern route (Fig. 7).

From the Plain of El Murkha, the western southern route crossed the wadies Sidri and Feiran, and followed more or less the telegraph line over the Plain of el Qa'a to Tor, as shown on the map of the Department of Survey and Mines (1934). Travellers could also order Bedouin guides and camels in Suez or Tor, and arrive by boat in Tor to join them and start the western southern route from there.

Between Tor and Mount Sinai, there were three main routes, via Wady Hebran, Wady ImlaHAh, or Wady 'Isleh. The route through Wady Hebran went from Tor northwards past the villages El Wady and El Kuram, respectively one and two hours away from Tor, and continued over the Abbas Pasha road until it reached the mountains where the route continued through Wady Hebran, Wady Solaf, and over the Naqb Hawy to the Monastery of St Katherine (Smith Lewis 1898). The other two routes ran from Tor southwards and entered the mountains either at Wady ImlaHah, slightly south of Tor, or Wady 'Isleh, a bit further to the south. Wady ImlaHah passed close to the mountain Umm Shomer, and continued as Wady Rahabah. Wady 'Isleh continued as Wady Tarfa. Wady Rahabah and Wady Tarfa joined in Wady Saba'iya, before reaching the Monastery. The routes through Wady ImlaHah and Wady 'Isleh were shorter than the one through Wady Hebran (Baedeker 1885: 517), but Wady 'Isleh was quite narrow and therefore not suitable for heavily loaded camels (Buxton

1895: 139). Travellers, such as Henniker (1824), Liebenau (1896), Böttcher (1898), Österreich (1895), Buxton (1895), Buxton *et al.* (1895), arrived in Tor by boat, and travelled from there through South Sinai.

Before the 19th-century, the southern route was considered to be the route of the Israelites, but rarely taken by 19th-century travellers; El Abbassi (1814-2) and Fazakerley (1820) were led along this route on the way back from the Monastery.

3.4.4. Mount Sinai and post-Monastery routes

19th-century travellers generally climbed Mount Sinai via the "sikket Sayidna Moussa" steps (Magi 2005: 29), which start immediately behind the Monastery, and seem to have received this name only in the 20th century. Travellers often descended on the western side of the mountain into Wady Leja, where they visited several Bible-related places, and the Monastery and garden of El Arba'in. From there they returned to the Monastery via Wady Leja and Wady El Deir (e.g. Bartlett 1879: 274), or they continued through Wady Leja to climb Mt St Catherine. The broader, less steep road of Abbas Pasha, built in 1853 and accessible for camels, only seems to have gained some popularity in the late 19th-century and early 20th-century (e.g. Clifton 1900: 14; Schoenfeld 1907), but it was rarely used in the 19th-century.

After visiting the Monastery of StK and its surrounding area, travellers returned either via Tor or 'Ayn Musa to Suez or Cairo, or they continued via Nakhl or the 'Aqaba/Petra region to Gaza or the Holy Land. The route back to 'Ayn Musa was generally different from the route along which they had been led on the way to the Monastery. According to Baedeker (1885), travellers generally went from Suez to the Monastery of StK along the south-central route and returned via the north-central route; however, from the traveller data it is clear that this was not always the case. A round trip Cairo – Monastery of StK – Cairo could be done in about 18 to 21 days (Baedeker 1885: 3); some early 19th-century travellers seem to have performed the trip faster because they travelled day and night, e.g. Turner (1820) and Bankes (Lewis & MacDonald 2003).

3.5. Routes between the Monastery of StK and Nakhl

3.5.1. The western central route

The western central route to Nakhl (Fig. 8) was the north-central route in reverse between the Monastery of StK and Wady Khamila, and from there, travellers went through Wady el SeiH, Wady Ramleh (Bonar 1857: 255) and entered the Tih Plateau via Naqb Rweiknah. From there the route was less straightforward, mainly because the wady names used by the relatively few travellers, e.g. Bonar (1857) and Bartlett (1879), who took this route were difficult to compare, and the maps of this area were not very detailed. The names that were in common between Bonar (1857) and Bartlett (1879) were "Wady Untaghah" (Bonar 1857), described by Bartlett as "Abu Nutheigineh" (Bartlett 1879: 319), Wady El 'Arish, and "Wady el Aujanah" before reaching Nakhl. Holland (1868-1:146), Field (1888), and Schoenfeld (1907) probably took the same route. Wallace (1868: 146) also travelled to Nakhl on his way to Gaza, but did not give a detailed description. Cook (1880: 31) did not mention Naqb Rweiknah, but it was clear from the description that he used the same pass to enter the Tih. From Nakhl there were routes to Gaza and Hebron (Palmer 1871-1: 287).

3.5.2. The eastern central route

The eastern central route (Fig. 9) followed part of the eastern north-central route, which will be discussed in detail later, up to Wady Zeleqah. From there, the route went westwards, through Wady Biyar, a side-branch of Wady Zeleqah (Hull 1885: 55/56; Department of Survey and Mines map 1934), and entered the Tih via Naqb Biyar, which Palmer (1871-2: 322) referred to as "Nagb el Mirad". Palmer (1871-2: 322) described this pass as "previously unknown". From there it is not clear how Palmer arrived in Nakhl, but it is likely that he either travelled through Wady el Gera'a, or along the western edge of Jebel Ejme more or less parallel to Wady el ʿArish. An anonymous traveller (Anon. 1848-3) travelled through what seems to be eastern Sinai to the Tih and Nakhl, but it was not very clear where "Wady Ramanah" and "El Rejum" were situated. It is likely that travellers, such as Arundale (1837) and Borrer (1845) were led along one of these alternative routes into the Tih, because they did mention crossing Wady el ʿArish and the Hajj route, but did not seem to have passed Nakhl.

From Nakhl travellers could return to Suez and Cairo via the Hajj route, continue to Gaza and Hebron (Palmer 1871-1: 287), or follow the Hajj route in the direction of ʿAqaba.

3.6. Routes between the Monastery of StK and ʿAqaba through eastern Sinai

In the early 19th-century the trip to ʿAqaba and Petra became popular. Some travellers wanted to investigate how Moses and the Israelites had continued to the Holy Land after leaving Mount Sinai, while others wanted to travel in the footsteps of Burckhardt, the first European to see Petra. However, some travellers who initially planned to travel to ʿAqaba and Petra changed their itinerary due to fears of robbery, tribal unrests and wars, and the high costs of crossing the area between ʿAqaba and Petra (e.g. Arundale 1837: 34; Wallace 1868: 129; Field 1888). Travellers who did continue to ʿAqaba/Petra included De Laborde (1838), Kinnear (1841), Roberts (Ballantine 1866), Bartlett (1854), Stanley (1857), an anonymous traveller (Anon. 1860), Mr Buckle and Mr Glennie (Glennie 1863, 1880), and Maughan (1873). From ʿAqaba and Petra travellers could continue to the Dead Sea, Hebron, Gaza, and Jerusalem. There were three main routes between the Monastery and ʿAqaba: the eastern north-central, south-central and southern route.

3.6.1. The eastern north-central route

From the Monastery of StK, the eastern north-central route (Fig. 10) went northwards through Wady el Sheikh, until it reached the Watia

Pass, which is the most north-eastern part of Wady el Sheikh. From there, the route continued in a northern direction over the Plain of el ʽAjramiya, through the wadies Zeleqah, Zarania and el ʽAyn (Department of Survey and Mines 1934; Hull 1885). Where Wady el ʽAyn meets Wady Watir, travellers could either follow the north-western branch up Wady Watir, or the south-eastern branch towards Nuweiba down a wady variously named as Wady Watir or Wady el ʽAyn (e.g. Department of Survey and Mines 1934; War Office 1907). The north-western branch through Wady Watir connected to the Hajj route via "Wady el Butum" and "Wady Shaura" (Department of Survey and Mines 1934; Hull 1885), or via an eastern sidebranch of this route, called Wady el Heissi. The Hajj route was followed eastwards towards ʽAqaba. The south-eastern branch connected to the south-central and southern routes, and continued in north-eastern direction along Sinai's coast to ʽAqaba.

3.6.2. The eastern south-central route

The south-central route (Fig. 11) ran across the Plain of el RaHah, and a short distance through Wady el Sheikh until the tomb of Sheikh Saleh where it turned northeastwards into Wady Suweireh. From there it continued through Wady Sa'al, and Wady Ghazala, until the point where travellers continued either through Wady Watir, which joined the north-central route, or through Wady el ʽAyn which ran towards Nuweiba (Burckhardt 1816; Stanley 1857; Maughan 1873; Baedeker 1885). Alternatively, a side-branch of Wady Ghazala, Wady Samghi, which branched off a short distance from a well called ʽAyn HuDrah (Maughan 1873), ran further eastwards and led via Wady Sa'ada to Nuweiba (Robinson in Stanley 1857: 81; Baedecker 1885). From Nuweiba, the eastern south-central route continued northwards along the coast until it fell in with the Hajj route and bent around the head of the Gulf of ʽAqaba until it reached ʽAqaba (Maughan 1873).

According to De Laborde (1838: 227), this route taken in the opposite direction was the most common route taken by travellers from "Gaza to Mount Sinai".

3.6.3. The eastern southern route

In the early 19th-century, De Laborde (1838) has described the eastern southern route (Fig. 12). This route ran from the Monastery through Wady el Sheikh and a narrow passage called "El Boueb" [El Bab, de door] (De Laborde 1838: 93) near Moses' seat in the Watia Pass, and continued through "Wady Zackal" (De Laborde 1838) to Dahab, and from there along the coast to Nuweiba and 'Aqaba. It is not clear if "Wady Zackal" referred to Wady Sa'al, which runs northeastwards from the Monastery and could have been misheard for Zackal because of the 'ayn in the name, or "Wady Zaghrah" (Survey of Egypt 1943), which winds from the Monastery eastwards and continues as Wady Nasb before reaching Dahab. From Dahab, De Laborde travelled along the coast to 'Aqaba, and joining the eastern south-central route in Nuweiba.

3.7. Geographical issues with the positions of wadies in South Sinai

There were two main areas of geographical confusion. For some reason, both issues were in the areas where the main routes split. The first area was where Wady Tayiba, Wady Humr and Wady Shubeiqeh along the western south-central route meet. For instance, Porter (1858: 14) described arriving from the north, "...we reach an open space among the low ridges, where Wady el-Humr [Wady Humr] joins Shubeikeh [Wady Shubeiqeh], and the two united form Wady Taiyibeh [Wady Tayiba]". Porter continued to explain the two routes to the Monastery of StK, which clarified the positions more or less. On an old map of Kiepert (1859), it seems that "Wady Taibeh" [Wady Tayiba] is the same as "Wady Sebekeh" [Wady Shubeiqeh], and that this wady turns to the east where it is initially called "Wady Taibeh" [Wady Tayiba] and further on "Wady Homr" [Wady Humr]. On the map of the War Office (1907), "Wady Shebeikeh" [Shubeiqeh], "Wady Taiyibeh" [Tayiba] and "Wady Hamr" [Humr] are named and positioned as described in the handbook of Baedeker (1885), and by several travellers. However, on the map of the Department of Survey and Mines (1934), the name "Wady Tayiba" is given to Wady Tayiba, Wady Humr, and possibly also to Wady Shubeiqeh, which is not clearly named and shown as an extension of Wady Tayiba.

The second geographical issue concerns the use of the names and positions of Wady Watir and Wady el ʿAyn along the eastern south-central and north-central route. One problem is that there seem to be several (parts of) wadies called Wady el ʿAyn. The name Wady el ʿAyn has been applied to the last part of the eastern north-central route, the wady to which it is connected that runs to Nuweiba, and a wady in-between the eastern north-central and south-central route, more-or-less parallel to the Wady el ʿAyn of the north-central route (Department of Survey and Mines map 1934). It is not very clear if these are all branches of the same wady, or separate wadies with an ʿAyn (well) in it. The second problem is that it is not very clear which part of the Wady el ʿAyn that runs to Nuweiba and the sea is actually called Wady el ʿAyn and which part is called Wady Watir. Bartlett used the name "Wady Weteir" [Wady Watir] for the wady running towards the coast (Bartlett 1854: 98), as on the map of the Survey of Egypt (1943). The War Office map (1907) left the question unanswered by writing "W. el Ain [Wady el ʿAyn] or W. Watir". Maughan (1873), however, referred to it as Wady el ʿAyn.

A third issue was that there were several wadies in South Sinai with the same name, and some wady names of western Sinai were also found in the ʿAqaba/Petra region. For instance, a sidebranch of the western north-central route leading towards Serabit el Qadim was called "Wady Nasb", the same name as one of the main drainage wadies in south-east Sinai leading to Dahab. Hull referred to "Wady Saal" (Hull 1885: 38) near "Serabit el Jemel", which is along the western north-central route, whereas other travellers refer to Wady Sa'al as part of the eastern south-central route to ʿAqaba. There was a Wady el Sheikh, leading to the Monastery, and one in central-western Sinai, leading to Nakhl (Cook 1880: 31). ʿAyn Musa was applied to the oasis opposite Suez along the routes to the Monastery, but there was also a well on Mount Sinai (Palmer 1871-1: 278;

Bartlett 1879: 265; Buxton *et al.* 1895: 136), inside the Monastery (Benjamin 1784: 163; Bartlett 1879: 280), and at the entrance of Petra (Von Hagen 1996: xxxii) with the same name. There was a "Wady el Szik" (Seetzen 1855: 65) between Wady Sa'al and the Monastery, a Wady SeiH along the western route to Nakhl, and a "Wady Sik" at the entrance of Petra (Palmer 1871-2: 441). There was a Wady Shubeiqeh along the western routes, and a "Wady Shibekha" (Koller 1842: 77) in the Wady el 'Ayn/Wady Watir area. There was "Wady Gharandel" along the western coast route and a "Wady Ghurundel" between 'Aqaba and Petra (Renouard de Bussiere 1829: 270; Koller 1842: 79; Bartlett 1854: 145; Stanley 1857: 85; Hull 1885: 83); the spellings were used interchangeably for the two different places. Furthermore, travellers used the name "Paran" for Wady Feiran and the ruins of the old city in Wady Feiran (e.g. Burckhardt 1816: 618; Carne 1826: 201; Palmer 1871-1: 154; Buxton *et al.* 1895: 140) and for an area in the Tih, in north-eastern Sinai (Borrer 1845: 352), or in the 'Aqaba/Petra region (Madden 1829-2: 214; Kinnear 1841: 122; Seetzen 1855: 18/19). Although it was clear from the context in which area these wadies were situated, it was initially very confusing.

It was also interesting that the routes through South Sinai were described, named and discussed in much detail, whereas the names of the wadies especially through the Tih were often not even mentioned or discussed. Central and North Sinai were discussed more in terms of general direction and things visible in the landscape, possibly because the Tih was less travelled, explored and described, and not very well mapped, or because Central and North Sinai were generally flatter, drier, less vegetated and more monotone than South Sinai. South Sinai, on the other hand, has been described for centuries, and wady names were increasingly mentioned and easier recognisable in the second half of the 19th-century.

3.8. Introduction to the chapters 4-7

The results presented in chapters 4-7 are reconstructions of the data communicated by travellers during the 19th and 20th century up to 1937 along the routes or "lines of flight" discussed in the chapters 2 and 3. In 1937, Plowden (1940) was probably (one of) the last traveller(s) to travel on camel back from Suez to the Monastery of StK and beyond; therefore this year served as the cut-off point. Chapter 4 discusses environmental fluctuations in the light of the Biblical Exodus, mainly based on the large flora and water availability data mentioned by the travellers. Animals move around and often go unnoticed, and therefore these data were left out. Chapter 5 deals with the interpretation of environmental fluctuations, and gives some insight into how travellers and Bedouin dealt with these fluctuations. Chapter 6 deals with the weather data communicated by the travellers, and discusses some of the links between weather events on a local as well as global scale. Chapter 7 discusses how travellers and Bedouin dealt with South Sinai's weather on a daily basis, and how they interpreted certain weather events.

"…it seems to me that all Western society's dealings with the desert – exploration, development, religious experience – are rooted in the image of the desert as a deathly place, and that the fascination with the desert is part of ageless human struggle to come to terms with the conditions of existence, with the inevitability of death after life and the search for life within life. We tend to see ourselves as reflected in the eyes of others, and sometimes we come to depend on them to such extent that we lose our own private sense of being, seeking assurance from others of the very fact that we are alive. And where that reassurance does not exist, as in the desert, we become afraid – not of the desert itself, but of what we see as its emptiness, as though that emptiness would slowly penetrate our souls and drain the life force from us. We create an easy progression of images for the desert – empty, void, forsaken, deserted. And we fear the image we have created, for in that image, we see our own." (Hazleton 1980: 44/45)

Chapter 4 Reconstruction of environmental changes through Biblical comparisons along the routes

4.1. Introduction of the flora used for the environmental reconstruction of South Sinai

The desert landscape of South Sinai was very different from the European landscapes travellers were used to. Special attention was given to the absence or presence of vegetation and water, which were very scanty in South Sinai, but "normal" landscape features in their own countries. Travellers tried to link the presence of vegetation and water to the Biblical landscape descriptions. The rich and detailed descriptions given by the travellers provide some insight into the (mainly weather linked) fluctuations of the flora.

Travellers mentioned mainly trees and shrubs, which had economic as well as cultural-religious value. Sometimes they mentioned scientific names, but more generally simply "acacia", "palm" and "tamarisk", or one of the many synonyms they used for these trees (Appendix 3, p. 346). Trees and shrubs which were included were:

Acacia (*Acacia* sp., Mimosaceae): Acacia was by some considered the species of the Burning Bush (Stanley 1857: 21; Bartlett 1879: 249), the Shittim wood mentioned in the Bible (e.g. Bonar 1857: 74; Stanley 1857: 21; Hull 1885: 47), that was used for making the tabernacle (e.g. Stanley 1857: 21; Porter 1858: 14), or the Biblical Ark (Field 1888: 79/80). Acacia was used by the Bedouin to make charcoal to sell in Cairo (e.g. Tyrwhitt 1864: 335). The young shoots were cut and fed to the camels (Burckhardt 1816: 479) and goats (Holland 1868-2: 240), the exudate was the edible gum arabic (e.g. Seetzen 1855: 78; Stanley 1857: 22; Holland 1868-2: 240) and "the bark of the tree is used by the Arabs to tan leather" (Burckhardt 1816: 479). These trees may have also been planted by the Bedouin as orientation point where a road splits off, e.g. between Cairo and Suez, and on the plain of El Qa'a (Palmer 1871-1: 210/211) to signal where to turn off to go enter the high mountains. Acacia mainly grew in the wadies and wady mouths near the coast. They can survive long periods of drought (Bown *et al.* 2009).

Tamarisk (*Tamarix* sp., Tamaricaceae): Tamarisks, or actually small insects on this tree, were thought to produce the manna of Scriptures (e.g. Burckhardt 1816; Turner 1820; Stanley 1857: 22). The amount that the trees produced depended on the amount of rainfall according to Burckhardt (1816: 600). The Bedouin collected it in May/June before sunrise and "boil it, strain it through a coarse piece of cloth, and put it into leathern skins" (Burckhardt 1816: 600). Tamarisk served as fodder for camels (e.g. Hull 1885: 49). Tamarisks could cope very well with drought (Burckhardt 1816: 601). Raboisson, a French traveller, seems to have mixed up tamarisk and tamarind (*Tamarindus* sp., Fabaceae) (e.g. Raboisson 1886: 298).

Palms (Arecaceae): travellers mentioned both date-palms (*Phoenix dactylifera*) and "doum"-palms (*Hyphaene thebaica*) (Burckhardt 1816: 611), but the latter seems always to have been very rare. Palms prefer water-rich areas, and therefore "the palm-tree in the desert is always a sign of moisture" (Hull 1885: 38). They were kept for date production and several other purposes:

> "...for shade. Its fruit we were enjoying every day, the stones of which are sent to be ground or food to camels. Its leaves formed the baskets, great and small, in which our oranges and fowls were mounted for conveyance. The shavings and thin yellow fibres formed the sponge which was laid down along with soap in our baths at Alexandria. Its sap forms the spirit called arrak..." (Bonar 1857: 193)

Zizyphus sp. (Rhamnaceae): Zizyphus was mainly kept for its edible fruits, which the Bedouin made into a kind of flour, which at least in the early 19th-century they carried with them on trips through the desert (Burckhardt 1816: 603/604). Palms and Zizyphus also seem to have been part of the Bedouin culture and possibly even their cosmology. Palmer claimed that when somebody passed away, the Bedouin said certain sentences, one being "the sidr [Zizyphus]-tree is thy aunt, and the palm-tree thy mother" (Palmer 1871-1: 94). The tree prefers wetter areas, and was almost exclusively found in water-rich gardens between Mt Sinai and Tor (Burckhardt 1816: 535, 549, 603; Burckhardt 1829: 361; Renouard de Bussiere 1829: 245/246; Tyrwhitt 1864: 346; Holland 1868-2: 242; Wallace 1868: 108; Palmer 1871-1: 23, 167; Bartlett 1879: 245).

Sycamores: strictly, this refers to the sycamore figs (*Ficus sycomorus*, Moraceae), but it was used more generally for any fig, as well as for 'sycamore' i.e. *Platanus* sp. or *Acer* sp. (Aceraceae). Sycamores (probably *Ficus* sp.) were only recorded in the gardens of El Wady in 1830 (Dumas 1839: 239) and the Monastery of StK's garden in 1848 (Anon. 1848-2: 369); the trees in the Monastery garden were definitely figs (Anon. 1848-2: 369; Borrer 1845: 342; Bartlett 1854: 80; Tyrwhitt 1864: 341; Brocklebank 1865: 183) or possibly both trees existed there. Fig trees were mentioned throughout the higher mountainous area (e.g. Burckhardt 1816: 525, 536, 590; Stephens 1996: 195; Borrer 1845: 320; Bartlett 1854: 53, 62; Stanley 1857: 71; Tyrwhitt 1864: 340; Maughan 1873: 95, 138; Bartlett 1879: 273; Sutton 1913: 90).

Hawthorn (*Crataegus sp.*, Rosaceae): Hawthorn has only been mentioned on Mt St Catherine (Burckhardt 1816: 569), Mt Sinai (Seetzen 1855: 82), and at the foot of Umm Shomer (Palmer 1871-1: 248). The tree is used by the Bedouin as a stem on which to graft fruit trees of the family Rosaceae (apple, pear, apricot, peach) (Bown *et al.* 2009: 90).

Broom (*Retama raetam*, Fabaceae): Broom was considered to be the Juniper of the Bible (e.g. Anon. 1838: 37; Anon. 1848-2: 363/364; Stanley 1857: 21/22; Smith Lewis 1898: 239/240), the shrub under which Elijah slept (1 Kings 19: 4). Broom occurred mainly in the plains and lower altitudes in places where there was no visible water, and where there were often no other shrubs or trees. The flowers were described as white or pinkish with a bit of purple (Anon. 1838: 37; Anon. 1848-2: 363; Bartlett 1879: 186; Smith Lewis 1898: 239); it is the earliest tree to flower in January and February.

Ghurkud (*Nitraria retusa*, Nitrariaceae): Ghurkud produces small edible red berries, suggested to be the fruit which Moses threw into the bitter waters of Marah to sweeten the water. The berries were ripe around June (Bartlett 1849: 69), and used by the Bedouin to "make a conserve" in years of plentiful production (Burckhardt 1816: 474). It mainly grew in the lower parts of the wadies and along the coast near brackish water sources (Burckhardt 1816; Borrer 1845: 302).

Apart from trees and shrubs, some herbs were included, often mentioned or significant indicators for water presence. For example: wild melons (*Citrullus colocynthis*, Cucurbitaceae) preferred "sandy plains, desert wadis, edges of cultivation in reclaimed lands" (Boulos 2000:140); *Capparis* spp. (Caparaceae) mainly hang from rocks in the mountains; rushes (Juncaceae) and sedges (Cyperaceae) generally grow in water-rich and nutrient-poor areas - rushes were used "for making mats" (Holland 1868-2: 240); grasses and reeds (Poaceae) are opportunists that grow in places rich in organic matter and water. Reed was used for housing and roofing (Burckhardt 1816: 530; Palmer 1871-1: 237), and for fences e.g. in 'Ayn Musa in 1845, 1866 and 1874 (Bartlett 1854: 27; Wallace 1868: 91; Bartlett 1879: 187/188). Grass was used as fodder for the camels, goats and sheep; *Crocus* (Liliaceae) were occasionally found in wadies and eaten by the Bedouin (Bonar 1857: 249).

Some garden plants have also been recorded, such as cypress (*Cupressus* sp.), olive (*Olea sp.*), willow (*Salix sp.*), and poplar (*Populus sp.*); especially the last two are strongly associated with water-rich areas. Some fruit trees were mentioned, such as almonds, pomegranates, oranges, lemons, apples, pears, apricots and mulberries, and also some herbs, vegetables, grains such as barley, wheat and corn, and tobacco.

4.2. Reconstruction of the ("Biblical") landscape along the main routes

4.2.1. The arrival of Moses and the Israelites and the wells of Naba and 'Ayn Musa

Hunted by the Egyptian Pharaoh, Moses and the Israelites crossed the Red Sea, also called "The Sea of Reeds". Eighteenth century travellers suggested that this event had taken place south of Suez, where there was enough water to drown the Pharaoh and his army, and that the landing place on the Sinai Peninsula had been near Hammam Fara'un (e.g. Montagu 1766: 53/54), situated along the western north-central route. Some Bedouin seem to have continued this story in the 19th-century:

> "The Arabs declare that it was here that Pharaoh crossed after the children of Israel; and the marks of his chariot wheels, and other extraordinary things are still to be seen. One of our Arabs who most firmly believed in this piece of tradition, picked me up a piece of iron on the shore, which be considered to be an antique of the age of Pharaoh." (Anon. 1848-2: 357)

However, most of the 19th-century travellers suggested that the crossing of the "Red Sea" had taken place further northwards, which coincided with the most popular 19th-century routes. Early 19th-century travellers proposed that the crossing took place near Suez or via the northern end of the Gulf of Suez (e.g. Madden 1829-2: 217; Arundale 1837: 14; Borrer 1845: 281; Baedeker 1885: 417), while in the later 19th-century the landing on the Sinai Peninsula was thought to have taken place a few miles north of 'Ayn Musa (e.g. Roberts 1839: 205; Stanley 1857: 66). The first camp of the Israelites "on the verge of the wilderness" was thought to have been the well of El Naba (e.g. Burckhardt 1816: 466; Madden 1829-2: 211), also called "El Ghurkudeh" (Bartlett 1879: 189), presumably named after the shrub ghurkud, or the "Wells of Moses" (e.g. Anon. 1848-1: 314; Anon. 1867: 407/408; Palmer 1871-1: 39; Field 1888: 64).

In the 18th-century, 'Ayn Musa was described as 3-5 holes in the sand and a palm (Clayton 1753: 112; Niebuhr 1792-1: 183). Throughout the 19th-century it developed into a rich vegetated oasis, but in the early 20th-century it seems to have quickly diminished again. Until the late 1820s, the vegetation and the state of the wells were variable. The vegetation changed from little or no vegetation in 1807 (El Abbassi 1814-2: 85), to "a few palm-trees" in 1811 (Fazakerly 1820: 366), and some acacias in 1815 (Turner 1820: 419). However, in the late 1820s and early 1830s, the oasis had expanded to several fountains of different size and some groups of palms (Renouard de Bussiere 1829: 230; Anon. 1859: 28; Geramb 1899: 166/167). There was little water in 1833 (Arundale 1837: 16), but by the late 1830s there were about 15 wells and a few stunted palm trees (Kinnear 1841: 63; Ballantine 1866: 116) (Fig. 13).

In 1843, the wells were partly dry, but there were many palms and a "small stone building in ruins" (Borrer 1845: 298). Near it was "a small Arab hut...with a bit of ground attached sowed with corn, and defended by a hedge..." (Borrer 1845: 298). Two years later, there were one or two fenced gardens, and a white house of a man from Suez who grew vegetables there (Bartlett 1854: 27).

In the early 1850s, the number of wells had increased to around 20, and there were "tamarisks" and palms (Graul 1854: 194; Stanley 1857: 66). The house was now owned by a European, Mr Costa (Graul 1854: 195), and Mr Lewick from the East-Indian Company in Suez, had a garden there with "cabbage...carrots, melons, cucumber, salad, spinach, potatoes...pomegranate...[and]...olive", and a well with potable, good tasting water (Graul 1854: 193/194). Stanley (1857: 66) called it the "Richmond of Suez". In 1856, water was pumped up with the help of animal force (Bonar 1857: 110). In the early 1860s, 'Ayn Musa was a "place of residence for Suez merchants", and the house belonged to a Belgian Consul (Bauerman 1869: 19). There were several wells, palms, tamarisks and gardens (Tyrwhitt 1864: 334; Brocklebank 1865: 160/161). In 1866, a Bedouin family was looking after the gardens and there was a shadoof to bring up the water (Wallace 1868: 91, 95). Almost all wells had been enclosed by then, and there was one relatively large well of "30 feet in diameter" (Bauerman 1869: 18/19). There were gardens with vegetables and flowers (Schwerdt 1870: 42). 'Ayn Musa did not only turn into a kind of holiday resort, but also produced vegetables for Suez (Palmer 1871-1: 34/35). In February 1874, it functioned more or less as the backgarden of Suez:

> "[There] is a series of five large gardens or plantations, enclosed by high reed fences, and partly filled with palms, tamarisks, apricots, pomegranates, and other trees, and occupied chiefly by beds of vegetables and herbs, irrigated by the water from these wells. Some of these enclosures contain small summer-houses, and are places of resort from Suez...These plantations extend a considerable distance, perhaps half a mile, from north to south." (Bartlett 1879: 187/188)

In the first half of the 1880s, travellers just mentioned the water sources, palms and tamarisks (Field 1888: 46; Hull 1885: 28; Wallace 1891: 34), and none of the settlements. However, Raboisson (1886: 288/289) described in early March 1882, two enclosures, twenty abundant wells with slightly brackish water, and palms, sycamore, acacias, orange trees all surrounded by tamarinds (presumably he meant tamarisks). 'Ayn Musa "belonged" in the 1880s to Mr Costa and in the 1890s to "Mr. George Athanasios, owner of the Red Sea Stores at Suez, and agent there for the Sinai Convent" (Smith Lewis 1898: 24/25). In the early 20th century, there were some palms in 1902 (Mauchamp 1903: 11), and palms and tamarisks in 1912 (Sutton 1913: 29). In 1937, there were wells and many palms and tamarisks owned by a Cairene, but they were taken care of by people who lived around the oasis, presumably Bedouin (Plowden 1940: 23).

Throughout the 19th-century, the water of the wells of 'Ayn Musa was described as brackish and muddy, and it became quickly bad. However, it served as potable water for Suez (Bauerman 1869: 19/20) and for passing ships (De Laborde 1838: 79).

4.2.2. The "Wilderness of Shur" and the area south of 'Ayn Musa

After leaving the first camping place, the Israelites entered the "Wilderness of Shur", or the "Wilderness of Etham" (Bartlett 1849: 68; Holland 1867: 14). The Bible positions the Wilderness of Shur between the "Sea of Reeds" and the well of Marah, a waterless three-day walk. This was thought to correspond with the two- or three-day walk over the dry plains south of 'Ayn Musa (e.g. Condor 1831: 111; Kinnear 1841: 60/61; Wallace 1868: 95). There was some discussion about the exact dimensions of the wilderness and the position of the "Marah". Holland suggested:

> "...the ancient wilderness of Etham, or Shur, is about seventy miles long, and from twelve to fifteen miles broad, being bounded on the east by the range of Jebel er-Rahah...This plain may be said to extend as far south as Jebel Hummam [Hammam Fara'un]..." (Holland 1867: 14)

Bartlett noted that "...Lepsius extended [it] as far as Ras Zelime" (Bartlett 1849: 68), which was further to the south. According to Palmer, "Shur" meant "wall", referring to the long wall formed on the eastside of the plain by El RaHah and Tih mountain range (Palmer 1871-1: 38).

This area was crossed by the coastal and inland route. The coastal route between 'Ayn Musa and Wady Shubeiqeh was described as a sandy, pebbly area with some acacias and broom in 1815 (Turner 1820: 420). In the late 1820s, Renouard de Bussiere (1829: 231) wrote "here the nature is dead". However, in 1865, it was "covered with grass, shrubs, and thickets of tamarisk" (Holland 1866: 158).

The inland route was considered more barren (Holland 1867: 14). However different kinds of vegetation were reported over time. Between 'Ayn Musa and Wady Sidr, there were some "thorny trees" in 1816 (Burckhardt 1816: 471). In the 1840s and 1850s broom and young tamarisks were reported (Borrer 1845: 300), and occasionally some herbs (Graul 1854: 196). In the 1870s and 1880s there was broom and some kind of thorny vegetation (Bartlett 1879: 190, 193; Field 1888: 59), which Raboisson (1886: 290) called "*Artemisia arabica*", but which may have been tamarisk. In 1883, Hull (1885: 34) found "beds of the pretty little desert melon (*Citrullus colocynthis*), and in March 1897, Smith Lewis (1898: 250/251) noticed "little bushes". Wady Wardan seems to have been a relatively flat area (Bonar 1857: 117/118; Bartlett 1879: 197), with a few shrubs in 1853 (Graul 1854: 196) and some herbs in 1874 (Bartlett 1879: 197), and broom in 1877 (Scott 1927: 10). According to Renouard de Bussiere (1829: 232), Wady Sidr and Wady Wardan were inhabited by Bedouin. Wady 'Amara seems to have been relatively dry and vegetation-poor in 1827, 1868, 1869, 1874 and 1882, apart from some tamarisks with showed dwarf-growth (Madden 1829-2: 219; Bauerman 1869: 20; Palmer 1871-2: 305; Bartlett 1879: 198; Raboisson 1886: 294).

4.2.3. The well of Marah: 'Ayn howara or 'Ayn Suweira?

After three days through the Desert of Shur without finding any water, the Israelites reached the Well of Marah, where the water was too bitter to drink. Travellers suggested several places that could correspond with Marah, such as 'Ayn Musa (De Laborde 1838: 79), Wady 'Amara (e.g. Madden 1829-2: 212), 'Ayn howara (Renouard de Bussiere 1829: 232; Arundale 1837: 16; Kinnear 1841: 63; Borrer 1845: 302; Bartlett 1849: 69; Tyrwhitt 1864: 334; Bartlett 1879: 202), Gharandel or 'Ayn howara (Stanley 1857: 37), and 'Ayn Suweira (Holland 1868-1: 192).

However, the most popular candidates were 'Ayn Suweira in or near Wady 'Amara along the coastal route, and 'Ayn howara in Wady howara along the inland route (Madden 1829-2: 212/213; Bartlett 1849: 69; Holland 1868-1: 192; Palmer 1871-2: 305), although there was some confusion about the geographical position of the two wells, and which traveller had visited which well (e.g. Madden 1829-2: 212/213; Kinnear 1841: 64; Bartlett 1879: 198). Both wells had "bitter" water, and both were situated at a similar distance from 'Ayn Musa. The name of either the well or the wady in which it was situated resonated the Arabic word for bitter, "marra" (e.g. Burckhardt 1816: 473). It depended on the route the travellers took, the amount of rain that had fallen, and the personal taste of the travellers concerning the bitterness of the water, whether they identified one or the other with Marah. Roberts (Ballantine 1866: 116) remarked that the water of 'Ayn howara was "delicious", and Palmer (1871-1: 40) suggested that "...it was not only drinkable but palatable...", while early 19th-century travellers had described how even their camels would not drink from it, because of its bitterness (e.g. Burckhardt 1816: 472; Renouard de Bussiere 1829: 232; Arundale 1837: 16), and preferred (at the time of Roberts' writing) sea water over this well water (Kinnear 1841: 64). As the Bedouin tried to warn the travellers about the bad-tasting water in the coastal areas by saying "marra" (the Arabic word for bitter), the travellers became increasingly excited thinking that this was the Marah of Scriptures.

The well of 'Ayn Suweira consisted in 1815 of a well with drinking water and another for watering animals, surrounded by low broom bushes (Turner 1820: 420). Later travellers only described one well, which was difficult to find (Burckhardt 1816: 625), and various kinds of vegetation, such as tamarisks (Burckhardt 1816: 625) and "green shrubs" (De Laborde 1838: 80). There was no vegetation in 1845 and 1867 (Bartlett 1854: 35; Holland 1868-2: 238), and a few herbs in 1869 (Palmer 1871-2: 304). The well seems to have been occasionally a place of conflict between Bedouin tribes, and the Terabin Bedouin of North Sinai sometimes made use of it (Palmer 1871-2: 304/305):

> "The Arabs of Tor seldom encamp in this place, but the Terabein Arabs are sometimes attracted by the well. During the war which happened about eight years ago between the Towara and the Maazy Bedouins, who live in the mountains between Cairo and Cosseir, a party of the former happened to be stationed here with their families." (Burckhardt 1816: 471)

This ‘Ayn or Abu Suweira should not be confused with another Abu Suweira mentioned by Ehrenberg, Palmer and Holland near Jebel Nagus, which is much more to the south, near the plain of El Qa’a (Ehrenberg 1830: 2/3; Palmer 1871-1; 217/218; Holland 1869-1: 215), and which was described in 1869 as a “pleasant little palm-grove” (Palmer 1871-1: 217).

Around ‘Ayn howara, the vegetation seems to have been equally scanty. In 1816 there were “a few date trees” (Burckhardt 1816: 472), in 1839 nothing much at all (e.g. Kinnear 1841: 116). Between 1843 and 1856, there were many ghurkud shrubs and two palms (Borrer 1845: 302; Bartlett 1854: 31/32; Anon. 1848-1: 316; Hindley 1850: 12; Anderson 1853: 73; Bonar 1857: 118). The presence of the ghurkud shrubs, which was thought to be the plant that Moses had thrown into the water to sweeten it, added to the Biblical imagination of Marah. Between 1862 and 1872, there was only one palm left and no ghurkud (Tyrwhitt 1864: 334; Palmer 1871-1: 40; Maughan 1873: 86). However, Tyrwhitt (1864), Mr Buckle and Glennie passed this well around the same time, and Glennie wrote that there were several “stunted palms” and some “ghurkud” (Glennie 1880: 94), which suggests that they described the place in more detail or saw a different well. In 1874 and 1882, there was a cluster of palms (Bartlett 1879: 199/200; Raboisson 1886: 293), but only one palm and “a few bushes” in 1877 (Scott 1927: 12). In 1912, there were some “wild palms” (Sutton 1913: 46). In the area between ‘Ayn Howara and Wady Gharandel, Graul (1854: 198) claimed to have seen a barley field in 1853, and Bartlett saw in February 1874 for “about two miles the way was studded thick with lines of shrubs” (Bartlett 1879: 202).

4.2.4. Elim and its potential candidates: Tor and the wadies Gharandel, Useit and Tayiba

Elim, the next place mentioned in the Exodus, had twelve sources and seventy palms (Ex. 15: 27). This was a challenge: Exodus did not specify the exact position of Elim (Ward 2008: 333), there were no linguistic or other links to define its position, and there were several water- and vegetation-rich wadies that formed potential candidates. Therefore, travellers solely relied on the landscape description and the distance from "Marah". However, several travellers pointed out that number of wells did not give any information at all, because new wells could be easily dug (Burckhardt 1816: 474; Anon. 1848-2: 357; Hull 1885: 35/36; Plowden 1940: 49), and the number of palms also fluctuated over time, so that the travellers' Biblical projections were just led by the contemporary landscape.

Pre-19th-century travellers positioned Elim at Tor, because the southern route to StK was the most travelled; this was probably a practical arrangement of the Bedouin to provision the Monastery of Deir Antous, which had been active until the early 18th-century, and was on the way to StK (Burckhardt 1816: 590). The area before reaching Tor, especially the plain of El Qa'a, was almost completely bare and could therefore be identified with the "Wilderness of Shur". It was described by travellers as extremely dry, warm, and barren/lifeless (e.g. Burckhardt 1829: 366; Carrington Bolton 1890: 588/589; Buxton 1895: 141; Liebenau 1896: 22). Holland called it "the burning waste of El Kaa" (Holland 1869-1: 215). Palmer (1871-1: 216, 223) travelled this plain during the night to escape from the sun and heat (e.g. Palmer 1871-1: 267), but he did see a few shrubs and a dwarf tree.

Further south along the Plain of El Qa'a, near the coast and just north of Hammam Musa, there was the well of "Bir Abu Suweirah"and trees (Palmer 1871-1: 217. This was followed "about half an hour distant from El Wady" (Burckhardt 1829: 362), by the warm, salty and sulphurous-smelling springs of Hammam Musa (Palmer 1871-1; Carrington Bolton 1890: 591; Buxton *et al.* 1895: 101). In the early 19th-century there were large date plantations near the springs:

> "Several warm springs issue from the calcareous mountain, the principal of which has a roof built over it, and is visited by all the

> surrounding Bedouins...Close by the springs are extensive date-plantations. I have never seen a richer and more luxurious growth of palm-trees than in this place; they form so thick a wood, that it is difficult to find one's way through it." (Burckhardt 1829: 362/363)

It is not clear if Seetzen referred to this garden when he mentioned the name "El-Tell" (1855: 88). In the late 19th-century, travellers estimated it to consist of thousands of palm trees (Carrington Bolton 1890; Buxton 1895: 158).

East of Hammam Musa was the water- and vegetation-rich village of El Wady (e.g. Fazakerley 1820: 379; Liebenau 1896: 21; Smith Lewis 1898: 198). In 1807, El Wady was inhabited mainly by Greek Christian families (El Abbassi 1814-2: 74). The village seems to have been a refuge for the inhabitants of Tor to protect themselves against sailors (Fazakerley 1820: 379) and diseases (De Laborde 1838: 232). Each house had a private well, date-palms, fruit trees and vegetable plots (El Abbassi 1814-2: 73/74; Burckhardt 1829: 361). Neither Hammam Musa, nor El Wady, nor the nearby village of "El Kuram" (Smith Lewis 1898: 198) seem to have been candidates for Elim. Tor, on the other hand, which throughout the 19th-century was described as a "miserable", "unhealthy", and "insignificant place" with too much "miasma" (bad air) (Burckhardt 1829: 359; Henniker 1824: 218; Dumas 1839: 239; Palmer 1871-1: 222/223) was considered to be Elim until the early 19th-century (e.g. Wolff 1839: 313).

However, with the decrease in trade in the early 19th-century (De Laborde 1838: 233), and the loss of its main income from provisioning ships (Salame 1819: xxxiv), Tor, until then considered the only town in "Arabia Petraea" (De Laborde 1838: 233), lost its important position. By 1807, most inhabitants had moved to El Wady, and Tor was almost empty apart from some fishermen and ships passing through (El Abbassi 1814-2: 73/74). At the end of the 19th-century, there were simple mud-houses, some luxurious white houses with some "neglected" palm groves, a white monastery, and the harbour which had fallen into disuse (Buxton 1895: 139; Österreich

1895: 11; Böttcher 1898: 188/189; Smith Lewis 1898: 193). In the 19th-century, other places became increasingly popular, such as the quarantine port/station called "Krum" just south of Tor (Liebenau 1896: 14; Hume 1901: 4) where some 45000 Mecca-pilgrims were kept for some weeks each year to prevent the spread of cholera and the plague (Sutton 1913: 127/128). There were also some projected possibilities of places that might be Elim along the western north- and south-central route.

During the early 19th-century, there was confusion about the position of Elim:

> "Tor is supposed to be the ancient Elim; the number of springs is still the same, but that of the palm-trees has increased - there is another place named Elim between this and Suez." (Henniker 1824: 219)

De Laborde pointed out that geographically, Tor did not fit in the Bible story:

> "The number of palm trees here naturally led the pilgrims, who formerly came by the way of Gaa, Tor, and Wady Seleh, to visit the convent of Sinai, to believe that this was the site of the Elim of seventy palm trees mentioned in the Bible; and it is so marked in most of their records. But the mere existence of palm trees is not sufficient to fix the position of Elim, and the relations of distance accord too little with Scripture to permit the adoption of such an opinion." (De Laborde 1838: 234)

Throughout the rest of the 19th-century, discussion about the position of Elim focussed on the central routes to Mt Sinai. De Laborde (1838) suggested that 'Ayn Musa was considered by some to be Elim, Holland (1868-1: 192) suggested it was 'Ayn Howara, Tyrwhitt (1864: 334) proposed that Elim was not so much a place, but a district, and Stanley (1857: 22) and Hull (1885: 71) put forward that "Elim" just meant "the trees", such as "Elath", the old name for 'Aqaba, and could have been situated anywhere where there were palm trees. Stanley (1857: 37) thought that the three main candidates for Elim were the wadies Gharandel, Useit and Tayiba.

The area of Wady Gharandel seems to have been the "favourite" wady for Elim (e.g. Burckhardt 1816: 473/474; Renouard de Bussiere 1829: 233; Borrer 1845: 305; Bartlett 1849: 70; Wallace 1868: 96; Palmer 1871-1: 40/41; Bartlett 1879: 203/204; Hull 1885: 35/36; Field 1888: 59/60; Smith Lewis 1898: 44-46). It was crossed by the coastal as well as the inland route, and fitted logically with 'Ayn howara as "Marah" along the route that most travellers seem to have taken (e.g. Bartlett 1879: 391). Travellers who took the coastal route described the lower part of Wady Gharandel as rich in vegetation and animal life. In 1807, El Abbassi (1814-2: 83/84) wrote in French that there were some palms and many "sapins en arbustes", which literally translates to fir shrubs; presumably these "firs" were tamarisks. In 1815, there were many palms trees, most of them showing dwarfed-growth, and acacias (Turner 1820: 422), but in the early 1820s only palms were described (Carne 1826: 253/254). In 1867, it was described thus:

> "The lower portion of this wady is one of the most fertile in the whole of the peninsula. It is nearly 300 yards broad in many places, and thickets of tamarisks, palms, and beds of bulrushes and reeds abound, and wild ducks with many kinds of smaller birds, frequent the pools, formed here and thereby a clear stream of running water, which never fails." (Holland 1868-2: 238)

Those travellers who crossed Wady Gharandel with the inland route described the wady as one of the richest in vegetation of western Sinai. In 1816 it was "almost a mile in breadth, and full of trees" (Burckhardt 1816: 473), more specifically "date trees, tamarisks, acacias of different species, and the thorny shrub Gharkad" (Burckhardt 1816: 474). Throughout the 19th-century, palms and tamarisks were recorded, although the large specimens were cut and young trees sprouted from time to time. Acacia and ghurkud were mentioned, but not always. In the late 1820s, there was no ghurkud (Renouard de Bussiere 1829: 233). In the early 1830s, there were palms and mixed unidentified vegetation (Arundale 1837: 17). Sometime in the late 1830s or early 1840s, the vegetation drooped because of drought (Günnel 1847: 22). In the first half of the 1840s, there were palms and tamarisks (1845: 305; Bartlett 1854: 33/34). Bartlett emphasised the relief of water in the "thirsty desert":

> "It wells out at the foot of a sandstone rock, forming a small pool of clear water, bordered by sedges, and looked highly refreshing after Ayun Musa and Howara: there was even, delightful sight! a little grass, and birds were hopping about, enjoying the rare luxury. The water, trickling off, pursues its way some distance down the valley, forming a reedy marsh, interspersed with thickets of bushes and dwarf palm-trees, and a considerable quantity of tamarisk, with other shrubs...and as there are also considerable masses of similar vegetation above this point, there are, probably, several other springs which nourish it. Altogether it was a reviving sight in the thirsty Desert." (Bartlett 1854: 34)

In the late 1840s, only tamarisks were described (Anon. 1848-1: 316). In 1850, there were tamarisks, ghurkud, and some 30 palms (Hindley 1850: 13; Anderson 1853: 73), and in the early 50s, there were lilies and other flowers, large tamarisks and a large palm-grove (Graul 1854: 198, 228/229). In 1856, the old palms were cut and young saplings had sprouted from its base (Bonar 1857: 121/122). In 1863 and 1866, acacias were mentioned again for the first time since the early 19th-century (Brocklebank 1865: 169/170; Wallace 1868: 97), but just a few years later they were not mentioned anymore (e.g. Palmer 1871-1: 40; Maughan 1873: 87). In 1874, Bartlett (1879: 204) reported "about thirty young palm-trees, and as many as ten old stumps, several of which showed marks of fire"; he also saw tamarisks, ghurkud and possibly some young acacias (Bartlett 1879: 204). In 1877, there were untrimmed palms, tamarisks, acacias, rushes and a stream (Scott 1927: 12). In 1882, there was less vegetation and less visible water:

> "Neither in water nor in shade does Elim approach the Wells of Moses. Instead of a running brook or bursting fountains, one finds only a sluggish rivulet melting away in the sand, with a few straggling palms along its brink...the water is somewhat brackish..." (Field 1888: 60/61)

Just a few days later, some *Orobanche*[19], a parasitic plant, and some other vegetation was recorded (Raboisson 1886: 298), which shows how traveller descriptions could give very different impressions of a place. A year later, in 1883, it was "...dotted with tamarisks and a few palms, as well as...numerous herbs and shrubs..." (Hull 1885: 36). In February 1895, Smith Lewis (1898) described Wady Gharandel as:

> "...filled with sandy mounds, torf bushes [tamarisk], and palms, which have sprouted again from the stumps of their cut and burnt predecessors. A bivouac of Bedawin will often in a single night destroy that which was a joy to the eye and a shadow from the heat to every passing traveller." (Smith Lewis 1898: 44/45)

In 1912, there were "stunted palms, tamarisks...papyrus reed", but no visible water (Sutton 1913: 48/49). Apart from palms, there was only "one well" in spring 1937, but Plowden (1940: 49) remarked that "wells in Arabia can be very temporary affairs...water can usually be found by digging...".

Due to the fluctuations in vegetation, other travellers identified Wady Useit, which was situated between Wady Gharandel and Wady Tayiba, with Elim based on the number of trees (e.g. Anon. 1848-2: 357; Wallace 1868: 98; Bartlett 1879: 209; Sutton 1913: 50). Baedeker (1885) was convinced that this was a misidentification, but did admit that distance-wise it may be better situated than Wady Gharandel:

> "...Wadi Uset, which contains several pools of water and palm saplings, and which has erroneously been identified with the Elim of the Bible...The only circumstance in favour of this theory is, that the Wadi Uset is more distant from the Wadi Hawara (Marah) than the Wadi Gharandel, which, however, lies much nearer the latter than a full day's journey." (Baedeker 1885: 488)

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[19] Probably *Cistanche phelypaea* (Francis Gilbert Pers. Comm.)

The lower part of Wady Useit, along the coastal route, seems to have been quite barren. In 1845, there was nothing but a caper growing out of the rocks (Bartlett 1854: 36). It is not clear what it looked like in other years.

The part of Wady Useit which was crossed by the inland route was much richer in vegetation. Throughout the 19th-century, there was a well and a few (stunted) palms growing in Wady Useit (e.g. Burckhardt 1816: 475; De Laborde 1838: 84; Anon. 1848-2: 357). In 1853, there were around fifteen fully grown palm trees and seventeen smaller ones, sometimes shooting from the same parent tree (Graul 1854: 199), and in 1856, the number of wells had increased to "ten or fourteen little wells" (Bonar 1857: 131, 133). Brocklebank did not mention vegetation in 1863 (Brocklebank 1865: 171), but in 1866 and 1868, there were some palms (Wallace 1868: 98; Palmer 1871-1: 43). In the early 1870s the vegetation expanded with tamarisks in 1872 (Maughan 1873: 87), and broom and small acacias in 1874 (Bartlett 1879: 209). In 1877, Scott (1927) only mentioned yellow, purple and white flowers in this area but no trees or shrubs. In 1882, Raboisson (1886: 298) described this wady as very green with a small stream, high reeds, tamarisks (he wrote "tamarinds"), palms, flowering broom and many *Orobanche*[20] up to 40 centimetres high. In March 1883, Carrington Bolton found flowers in wady Useit, which he called "dandelions and daisies" (Carrington Bolton 1890: 596). However, in 1897 only palms were mentioned (Smith Lewis 1898: 242).

The third candidate for Elim was Wady Tayiba, which formed the start of the western south-central route and led to the Gulf of Suez. Throughout the 19th-century, there was vegetation and water in this wady, sometimes in visible wells (e.g. Arundale 1837: 18; Porter 1858: 14; Maughan 1873: 87), sometimes not (e.g. Bartlett 1849:

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[20] See footnote 19

73; Bonar 1857: 134). Turner (1820: 458) was the only one who mentioned in 1815 that there were "many thorny acacia"; possibly he meant tamarisks, because all the later travellers referred to palms and tamarisks, e.g. in late 1830s/early 1840s (Günnel 1847: 23), 1845 (Bartlett 1854: 38), 1852 (Stanley 1857: 69), 1853 (Graul 1854: 227) and in 1856 (Bonar 1857: 134). Burckhardt (1816: 625) mentioned in 1816 that the date palms were "completely withered". In 1853 and 1856, there were capers hanging from the rocks (Graul 1854: 227; Bonar 1857: 134). In 1856, Bonar noticed large palms, but in 1869, there were only tamarisks and a visible stream (Palmer 1871-1: 238). In 1872, there were again palm trees (Maughan 1873: 87). In spring 1866, Wallace described Wady Tayiba as "wild and desolate grandeur" (Wallace 1868: 98), but in 1872, Maughan (1873: 87/88) called it "absolute lifelessness being profoundly striking". In February 1874, Bartlett described Wady Tayiba as follows, which suggests that there had been an earlier flashflood:

> "...about an hour from the entrance [northside], the sight of bushy palm-trees indicated water. We found it issuing from a bed of rock, and running off in a small stream, less than at Gharandel…After running for some distance, it seemed to sink into the sand. There were trunks of large palm-trees lying prostrate, and from twenty to thirty smaller ones growing. Farther along the water seemed to have swept with such violence as to have destroyed vegetation, except here and there a tamarisk..." (Bartlett 1879: 212)

In 1877, it was full of tamarisks and "some palms", rushes and large reeds and a small stream (Scott 1927: 15). In 1882, Raboisson described a small stream and rich vegetation, including palms, tamarisks, broom and large reeds (Raboisson 1886: 300). In 1912, there were palms and capers (Sutton 1913: 52) and in 1937, palms and "feathery grasses" (Plowden 1940: 58).

4.2.5. The projection of the "Encampment by the sea", the "Wilderness of Sin" and "Rephidim" pre- and early 19th-century

The "encampment by the sea", between Elim and the Wilderness of Sin, was not actually mentioned in Exodus, but in Numbers (33:10), and therefore it was not so much discussed. From the "encampment by the sea", the Israelites turned landwards and passed the Desert, or Wilderness, of Sin on their way to Mt Sinai. The projection of these two places was linked to the position of Elim. Dophkah and Alush were two stations of the Israelites along the route to Mt Sinai, but like the "encampment by the sea" they were only mentioned in Numbers (33:12-14), and therefore hardly mentioned by travellers. Rephidim was the last place mentioned in the Bible before Moses and the Israelites reached Mt Sinai. According to Scriptures this was where the Israelites were attacked by the Amalekites (Exodus 17), and where Moses hit the rock and water appeared (Exodus 17:1); a few travellers called it "Massah and Meribah" (e.g. Montagu 1766: 44; Wolff 1824: 179; Arundale 1837: 23).

Before the 19th-century, Tor, which was situated at the sea, was thought to be at the position of the Biblical Elim. The Wilderness of Sin was thought to be situated east of Tor (Bruce 1790: 240), but between Tor and the Mount Sinai there were three different routes. Until the early 18th-century, the route through Wady ImlaHah was probably linked to the Wilderness of Sin, because it was a much-used route, running straight to the mountain Umm Shomar and the convent of "Antous" at its foot, still inhabited at the time; from there the route went to Mount Sinai and the Monastery of StK. However, in the 19th-century this was not much used anymore. In the 19th-century, the route through Wady 'Isleh was not much used either, because it was impractical for camel caravans because it is narrow, and prone to flashfloods in winter. Flashflood events were extremely dangerous in this wady, because of its bottle-neck shape; the mouth that connects the wady with the Plain of El Qa'a is very narrow in comparison with the rest of the wady, which allows water to rise very quickly during a flashflood. In some places the water can reach 20 m deep!

In the early 1820s, Wady 'Isleh was far from a "wilderness", with just a rivulet and a single palm (Henniker 1824: 223/224). However, in the late 19th-century, this wady was described as highly "romantic" (Baedeker 1885: 517; Carrington Bolton 1890: 591) and well vegetated. In January/February 1894, there was some water, and much vegetation near its mouth: "groups of palms and groves of giant reeds with yellow stems" (Buxton 1895: 141; see also Buxton *et al.* 1895: 101/102). Higher up, there were "groves of rushes and reeds, over 20 feet high, and thickets of tarfah [tamarisk]", and towards Wady Tarfa, there was "one particularly exquisite group of palms" (Buxton *et al.* 1895: 103/104). However, less than a month later, Wady 'Isleh was hit by a flashflood, and "rendered impassable for camels", because it was "blocked by the rocks, &c., brought down by the flood" (Buxton *et al.* 1895: 146). In 1912, there were many palms, tamarisks, and reeds (Sutton 1913: 118/119).

Throughout the 19th-century, the Wady Hebran was the most used route due to easy accessibility (Burckhardt 1816: 598; Buxton 1895: 139). Then it seems to have been rich in water and vegetation, and in the late 19th-century it was described as "wild" and "highly romantic" (e.g. Liebenau 1896: 26). There were palms in parts of this wady (e.g. De Laborde 1838: 232; Liebenau 1896: 26; Buxton *et al.* 1895: 154; Smith Lewis 1898: 201). In 1816, there were also "gardens" (Burckhardt 1816: 598), and in 1874, some broom and grass (Bartlett 1879: 257/258). Some mentioned visible water (De Laborde 1838: 232), others a stream (Anon. 1859: 37; Smith Lewis 1898: 200). In the second half of the 19th-century, Abbas Pasha's road, connecting Tor with the Monastery of StK also ran through this wady (e.g. Palmer 1871-1: 223; Smith Lewis 1898: 198/199).

The location of Rephidim was according to the monks at the foot of Mt Sinai/Horeb in Wady Leja; they showed travellers where Moses had hit the rock and water was still coming out.

4.2.6. *The projection of the "Encampment by the sea", the "Wilderness of Sin", "Dophkah and Alush", and "Rephidim" during the 19th-century*

With the shift from Tor to the wadies Gharandel, Useit and Tayiba as possible candidates for Elim, it was suggested that the Israelites had descended to the sea via Wady Gharandel and ascended via Wady Useit (between 'Ayn Musa and the splitting point of the three main western routes), or descended through Wady Tayiba to Ras Abu Zenima, and ascended via the Plain of El Murkha (western south-central route) (e.g. Stanley 1857: 37/38; Holland 1868-2: 255/256; Bartlett 1879: 212; Baedeker 1885: 489). As a result, the Desert of Sin was thought to start "beneath the Tih range" (Holland 1868-2: 255), in line with the western north-central route, or at the Plain of El Murkha (Bartlett 1849: 74; Bartlett 1879: 213; Raboisson 1886: 302), in line with the western south-central route. Hull (1885), who suggested another route of the Israelites altogether, identified Elim with 'Aqaba, and positioned "the Wilderness of Zin" north of 'Aqaba in the "Wady el Araba" (Hull 1885: 73); since this area is outside South Sinai, it will not be discussed further.

4.2.6.1 Biblical projection along the western north-central route

The western north-central route was described as relatively little vegetated. In Wady Humr, which forms the geological transition between limestone and sandstone, between flat and mountainous, and between brackish groundwater and sweet rainwater (Palmer 1871-1: 43; Hull 1885: 40; Bauerman 1869: 25), there was little vegetation apart from "a few acacia trees" in 1816 and 1874, and some broom in 1874 (Burckhardt 1816: 476; Bartlett 1879: 314/315). In Wady Nusb, which led to Serabit el Qadim, there was a well or reservoir for rainwater, which contained "sweet" potable water (Turner 1820: 424); this well was hailed by the travellers after the brackish water of the coastal area (e.g. Burckhardt 1816: 477; Turner 1820; Hull 1885: 41; Smith Lewis 1898: 125), and used by the Bedouin (Anon. 1859: 30/31) and workers in the nearby manganese mining area (Bauerman 1869: 28-30; Holland 1869-1: 208). In 1815 and 1816, there were acacias in this wady (Burckhardt 1816: 479; Turner 1820: 424). In 1828, there was “a plantation of date-trees round it” (Anon. 1859: 30), but this was not mentioned by any other travellers.

In the area around Serabit el Qadim, turquoise could still be found in the 19th-century (e.g. Laborde 1838: 91), and some mangane, copper and iron were still dug in small amounts in 1868 (Bauerman 1869: 31). There was little or no vegetation in this area (De Laborde 1838: 90; Kinnear 1841: 69), although there were some “tamarisks, acacias and green shrubs” at the foot of the plateau in 1828 (De Laborde 1838: 86). In 1839, there were “a few leafless prickly bushes” at the bottom (Kinnear 1841: 68), and in 1868, some “flowers and herbs”, Bedouin camps and flocks (Holland 1868-2: 255), so this must have been preceded by rain. In 1897, Smith Lewis (1898: 240) mentioned “many sweet little daisies, and some cultivated plots sown with beans near the path which leads up to the temple”. In April 1930, there was some cultivation in the surroundings of Serabit (Barrois 1932). Wady Suwiq, which connects Serabit el Qadim with Wady Khamila, is sandy, and in 1883 there was some desert melon (*Citrullus colocynthus*) (Hull 1885: 42), and in 1930 some broom (Barrois 1932).

Wady Khamila was a popular place for the Bedouin for herding, as it had a water source and pasture after rainfall. There were at least Bedouin encampments in 1816 and 1836 (Burckhardt 1816: 482; Wolff 1839: 309). In 1836, 1856 and 1862, there was grass (Wolff 1839: 309; Bonar 1857: 253/254; Tyrwhitt 1864: 339). In 1868, the wady was “fairly well covered with grass and scrubby bushes...for about three or four miles...” (Bauerman 1869: 31).

Wady Baraq was in the late 1820s quite rich in acacias (Renouard de Bussiere 1829: 239), but in 1856, there was only one left (Bonar 1857: 252). In 1874, acacias were again very abundant and large (Bartlett 1879: 306). In 1883 and 1897, there was vegetation, but not specified (Hull 1885: 45/46; Smith Lewis 1898: 240).

In Wady Lebwa there was a water source in 1868 (Palmer 1871-1: 47). It was rich in broom in 1839 (Kinnear 1841: 73) and 1874 (Bartlett 1879: 305), but possibly without vegetation in 1868 (Palmer 1871-1: 47). In November 1883, there were some herbs (Hull 1885: 47).

Little is known about wady BerraH, but in 1856, it was "bleak and monotonous" apart from some "pink crocuses" (Bonar 1857: 249). Holland (1868-1/2) projected Dophkah initially onto a place "...near the head of Wady Berah..." (Holland 1868-1: 192), and later onto a place that could not be traced on any map (Holland 1868-2: 256). Based on linguistics and water presence mentioned by earlier travellers (Bartlett 1879: 304), Alush was thought to be in Wady el Esh (Department of Survey and Mines 1934), also written as Wady El Osh (Holland 1868-1: 192), W. El Ash (Holland 1868-2: 256), and Wady Oesch (Bartlett 1879: 304), a side branch of Wady BerraH, northwest of Wady el Sheikh.

Wady BerraH ends in Wady el Sheikh, a long, broad, and accessible wady with different kinds of vegetation that leads to the Monastery of StK. Bonar (1857: 201, 263) described it as the "prince of the southern wadys of the peninsula", because of its size and vegetation. Between Wady BerraH and the northern top of Wady el Sheikh, there was "pasturage" at the end of April 1816 (Burckhardt 1816: 487), while it was "bare and tame" in 1856 (Bonar 1857: 245). From the northern top south-eastwards, this wady was rich in very large tamarisk trees (e.g. Burckhardt 1816: 488; Graul 1854: 221; Bonar 1857: 245; Hull 1885: 49), which were used for fodder and produced manna (e.g. Burckhardt 1816: 488; Palmer 1871-1: 81; Hull 1885: 49). Borrer described the tamarisks in 1843, and his story seems to suggest that a flashflood may have taken place days before, on the 17th March, when he experienced a thunderstorm in Wady Shubeiqeh:

> "...clumps of huge tamarisks, by far the largest I ever saw, but torn and shivered in the most extraordinary manner; some, as if their great limbs had been struck and splintered by the forked lightning,

> others, as if an enormous fragment of rock precipitated on them had crushed their boughs, or whirlwinds howling through the bleak recesses of the surrounding mountains had there met and spent their fury." (Borrer 1845: 347/348)

Further to the south, near the tomb of Sheikh Saleh, there was a well called "Abou Szoueyr" (Burckhardt 1816: 489), not to be confused with the earlier mentioned coastal wells called 'Ayn/Abu Suweira. Between this point and the Monastery, there were shrubs in 1840 and 1874 (Koller 1842: 75/76; Bartlett 1879: 285), and in 1883 many herbaceous plants (Hull 1885: 52).

Some travellers suggested that "Rephidim" had been in Wady el Sheikh (e.g. Borrer 1845: 329) near another "seat of Moses" (Holland 1868-1: 191/192; Holland 1868-2: 253; Bartlett 1879: 302). The monks continued to project the location of Rephidim in Wady Leja. However, travellers suggested that the openings in the rock were man-made (e.g. Burckhardt 1816: 579; Stephens 1996: 195). The number of fissures changed over time (e.g. Carne 1826: 227; Arundale 1837: 33; Seetzen 1855: 94), which was probably linked to rainfall. Henniker (1824) believed the fissures were natural, but because they also appeared in nearby rocks, doubted the authenticity of the rock and the place altogether (Henniker 1824: 236). Kinnear (1841: 87) did not believe the story altogether and Stanley (1857: 33) commented that Wady Leja could not be Rephidim, because it was supposed to be one day away from Mt Sinai rather than one hour.

4.2.6.2 Biblical projection along the western south-central route

The projection of the "Desert of Sin" on the western south-central route started on the Plain of el Murkha, a plain where throughout the 19th-century there was hardly any vegetation apart from very few small shrubs and some herbs (Bartlett 1854: 40; Bartlett 1879: 213; Raboisson 1886: 301; Carrington Bolton 1890: 581). In 1877, there were some logs of palm trees (Scott 1927: 17). The only well between Wadies Gharandel and Feiran was on this plain (Burckhardt 1816: 628; Bartlett 1854: 39/40; Bonar 1857: 136; Palmer 1871-1: 237;

Bartlett 1879: 214). At the end of the Plain of Murkha, travellers entered the granite mountains via Wady Shellal/Wady Ba'ba'. In the lower part of Wady Ba'ba'/Shellal, there were a few palm trees (e.g. Graul 1854: 226; Stanley 1857: 70; Palmer 1871-1: 236; Bartlett 1879: 215). In the higher areas of Wady Shellal there were acacias. In 1816, there were many, but "all...completely dried up" (Burckhardt 1816: 622), and in the 1840s and 1850s, there were "some" (Bartlett 1849: 75; Bonar 1857: 142/143). In 1874, the acacias were "of good size", and there were also capers hanging from the rocks and "many flowers" (Bartlett 1879: 215). In 1882, Raboisson (1886: 303) did not mention any vegetation in Wady Shellal. In spring 1906, there was some vegetation: an acacia the size of a shrub, some low tamarisks, broom, myrrh and some other shrubs (Kergorlay 1910: 315); in 1912 there was none (Sutton 1913; 63). The higher part of Wady Shellal had been "practically dry since the summer of 1914" (Barrois 1932: 104); nevertheless there were acacias, broom and other shrubs. All the travellers complained about the high day-time temperatures in this wady, irrespective of the season, and described the wady in terms of "dreariness" (Bonar 1857: 145), "loneliness" (Wallace 1868: 103), and desolation (Maughan 1873: 89). In April 1866, Wallace captured it as:

> "...a vulture perched on a cliff, the very impersonation of loneliness - oppressive silence and solitude - you startle at your own voice - sound carries to an incredible distance here - a bird uttering a few notes, which seem to frighten it - a dwarfed shrub - a lonely stunted tree - not a human being to be seen beyond our own encampment." (Wallace 1868: 102/103)

Via the Naqb Baderah, which formed the transition between sandstone and granite (Bartlett 1854: 41), travellers arrived in Wady Maghara, "the valley of caves" (Bartlett 1879: 218). Wady Maghara was known for the turquoise mines (Bauerman 1869: 34; Raboisson 1886: 304; Mauchamp 1903: 18), copper extraction (De Laborde 1838: 263; Raboisson 1886: 304), a cave with engravings (Bartlett 1854: 43), hieroglyphic and "Sinaitic inscriptions" and drawings of desert animals (Tyrwhitt 1864: 352-355). There was hardly any vegetation in Wady Maghara, but towards its southern end, there were flowers, herbs and acacias:

> "Almost at no time were we out of sight of acacias. Usually a large part of their branches had been cut off, even when the tree itself had been spared. There would seem to be no good reason why these valleys, except in the most direct line of the violent winter torrents, might not be lined and filled with acacias, and then with a fair amount of vegetation. One is surprised to see how many kinds of shrubs can grow and what varieties of flowers manage to peep forth under the most adverse circumstances...large number of these desert herbs seem to make amends for their otherwise hard lot by being exceedingly fragrant." (Bartlett 1879: 225/226)

Here, travellers entered Wady Mukatteb, which has been translated as "Valley of the Written" (Arundale 1837: 19; Anon. 1848-2: 361). As in Wady Maghara and many other wadies such as Sidr, Mukatteb, Maghara, Feiran, 'Aleyat, at the foot and on the top of Mt Serbal, wadies Solaf, Sheikh, Leja, Hebran, 'Ayn HuDrah, 'Isleh, and between Wady Sa'al and el 'Ayn (Burckhardt 1816: 608/609; Arundale 1837: 19; Stanley 1857: 59/60; Bonar 1857: 198; Tyrwhitt 1864: 352; Bartlett 1879: 226; Baedeker 1885; Field 1888: 64; Buxton 1895: 141), there were rock-drawings in Wady Mukatteb. These were thought to have been the work of the Israelites (Arundale 1837: 20; Lewis & MacDonald 2003: 43), early Christians (Burckhardt 1819: lxvii; Bartlett 1854: 48) or pilgrims (Burckhardt 1816; Lewis & MacDonald 2003: 45/46). However, halfway through the 19th-century it became clear that these were Nabatean handwriting related to inscriptions in Petra (Jordan), Nubia (South Egypt/North Sudan) and Hawran (Syria) (Lewis & MacDonald 2003). Apart from some herbs (e.g. Bonar 1857: 157), it was quite barren in Wady Mukatteb.

Next was Wady Feiran, which had the shape of a winding river (Stanley 1857: 70) and served as a drainage for the higher wadies, such as BerraH, el Sheikh (Burckhardt 1816: 486), Solaf, and 'Aleyat. Throughout the 19th-century, this wady was rich in water and vegetation. In the lower part of the wady, there was not much vegetation apart from some acacias and occasionally some tamarisks (e.g. Turner 1820: 454; Graul 1854: 223; Bonar 1857: 181; Bartlett 1879: 241). At the end of February 1872, there was a "broad water-course", and "quantities of scattered stones with tufts of grass and shrubs" in Wady Feiran (Maughan 1873: 92/93), which may have been the result of a recent flashflood, because normally there was no water in the lower part of Feiran (e.g. Holland 1868-2: 239). In mid-February 1874, there were some acacias, low shubs and birds, and many dead palm trees and tree trunks, and "deep gullies" (Bartlett 1879: 237/238). In 1877, there was little vegetation apart from some shrubs, capers, and some palm logs (Scott 1927: 20). In 1882, 1889 and 1906, there were only some shrubs including broom, and large rocks and remains of palm trees (Raboisson 1886: 304/305; Carringon Bolton 1890: 579; Kergorlay 1910: 320).

In the central part of Wady Feiran, starting with the most southern palm gardens of el Hessuyeh, there were large palm plantations. In 1816 there were palms and some Bedouin huts (Burckhardt 1816: 618). By the 1820s, this had expanded with some "acacias" and stone Bedouin huts (Renouard de Bussiere 243/244). In 1852, there were also some tamarisks (Stanley 1857: 71). In late 1867 Wady Feiran was hit by a severe flashflood, but in early 1869, El Hessuyeh was still described as a "pretty palm-grove" (Palmer 1871-1: 189). It is not very clear if this part of the wady was less hit by the flood, or replanted immediately after. There may also have been some specimens of *Zizyphus* (Burckhardt 1816: 603; Turner 1820: 454; Palmer 1871-1: 165-167; Bartlett 1879: 245).

The middle part of wady, which ran for several miles (Burckhardt 1816: 602; Bartlett 1854: 52), includes the ruins of Wady Feiran where Wady 'Aleyat joins Wady Feiran. Most 19th-century travellers agreed that this must have been the Biblical "Rephidim" (e.g. Bartlett 1854: 51, 59; Stanley 1857; Raboisson 1886: 305). This was probably based on the presence of large amounts of water and vegetation. They also mentioned a "seat of Moses" and a place where

Moses had watched the battle between the Amalekites and Israelites (e.g. Anon. 1867: 414; Bishop Bird 1886-1: 175; Field 1888: 77). However, others concluded that Wady Feiran was a bit too far from Mt Sinai to be Rephidim, and that Mt Serbal might actually have been the real Mt Sinai (Brocklebank 1865: 175). Palmer proposed that when the monastic life flourished (pre-19th-century), Rephidim was initially at the foot of Mt Serbal in Wady Feiran (Palmer 1871-1: 6), but later on moved near Mt Sinai:

> "...when Feiran had perished, and the rival establishment came into undisputed possession of the field, the monks of Jebel Musa began to group around their monastery all the most interesting sites, so as to bring them within easy pilgrim distance..." (Palmer 1871-1: 8)

Throughout the 19th-century, these date-palm plantations at the centre of Wady Feiran were the largest of the Peninsula. There were stone Bedouin houses and tents, a stream, several gardens with tamarisk, fruit trees, such as figs, pomegranates, *Zizyphus*, almonds, fruits and vegetables, such as water-melons and cucumbers, tobacco, some wheat, barley and corn (Turner 1820: 454; Renouard de Bussiere 1829: 243-246; Bartlett 1854: 53, 70; Tyrwhitt 1864: 346; Bonar 1857: 181; Brocklebank 1865: 174; Wallace 1868: 107; Bartlett 1879: 246; Raboisson 1886: 305/306; Carrington Bolton 1890: 590; Buxton *et al.* 1895: 140; Clifton 1900: 23; Sutton 1913: 70; Scott 1927: 21). Burckhardt (1816: 611) noticed "Doum" palms, while Bartlett (1854: 52) mentioned in October 1845 also tamarisks, sedges and rivulets. In spring 1853, the palms, *Zizyphus*, and Bedouin huts were present, but the stream of water had (exceptionally?) dried up (Graul 1854: 222). In 1866, Wallace described thousands of large palm trees, tamarisks, acacias and *Zizyphus* and much water:

> "The palm grove of Feiran extends two or three miles up the valley, and consists of several thousand trees, many of them, like the majestic palms of Egypt, shooting up fifty or sixty feet. The tamarisk, the acacia, and the nubk trees are not less numerous. A carpet of soft grass is beneath your feet; a bubbling brook, the source of this

> tropical beauty and verdure, murmurs at your side. Coming from the desert worn out, weary, and parched with thirst, where for days you have been surrounded by the sternest forms of desolation and sterility, you are filled with wonder and astonishment when you enter this delightful spot." (Wallace 1868: 108/109)

However, late 1867, it was hit by a flashflood, which destroyed many trees:

> "In the morning a gently flowing stream, but a few yards broad and a few inches deep, was all that remained of the flood. But the whole bed of the wady was changed; where yesterday a bank had stood covered with trees was now a deep muddy watercourse. In other spots huge banks of sand and stones had taken the place of hollows...Nearly a thousand palm-trees had been swept away in W. Feiran...It will be many years before W. Feiran recovers from the effects of this flood, for many miles every herb in the bed of the wady was swept away, the wells were filled up, the gardens destroyed, and where a few days before I had passed through a thick wood of tamarisks, nearly two miles in length, I now found a barren waste of sand, without a vestige of a tree." (Holland 1868-2: 249/250)

Wady Feiran recovered well though, because in January 1869, just over a year after this flashflood, Palmer described "tall graceful trees", "fresh water" and "bulbuls flit[ing] from branch to branch uttering their sweet notes" (Palmer 1871-1: 153), and where Wady Feiran and Wady 'Aleyat meet, "a palm-grove which extends, notwithstanding the late destructive flood, for miles along the valley" (Palmer 1871-1: 158). In 1872, the plantation seems to have been smaller, and "each man had his special garden of some thirty or forty trees surrounded with fences of dried palm branches" (Maughan 1873: 100). In 1874, the water stream in Wady Feiran was "swift" (Bartlett 1879: 245), and there were, apart from the trees and gardens, "flowers...scattered in various spots" (Bartlett 1879: 246). In 1882, the wady was rich in trees and domestic animals (Field 1888), quite in contrast with the rest of the desert:

> "Our tents had been pitched on the margin of the stream, the very sight of which was cooling to eyes that had rested so long only on burning rocks and sands. The change was a relief both to body and mind, for the mind too had been under a constant tension, which needed to be relaxed." (Field 1888: 79)

In 1877, there were many grain plots, and the wady seems to have been in a very good condition with grass and *Zizyphus* trees (Scott 1927: 22). In 1894, a very heavy storm or possibly a flashflood, uprooted many palms in the Wady 'Aleyat/Wady Feiran area (Buxton *et al.* 1894: 140). In 1937, there were palms, tamarisks, acacias, tobacco and corn (Plowden 1940: 100).

In the upper part of Wady Feiran, before entering Wady el Sheikh or Wady Solaf, there were many tamarisks during the 19th-century, and several travellers referred to it as a forest (Turner 1820: 451; Burckhardt 1816: 602; Bartlett 1854: 68; Anon. 1848-2: 363; Graul 1854: 222; Brocklebank 1865: 175; Sutton 1913: 82; Scott 1927: 27). In 1856 and 1882 there was also some broom (Bonar 1857: 194; Raboisson 1886: 306). At the upper end of Wady Feiran there was a narrow connection called "El Buweib" (Palmer 1871-1: 153), which is Arabic plural for "door/passage", which connects this wady to Wady el Sheikh (going north-eastwards) and Wady Solaf (going south-eastwards), which both lead to the Monastery of StK; it was probably what Turner called the "gates of Pekin" (Tyrwhitt 1864: 346).

In Wady Solaf there was little vegetation throughout the 19th-century. Travellers mentioned a few acacias, some broom, grass, and herbs, and many trees on the floor as a result of flashfloods, and some wild melons (e.g. Palmer 1871-1: 152; Bartlett 1879: 255/256; Buxton *et al.* 1895: 146). The Naqb Hawy, or "Gap"/"Pass of the Wind" (Bishop 1886-1: 177; Field 1888: 102; Smith Lewis 1898: 63) was very bare on the side of Wady Solaf (Bonar 1856; Maughan 1873: 100/101). Along the steep part of the pass, there was some water and vegetation, such as some stunted palms and fig trees, "rushes" and some shrubs (Borrer 1845: 320; Stanley 1857: 73/74; Bonar 1857: 208; Wallace 1868: 113; Bartlett 1879: 261; Raboisson 1886: 308;

Liebenau 1896: 29; Sutton 1913: 90; Scott 1927: 29). On the side of the Monastery of StK, there was in January 1869 "a thick bed of rushes and a tiny trickling stream" (Palmer 1871-1: 148).

4.2.7. *Mount Sinai, the encampment of the Israelites and the Burning Bush*

The Mount of Conversation and the encampment of the Israelites was another large debate. Discussions about the "real" Mt Sinai/Horeb took place at different levels. On a larger geographic scale there were several mountains put forward as the potential Mt Sinai/Horeb of the Bible. On a smaller geographic scale there was a discussion about the different peaks of what is now called Mt Sinai. At a macro-level, travellers suggested that the Mt Sinai of Scriptures had been identified with Mt St Catherine (Seetzen 1855: 85; Carne 1826: 225; Burckhardt 1816: 609), Mt Serbal with its many inscriptions which were absent on Mt St Catherine and Mt Sinai (Burckhardt 1816: 609; Anon. 1848-2: 363; Bartlett 1849: 84), Gebel Minnegia, not far west from Mt Sinai (Kinnear 1841: 90), Ras Sufsafeh, which is part of the traditional Mt Sinai (Holland 1868-2: 256), Mt Odjmeh, which was part of the Tih range (Holland 1868-2: 252), and Mt Um Alowee, northeast of Mount Sinai (Holland 1868-1: 192).

Holland (1868-2: 252, 256) ruled out Mt Serbal and Mt Odjmeh, because there was no plain near Serbal, and Odjmeh was actually part of a mountain range and not a specific mountain. The monks seem to have pointed out Wady Seba'iya as the place of the Israelites' encampment (Palmer 1871-1: 137; Bartlett 1879: 270), which would have fitted with arrival at Mount Sinai via the southern route, popular before the 19th century. However, according to Palmer (1871-1: 137) it "appears in no way adapted to the events attending the Proclamation of the Law", and Bartlett pointed out that the floor of this wady was too stony and unsuitable for the encampment (Bartlett 1879: 270).

Some suggested that Mt Serbal had been a special mountain for the Bedouin (e.g. Stanley 1857: 40), and that it would geographically fit with Wady Feiran as Rephidim (Brocklebank 1865: 175). In the 18^{th}-century, Niebuhr's Bedouin guides from the 'Awlad Said tribe placed the mountain range of Moses in Feiran, and from Niebuhr's descriptions it seems that the Bedouin showed him Mt Serbal as Mount Sinai (Niebuhr 1792-1: 191). Mount Serbal could be accessed via the western south-central route through Wady Feiran and Wady 'Aleyat, a side-branch of Wady Feiran, and via the southern route through Wady Hebran. Palmer (1871-1: 173) suggested that the Bedouin offered goods to Moses on Mt Moneijah in Wady 'Aleyat, the wady leading to Mt Serbal; this is a different mountain from the part of Mt Sinai also called Moneijah on the side of Wady Saba'iya. Furthermore, Palmer claimed that he saw this name on a stone inside the Monastery:

> "...Jebel Musa itself, on an old Arabic tablet, which purports to be a translation of the original one placed over the convent door by the founder, to record the building of the Chapel of the Burning Bush, is called Jebel Moneijah; and this name, I take it, was originally applied to the mountain now called Jebel Musa, or Moses' Mount; the latter title having been adopted by the monks in preference to the old Arabic name, which was then transferred to the neighbouring hill." (Palmer 1871-1: 6)

Kinnear (1841: 87-89) suggested that Horeb comprised of an area including the Mt Serbal and Mt Sinai chains, and supported Burckhardt's idea that Serbal had been the place for pilgrimage, before the Monastery of St Katherine was built. Bartlett (1854: 88) and Palmer (1871-1: 6-8) added that the position of "Mt Sinai" "shifted" with the change of the centre of importance, in other words, from the Wady Feiran area to the Monastery of StK area.

In reality, there was little reason to prefer one mountain over the other for as candidate for the Biblical Mount Sinai, apart from the fact that the monks of StK actively projected Biblical themes on the area around Mount Sinai. The natural descriptions of the mountains Serbal, Sinai and St Catherine did not disclose anything particular.

In the first half of the 19th-century, there were some herbs on Mt Serbal (Burckhardt 1816: 607; Bartlett 1854: 66), and a "wild fig-tree" (Bartlett 1854: 62), but in 1874 there were many acacias and herbs, and some birds (Bartlett 1879: 249). In 1877, there were "a few sturdy trees" and herbs (Scott 1927: 23).

The Sikket Sayidna Musa steps (the trail of Moses), which were generally used in the 19th-century to ascend Mt Sinai, start behind the Monastery (Magi 2005: 29). Next to these stairs, before reaching the Chapel of the Virgin, there was a permanent water source that nevertheless seems to have contained rain water (e.g. Clayton 1753: 25; Niebuhr 1792-1: 195; Seetzen 1855: 82; Turner 1820: 434; Burckhardt 1816: 565; Renouard de Bussiere 1829: 255; Arundale 1837: 31; Stephens 1996: 184; Borrer 1845: 324; Palmer 1871-1: 104). In 1856, there were "small plants" growing around it (Bonar 1857: 232). Near this well was another well with a "fig-tree" next to it (Bartlett 1879: 273). A bit higher up the mountain, on the Plain of Elijah, where there had been two cypresses and two olive trees in the early 18th-century (Clayton 1753: 26), there was only one cypress throughout the 19th-century, called "Elijah's tree" (e.g. Fazakerley 1820: 372; Turner 1820: 435; Burckhardt 1816: 565; Henniker 1824: 234; Renouard de Bussiere 1829: 255; De Laborde 1838: 251; Arundale 1827: 30; Bartlett 1854: 90; Anderson 1851: 33; Bonar 1857: 233; Stanley 1857: 75; Tyrwhitt 1862: 345; Wallace 1868: 125; Palmer 1871-1: 105; Maughan 1873: 115; Hull 1885: 53; Scott 1927: 39). Fazakerley (1820: 372) did not mention water near the cypress in February 1811, but most other travellers did (e.g. Turner 1820: 435; Arundale 1837: 30; Bartlett 1854: 90; Anderson 1851: 33). The tree was incorrectly identified as "a solitary palm" (Carne 1826: 221) and "sinobre tree" (Anon. 1859: 36). In 1845, there was some grass around it (Bartlett 1854: 90). In February 1874, Bartlett mentioned the tree, the well and "the enclosure of a ruined garden" (Bartlett 1879: 267). In the spring of 1906, Kergorlay found several cypresses and a few herbs (Kergorlay 1910: 336). In 1963, there were also other cypresses, poplars and shrubs, and there had been a "tree-school" of the monks here (Schlink 1866: 104). Between this plateau and the top of the mountain, there were some herbs such as thyme (Graul 1854: 215; Bonar 1857: 234; Scott 1927: 41). On the top of Mt Sinai, there was a water reservoir (e.g. Burckhardt 1816: 667; Turner 1820: 436; Renouard de Bussiere 1829: 256).

Most travellers descended on the other side of Mt Sinai, and ended up in Wady Leja, which led to Mt St Catherine. There were some herbs on this mountain (Porter 1858: 35), and around the Partridge Well, there was a hawthorn tree in 1807 (Seetzen 1855: 90) and 1816 (Burckhardt 1816: 569); in 1816 there were also several other trees. However, Fazakerley (1820: 374) did not mention any vegetation in 1811. In Wady Leja itself, there two gardens: El Arba'in and El Bustan. In El Bustan, there were still apricot trees and roses in 1816, and it was inhabited by some Jebeliya Bedouin (Burckhardt 1816: 583). However, in 1874, it was deserted apart from "cypress and other trees" (Bartlett 1879: 275/276). El Arba'in was worked by the Bedouin in the early 19th-century, and contained fruit trees, such as pear, apple, lemon, apricots, pomegranate and grapes, and other trees such as poplars, cypress, and some very small date palms; poplar wood was used for repairing the Monastery (Seetzen 1855: 87). Until the early 1820s, it was inhabited by the Bedouin. It was attacked by locusts at least between 1811 and 1816 (e.g. Burckhardt 1816: 569; Turner 1820: 437-439). From the 1820s, the gardens were possibly not inhabited anymore (e.g. Carne 1826: 224; Graul 1854: 215). The diversity seems to have decreased between the early 1820s and the second half of the 19th-century to palms, olives and poplars in the early 1820s and only olives by late 1820s and early 1830s (e.g. Renouard de Bussiere 1829: 257; Arundale 1837: 33); travellers may have not been able to visit the garden properly during this period due to security issues with the Bedouin (e.g. Renouard de Bussiere 1829: 257). From the 1850s onwards, fruittrees were mentioned again (e.g. Graul 1854: 215). In 1877, corn and olive grew in El Arba'in, and reeds, figs, palms and cypresses in or near it (Scott

1827: 42). In February 1894, Buxton (1895: 134) mentioned "some old deserted gardens".

Burckhardt suggested, as Seetzen had, that the Israelites had actually stayed forty years somewhere further north in Sinai, for instance in the Tih, the "Wilderness of (the) Wandering(s)" (e.g. Tyrwhitt 1868: 332; Wallace 1868: 142; Bartlett 1879; 292), instead of near Mt Sinai (Burckhardt 1816: 609; Seetzen 1855: 47). Travellers who took the western or eastern central route towards Nakhl crossed the Tih and described it as a waterless area. In 1937, Plowden wrote:

> "...et Tih, the traditional Desert of the Wanderings – such a bleak forbidding district that until a few years ago it was not even properly surveyed, and is by no means even now fully explored." (Plowden 1940: 7)

There were, however, water sources at the bottom of the Tih, (Bartlett 1879: 352/353). The most copious and numerous, with several sources in 1807 (Seetzen 1855: 62), and "three or four deep wells" in February 1874 (Bartlett 1879: 353), was near Wady Biyar. The landscape of the Tih has been compared by travellers to the area between Cairo and Suez: white, slightly hilly and lifeless (e.g. Seetzen 1855: 48, 50). Nakhl, which should not be confused with "El Nachel", a date-palm plantation near Tor (Seetzen 1855: 93), was a place situated in the middle between Suez and 'Aqaba. It consisted of a castle, a brackish well inside the castle (Bartlett 1879: 326/327) and later in the 19th-century several wells which were important for the Bedouin to water their herds (e.g. Anon. 1848-3: 420; Wallace 1868: 152; Palmer 1871-2: 327-320). There was no vegetation, apart from "one small sidr [Zizyphus]-tree" growing inside the castle (Palmer 1871-2: 342).

Sinai and Horeb were terms that were sometimes used as synonyms, and sometimes as separate names for (peaks of) the traditional Mt Sinai. Horeb was suggested to be the lower northern peak, while Mt Sinai was thought to be the higher southern peak (e.g. Seetzen 1855:

82-84). Renouard de Bussiere (1829: 254/255) suggested that only the highest point was Mt Sinai, and that Horeb ended at the Plain of Elijah, about halfway up Mt Sinai (s.l.), where according to the "Arabs" Moses received the Ten Commandments on the spot where the cypress grew. Robinson suggested that Horeb was Ras Sufsafeh (Stanley 1857: 18; Field 1888: 114), part of the massif of Mt Sinai (s.l.) and named after the willow tree growing there (Bartlett 1879: 268; Bishop Bird 1886: 316; Field 1888: 113). Tyrwhitt used the name "Horeb" for Mt Sinai (s.l.) (Tyrwhitt 1864: 345). Palmer discussed the confusion surrounding the term "Horeb":

> "The whole southern portion of the mountain is called by the monks Horeb. It is difficult to determine the exact application of this name, as it appears to be used in the Bible with reference both to the mount itself and to the district in which it was situated. From such considerations, as the meaning of the word, Horeb, 'ground which has been drained and left dry,' and such expressions as 'thou stoodest before the Lord thy God in Horeb,' 'the rock in Horeb,' it would rather seem that the whole desert of Sinai was so called, and that the name was subsequently attached to the Mountain." (Palmer 1871-1: 118)

In the late 19th-century, El RaHah ("The Rest": Smith Lewis 1898: 63) at the foot of Mount Sinai was accepted as the plain where the Israelites had camped.

There seems to have been little discussion about the place of the Burning Bush, in which God appeared to Moses with the message to guide the Israelites from Egypt to the Promised Land: travellers seem to have accepted the monks' claim that the Burning Bush was still growing inside the Monastery walls, and that it was "immortal" (Hindley 1850: 22). However, at least two or three different plant species were described. Stanley suggested that the Burning Bush had been an acacia (*Mimosa nilotica*) (Mimosaceae) (Stanley 1857: 21; Bartlett 1879: 249). Post, a botanist, identified the bush inside the Monastery as a species of blackberry (Rosaceae) (Field 1888: 181). In the 20th century, it seems to have been replaced by a "(syrischer)

Blasenstrauch" (Schlink 1966: 98; Binder & Binder 2000: 43), i.e. *Colutea istria* (Fabaceae). On a website of Geographia of 1997-1998, the shrub seems to have been replaced again by a blackberry, *Rubus sanctus* (Rosaceae). It seems that these shrubs were slowly disappearing, because travellers were given or taking parts of it (e.g. Clifton 1900: 12).

4.2.8. How Moses and the Israelites continued from Mt Sinai to Jerusalem

The route of the Israelites between Mt Sinai and Jerusalem was much less discussed than the first part of the route between Egypt and Mt Sinai. There were fewer travellers who continued through eastern Sinai. There were no clues about the direction in the Bible, and assumptions were mainly based on the presence of water sources along the route. There were three main routes in eastern Sinai.

The eastern north-central route seems to have been relatively bare, and apart from Bartlett (1879: 392), who suggested that this could have been their route, no links were mentioned with the route of the Israelites. Travellers passed via the Watia Pass and the Plain of el 'Ajramiyah; 'Ajramiyah is the Arabic name for the desert herb *Anabasis articulata* (Chenopodiaceae) (Duke 2008: 36). There is little information about Wady Zelega, apart from that there were occasionally some "shrubs and plants; and little groups of tamarisk" (Hull 1885: 56). In 1840, Koller (1842: 76/77) came across many tamarisks, and around the well "rushes and sedges, with here and there groups of stunted palm-trees". In 1883, there was a well and a "grove of palms" (Hull 1885: 58). The area of Wady Watir and Wady el Heissi was sandy and with some acacias and some shrubs (Koller 1842: 77/78).

The eastern southern route ran from the area of the Monastery through Wady Nasb towards Dahab, and was not linked to the route of the Israelites either. The wady was very narrow and attractive because of its colourful rocks (e.g. Palmer 1871-1: 143; Buxton

1895: 149). It was described in term of “beautiful”, “wild” and “romantic” and among the most beautiful of the Peninsula (e.g. Palmer 1871-1: 143; Liebenau 1896: 37). It was particularly popular among the ibex-hunters (e.g. Buxton 1895; Österreich 1895; Liebenau 1896: 40), and the Bedouin let their herds graze in the neighbourhood (e.g. Liebenau 1896: 35; Buxton *et al.* 1895: 108). It was rich in palm and tamarisk trees, and occasionally some reed (Buxton *et al.* 1895: 108, 117; Österreich 1895: 47; Liebenau 1896: 37; Hume 1901: 7). In early 1894, after some rain there was a small stream:

> “...golden-stemmed reed lining the little perennial stream, which here flows over silver sand, and there expands into an oozy bottom. So rankly do these grow in this hothouse that their white plumes mingle with the waving fronds of the palms thirty feet from the ground. When we passed through, our cavalcade of thirty camels was completely hidden by the tropical vegetation, but the crashing of the canes, the loud-voiced complaints of the camels, and the wild shouts of their owners, were magnified by the walls of the narrow chasm as by the throat of a trumpet, and made such thunder-music as I shall not soon forget. Above the gorge there is a large grove of Tarfah trees and a colony of Arabs. Here there were some signs of cultivation, and partridges called from the rocks.” (Buxton 1895: 149)

In Dahab, there were several water sources and walled gardens with date palms from the Mzeina and ‘Aleygat Bedouin and some small huts (Burckhardt 1816: 523/524; Seetzen 1855: 89). In 1828, when De Laborde visited the place, it was “inhabited only by four poor Arabs, and now and then visited by a few wretched caravans, which come to its well for water” (De Laborde 1838: 99). There were no data for the coastal area between Dahab and Nuweiba.

It seemed most logical to Palmer (1871-1: 257/258) and Bartlett (1879: 392) that the Israelites had travelled in northeastern direction, and had followed the eastern south-central route. This route went from the Monastery of StK through Wady el Sheikh for a short while, and turned near the well of Abu Suweir into the Wady Sa'al. In 1816, there was "a small walled plantation of tobacco, with some fruit trees, and onions, cultivated by some of the Bedouin Oulad Said" (Burckhardt 1816: 489). In 1852, the Bedouin took water from this well (Stanley 1857: 79), but no gardens were mentioned. In 1872, the place was described as slightly dirty and "two or three small enclosures of what seemingly, at one time, had been a miserable garden" (Maughan 1873: 131). Although this enclosure could have fit with the description that Palmer used for the next camp of the Israelites, Kibroth Hattaavah, he projected it northeast of Mt Sinai in a place which the Bedouin called Erweis el Eberig; this was situated southeast of Wady Sa'al (Palmer 1871-1: 257) and had "small enclosures of stones" (Bartlett 1879: 291). However, on the map of the Department of Survey and Mines (1934) it was situated northwest of Mt Sinai, near Wady BerraH. Palmer regarded the "enclosures" as settlement remains, and the Bedouin had a folktale about Hajj pilgrims who after this point got lost in the desert, which Palmer thought must have been the Israelites:

> "Arab tradition declares these curious remains to be 'the relics of a large Pilgrim or Hajj caravan, who in remote ages pitched their tents at this spot on their way to 'Ain Hudherah, and who were soon afterwards lost in the desert of the Tih, and never heard of again.' For various reasons I am inclined to believe that this legend is authentic, that it refers to the Israelites, and that we have in the scattered stones of Erweis el Ebeirig real traces of the Exodus. Firstly: they are said tahu, to have 'lost their way,' the Arabic verb from which the name Tih, or 'Wilderness of the Wanderings,' is derived. Secondly: they are described as a Hajj caravan; at the first glance this would seem an anachronism, as the word is employed exclusively by the Muslims, and applied to their own annual pilgrimage to Mecca. But this very term owes its origin to the Hebrew Hagg, which signifies 'a festival,' and is the identical word used in Exodus (x, 9) to express the ceremony which the Children of Israel alleged as their reason for wishing to leave Egypt—namely: 'to hold a feast unto the Lord' in the wilderness. It could not apply to the modern Mohammedan Hajj Caravan, for that has never passed this way, and would not under

any circumstances find it necessary to go to 'Ain Hudherah..." (Palmer 1871-1: 258/259)

The eastern south-central route continued through Wady Sa'al. This should not be confused with another small wady in west Sinai, which is situated near Sarbut el Jemel and Wady Humr (De Laborde 1838: 84; Hull 1885: 38). Wady Sa'al was "white sandy...with hardly any stone on the surface" (Maughan 1873: 133). There were acacias in Wady Sa'al, but the number and size seem to have been very variable throughout the 19th-century. In 1816, Wady Sa'al was "extremely barren", apart from an occasional acacia (Burckhardt 1816: 493). In the late 1830s/early 1840s, it seems to have been relatively wet in this area, because there were acacias with gum Arabic, and even some olive trees growing here (Günnel 1847: 48). In 1850, Hindley (1850: 26) did not mention any trees. In 1852, there were a few acacias (Stanley 1857: 79), but in spring 1869 there were many (Palmer 1871-1: 257). In 1872, Maughan (1873: 132) mentioned many thorny desert shrubs, which may have been young acacias. In 1874, there were many acacias:

> "...apparently a mile in breadth, and covered with numerous acacias and very considerable vegetation. Its aspect was in marked and pleasant contrast to the general barrenness of the region through which we had travelled nearly all the morning." (Bartlett 1879: 289)

In 1877, there were only "a few acacias" and some broom (Scott 1927: 49).

The next stop of the Israelites, "Hazeroth", was projected on a well, 'Ayn HuDrah, just west of Wady Ghazala (Burckhardt 1816: 495); this was based on a linguistic link (e.g. Koller 1842: 76; Robinson in Bartlett 1854: 96; Bartlett 1879: 392), and logical reasoning on the basis of distance between places (Bartlett 1854: 96; Palmer 1871-1). Stanley (1857: 81) warned that these linguistic links were not trustworthy in identifying the place; Holland, who assumed that a place called "El Huther" was Hazeroth (Holland 1868-2: 256/257), later found that El Huther was actually called Wady el Akhdar, and concluded that therefore it could not be Hazeroth (Holland 1869-1: 208). In May 1816, Burckhardt did not visit it, probably because this was part of another tribe's territory, the Mzeina, but he did mention palm plantations (Burckhardt 1816: 495). In March 1869, there was a "dark green palm-grove" and some Bedouin gardens (Palmer 1871-1: 261/262).

Next in the Exodus was "the desert of Paran", which was situated along the route leaving Sinai. The linguistic similarity between Paran and Feiran led travellers to assume that the Desert of Paran and Wady Feiran were linked (e.g. Stanley 1857: 30; Palmer 1871-1: 20). However, this did not fit with the route through eastern Sinai, and Paran was thought to be situated in the area north of 'Aqaba (Madden 1829-2: 214; Seetzen 1855: 18/19; Kinnear 1841: 122). The eastern south-central route continued via Wady Ghazala and Wady el 'Ayn to Nuweiba and from there along the coast to 'Aqaba. Throughout the 19th-century, Wady el 'Ayn was characterised by a stream of water, some palms, tamarisks, reeds, and occasionally some herbs, figs and capers (e.g. Hindley 1850: 27; Bartlett 1954: 97/98; Stanley 1857: 80/81; Maughan 1873: 136; Hull 1885: 59; Scott 1927: 52/53). The wady itself was very narrow, and the overhanging rocks were almost touching each other (Maughan 1873: 136; Scott 1927). It only opened up towards Nuweiba, where there were traces of floods such as large stones and damaged trees (Stanley 1857: 80/81; Maughan 1873: 138). Nuweiba was divided into two: the southern part was called Nuweiba el Emzeing and the northern part, Nuweiba el Terabin, probably linked to the Mzeina and Terabin tribal territories. Both had a well and date-palm groves, and in Nuweiba El Emzeing there were some Bedouin huts made of stones and branches (Burckhardt 1816: 498, 517; Laborde 1838: 99), and ghurkud was growing there (Burckhardt 1816: 500). Between these Nuweibas, there was a spring and a mix of palms and tamarisks (Burckhardt 1816: 498); in 1872, there were two or three palm trees and some grass in this area (Maughan 1873: 144). The beach between Nuweiba and 'Aqaba was in some places stony and in other places sandy, covered in small amounts of vegetation near places where wadies emptied their water in the Gulf of ‘Aqaba. There were occasionally some date trees, acacias and grass, and a group of palms was situated some distance north of Nuweiba (Burckhardt 1816; Günnel 1847: 49; Hindley 1850: 28; Maughan 1873: 144/145; Scott 1927: 54). In 1872, a few doum-palms were mentioned:

> “There is a fine cluster of doum palms round a well...which we specially noted, as this description of palm is rare in the Sinaitic peninsula.” (Maughan 1873: 156)

According to De Laborde (1838), everything north of Nuweiba was sterile. However, he and Maughan described many palms and tamarisks in Wady Taba (De Laborde 1838: 99; Maughan 1873: 156).

Towards ‘Aqaba, travellers left South Sinai. Most travellers went to Sinai in the first few months of the year. On the one hand this was for practical reasons, because for its temperatures it was considered the best season and agents such as Cook & Son (1880) offered trips during this period of the year. On the other hand, it allowed travellers who continued to Jerusalem to arrive in time for Easter, which symbolised the liberation of the Israelites from the slavery in Egypt, and formed the cherry on the cake.

4.3. Discussion

The different pre-19th and 19th-century Biblical projections onto South Sinai, and the positioning of Mount Sinai were politically and economically influenced. Pre-19th-century, the southern route via Tor was popular; this was connected to the trade and provisioning between Tor and the Monastery of StK. Probably linked to the Bedouin tribes that reigned this area, the positioning of Mount Sinai of Scriptures was different: the ‘Awlad Said suggested it was Mt Serbal near the old Christian village in Wady Feiran/’Aleyat, while the Jebeliya and monks suggested it was Mt Sinai near the Monastery of StK. The most popular routes were based on the comparison of the contemporary vegetation and water sources, with the vegetation and water sources mentioned in the Bible. The number of projections was limited, because there were only a few vegetated areas in South Sinai. In combination with the amount of precipitation, which influenced the contemporary presence of water and vegetation, certain areas were favoured over others over time. Throughout the 19th-century, scepticism grew over the reliability of the Biblical projections of the Greek monks (e.g. Seetzen 1855: 19; Bonar 1857: 212; Sutton 1913: 93).

In the 19th-century, western Sinai was generally more vegetated than eastern Sinai (e.g. Burckhardt 1816: 497), although the amount and composition of vegetation fluctuated from year to year with the amount of precipitation. The coastal areas were poor in vegetation, apart from the wadies such as Gharandel, Useit, Tayiba, Feiran, Nasb and Watir/El 'Ayn, which received enough rainwater and nutrients from the Tih and the high mountains to allow palms, tamarisks, acacias, shrubs and herbs to grow. However, in the coastal areas, most trees showed dwarf-like growth (e.g. Tyrwhitt 1864: 340), which suggests that the growing conditions were not optimal. This was most likely to have been caused by high level of minerals in the water: travellers described the taste of water from coastal wells and in the Tih as bitter or brackish. In the high mountains, trees had a normal shape and the available water was rain water.

Chapter 5 Interpretation and representation of South Sinai's landscape

5.1. Landscape imaginations of the travellers

In chapter 4, the different Biblical projections onto South Sinai have been discussed. Although the presence or absence of vegetation and water was clearly related to precipitation, as in other parts of the MENA 19th-century travellers developed their own explanations. The declensionist, Biblical and civilisation-redemption narratives, discussed for other parts of North Africa and the Middle East (e.g. Davis 2007, 2011, 2013; Satia 2011) and in chapter 1 of this thesis, were most popular. These narratives were not the only way in which European/Christian superiority was emphasised. Other references in travel writing, and the art and maps that came with it, also suggested this superiority, as will be discussed in the second part of this chapter.

5.1.1. The declensionist narrative in South Sinai

In the 19th-century, charcoal was the main trading product of the South Sinai Bedouin. Travellers suggested that the Bedouin made charcoal from different plants, such as tamarisk (Anon. 1848-3: 416), acacia (Stanley 1857: 27; Tyrwhitt 1864: 335; Bauerman 1869: 30), and the roots of broom (Burckhardt 1816: 483; Holland: 1868-2: 240; Scott 1927: 50). Charcoal was made in the wadies with trees (e.g. Burckhardt 1816: 623; Henniker 1824: 247/248; Anon. 1859: 30; Bartlett 1879: 304). In the early 19th-century, Burckhardt (1816: 483) observed that the Bedouin were "employing a considerable time in collecting brush-wood, which they burn[ed] into charcoal for the Cairo market". Several travellers remarked that the Bedouin received very small amounts of money for it in Cairo, which they used for buying necessities such as grain and clothes (e.g. Denon 1803: 308/309; Burckhardt 1816: 495; Holland 1868-2: 240).

However, in the second half of the 19th-century travellers accused the Bedouin, and to some extent even the monks, of active and "careless" tree destruction for charcoal (e.g. Bauerman 1869: 30; Bartlett 1879: 216, 203; Raboisson 1886: 289; Plowden 1940: 37/38):

> "...it is mentioned by Rueppell, that the acacia trees have been of late years ruthlessly destroyed by the Bedouins for the sake of charcoal; especially since they have been compelled by the Pasha of Egypt to pay a tribute in charcoal for an assault committed on the Mecca caravan in the year 1823 [or 1828? (Bartlett 1879: 203)]. Charcoal from the acacia is, in fact, the chief, perhaps it might be said the only traffic of the Peninsula. Camels are constantly met, loaded with this wood, on the way between Cairo and Suez. And as this probably has been carried on in great degree by the monks of the convent, it may account for the fact that whereas in the valleys of the western and the eastern clusters this tree abounds more or less, yet in the central cluster itself...there is now not a single acacia to be seen." (Stanley 1857: 27)

Burned tree stumps or ashes around the foot of trees were considered proof of the Bedouin's reckless behaviour of burning trees (e.g. Smith Lewis 1898: 44/45; Bartlett 1879: 204, 301; Hull 1885: 49). While passing through Wady Baraq in 1874, which was at the time abundant in large acacias, Bartlett commented:

> "...began to encounter very large acacias, many of which were more than two feet in diameter. At one point a little farther along there were more than two hundred in sight, at another point I counted sixty-seven, at another more than sixty. In one or two places I noticed traces of coal-pits. Young and thrifty trees were scarce, nearly all being old and crippled. Neither here nor elsewhere did the slightest attention seem to have been given to the trees, except to destroy them." (Bartlett 1879: 306)

At the same time, it was observed that there were still many mature trees (Bauerman 1869: 30), and that charcoal making had been a long-term practice (Bartlett 1879: 202). On top of that, travellers claimed throughout the 19th-century that the landscape had not changed since Moses and the Israelites had passed through (Seetzen 1855: 100; Holland 1868-1: 194; Maughan 1873: 86). There were, however, also many 19th-century travellers who noticed charcoal, but did not comment at all. For instance, Scott (1927) saw many loads passing on his way to the Monastery in 1877, but at no point refers to destruction of the trees. He only published his diary several decades after his actual trip, which may have made a difference.

Bedouin who lopped the branches in winter for camel fodder (Bartlett 1879: 300) were also accused of destruction whereas in reality lopping stimulated growth. Extremely wet or dry years were misinterpreted in relation to the present vegetation. For instance, Bartlett commented in 1874 in Wady Sa'al that the amount of rain did not match with the relatively small amount of vegetation in this wady (Bartlett 1879: 308). What he did not understand was that 1874 was an exceptionally wet year (this will be discussed in more detail in chapter 6). In the early 20th century, goats and camels were also considered destructive to the environment (e.g. Flower 1919; Plowden 1940: 38).

Travellers compared Sinai's landscape with landscapes they knew, e.g. the Alps (Henniker 1824: 219; Maughan 1873: 135), (Scottish) Highlands (Bartlett 1854: 160; Bonar 1857: 152), Colorado valleys and terraces (e.g. Hull 1885: 39; Scott 1927: 52), or what they had seen on earlier trips in mainland Egypt, e.g. tall, trimmed palms on the mainland versus untrimmed, stunted ones in Sinai (Bartlett 1854:27/28). They accused the Bedouin of laziness in replanting, managing water sources and taking care of gardens. This idea of "neglect" was mainly based on the wild-looking unclipped palms in contrast with the finely trimmed palms in Egypt (e.g. De Laborde 1838: 238), dry-looking gardens (e.g. Turner 1820: 439), and layers of organic material on top of water sources (Field 1888: 46). An example was the garden El 'Arba'in near Mount Sinai. Throughout the 19th-century, there were travellers who mentioned that the garden looked dilapidated and "neglected" even though it was rich in trees and other vegetation (e.g. Carne 1826: 224; Seetzen 1855). In the early 19th-century, this was probably the result of prolonged drought, but in the second half of the 19th-century, it was presumably more influenced by the Orientalist outlook of the travellers.

> "...not less than five hundred olive-trees, with a few apricots and almonds, two lime-trees, and some others...Cabbages, and a few other kitchen-herbs, were growing here. The whole aspect was that of neglect and desolation." (Bartlett 1879: 276/277)

Environmental "decay" got also linked to religious and civil "decay". Turner referred to the Christian village in Wady Feiran, which had once "flourished", was now "deserted" and taken over by the Bedouin:

> "...the depredations and laziness of the Arabs have now reduced it to a miserable village of a few low stone cottages and tents, of which the almost neglected gardens produce only dates a few water-melons, that are sold to Suez, and to the Greek convent of Mount Sinai. The Arabs live here only in summer to gather the fruit, and in winter emigrate with their tents further into the desert." (Turner 1820: 451/452)

Kergorlay (1910: 324) suggested that the Bedouin in Wady Feiran were so poor, because they did not take care of their date palms, so that the harvests were very low. Clifton (1900: 21) commented that the water management in Wady Feiran was not very good, and that water was wasted because it was not captured. Towards the late 19th-century, the monks of StK were also accused of ruining the environment and being backward (Bartlett 1879: 275). Part of the argument was that they did not help the Bedouin to develop, meaning convert to Christianity (e.g. Wallace 1868: 118; Palmer 1871-1: 72).

On the basis of geological compositions and landscape features, travellers such as Hull (1885: 49), Post (Field 1888: 101), and Carrington Bolton (1890: 591/592) suggested that the wadies Gharandel, Humr and Feiran had once been the bottoms of lakes; they linked this to more rain in the past, and "changes in the level of the country" (Hull 1885: 49). Based on specific Bible passages that focussed on rainfall, it was also concluded that there had been more rain (and vegetation) at the time of Moses and the Israelites (e.g. Palmer 1871-1: 25). Other landscape imaginations included volcanic activity in South Sinai (e.g. Dumas 1839: 180; Anderson 1853: 74).

Although travellers condemned the Bedouin for environmental destruction, it was these same travellers who made use of charcoal for cooking and staying warm (e.g. Carne 1826: 196; Kinnear 1841: 55; Buxton *et al.* 1895: 152/153; Scott 1927: 8). The Bedouin, on the other hand, often used camel-dung, herbs or dead wood for these purposes (Fazakerley 1820: 368; Günnel 1847: 10; Tilt 1849: 233; Bartlett 1854: 30; Schwerdt 1870: 43), which gave relatively short fires and required efficiency:

> "One of them [Bedouin] collected dry shrubs, and clearing a bed in the sand, set fire to them, another had taken a measure of flour from his sack, and adding salt and laban (like buttermilk) was forming a flat cake - the third roasted some coffee-beans in an iron shovel, then put them into a wooden mortar, and hammered them to atoms with his bludgeon. By the time that the cake was made the shrubs were burnt, the place was swept - the cake placed in the hollow, and the embers collected and thrown on it. - There was no quarrel about the bread being sufficiently baked, it was soon brought forth and devoured. The whole time from creating it till it was no more seen might be about ten minutes. The coffee-pot was next produced, and the ashes were raked together to perform the further office of boiling what they had roasted...the coffee-cup was put into circulation, and the ashes finished their services on the bowls of the pipes." (Henniker 1824: 222/223)

However, there were also English travellers who did not mention this idea of environmental degradation at all. Among the French travellers, such as De Laborde, Dumas, Renouard de Bussiere, and Raboisson, some shared the environmental degradation ideas, e.g. Raboisson, but others did not mention it. German travellers, e.g. Günnel, Graul, Liebenau, Österreich, Schoenfeld and Schneller did not suggest at any point that the Bedouin damaged the environment. They did, however, describe how luxurious the English travellers travelled in comparison to the German travellers, and how they ordered the Bedouin to do everything for them, while the Germans did everything themselves (Günnel 1847).

5.1.2. The Bedouin and tree ownership

In reality, the Bedouin and monks had gardens more or less everywhere in South Sinai where nature allowed it, and where there was enough water available the whole year round, either in natural reservoirs or from rain-water that they had captured in man-made reservoirs (e.g. Palmer 1868: 48). For at least date-palms and acacias, the Bedouin had a special system of private tree ownership; dates were important staple food for the Towara (Palmer 1871-1: 80), while acacia was important for charcoal (Henniker 1824: 247/248) and gum-Arabic.

In Tor most date palms were privately owned and very valuable:

> "We now entered that grove of palms which constitutes the wealth of Tor - every tree of it is registered - most of them are entailed property; and they produce marriage portions in dates - as portions in Holland are given in tulips." (Henniker 1824: 221/222)

In Wady Feiran, the gardens were owned by the Sowalha Bedouin and other tribes of the Towara Bedouin, but they were worked by "Tebna Arabs, a branch of the Djebalye [the Jebaliya Bedouin], who serve as gardeners to the Towara Bedouins", and who were allowed to keep a third of the harvest (Burckhardt 1816: 602). Some seem to have lived there permanently to look after the trees and some animals (Burckhardt 1816: 602-604). The Tebna grew tobacco and vegetables, which they sold to other Bedouin tribes.

In Nuweiba el Terabin, the date-palms belonged to "some of the Towara tribes", amongst others the "Aleygat" (Burckhardt 1816: 500), and in Nuweiba el Emzeing, the date-palms belonged "to the tribe of Mezeine" (Burckhardt 1816: 517); these two tribes also owned the date-palms in Dahab (Burckhardt 1816: 524). In 1856, Bonar described a similar system in Wady Feiran, in which the ground was owned by the tribe, but worked by others from outside the tribe. However, the workers owned the trees:

"The palm-trees here are said to amount to about a thousand, - a good many of them belonged to our sheikh, who seemed rather proud of his leafy possessions. For it is the tree and not the ground that has an owner. The latter belonged to no man in special. It was the common property of the tribe. But the former were all parcelled out among individuals, so that our sheikh was a 'landed proprietor' as far as any one can have such a name in the desert, where the land belongs to all." (Bonar 1857: 185)

The number of palms per owner was variable (Palmer 1871-1: 167), and within a plantation, there could be many different palm owners (e.g. Buxton *et al.* 1895: 140).

Most trees and plantations were situated in water-rich wadies prone to (flash)floods, and therefore they had to be well maintained, and replanted to prevent them from disappearing:

"I asked our dragoman, Ibraham, whether Arabs ever cut down palm-trees. He replied 'No, but they are sometimes blown down by storms, or swept away by floods.' 'Do they ever plant them?' I asked. 'Yes; they put seed into moist places, let the plants grow two or three years, then take them up and transplant them. This is necessary, for they will not bear fruit unless they are transplanted. After the fifth year they bear fruit.'" (Hull 1885: 38)

Just a year after the devastating flashflood of the 3rd December 1867, Palmer described in January 1869 healthy palm-groves in Wady Feiran (Palmer 1871-1: 153). It is very likely that the palm-owners planted or re-located trees or saplings from other places to Wady Feiran. Similar practices were mentioned in 1816 in North Sinai, where Bedouin planted young palms in water-rich areas (Römer *et al.* 1917: 40) and protected trees which were economically important. In the early 20th century, this was still the case in Wady Feiran (Schneller 1910: 124/125).

However, it occasionally happened that the damage was beyond repair, in which case the palm-groves disappeared:

> "On the declivity of the mountains, farther on, I saw many ruins of walls, and was informed by my guides, that fifty years ago this was one of the most fertile valleys of their country, full of date and other fruit trees; but that a violent flood tore up all the trees, and laid it waste in a few days, and that since that period it has been deserted." (Burckhardt 1816: 538)

In North Sinai there were similar systems of protection:

> "We had occasion to notice in the evening how careful the Arabs are of their trees. Of the low shrubs they make fires, but not of tarfas and such like. Once or twice, indeed, we did see a seyaleh scorched, as if a fire had been kindled beneath it, but this was rare. Some of our party had kindled a fire within some feet of a tarfa. Scarcely, however, had we done so, than our sheikh came, and with the politest signs imaginable, accompanied of course with a flood of words which we did not understand, requested us to remove it from the tree. From the way in which he shook his head, and pointed to the different quarters, we guessed that he meant to tell us that the Bedaween of the neighbourhood would be very angry at us, if we set fire to their trees. Of course we complied with his most reasonable request." (Bonar 1857: 266)

In North Sinai (Tilt 1849: 239/240) and in mainland Egypt there was a taxation of palm trees. There, palm-trees were used as a kind of negotiation item between the Pasha and the Bedouin, in the sense that Bedouin were forced to pay tax over their trees, otherwise their trees would be cut down by the government (Tilt 1849: 239/240). However, this also worked the other way around, as "the tax of seven or eight cents on each palm-tree has caused many of them to be cut down" (Bartlett 1879: 46). It is not clear if the same was applied in South Sinai (Bartlett 1879: 46).

5.1.3. The redemption narrative in South Sinai

The Biblical and civilisation-redemption narratives became increasingly popular among South Sinai travellers during the 19th-century. Travellers claimed that with patience, watering, and zealous (Christian/European) care, the process of desertification could be turned around (e.g. Bartlett 1879: 187/188, 223). 'Ayn Musa and the prolific garden of the Monastery of StK were considered proof (e.g. Arundale 1837: 25; Anon. 1848-2: 369) of this:

> "How much may be done by a careful use of such water and such soil as the Desert supplies, may be seen by the only two spots to which, now, a diligent and provident attention is paid; namely, the gardens at the Wells of Moses, under the care of the French and English agents from Suez, and the gardens in the valleys of Gebel Mousa, under the care of the Greek monks of the convent of St. Catherine." (Stanley 1857: 27)

'Ayn Musa was the first oasis after leaving Cairo, and upon arrival on the Sinai Peninsula. In 1848, a traveller commented on the reclaiming of the desert:

> "Our eyes feasted with delight upon the little vegetation that we met with at the wells of Moses. It is indeed quite an oasis in the desert, for here we saw the first blade of grass since we left the valley of the Nile. The shallow pools that make this little garden here, are very few in number, and quite brackish and unfit to drink. Nevertheless they are quite good enough to make trees and vegetables grow very luxuriantly. A few years ago there were only a dozen stunted palm trees here, and the water was running to waste. Now it is collected into tanks, and supplies four or five little inclosures with the necessary quantity; and trees and garden herbs of all kinds grow where not a blade of grass was ever before seen." (Anon. 1848-1: 314)

This "reclaiming" of the desert became linked to Christian moral and European superiority, even though a Bedouin family was actually taking care of the gardens:

> "A white villa, surrounded by a garden, with here and there a few wild palms and bushes, some fruit trees, flowers, and vegetables, all treated as pets, and tended with great care, form a bright green spot, an oasis, on the borders of this 'great and terrible wilderness', a circlet of verdure which still marks the spot where probably the Israelites had their first halting place after crossing the Red Sea...The

> children whose voices we heard belonged to an Arab family residing here for the purpose of keeping the gardens in order. The white villa...belonged to a gentleman in Suez who is fond of making agricultural experiments on the desert. The patches that he has brought under cultivation around this spot, which, from its historical associations, is a household word throughout Christendom, show what irrigation and culture may yet do on a much larger scale for the waste places of the earth. He comes over occasionally and spends a few days at his solitary 'country house'..." (Wallace 1868: 91)

The arrival at the Monastery of StK, which formed a kind of green Christian island in a Muslim desert, was for many travellers a relief for the eye and soul. The Monastery garden was especially striking, full of trees, such as cypress, poplar, almond and olive trees, fruit trees, such as apple, pear, orange, lemon, apricot, fig, grape-vine and vegetables, such as cabbage, onion, bean, salad and herbs (e.g. Burckhardt 1816: 541-550; Fazakerley 1820: 377; Henniker 1824: 239; Carne 1826: 217; Renouard de Bussiere 1829: 249-251; Borrer 1845: 342; Anon. 1848-2: 369; Graul 1854: 208; Bartlett 1854: 80; Seetzen 1855: 69-74; Tyrwhitt 1864: 341; Palmer 1871-1: 56/57; Maughan 1873: 102-108; Field 1888: 104/105; Carrington Bolton 1890: 596; 1910: 334/335). In the late 19th-century even palms (Österreich 1895: 49/50) left a deep impression, as well as the large amount of potable and good-tasting water inside and around the Monastery. Even though the garden went through droughts, locust attacks, and destruction caused by flashfloods (e.g. Bartlett 1854: 79; Bartlett 1879: 275), it was always restored.

Another place that triggered the imagination of some travellers was the house and garden of Major MacDonald, who had worked in the turquoise mines in Wady Maghara together with the Bedouin, and had settled in the area in 1845 (Bartlett 1879: 220; Wallace 1868: 71/72; Scott 1927: 18; Schoenfeld 1907: 33/34). He was nick-named "the King of Sinai" (Tyrwhitt 1864: 348), and British travellers referred to his house as "the most lonely Robinson-Crusoe wigwam sort of dwelling" (Wallace 1868: 71), built in "a very wild and romantic place"

(Bartlett 1879: 225). MacDonald had tried to create a garden, but this had dried up by April 1866 (Wallace 1868: 105), which must have been just after he left the Sinai (Carrington Bolton 1890: 596; Holland 1866: 158; Wallace 1868: 71/72; Bauerman 1869: 33).

Wady Feiran (Fig. 14), the largest and most vegetated wady of South Sinai, was described in mixed terms. On the one hand, travellers expressed their relief to see vegetation, have some shade, drink fresh water, and hear birds for the first time since they had started their trip (e.g. Renouard de Bussiere 1829: 244; Field 1888; Kergorlay 1910: 310). They described Wady Feiran in terms of "delicious", refreshing, the "paradise of the Bedouin", and "the Pearl of the Desert" (Anon. 1848-2: 362/363; Anderson 1853; 78; Brocklebank 1865: 174; Wallace 1868: 107; Bartlett 1879: 245):

> "On stepping out of my tent I was at once in the midst of an almost tropical wilderness. In the palm-groves of Egypt the stems are trimmed and straight, and placed generally at regular intervals; but here this most graceful of trees, is half untended, its boughs spring direct from the earth, and form tufts and avenues, and dense overarching thickets...the clear stream bubbles freshly on the edge of these arcades, and the deep solitude is vocal with the song of birds; the wind, sweeping down the rocks, plays over the rustling foliage with the gentlest murmur; and shut in by two lofty walls of rock from the dreary Desert without, the traveller, lulled in a dreamy and delicious repose, heightened by his past weariness, forgets awhile its perils and privations, and the long distance he has yet to accomplish across its drouthy [sic] sands." (Bartlett 1854: 52/53)

In the area of the old Christian village, near Wady 'Aleyat, some caves were used as grain storage by the Bedouin (Renouard de Bussiere 1829: 246/247). The area was carefully planted, replanted and looked after by the Bedouin. In this respect, Wady Feiran was "civilised" and "redeemed", but not in European/Christian terms. On the other hand, it was also discussed in terms of "decay" in comparison to earlier Christian periods, and "neglect" in periods of drought (see §5.1.1).

5.1.4. *The declensionist and redemption narratives further dismantled*

Although travellers pointed at the Bedouin for their environmental destruction, and hailed European/Christian environmental interference as redemption, there are many indications in the diaries of these same travellers that the situation was quite the opposite.

Throughout the 19th-century, the Towara lived mainly in highly mobile tent camps in remote parts of South Sinai (e.g. Henniker 1824: 248). This way of living was totally adapted to water and pasture availability, temperature and seasonal activities such as working in their gardens and harvesting. In comparison with the sober diet of the monks, almost always mentioned by travellers (e.g. Burckhardt 1816: 549; Henniker 1824: 232; Turner 1820: 443; Seetzen 1855: 97), the Bedouin diet seems to have been even more severe. Bedouin guides mainly lived on freshly prepared flat-breads made of wheat or corn, salt and water, with sometimes some oil, butter or laban (yoghurt) added or some dried fruits, and coffee (e.g. Schoenfeld 1907: 21/22); some seem to have taken Nebk flour and laban on their trips (Burckhardt 1816: 602/603). Everything edible found along the route was an extra, and it was generally consumed on the spot: a purple mushroom called "Mesrur" (Seetzen 1855: 54), raw brownish flowers and leaves of a good-smelling kind of "Hyacinth"-like plant (Seetzen 1855: 68), gum-arabic which helped against thirst (Burckhardt 1816: 533; Turner 1820: 426/427), raw fennel (Burckhardt 1816: 589), the roots of crocus-like flowers (Bonar 1857: 249), a "fleshy-leaved plant called gataf" (Palmer 1871-2: 322), sorrel (Bartlett 1879: 225), and certain roots (Österreich 1895: 48). The Bedouin did not eat meat when they travelled, unless they received some from the travellers (e.g. Anderson 1853: 72; Liebenau 1896: 27/28).

Limitation in water, pasture and plants for fodder restricted the number of domestic animals which could be kept in South Sinai.

Camels fed on herbs, shrubs and trees along the route, e.g. broom (Turner 1820: 420), acacia (Burckhardt 1816: 479), ghurkud (Wallace 1868: 81), and tamarisk (Burckhardt 1816: 488). The Bedouin made sure the animals had the chance to eat (e.g. Anon. 1848-3: 418; Bartlett 1879: 322/323), sometimes to the desperation of the travellers who wanted to push forward (e.g. Bonar 1857: 279). They were fed additionally with some barley (Henniker 1824: 223), corn (Maughan 1873: 140), other grains (Bartlett 1879: 302), or beans (Günnel 1847: 10; Bartlett 1854: 10; Borrer 1845: 265; Geramb 1899: 163). Camels were mainly used for transport purposes, but sometimes also for their milk, and they were of great value to their owners. Other domestic animals, such as sheep, goats, and donkeys, required regular water and food, and could only be kept in places with permanent water sources and good pasturage (Schoenfeld 1907: 22). Sheep and goats were used for trade, sacrifice, and food (e.g. Palmer 1871-1: 80/81). Their wool was used for making tents, the skin for water transport, milk and laban for food, and their especially fatty tail for making a kind of butter.

In the early 19th-century, travellers followed a similar pattern of travelling: they only carried highly necessary luggage and food (e.g. Burckhardt 1816; Turner 1820; De Laborde 1838). Food was partly brought, and partly bought, caught or received along the way, such as a sheep, small game, fish, or food donated by the monks:

> "With respect to provisions, a sufficient quantity of rice should be purchased: it may be had at Suez and Akaba. Wheat is excellent cooked with rice, or even by itself, as a pilau: the Arabs supply it. An abundant store of coffee should be added, in order to enable the traveller to present some occasionally to the Arabs. Part of it should be roasted and ground beforehand, to avoid any trouble of that kind on the journey. Some pounds of tobacco, cut small, will be useful, indeed necessary, in the peninsula of Sinai. It need not be of the best quality. Salt, pepper, chocolate, which requires little room and is extremely nourishing, dates, apricot pates, and dried apricots of Damascus, pickled tongues, and potted cheese, should by no means be omitted." (De Laborde 1838: 46)

However, throughout the 19th-century, the amount of luggage and the luxury of the meals became quite excessive and polluting. Dozens of chickens and turkeys were transported alive in cages through the desert (e.g. Hindley 1850; Raboisson 1886: 290; Liebenau 1896: 14; Österreich 1895: 6; Brockbank 1914). Bonar described his luggage and provisions as follows:

> "On another camel were two large square panniers, of palm-branch wicker-work, filled with oranges and lemons, to the amount of at least 600 of the former and 100 of the latter. On another was our 'canteen', that is, two immense wooden chests, containing our dining apparatus, such as plates, knives, forks, spoons, cups, not omitting candles and fenusses, that is lanterns made of linen...Above this apparatus was placed our kitchen-grate, a long iron box, pierced with a hundred holes in sides and bottom,—its four legs, like signal posts stretched upwards to the sun. Then came another with an immense wicker-cage, which formed the prison house of some 100 fowls, all alive...Balancing these fowls is another cage, with half-a-dozen turkeys, which we are told are to be our 'Sunday dinners'. On another our bedding is mounted, on another our tents, on another our charcoal, on another our barrels of Nile-water, on another sacks containing our camp-stocks and table,—our bed-steads, and the pins (watt-watts) of our tents. Most carefully was everything packed up before it mounted the camel." (Bonar 1857: 69/70)

Liebenau (1896: 11) and his companions took a total weight of more than "1200 kilos" foodstuff and camping gear in January 1893. All these things had to be carried by camels, and this often led to quarrels with the Bedouin, because travellers wanted generally as few as possible camels to spare money.

5.2. Representations of South Sinai in art, writing, and on maps

5.2.1. Representation of South Sinai in writing

Apart from the declensionist and redemption narratives discussed in § 5.1, South Sinai was often described in contradictive terms, as has been suggested by Said (2003) for other parts of the MENA:

Danger & dishonesty vs. safety & honesty. In the early 19th-century, travellers described South Sinai as dangerous in relation to its sparsely inhabited desert landscape and the Bedouin inhabitants:

> "...the sudden transition from comfort to the contrary - from society to loneliness - from Englishmen to Arabs - from safety to danger, &c.; let it be supposed that I hide my feelings in solitude..." (Henniker 1824: 220/221)

Early 19th-century travellers respected and feared the Bedouin, because they depended on them for survival and water. The Bedouin had a powerful position, because they knew where they could find permanent brackish wells and rainwater. Furthermore, whoever wanted to enter the Bedouin territories without giving notice, would have to pass certain wells on his way where he would be noticed. Travellers had to travel together with the Bedouin to stay safe.

Early 19th-century travellers also learned Arabic and often dressed up to protect themselves from being recognised as a "Frank" or Christian (e.g. Burckhardt 1816; Turner 1820: 396; Irby & Mangles 1823: 338). This was done out of fear of being murdered by the Bedouin (Turner 1820: 458; Henniker 1824: 253/254). There were more or less two styles: the Burckhardt style, who "dressed like an Arab of the lowest class" (De Laborde 1838: 39/40), or the Seetzen/De Laborde style, who both travelled in such luxurious style that it made people think they travelled under the protection of the Pasha, so nobody touched them. Travellers took on Arabic names: for instance, Seetzen was known as Musa, Burckhardt as Sheikh Ibrahim (De Laborde 1838: 19), Henniker as Joseph (1824: 240/241), Palmer as Abdallah Effendi, and Stephens (1996: xxxi) as Abdel Hasis.

However, at the same time, these early travellers praised the Towara for their honesty and trustworthiness, based on the fact that valuable goods, such as charcoal and other valuables, were left unprotected in the desert without it being taken by others (e.g. Burckhardt 1816: 588/589; Henniker 1824: 247/248):

> "We halted...close by about a dozen small buildings, which are called by the Bedouins Makhsen (magazines), and which serve them as a place of deposit for their provision, clothes, money, &c. As Bedouins are continually moving about, they find it inconvenient to carry with them what they do not constantly want; they therefore leave whatever they have not immediate need of in these magazines, to which they repair as occasion requires...These buildings are altogether so slight, and the doors so insecure, that a stone would be sufficient to break them open; no watchmen are left to guard them, and they are in such solitary spots that they might easily be plundered in the night, without the thief being ever discovered...The Towara are well entitled to pride themselves on this trait in their character; for I found nothing similar to it among other Bedouins." (Burckhardt 1816: 588/589)

Some travellers were even invited in Bedouin camps, where they were offered food and drink, generally involving a slaughtered sheep in honour of the visitor (e.g. Burckhardt 1816; Seetzen 1855: 49). The act of eating together, sharing food, or "eating salt together" symbolised that there was and could not be hostility between the two parties afterwards (Henniker 1824: 242/243).

The relation to the Bedouin continued to be ambiguous throughout the 19th-century, but the balance shifted over time with increased independency concerning access to potable water and safety. On the one hand, there were travellers who reported loss of properties or food (e.g. Schoenfeld 1907: 19). Non-edible things were returned at some point if the travellers complained about it. Some travellers, like Schoenfeld (1907), threatened to make an official complaint if the goods were not returned, after which they were very quickly returned. Official complaints could lead to very heavy punishments, such as beheading (Dumas 1839: 252). Travellers were supposed to give "backsheesh" to the Bedouin at the end of the trip (e.g. Bonar 1857: 273; Österreich 1895: 59-61), but this seems to have got lower and lower towards the end of the 19th-century, and Bedouin who had not been obedient received either no tobacco or no backsheesh (e.g. Liebenau 1896: 58). Travellers also complained about the hideous prices charged by the Bedouin and accused them for not being practical and economic in loading the animals (e.g. Schoenfeld 1907: 15, 70). Female travellers sometimes entered the female Bedouin spaces, but described the latter as "very dirty and uncultivated" (Hindley 1850: 17), and "almost repulsive-looking" (Bishop Bird 1886-1: 174), while others did not really comment on them (e.g. Buxton *et al.* 1895: 109-111). English and American travellers spoke generally in less positive words about their Bedouin guides, and used words such as "swarthy" (Bonar 1857: 70; Buxton 1895: 145; Smith Lewis 1898: 46), "Arab urchins" (Palmer 1871-1: 221) and "ragamuffin" (Wallace 1868: 76). Some travellers such as Bartlett (1879) and Bishop Bird (1886) were influenced by Stanley's book, and they copied his relatively negative tone.

On the other hand, some travellers moved independently of the Bedouin and the luggage camels in the later 19th-century, and just met up at the camp site (e.g. Scott 1927). Most travellers agreed that the area of Syria, Palestine and 'Aqaba/Petra was much less safe, and the Bedouin in these areas charged much higher prices and were much less agreeable than those of South Sinai (e.g. Bartlett 1879: 329; Palmer 1879-2: 330; Smith Lewis 1898). Female travellers, such as Ms Hindley (1850), Isabella Bishop Bird (1886-1/2/3), the three Buxton ladies (*et al.* 1895), the sisters Margaret Dunlop Gibson and Agnes Smith Lewis (1898) who were the first women to study at Cambridge University and the first women to visit South Sinai for academic purposes, and Plowden (1937) gave a very positive and safe impression of South Sinai. These early feminists celebrated their mental and physical freedom and their equality to (Oriental) men, and they travelled self-confidently with a male dragoman and male Bedouin guides (e.g. Buxton *et al.* 1895: 109; Plowden 1940: 48), something unheard of in conservative Victorian England at the time. Some travellers still dressed up, e.g. Hindley (1850: 13/14), and Loti (1993), but this was not for safety reasons anymore; it was for the ethnic experience.

Civilised oases vs. uncivilised emptiness. South Sinai's desert landscape is a mosaic of little vegetated areas and wadies rich in vegetation and wildlife. Travellers arriving after a long, dry, and hot trip from Cairo to Suez at the vegetation and waters of 'Ayn Musa, described the place as refreshing. After two or three more days through a relatively dry and monotonous landscape (e.g. Sutton 1913: 35; Plowden 1940; 30), the landscape started to change: vegetation rich wadies became more frequent, and the flat landscape was replaced by mountains with different colours and shapes. Wadies, such as Gharandel and Feiran, which had a rich flora and fauna formed a relief to the eye and ear: travellers described their relief in seeing vegetation and hearing the sound of birds (e.g. Arundale 1837: 21; Bartlett 1854: 53; Bonar 1857: 121/122; Bartlett 1879: 204). They eventually reached the Monastery of StK with its green gardens. Over the 19th-century, the oases became more and more linked to civilisation and Christianity, while the presence of Bedouin became increasingly linked to environmental destruction and lower civilisation.

Feelings of homesickness, nostalgia, and longing for family and friends, vegetation and sounds (e.g. Günnel 1847: 11; Böttcher 1898: 191) were emphasised while travelling away from the Monastery, especially along the roads towards Gaza or 'Aqaba/Petra, which were generally drier and less vegetated than western Sinai:

> "In leaving Mount Sinai for Akaba, the solitude of the Desert seems to deepen, and the prospect of possibly breaking down among its remote defiles becomes more dreary and hopeless. One has no longer the hospitable convent in perspective, but a country increasing in wildness, and more and more insecure and remote from all chance of assistance." (Bartlett 1854: 94)

Once the travellers left Sinai, they left the "dead", "uninhabited", "naked" desert landscape behind, and described how "life" slowly returned in the landscape. They described their first sensations, at seeing signs of vegetation (e.g. Arundale 1837: 39; Anon. 1848-3: 421/422; Hull 1885: 83), the green colour of the vegetation, the sound of birds, and maybe most important of all, the return to "civilisation":

> "...but nothing I think...imparted a sensation quite so exquisite as this coming up out of the desert out of void and vacancy, out of vast spaces and solemn silences—into the world of life and sound and motion. The return is very gradual. Nature gives signs of the coming change by an occasional quiver in her frame; perchance a rill trickling in the sands marks where the life-current is flowing faintly in her veins; then a new vegetation shows itself, as familiar flowers peep out by the way, and the small grasses begin to appear— Then there is a tender vibration in the world of sound; the note of a bird, faint as if she hardly dared to hear the voice of her own singing, quivers for an instant in the deep solitude; to which follow hours of marching, when is heard in the distance the bleating of sheep, and after another long march the lowing of cattle…there is a gentle murmur in the air; and on the straining ear comes the sweetest sound ever heard, that of human voices: and so we come back into the living, breathing world again." (Field 1888: 262/263)

South Sinai as a healthy environment. Apart from Tor and Wady Feiran, which were suggested to be unhealthy in summer because of "miasma" (unhealthy air) and "fevers" such as malaria (Burckhardt 1816: 602-604; Tyrwhitt 1864: 346; Palmer 1871-1: 222/223), South Sinai was considered a physically and morally healthy environment (e.g. Baedeker 1885: 473). It was hardly or not at all visited by the Bubonic plague, which yearly ravaged Egypt and the Eastern Mediterranean throughout the 19th-century. The dry environment was considered as a good place to visit for health reasons (e.g. Money-Kyrle, 1843-6), or to escape from less healthy or plague-visited areas (e.g. Burckhardt 1816: 457). The trip through South Sinai to the Monastery of StK was often regarded as an escape from Europe where there were wars, severe air and water pollution, overcrowded cities, humidity and epidemics, while South Sinai was non-industrialised, dry, hardly inhabited, safe (at least after the 1820s/30s) and clean:

> "Day succeeds day in these calm solitudes with few events to chequer their even monotony, and the traveller thinks nothing about the grave events which may, hour by hour, be enacting in unquiet Europe. He cares not for newspapers, politics, or the daily share list...For the time being he rolls away the accumulated load of cares and worries of a domestic or business nature, rejoicing in his desert freedom and immunity from letters and telegrams. He looks around and sees the face of nature unchanged; even as it was 6,000 years ago, so is it now. No sound of railway-engine will ever make the slumbering echoes of this secluded valley, no telegraph-posts will ever find holding-ground in these shifting sands; a solitude it will remain till time is no more. Better that it should be so; the world is going too fast in these days of electric excitement, and has few spots remote from the haunts of men." (Maughan 1873: 86)

Furtermore, quarantine stations came into existence near Tor and near Suez in Port Tewfiq, to prevent diseases such as the plague and cholera from spreading.

Many travellers commented on the good health of the monks and Bedouin (e.g. De Laborde 1838: 242; Borrer 1845: 340; Bartlett 1854: 86; Baedeker 1885: 505; Böttcher 1898: 204), and many admired Bedouin for their physical strength even though the latter ate very little while travelling (e.g. Bartlett 1854: 30), and their main food was restricted to freshly prepared bread and sometimes some dried fruits or things they found or received along the route (e.g. Maughan 1873: 152):

> "They sleep all night among the legs of their camels, with no covering about them but some old cloak or wrapper; and as to their food, it was always a mystery to us how they could exist on such scant meals." (Wallace 1868: 133)

Christian landscape vs. criminal monks. Many travellers visited the Christian landscape of South Sinai, but their opinion of the monks changed over time in a similar line as their opinion of the Bedouin. Throughout the 19th-century, travellers wrote about the hospitality of the monks, and the coffee, date brandy, bread, confiture, and sometimes dinner that were served upon arrival at the Monastery (Renouard de Bussiere 1829: 250; Günnel 1847: 41; Graul 1854: 207; Seetzen 1855: 73; Smith Lewis 1898: 194; Scott 1927: 36; Stephens 1996: 178/179), and in the early 19th-century, they seem to have received provisions for their return trip, such as "bread and cheese, some of their delicious well water, and a bottle of rackee" (Turner 1820: 448), or "loaves and fishes...rice, coffee, and sago" (Henniker 1824: 243), and sometimes presents, such an animal skin, or some cinnabar (Burckhardt 1816: 596), for which the travellers gave something in return, such as money.

However, in the second half of the 19th-century, travellers increasingly complained about the charges of the monks, and most travellers emphasized that these monks were not educated, ignorant, not very religious, dirty and that there were drunkards among them (e.g. Graul 1854: 216; Bishop Bird 1886-2: 237; Österreich 1895: 15; Hanstein 1923: 127). There was even doubt if they could read, and had ever read the Old Testament (Burckhardt 1816: 583/584), and there was scepticism about their Biblical projections onto South Sinai (e.g. Stanley 1857: 33/34). Henniker described in the early 19th-century, that the monks had no idea of the value of the Monastery library:

> "...the library does not contain many books of value; all that were thought worth moving have been lately carried to Egypt; there still remain many scrolls of parchment, on which are written prayers in Greek and Syriac, and also some damaged Aldine editions...whilst I was dirtying my fingers in search of the true black letter, the superior told me to throw away the stupid old books, and look at some nice new ones! - They are very clean copies - they bear no mark, but that of the Bible Society, and are carefully put on the shelf." (Henniker 1824: 228/229)

There was little communication between the travellers and monks (e.g. Bartlett 1854: 92), because the monks had very limited or no knowledge of languages other than their mother tongue, Greek (e.g. Seetzen 1855: 97; Bonar 1857: 227). Travellers commented on the backgrounds of the monks, which were very variable: traders (Seetzen 1855: 98; Palmer 1871-1: 55), a sailor (Burckhardt 1816: 565; Turner 1820: 433) who had "appeared to have turned monk chiefly for the sake of getting his fill of brandy from the convent's cellar" (Burckhardt 1816: 565), a monk who had been captain on a ship and organist in a Lutheran Church in Germany before becoming a Greek-Orthodox monk (Graul 1854: 211), a Turkish soldier (Henniker 1824: 232), a Cossack (Dumas 1839: 218), "and they usually belong to the lower ranks of society" (Maughan 1873: 110). Some travellers even suggested that some of the monks looked mean and criminal, or had a criminal background (e.g. Henniker 1824: 231; Liebenau 1896: 31; Österreich 1895: 51; Stephens 1996: 202), and that the Monastery functioned as a punishment for monks who had sinned or had been cast out (Stanley 1857: 33; Österreich 1895: 52; Böttcher 1898: 203/204; Bishop Bird 1886-2: 235). These monks stayed from a few years up to their whole lives (Wolff 1839: 310; Maughan 1873: 110; Scott 1827: 31).

Travellers also gave their opinion about the connection between the monks and Bedouin through their comments about the quality of the bread given by the monks to Bedouin, in order to discuss their opinion about the monks. In 1821 Carne wrote:

> "The hatred these people [the Bedouin] bear to the monks is excessive; they made use of every oath in their language when abusing them and a chief took a piece of brown bread from his vest and held it up – 'Is this good', said he, 'for us to eat, while in the convent they have it so white?' The sons of devils and of perdition, they declared, should not be feasting within their walls in that manner." (Carne 1826: 242)

However, in 1836 Stephens described the bread given by the monks as "hard, black, and mouldy...such as the meanest beggar in our country would not accept from the hand of charity", and the thankfulness of the Bedouin for it (Stephens 1996: 193/194), which seems to show a shift in sympathy. Stephens was also quite sceptical about the monks and their Biblical projections onto the landscape around the Monastery in general. In 1872, Maughan (1873: 105) suggested that "three different sorts of bread are made, the inferior quality being for the Arabs". In the late 1890s, Clifton (1900: 10) also wrote about the dark bread for the Bedouin and the white bread for the monks and travellers. What is interesting is that throughout the 19th century, Bedouin as well as the monks of StK were on the one hand increasingly considered inferior, destructive and of disputable trustworthiness, but on the other hand there were also travellers who sympathised with them.

5.2.2. Representation of South Sinai in art

In the first half of the 19th-century, South Sinai's landscape was represented in drawings and paintings (e.g. De Laborde 1838; Roberts *et al.* 1842; Hindley 1850; Buxton *et al.* 1895). These works of art could be easily manipulated, and some artists consciously added elements to their drawings, such as De Laborde (1838) who admitted:

> "In order to vary the costume, I have imagined a caravan of Mograbbins approaching the mosque of the convent on their return from Mecca. It is usual, when a caravan arrives at the end of a journey, to discharge a few guns as a signal of rejoicing." (De Laborde 1838: 239)

According to Bentley, Roberts was different from painters such as Catherwood and De Laborde, who pretended to be "...sketching just as some quaintly dressed traveller was being hoisted into the monastery by means of the rope and pulley...this romantic feature is absent from...David Roberts[' paintings]" (Bentley 1985: 53). However, Roberts' paintings also contained elements such as European tents (figs 3 & 15), and the representation of European travellers dressed-up as politically dominant groups such as the Ottomans, which could be interpreted as European dominance and clear separation of the Bedouin. Inside the Monastery, there were paintings depicting "Arabs firing at those [visitors] who are hoisted up by the rope" (Turner 1820: 432).

From the second half of the 19th-century, South Sinai was also captured on photos (e.g. Bonar 1857; McDonald 1869; Carrington Bolton 1890; Smith Lewis 1898). Bonar was (one of the) first ones to take pictures of South Sinai in 1856. The cameras and materials for photography were still very large, expensive and heavy at the time, and they had to be transported on camel-back, which was a risky process. In the 19th-century, photos were less easy to manipulate, although the position of the camera and the close-up could influence the impression.

5.2.3. Representation of South Sinai on maps

Given the important strategic position of Sinai between Africa and Asia, and its inaccessibility because it was Bedouin territory, there was great Western political interest in being the first to map the area accurately, as it would increase power over the area. Although many travellers and guidebooks explored and mapped the routes of Moses and the Israelites through South Sinai (e.g. Arundale 1837; Günnel 1847; Wilkinson 1847; Baedeker 1885), some scholars seem to have entered the area under the pretence of doing research (Heffernan 1996: 512) in order to map South Sinai as a whole for political purposes (e.g. De Laborde 1837; Wilson & Palmer 1869).

The French traveller De Laborde (1838) produced a map of some of the main geographical features, and travelled together with Linant de Bellefonds, who was soon after involved in the construction of the Suez Canal, led by the French. The Suez Canal itself was considered by Lesseps as "a 'marriage' between the virile, progressive and masculine West and a passive, static and feminized East" (Cosgrove 2008: 23). Palmer and Wilson, who mapped the Sinai Peninsula in the late 1860s for the Palestine Exploration Fund (Palmer 1871-2), both carried the military title "Captain", and Wilson was "a founder member of the Palestine Exploration Fund" as well as "a Fellow of the Royal Society and the RGS [Royal Geographical Society]" (Heffernan 1996: 506). They were sent to map the route of the Exodus, and (Biblically) explore the almost unexplored Tih and northeast Sinai.

However, this was combined with an Ordinance Survey, and resulted in a detailed map of South Sinai (Wilson & Palmer 1869). The most detailed map of South Sinai was produced in the 1930s by the Department of Survey and Mines (1934), which mapped the whole of South Sinai in minute detail, even though mining activities were only taking place at the time in western Sinai. However, in 1937, Plowden (1940: 7) pointed out that there were no proper maps available of the area.

On many 19th-century maps and in many texts, South Sinai is referred to as "Arabia Petraea", a name first used by the Ancient Greek geographer Ptolemy, and which therefore referred to pre-Islamic times and reflected the Nabatean link (e.g. De Laborde 1838; Cooley 1843; Bartlett 1854; Seetzen 1855; Tyrwhitt 1864; Bauerman 1869; Baedeker 1885: 48; Hull 1885; Carrington Bolton 1890; Stephens 1996). Throughout the 19th-century, travellers described the passage from Egypt to the Sinai Peninsula as the transition from Africa to Asia (e.g. Palmer 1871-2: 301; Bartlett 1879: 185; Baedeker 1885: 419).

Mapping also included the Bedouin territories. At least in the early 19th-century, travellers mentioned firmans, which were letters of protection from the Pasha or the Monastery in Cairo, which were necessary to enter South Sinai. They guaranteed access to the area and security (Turner 1820: 409; Henniker 1824: 62); without them travellers could not proceed (e.g. Madden 1829-2: 211/212). Ehrenberg and Günnel mentioned respectively in the 1820s and 1830s that the Bedouin of South Sinai and in Wady 'Araba protected them with their own version of a firman, by painting lines or crosses with the blood of a slaughtered sheep on their camels (Günnel 1847: 71; Hanstein 1923: 120-123).

Within South Sinai, the Bedouin territories seem to have been mainly discussed in the texts about the change of camels and Bedouin guides. In 1807, Seetzen (1855: 41, 45/46, 48) noticed that Bedouin territory boundaries and rights of guiding were indicated by the specific places where travellers had to change camels and Bedouin guides. Burckhardt, a Swiss explorer in the early 19th-century who was funded by the English African Association to explore the area and its inhabitants in detail (Burckhardt 1831; Heffernan 2001) described that there were transition areas, a kind of no-man's land that separated the territories:

> "...every district has its acknowledged owners, with its limits of separation from those of the neighbouring tribes, although it is not always occupied by them." (Burckhardt 1816: 462)

In the early 19th-century, the South Sinai Towara Bedouin conducted travellers also outside South Sinai, almost until Gaza:

> "When within half a mile of Gaza, our Arabs drew up under a bank, and told me that their agreement was at an end. They refused to go into the town; and if we had taken the route to Jerusalem, they would not have entered Hebron, for they did not belong to Syria, and the camelliers of the country would punish them for robbing them of their livelihood..." (Henniker 1824: 268)

Later in the 19th-century, the Towara Bedouin would not guide travellers beyond Nakhl, where either the Heywat (Borrer 1845: 355/356) or Tiyaha guides and their camels took over (e.g. Maughan 1873: 127; Bartlett 1879: 323, 329). However, late 19th-century travellers requested the Towara sometimes to continue guiding them outside their territory, because they did not want to be delayed by the new Bedouin guides who had not arrived yet with their camels (e.g. Borrer 1845: 360), or because they could use the Towara Bedouin as a kind of hostages to blackmail the new Bedouin to get better prices; if the price of the new guides was not lowered, the travellers threatened to return with the Towara (e.g. Bartlett 1854: 100-104).

In the early 19th-century, Burckhardt could not reach 'Aqaba, because the territory of the Heywat was situated between the northeastern boundary of the Towara territory and 'Aqaba (Burckhardt 1816: 507/508). Possibly this was (and is still) reflected in Nuweiba, which was divided into Nuweiba El Terrabin and Nuweiba el Mzeina (e.g.

Baedeker 1885: 519; Department of Survey and Mines 1934; Survey of Egypt 1943), named after two Bedouin tribes. Later in the 19th-century, the Towara were allowed to conduct the travellers up to ‘Aqaba, but not between ‘Aqaba and Petra as this was Aloween territory (Bartlett 1854: 100). In the late 19th-century, travellers to ‘Aqaba had to change Bedouin guides at the Monastery for Bedouin guides from the ‘Aqaba region (Smith Lewis 1898: 224).

Whereas early travellers were impressed about how Bedouin could find their way through the landscape (e.g. Madden 1829-2: 202), and recognised the footprints of their camels (Burckhardt 1816: 535/536) and of non-Bedouin (Burckhardt 1831: 376/377), later travellers often complained that the Bedouin were ignorant about time and distance in South Sinai’s landscape:

> “Dr. Robinson reported them, on the authority of his Arabs, at half-an-hour's distance, while all mine declared it to be at two hours; and Ibrahim, my interpreter, boldly affirmed that Robinson's book ‘lied’. This was discouraging; but I determined to find out for myself; and thus, sending on the main body, with directions to halt and wait for us in Wady Useit, I took with me Umbarak and Ibrahim, and sheepish enough they looked when in just half-an-hour, as it happened, we reached the principal spring.” (Bartlett 1854: 33)

5.3. Discussion & conclusion

Throughout the 19th-century, particularly English and French travellers repeatedly accused the Bedouin of laziness and vegetation destruction. In reality, the Bedouin were actually very careful managers of the environment, and especially protected their economically important trees, such as date-palms and acacia, through private ownership. Charcoal and dates formed important trade products and dates were part of the staple food, therefore trees required care to guarantee a sustainable source of food and income. The Bedouin clearly developed every part of South Sinai that could be developed in a sustainable way, and they were active agents in planting and replacing trees. Their lifestyle was very sober and adjusted to the desert life. The (mainly English) travellers, on the other hand, travelled in an increasingly luxurious manner in the 19th-century; they made use of the charcoal while accusing the Bedouin of tree and environmental destruction.

Stories about dry-looking gardens and about the destructiveness of the Bedouin were already mentioned early in the 19th-century, and these stories were especially strong in years of drought, such as in 1815 (Turner 1820), in early 1895 (Smith Lewis 1898: 44/45), and in 1906 (Kergorlay 1910). French and English travellers suggested that less rain was the result of the Bedouin cutting too many trees, and if trees or plants drooped as a result of drought, it was suggested that the Bedouin did not water their gardens out of laziness. In years of abundant rainfall, such as 1874, the Bedouin were blamed for environmental degradation, because it was considered that there was enough rain, but few trees because of the destructive nature of the Bedouin. At the same time, travellers contradicted themselves reporting abundant vegetation or old trees, and by claiming that "nothing had changed" since the time of Moses. German travellers do not seem to have considered the Bedouin destructive.

Whereas travellers referred to Wady Feiran as "the Paradise of the Bedouin", the Monastery garden was for most travellers a kind of Garden of Eden in the middle of a dead desert (e.g. Holland 1869-1: 211). The idea of redemption was linked to Christianity and European civilisation, and this played an important part in the travellers' environmental imagination. Travellers mentioned desert greening projects, such as in 'Ayn Musa, where Christians/Europeans had re-greened the desert with hard work and irrigation. However, 'Ayn Musa had only developed after the Bedouin lost the control over Suez in the early 19th-century, and the house that was situated there was in the hands of Europeans; it can therefore be regarded as a symbol for European/Christian power, and it probably served as a strategic location. Ironically enough, projects such as 'Ayn Musa only worked in years with enough rainfall, mainly due to the care of the Bedouin(!), and failed during years of drought.

It is likely that the political power struggle of England and France over the Sinai Peninsula was (at least partly) on the basis of the declensionist/redemption narratives. Under the veil of finding the route of Moses and the Israelites, explorers and researchers mapped South Sinai routes, mountains, water sources and oases. Knowledge of the area was an important tool to win power and control over South Sinai. Both the French and the English invested in exploration. Projects like the Suez Canal, Ordinance surveys, the telegraph line between Suez and Tor, the necessity of firmans to travel through Sinai, the quarantine centres near Tor and Port Tewfiq, and the Monastery of StK itself were expressions of the political control of different governments over the Sinai Peninsula. Even travel agents such as Cook and Son were a form of Imperial control through landscape imagination, and travellers were the embodiment of it. This links in with the suggestion that travel writing and politics are linked (e.g. Gregory 1995; Said 2003; Heffernan 2001).

"The only way to understand the potential of the desert rainfall is to live in the desert. It may rain four or five times a year, or only once, or even not at all. There is never any telling where it will rain or when. You simply have to be there, and wait. Even then, the waiting can be very frustrating. The sky may be completely clouded over, colored a deep gray, sometimes almost cobalt blue, and yet no rain may fall. It may be a beautifully sunny day where you are, and yet at day's end companions will come back from a trip "just the other side of those hills", drenched from a downpour. But eventually, when you are patient, it will happen." (Hazleton 1980: 156)

Chapter 6 Reconstruction of weather events along the routes

6.1. Introduction

Traditionally, the Sinai Bedouin distinguish five seasons, unequal in length and linked to the visibility of specific stars (Bailey 1974). The star Canopus, only visible between mid-October and late April indicates the rainy season (Bailey 1974; Greenwood 1997: 68). The Bedouin year starts at the beginning of the rainy season (Bailey 1974; Greenwood 1997: 68). The seasons run roughly from "early October to early January" (autumn/"Assferi"), early January until mid-February (winter/"Assta"), from "mid-February to mid-April" (spring/"Assmak"), "from mid-April to early June" ("good summer"/"Asseif"), and from early June until early October ("the terrible summer"/"Al-Kez") (Bailey 1974; Greenwood 1997: 68/69).

During the summer, which runs from mid-April until early October, the wind blows predominantly from the north, bringing (very) warm, dry and stable weather. During autumn, winter and spring, from early October until mid-April, the wind can be variable, causing unstable weather and sudden large temperatures fluctuations. In autumn and winter this variability expresses itself in precipitation, (thunder)storms and flash-floods, while in the fifty days of spring (Greenwood 1997: 68) ("fifty" in Arabic is "khamseen"), it can be expressed in oppressively hot, dry and sand-filled winds called Khamseen (for a list of synonyms for khamseen see Appendix 4, p. 349). The Bedouin division of seasons has been used in this chapter to discuss the weather data.

Autumn rains are the most important for pastures, because the soil can only absorb the winter and spring rains efficiently if the autumn rains have been sufficient (Greenwood 1997: 68). Flash-floods can be very powerful and devastating, uprooting trees, creating deep gullies, changing rock formations by moving whole boulders, and in fact changing the whole environment of the affected area. These events can be very local, or they can affect large areas, as the water finds its way through the wadies to the lower elevations and eventually the sea. In the early 19th-century, the monks of StK seem to have estimated the number of rain days between zero and five (Turner 1820: 482), while in the later 19th-century they suggested that "it rains or snows perhaps twenty times in the year - sometimes, though not often, two or three days together" (Bartlett 1879: 266); this may suggest that (part of) the first half of the 19th-century was drier than (part of) the second half of the 19th-century. The number of rain days in El 'Arish (North Sinai) has also been estimated at around twenty, while in Nakhl (Tih) and Taba (eastern Sinai) the average is only five days (Greenwood 1997: 59). However, in years of drought there may be little or no precipitation at all (e.g. Turner 1820: 482) independent of the normal average.

Carrington Bolton (1890: 579) pointed out that the data from traveller diaries are "unreliable...for scientific conclusions as to the meteorology of the country". This is probably true for data from instrumental measurements such as thermometers (e.g. Burckhardt 1816: 570; Turner 1820: 5; Henniker 1824: 87; Arundale 1837: 25; Tyrwhitt 1864; Bartlett 1879; Hull 1885; Carrington Bolton 1890; Liebenau 1896: 29; Schneller 1910: 206) and barometers (e.g. Palmer 1871-1; Bartlett 1879), because it is impossible to know how precisely these instruments measured, and to what extent values were comparable. The temperature felt by the travellers was just as subjective (e.g. Anon. 1848-2: 365). However, travellers reported many objective data, such as the presence of rain, snow, drought, khamseen winds, storms, and flash-floods, which are extremely valuable in the absence of other weather records. It is likely that data are very complete for the period of the traveller's visit, because some events, such as sandstorms and very high temperatures, were contrasted with the weather of their home-country, while clouds, strong winds, precipitation, (thunder)storms and flash-floods may have clashed with their expectations of a desert. Travellers were also focussed on weather events described in Exodus, such as “dew” and “frost on the ground” (Ex. 16:14), “thunders and lightnings” and “a thick cloud” (Ex. 19:16). The weather data from traveller diaries, though limited in space and time, form the most complete weather data for South Sinai, and provide some insight in the still poorly understood frequency and sequence of weather events. They may also give some clues about changes in frequency of events over time, and help improve models and prediction of life-threatening weather events (e.g. Cools *et al.* 2012; El Afandi *et al.* 2013).

This chapter focuses on the weather events and its possible indicators, the weather experience, adaptation and prevention of the travellers, Bedouin and monks.

6.2. Reconstruction of South Sinai’s 19th and 20th century (extreme) weather events

6.2.1. Data used for the reconstruction & seasons of events

The reconstruction of the 19^{th} and 20^{th} century weather events (Fig. 15), is a compilation of data on precipitation (rain, snow, hail, and flash-flood), storms (thunderstorm, khamseen), and drought. These events were generally described in detail by the travellers (table 5, p. 280), and form the extreme weather events of South Sinai. As the frequency and intensity of these events is expected to change with climate change, and societies are least adapted to extreme events (e.g. Endfield 2014), these data are the most informative. There were also strong wind gusts, rainless storms, and sandstorms without the typical characteristics of the khamseen, but they were of less interest for the weather reconstruction, because they were not seasonal but occurred all year round (e.g. Turner 1820: 422; Plowden & Plowden 1868: 337-339; Bartlett 1854: 82; Österreich 1895: 26); they seem to have been connected more to daily fluctuations (e.g. Palmer 1871-1: 241-243).

Traveller data show that rainstorms take place between early October and early June, and hail- and snowstorms between early December and the end of March. Flash-floods, also called "seil" (Palmer 1871-1: 22; Buxton 1895: 141), and floods, also called "fayadan" (Marx 1999: 345), have been recorded between October (e.g. Hull 1885) and late May (e.g. Marx 1999). They occur in the wadies which drain the high mountains of South Sinai, and the Tih Plateau in Central Sinai, and are caused by extremely heavy rainfall in the wady itself or in the higher areas which are drained by the wady. Although Greenwood (1997: 68) suggested that thunderstorms sometimes happen in autumn (October - early January), traveller data proved that thunderstorms can take place up to mid-May (Burckhardt 1816: 534).

Sandstorms were mentioned more or less all year round, and arrived either with southern winds or northern winds. However, the Khamseen only arrives with southern winds, and although it is said to be restricted to spring time (mid-February until mid-April), the season may actually fluctuate per year. Khamseen has been recorded between late January (e.g. Carrington Bolton 1890), and May/June (e.g. Dumas 1839). It was not always clear if the droughts mentioned by travellers were actual or "imagined" drought based on the pre-determined understanding of what they might expect to experience in this desert environmental. There was more certainty of a real drought if more than one traveller mentioned a period of drought, if the Bedouin asked the monks to climb Mount Sinai to pray for rain, or if the travellers received information about drought from the Bedouin. Weather events were sometimes local and sometimes spread over a larger area. Travellers either experienced the events or received information from the monks or Bedouin.

Fig. 15 gives an overview of the weather events in South Sinai that were found in the 19th and 20th century literature that was studied for this thesis. Both temporal and spatial dimensions are added, because weather events can be very local. Any available data can therefore not be generalised for the whole of South Sinai.

6.2.2. Reconstruction of the 19th-century weather data

In the early 19th-century, there were consecutive years of widespread drought in South Sinai. This may have spread from the central-western area (1806/1807-1815) over the area of the Monastery (1809-1816) to southern and eastern Sinai (1813/1814-1816) (Burckhardt 1816; Fazakerley 1820: 367; Turner 1820: 433). April 1807 seems to have been relatively cold (Seetzen 1855). However, in the winter of 1811, some rain and quite a lot of snow was reported in western Sinai and around the Monastery (Fazakerley 1820). Possibly this was a wetter year within a succession of dry years. This drought seems to have finished in the winter of 1815 for North Sinai, where they received "copious rains" (Burckhardt 1816: 505), and in the spring of 1816 in eastern Sinai, where Burckhardt (1816) reported several rain events. It is not very clear if western Sinai received much rain in 1816.

Burckhardt and his Bedouin guide experienced cold, wet weather in May and early June 1816, which seems to have been quite late in the season. Even after mid-May they were sometimes forced to make fires in order to keep warm (Burckhardt 1816: 537, 588). Burckhardt concluded that summer rains occurred regularly, but that the amount of rain was much less in summer than in winter (Burckhardt 1816: 539). Although there are not many accounts of travellers who travelled in summer, summer rains are extremely rare in this area today. However, Burckhardt's account does fit with the data of East Asia, where the temperatures were lower than normal, possibly due to the eruption of the Tambora (Indonesia) in April 1815, and its worldwide effects the following year, now dubbed "the year without a summer" (Oppenheimer 2003; Raible *et al.* 2016). Burckhardt's weather experiences in South Sinai may therefore not be representative for the "normal" weather during these months of the year.

In the early 1820s, Henniker (1824), Carne (1826), and Wolff (1824) mentioned some rain, but nothing exceptional. In the late 1820s, probably around 1827, there was another period of drought. There was little water available in western Sinai, and there must have been a drought around the Monastery, because the Bedouin asked the monks to climb Mount Sinai to pray for rain (Renouard de Bussiere 1829: 257/258, 269/270). In the February/March 1828, De Laborde mentioned a "marshy" area between El Wady and Tor (De Laborde 1838: 233) and he found water and snow in the high mountains. However, he travelled without a tent, mentioning that "it would be superfluous, except in the rainy season" (De Laborde 1838: 44), which may suggest that it had been very dry in the preceding years, or possibly he had read Burckhardt (1816) and Turner's (1820) books, who travelled in the summer without tents. In 1830, there was a strong khamseen wind lasting one-and-a-half days in western Sinai (Dumas 1839: 239/244). This was relatively long and strong in comparison to other khamseen reported in the 19th-century, and since it was reported by Dumas, who did not travel to South Sinai himself, the information may have been incorrect or manipulated.

This relatively dry first three decades of the 19th-century seem to agree with the low Nile levels mentioned by Johnson (1992) and Hassan (2007) for this period, and the low levels of the Dead Sea mentioned by Klein & Flohn (1987). Tree-rings of Jordan (Tarawneh & Hadadin 2009) show extreme drought for 1827, when there was drought around the Monastery.

From the 1830s, it seems to have been wetter in South Sinai. In spring 1831, animals drowned in western Sinai as a result of a flash-flood (Aucher-Eloy 1843: 730). In 1833, there seems to have been more than normal snowfall (Geramb 1899: 173). Late March 1836, there was a flash-flood within one day northeast of the Monastery of

StK (Stephens 1996: 211/212). In October 1845 most of the inhabitants had left Wady Feiran and the valley was "not carefully cultivated" Bartlett (1854: 70), and in autumn 1845, the Monastery garden was damaged by excessive rainfall (Bartlett 1854: 79); possibly both were the result of a flashflood. In 1846, there must have been quite some winter rain, because the desert was "quite green" (Money-Kyrle 1843-6). On the 8th February 1848, there was a flash-flood in Wady Feiran, Wady Solaf and the Mount Sinai area (Anon. 1848-2: 363), and in 1849, it snowed seven consecutive days around the Monastery (Graul 1854). In 1853, the khamseen affected South Sinai before reaching Cairo, where it was reported to be longer than normal, and this was followed by excessive snowfall around the Monastery (Graul 1854). After an excessively hot summer in 1855, the winter of 1856 seems to have been relatively wet, with several showers in South Sinai, North Sinai, and between Cairo and Suez (Bonar 1857).

In the years 1844-1845, there was a Nile drought, which seems to in anti-phase with the weather around the Monastery, although Bartlett (1854) did suggest drought in the area (Bartlett 1854: 81), and 1855 was a weak Nile year (Johnson 1992), which seems to correspond with the extremely hot summer in South Sinai. The Dead Sea level showed fluctuations in this period (Klein & Flohn 1987). The *Pistacia* trees of Mount Serbal that were only sensitive to November temperatures, show narrow rings from 1844-1862 (18 years), but it is not very clear if this suggests lower or higher November temperatures. *Juniper* in North Sinai (Jebel Maara) also showed narrow tree-rings for a period of 18 years (1832-1850).

In the early 1860s, some rain and quite a lot of snow were recorded (e.g. Tyrwhitt 1864; Brocklebank 1865), but nothing extraordinary. The late 1860s and early 1870s, however, may have been relatively wet in western Sinai and around the Monastery. On the 3rd December 1867, an extreme flash-flood took place in Wady Feiran, Wady 'Aleyat

(Holland 1868-2: 248/249), and Wady Solaf (Palmer 1871-1: 151; Shuqair 1916: 84), in which 35 to 50 Bedouin were killed (Shuqair 1916: 84; Clifton 1900: 3). In the winter of 1868-1869, several normal to heavy rain and snow events were reported by Palmer (1871-1) and Holland (1869/1) around the Monastery and in western Sinai. However, in central and eastern Sinai, drought was mentioned in 1869-70 (Palmer 1871-2: 324/325, 387, 394). In May 1872 there was a flash-flood through the Monastery's garden (Bartlett 1879: 266). In winter and spring 1874, there were 10 "normal" to heavy rain and snow events reported around the Monastery and in western and central Sinai, which seems to have been more than normal. Bartlett (1879: 248-251) mentioned that the snow on Mount Serbal was in some places waist-deep. According to the monks "there had been twice the usual amount of snow" in the mountains in 1874, but Bartlett noticed that there had been hardly anything around the Monastery itself (Bartlett 1879: 260-266). It even snowed in Suez on the 21st March 1874, while normally it snows only on the highest mountain tops of South Sinai, and this was followed by heavy rain later on the 21st and the 22nd (Taylor 1886: 37/38).

This wet period between 1868 and 1875 must have been significant for western South Sinai, because that was the only period in the 19th-century that the precipitation-sensitive *Pistacia* on Mount Serbal showed wide tree-rings (Liphschitz *et al.* 1987). Nile records showed a drought for 1866-1868 (Johnson 1992), which seems to have moved over the Tih (1869-1870) to Jordan where the tree-rings showed a two-year extreme drought in 1870-1871 (Tarawneh & Hadadin 2009). The wet period in South Sinai was in anti-phase with the drought (1856-1881) that was going on in the northern Mediterranean (Cook *et al.* 2016); 1864 seems to have been an exception because it was an exceptionally wet year in the Mediterranean (Brewer *et al.* 2007). The 1873/1874 "catastrophic drought" in southwestern Turkey (Heinrich *et al.* 2011), seems to have corresponded with a wetter-than-normal year in South Sinai.

The second half of the 1870s was, at least partly, relatively dry. In spring 1877, little precipitation was reported around the Monastery and in western Sinai, and there was a drought between 1876 and late spring 1878 in the eastern part of the Sinai Peninsula (Holland 1878: 455). In late October or early November 1883, a Bedouin camp was swept away by a flash-flood in Wady Sidr, western Sinai, and some rain was reported in south and central Sinai (Hull 1885). March 1889 may have been the end of a drought in western Sinai, as Carrington Bolton (1890: 590) wrote that along the west coast of Sinai, "all wells were very low, and in some places entirely dried up". However, there had been rain just a few days before, so it was not entirely clear if this was the end of a drought, an ongoing drought, or if sand had slipped into the wells; he reported several days of khamseen immediately followed by two days of rainfall in western Sinai (Carrington Bolton 1890). 1893 and early 1894 seem to have been relatively dry in western Sinai, even though some rain and snow was reported in January 1893 in Western Sinai and around the Monastery (Liebenau 1896).

This was followed by some powerful rain and snowstorms in the winter and spring of 1894. Around the 7th February, a flash-flood had wiped out a Bedouin encampment in Wady Solaf (Buxton *et al.* 1895: 152). In February and March 1894, travellers reported several days of heavy rain- and snowstorms in a wide area around the Monastery, which caused destructive flash-floods in different parts of the Peninsula and many casualties among the Bedouin (Buxton 1895; Buxton *et al.* 1895; Österreich 1895; Loti 1993). At least "two...camps of Europeans in different parts of the peninsula were invaded by the flood" (Buxton 1895: 147), among them probably "Messrs. Cowley and Stenning" mentioned by Smith Lewis (1898: 112). However, at the end of February 1895, there seems to have been another drought, as the Bedouin asked the monks to climb Mount Sinai to pray for rain (Smith Lewis 1898: 112/113), because there had not been any rain around the Monastery and in other parts of South Sinai between March/April 1894 and the end of February 1895. By 1895/1896, drought or storms had damaged the cypresses beyond recovery, and in February 1897 the "old gaunt cypresses had been cut down, and fresh young ones had taken their place" (Smith Lewis 1898: 208).

The Nile data also indicate drought in 1877, and 1890, which was the end of a 10-year drought (Johnson 1992). The tree-rings of the *Pistacia* trees on Mount Serbal that were only sensitive to November temperatures showed wide rings between 1882 and 1890 (8 years), which may indicate that the November temperatures were lower or higher than normal during this period. The wide tree-rings of *Juniper* on Jebel Hallal between 1883-1892 (9 years) suggested warmer summers and autumns or cooler winters. This may be linked to the eruption of the Krakatoa in August 1883, but further research is needed to explore this potential link. The flash-flood in October/November 1883 in Wady Sidr, a drainage of the Tih, seems to have been quite exceptional, because generally flash-floods seem to have taken place on the eastern side of the Tih (Wady Watir) rather than on the western side, and if they took place on the western side it was normally further to the south in drainage wadies of the high mountains, e.g. Wady Feiran, not the Tih. However, this may have been deceptive, because of the limited amount of data which has been studied. Tree-ring data from Jordan show extreme drought in 1895 (Tarawneh & Hadadin 2009), which matches with the data of the area around the Monastery.

Presumably in the late 1890s, Clifton (1900: 18) reported a period of four consecutive years with "no rain and very little snow" around the Monastery; the well of Elias on Mount Sinai had dried up two consecutive summers. During this period there were "El-Niño-induced famines...in Anatolia and Iran" (Mikhail 2013-1: 7). The year that Clifton visited, which was probably in the late 1890s or 1900, was probably the end of the drought as there had been five or six days of rain. However, spring 1897 seems to have been relatively wet, as several normal to heavy rainstorms and some snow were reported around the Monastery and in western Sinai, and possibly a (flash)flood in Wady Hebran (Smith Lewis 1898). There was also some snow in late 1898 (Hume 1901). Clifton possibly travelled earlier in the 19th-century, and only wrote up her work in 1900. On the other hand, it may be that the last part of the 19th-century was actually quite dry, as there was a drought reported for 1899-1921 for the Nile (Johnson 1992). The tree-rings do not, however, indicate a drought in these years and the Dead Sea level increased in the last 20 years of the 19th-century more or less in anti-phase with the situation in South Sinai.

6.2.3. Reconstruction of the 20th century weather

The 20th century started off with a two-year drought around the Monastery. The monks provided the Bedouin who lived within three days of travelling from the Monastery daily with bread during this period of famine, and they went to the top of Mount Sinai to pray (with success) for rain in early November 1903 (Schoenfeld 1907: 55/56). In March 1906, there was a very strong flash-flood that damaged part of the Monastery's southern wall and northern entrance (Shuqair 1916: 84). There was more than normal snowfall in the winter of 1907/1908 around the Monastery (Hobbs 1995: 10), but during this period, there was already a drought going on in western Sinai. In March of probably 1909, there was no water in the well on the top of Mount Serbal (Schneller 1910: 133), which was exceptional according to Schneller's Bedouin guide, and the result of an ongoing three-year drought (probably 1906-1909) (Schneller 1910: 102, 137/138). In the same year, there been no rain for a year near Suez (Schneller 1910: 20). Between 1911 and the 11th April 1914, there was an ongoing drought around Nuweiba (Brockbank 1914: 40). The Bedouin considered the period between 1926 and 1936 "relatively dry" in northeastern Sinai, which does not seem to have been the case in Palestine over this same period (Gottmann 1939: 515). However, the spring of 1929 around the Monastery was extremely wet (Hobbs 1995: 12), and in early 1930 there may have been several flash-floods in Wady Shellal (Barrois 1932: 103). This again seems to match reasonably well with the relative low amount of rainfall in East Africa feeding the Nile in the first three decades of the 20th century (Johnson 1992).

There was very high rainfall in 1903 in the Ethiopian highlands (Conway 2000), and later that year rainfall ended a drought around the Monastery. However, the flash-flood of 1906 and the heavy snowfall around the Monastery in 1907-1908 are not reflected in any of the other data, and seem in anti-phase with what was happening in East Africa. In fact the narrow tree-rings from 1905-1962 of the *Pistacia* trees on Mount Serbal, which are sensitive to November temperature, may suggest warmer or cooler autumns/winters. The tree-ring data from North Sinai suggests cooler summers/autumns or warmer winters from 1932-1947 and 1957-1966, and possibly increased precipitation between 1911-1922 (Liphschitz *et al.* 1987). In 1914-1915, the data for East Africa show wet weather (Johnson 1992), while there was drought in eastern Sinai, and the tree-rings of Jordan also showed extreme drought (Tarawneh & Hadadin 2009). In 1926 or 1927, there were relatively large amounts of snow in South Sinai, but this seems to have been in anti-phase with the drought in East Africa at this time. However, in 1930, there were strong Nile floods and there was a flash-flood in western Sinai.

The late 1960s and early 1970s seem to have been quite wet in western Sinai, with flash-floods in Wady Feiran in the winter of 1967/1968 in Wady Feiran (Eichler & Scheuerbrandt 1983: 213), in May 1968 in Wady Feiran (Eichler & Scheuerbrandt 1983: 196; Marx 1999: 345), in 1970 and 1973 (Eichler & Scheuerbrandt 1983: 213), and in February 1975 (Marx 1999: 345). There was also excessive snowfall in December 1972 in the high mountains around the

Monastery, which stayed for about three months (Hobbs 1995: 10). The second half of the 1970s was dry for most of South Sinai. In 1979, there had been a two-year drought around the Monastery, and what seems lower than normal rainfall in western Sinai (Eichler & Scheuerbrandt 1983), and a three-year drought in eastern Sinai, which seem to contradict a photo of Wady Watir (ES) in the winter of 1977/1978, which showed a lot of water (Nomachi 1979: 122). In 1979, there must have been quite a large amount of snow in the high mountains, because the melting snow caused a mudslide in Wady Kid and Na'ama Bay (Semsek 2008: 407), while in the 1980s, there was a drought around the Monastery from 1982 until May/June 1989 (Hobbs 1995: 12).

The second half of the 1980s brought flash-floods in October 1987 and 1988 in Wady Watir (eastern Sinai) (Cools *et al.* 2012), and a flash-flood in April 1989 in Wady Feiran, just west of the Monastery (Hobbs 1995: 13). In the 1990s, there were flash-floods in Wady Watir (ES) in October 1990, in Wady Feiran (WS) in March 1991 (Hobbs 1995), in 1996 in Wady Kid and Na'ama Bay (ES) (Semsek 2008: 407), and in October 1997 in Wady Watir (ES) (Cools *et al.* 2012)[21]. From 1997 to 2000, there was drought around the Monastery and in Nuweiba (Binder & Binder 2000).

In the 21st century, it seems to have been quite wet in northeastern Sinai, with flash-floods in 2002, 2004, 2008 and 2010 in Wady Watir (ES) (Cools *et al.* 2012). The mid-1960s to late 1980s were relatively dry in Eastern Africa (Conway 2000), very wet in Turkey (Jones *et al.* 2006), and South Sinai seems to have had more or less wet years from 1965-1975 in western Sinai, drought conditions throughout South Sinai in the last part of the 1970s, and drought throughout

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[21] I only discussed the flashflood data from Cools *et al.* 2012 here. They also mentioned rainfall, but it was not clear how this could be coded for Fig. 15.

most of the 1980s around the Monastery. In the second half of the 1980s, southwestern and northeastern Sinai experienced several flash-flood events, but drought continued in the area around the Monastery (Hobbs 1995: 12; Cools *et al.* 2012). In the 1990s and 21st century, eastern Sinai may have experienced more flash-flood events than normal, but at this point there are not enough data about this area to compare with earlier periods. Between the late 1990s and the 2010s, there seems to have been a period of prolonged drought throughout the Eastern Mediterranean, in South Sinai and over the Arabian Peninsula (Almazroui *et al.* 2012; Dadamouny & Snittler 2015; Cook *et al.* 2016).

6.2.4. Some conclusions and thoughts on the 19th and 20th-century weather data

The weather data mentioned in the 19th-century diaries of South Sinai travellers are rich and informative. However, they are only temporal and spatial snap-shots extracted from a selection of 19th-century literature. Data from late winter and early spring are overrepresented, because 19th-century travellers predominantly visited South Sinai during these months. There are many gaps in the data in time and space, and those presented here should therefore be interpreted with caution.

Nevertheless, several conclusions can be drawn. The first thirty years of the 19th-century seem to have been the longest dry period of the whole 19th-century. From the data that have been studied it seems that other dry periods were on average between one and three to four years, which reflects reports that droughts of "three to four years" were common in the second half of the 19th-century around the Monastery (Hobbs 1995: 12). Slightly longer periods of drought seem to have taken place at the very end of the 19th-century and start of the 20th century, and in the 1980s around the Monastery. However, there are many data missing for both centuries, so there may be other periods of drought. Apart from fluctuations in precipitation, there were also temperature fluctuations, which both seem to be reflected quite well in the South Sinai tree-rings, but are not straightforward to interpret. From the 19th-century data it is clear that drought cannot only be defined by "no rain"; the total amount of precipitation in a rain season, the timing of the showers, the number of events, the time between rain seasons, and other factors such as the temperature and evaporation in different seasons also play a role.

The available 19th-century data, which are predominantly from western Sinai and the area around the Monastery, generally show a very high overlap with the data from the Nile and the rainfall in the high mountains of East Africa, which feeds the Nile. Four drought periods (1827, 1870-71, 1895 and 1914-15) appeared as extreme drought years in tree-ring data from Jordan suggest that these drought years were spread over a larger area in the Middle East. The two-year drought, first seen in the Nile level between 1866-1868, then in the Tih and eastern Sinai in 1869-1870, and afterwards in Jordan in 1870-1871 may suggest a movement from southwestern to northeastern direction. Furthermore, the length of drought spells may be influenced by more global weather systems. However, the tree-rings in Jordan only seem to show the droughts in eastern Sinai and around the Monastery of StK, but not those of western Sinai. During the periods 1868-70, 1876-78, 1896-1897, and 1899-1900, which are (at least partly) overlapping with drought periods in South Sinai, East Africa and the Middle East, there was drought in India, due to lower rainfall than normal during the Indian Monsoon (e.g. Meena 2015), and at least during 1876-78 and 1899-1900 also in other parts of East Asia (e.g. Davis 2000). These events have been linked to strong El Niño/Southern Oscillation (ENSO) and higher than normal Sea Surface Temperature (SST) (Davis 2000; Ihara *et al.* 2008). Nile levels have been linked to these systems but also to the North Atlantic Oscillations (e.g. Hassan 2007; Santoro *et al.* 2015), and it is likely that a combination of these systems defines the weather in South Sinai.

On the Sinai Peninsula, but also for instance, the Arabian Peninsula, and the Indian Peninsula, the areas that receive most rainfall are situated in the southwest along the coast (e.g. Almazroui *et al.* 2012: 43), and along the line from the southwest to the northeast. This can be explained by the situation near the sea, the pushing and pulling factor caused by the land mass which warms up and cools down much more quickly than the sea with the movements of the sun, and the dominant wind directions caused by the Hadley and Ferrell cells. However, the Sinai Peninsula and the Gulf of Suez are very small land and sea masses in comparison with the Arabian and Indian Peninsula; Sinai is almost completely surrounded by sea, and is more or less cut in the middle by the 30° meridian, which means that there may be many influences on the weather.

The 20th century data presented here are very limited. Although Fig. 15 seems to show an increase in flash-flood events in the 20th and 21st century, this is likely to be a distortion caused by the more systematic registration of flash-floods in Wady Watir from the 1980s onwards (Cools *et al.* 2012) and from the late 1960s onwards in Wady Feiran. Nevertheless, the frequency of flash-floods in the late 1960s and early 1970s in Wady Feiran, and in the 1980s, 1990s and the first decade of the 21st century seems extraordinary high. While the middle of the 20th century the weather seems to have been relatively stable worldwide, El Niño has been influential from the 1960s onwards (Ihara *et al.* 2008). This may explain some instability in South Sinai too, although there are no drought data among the collected data for the 20th century to explore possible connections for this period in more depth.

6.3. Indicators for weather prediction based on traveller data

Travellers often wrote about weather events in a broader context than just the event itself, and included information about wind-directions, clouds, temperature, and observations linked to the events. This information is very valuable for South Sinai, because the mechanisms underlying weather events are still little understood in this area.

6.3.1. Wind direction as an indicator of khamseen and precipitation

Throughout the year, northern winds dominate in South Sinai. Northern winds have been generally described as gusty or stormy (e.g. Turner 1820: 422), and refreshing (e.g. Turner 1820: 420/421; Seetzen 1855: 68; Brockbank 1914: 29). They occasionally carried some sand (Turner 1820: 412, 422; Seetzen 1855: 131), but these sandstorms were generally less intensive and shorter than the khamseen, and without the characteristic heat of the khamseen. Generally, northern winds brought dry, stable, cloudless, warm, and sunny weather (e.g. Bishop Bird 1886/3: 314; Österreich 1895: 62/63), and rarely some humidity or mist in winter clouds (Bonar 1857: 180). However, Shuqair (1916: 84) suggested that the 1906 flash-flood arrived with northern winds, and this was also the case with the flash-flood in eastern Sinai in 2010 (El Afandi *et al.* 2013). Other travellers also suggested that precipitation and thunderstorm arrived with northern winds, but these events were preceded by southern winds that brought in clouds (e.g. Anon. 1848-1: 316); this was also described between Cairo and Suez (Graul 1854: 189/190).

Northeastern winds were described as very cold winds, but they did not carry precipitation (e.g. Bishop Bird 1886-2: 233). Western winds could bring some clouds (e.g. Arundale 1837: 37) or blow away clouds (Bishop Bird 1886/1: 174), and occasionally brought rain, storm and thunderstorms over Sinai and the adjacent areas (Kinnear 1841: 54; Bonar 1857: 77; Field 1888: 210/211), but these were generally without precipitation (Seetzen 1855: 108; Bishop Bird 1886/1: 174; Schoenfeld 1907: 44/45).

Shifts between northern and southern winds were experienced as days with little or no wind, followed by sudden changes in temperature, wind direction and weather conditions (e.g. Burckhardt 1816: 611). The play between the two wind directions could take place for a few days before there was either a storm or a shift to northern winds for a longer period of time. The shift from northern to southern winds was followed in winter by low temperatures and often precipitation (e.g. Burckhardt 1816: 606; Liebenau 1896: 25/26), but in spring and early summer it could also bring high temperatures and Khamseen winds (e.g. Dumas 1839: 192). The change from southern to northern winds was characterised in autumn and winter by temperature increase and a blue sky. In springtime and early summer, it would bring temperature increase and open skies after precipitation and low temperatures, but if there had been khamseen winds, the northern or northwestern winds, also called "Shamal", would bring a sudden end to the khamseen winds and a temperature drop, sometimes accompanied by mist or some rain (e.g. Carrington Bolton 1890: 582; Greenwood 1997: 57).

Southern winds only blow occasionally for a couple of days in a row, and are generally the sign for weather change. In South Sinai, travellers noticed that the Khamseen arrived with very warm southern (e.g. Graul 1854: 197; Stanley 1857: 66/67; Ballantine 1866: 119; Carrington Bolton 1890: 581/582), and southwestern winds (Günnel 1847: 27). Southern, southwestern and southeastern winds also caused Khamseen in North Sinai (Wittman 1804: 202; Seetzen 1855: 43, 49), Suez (Turner 1820: 412) and other parts of mainland Egypt (e.g. Antes 1800: 94; Fitzclarence 1819: 472/473; Edmonstone 1822: 53; Henniker 1824: 85/86; Fuller 1830: 164). The Bedouin recognised the approach of the khamseen by the "red lines" in the sky (Dumas 1839: 239), a characteristic which was also mentioned by later travellers such as Günnel (1847: 26) and Kazantkazis *et al.* (1975: 132/133). However, this was only visible shortly before the khamseen arrived, and it did not indicate the strength and length of the sandstorm. Some travellers also noticed a sulphurous smell of the air during the event (e.g. Günnel 1847: 27).

This red colour, the sulphurous smell and the reaction of the local inhabitants to lie on the floor during the event, was also described on the Arabian Peninsula (Niebuhr 1792-2: 318). Southern, southeastern and eastern winds also brought precipitation and sometimes thunderstorms in winter and spring. Seetzen (1855: 49) described a southern wind before a thunderstorm, and noticed that the southern and southeastern wind was very cold (Seetzen 1855: 62). Wittman (1804: 157, 360) observed the same patterns in the early 19th-century in the southeastern Mediterranean, and also on the Red Sea, rain arrived with southern winds (George 1811: 289).

The rain and snow events in late February, early March 1894 were observed by at least three different traveller groups in different parts of South Sinai. A reconstruction based on the material from these traveller diaries shows that rain first arrived in southeast Sinai on the 26th February (Österreich 1895: 34), likely with winds from the same direction. On the night of the 27th to 28th, there was a rain- and thunderstorm further northwest, in Wady Solaf (Buxton *et al.* 1895: 152), while there was a rainless storm in the southeast (Österreich 1895: 38); it is not clear if this rain and thunder arrived from the southeast, from the northwest, or if this was the earlier storm of the 26th that was blown back by northwestern winds. On the evening and night of 28th February to 1st March, there was rain in southeast Sinai (Österreich 1895: 39), very heavy snowstorms around and west of the Monastery (Loti 1993), but a rainless storm in Wady Hebran (Buxton *et al.* 1895: 152), which is southwest of the Monastery. Loti described a very cold "headwind", which brought "rain, sleet, and hail" and snow (Loti 1993: 23); this must have been an eastern, southeastern or southern wind, because they were about one day west or northwest of the Monastery, moving towards the Monastery, when this happened. However, as there was no precipitation in southwestern Sinai, it is likely that the wind came from southeastern direction. On the afternoon of the 1st March 1894 there were rain- and snowstorms in the southeast, around the Monastery and southwest of the Monastery (Buxton *et al.* 1895: 154; Österreich 1895: 40/41; Loti 1993). Possibly, the rainstorms turned further to the north over the Tih, because a few days later, Loti noticed a lot of water in Wady el 'Ayn, eastern Sinai, which suggests that it must have rained either there or in the Tih, which is drained by Wady el 'Ayn (Loti 1993: 56). Schoenfeld (1907: 65-67) described how heavy clouds, a thunderstorm and very heavy rain arrived from eastern direction.

In some cases khamseen and precipitation were mentioned just a few days apart. On the 15th March 1906 there was khamseen followed by rain near Petra (northeast of Sinai), and cloudy weather on the 16th (Kergorlay 1910: 339/340). Although it is not clear if this weather also occurred in South Sinai, or if the wind changed on the 16th, but on the 17th March there was a severe flash-flood at the Monastery (Shuqair 1916: 84). In spring 1926 or 1927, there was a khamseen after snowfall in the high mountains (Kazantkazis *et al.* 1975; Nomachi 1979). Schoenfeld (1907: 20) mentioned a sandstorm with high temperatures several days before the storm experienced at the Monastery, although this would not be called a khamseen, because it was in autumn!

There were some clear examples of these shifts between northern and southern winds in South Sinai. For instance, on the 16th March 1912, there was a sudden temperature drop around the Monastery, followed on the 17th by a windless sunny day (Sutton 1913: 94/95), and on the 18th by southern wind, heavy clouds, very strong winds, but the expected thunderstorm did not arrive (Sutton 1913: 104/105). Two days later, cold weather was initially followed by a windless day, and then a strong northwestern wind brought sunny and warm weather (Sutton 1913: 115-123). Another example was in late February/early March of 1894, when after some windy, dry and sunny days with large temperature differences between night and day, there was first a very "hot" and "dreary" day (Loti 1993: 14), possibly the windless day, before the temperature plunged, which was followed by a thunderstorm with heavy rains and wind in the wadies (Buxton *et al.* 1895: 152; Loti 1993: 19/20), and snow on the high mountains tops (Buxton *et al.* 1895: 152; Loti 1993: 23). These events continued the day after (Buxton *et al.* 1895: 152; Loti 1993: 23/24), and Loti (1993: 23) noticed dark clouds arriving from southern direction. A third example was in early March 1877, when very windy weather was followed by hazy weather and "a sharp cold wind" around Mount Serbal (Scott 1927: 22-24), and a cold, windy day with "rain and hail" on Naqb Hawy and around the Monastery of StK (Scott 1927: 27-31). The two days that followed were very cold, windy and slightly cloudy, and there was snow and ice on the high mountain tops (Scott 1927: 40). This was followed by clear, warmer and windless weather in the mountains and a sandstorm over El Qa'a (Scott 1927: 45/46).

6.3.2. Clouds and other signs of humidity in the air

Clouds are relatively rare in South Sinai and could be a sign of upcoming precipitation or storms. Apart from storms, clouds could cause several small showers spread over the course of the day (e.g. Bonar 1857: 247/248) or over several days (Binder & Binder 2000: 60/61, 78), or they could produce very little or no precipitation at all (e.g. Anon. 1848: 316; Graul 1854: 222; Seetzen 1855: 55; Bonar 1857: 114; Field 1888: 246; Buxton *et al.* 1895: 105; Liebenau 1896: 61; Smith Lewis 1898: 114; Sutton 1913); in the last two cases, the main precipitation could fall over another part of the Peninsula (e.g. Anon. 1848-2: 363), or elsewhere. Sometimes, clouds appeared and disappeared some consecutive days before they released precipitation, such as before the heavy flash-flood on the 3rd December 1867 in Wady Feiran (Holland 1868-2: 248), and before the rain on the 27th February 1874 in Serabit el Qadim (Bartlett 1879: 306/307). Clouds were sometimes mentioned in the morning or evening (e.g. Schoenfeld 1907: 17), or during the heat of the day (e.g. Hindley 1850: 27), but these were generally quite light, did not cause any precipitation, but tempered the temperature by filtering the sunlight (Bonar 1857: 180). Clouds which carried precipitation and storms were dark, dense and accompanied by strong winds (e.g. Bonar 1857: 236/237; Holland 1868-2: 248; Palmer 1871-1: 127; Buxton *et al.* 1895: 108; Smith Lewis 1898: 250/251; Schoenfeld 1907: 65; Loti 1993: 19-24).

Sandstorms were sometimes mistaken for clouds. Clouds and precipitation mainly arrived with the southern, eastern (Schoenfeld 1907: 65) and sometimes northern winds. The day after a heavy storm, precipitation or khamseen, the sky was generally cloudless and sunny (e.g. Burckhardt 1816: 534; Dumas 1839: 245; Österreich 1895: 41; Schoenfeld 1907: 68; Loti 1993: 42; Stephens 1996: 212/213). However, if there was more precipitation to come, the clouds continued to appear and drop precipitation until all the precipitation was gone and the clouds disappeared (e.g. Loti 1993: 20-41). The intensity of storms and the amount of precipitation were quite unpredictable. Even if all the signs for precipitation or storms are present, it is not necessarily followed by the actual events (e.g. Sutton 1913), and very heavy flash-floods, such as the one on the 3rd December 1867, started as an innocent drizzle (Shuqair 1916: 84).

Fog, mist or haziness was mainly reported in winter and early spring, often before or after precipitation or sandstorms, or after change in wind direction from southern to northern winds (George 1811: 327/328; Burckhardt 1816: 512; Fazakerley 1820: 372/373; Kinnear 1841: 93/94; Koller 1842: 79; Bartlett 1854: 151-162; Seetzen 1855: 43-85; Bonar 1857: 117/118, 235-239, 245-248; Palmer 1871-1: 127, 180, 237, 249/250; Maughan 1873: 100, 137; Carrington Bolton 1890: 578/579; Scott 1927: 78/79, 82, 85; Plowden 1940: 100-102). For instance, in March 1889, "heavy mists" followed after a sandstorm, a change from southern to northern wind, and a temperature drop of 26 degrees within one day (Carrington

Bolton 1890: 582). Tyrwhitt (1864: 343) mentioned that "thick mist" rolled in from the south, seen from the top of Umm Shomer. Wittman observed that storms on the Mediterranean, north of Sinai, were preceded by "haziness of atmosphere, coming from the southward...and a large disk or circle round the moon" (Wittman 1804: 358). Mist and fog were also mentioned as a morning event, especially over the gulfs; this disappeared as the sun rose (e.g. Hull 1885: 65; Schneller 1910: 183; Sutton 1913: 55). Other expressions of humidity, such as dew (e.g. Carne 1826: 203; Anon. 1848-1: 315; Bonar 1857: 96; Hull 1885: 47/48) and mirages or "Serab" (e.g. Hindley 1850: 11; Palmer 1871-1: 216), were relatively rare in South Sinai, and especially dew was only mentioned in western Sinai. It is not very clear if the dew mentioned by Turner (1815: 460) on the 11th August 1815 between 'Ayn Musa and Wady Gharandel was a normal phenomenon, for instance linked to the rising of the Nile which starts in late June, early July, or if it was possibly an anomaly due to the Tambora outburst earlier that year. Mirages have been regularly mentioned between Cairo and Suez (e.g. Fazakerley 1820: 363; Madden 1829-2: 199/200; Renouard de Bussiere 1829: 220; Günnel 1847: 14; Kinnear 1841: 54; Fisk 1842; Borrer 1845: 262; Bartlett 1854: 9; Bonar 1857: 281; Wallace 1868: 70), but much less in South Sinai. They were sometimes an announcement of rain (e.g. Ballantine 1866: 115).

6.3.3. Temperature and remnants of snow and ice as indicator of weather events

Often the temperature fluctuated with the level of cloudiness, wind direction and wind speed in the days before there was precipitation (e.g. Loti 1993; Binder & Binder 2000). Sudden temperature drops were mentioned before and/or after snow, rain or thunderstorms (Burckhardt 1816: 534; Borrer 1845: 312; Schoenfeld 1907: 64/65, 74-76; Loti 1993: 19/20). Especially in the high mountains, where the temperatures were lower due to elevation and exposure to the wind, travellers described intense cold before and during snowfall or hail (e.g. Kazantzakis *et al.* 1975: 88-122; Loti 1993: 22-29). Night temperatures were also very low during these periods. Liebenau (1896: 36) reported a night temperature of -10°C on the night of 27-28 January 1893 slightly south of the Monastery, and Holland measured -15°C around 1500 m, on the 13th November 1867 in Wady "Sebaizeh", which is probably Wady Saba'iya (Holland 1868-2: 245). Frost was also reported in some wadies, such as Wady Khamila and Wady el Sheikh (Bonar 1857: 339-341), Wady Feiran (Brocklebank 1865: 174-176), and Wady Nasb (Buxton *et al.* 1895: 110-113). Several travellers reported that their washbasins were solidly frozen in the morning (e.g. Holland 1867: 21; Palmer 1868: 57; Österreich 1895: 50/51; Smith Lewis 1898: 109). In some years, there was such strong frost that streams and large water reservoirs were frozen solidly, such as the stream in Wady Leja which could carry the weight of people in 1862 (Tyrwhitt 1864: 344/345), or in 1987 "al-Galt al-Azraq" in Wady Tala'a, west of the Monastery (Hobbs 1995: 11).

Day temperatures could be relatively high, even if the nights were very cold. The day after Liebenau measured -10°C, it was 11°C, and two days later it reached 35°C in the sun (Liebenau 1896: 36-40). At around 1600 m, more or less the altitude of the Monastery, the snow would melt quickly (e.g. Liebenau 1896: 32), but at the higher altitudes, such as on the tops of mountains such as Sinai, Serbal, St Catherine, Umm Shomer, the low night temperatures caused ice and snow to stay sometimes for days or weeks (e.g. Anon. 1848-2: 365; Bonar 1857; Tyrwhitt 1864: 343; Holland 1868-2: 254; Field 1888: 113; Carrington Bolton 1890: 592). Winter precipitation and freezing conditions were reported in the high mountains of South Sinai, and hail rarely in the lower areas (e.g. Smith Lewis 1898: 250/251). Precipitation was sometimes experienced as rain in the areas below 1600 m and snow in the higher areas (e.g. Buxton *et al.* 1895: 154; Scott 1927: 23-31; Loti 1993: 23; Binder & Binder 2000: 79). After precipitation finished, the temperature increased again. The change in wind direction from southern to northern wind played an important role in the temperature change. In this respect the khamseen was a bit strange, because the temperature actually increased before and during the event, while the wind speed was very high and the sun was filtered by the sand.

6.3.4. Visibility of weather events in the landscape

Extreme weather events, such as droughts, sandstorms, and extremely heavy rain causing (flash)floods, have shaped, and are still daily shaping South Sinai's landscape. The effects of especially rainfall can be seen in the landscape, some quite subtle, others very obvious, such as imprints of raindrops in the ground caused by small showers or just a few drops of rain, moist soil, "cracked muddy surfaces" (Bauerman 1869: 20), dried up river-like meanders or gullies caused by heavier rainfall (e.g. Bonar 1857: 117; Hull 1885: 33), or boulders (Palmer 1871-1: 22) and broken or uprooted trees at the bottom of wadies or in wady mouths caused by very heavy rain and flash-floods, e.g. at the mouth of Wady el 'Ayn (Stanley 1857: 81) and Wady Feiran (Bartlett 1879: 237). Carrington Bolton captured some of the weather indicators in the landscape:

> "Being on the lookout for signs of water in the desert of Sinai, I made the following notes: The slight depressions in broad plains and the deep, narrow valleys in the hill country, both indiscriminately called wadis, present the appearance of dried-up water-courses: the signs are unmistakable, a tortuous channel with vertical sides carved out of the gravelly bottom, pebbles and boulders transported from distant sources scattered over the surface, mud-flakes and mud-cracks in small bays, as it were, at the sides of the main channels. At two or three places on the sea-coast, extensive mud-flats were pitted with characteristic raindrop impressions. The line of the now arid water-course was often bordered by scanty and hardy shrubs." (Carrington Bolton 1890: 578)

Palmer mentioned a “circular space” caused by a flood in Wady Wutah (Palmer 1871-2: 308). The wadies themselves, their course and hollowed-out shapes and depths, are probably the best example of precipitation-related erosion: the “polished walls” (Palmer 1871-1: 212) and “polished edges” (Buxton 1895: 141) of wadies, “a jorf, that is, a steep bank formed by the torrent cutting through the soil of the wady-bed” (Palmer 1871-2: 338), the bottom of the wady covered in stones of different sizes. Buxton described the shape of Wady Isleh or Wady Hebran:

> “The flat, gravelly bottom of the ravine was the road which we travelled the following morning. In places the rocky walls approached within six yards of one another, and, 200 feet overhead, were scarcely further apart. In such narrows, though the bed of the stream is ordinarily dry, the torrent had left its mark unmistakably, in polished edges, to a height of at least 150 feet.” (Buxton 1895: 141)

The power of these flood-events, but also the adaptation of nature to it, was visible in the following fragment:

> “...the tarfah, or tamarisk, which we encountered in many places at a higher elevation...is perhaps the most tenacious-rooted tree in Nature. The largest specimen which I saw grew in a narrow rocky gorge, where the weight of the flood must be all but irresistible. Three or four stones, as large as tea-chests, were jammed among the forks of the branches, higher than the top of my head. These must have been whirled and wedged there by the force of the current.” (Buxton 1895: 141)

Precipitation or droughts can also be visible in the level of water sources and streams. However, water often seeps into the sand, and sand often slips into the wells, hiding the presence of water (e.g. Holland 1867: 17/18). Droughts and high temperatures cause cracks in the soil and rocks, and wind and sandstorms cause erosion of topsoil and movement of sand and sand-dunes. It would be wrong, however, to conclude that such traces are the result of recent events, because cracks and evidence of erosion can still be visible and look fresh some years after the weather event. Burckhardt wrote in 1816 for instance:

> "The rocks round the resting-place of Naszeb are much shattered and broken, evidently by torrents; yet no torrents within the memory of man have ever rushed down the valley." (Burckhardt 1816: 479)

In January 1869, there were broken trees in Wady Solaf, according to Palmer remnants of the flash-flood in 1867, witnessed by Holland (Palmer 1871-1: 151). However, Palmer's interpretation should be handled with care, as he himself reported storms in December 1868 and January 1869 in the surrounding areas (Palmer 1871-1: 126/127, 173). Some travellers who witnessed rain and storms noticed few or no traces afterwards (e.g. Burckhardt 1816: 534; Smith Lewis 1898: 244). During a two-year drought, there was still plenty of water in Wady Feiran (Schoenfeld 1907: 40). Burckhardt saw that the acacias produced a lot of gum arabic on the 15th May 1816, which may indicate rainfall or possibly increased lopping for fodder and firewood.

6.4. Challenges and adaptations of travellers and Bedouin to environmental and weather

6.4.1. Hot and dusty challenges

The weather challenges of the travellers were connected to the daily weather during the few weeks in which they visited South Sinai. Temperature and the intensity of the sunlight were for many travellers the key challenges of the journey, especially the fact that there was no place to shelter or escape these elements. Early travellers like Burckhardt (1816) and Turner (1820) travelled day and night to protect themselves against the sun, and probably also against the Bedouin as it was not very safe to camp at the time. They also had to manage carefully the amount of water they carried, as they were relying on the knowledge of the Bedouin for finding water (e.g. Seetzen 1855: 60; Dumas 1839: 244). Occasionally, a lack of potable water and thirst was mentioned, but this was never longer than a couple of hours or a few days at the longest (e.g. Burckhardt 1816: 501; Renouard de Bussiere 1829: 239; Dumas 1839: 179; Seetzen 1855). The Bedouin knew the wells and places where they potentially could find some rainwater (e.g. Burckhardt 1816: 503; Arundale 1837: 37), but did not drink from the brackish, mineral-rich wells near the coast (e.g. Bartlett 1854: 31/32) and recommended travellers to do the same (Bonar 1857: 118; Wallace 1868: 96). The Bedouin preferred to wait if they could, until they could drink the sweet rainwater in the high mountains. Bonar described in Wady Shellal:

> "We had seen some half-a-dozen of our men spring away to the left at full speed, and dash into a rock-cleft; and we concluded that their eye had caught sight of some gazellah…We now saw the object of their pursuit; there was water there." (Bonar 1857: 143)

Later in the 19th-century, desert camping was safe from the Bedouin. This encouraged travellers to visit South Sinai during the late winter and early spring in order to avoid the summer heat and the chance of not finding drinking water along the route. Nevertheless, travellers complained about the effects of the sun on their head, skin, view, and drowsiness (e.g. Dumas 1839: 160, 192; Anon. 1848: 362; Palmer 1871-1: 208; Sutton 1913: 42/43). They occasionally suffered from sunstroke (e.g. Scott 1927: 81). Turner, who travelled through South Sinai in August 1815 complained:

> "The state in which I returned from Sinai, was by no means an enviable one. When I reached the convent, my neck was so blistered by the sun, that the skin had peeled off, and my lips were cracked like a ploughed field. Rest in the convent had removed these complaints, but travelling in the day as we had returned had now so aggravated them, that I could not turn my head, nor open my mouth, without pain." (Turner 1820: 462/463)

The reflection of heat and light on the white soil surface in the coastal plains, the Tih mountains and North Sinai was especially challenging (e.g. Scott 1927: 81), as was the heat in narrow wadies, on plains such as El Qa'a, and during the Khamseen. The shade of trees and bushes, and the water and shade-rich oases were especially appreciated (e.g. Clifton 1900: 21).

Travellers used goggles with coloured glass (e.g. Maughan 1873: 84), hats, umbrellas and such (e.g. Madden 1829-2: 196; Bartlett 1854: 44; Bonar 1857: 47/58; Palmer 1871-1: 33), but these were often not very practical because of the strong winds (e.g. Smith Lewis 1898). Travellers were astonished to see that the Bedouin covered themselves with a blanket in the middle of the day to sleep (Salame 1819: xviii), ate and drank little or nothing during the day, and always covered their heads while sleeping in the desert. Those who tried to imitate this ended up dehydrated and overheated (Madden 1829-2: 197; Renouard de Bussiere 1829: 238/239). Later in the 19th-century, travellers started travelling with lunch tents etc. just for the shade (e.g. Scott 1927: 6).

From the diaries it was clear that the travellers' worst experiences were linked to the heat of the khamseen in combination with the penetrating sand. During khamseen winds, the Bedouin threw themselves on the ground (Graul 1854: 197), searched for protection in caves or behind bushes (e.g. Dumas 1839; Günnel 1847: 27/28), and covered their head completely apart from the eyes (e.g. Kinnear 1841: 95). Travellers regarded the "throwing on the ground" technique useless (e.g. Günnel 1847), but they did try to imitate the Bedouin by covering their head. However, not used to being covered in intense heat, it did not take long before they almost suffocated (Dumas 1839: 240/241; Graul 1854: 197). Dumas described his experience with the khamseen:

> "The Desert was imposing and gloomy. It seemed to be alive, - to palpitate, - to smoke to its very entrails. The transition we had undergone was rapid, singular, and appalling. We no longer had the oasis of yesterday, the repose under the palm-trees, the sleep lulled

> by the murmur of the fountain: but, in their place, the burning sand; the harsh jolting of the camels; thirst that was consuming, inhuman, maddening; thirst which makes the blood boil, - which fixes the eye and shows to the parching wretch lakes - islands - trees - fountains - shade - water, water, water!!...Now and then our dromedaries would drop down, and thrust their heads into the heated sand to find an instant of comparative coolness beneath the surface; then, rising, they continued their impetuous course, feverish and panting like ourselves." (Dumas 1839: 242)

Travellers complained about difficulty of breathing, problems with their eyes, sand in their facial orifices, between their teeth, in their food (e.g. Dumas 1839: 241; Günnel 1847: 28; Carrington Bolton 1890: 581), and spoiled water:

> "This was certainly the most uncomfortable evening we had had. Our eyes, noses, and ears, were filled with sand. I felt it grinding in my teeth the whole evening...The water, too, was worse than ever; stinking and full of animalcules; and I could scarcely swallow it after being strained through two or three pocket-handkerchiefs." (Kinnear 1841: 95/96)

Some travellers developed their own techniques and ideas to survive the khamseen and sandstorms. Some sat the wrong away round in the saddle to protect themselves against the sand and wind (e.g. Stanley 1857: 68; Glennie 1880: 94), others put vinegar in their mouth (e.g. Günnel 1847). They were convinced that the intense heat was damaging and even deadly for the body and required blood-letting (e.g. Günnel 1847: 27; Plowden & Plowden 1868: 349). Some travellers complained about the taste of the water in the leather water bags, or zemzemias, after a period of very high temperatures such as during a khamseen, or if the bags were "too new" and the product they were tanned with gave the water a very bad taste (Dumas 1839: 148/149; Stephens 1996: 170/171).

Many travellers became exhausted with the heat very quickly, and, in combination with the relatively monotonous and scarcely vegetated plains, they were looking forward to some form of 'change':

> "After an hour or two, it began to grow rather monotonous; and fearing lest I should dissolve, if this heat continued all the afternoon, I turned meekly to the dragoman, and asked 'Yohanna, how long are we to have this sort of thing?' 'Thirty days', was the answer. I dropped the subject." (Field 1888: 47)

Vegetation and water in the oases were often regarded as "refreshing" (Maughan 1873: 100; Field 1888: 60), possibly more to the eye than from the temperature. Travellers were generally relieved to leave the very warm coastal areas and enter the cooler mountains. However, if the temperatures were very low in the mountains, they were quite relieved to go down to the warmer lower areas.

The camels were very well adapted to the heat and to travelling for several days without water (e.g. Volney 1788: 419/420; Fazakerley 1820: 388; Bonar 1857: 81/82). However, in the early 20th century, when travelling South Sinai on camel back was not popular anymore, Plowden (1940: 18) found that the "watercamels" from Cairo were not adapted to the conditions in South Sinai, because they required water every 2-3 days.

6.4.2. Cold challenges for the travellers and Bedouin

Traveller guides and travellers, for example Maughan (1873: 73), suggested travelling in late February through South Sinai, because the coldest period was past, the hottest period had not yet arrived, and it would allow arriving in the Holy Land after the rains. However, travellers encountered rain- and snowstorms and cold weather in South Sinai in autumn, winter and spring. They generally wore thick layers of clothes, and strong shoes or boots, but they generally did not feel warm enough during very cold spells, and too warm on mild, sunny days (e.g. Fazakerley 1820: 366; Glennie 1880: 71/72; Plowden 1940: 5).

The Bedouin, on the other hand, were dressed all year round in long thin cotton clothes, a head dress, and went barefoot or on sandals, a perfect adaptation to heat and sandstorms (e.g. Dumas 1839: 240; Kinnear 1841: 95), but not to cold and wet conditions. Their camels were not very well adapted to cold and wet circumstances either (Loti 1993: 27), and their hooves slipped on wet and muddy surfaces (e.g. e.g. Henniker 1824: 224; Bonar 1857: 116/117; Palmer 1871-1: 266/267; Buxton 1895: 142; Smith Lewis 1898: 118). The Bedouin normally avoided the cold and wet winter weather by moving "into the lower wadies" (Holland 1868-2: 245; Österreich 1895: 38). However, most travellers came to South Sinai at the end of winter or start of spring, and wanted to visit the high areas, such as the top of the mountains Sinai, St Catherine, and Serbal. The Bedouin guides were not at all equipped for such cold trips, with snow, ice, cold winds, and sometimes winter storms, and really suffered from the precipitation and cold, also because they travelled without tents (e.g. Stephens 1996: 177; Buxton 1895 *et al.*: 109). #

Whereas travellers had special clothes to protect them against the rain, the Bedouin would get soaked. Several travellers described how the Bedouin and their camels were almost incapable of working or moving anymore (e.g. Bonar 1857: 75; Liebenau 1896: 32/33). They needed fires to keep themselves warm, and to dry their clothes. In early 1894, Buxton wrote south of the Monastery:

> "...our poor Bedawin, clad in the meanest rags, suffered severely at night. They lay in half a dozen little camps, with no other protection against the weather than their fires of desert scrub, which gives a moment's flame but little heat. In the morning they were so torpid with cold that it was hard to get them to start. At the first pause they would pull up two or three dry plants, and in less time than it takes to write would be crouching over a blaze. At every opportunity during

the day an Arab repeats this process, and so constant is the collection of fuel that, if in hunting the ibex are disturbed, the hunter endeavours to disarm their suspicions by stooping and moving slowly about, as if engaged in the one occupation which is always going on. Certainly it often has the effect of causing the herd to stop and gaze." (Buxton 1895: 144/145)

Travellers put themselves as well as the Bedouin guides in danger (e.g. Bartlett 1879: 251). Under "normal" (warm) conditions, the Bedouin climbed the sharp mountains barefoot (e.g. Burckhardt 1816: 503), whereas travellers complained that the sharp rocks destroyed their shoes (Palmer 1871-1: 224; Scott 1927: 26). However, climbing barefoot in sub-zero temperatures was something else. Palmer's ascent of Mt St Catherine in icy conditions is a good example to illustrate this:

"For about the first hour of our ascent we got along very well, as the stones which covered the lower portion of the mountain-side were tolerably free from snow; but when we approached the summit our real troubles began. The wind blew bitterly cold, and the road lay over a smooth white expanse of snow, which instead of being firm as it appeared, was a mere trap to let one down knee-deep, amidst sharp slippery stones, imperilling one's limbs at every step. It was a most exasperating walk; our legs had entirely their own way, and one or other of us was constantly disappearing between some concealed boulders, or slipping gracefully down the slope and having to begin again. One of the Arabs flatly refused to go on, but as I insisted, and old Salem offered to shew him the way, the poor shoeless vagabond started off again with the theodolite on his shoulders." (Palmer 1871-1: 132)

In extreme conditions, such as the snowstorm poetically described by Loti on the evening that he reached the Monastery, the Bedouin had to stay outside the Monastery:

"...hearing the wind and snow raging outside, thinking of our tents left behind, of our poor Bedouin, and of our poor camels we couldn't

> possibly bring along, and who are lying out there with no shelter under a shroud of snow." (Loti 1993: 29)

The main health problems related to cold weather among the Bedouin of South Sinai that were reported were "coughs" in winter, and rheumatism. For coughs they sometimes asked the travellers for help (e.g. Buxton *et al.* 1895: 156). In case of illness they visited the hot springs of Hammam Faraoun or Hammam Musa (e.g. Holland 1868-2: 238; Smith Lewis 1898: 46).

Travellers were often confused by the temperature sensations. While climbing the South Sinai mountains in winter, travellers felt one moment extremely warm and the other moment really cold (e.g. Palmer 1871-1: 9; Geramb 1899: 173). During cloudless, sunny weather travellers could feel very warm, even though they were standing on a windy mountain top in the snow; some even wondered how ice and snow could stay such long time on the mountain tops given the heat during the day (e.g. Anon. 1848-2: 365; Field 1888: 113). Even during the winter, daytime temperatures could be relatively high, while the nights, especially in the mountains, could be intensely cold (e.g. Fazakerley 1820: 366; Liebenau 1896: 34/35):

> "...in the morning before sunrise the cold is so great that large woollen cloaks will not keep us warm, and when the sun has been up an hour or two, we are impatient to obtain some shelter from the heat." (Fazakerley 1820: 366)

Tyrwhitt described the difference in temperature sensation between shade and sun:

> "It is bitter cold in shade, and when you are in the sun it burns with the combined effect of frost and fire." (Tyrwhitt 1864: 340)

6.4.3. Windy and wet challenges

Travellers experienced very sudden changes of wind and weather during their trips, such as sandstorms (e.g. Dumas 1839; Kinnear 1841), sudden increases in wind or storms (e.g. Palmer 1871-1:

252), and flash-floods (e.g. Holland 1868-2). Palmer was descending Umm Shomer when the weather suddenly changed:

> “When we reached the summit, the air was so still and calm that a lighted match burnt steadily upon the highest point. As we came down, a few drops of rain fell, a fresh wind sprang up, and by the time we had returned to camp a hurricane was blowing which threatened every moment to bring the tent about our ears.” (Palmer 1871-1: 252)

In the high mountains of South Sinai, sudden wind changes, caused by variability of the wind itself and the position of the wadies, disturbed ibex-hunting expeditions (e.g. Burckhardt 1816: 571/572; Österreich 1895: 37; Buxton 1895: 148; Liebenau 1896: 53). Sudden increases in wind speed and wind gusts were often mentioned in the mountains and lower plains during the evening or night (e.g. Turner 1820: 425; Hindley 1850: 12; Sutton 1913: 64); this complicated setting up the tents (e.g. Plowden 1940: 211), and sometimes overturned them (e.g. Brockbank 1845: 35-45; Hindley 1850: 11; Bishop Bird 1886-2: 233). In the lower plains it could be cold if there were cold winds (Fazakerley 1820: 366, 386; Schwerdt 1870: 42; Schneller 1910: 60; Plowden 1940: 40), but never as cold as in the high mountains.

In the early 19th-century, travellers were not very well prepared for rain and snow, and clearly did not expect it (e.g. De Laborde 1838; Stephens 1996: 212). The Bedouin and dragoman played an important role in the safety of the travellers by making sure that the roofs of the tents were kept snow free to prevent them from collapsing (e.g. Loti 1993: 27); when heavy rainfall was expected, they took precautions by making “trenches” around the tents (Borrer 1845: 309; Hull 1885: 73/74; Buxton 1895; Smith Lewis 1898: 114). They also made sure not to camp at the bottom of e.g. Wady Khamila, Wady Hebran, Wady ‘Isleh (e.g. Bauerman 1869: 31/32; Stephens 1996: 211) and did not enter narrow wadies, such as the wadies El

‘Ayn and Sigaliyeh during the seasons when floods could take place (Palmer 1871-1: 212; Hull 1885: 59), because wadies could fill very quickly with water during heavy rain. This prevention saved at least one life, that of Stephens (1996: 211/212). The weather also changed the appearance of the landscape, and according to Bonar, the Bedouin maintained a set of “signposts” to find their way through the desert:

> “No trace of a road appeared; for though the camels do form a track, or rather a number of parallel tracks, yet the drifting sand obliterates them, or the rain washes them out. Still the way-marks are preserved everywhere,— consisting of small heaps of stones set up on each side, which are carefully preserved by the Bedaween; for even they might at times be at a loss as to the way, so great is the sameness of the region, for miles on every hand.” (Bonar 1857: 112)

6.4.4. Drought challenges for the Bedouin and monks

For the Bedouin and the monks the biggest challenge for day-to-day well-being was drought. Long periods between rain seasons, or rain seasons with little or no rain posed immediate threats for their survival. It seems that for the Bedouin the main problem was not an immediate lack of potable water, but the lack of trading products (e.g. herds and fruits) for income and food, which led to famine. For the monks, access to potable water does not seem to have been an issue either, because the reservoir in the garden and two wells in the Monastery gave them permanent access to water (Burckhardt 1816). They suffered, however, from the aggressive behaviour of the Bedouin, and linked to that, access to provisions.

Until 1760, the date on the well inside the Monastery, which seems to have been built by an Englishman (Burckhardt 1816: 544), the monks were “absolutely dependent on the Arabs for water as they still are for provisions” (Turner 1820: 433). The year in which the well was built was also the last year that the archbishop visited Mount Sinai, visits for which the monks had to pay the Bedouin huge amounts of money: the archbishop of Mount Sinai talked in 1806 of 100000 piastres (George 1811: 367/368), and in 1807 of 50000 francs (El Abbassi 1814: 77), and Burckhardt mentioned the amount of 10000 dollars in 1816 (Burckhardt 1816: 549). The presence of the well allowed the Monastery to be closed hermetically. In the early 19th-century, this seems to have been necessary as a protective measure against Bedouin attacks, which were, at least partly, linked to the weather. On top of that, there may have been many fears of the Wahabees, fundamental Islamists who were expanding their territory in the 18th-century. Bedouin tribes such as the Omran, Aloween and Terabin, who had still served in the 18th-century as ghafirs, were in the 19th century living in areas occupied by the Wahabees, and were no longer allowed to be ghafirs for the Monastery in the 19th-century (Burckhardt 1816; Seetzen 1855).

During periods of drought and during the summer, when Bedouin (presumably the Jebeliya) inhabited the area around the Monastery, the monks distributed bread, coffee, flour and other goods (Seetzen 1855). The monks could not really refuse to do so, because they depended on the Bedouin for part of their provisions and protection. Nevertheless, travellers reported incidents between the Bedouin and the monks, which seem to have been, at least partly, linked to drought. In 1806, the Archbishop of Mount Sinai stayed inside the Dependency in Cairo for a year, not leaving the building out of fear of incidents (George 1811: 362). In April 1807, Bedouin were shouting for food under the window of the Monastery (Seetzen 1855: 97). Seetzen was accompanied by a monk, the Sheikh of the "Monastery Bedouin" (Jebeliya) and three Bedouin, while climbing Mount Sinai; the Sheikh and one Bedouin carried weapons (Seetzen 1855). During this period there was a drought in at least western Sinai.

In 1815 and 1816, during a period of drought in southern and eastern Sinai, several incidents took place in and around the Monastery. In the summer of 1815, Bedouin had taken possession of seven of the eight gardens belonging to the Monastery (Turner 1820: 445). The fruits of the eighth garden, the one adjacent to the Monastery, were plundered every year between 1813 and 1816, years of prolonged drought; the monks had to buy their own fruits from the Bedouin (Burckhardt 1816: 550). Also in 1815, Bedouin stopped supplying the monks with "fish from Tor" (Turner 1820: 443), and they plundered a caravan going to the Monastery:

> "...only a month before I came they [the Bedouin] had intercepted and carried off a provision (of wine, rackee, oil, flour, &c.) of the value of 12,000 piastres coming from Cairo to the convent." (Turner 1820: 446)

During Turner's visit, a monk was sent to Wady Feiran "to make peace" to ensure the safety of the monks and trade between Tor and the Monastery (Turner 1820: 446-447); normally this would have been the Economos who would have offered money and goods to the Bedouin in order to restore the peace, but this time it was another monk who was sent there with "a firman from the Pasha" (Turner 1820: 447). The Bedouin gave in and did not receive any payments. In the same year, or possibly a year earlier, some Bedouin had climbed the rocks near the Monastery, and "shot two of the fathers who happened to be at the door of their apartments" (Carne 1826: 216). The monk who lived in the garden of Hammam Musa, near Tor, seems to have locked himself up in the tower in this garden to protect himself against Bedouin who walked off with the highly valuable date harvest (Burckhardt 1829: 362/363). Burckhardt mentioned that the Jebeliya did not treat the monks and travellers with much respect (Burckhardt 1816: 565), but that "they have sonic fear of being excluded from the gains accruing from the transport of visitors to the convent" (Burckhardt 1816: 485). In 1816, around 30-40 Bedouin asked for bread twice a day (Burckhardt 1816).

Late in 1821, perhaps drought-related, there was once again a dispute between the monks and the Bedouin about the demands of the Bedouin, and the monks could not safely leave the Monastery (Wolff 1824: 179). The co-travellers Clarke, Wolff and Carne were kidnapped somewhere between the Monastery and Mount Sinai by a Bedouin tribe, probably from around Wady Feiran (Carne 1826: 228-233), who used them as hostages to leverage goods from the monks which had been denied earlier (Carne 1826: 228-330):

> "...one of the Shechs, Hassan by name, told me it was the wish of the Arabs, that we should write a letter to the English consul in at Cairo, and tell him that the Arabs had taken us on account of the priests, who would give them neither meat or drink, and that we should be kept in prison until the English consul compelled the president of the Greek convent at Cairo to send the desired letter to their convent at mount Sinai. And they desired further that we should add that the priests upon mount Sinai are sons of devils, and sons of robbers, and sons of the cursed, for they are in the possession of a book, called the Book of Moses, which they have buried in the ground, and as often as they take that book in their hand, and say; "O God, send down rain from heaven", the Lord sends rain in abundance, but they are so wicked, as to leave the book always buried. I told them that God is the God of the Arabs as well as of the Greeks, and that they should pray to God, and God will hear them as well as the Greeks. They replied, that God never minds the prayer of an Arab." (Wolff 1824: 181)

The Bedouin were not violent with the travellers, but fed them, and the Sheikh "swore by Allah we [the travellers] should suffer no injury while in his power" (Carne 1826: 232). The monks, on the other hand, were besieged by Bedouin (Carne 1826: 237). After some gifts from the travellers and a meeting of Bedouin sheikhs to discuss the fate of the travellers, the other Bedouin sheikhs convinced the sheikh who had kidnapped the travellers to release them:

> "...'the English are favoured by the Pasha; their consul is his friend; and when he hears that you have taken some of this nation prisoners, he will send Turkish soldiers to attack your camp, and either put you to death, or carry you and your families captives to Cairo'." (Carne 1826: 249/250)

The Frenchman Caillaud (Anon. 1821) suggested in 1821 that Mohammed Ali's actions and payments by the monks to the Bedouin for each pilgrim created a peaceful situation in South Sinai (Anon. 1821: 554). However, problems persisted later in the 1820s, and the monks complained to travellers that Bedouin tried to shoot at them, pillaged their provisions, and that they could not go further than the immediate surroundings of the Monastery, otherwise Bedouin would assault or kidnap them and only release them after receiving ransom (Henniker 1824: 237/238; Renouard de Bussiere 1829: 251/252).

In the late 1820s, during another drought, aggression continued, even though the monks gave the Bedouin bread and flour on a daily basis (Renouard de Bussiere 1829: 249). In April/May 1828, a pilgrim visiting the Monastery was shot in his leg, because the Bedouin had mistaken him for a monk (De Laborde 1838: 243). In 1830, it seems to have been safer in South Sinai, probably the result of increased rainfall and political changes. Sometime before, there had been a skirmish in western Sinai between the Egyptian leaders and the South Sinai Bedouin, who kept pillaging the caravans of the Pasha. According to Stephens (1996), an American diplomat who travelled through South Sinai in 1836, an agreement had been signed in the Monastery that the "pasha should not invade their territory [South Sinai], and that they would be his subjects, provided he would not call upon them for duties, or soldiers, or, indeed, for anything which should abridge their natural freedom" (Stephens 1996: 170).

In 1833, Arundale (1837) crossed the desert without any issues. In 1836, Stephens noted south of Wady Mukatteb, that it was safe and in the hands of the "friendly Arabs" (Stephens 1996: 173). In the late

1830s, Günnel (1847: 41/42) described how the Bedouin were even allowed to enter the Monastery garden and the Monastery itself, and how grateful the monks were towards Mohammed Ali for the peace in South Sinai. In 1839, the Jebeliya received some bread "three times a week" (Kinnear 1841: 84). This peaceful atmosphere seems to have continued throughout the 1850s and -60s, a period during which the weather seems to have been much more stable, according to the available data.

The change in behaviour between the monks and the Bedouin was also visible in the entrance to the Monastery. Until the late 1840s, travellers were hoisted up by the monks with a rope, in order to enter the Monastery through a small window about 30 feet above the ground in the northeastern/eastern wall (e.g. Burckhardt 1816; Kinnear 1841: 77/78). This was the only way to enter the Monastery, because the main entrance had been walled up since the early 18th-century (Burckhardt 1816: 549), and the only other entrance, through the garden, was always kept closed. Borrer (1845) in 1843 and Bartlett (1854) 1845 were still hoisted by rope, Ms Hindley (1850: 29) in 1850 and Mrs Graul (1854: 207) in 1853 entered through the garden entrance. By the 1850s, the situation between the monks and Bedouin was calm enough occasionally to open the door to let travellers enter. However, in the late 1860s, a period of drought in eastern and central Sinai, Schwerdt (1870: 46) was hoisted up. He commented that the monks had provisions for two years in case of calamities with the Bedouin. In 1872, Maughan (1873: 108/109) commented that the Bedouin occasionally plundered the Monastery's garden.

In 1901/1902, a period of drought around the Monastery, the Jebeliya received baskets of bread twice a week (Mauchamp 1903: 19). In 1903, probably as a result of a prolonged drought, they received bread every day (Schoenfeld 1907: 56), but there seem to have been no incidents between the Bedouin and the monks. In 1906, a period of drought around the Monastery and in western Sinai, one monk of the Monastery of StK was living in a small house in a new garden, near Mount El Meharret; this is probably what Bartlett (1879: 245) called "Maharrad", the old city in Wady Feiran. The monk worked with the Bedouin and did not feel comfortable (Kergorlay 1910: 324), but no incidents were recorded.

Although there seems to be a strong link between years of drought and aggression of the Bedouin towards the monks, incidents reported in the early 19th-century are likely to have been not solely the result of drought. Throughout the 19th-century and into the 20th-century, the monks paid the Towara (South Sinai Bedouin tribes), the Tiyaha (North Sinai Bedouin tribes), and the tribes around El 'Arish thousands of pounds annually in money and gifts to protect the Monastery in return. In the early 20th century, the amount was £2000, a third of the total annual income of the monks (FO 141/655/1: "Extracts from 'the History of Sinai & Arabs' pp. 228-230"). The money was not equally distributed among the tribes. Jebeliya received goods and bread from the monks, they were allowed to ask money from the travellers (e.g. Burckhardt 1816: 491/492), and as ghafirs, they received a tip ("backsheesh") from the travellers. However, the loss of power over Suez, the decrease in backsheesh over the 19th century, the increased independence of the travellers for water, food and protection, and the new regulations that were introduced in the 1894 when the Archbishop of Sinai visited StK for the first time since the early 18th-century, which entitled Bedouin from the four ghafir Bedouin tribes (Jebeliya, Sowalha, 'Awlad Said, and Alegat) to guide in mixed groups rather than alone (Smith Lewis 1898: 21-23) must have had severe financial consequences for the tribes and their dependence of the monks. It also seems to have had consequences for the relations between the tribes (e.g. Smith Lewis 1898: 8/9; Buxton 1895: 104; Böttcher 1898: 193). In South Sinai, a similar process seems to have taken place as in Palestine, where Bedouin were in the first half of the 19th-century described as powerful and fearful men, but in the latter part of the 19th-century as "weak, deprived, and frustrated men" (Suwaed 2016: 105).

6.5. Preventing, and coping with disasters

South Sinai regularly suffers from disastrous flash-floods. The best description of the force of this event was that of Reverend Holland, who witnessed probably the most phenomenal flash-flood of the 19th-century on the 3rd December 1867 in Wady Feiran:

> "For some days a storm appeared to have been gathering, and on the 3rd December the clouds looked so threatening and the wind was so high that I did not venture far from my tent...at half-past four a few heavy drops of rain began to fall…at five, however, a tremendous thunder-storm burst upon us...I never saw such rain, and the roar of the thunder echoing from peak to peak and the howling of the wind was quite deafening...in a quarter of an hour every ravine and gully in the mountains was pouring down a foaming stream...in a few minutes the stream rose so rapidly...soon so sudden an increase took place that I had barely time to rush back to the tent, and with the Arabs help carry my things to a wall, about 15 yards distant...when I took the last load the water was nearly ankle deep. I ran to the wall and back, and it was nearly up to my knees; with a desperate effort I seized the tent and dragged it to the wall, but narrowly escaped being washed away in doing so. We were congratulating ourselves on having saved everything, when down came another sudden rush of water, and we had barely time to carry the things to higher ground...it was now only a few minutes past six. It had left off raining, the flood began to subside, and, with the help of a little dry straw from the middle of the camel's saddle, we managed to light a fire. We had just got a good blaze, and were sitting round it drying ourselves, when suddenly a tremendous wave leaped over the wall of the garden in which we had placed ourselves and carried away our fire, a second wave demolished the wall...it seemed almost impossible to believe that scarcely more than an hour's rain could turn a dry desert way, upwards of 300 yards broad, into a foaming torrent from 8 to 10 feet deep. Yet there it was, roaring and tearing down, bearing with it tangled masses of tamarisks, hundreds of

beautiful palm-trees, scores of sheep and goats, camels and donkeys, and still worse, men, women, and children. A few miles above the spot where I stood a whole encampment was swept away. I saw some of them swept past me in the pale moonlight: nearly thirty people were known to have perished, but two bodies only were found; the rest were buried in the debris, or carried down to the sea. The roar of the torrent as it swept past me was tremendous; the boulders ground along beneath the water with the noise as of a hundred mills at work, and every now and then the very ground on which I stood shook..." (Holland 1868-2: 248/249)

The memory of this flash-flood event still survived in the oral tradition for at least thirty (Clifton 1900: 3) to forty years (Shuqair 1916: 84). Sheikh Musa, a Bedouin, confirmed the presence of Holland (Shuqair 1916: 84), but recalled the details of his story slightly differently. He mentioned the year 1869 instead of 1867, but this cannot be correct, because Holland published his work in 1868. The flash-flood initially started in Wady Solaf (which is higher up in the mountains), and he estimated the level of the water "5 el" high (1 el = 55-80 centimetres), which converts to 9 to 13 feet. The storm killed 35 members of the 'Awlad Said tribe, who were buried in the nawamis near Wady Hebran in Wady Solaf, and six people in Wady Feiran. Apart from people, herds, many palms and tamarisks were washed away (Shuqair 1816: 84).

The Bedouin seem to have been unable to predict flash-floods, and this led on several occasions to casualties, such as in 1867 in Wady Feiran and Wady 'Aleyat (Holland 1868-2: 248/249), in 1894 in Wady Solaf (Buxton *et al.* 1895: 152), and several times during the 19th-century in Wady 'Isleh and Wady Hebran (Liebenau 1896: 20). They tried to prevent themselves being caught in these events by not camping on lower grounds in the rainy season. However, the fact that predictive insight did not improve over the 19th-century suggests that they may have been very difficult to predict. It was probably not worth investing in further prevention, even for Bedouin living in areas regularly hit by flash-floods, such as Wady Feiran. Bedouin seem to have dealt with the casualties and damage in 1867 by accepting it as part of life and by rebuilding their community again. After the great flash-flood in 1867, Reverend Holland wrote:

> "Nearly a thousand palm-trees had been swept away in W. Feiran: this in itself was a terrible loss to the poor Arabs, who depend so much on dates for food. But I was much struck by the quiet way in which the men heard of their losses. Not a murmur was uttered; 'All comes from God', was the one expression in the mouth of all. One poor fellow, whom I knew well, hurried back from a distance when he saw the storm gathering, to find his wife, six children, his tent, and all his worldly possessions swept away; yet he, too, seemed to find comfort in this thought." (Holland 1868-2: 249/250)

One century later, in 1968 under the Israelis, after another devastating flash-flood around "thirty of the 330 families" in Wady Feiran reacted differently and left for Egypt (Eichler & Scheuerbrandt 1983: 213). Migration was probably not an option in the 19th-century, perhaps another explanation why they accepted the events as they did.

Bedouin also do not seem to have taken precautions against the khamseen winds until the impacts were felt, even though they seem to have been able to recognise the signs. This suggests that it may be complicated to predict whether storms will actually reach the area. At least in the early 19th-century, it seems to have been worth investing in issues connected to drought, such as food shortage, because in the early 19th-century, there were food/grain storages mentioned at least in Wady Maghara (Burckhardt 1816: 620) and in Wady 'Aleyat (Renouard de Bussiere 1829: 246/247).

In contrast to the Bedouin, travellers seem to have taken all kinds of precautions against the sun, the rain, the heat and the cold. For example, they brought thermometers and barometers which they hoped would enable them to some extent to predict the weather. However, travellers interpreted weather signs, such as clouds, within their European idea of weather, and not within South Sinai's context. For instance, they linked clouds to precipitation, which was not necessarily true for the Bedouin for the simple reason that in South Sinai clouds were not always followed by precipitation. Bedouin based some of their predictions of precipitation on the behaviour of their camels, which they felt could smell water and rain (Smith Lewis 1898: 242). Travellers also suggested that camels could smell water (e.g. Edmonstone 1822: 22/23), and increased their pace before reaching a well (e.g. De Laborde 1838: 79). However, both the travellers and the Bedouin seem to have been caught by surprise just as often (e.g. Kinnear 1841: 55; Bauerman 1869: 20; Palmer 1871-1: 173).

6.6. Discussion

The South Sinai travel diaries are relatively rich in weather data. However, the data are limited to the main routes and places, and cannot be generalised for the whole of South Sinai. On the one hand this is a drawback of the data, but on the other hand it reflects very well the mosaic reality in South Sinai.

The precipitation and drought data seem to show that the first three decades of the 19th-century were drier than normal, and there was relatively 'normal' precipitation between the 1830s and the early 1890, and a drier period towards the end of the 19th-century. The 19th-century as a whole was relatively dry, and wet years seem to show strong overlap with the Nile data (Johnson 1992), tree-ring data from Jordan (Tarawneh & Hadadin 2009) and the level of the Dead Sea (Klein & Flohn 1987); these data are mainly in phase, but towards the end of the 19th-century they became out-of-phase particularly with data from Turkey. The Tambora eruption in 1816 may have led to relatively low summer temperatures and more frequent showers in South Sinai. This would fit with the relatively low summer temperatures and increased winter temperatures in 1816-17 worldwide, and the higher frequency but not higher intensity of rainfall over Central Europe and drought over South-east Asia which suggests a positive NAO after the eruption (Raible *et al.* 2016).

From the 1960s onwards, the frequency of flash-floods seems to have been relatively high. However, these observations were more systematic than those in the 19th-century, and no conclusions can be drawn based on these data. Dadamouny & Schnittler (2015) suggested that the period between 1970 and 2014 was increasingly dry. This drought was part of a widespread drought in the Mediterranean (Cook *et al.* 2016). Both 19th and 20th century data show that even though precipitation and flash-flood events might take place, a general condition of prolonged drought may be described, forcing a rethink of the definition of drought.

Drought in South Sinai may be linked to positive NAO and periods of strong El Niño, and possibly also to high SST in the Pacific and a weak Indian Monsoon. The tree-rings and the similar length of drought periods slightly delayed in time in different parts of the Middle East, suggest a kind of movement of drought. Precipitation and khamseen winds arrived mainly with southern winds, although at least some flash-floods arrived with north-western winds. This may suggest that South Sinai's weather is a push-and-pull system based on the strength and pressures of weather systems such as the NAO (north-western direction), eastern African monsoon (south-western direction), and Indian monsoon (south-eastern direction). This would also explain why precipitation arrives mainly from these wind directions, and why the drought/precipitation data for South Sinai are sometimes in phase with the Nile and Indian Monsoon records (most of the 19th-century) and sometimes not. Circulations systems such as the Hadley Cell may explain why khamseen winds in Israel are, for instance, caused by south-western and western winds and occasionally eastern winds (Sattler 1971: 9; Yaalon & Ganor 1979), while those on the Arabian Peninsula arrive with northern winds[22] (El Abbassi 1814: 294), completely the opposite wind direction from on the Sinai Peninsula.

The tree-ring data of South Sinai shows high temporal and spatial variation and sensitivity to different weather aspects, namely temperature and rainfall, in specific periods during the year. Drought and rainfall regimes in different parts of the Peninsula may overlap in some years, but generally seem quite different and sometimes even opposite. Drought in one part of the Peninsula may be years of high rainfall or flash-floods in other part of the Peninsula, which makes extrapolation of data impossible.

Although the whole Peninsula receives precipitation up to an extent, the area that receives most rainfall is probably situated in the southwest, specifically Wady Feiran, although not all of the water it receives is from rainfall in the wady itself, but also drainage water from the high mountains around StK. The Tih plateau and high mountains in the South form the barriers that block clouds. However, years with several witnesses at the same time in different parts of the Peninsula, such as 1894, show that clouds passed over the mountains, dropping their contents in different places. Snowstorms in the mountains and rainstorms in the lower areas sometimes happened simultaneously.

Some of the travellers' observations were confusing. Bonar for instance wrote that there was "a pleasant breeze...from the east", but immediately afterwards talks about the "cool sea-breeze", which must have been a western wind because they were near Wady Shelall in western Sinai (Bonar 1857: 140); unless the wind was extremely variable at that moment, there may have been an error. Travellers

[22] http://www.britannica.com/place/Arabian-Desert

used different terms to refer to the khamseen, such as Simoum or Sirocco. However, Burckhardt (1816: 624) used the word Simoum for hot winds that did not contain sand. On the 26th October 1903 (Schoenfeld 1907: 20), there was a sandstorm with the characteristics of the khamseen between ‘Ayn Musa and Wady Gharandel, but this was also outside the khamseen season.

In the 19th-century, the Bedouin depended on precipitation for water and vegetation. During short periods of drought, they seem to have relied on captured water. Prolonged drought formed a serious issue, because it ruined the vegetation and the trade; during these periods they seem to have depended on the travellers and monks for food. In the coastal areas there were some permanent water sources, but they were brackish. Like other parts of the MENA (e.g. Davis 2007: 29), pastures were collectively owned by the tribe in South Sinai to deal with spatial and temporal irregularity in rainfall. The problem of high temperatures in summer in the lower areas and low temperatures in winter in the high mountains was solved by seasonal migration. However, this did not fit with the increasing demands of the travellers. Whereas the travellers were focussed on measuring and predicting weather events, the monks and Bedouin both dealt more or less fatalistically with the irregularity of the weather.

Chapter 7 Climatic imaginations

7.1. The Bedouin and the myth of the Book of Moses

There was one particular weather-related myth which appeared in several versions in the traveller diaries. In short, travellers suggested that the Bedouin believed that the monks of StK used prayers or a very important book, presumably the Torah/Old Testament, to control the rainfall in South Sinai: if the book stayed closed, there was no rain, while if the book was opened there was rain. However, if the book was opened too long or too much, it resulted in a (flash)flood. This myth seems to have been very popular in the early 19th-century, but seems to have disappeared afterwards. Burckhardt (1816) described this story in more detail and mentioned the book:

> "The Arabs believe that the tables of the commandments are buried beneath the pavement of the church on Djebel Mousa, and they have made excavations on every side in the hope of finding them. They more particularly revere this spot from a belief that the rains which fall in the peninsula are under the immediate control of Moses; and they are persuaded that the priests of the convent are in possession of the Taourat, a book sent down to Moses from heaven, upon the opening and shutting of which depend the rains of the peninsula. The reputation, which the monks have thus obtained of having the dispensation of the rains in their hands has become very troublesome to them, but they have brought it on by their own measures for enhancing their credit with the Bedouins. In times of dearth they were accustomed to proceed in a body to Djebel Mousa, to pray for rain, and they encouraged the belief that the rain was due to their intercessions..." (Burckhardt 1816: 567/568)

As the droughts continued, travellers such as Carne (1826: 242/243) and Wolff (1824: 181) suggested that the Bedouin really emphasised the control and the bad intentions of the monks. Towards the end of the 1820s, while Renouard de Bussiere was visiting the Monastery, the Bedouin came to ask the monks to climb Mount Sinai and 'make' the rain; according to De Bussiere they believed that if the monks climbed to the top of Mount Sinai and opened the “Taurat” at arrival in the Monastery, they could make it rain as much as they wanted.

Almost half a century later, when the same myth was recorded by Palmer (1871-1), it had changed very little. In his version, the monks were painted as more powerful, and the story itself seems a mix between Moses receiving the Ten Commandments and the earlier myth of the book. Moreover, the Bedouin referred to more rain in the past. Palmer (1871-1) wrote on 18 November 1868 about the Chapel of the Burning Bush:

> “Over the altar is a little window...it is said that the sunlight only penetrates it one day in the year, and then a solitary ray darts through a cleft in the mountain above and falls upon the chapel-floor. The cleft is marked by a wooden cross, and the mountain is accordingly called by the Arabs Jebel es Salíb (the Mount of the Cross). This fact, or fancy, has given rise to a curious Arab legend. They say that once upon a time the Book of Moses, which had been delivered to him by God on the top of Sinai, was kept upon the summit of the mountain, and then the rain fell round about for alternate periods of forty days and forty nights. But the monks, wishing to obtain greater control over the Arabs, brought down the mysterious book, which was engraved upon stone, and built it into the walls of the church, leaving this little window through which it might be occasionally seen. Whenever they desire rain, they have only to open the window to procure it at once, and they can even bring wind and storms and locusts upon the country by the same means.” (Palmer 1871-1: 65/66)

The tradition survived throughout the 19th-century and into the 20th century. Smith Lewis (1898: 113) suggested in the late 19th-century that according to the Bedouin, clay tablets with the Ten Commandments were “...either built into the wall of the Chapel of the Burning Bush, or concealed in the ruins of the church on the top of Jebel Musa”. The Bedouin continued to ask the help of the monks in time of drought:

"...not a drop of rain had fallen since March or April of the previous year...the monks lamented the lowness of the water in their wells, and one morning we were surprised by the arrival of three sheikhs, who had come a long four days' journey as a deputation from the tribes of the Tih, for the purpose of requesting the monks to pray for rain." (Smith Lewis 1898: 112/113)

Although there was no rainfall during the three weeks that followed (Smith Lewis 1898: 114/115), there does not seem to have been any violence towards the monks, as had occurred in the early 19th-century.

In the early 20th century, on the 5th November 1903, 29 of the 32 monks climbed Mount Sinai to pray for 48 hours for rain, after Bedouin had asked them to do it because there had been a drought for two years (Schoenfeld 1907: 55). On the 8th November 1903 it started to rain (Schoenfeld 1907: 61). To what extent the Bedouin really believed that the monks had the power to pray for rain, or in general what their thoughts were about this event, is not clear, because we do not have their side of the story.

The position of the monks, who according to Burckhardt (1816) created this myth of the Book of Moses themselves, was precarious though, because the Bedouin also reasoned the other way around and concluded that the monks "had it in their power to withhold [the rain]" (Burckhardt 1816: 568; see also Plowden 1940: 27). Continuing drought or too much rain both caused tensions between the Bedouin and the monks (e.g. Turner 1820: 447/448; Renouard de Bussiere 1829: 257/258):

"Some years since, soon after an occurrence of this kind [praying at the top of Mount Sinai], it happened that a violent flood burst over the peninsula, and destroyed many date trees; a Bedouin, whose camel and sheep had been swept away by the torrent, went in a fury to the convent, and fired his gun at it, and when asked the reason, exclaimed; 'You have opened the book so much that we are all

> drowned!' He was pacified by presents; but on departing he begged that in future the monks would only half open the Taourat, in order that the rains might be more moderate." (Burckhardt 1816: 568)

It seems that the myth was known outside South Sinai. In Wady 'Araba, which is situated between 'Aqaba and the Dead Sea, a Bedouin thanked the monks of StK when it started raining at the end of the 1830s, and explained the story of the book, but also added that in his opinion the monks were as insensitive as the rocks on which they lived (Günnel 1847: 55/56).

The belief that religious leaders could bring rain was widespread in Asia and Africa (e.g. Condor 1831: 94/95). A similar story existed for the level of Nile inundation, which was suggested to be controlled by the Pasha "by opening and shutting the Book of Miriam" (Holland 1868-1: 195).

7.2. Rain snatchers

Not only the monks, but all visitors from outside were potential rain bringers or rain-'deprivers'. Those with scientific instruments and pencils and paper were particularly suspicious, because they could potentially write magic spells to keep the rain away (Palmer 1871-2: 294):

> "...'but we all know that some years since several men, God knows who they were, came to this country, visited the mountains, wrote down everything, stones, plants, animals, even serpents and spiders, and since then little rain has fallen, and the game has greatly decreased'...they believe that a sorcerer, by writing down certain charms, can stop the rains and transfer them to his own country. The travellers to whom Ayd [a Bedouin] alluded were M. Seetzen, who visited Mount Sinai eight years since, and M. Agnelli, who ten years ago travelled for the Emperor of Austria, collecting specimens of natural history, and who made some stay at Tor, from whence he sent Arabs to hunt for all kinds of animals." (Burckhardt 1816: 519/520)

In the period between Seetzen's expedition 1807 and Burckhardt's visit in 1816, there was severe drought throughout South Sinai. Burckhardt wrote on the 21st May 1816 near Mount St Catherine:

> "In making the preceding observations I was obliged to take out my compass and pencil, which greatly surprised the Arabs, who, seeing me in an Arab dress, and speaking their language, yet having the same pursuits as the Frank travellers whom they had seen here, were quite at a loss what to make of me. The suspicion was immediately excited, that I had ascended this mountain to practise some enchantment, and it was much increased by my further proceedings. The Bedouins supposed that I had come to carry off the rain, and my return to Cairo was, in consequence, much less agreeable than my journey from thence; indeed I might have been subjected to some unpleasant occurrences had not the faithful Hamd [a Bedouin] been by my side, who in the route back was of more service to me than all the Firmahns of the Pasha could have been." (Burckhardt 1816: 577)

In the second half of the 1820s, during a period of drought, Renouard de Bussiere described how clouds started to cover the sky while he was drawing, but then disappeared without dropping any rain; the Bedouin considered him, and the presumed magic spells he had written down, as the cause of this (Renouard de Bussiere 1829: 267). In the late 1860s, the Bedouin expressed again (according to Holland 1868-2: 244) that there had been more rain in the past. In January 1870, Palmer noted that Bedouin suspicions increased during periods of drought, and tried to resolve this problem by describing his work to the Bedouin:

> "...our friend confessed to having prevaricated, and frankly owned that he considered our presence and the recent drought as suspiciously coincident, expressing also his decided opinion that such dangerous curiosity as ours ought not to be encouraged." (Palmer 1871-2: 325)

At the end of the 19th-century, this superstition was still very much alive. Smith Lewis (1898) described in 1897 during a period of drought, how Bedouin thought she had stopped the rain from falling by working on the manuscripts of the Monastery of St Katherine:

> "The camels were sniffing the air and looking upwards, so the Bedawin expected the rain, which they really believed had been kept back by our work among the Convent MSS!" (Smith Lewis 1898: 242)

Around 1909, a Bedouin sheikh referred to the "immoral" flirting behaviour of the women in Cairo, which discontented God, who therefore did not send as much rain as in the time of his grandfather (Schneller 1910: 102). In the early 1920s, the belief that the Europeans stole the rain with their instruments, still survived. Beadnell wrote:

> "Firmly convinced that my survey cairns would keep away the occasional rains on which their livelihood so much depends, they [Bedouin] had them all levelled to the ground almost before we were clear of their district." (Beadnell 1926: 389)

While visitors were regarded suspiciously at times of drought, they could be fortunate if they arrived at the same time as the rain (Palmer 1871-2: 357; Stephens 1996: 208/209). Nevertheless the suspicions always stayed in the background. Just as the book of Moses backfired on the monks, books and instruments did on travellers. Palmer recorded in Wady 'Aleyat in January 1869:

> "My first acquaintance with Wady 'Aleyat was made on the eve of a heavy storm; and grand indeed it was to hear the wind roaring amidst the crags of the gigantic mountain. I hurried home, telling my Arab guide to make haste, unless he wished to get wet through. He, poor fellow, had no notion of reading the sky for indications of the weather, and professed the greatest astonishment at my prophecy of the coming rain. When, in order to enlighten him still further, I carefully explained the use and construction of a barometer, he listened attentively, and observed, 'I suppose you can stop the rain as well as bring it?'" (Palmer 1871-1: 173)

A similar remark was made by a Bedouin northeast of El 'Arish:

> "Husein, the sheikh of the Arabs who dwell in and near Wady Garaiyeh, asked me to tell him whether there was not a well containing fresh water somewhere in the vicinity. He said I ought to know, and that if I did not, I might find out from some of our books." (Palmer 1871-2: 342/343)

However, for travellers it could also work two ways. Smith Lewis explained how her dragoman used pencil and paper to prevent discussions and delays of the Bedouin, as was often the case at the start of the first day of travelling:

> "Joseph explained to us his method. He had neither bullied the Bedawin, nor stormed at them, nor argued with them, but, in imitation of the Rev. Dr. Bliss' manner with his students, he had taken out a pencil and a note-book, and begun to write down all that was being said and done. This was too much for our superstitious friends; they have some vague idea of a Recording Angel, and they did not know what mysterious power these notes would have over them in the future. So they tied on their burdens in peace." (Smith Lewis 1898: 31/32)

However, in February 1895, this backfired again on this dragoman, when Bedouin around the Monastery of St Katherine asked him for help during a drought:

> "...still more curious was it when they preferred a like request to our dragoman. 'But it will be of no use', they said, 'unless you put on a white dress and go to the top of Jebel Musa about midnight, and pray there'. Joseph excused himself by saying that the great thing was for people to pray for themselves. 'If you don't do that', he said, 'my prayers won't help you much.'" (Smith Lewis 1898: 113/114)

The monks simply explained drought as "it is for our sins" (Smith Lewis 1898: 114).

7.3. Travellers' weather imaginations

The Bedouin were not alone in suggesting that there had been more rain in the past. Especially in the second half of the 19th-century, travellers suggested the same (e.g. Hull 1885: 49), based on the descriptions of vegetation in the Bible and visible vegetation in the landscape. As Sinai was considered the land of the Exodus, it was supposed that the area must have been rich enough in rain, water and vegetation to enable the large group of Israelites to survive for 40 years. Palmer, for instance, referred to Bible passages such as Psalms 68 and 77 as evidence that there had been more rain in the past (Palmer 1871-1: 25).

Other weather phantasies related to the Bible were the thunder and clouds (Exodus 19: 16), which both Loti (1993: 20), and Schoenfeld (1907: 67) experienced in real life at the foot of Mount Sinai. During the event Schoenfeld read psalm 50 about the power of God and the thunder and lightning. Stanley tried linking the "howling wilderness" to the stormy weather he encountered in South Sinai (Stanley 1857: 68). Bonar remarked:

> "How natural must the Lord's remark...'when ye see a cloud rise out of the west, straightway ye say, There cometh a shower; and so it is. And when ye see the south wind blow, ye say, There will be heat; and it cometh to pass' (Luke xii. 54, 55)" (Bonar 1857: 279)

Early 19th-century travellers suggested that it never rained in the desert, or in Egypt in general (e.g. Cooley 1843: 10). This is likely a reflection of the many droughts and the relatively dry first three decades of the 19th-century. As a result of this idea, travellers sometimes suggested that they did not need to take tents or rain protection (e.g. De Laborde 1838: 44; Schoenfeld 1907: 31; Schneller 1910: 28), even though they were still travelling in spring when precipitation events could and did take place.

In the later 19th-century, however, some travellers visiting South Sinai in years with a lot of precipitation concluded that there was "no lack of rain in the Sinaitic peninsula...in the months of December, January, February, and March" (Bartlett 1879: 307), even though in reality the amount of rainfall fluctuated over the years. This led to the idea linked to the declensionist narrative that more intense rainstorms and increased soil-erosion were the result of Bedouin tree-cutting activities (Bartlett 1879: 216). Trees were thought to limit erosion and vegetation was thought to influence rainfall:

> "There are still many groves of acacia and other trees in the Peninsula, and these, like the gardens, form a sort of barricade against the force of the torrents. Now when one of them is destroyed, and a storm comes, whatever vegetation depended on or was protected by the forest is soon swept away, and barrenness and devastation mark the course of the stream down to the sea. It is a well-known fact that rain falls more gently and regularly where there is vegetation. (Palmer 1871-1: 25/26)

This idea led to the redemption narrative in South Sinai, that planting trees and vegetation would increase rainfall. After the opening of the Suez Canal, the crops and trees on mainland Egypt increased, and this was thought to have led to increased rainfall in the late 19th-century over mainland Egypt (e.g. Anon. 1848-2: 306; Holland 1878: 456; Taylor 1886: 35). However, the second part of the 19th-century was generally wetter than the early 19th-century, independent of the vegetation.

In drawings and paintings, there were often some clouds visible (e.g. Roberts *et al.* 1842; Schneller 1910: 166/167), whereas in reality, the sky was most of the time described as completely cloudless, or full of clouds for a short time, often prior to precipitation. The transition from Sinai to Palestine/Syria, such as between Nakhl and Gaza, was the transition of very barren area to a more vegetated area, which travellers called the "region of rain" (Bonar 1857: 278) or "the rainy belt" (Field 1888: 246). However, increased vegetation in this area was probably partly linked to the season, because travellers generally entered the area during or after the spring rains.

7.4. Discussion

The 19th-century weather imaginations reflected the periods of drought and the changing power-relations in South Sinai very well. In the first three decades of the 19th-century, a period of prolonged drought, travellers reported that Bedouin were regularly aggressive towards the monks. This seems to have been at least partly linked to the myth of the book introduced by the monks to keep Bedouin under control. At times this myth backfired, because Bedouin seem to have reasoned that if the monks could cause rain, they could also stop it or cause devastating floods. The Bedouin seem also to have held travellers, and specifically their writing activities, responsible for causing drought. It is likely that this is linked to the long periods of drought which coincided with the first visiting scientists, such as Seetzen (1855) and Burckhardt (1816) during the early 19th-century.

With the stabilisation of the weather between the 1830s and the early 1890s, and the strong political control from Egypt over the Bedouin during this period, aggression towards the monks disappeared. By the late 19th-century, during another period of drought, Bedouin asked the monks to pray on Mount Sinai, but were not aggressive anymore. Throughout the 19th- and early 20th-century, Bedouin held travellers responsible for negatively affecting the rainfall (e.g. Burckhardt 1816: 577; Palmer 1871-2: 315; Beadnell 1926: 389), a phenomenon which has also been described in other parts of Africa (e.g. Endfield & Nash 2002). It is not clear to what extent the Bedouin really believed this. However, these myths created a space for negotiations and to vent frustrations.

Both the Bedouin and the travellers claimed that there had been more rain before the 19th-century. For the Bedouin this may have symbolised their earlier powerful position (Endfield & Nash 2002: 38).

Travellers held the Bedouin responsible for vegetation destruction and linked this to a decrease in rainfall. This connects to the desiccation and declensionist ideas expressed in other parts of the MENA (e.g. Davis 2007), and reflected the growing power of Christian Europe over the Middle East.

Discussion & conclusion

This thesis is the result of multi-disciplinary and multi-lingual research on 19th-century travel writing in South Sinai. It has explored the value of travel writing along "lines of flight" for the field of environmental and climatic history. The traveller diaries were amazingly rich in data, and although the data have some drawbacks and limitations, this does not necessarily form an issue for environmental history reconstructions in arid regions, as will be discussed in more detail below.

Data extracted from archival material have several issues. The level of detail in these travel diaries was variable and limited to the interest and knowledge of the traveller. Travellers were not always consistent, and some forgot to mention the year, month or day of their trip or observations (e.g. Henniker 1824; Carne 1826; Clifton 1900; Schneller 1910), or the names of the wadies through which they travelled (e.g. Loti 1993). Others only mentioned the names of the projected Biblical places instead of the actual wadies (e.g. Hindley 1850). These data are almost impossible to work with, unless there are hints elsewhere in the diaries about the year, or diaries of co-travellers exist that contain more precise information; for instance Hindley travelled together with Anderson (1853), and Carne together with Wolff (1824). Sometimes, there were differences between the original diary and the published diary of the same writer. For instance, in Palmer's (1868) handwritten diary there were dates for certain weather events which were not in his published diary (Palmer 1871-1). It was therefore necessary to read both. Data from springtime, large-sized flora, precipitation and extreme weather events collected by male travellers were all over-represented.

Using these data for environmental history reconstruction is not straightforward. In South Sinai, the spelling of the geographical names was extremely variable and sometimes hardly recognisable as synonyms; basic knowledge of the Arabic language and standardisation of the names was indispensable. Partly overlapping orthographic varieties of wady names, such as the wadies Beiraq and BerraH, were extremely difficult and required a detailed knowledge of the routes. The reconstruction of the data was complicated by the fact that travellers travelled in both directions along these routes, and crossed the same wady, e.g. Gharandel and Feiran, in different places depending on the route they took. On top of that, travellers sometimes changed route which complicated the location of their exact position; in-depth knowledge of the routes and the geography of South Sinai was essential.

The reliability of the data is a complicated issue. There were diaries that seemed realistic, e.g. Dumas (1839) who based his book on the data of a real traveller, Dauzats, but never actually travelled to South Sinai himself. However, it is not clear to what extent the dates and events mentioned in the book correspond with the reality, and therefore the data cannot be included in the research. Some travellers only published their diaries years or even decades after their trip (e.g. Scott 1927), and it is not clear what was original or added later, and how time had influenced the description and interpretation of events. Travellers may have copied data from each other; in South Sinai, the works of especially Burckhardt, Stanley, and Palmer seem to have inspired later travellers, and it was therefore essential to read these works in detail. Multiple data for the same period or events, such as 1839 (Kinnear 1841; Ballantine 1866), and 1894 (Buxton 1895; Buxton *et al.* 1895; Österreich 1895; Loti 1993) increased the reliability. The declensionist and redemption narratives mentioned in connection with other arid regions, were also found in the descriptions of South Sinai; in-depth knowledge of these narratives was therefore essential.

Even though the data from archival sources have their drawbacks, they are highly valuable for environmental and climatic historical reconstructions especially for mosaic environments with episodic weather events such as South Sinai. The data extracted from the traveller diaries were limited to the traveller routes, and only provided snapshots in time and space. However, in a mosaic landscape such as South Sinai this worked well. The travel routes passed the main oases in the otherwise vegetation-poor landscape. The vegetation was generally described in detail while discussing the imaginary link between the oases and the Bible passages of the Exodus. Weather events, which were either considered rare, highly impressive due to their intensity, or in conflict with the travellers' desert imaginations, were also mentioned and discussed in detail. Although this has resulted in the over-representation of certain places and events, it enables comparison and reconstruction over time along these routes. Little is known about the vegetation and weather conditions in the areas outside the traveller routes and the periods not covered by travel diaries, and the data do not allow an overview of yearly precipitation averages. However, due to South Sinai's mosaic environment and climate, it is not clear at this point if off-route data would add anything to the general understanding of the environmental history of South Sinai, and in any case precipitation averages are not informative due to the episodic nature of weather events in South Sinai.

Apart from that, there was much information in these diaries about the complex relations between the travellers, monks and Bedouin. It is clear these relations were at least to some extent influenced by the weather, especially during (prolonged) periods of drought. However, other factors such as political and socio-economic changes have also played a role in the interaction between these groups. The political changes in Egypt and the increased power of Europe in the Middle East were definitely reflected in the way these groups dealt with each other. The relations between the travellers and the Bedouin changed over the 19^{th}-century from fearing to dominating and marginalising. Between the travellers and the monks, the relation changed from respectful to highly (religiously) sceptical during this period. And after the first 30 years of the 19th-century, which was a period of social and political turmoil and of prolonged drought, the relation between the Bedouin and the monks seems to have changed from aggressive to peaceful. All three groups seem to have, at least partly, vented their frustrations in environmental and climatic imaginations, in which they accused the other group of environmental destruction or drought.

In conclusion, the data extracted from the traveller diaries provide an interesting first insight into South Sinai's environmental history, and the little understood weather systems that rule this area. There seem to be clear links with the environmental histories and environmental narratives of other parts of the MENA. Travel writing, especially along specific routes, can therefore be considered extremely useful for environmental history reconstructions, at least in arid regions where the environment and people are so strongly depending on precipitation. This type of qualitative research requires in-depth knowledge of the geography and the contemporary ideas of the environment. It is very useful in this respect to be familiar with the environmental histories of other environmentally and climatically similar regions. Furthermore, travel writing from travellers of different nationalities seems to be indispensable in order to get a grip on the environmental and climatic imaginations and social interactions inspired by socio-political changes and contemporary environmental ideas. McNeill (2013: 32) wrote that "one of the interesting avenues for future research in MENA environmental history is to integrate climate change into general social, economic, and political narratives". I think he is totally right, because without this integration and multi-disciplinary approach, there may be a risk that environmental histories get caught in the trap of generalisation and repetition of new environmental and climatic narratives, and environmental changes may be explained too easily by climate change, while the reality may be much more complex.

Recommendations for future research

There have been claims of climate change and increased frequency of extreme precipitation events in recent years in the Middle East and in Sinai (e.g. Almazroui *et al.* 2012; Dadamouny & Schnittler 2015). This is based on observations during a prolonged and most severe drought period of the last two decades. Although this may be a sign of climate change, follow-up studies should be planned, in which a detailed environmental and climatic reconstruction of the 19th and 20th century would be essential. The study of the oral environmental and climatic histories passed on among the local Bedouin could be very helpful in this reconstruction because they are the experts of the area. Their knowledge about coping and adapting to (prolonged) drought and extreme precipitation events can help to prevent human disasters in the future.

Bibliography

ABD EL-GHANI, M. M., FAHMY, A. G. 1998. Composition of and changes in the spontaneous flora of Feiran Oasis, S Sinai, Egypt, in the last 60 years. *Willdenowia,* 28, 123-134.

ADGER, W. N. 2003. Social capital, collective action, and adaptation to climate change. *Economic Geography,* 79, 387-404.

ADGER, W. N., HUGHES, T.P., FOLKE, C., CARPENTER, S.R., ROCKSTRÖM, J. 2005. Social-ecological resilience to coastal disasters. *Science,* 309, 1036–1039.

ADGER, W. N. 2006. Vulnerability. *Global Environmental Change,* 16, 268-281.

ALMAZROUI, M., NAZRUL ISLAM, M., JONES, P.D., ATHAR, H., ASHFAQUR RAHMAN, M. 2012. Recent climate change in the Arabian Peninsula: Seasonal rainfall and temperature climatology of Saudi Arabia for 1979-2009. *Atmospheric Research, 111,* 29-45.

ALPERT, P., BEN-GAI, T., BAHARAD, A., BENJAMINI, Y., YEKUTIELI, D., COLACINO, M., DIODATO, L., RAMIS, C., HOMAR, V., ROMERO, R., MICHAELIDES, S., MANES, A. 2002. The paradoxical increase of Mediterranean extreme daily rainfall in spite of decrease in total values. *Geophysical Research Letters,* 29(11), 31(1-4).

ANATI, E. 2001. *The riddle of Mount Sinai: Archaeological discoveries at Har Karkom,* Capo di Ponte, Edizioni del Centro.

ANATI, E. 2013. *Is Har Karkom the Biblical Mount Sinai?,* Capo di Ponte, Atelier.

ANDERSON, J. R. 1851. *Pencillings in Palestine: Being scenes descriptive of the Holy Land and other countries in the East, written during a visit in 1850,* London, James Nisbet.

ANDERSON, J. R. 1853. *Wanderings in the land of Israel and through the wilderness of Sinai, in 1850 and 1851. with an account of the inscriptions in wady Mokatteb, or the written valley,* Glasgow/London, Collins.

ANONYMOUS 1820. Literary and scientific intelligence. *London Magazine,* 2, 563-567.

ANONYMOUS 1821. Original correspondence. *Literary Gazette,* 241, 553-555.

ANONYMOUS 1829. Visit to Mount Sinai. *Imperial Magazine,* 11(125), 414-418.

ANONYMOUS 1830. Art. IX - Travels through the Crimea, Turkey, and Egypt, performed during the years 1825-1828, including particulars of the last illness and death of the Emperor Alexander, and of the Russian Conspiracy in 1825. By the late James Webster, Esq. of the Inner Temple. in two vols, 8vo. London: Colburn and Co. 1380. *Monthly Review,* 14, 434-449.

ANONYMOUS 1834. Arts and Sciences: Geographical Society. *Journal of the Belles Lettres, Literary Gazette,* 936.

ANONYMOUS 1838. Lord Lindsay's letters from the East – Egyptian Magic. *Dublin University Magazine,* 12(71), 568.

ANONYMOUS 1848-1. Notes of a Journey in the Holy Land (part 1). *The Christian Guardian, and Church of England Magazine.* London: Seeleys.

ANONYMOUS 1848-2. Notes of a Journey in the Holy Land. *The Christian Guardian, and Church of England Magazine.* London: Seeleys.

ANONYMOUS 1848-3. Notes on a journey in the Holy Land (part 3). *The Christian Guardian, and Church of England Magazine.* London: Seeleys.

ANONYMOUS 1859. Notes of a mineralogical excursion from Cairo into Arabia Petraea. *The Natural History Review, and Quarterly Journal of Science,* 6, 28-42.

ANONYMOUS 1860. Journey by Sinai to Syria. *Good Words,* 1, 791-794.

ANONYMOUS 1867. Art. V. - The Comparative Geography of Palestine and the Sinaitic Peninsula. *London Quarterly Review,* 28(56), 404-452.

ANTES, J. 1800. *Observations of the manners and customs of the Egyptians, the overflowing of the Nile and its effects; with remarks on the plague, and other subjects. Written during a residence of twelve years in Cairo and its vicinity,* London, John Stockdale.

ARUNDALE, F. 1837. *Illustrations of Jerusalem and Mount Sinai; Including the most interesting sites between Grand Cairo and Beirout,* London, Henry Colburn.

AUCHER-ELOY 1843. *Relations de voyages en Orient de 1830 à 1838. Seconde partie,* Paris, Encyclopédique de Roret.

AYYAD, M. A., FAKHRY, A.M., MOUSTAFA, A.-R.A. 2000. Plant biodiversity in the Saint Catherine area of the Sinai peninsula, Egypt. *Biodiversity and Conservation,* 9, 265–281.

BAEDEKER, K. E. 1885. *Egypt: Handbook for travellers. (2nd ed.),* Leipsic/London, Karl Baedeker/Dulau.

BAILEY, C. 1974. Bedouin Star-Lore in Sinai and the Negev. *Bulletin of the School of Oriental and African Studies,* 37, 580-596.

BAILEY, C. 1985. Dating the arrival of the Bedouin tribes in Sinai and the Negev. *Journal of the Economic and Social History of the Orient,* 18, 20-49.

BALLANTINE, J. 1866. *The life of David Roberts, R.A.: Compiled from his journals and other sources,* Edinburgh, Adam and Charles Black.

BANKOFF, G. 2009. Cultures of disaster, cultures of coping: Hazard as a frequent life experience in the Philippines. *In:* MAUCH, C., PFISTER, C. (ed.) *Natural disasters, cultural responses: Case studies towards a global environmental history.* Plymouth: Lexington Books, 265-284.

BARDTKE, H. 1968. *Vom Nildelta zum Sinai: Bilder zur Landes- und Altertumskunde nach eignen Aufnahmen des Verfassers während einer Studienreise im Sommer 1966,* Berlin, Union Verlag.

BARNES, J. 2013. Expanding the Nile's watershed: the science and politics of land reclamation in Egypt. *In:* MIKHAIL, A. (ed.) *Water on sand: Environmental histories of the Middle East and North Africa.* Oxford: Oxford University Press, 251-272.

BARROIS, A. 1932. The Mines of Sinai. *Harvard Theological Review,* 25, 101-121.

BARTLETT, S. C. 1879. *From Egypt to Palestine, through Sinai, the wilderness and the South Country: Observations of a journey made with special reference to the history of the Israelites,* New York, Harper & Brothers.

BARTLETT, W. H. 1849. *Scripture sites and scenes, from actual survey in Egypt, Arabia, and Palestine,* London, Arthur Hall & Co.

BARTLETT, W. H. 1854. *Forty days in the desert on the track of the Israelites: A journey from Cairo, by Wady Feiran, to Mount Sinai and Petra,* London, Arthur Hall & Co.

BASSNETT, S. 2006. Travel writing and gender. *In:* HULME, P., YOUNGS, T. (ed.) *The Cambridge Companion to travel writing.* Cambridge: Cambridge University Press, 225-241.

BASUONY, M. I., GILBERT, F., ZALAT, S. 2010. *Mammals of Egypt: atlas, Red Data Listing & conservation,* Cairo, Ministry of State for Environmental Affairs.

BAUERMAN, H. 1869. Note on a Geological Reconnaissance made in Arabia Petraea in the Spring of 1868. *Quarterly Journal of the Geological Society,* 25, 17-39.

BAUMGARTEN, M. 1732. The travels of Martin Baumgarten, a nobleman of Germany, through Egypt, Arabia, Palestine and Syria, with the Author's life done out of Latin. *A collection of voyages and travels, some now first printed from original manuscripts, others now first published in English. Vol. I.* London: John Walthol.

BEADNELL, H. J. L. 1926. Central Sinai. *Geographical Journal,* 67, 385-398.

BENJAMIN, R. 1784. *Travels of Rabbi Benjamin, Son of Jonah, of Tudela: Through Europe, Asia, and Africa; from the ancient Kingdom of Navarre, to the frontiers of China,* London, printed for the translator.

BENJAMIN, R. 1907. *The itinerary of Benjamin of Tudela. 1 ed,* New York, Phillip Feldheim.

BENTLEY, J. 1985. *Secrets of Mount Sinai: The story of the Codex Siniaiticus,* London, Orbis.

BERNSTEIN, B. 1980. *Sinai: the great and terrible wilderness,* London, Weidenfeld and Nicolson.

BISHOP BIRD, I. 1886-1. A Pilgrimage to Sinai III. *Leisure Hour (Mar.)*, 173-178.

BISHOP BIRD, I. 1886-2. A Pilgrimage to Sinai IV. *Leisure Hour (Apr.)*, 233-238.

BISHOP BIRD, I. 1886-3. A Pilgrimage to Sinai V. *Leisure Hour (May)*, 314-317.

BLACK, E., BRAYSHAW, D.J., RAMBEAU, C.M.C. 2010. Past, present and future precipitation in the Middle East: insight from models and observations. *Philosophical Transactions of the Royal Society A,* 368, 5173-5184.

BLACK, I. S. 2010. Analysing historical and archival sources. *In:* CLIFFORD, N., FRENCH, S., VALENTINE, G. (ed.) *Key methods in geography.* London: Sage.

BLOT, J. 1990. *Si loin de Dieu,* Paris, Albin Michel.

BONAR, H. 1857. *The desert of Sinai: Notes of a spring-journey from Cairo to Beersheba,* New York, Carter.

BONOMI, J. 1876. The Sinaitic inscriptions. *Athenaeum, 2562, 723*.

BORRER, D. 1845. *A journey from Naples to Jerusalem,* London, J. Madden & Co.

BÖTTCHER, K. 1898. *Aus geweihten Landen: Studienfahrten durch Palästina, Syrien und die Sinai-Halbinsel,* Leipzig, Bernhard Franke.

BOULOS, L. 1999-2005. *Flora of Egypt vol. 1-4,* Cairo, El Hadara.

BOWN, K. J., DUYMAER VAN TWIST, M., EROS, E., GILBERT, F. *ET AL.* 2009. *Discover Sinai: A guide to the natural, cultural and historical faces of South Sinai.* www.discoversinai.net

BRADLEY, R. S., JONES, P.D. 1995. *Climate change since A.D. 1500,* London, Routledge.

BREWER, S., ALLEAUME, S., GUIOT, J., NICAULT, A. 2007. Historical droughts in Mediterranean regions during the last 500 years: a data/model approach. *Climate of the Past,* 3, 355–366.

BRIDGES, K. W., MCCLATCHEY, W.C. 2009. Living on the margin: Ethnoecological insights from Marshall Islanders at Rongelap atoll. *Global Environmental Change,* 19, 140–146.

BRIDGES, R. 2006. Exploration and travel outside Europe (1720-1914). *In:* HULME, P., YOUNGS, T. (ed.) *The Cambridge Companion to travel writing.* Cambridge: Cambridge University Press, 53-69.

BROCKLEBANK, J. 1865. *Continental and oriental travels: Excursions in France, Italy, Egypt, Sinai, Palestine, and Syria with Biblical elucidations and historical notes,* Leeds, Walker.

BROWNE, W. G. 1799. *Travels in Africa, Egypt and Syria from the year 1792 to 1798,* London, Cadell Jr., W. Davies, Longman and Rees.

BRUCE, J. 1790. *Travels to discover the source of the Nile in the years 1768, 1769, 1770, 1771, 1772, and 1773,* Edinburgh, G.G.J. & J. Robinson.

BRUNET, M., GILABERT, A., JONES, P. 2014. A historical surface climate dataset from station observations in Mediterranean North Africa and Middle East areas. *Geoscience Data Journal,* 1, 121-128.

BULLIET, R. W. 2013. History and animal energy in the Arid Zone. *In:* MIKHAIL, A. (ed.) *Water on sand: Environmental histories of the Middle East and North Africa.* Oxford: Oxford University, 51-69.

BURCKHARDT, J. L. 1816. *Travels in Syria and The Holy Land,* London, John Murray (1992 Reprint, Darf Publishers).

BURCKHARDT, J. L. 1819. Travels in Nubia, London, John Murray.

BURCKHARDT, J. L. 1829. Travels in Arabia, comprehending an account of those territories in Hedjaz which the Mohammedans regard as sacred, London, Henry Colburn.

BURCKHARDT, J. L. 1831. *Notes on the Bedouins and Wahabys, collected during his travels in the East, by the late John Lewis Burckhardt,* London, Henry Colburn & Richard Bentley.

BURTON, A. E. 2005. *Archive stores: Facts, fictions & the writing of history,* Durham/London, Duke University Press.

BUTZER, K. W. 2012. Collapse, environment, and society. *Proceedings of the National Academy of Sciences of the United States of America,* 109, 3632-3639.

BUTZER, K. W., ENDFIELD, G.H. 2012. Critical perspectives on historical collapse. PNAS, 109(10), 3628–3631.

BUXTON, E. N. 1895. Stony Sinai. *The Nineteenth century and after: A monthly review,* 37, 138-155.

BUXTON, H. M., BUXTON, C.E., BUXTON, T. 1895. *On either side of the Red Sea with illustrations of the granite ranges of the Eastern desert of Egypt, and of Sinai,* London, Edward Stanford.

BUZARD, J. 2006. The Grand Tour and after (1660-1840). *In:* HULME, P., YOUNGS, T. (ed.) *The Cambridge Companion to travel writing.* Cambridge: Cambridge University Press, 37-52.

CARBONELL, E. 2012. The Catalan fishermen's traditional knowledge of climate and the weather: A distinctive way of relating to nature. *International Journal of Intangible Heritage,* 7, 62-75.

CAREY, M., GARONE, P. 2014. Forum introduction. *Forum: Climate change and environmental history. Environmental History,* 19, 282-293.

CAREY, M. 2014-1. Beyond weather: the culture and politics of climate history. *In:* ISENBERG, A. C. (ed.) *The Oxford handbook of environmental history.* Oxford: Oxford University Press, 23-51.

CAREY, M. 2014-2. Science, models, and historians: toward a critical climate history. *Environmental Reviews,* 19, 354-364.

CARNE, J. 1826. *Letters from the East: Written during a recent tour through Turkey, Egypt, Arabia, the Holy Land, Syria, and Greece,* London, Henry Colburn.

CARR, H. 2006. Modernism and travel (1880-1940). *In:* HULME, P., YOUNGS, T. (ed.) *The Cambridge Companion to travel writing.* Cambridge: Cambridge University Press, 70-86.

CARRINGTON BOLTON, H. 1890. Four weeks in the wilderness of Sinai, with notes on Egypt. *Journal of the American Geographical Society of New York,* 22, 575-598.

CATCHPOLE, A. J. W. 1995. Hudson's Bay Company ships' log-books as sources of sea ice data, 1751-1870. *In:* BRADLEY, R. S., JONES, P.D. (EDS) (ed.) *Climate since AD 1500.* London: Routledge, 17-39.

CLAYTON, R. 1753. *A journal from Grand Cairo to Mount Sinai, and back again: Translated from a manuscript, written by the Prefetto of Egypt, in company with some Missionaries de propaganda fido at Grand Cairo,* London, William Bowyer.

CLIFFORD, J. 1997. *Routes: travel and translation in the late twentieth century*, Harvard University Press, Cambridge.

CONDOR 1831. *The modern traveller: A popular description, geographical, historical and topographical, of the various countries of the globe. Vol. IX - Arabia,* Boston, Lilly & Wait.

CONWAY, D. 2000. The climate and hydrology of the Upper Blue Nile River. *Geographical Journal,* 166, 49-62.

COOK, B. I., ANCHUKAITIS, K.J., TOUCHAN, R., MEKO, D.M., COOK, E.R. 2016. Spatiotemporal drought variability in the Mediterranean over the last 900 years. *Journal of Geophysical Research: Atmospheres,* 121, 2060-2074.

COOK, E. R., SEAGER, R., CANE, M.A., STAHLE, D.W. 2007. North American drought: Reconstructions, causes, and consequences. *Earth-Science Reviews,* 81, 93-134.

COOK, E. R., KRUSIC, P.J., ANCHUKAITIS, K.J., BUCKLEY, B.M., NAKATSUKA, T., SANO, M., PAGES ASIA2K MEMBERS. 2012. Tree-ring reconstructed summer temperature anomalies for temperate East Asia since 800 C.E. *Climate Dynamics,* 41, 2957-2972.

COOK, F. H. 1880. *Programmes and itineraries of Cook's arrangements for Palestine tours, available for one or more passengers by any route, with extensions to Egypt and the Nile, Sinai, Petra, Moab, the Hauran, Turkey, Cyprus, Greece, Asia Minor, and Italy for the season of 1880-81. With maps,* London, Thomas Cook & Sons.

COOLEY, J. E. 1843. *The American in Egypt, with rambles through Arabia Petraea and the Holy Land, during the years 1839 and 1840,* New York, D. Appleton & Co.

COOLS, J., VANDERKIMPEN, P., EL AFANDI, G., ABDELKHALEK, A., FOCKEDEY, S., EL SAMMANY, M., ABDALLAH, G., EL BIHERY, M., BAUWENS, W., HUYGENS, M. 2012. An early warning system for flash floods in hyper-arid Egypt. *Natural Hazards and Earth System Sciences,* 12, 443-457.

COPE, M. 2010. Coding qualitative data. *In:* HAY, I. (ed.) *Qualitative research methods in human geography.* Oxford: Oxford University Press, 223-233.

CORNISH, G. P. 2004. *Copyright: Interpreting the law for libraries, archives and information services,* London, Facet Publishing.

COSGROVE, D. 2008. *Geography and vision: seeing, imagining and representing the world,* London/New York, I.B. Tauris.

COSTANZA, R., GRAUMLICH, L.J., STEFFEN, W. 2007. *Sustainability or collapse?: an integrated history and future of people on earth,* Cambridge/London, MIT Press/Dahlem Press.

CULVER, L. 2014. Seeing climate through culture. *Environmental History,* 19, 312-318.

DADAMOUNY, M. A., SCHNITTLER, M. 2015. Trends of climate with rapid change in Sinai, Egypt. *Journal of Water and Climate Change,* 7, 393-414.

DAMODARAN, V. 2009. Famine in Bengal: A comparison of the 1770 famine in Bengal and the 1897 famine in Chotanagpur. *In:* MAUCH, C. P., C. (ed.) *Natural disasters, cultural responses: Case studies towards a global environmental history.* Plymouth: Lexington Books, 197-232.

DANIN, A. 1973. Contributions to the flora of Israel and Sinai. II. New records. *Israel Journal of Botany,* 22, 18-32.

DANIN, A. 1983. *Desert vegetation of Israel and Sinai,* Jerusalem, Cana Publishing House.

DAUMAS, J. 1951. *La péninsule du Sinaï,* Cairo, Royal Automobile Club d'Egypte.

DAVIS, M. 2000. The origin of the third world. *Antipode,* 32(1)**,** 48-89.

DAVIS, D. K. 2007. *Resurrecting the granary of Rome: Environmental history and French colonial expansion in North Africa,* Athens, Ohio University Press.

DAVIS, D. K. 2013. Enclosing nature in North Africa: National parks and the politics of environmental history. *In:* MIKHAIL, A. (ed.) *Water on sand: Environmental histories of the Middle East and North Africa.* Oxford: Oxford University Press, 159-180.

DAVIS, D.K. 2016. *The arid lands: history, power, knowledge*, Cambridge, MIT Press.

DAVIS, D. K., BURKE III, E. 2011. *Environmental imaginaries of the Middle East and North Africa,* Athens, Ohio University Press.

DE LABORDE, L. 1838. *Journey through Arabia Petraea, to Mount Sinai, and the excavated city of Petra, the Edom of the Prophecies,* London, John Murray.

DELEUZE, G., GUATTARI, F. 2005. *A thousand plateaus: capitalism and schizophrenia,* Minneapolis/London, University of Minnesota Press.

DENON, V. 1803. *Travels in Upper and Lower Egypt, in company with several divisions of the French army, during the campaigns of General Bonaparte in that country,* London, Longman.

DERR, J. L. 2011. Drafting a map of colonial Egypt: The 1902 Aswan Dam, historical imagination, and the production of agricultural geography. *In:* DAVIS, D. K., BURKE III, E. (ed.) *Environmental imaginaries of the Middle East and North Africa.* Ohio: Ohio University Press, 136-157.

DERRIDA, J. 1998. *Archive fever: A Freudian impression,* Chicago, University of Chicago Press.

DESILVEY, C. 2007. Practical remembrance: material and method in a recycled archive. *In:* GAGEN, E., LORIMER, H., VASUDEVAN, A. (EDS) (ed.) *Practising the archive: Reflections on method and practice in historical geography.* London: Historical Geography Research Group, Royal Geographical Society - Institute of British Geographers, 37-46.

DIAZ, H. F., STAHLE, D.W. 2007. Climate and cultural history in the Americas: An overview. *Climatic Change,* 83, 1-8.

DOEL, M. A. 2010. Analysing cultural texts. *In:* CLIFFORD, N., FRENCH, S., VALENTINE, G. (ed.) *Key methods in geography.* London: Sage, 485-496.

DOMINGUEZ-CASTRO, F., GARCIA-HERRERA, R. 2016. Documentary sources to investigate multidecadal variability of droughts. *Cuadernos de Investigación Geográfica,* 42, 13-27.

DOUGHTY, D. 1995. The gardens of the high Sinai. *Aramco World,* 46(2), 20-27.

DUKE, J. A. 2008. *Duke's handbook of medicinal plants of the Bible.* Boca Raton, CRC Press.

DUMAS, A. 1839-1. *Impressions of travel, in Egypt and Arabia Petraea,* New York, John. S. Taylor.

DUNCAN, J., GREGORY, D. 1999. *Writes of passage: Reading travel writing,* London/New York, Routledge.

DUNCAN, J., GREGORY, D. 1999-1. Introduction. *In:* DUNCAN, J., GREGORY, D. (ed.) *Writes of passage: Reading travel writing.* London/New York: Routledge, 1-13.

ECKENSTEIN, L. 1921. *A history of Sinai,* London, Society for Promoting Christian Knowledge.

EDMONSTONE, A. 1822. *A journey to two of the oases of Upper Egypt,* London, John Murray.

EDWARDS, P. N. 2011. History of climate modeling. *WIREs Climate Change,* 2, 128–139.

EICHLER, H., SCHEUERBRANDT, A. (ED.) 1983. *Israel Sinai: Exkursion 1979. Exkursionsbericht, Protokolle und Abhandelungen,* Heidelberg, Geographisches Institut der Universität Heidelberg.

EL ABBASSI, A. B. 1814-1. *Voyages d'Ali Bey el Abbassi en Afrique et en Asie pendant les annees 1803, 1804, 1805, 1806 et 1807 Vol 2,* Paris, P. Didot l'Aine.

EL ABBASI, A. B. 1814-2. *Voyages d'Ali Bey el Abbassi en Afrique et en Asie pendant les annees 1803, 1804, 1805, 1806 et 1807. Vol. 3.,* Paris, P. Didot l'Aine.

EL AFANDI, G., MORSY, M., EL HUSSIENY, F. 2013. Heavy rainfall simulation over Sinai Peninsula using the Weather Research and Forecasting Model. *International Journal of Atmospheric Sciences* http://dx.doi.org/10.1155/2013/241050.

ELSNER, J., WOLF, G. 2010. The transfigured mountain: Icons and transformations of pilgrimage at the Monastery of St Catherine at Mount Sinai. *In:* GERSTEL, S. E. J., NELSON, R.S. (ed.) *Approaching the Holy Mountain: Art and liturgy at St Catherine's Monastery in the Sinai.* Turnhout: Brepols Publishers, 37-71.

ELTAHIR, E. A. B., WANG, G. 1999. Nilometers, El Nino, and climate variability. *Geophysical Research Letters,* 24, 489-492.

ELWOOD, A. K. 1830. *Narrative of a journey overland from England by the continent of Europe, Egypt, and the Red Sea to India; including a residence there, and voyage home, in the years 1825, 26, 27, and 28,* London, Henry Colburn & Richard Bentley.

ENDFIELD, G. H., NASH, D.J. 2002. Drought, desiccation and discourse: missionary correspondence and the drying up of Central Southern Africa. *Geographical Journal,* 168, 33-47.

ENDFIELD, G. H., DAVIES, S.J., FERNANDEZ TEJEDO, I., METCALFE, S.E., O'HARA, S.L. 2009. Documenting disaster: archival investigations of climate, crisis, and catastrophe in colonial Mexico. *In:* MAUCH, C. P., C. (ed.) *Natural disasters, cultural responses: Case studies towards a global environmental history.* Plymouth: Lexington Books, 305-325.

ENDFIELD, G. H. 2012. The resilience and adaptive capacity of social-environmental systems in colonial Mexico. *Proceedings of the National Academy of Sciences of the United States of America,* 109, 3676-3681.

ENDFIELD, G. H. 2014. Exploring particularity: vulnerability, resilience, and memory in climate change discourses. *Environmental History,* 19, 303-310.

ESHEL, G., FARRELL, B.F. 2000. Mechanisms of eastern Mediterranean rainfall variability. *Journal of the Atmospheric Sciences,* 57, 3219-3232.

FAROQHI, S. 2013. Fish and fishermen in Ottoman Istanbul. *In:* MIKHAIL, A. (ed.) *Water on sand: Environmental histories of the Middle East and North Africa.* Oxford: Oxford University Press, 9-107.

FAZAKERLEY, J. 1820. Journey from Cairo to Mount Sinai, and return to Cairo. *In:* WALPOLE, R. (ed.) *Travels in various countries of the East; being a continuation of memoirs relating to European and Asiatic Turkey, &c.* London: Paternoster Row, 362-391.

FEATHERSTONE, M. 2006. Archive. *Theory, Culture & Society,* 23, 591-596.

FIELD, H. M. 1888. *On the desert: With a brief review of recent events in Egypt,* New York, Charles Scribner's Sons.

FIELD, R. 2010. Data handling and representation. *In:* CLIFFORD, N., FRENCH, S., VALENTINE, G. (ed.) *Key methods in geography.* London: Sage, 317-349.

FITZCLARENCE 1819. *Journal of a route across India, through Egypt, to England, in the latter end of the year 1817, and the beginning of 1818* London, John Murray.

FOUCAULT, M. 2002. The archaeology of knowledge, London, Routledge.

FRESCOBALDI, L., GUCCI, G., SIGOLI, S. 1948. *Visit to the Holy Places of Egypt, Sinai, Palestine and Syria in 1384,* Jerusalem, Franciscan Press.

FULLER, J. 1830. *Narrative of a tour through some parts of the Turkish Empire,* London, John Murray.

GÄBELMANN, A. 1928. Von Berlin nach Kairo: Mit dem Motorrad durch sie Wüste Sinai, Leipzig, A.H. Panne. [Berlin State Library]

GALLOPIN, G. C. 2006. Linkages between vulnerability, resilience and adaptive capacity. *Global Environmental Change,* 16, 293–303.

GEORGE 1811. *Voyages and travels to India, Ceylon, the Red Sea, Abyssinia, and Egypt, in the years 1802, 1803, 1804, 1805, and 1806. Vol. 3,* London, C. & J. Rivington.

GERAMB, P. M. J. 1899. Eine Pilgerreise auf den Berg Sinai im Jahre 1833. Broschüren-Cyclus für das katholische Deutschland, 34, 161-176.

GHAZANFAR, S. A., ELSHAFAEY, S. Quantitative analysis of the flora of the Sinai Peninsula and its conservation (in prep.).

GILBERT, F., RASHAD, S., KAMEL, M., EL DIN ISMAIL, JAMES, M., ZALAT, S. 2010. Monitoring of the endemic Sinai Baton Blue butterfly *Pseudophilotes sinaicus* in the St Katherine Protectorate, South Sinai. *Egyptian Journal of Biology,* 12, 18-26.

GILBERT, H. C. 2010 *'Everything has its price'. Conservation development and Bedu in St Katherine Protectorate, South Sinai.* PhD thesis, University of Manchester.

GLENNIE, J. S. S. 1863. Mr. Buckle in the East. *Fraser's Magazine for Town and Country,* 68(404), 171-189.

GLENNIE, J. S. S. 1880. *Pilgrim-memories: travel and discussion in Egypt, Sinai, Idumæa, Palestine, and Syria with the late Henry Thomas Buckle, 3d ed,* London, Moxon, Saunders.

GOTCH, P. 1945. *Three caravan cities: Petra, Jerash, Baalbek, and St. Catherine's Monastery, Sinai.* Alexandria, Whitehead Morris Egypt.

GRAINGER, J., GILBERT, F. 2008. Around the sacred mountain: The St Katherine Protectorate in South Sinai, Egypt. *In:* MALLARACH, J.-M. (ed.) *Values of protected landscapes and seascapes Vol. 2.* Heidelberg: Kasparek Verlag, 21-37.

GRAUL, K. 1854. Reise nach Ostindien über Palästina und Egypten von Juli 1849 bis April 1853. Zweiter Theil: Egypten und der Sinai, Leipzig, Dörffling und Franke.

GREENWOOD, N. H. 1997. *The Sinai: A physical geography,* Austen, University of Texas Press.

GREGG, C. E., HOUGHTON, B.F., PATON, D., LACHMAN, R., LACHMAN, J., JOHNSTON, D.M., WONGBUSARAKUM, S. 2006. Natural warning signs of tsunamis: human sensory experience and response to the 2004 great Sumatra earthquake and tsunami in Thailand. *Earthquake Spectra,* 22(S3), S671–S691.

GREGORY, D. 1995. Between the book and the lamp: Imaginative geographies of Egypt, 1849-50. *Transactions of the Institute of British Geographers, New Series,* 20, 29-57.

GREGORY, D. 1999. Scripting Egypt: Orientalism and the cultures of travel. *In:* DUNCAN, J., GREGORY, D. (ed.) *Writes of passage: Reading travel writing.* London/New York: Routledge, 114-150.

GREGORY, D. 2001. Colonial nostalgia and cultures of travel: Spaces of constructed visibility in Egypt. *In:* ALSAYYAD, N. (ed.) *Consuming tradition, manufacturing heritage: Global norms and urban forms in the age of tourism.* London/New York: Routledge, 111-151.

GROVE, R. 1989. Scottish missionaries, evangelical discourses and the origins of conservation thinking in Southern Africa 1820-1900. *Journal of Southern African Studies,* 15, 163-187.

GROVE, R. 1995. *Green Imperialism: Colonial Expansion, Tropical Island Edens and the Origins of Environmentalism, 1600-1860,* Cambridge, Cambridge University Press.

GÜNNEL, J. G. 1847. Das Morgenland 2: Die Sinaihalbinsel und das heilige Land, Zwickau, Eigenthum des Vereins zur Verbreitung guter und wohlfeiler Volkschriften.

HALDON, J., ROBERTS, N., IZDEBSKI, A., FLEITMANN, D., MCCORMICK, M., CASSIS, M., DOONAN, O., EASTWOOD, W., ELTON, H., LADSTÄTTER, S., MANNING, S., NEWHARD, J., NICOLL, K., TELELIS, I., XOPLAKI, E. 2014. The climate and environment of Byzantine Anatolia: integrating science, history, and archaeology. *Journal of Interdisciplinary History,* 45, 113-161.

HANSTEIN, O. V. 1923. *Mit Kamel und Nilbarke: Von der libyschen Wüste zum Sinai. Eine Afrikareise vor hundert Jahren,* Leipzig, Leipziger Graphische Werke.

HARLEY, J. B. 1989. Deconstructing the map. *Cartographica,* 26, 1-20.

HASSAN, F. A. 2007. Extreme Nile floods and famines in Medieval Egypt (AD 930–1500) and their climatic implications. *Quaternary International,* 173–174, 101–112.

HAZLETON, L. 1980. *Where mountains roar: In search of the Sinai Desert,* London, Victor Gollancz.

HEFFERNAN, M. 1996. Geography, Cartography and Military Intelligence: The Royal Geographical Society and theFirst World War. *Transactions of the Institute of British Geographers,* 21, 504-533.

HEFFERNAN, M. 2001. “A dream as frail as those of ancient Time”: the in-credible geographies of Timbuctoo. *Environment and Planning D: Society and Space,* 19, 203-225.

HEINRICH, I., TOUCHAN, R., HELLE, G. 2011. Long-term drought and streamflow variations in Turkey. *In:* MAATEN-THEUNISSEN, M., SPIECKER, H., GÄRTNER, H., HELLE, G., HEINRICH, I. (ed.) *TRACE - Tree Rings in Archaeology, Climatology and Ecology. Vol.9: Scientific Technical Report STR 11/07.* Potsdam: Deutsches GeoForschungsZentrum, 34-41.

HENNIKER, F. 1824. *Notes during a visit to Egypt, Nubia, the Oasis Boeris, Mount Sinai, and Jerusalem,* London, John Murray.

HIBBARD, K., CRUTZEN, P.J., LAMBIN, E.F., LIVERMAN, D.M., MANTUA, N.J., MCNEILL, J.R., MESSERLI, B., STEFFEN, W. 2007. Group-report: Decadal-scale interactions of humans and the environment. *In:* COSTANZA, R., GRAUMLICH, L.J., STEFFEN, W. (ed.) *Sustainability or Collapse?: An Integrated History and Future of People on Earth.* Cambridge/London: MIT Press/Dahlem Press, 341-378.

HINDLEY, A. 1850. *Life in the tent: or travels in the desert of Sinai and Syria, in 1850,* London, Longman, Brown, Green, and Longmans.

HOBBS, J. J. 1995. *Mount Sinai,* Austin, University of Texas Press.

HOBBS, J. J. 2006. Guidelines for the involvements of nomadic pastoralists in conservation and development efforts. *In:* CHATTY, D. (ed.) *Nomadic societies in the Middle East and in North Africa: Entering the 21st century.* Leiden/Boston: Brill, 785-799.

HOLLAND, F. W. 1866. Notes on travel in Sinai 1. *Proceedings of the Royal Geographical Society of London,* 10, 158-160.

HOLLAND, F. W. 1867. The geology of Sinai. *Popular Science Review,* 6(22) (Jan.), 10-21.

HOLLAND, F. W. 1868-1. On the Peninsula of Sinai. *Proceedings of the Royal Geographical Society of London,* 12, 190-195.

HOLLAND, F. W. 1868-2. On the peninsula of Sinai. *Journal of the Royal Geographical Society of London,* 38, 237-257.

HOLLAND, F. W. 1869-1. Recent explorations in the Peninsula of Sinai. *Proceedings of the Royal Geographical Society of London,* 13, 204-219.

HOLLAND, F. W. 1869-2. Notes on the map of the Peninsula of Sinai. *Journal of the Royal Geographical Society of London,* 39, 342-346.

HOLLAND, F. W. 1878. Brief report on his recent journey to Sinai. *Proceedings of the Royal Geographical Society of London,* 22, 455-456.

HORNEMAN, F. 1802. *The journal of Frederick Horneman's travels, from Cairo to Mourzouk, the capital of the Kingdom of Fezzan, in Africa in the years 1797-8,* London, J. & W. Nicol.

HOWARD, J. E. 1961. *Letters and Documents of Napoleon. Volume 1: The rise to power,* New York, Oxford University Press.

HUGHES, J. D. 2016. *What is environmental history? (2nd ed.),* Cambridge, Polity Press.

HULL, E. 1885. *Mount Seir: Sinai and Western Palestine,* London R. Bentley and son.

HULME, P., YOUNGS, T. 2006-1. Introduction. *In:* HULME, P., YOUNGS, T. (EDS) (ed.) *The Cambridge Companion to travel writing*. Cambridge: Cambrdige University Press, 1-14.

HUME, W. F. 1901. *The rift valleys & geology of Eastern Sinai,* London, Dulau & Co.

HUNTER, F. R. 2004. Tourism and empire: the Thomas Cook & Son enterprise on the Nile, 1868–1914. *Middle Eastern Studies,* 40, 28-54.

IBRAHIM, F., IBRAHIM, B. 2003. *Egypt: an economic geography,* London/New York, I.B. Taurus.

IHARA, C., KUSHNIR, Y., CANE, M.A. 2008. July droughts over homogenous Indian Monsoon region and Indian Ocean dipole durig El Nino events. International Journal of Climatology, 28, 1799-1805.

IRBY, C. L., MANGLES, J. 1823. *Travels in Egypt and Nubia, Syria, and Asia Minor; during the years 1817 & 1818,* London, T. White & Co.

ISENBERG, A. C. (ed.) 2014. *The Oxford handbook of environmental history,* Oxford: Oxford University Press.

ISENBERG, A. C. 2014-1. Introduction: a new environmental history. *In:* ISENBERG, A. C. (ed.) *The Oxford handbook of environmental history.* Oxford: Oxford University Press, 1-20.

IUCN/WCU 2003. IUCN *Evaluation of Nominations of Natural and Mixed Properties to the World Heritage List: Report to the World Heritage Committee, twenty-seventh session, 30 June – 5 July 2003,* Paris, France, Paris: International Union for Conservation of Nature & The World Conservation Union.

JARVIS, A., RAMIREZ-VILLEGAS, J., HERRERA CAMPO, B.V., NAVARRO-RACINES, C. 2012. Is cassava the answer to African climate change adaptation? *Tropical Plant Biology,* 5, 9-29.

JOHNSON, D. H. 1992. Reconstructing a History of Local Floods in the Upper Nile Region of the Sudan. *International Journal of African Historical Studies,* 25, 607-649.

JONES, M. D., ROBERTS, C.N., LENG, M.L., TURKES, M. 2006. A high-resolution late Holocene lake isotope record from Turkey and links to North Atlantic and monsoon climate. *Geology,* 34, 361-364.

JONES, P. D., BRIFFA, K.R., OSBORN, T.J., LOUGH, J.M., VAN OMMEN, T.D., VINTHER, B.M., LUTERBACHER, J., WAHL, E.R., ZWIERS, F.W., MANN, M.E., SCHMIDT, G.A., AMMANN, C.M., BUCKLEY, B.M., COBB, K.M., ESPER, J., GOOSSE, H., GRAHAM, N., JANSEN, E., KIEFER, T., KULL, C., KÜTTEL, M., MOSLEY-THOMPSON, E., OVERPECK, J.T., RIEDWYL, N., SCHULZ, M., TUDHOPE, A.W., VILLALBA, R., WANNER, H., WOLFF, E., XOPLAKI, E. 2009. High-resolution palaeoclimatology of the last millennium: a review of current status and future prospects. *Holocene,* 19, 3-49.

JOUBERT, J.-M. 2004. *Journal d'un Sinaïte: Moine français au monastère Saint-Catherine,* Paris, L'Harmattan.

KAMEL, W., GAZAR, M., ZALAT, S., GILBERT, F. 2001. Flora of St Katherine Protectorate: key to families and genera. *Egyptian Journal of Natural History,* 3, 1-39.

KANIEWSKI, D., VAN CAMPO, E., PAULISSEN, E., WEISS, H., OTTO, T., BAKKER, J., ROSSIGNOL, I., VAN LERBERGHE, K. 2010. Medieval coastal Syrian vegetation patterns in the principality of Antioch. *Holocene,* 21, 251-262.

KAZANTZAKIS, N., VASILS, T. & VASILS, T. 1975. *Journeying: travels in Italy, Egypt, Sinai, Jerusalem and Cyprus*, Boston Little/Brown.

KEIGHREN, I. M., WITHERS, C.W.J., BELL, B. 2015. *Travels into print: exploration, writing, and publishing with John Murray, 1773-1859,* Chicago/London, University of Chicago Press.

KERGORLAY, J. D. 1910. Sites délaissés d'Orient: du Sinai à Jérusalem. Le Tour du Monde: Journal des voyages et des voyageurs. Paris: Librairie Hachette.

KHAZENI, A. 2013. Through an ocean of sand: Pastoralism and the equestrian culture of the Eurasian steppe. *In:* MIKHAIL, A. (ed.) *Water on sand: Environmental histories of the Middle East and North Africa.* Oxford: Oxford University Press, 133-58.

KIEPERT, H. 1859. *Routen in der Sinai-Halbinsel nach den Messungen vom Prof. R. Lepsius,* Berlin: C. Monecke.

KINNEAR, J. 1841. *Cairo, Petra, and Damascus in 1839,* London, John Murray.

KITCHIN, R., TATE, N.J. 2000. *Conducting research in human geography: Theory, methodology and practice,* Harlow, Pearson Education Limited.

KLEIN, C., FLOHN, H. 1987. Contributions to the Knowledge of the Fluctuations of the Dead Sea Level. *Theoretical and Applied Climatology,* 38, 151-156.

KOLLER, B. 1842. Extract from Baron Koller's Itinerary of His Tour to Petra, Describing an Inland Route from Mount Sinai to Akabah. *Journal of the Royal Geographical Society of London*, 12, 75-79.

KRAACK, D. 1997. *Monumentale Zeugnisse der spaetmittelalterlichen Adelsreise: Inschriften und Griffiti des 14.-16. Jahhunderts,* Goettingen, Vandenhoeck & Ruprecht.

KURUPPU, N., LIVERMAN, D. 2011. Mental preparation for climate adaptation: The role of cognition and culture in enhancing adaptive capacity of water management in Kiribati. *Global Environmental Change,* 21, 657-669.

LA PELLE, N. 2004. Simplifying Qualitative Data Analysis Using General Purpose Software Tools. *Field Methods*, 16, 85-108.

LABIB, M. 1961. *Pelerins et voyageurs au Mont Sinai,* Cairo, L'institut francais d'archeologie Orientale.

LAMB, H. H. 1995. *Climate, history and the modern world,* London, Routledge.

LANDSBERG, H. 1980. Past climates from unexploited written sources. *Journal of Interdisciplinary History,* 10, 631-642.

LATHAM, A. 2010. Diaries as a research method. *In:* CLIFFORD, N., FRENCH, S., VALENTINE, G. (ed.) *Key methods in Geography.* London: Sage, 188-201.

LATZKE, H. E., HANNING M., LENZEN, M. (EDS.) 1995. *Dumont visuell: Heiliges Land,* Köln, DuMont Buchverlag.

LE ROY LADURIE, E. 1971. *Times of feast, times of famine - a history of climates since the year 1000,* London, Allen and Unwin.

LEACH, K., ZALAT, S., GILBERT, F. 2013. Egypt's Protected Area network under future climate change. *Biological Conservation,* 159, 490-500.

LEWIS, M. 2014. And all was light? - Science and environmental history. *In:* ISENBERG, A. C. (ed.) *The Oxford handbook of environmental history.* Oxford: Oxford University Press, 207-226.

LEWIS, N. N., MACDONALD, C. A. 2003. W. J. Bankes and the Identification of the Nabataean Script. *Syria,* 80, 41-110.

LIEBENAU, E. V. 1896. *Ein Ausflus nach dem Sinai,* Wiesbaden, J.F. Bergmann.

LIPHSCHITZ, N., LEV YADUN, S., WAISEL, Y. 1987. A climatic history of the Sinai peninsula in light of dendrochronological studies. *In:* DVIRZMAN, G., GARDUS, Y., BET ARIEH, I., HAREL, M. (ed.) *Sinai. Part 1: Physical Geography.* Ministry of Defense, Tel Aviv: Eretz publishing house, 525-531.

LIVERMAN, D. M. 1990. Drought Impacts in Mexico: Climate, Agriculture, Technology, and Land Tenure in Sonora and Puebla. *Annals of the Association of American Geographers,* 80, 49-72.

LIVERMAN, D. M. 2009. The geopolitics of climate change: avoiding determinism, fostering sustainable development. *Climatic Change,* 96, 7-11.

LIVINGSTONE, D. N. 2003. *Putting science in its place: geographies of scientific knowledge,* Chicago/London, The University of Chicago Press.

LOTI, P. 1993. The Desert, Salt Lake City, University of Utah Press.

LUTERBACHER, J., GARCÍA-HERRERAB, R., AKCER-ONC, S., ALLANE, R., ALVAREZ-CASTROF, M.-C., BENITOG, G., BOOTHH, J., BÜNTGENI, U., CAGATAYC,, N., COLOMBAROLIJ, D., DAVISK, B., ESPERL, J., FELISM, T., FLEITMANNN, D., FRANKI, D., GALLEGOF, D., GARCIA-BUSTAMANTEA, E., GLASERO, R., GONZALEZ-ROUCOB, F.J., GOOSSEQ, H., KIEFERR, T., MACKLINH, M.G., MANNINGS, S.W., MONTAGNAT, P., NEWMANR, L., POWER, M.J., RATHP, V., RIBERAF, P., RIEMANNO, D., ROBERTS, N., SICREW, M.-A., SILENZIX, S., TINNERJ, W., CHRONIS TZEDAKISY, P., VALERO-GARCÉSZ, B., VAN DER SCHRIERAA, G., VANNIÈREAB, B., VOGTO, S., WANNERAC, H., WERNERA, J.P., WILLETTE, G., WILLIAMSAD, M.H., XOPLAKIA, E., ZEREFOSAE, C.S., ZORITAAF, E. 2012. A Review of 2000 Years of Paleoclimatic Evidence in the Mediterranean. *In:* LIONELLO, P. E. (ed.) *The climate of the Mediterranean region.* London: Elsevier, 87-185.

MACAIRE, P. 2012. *Voyage illustré en Egypte,* Liouc, Le Plein des Sens.

MADDEN, R. R. 1829-1. *Travels in Turkey, Egypt, Nubia, and Palestine, in 1824, 1825, 1826, and 1827. Vol. 1,* London, Henry Colburn.

MADDEN, R. R. 1829-2. *Travels in Turkey, Egypt, Nubia, and Palestine, in 1824, 1825, 1826, and 1827. Vol. 2,* London, Henry Colburn.

MAGI, G. 2005. *Sainte-Catherine du Sinaï,* Firenze, Casa Editrice Bonechi.

MALANGRÉ, H. 1983. *Vom Sinai zum Areopag: Paulinische Impressionen einer Reise durch Israel und Griechenland,* Kevelaer, Butzon & Bercker.

MALIVA, R. G., MISSIMER, T.M. 2012. Aridity and Drought. *In:* MALIVA, R. G., MISSIMER, T.M. (ed.) *Arid Lands Water Evaluation and Management.* Berlin/Heidelberg: Springer, 21-39.

MANSVELT, J., BERG, L.D. 2010. Writing qualitative geographies, constructing meaningful geographical knowledges. *In:* HAY, I. (ed.) *Qualitative research methods in human geography.* Oxford: Oxford University Press, 248-265.

MAPHILL. 2011. *Blank Simple Map of Frontier Governates*. http://www.maphill.com/egypt/frontier-governates/simple-maps/blank-map/ [Accessed March 2016].

MARIN, A. 2010. Riders under storms: Contributions of nomadic herders' observations to analysing climate change in Mongolia. *Global Environmental Change,* 20, 162-176.

MARX, E. 1999. Oases in South Sinai. *Human Ecology,* 27, 341-357.

MARX, E. 2013. *Bedouin of Mount Sinai: An anthropological study of their political economy,* New York/Oxford, Berghahn.

MASLIN, M., AUSTIN, P. 2012. Climate models at their limit? *Nature,* 486, 183-184.

MAUCH, C. 2004. Natural disasters and cultural strategies: responses to catastrophe in global perspective. *GHI Bulletin,* 35, 125-132.

MAUCH, C., PFISTER, C. (EDS) 2009. *Natural disasters, cultural responses: Case studies towards a global environmental history,* Lanham/Plymouth, Lexington Books.

MAUELSHAGEN, F. 2009. Disaster and political culture in Germany since 1500. *In:* MAUCH, C. P., C. (ed.) *Natural disasters, cultural responses: Case studies towards a global environmental history.* Plymouth: Lexington Books, 41-75.

MAUCHAMP, E. 1903. *Un raid au désert: Sinai, Arabie-Pétrée, Arabie, Moab (Notes de voyage - 1902),* Chalon-sur Saone, E. Bertrand.

MAUGHAN, W. C. 1873. *The Alps of Arabia: Travels in Egypt, Sinai, Arabia and the Holy Land,* London, Henry S. King.

MAYHEW, R. 2007. Denaturalising print, historicising text: historical geography and the history of the book. *In:* GAGEN, E., LORIMER, H., VASUDEVAN, A. (EDS) (ed.) *Practising the archive: Reflections on method and practice in historical geography.* London: Historical Geography Research Group, Royal Geographical Society - Institute of British Geographers, 23-36.

MCCLURE, M. L., FELTOE, C.L. 1919. *The pilgrimage of Etheria,* London, Society for Promoting Christian Knowledge.

MCDONALD, J., SGT, R.E. 1869. *Views in the peninsula of Sinai 1868-9 Vol I.-III*, London, Royal Geographical Society.

MCNEILL, J. R. 2003. Observations on the nature and culture of environmental history. *History and Theory,* 42, 5-43.

MCNEILL, J. R. 2013. The eccentricity of the Middle East and North Africa's environmental history. *In:* MIKHAIL, A. (ed.) *Water on sand: Environmental histories of the Middle East and North Africa.* Oxford: Oxford University Press, 27-50.

MEENA, H. K. 2015. Famine in late 19th-century India: natural or man-made. *Journal of Human and Social Science Research,* 6, 35-44.

MELMAN, B. 2006. The Middle East/Arabia: 'the cradle of Islam'. *In:* HULME, P., YOUNGS, T. (ed.) *The Cambridge Companion to travel writing.* Cambridge: Cambridge University Press, 105-121.

MESHEL, Z. 2000. *Sinai: Excavations and studies,* Oxford, Archaeopress.

MIKHAIL, A. 2011. *Nature and empire in Ottoman Egypt: An environmental history*, Cambridge, Cambridge University Press.

MIKHAIL, A. E. 2013. *Water on sand: Environmental histories of the Middle East and North Africa,* Oxford, Oxford University Press.

MIKHAIL, A. 2013-1. Introduction: Middle East environmental history: The fallow between two fields. *In:* MIKHAIL, A. (ed.) *Water on sand: environmental histories of the Middle East and North Africa.* Oxford/New York: Oxford University Press, 1-25.

MIKHAIL, A. 2013-2. Plague and environment in Late Ottoman Egypt. *In:* MIKHAIL, A. (ed.) *Water on sand: Environmental histories of the Middle East and North Africa.* Oxford: Oxford University Press, 111-131.

MILNE, C. 1805. *A botanical dictionary: or, elements of systematic and philosophical botany,* London, H.D. Symonds.

MOBERG, A., SONECHKIN, D.M., HOLMGREN, K., DATSENKO, N.M., WIBJÖRN 2005. Highly variable Northern Hemisphere temperatures reconstructed from low- and high-resolution proxy data. *Nature,* 433, 613-617.

MONTAGU, E. W. 1766. A letter from Edwards Wortley Montagu, Esquire, F.R.S. to William Watson , M.D. F.R.S. containing an account of his journey from Cairo, in Egypt, to the Written Mountains, in the Desert of Sinaï. *Philosophical Transactions,* 56, 40-57.

MOSSMANN, X. 1846. *Analyse de la relation manuscrite d'un pèlerinage à Jérusalem et au mont Sinaï, entrepris en 1604 par Sébastien Schach, de Strasbourg,* Colmar, Vve Decker.

MURRAY, G. W. 1967. *Dare me to the desert,* London, George Allen & Unwin Ltd.

NANDRIS, J. G. 1990. The Jebaliyeh of Mount Sinai, and the land of Vlah. *Quaderni di Studi Arabi,* 8, 45-90.

NASH, D. J., ENDFIELD, G.H. 2002. A 19th-century climate chronology for the Kalahari region of Central Southern Africa derived from missionary correspondence. *Iinternational Journal of Climatology,* 22, 821-841.

NASH, D. J., GRAB, S.W. 2010. "A sky of brass and burning winds": documentary evidence of rainfall variability in the Kingdom of Lesotho, Southern Africa, 1824–1900. *Climatic Change,* 101, 617-653.

NAUTIYAL, S., RAO, K.S., KAECHELE, H., RAJU, K.V., SCHALDACH, R. 2013. *Knowledge Systems of Societies for Adaptation and Mitigation of Impacts of Climate Change,* Berlin/Heidelberg, Springer.

NEWBOLD, T., GILBERT, F., ZALAT, S. EL-GABBAS, A., READER, T. 2009. Climate-based models of spatial patterns of species richness in Egypt's butterfly and mammal fauna. *Journal of Biogeography*, 36, 2085-2095.

NICHOLSON, S. E. 2011. *Dryland climatology,* Cambridge/New York, Cambridge University Press.

NIEBUHR, M. 1792-1. *Travels through Arabia and other countries in the East,* Edinburgh, G. Mudie.

NIEBUHR, M. 1792-2. *Travels through Arabia and other countries in the East,* Edinburgh, G. Mudie.

NOMACHI, K. 1979. *Sinai: Land der verheissung,* Luzern, Reich Verlag.

OGBORN, M., WITHERS, C.W.J. 2010. *Geographies of the book,* Farnham, Ashgate Publishing.

OLDFIELD, F. 2005. *Environmental change: Key issues and alternative approaches*, Cambridge, Cambridge University Press.

OPPENHEIMER, C. 2003. Climatic, environmental and human consequences of the largest known historic eruption: Tambora volcano (Indonesia) 1815. *Progress in Physical Geography,* 27, 230–259.

ORLOVE, B., CHIANG, J.C.H., CANE, M.A. 2002. Ethnoclimatology in the Andes: A cross-disciplinary study uncovers a scientific basis for the scheme Andean potato farmers traditionally use to predict the coming rains. *American Scientist,* 90, 428-435.

ÖSTERREICH, O. E. V. 1895. *Drei Wochen auf der Insel Sinai,* Wien, Lechner.

PALECZNY, D., ALLAM, KH.,TALAAT, M., IBRAHIM, W. 2007. The State of Saint Katherine Protectorate and the Saint Katherine World Heritage Site: an evaluation of management effectiveness. Egyptian-Italian Environmental Cooperation Program, Cairo, Nature Conservation Sector Capacity Building Project.

PALMER, E. H. 1871-1. *The desert of the Exodus 1: Journeys on foot in the wilderness of the forty years' wanderings,* Cambridge, Deighton, Bell, & Co.

PALMER, E. H. 1871-2. *Desert of the Exodus 2: Journeys on foot in the wilderness of the forty years' wanderings,* Cambridge, Deighton, Bell, & Co.

PEACE, R., VAN HOVEN, B. 2010. Computers, qualitative data, and geographic research. *In:* HAY, I. (ed.) *Qualitative research methods in human geography.* Oxford: Oxford University Press, 234-247.

PEREVOLOTSKY, A. 1981. Orchard agriculture in the high mountain region of South Sinai. *Human Ecology,* 9, 331-357.

PEREVOLOTSKY, A. 1987. Territoriality and resource sharing among the Bedouin of southern Sinai: A socio-ecological interpretation. *Journal of Arid Environments,* 13, 153-161.

PEREVOLOTSKY, A., PEREVOLOTSKY AY., NOY-MEIR, I. 1989. Environmental adaptation and economic change in pastoral mountain society: the case of the Jabaliyah Bedouin of the Mt Sinai region. *Mountain Research and Development,* 9, 153-164.

PFISTER, C., BRADZIL, R., GLASER, R., BARRIENDOS, M., CAMUFFO, D., DEUTSCH, M., DOBROVOLNY, P., ENZI, S., GUIDOBONI, E., KOTYZA, O., MILITZER, S., RACZ, L., RODRIGO, F.S. 1999. Documentary evidence on climate in sixteenth century Europe. *Climate Change,* 43, 55-110.

PFISTER, C. 2009. Learning from nature-induced disasters: Theoretical considerations and case studies from Western Europe. *In:* MAUCH, C. P., C. (ed.) *Natural disasters, cultural responses: Case studies towards a global environmental history.* Plymouth: Lexington Books, 17-40.

PLOWDEN, J. M. C. 1940. *Once in Sinai: the record of a solitary venture,* London, Methuen & Co.

PLOWDEN, W. C., PLOWDEN, T.C. (ED.) 1868. *Travels in Abyssinia and the Galla country with an account of a mission to Ras Ali in 1848,* London, Longmans, Green & Co.

PORTER, L. 1858. *Handbook for travellers in Syria and Palestine Part 1,* London, John Murray.

POST, G. E. 1896. *Flora of Syria, Palestine and Sinai: from the Taurus to Ras Muhammad, and from the Mediterranean Sea to the Syrian desert,* Beirut, Syria, Syrian Protestant College.

PRATT, M. L. 2003. *Imperial eyes: travel writing and* transculturation, London/New York, Taylor & Francis.

PURI, R. K. 2007. Responses to medium-term stability in climate: El Niño, droughts and coping mechanisms of foragers and farmers in Borneo. *In:* ELLEN, R. (ed.) *Modern crisis and traditional strategies: Local ecological knowledge in Island Southeast Asia. Studies in Environmental Anthropology and Ethnobiology 6.* Oxford: Berhahn Books, 146-169.

QUINN, W. H. 1992. A study of Southern Oscillation-related climatic activity for A.D. 622-1900 incorporating Nile River flood data *In:* DIAZ, H. F., MARKGRAF, V. (ed.) *El Nino: Historical and paleoclimatic aspects of the Southern Oscillation.* Cambridge, Cambridge University Press.

RABINOWITZ, D. 1985. Themes in the economy of the Bedouin of South Sinai in the nineteenth and twentieth centuries. *International Journal of Middle Eastern Studies,* 17, 211-228.

RABOISSON, L. A. 1886. *En Orient: Recits et notes d'un voyage en Palestine et en Syrie par l'Egypte et le Sinaï. Première partie comprenant l'Égypte et le Sinaï,* Paris, Librairie catholique de l'Oeuvre de Saint-Paul.

RADFORD, E. A., CATULLO, G., DE MONTMOLLIN, B. (EDS) 2011. *Important Plant Areas of the southand east Mediterranean region: Priority sites for conservation,* Gland/Málaga, IUCN.

RAIBLE, C. C., BRÖNNIMANN, S., AUCHMANN, R., BROHAN, P., FRÖLICHER, T.L., GRAF, H.-F., JONES, P., LUTERBACHER, J., MUTHERS, S., NEUKOM, R., ROBOCK, A., SELF, S., SUDRAJAT, A., TIMMRECK, C., WEGMANN, M. 2016. Tambora 1815 as a test case for high impact volcanic eruptions: earth system effects. *Climate Change,* 7, 569–589.

RASHAD, S., BASSET, Y. A., HEMEED, M., EL ALQAMY, H. 2002. *Grazing patterns in high altitude mountains around St. Katherine Town (A GIS integrated approach),* Cairo, Egyptian Environmental Affairs Agency.

RENOUARD DE BUSSIERRE, T. 1829. *Lettres sur l'Orient, écrites pendant les années 1827 et 1828. Tome second,* Paris, F.G. Levrault.

REUVENY, R. 2007. Climate change-induced migration and violent conflict. *Political Geography,* 26, 656-673.

REYNOLDS, N. Y. 2013. Building the past: Rockscapes and the Aswan High Dam in Egypt. *In:* MIKHAIL, A. (ed.) *Water on sand: Environmental histories of the Middle East and North Africa.* Oxford: Oxford University Press, 181-205.

RIANT, C. 1884. Voyage en Terre-Sainte: D'un maire de Bordeaux au XIVe siècle. *Archive de l'Orient latin,* 2, 378-388.

RICHARDS, J. F. 2003. *The unending frontier: an environmental history of the early modern world,* Berkeley/Los Angeles/London, University of California Press.

RICHARDSON, R. 1822-2. *Travels along the Mediterranean, and parts adjacent; in company with the Earl of Belmore, during the years 1816-17-18: Extending as far as the second Cataract of the Nile, Jerusalem, Damascus, Balbec, &c. &c. Vol. 2,* London, T. Cadell.

RIMBU, N., LOHMANN, G. 2011. Winter and summer blocking variability in the North Atlantic region - evidence from long-term observational and proxy data from southwestern Greenland. *Climate of the Past,* 7, 543–555.

ROBERTS, D. 1839. Mr Robert's excursion - second letter. *Chambers's Edinburgh Journal,* 390, 204-205.

ROCHE, M. 2010. Historical research and archival sources. *In:* HAY, I. (ed.) *Qualitative research methods in human geography.* Oxford: Oxford University Press, 133-146.

RÖMER, H., W. ANDE & LEUTNANT VON CHAMIER 1917. *Mit deutschen Machinengewehren durch die Wüste Sinai,* Berlin, Spaeth & Linde.

ROSARIO PRIETO, M. D. 2009. The Panama river floods during the Spanish colonial period: impact and responses. *In:* MAUCH, C. P., C. (ed.) *Natural disasters, cultural responses: Case studies towards a global environmental history.* Plymouth: Lexington Books, 285-303.

ROTHENBERG, B. 1979. *Sinai: Pharaonen, Bergleute, Pilger und Soldaten,* Bern, Kümmerly & Frey, Geographischer Verlag.

SAID, E. W. 2003. *Orientalism,* London, Penguin Books.

SALAME, A. 1819. *A narrative of the expedition to Algiers in the year 1816, under the command of the right Hon. Admiral Lord Viscount Exmouth,* London, John Murray.

SALM, R. V., CLARK, J., SIIRILA, E. 2000. *Marine and coastal protected areas: a guide for planners and managers (third ed.),* Gland/Cambridge, IUCN.

SAMY, M., SÁNCHEZ LIZASO, J. L. & FORCADA, A. 2011. Status of marine protected areas in Egypt *Animal Biodiversity and Conservation,* 34, 165-177.

SANTORO, M. M., HASSAN, F.A., WAHAB, M.M.A., CERVENY, R.S., BALLING JR, R.C. 2015. An aggregated climate teleconnection index linked to historical Egyptian famines of the last thousand years. *Holocene,* 25, 872-879.

SATIA, P. 2011. "A rebellion of technology": Development, policing, and the British Arabian imaginary. *In:* DAVIS, D. K., BURKE III, E.

(ed.) *Environmental imaginaries of the Middle East and North Africa.* Athens: Ohio University Press, 23-59.

SATTLER, D. 1971. Das Klima Israels im Rahmen der Winterregenzone. *In:* BREMER, H., EICHLER, H. (ed.) *Israel-Exkursion,* Heidelberg, University of Heidelberg, Geographical Institute.

SCHLINK, M. B. 1966. *Sinai heute: Stätten der Gottesoffenbarung zwischen Nil und Moseberg,* Darmstadt - Eberstadt, Evangelische Marienschwesternschaft.

SCHNELLER, D. L. 1910. *Durch die Wüste zum Sinai: In Moses Spuren vom Schilfmeer bis zum Nebo,* Leipzig, H.G. Wallmann.

SCHOENFELD, E. D. 1907. *Die Halbinsel des Sinai in ihrer Bedeutung nach Erdkunde und Geschichte auf Grund eigener Forschung an Ort und Stelle,* Berlin, Dietrich Reimer.

SCHRÖDTER, J. 1800. *See- und Landreise nach Ostindien und Aegypten, auf die Berge Sinai und Horeb, nach Gaza, Rama, Damascus, Sydon, Tyrus, Jerusalem, Bethlehem, nach dem todten Meere, u.s.w. in den Jahren 1795-1799,* Leipzig, Wolf.

SCHWARTZ, J. M., RYAN, J.R. (EDS) 2003. *Picturing place: photography and the geographical imagination,* London/New York, I.B. Tauris.

SCHWERDT, H. 1870. *Die Länder der Bibel, wie sie waren und wie sie sind: Pilgerfahrt auf den Sinai und nach Jerusalem,* Langensalza, F.E.L. Breßler.

SCOTT, R. A. 1927. *Sand and Sun: The narrative of a journey to Sinai and the wilderness of El-Tih in 1877,* Carlisle, Charles Thurnam & Sons.

SEETZEN, E. J. 1855. *Ulrich Jasper Seetzen's Reisen durch Syrien Palästina, Phönicien, die Transjordan-Länder, Arabia Petraea und Unter-Aegypten vol. 3,* Berlin, G. Reimer.

SEMSEK, H.-G. 2008. *Ägypten und Sinai,* Ostfildern, DuMont-Reiseverlag.

SEN, Z. 2008. *Wadi hydrology,* Boca Raton, CRC Press.

SHAMS, A. 2011. *Eight years wandering in the high mountains of Sinai Peninsula: A tale of two maps,* Lulu.com.

SHUQAIR, N. 1916. *Ta'rikh sina' al-qadim wal-hadith wa-jighrafiatiha (The history and geography of ancient and modern Sinai),* Cairo, Al-Ma'arif Press.

SMAKHTIN, V. U., SCHIPPER, E.L.F. 2008. Droughts: The impact of semantics and perceptions. *Water Policy,* 10, 131–143.

SMITH LEWIS, A. 1898. *In the shadow of Sinai: A story of travel and research from 1895 to 1897,* Cambridge, Macmillan & Bowes.

SOWERS, J., WEINTHAL, E. 2010. Climate Change Adaptation in the Middle East and North Africa: Challenges and Opportunities. The Dubai Initiative: Working paper No. 2. Cambridge, MA: Dubai School of Government & Belfer Center for Science and International Affairs, Harvard Kennedy School.

STANLEY, A. P. 1857. *Sinai and Palestine in connection with their history,* New York, Redfield.

STEEDMAN, C. 2001. *Dust,* Manchester, Manchester University Press.

STEFFEN, W., BROADGATE, W., DEUTSCH, L., GAFFNEY, O., LUDWIG, C. 2015. The trajectory of the anthropocene: The Great Acceleration. *Anthropocene Review,* 2, 81-98.

STEPHENS, J. L. 1996 (original 1837). *Incidents of travel in Egypt, Arabia Petraea, and The Holy Land,* New York, Dover Publications.

SUTTON, A. W. 1913. *My camel ride from Suez to Mount Sinai: A diary with sixty-six illustrations from photographs of which twelve are reproduced in colour and a map,* London, J. & J. Bennett, The Century Press.

SUWAED, M. 2016. The image of the Bedouin in travel literature and Western researchers who visited Palestine in the nineteenth century. *Digest of Middle East Studies,* 25, 88-108.

TAINTER, J. A. 1988. *The collapse of complex societies,* Cambridge, Cambridge University Press.

TARAWNEH, Z., HADADIN, N. 2009. Reconstruction of the rainy season precipitation in central Jordan. *Hydrological Sciences Journal,* 54, 189-198.

TAYLOR, B. 1886. *Egypt and Iceland in the year 1874,* New York, G.P. Putnam's Sons.

THEOTOKAS, G. 1969. *Montagnes saintes du Proche-Orient: Samarie, Sinai, Athos,* Athens, Institut français d'Athènes.

THOMPSON, J. 2008. *History of Egypt: From Earliest Times to the Present,* Cairo, American University in Cairo Press

THOMPSON, K., GILBERT, F. 2013. The effects of grazing on the endangered Sinai Thyme (*Thymus decussatus*) in a hyper-arid environment. *Journal of Arid Environments,* 99, 14-22.

TIETZE, C. E. 1995. Sinai: Eine interdisziplinäre Exkursion Oktober 1994. *Berichte aus Archäologie, Beugeschichte und Nachbargebieten,* 1995, 103.

TILT, C. 1849. *The boat and the caravan: A family tour through Egypt and Syria,* London, David Bogue.

TOUCHAN, R. A., K.J., SHISHOV, V.V., SIVRIKAYA, F., ATTIEH, J., KETMEN, M., STEPHAN, J., MITSOPOULOS, I., CHRISTOU, A., MEK, D.M. 2014. Spatial patterns of eastern Mediterranean climate influence on tree growth. *Holocene,* 21, 381-392.

TOZER, C. R., KIEM, A.S., VERDON-KIDD, D.C. 2012. On the uncertainties associated with using gridded rainfall data as a proxy for observed. *Hydrology and Earth System Sciences,* 16, 1481-1499.

TROUET, V., PANAYOTOV, M.P., IVANOVA, A., FRANK, D. 2012. A pan-European summer teleconnection mode recorded by a new temperature reconstruction from the northeastern Mediterranean (AD 1768–2008). *Holocene,* 22, 887-898.

TRUMBULL IV, G. R. 2011. Body of work: Water and reimagining the Sahara in the era of decolonization. *In:* DAVIS, D. K., BURKE III, E. (ed.) *Environmental imaginaries of the Middle East and North Africa.* Ohio: Ohio University Press, 87-113.

TSVIELI, Y., ZANGVIL, A. 2007. Synoptic climatological analysis of Red Sea Trough and non-Red Sea Trough rain situations over Israel *Advances in Geosciences,* 12, 137-143.

TURNER, W. 1820. *Journal of a tour in the Levant. Vol. 2,* London, John Murray.

TYRWHITT, R. S. J. 1864. Sinai. *Vacation Tourists and Notes of Travel in 1862-3,* 3, 327-356.

USICK, P. 2002. *Adventures in Egypt and Nubia: The travels of William John Bankes (1786-1855),* London, The British Museum Press.

VOLNEY, C. F. 1788. *Travels through Syria and Egypt, in the years 1783, 1784, and 1785,* London, G.G.J. & J. Robinson.

VOLNEY, C. F. 1788. *Travels through Syria and Egypt, in the years 1783, 1784, and 1785,* London, G.G.J. & J. Robinson.

VON HAGEN, V. W. 1996. Introduction. In: VON HAGEN, V. W. (ed.) *Incidents of travel in Egypt, Arabia Petraea, and the Holy Land.* New York: Dover Publications.

WALLACE, A. 1868. *The desert and the Holy Land,* Edinburgh, William Oliphant and Co.

WALLACE, S. E. 1891. *The repose in Egypt: A medley,* New York, John B. Alden.

WALPOLE, R. 1820. *Travels in various countries of the East; being a continuation of memoirs relating to European and Asiatic Turkey, &c.,* London, Longman, Hurst, Rees, Orme, and Brown.

WANG, P. K., ZHANG, D. 1995. Reconstruction of the 18th century summer precipitation of Nanjing, Suzhou, and Hangzhou, China, based on the Clear and Rain Records. *In:* BRADLEY, R. S., JONES, P.D. (EDS) (ed.) *Climate since AD 1500.* London: Routledge, 184-209.

WANG, W. C., PORTMAN, D., GONG, G., ZHANG, P., KARL, T. 1995. Beijing summer temperatures since 1724. *In:* BRADLEY, R. S., JONES, P.D. (EDS) (ed.) *Climate since AD 1500.* London: Routledge, 210-223.

WARD, W. D. 2008. *From Provincia Arabia to Palaestina Tertia: The Impact of Geography, Economy and religion on sedentary and nomadic communities in the later Roman province of Third Palestine.* PhD, University of California, Los Angeles.

WARNER, T. T. 2004. *Desert meteorology,* Cambridge University Press, Cambridge.

WARRAQ, I. 2007. *Defending the West: A critique of Edward Said's Orientalism,* New York, Prometheus Books.

WEBSTER, J. 1830. *Travels through the Crimea, Turkey, and Egypt; performed during the years 1825-1828: Including particulars of the* *last illness and death of the Emperor Alexander, and the Russian conspiracy in 1825,* London, Henry Colburn & Richard Bentley.

WEINTRITT, O. 2009. The floods of Baghdad: Cultural and technological responses. *In:* MAUCH, C. P., C. (ed.) *Natural disasters, cultural responses: Case studies towards a global environmental history.* Plymouth: Lexington Books, 165-182.

WELLARD, J. 1970. *Desert pilgrimage: Journeys to the Egyptian and Sinai Deserts: Completing the third of the trilogy of Saharan explorations,* London, Hutchinson.

WHARTON, A. J. 2006. *Selling Jerusalem: relics, replicas, theme parks,* Chicago, University of Chicago Press.

WHEATER, H., AL-WESHAH. R.A. (EDS) 2002. *Hydrology of wadi systems: IHP regional network on wadi hydrology in the Arab region. Technical Documents in Hydrology,* 55, Paris, UNESCO.

WHITE, M. L. J., MOHAMMED, A.E.I., DAUPHINE, N.S., GILBERT, F.S., ZALAT, S., GILBERT, H. 2008. Recent surveys of resident breeding birds in the St Katherine Protectorate, south Sinai, Egypt. *Sandgrouse,* 30, 190-200.

WHITE, P. 2010. Making use of secondary data. *In:* CLIFFORD, N., FRENCH, S., VALENTINE, G. (ed.) *Key methods in geography.* London: Sage, 61-76.

WHITE, S. 2011. The climate of rebellion in the early modern Ottoman Empire, Cambridge, Cambridge University Press

WHITE, S. 2013. The Little Ice Age Crisis of the Ottoman Empire: A conjuncture in Middle East environmental history. *In:* MIKHAIL, A. (ed.) *Water on sand: Environmental histories of the Middle East and North Africa.* Oxford: Oxford University Press, 71-90.

WHITE, S. 2014. Animals, climate change, and history. *Environmental History,* 19, 319-328.

WILKINSON, G. 1847. *Hand-book for travellers in Egypt; including descriptions of the course of the Nile to the Second Cataract, Alexandria, Cairo, the Pyramids, and Thebes, the overland transit to India, the Peninsula of Mount Sinai, the oases, &c.,* London, John Murray.

WILLIAMS, M. 1994. The relations of environmental history and historical geography. *Journal of Historical Geography,* 20, 3-21.

WINCHESTER, H. P. M., ROFE, M.W. 2010. Qualitative research and its place in human geography. *In:* HAY, I. (ed.) *Qualitative research methods in human geography.* Oxford: Oxford University Press, 3-25.

WITHERS, C. W., KEIGHREN, I.M. 2011. Travels into print: authoring, editing and narratives of travel and exploration, c. 1815-c.1857. *Transactions of the Institute of British Geographers,* 36, 560-573.

WITTMAN, W. 1804. *Travels in Turkey, Asia-Minor, Syria, and across the desert into Egypt, during the years 1799, 1800, and 1801, in company with the Turkish Army, and the British Military Mission: Aslo through Germany, Holland, &c. on the return to England: To which are annexed, observations on the plague, and on the diseases prevalent in Turkey, and a meteorological journal,* Philadelphia, James Humphreys.

WOLFF, R. J. 1824. *Missionary journal and memoir of the Rev. Joseph Wolff, missionary to the Jews,* London, James Duncan.

WOLFF, J. 1839. *Journal of the Reverend Joseph Wolff, in a series of letters to Sir Thomas Baring, Bart. containing an account of his missionary labours from the years 1827 to 1831; and from the years 1835 to 1838,* London, James Burns.

WORSTER, D. 1979. *Dust Bowl: The Southern Plains in the 1930s,* New York/Oxford, Oxford University Press.

WRESZINSKI, W. E. 1913. *Denkmäler aus Aegypten und Aethiopien: Nubien, Hammamat, Sinaï, Syrien und europäische Museen,* Leipzig, Hinrich's.

YAALON, D. H., GANOR, E. 1979. East Mediteraanean trajectories of dust-carrying storms from the Sahara and Sinai. *In:* MORALES, C. (ed.) *Scope 14: Saharan dust (mobilization, transport, deposition).* Chichester: John Wiley & Sons, 187-193.

YOUNG, M. N., LEEMANS, R., BOUMANS, R.M.J., COSTANZA, R., DE VRIES, B.J.M., FINNIGAN, J., SVEDIN, U., YOUNG, M.D. 2007. Group report: Future scenarios of human-environment systems. *In:* COSTANZA, R., GRAUMLICH, L.J., STEFFEN, W. (ed.) *Sustainability or Collapse?: An Integrated History and Future of People on Earth.* Cambridge/London: MIT Press/Dahlem Press, 447-470.

ZAHRAN, M. A., WILLIS, A.J. 2009. *The vegetation of Egypt. Second Edition, Dordrecht,* Springer.

ZIV, B., SAARONI, H., ALPERT, P. 2004. The factors governing the summer regime of the Eastern Mediterranean. *International Journal of Climatology,* 24, 1859-1871.

Archival sources

ANONYMOUS Extracts from 'the History of Sinai & Arabs' pp. 228-230. [National Archives, Kew, FO 141/655/1 letter 350]

BINDER, B. & BINDER, H. 2000. Sinai 28.12.1999 - 4.1.2000: Reisebeschreibung und Tagebuch, Lichtenfels, private publication. [Bavarian State Library]

BROCKBANK, O. 1914. *Diary of a journey through the Sinai Peninsula and Arabia 1914,* private publication. [University of Manchester]

CALLIER, C.-A. 1833. Voyage de Jerusalem a Akaba au Mt Sinai, a Soues et au Caire. [National Library of France]

CHAMBERS, W. M. 1833-1835. Letter Book containing copies of letters from W. M. Chambers [William Mellish Chambers, 1812-1845] to his mother [Anne Chambers] and uncle while on a tour of Europe, Egypt and Palestine. [University of Nottingham Manuscripts and Special Collections ME C 36]

CHAMBERS, W. M. 1834-1835. Note book and travel journal of William Mellish Chambers [1812-1845, son of William Leigh Chambers], of 31 Mount Street, Grosvenor Square, with enclosures. [University of Nottingham Manuscripts and Special Collections Me J 8/1]

CLIFTON, C. T. 1900. Wandering in Sinai. Text, photographs, map ed. [National Library of France]

DEPARTMENT OF SURVEY AND MINES. 1934-. *Egypt. Southern Sinai*. El Giza: Survey of Egypt, 1934 [Royal Geographical Society rgs546910]

EHRENBERG, C. G. 1830. Erläuterungen über das eigenthümliche Getös in Nakuhs am Berge Sinai. *Beitrag zur Charakteristik der Nordafrikanischen Wüsten,* 1830, 8 pages. [Berlin State Library]

FISK, G. [1842]. Diary of George Fisk. Handwritten diary ed. [Birmingham: Walsall history Centre 142/2 No. II]

FLOWER, S. S. 1919. Preliminary report on Southern Sinai. Note on course of Wadi el Arish, Sinai. Nile, East Delta. Covering letter to General Allenby of 16/07/1919. [Royal Georgaphical Society]

MONEY-KYRLE, W. 1843-1846. [no title]. 28 Letters written to his parents from abroad ed. [Wiltshire & Swindon History Centre]

MORIN, E. 1862. *Notice sur un manuscrit de la bibliothèque publique de Rennes, inscrit dans le catalogue imprimé des manuscrits de cette bibliothèque sous le n° 157, avec ce titre : "Voyage à la terre sainte, au mont Sinaï et au couvent de Sainte-Catherine",* Rennes, Catel. [National Library of France]

PALMER, E. H. 1868. "Notebooks donated by Mr H.T. Lloyd-Davis to Rev. J.S. Boys Smith". Part of Palmer's diary ed.

ROBERTS, D., HAYDAY, J. F. B., HAGHE, L., CROLY, G. 1842. *The Holy Land, Syria, Idumea, Arabia, Egypt & Nubia: from drawings made on the spot by David Roberts, with historical descriptions by the Rev. George Croly,* London, F.G. Moon. [University of Manchester]

SURVEY-OF-EGYPT. 1943. *South Sinai*. Cairo: Survey of Egypt, map 6 [University of Heidelberg, Geographical Institute 59670835]

WALSH Sinai. 104 lantern slides. [Royal Geographical Society, rgs241345]

WAR OFFICE. 1907. *Sinai Peninsula* London: War Office [Royal Geographical Society rgs546900].

WILSON, C. W., PALMER, H.S. 1869. *Ordnance Survey of the Peninsula of Sinai. Two maps, one showing physical features, the other geological formations.* [National Archives, Kew, OS3-36]

Appendices

Table 2 Overview of the most important materials consulted in British, German and French libraries.

Country	Name library/archive	Sections visited	Main materials + approximate numbers
UK	Royal Geographical Society	Maproom, Picture Library, Photographs & Artworks, Book Library	Diaries (1), letters (6), report (1), comments on Exodus (1), archaeological notes (1), photo book (2), painting collection (1), and touring, war, survey, and Biblical maps (19 folders containing sometimes 12 or more maps)
UK	National Archives, Kew	Document Reading Room (archives), Microfilm, Map & Large Document reading room	Foreign Office communications (138), Board of Trade (2), Ordinance Survey and war maps (11

			folders with several maps per folder), microfilms (2)
UK	Walsall Local History Centre, Birmingham	Archive	1 diary of anonymous traveller
UK	Wiltshire & Swindon History Centre, Chippenham	Archive	28 letters from William Money-Kyrle to his family
UK	School of Oriental & African Studies	Library (no material in the Archives & Special Collections)	Published dairies and books about Sinai (not checked in detail yet)
UK	University of Nottingham	Manuscripts and Special Collections	1 notebook and 1 diary of William Mellish Chambers
UK	Manchester University Library	Main Library, John Rylands Library (special collections)	Diaries (6), David Roberts' painting collection (1), book about Bedouin (1)

Germany	Berlin State Library	Haus Unter den Linden: Rara-Lesesaal; Potsdamer Strasse: Map Department, General Reading Room, Manuscript Department	Diaries (13), books about the Monastery and manuscripts of St Katherine (3), book of Hanstein (1923), the grandson of researcher Ehrenberg, who wrote about the Sinai trip of his grandfather (1), articles about the environmental history of Sinai (4), Sinai war and quarantine literature (3)
Germany	Saxon State and University Library Dresden (SLUB)	Central Library, Bereichsbibliothek DrePunct	Diaries (4), travel guides (1), photobook (1), maps (1), microfilm (1), research (1)
Germany	Bavarian State Library, Munich	General Reading Room, Reading	Recent books of the late 20th and 21st

		Room Music, Maps, and Images	century: Travel diaries (5), Bible related books (1), books about the Monastery of St Katherine (2), photobook (1), research (expedition) (2), books about politics and war (3), travel guides (1), Bible related maps (3 books)
Germany	Ludwig-Maximilians-University Library, Munich	Central Library	1 book which in the end had nothing to do with Sinai
Germany	University Library, Heidelberg	University Main Library, Hochschule für Jüdischen Studien, Institute of Geography Library, Library of the Department of Academic Theology, Institute for Classical Archaeology,	Diaries (9), research papers (4), excursions (3), travel guides (1), Monastery of St Katherine (1), and war, biblical, survey, and touring maps (12)

		Forschungsstätte der Evangelischen Studiengemeinschaft, Institute for Egyptology	
Germany	Landesamt für Kultur und Denkmalpflege Mecklenburg-Vorpommern	Ordered archival material via email	1 Handwritten diary of Carl Schoeder
Germany	University of Leipzig	Ordered archival material via email	2 handwritten letters; 1 from G. Fejervary to G.F. Haenel; 1 from C.G. Ehrenberg to G. Kunze
France	National Library of France, Paris	Richelieu: Societe de Geographie, Arts du Spectacle, Cartes et Plans; François Mitterrand: Philosophie, histoire, sciences de l'homme; online collections, microfilm	Travel diaries (12), war diaries (1), and 1 diary from a monk who lived in the Monastery of St Katherine, books about the Monastery of St Katherine (11), photographs (1), and survey,

			Biblical, hydrological, marine, and war maps (around 30 maps in total; most of the are online on Gallica, as are some images), 2 microfilms

Table 3 List of the South Sinai travellers, whose diaries have been included in this research, and their co-travellers. Most of the literature was primary. Some of the literature cited here is on the edge of primary and secondary data. Secondary data are defined as "...information that has already been collected for another purpose but which is available for others to use" (White 2010: 61). It can be recognised in the table where the name of the author and traveller do not correspond, or if the author was anonymous; some diaries with anonymous writers were original diaries though. Some of these publications were reviews or other publications that quoted parts of original diaries. Others were publications by other authors than the original author of the diary, who had found (partly) lost or damaged diaries and published some the parts which were found. There is a remark with the travellers who only visited North Sinai.

Year	**Month**	**Traveller(s)**	**Co-travellers & remarks**	**Author**
1160		Bejamin de Tudela		(Benjamin 1784; Benjamin 1907)
1384	Oct.	Frescobaldi, L., Gucci, G., Sigoli, S.		(Frescobaldi, Gucci & Sigoli 1948)
1392	Nov.	De Swinburne, T.		(Riant 1884)
1507	Oct.-Nov.	Baumgarten, M.	Vincent (priest), Gregory (servant	(Baumgarten 1732)
1604	Sep.	Schach, S.	8 other pilgrims	(Mossman 1846)
1722	Sep.-Oct.	Bishop of Clogher		(Clayton 1753)
1762	Aug.-Sep.	Niebuhr, M.	Mr Von Haven; Baurenfiend, Forskal & Cramer stayed in Suez	(Niebuhr 1792-1)

1766	Mar.	Montagu, E.W.		(Montagu 1766)
1790	Apr.	Bruce		(Bruce 1790)
1793	Mar.	Browne, W.G.		(Browne 1799; Walpole 1820)
1799	Jun.?	Napoleon Bonaparte	[North Sinai]	(Howard 1961)
1799	Dec.	Schrödter, J.	Two French merchants [North Sinai]	(Schrödter 1800)
1801	Apr.	Wittman, W.	[North Sinai]	(Wittman 1804)
1805	Winter/spring	Salame, A.	Mr Petrucci	(Salame 1819)
1806	Jan.	Mr Salt (English Consul of Alexandria)	On return from Jedda, he passed the Gulf of Suez	(George 1811)
1806	Dec.	Ali Bey al-Abbasi, pseudonym for Domingo Badia y Leblich	He went down the Gulf of Suez by boat with a stop in Tor and past Ras Mohammed	(El Abbassi 1814-1&2)
1807	Apr.	Seetzen		(Seetzen 1855)
1811	Feb.	Fazakerley, J.	Mr. Gaily Knight	(Fazakerley 1820)

1815	Jul.-Aug.	Turner, W.	Mr S.	(Turner 1820)
1815	Aug.-Sep.	Bankes, W.J.		(Usick 2002; Lewis & MacDonald 2003)
1816	Apr.-Jun.	Burckhardt, J.L.		(Burckhardt 1816)
1817	Oct.	Irby & Mangles	Mr Bankes, Mr Legh [North Sinai]	(Irby & Mangles 1823)
1819		Anciro, pseudonym for Count Enegildo Frediano		(Anon. 1820)
Early 1820s?	Mar.-Apr.	Henniker, F.		(Henniker 1824)
1821	Oct.-Nov.	Wolff, R.J.	Mr Carne & Mr Clarke (see Wolff 1824: 179)	(Wolff 1824)
1821	Oct.-Nov.	Carne, J.	R.J. Wolff, Mr Clarke; Carne's diary revealed no year, but Wolff travelled in 1821	(Carne 1826)
1823?		Ehrenberg, C.G.	Dr. Hemprich	(Hanstein 1923; Ehrenberg 1830)

1827-1828?		De Bussiere, R.		(De Bussiere 1829)
1828	Feb.-Mar.	De Laborde, L.		(De Laborde 1838)
1828	Jul.	Mr Newnham	Mr J. Webster	(Anon. 1830; Webster 1830)
1828	Sep.	?		(Anon. 1859)
1830s?		Callier, C.-A.		(Callier 1833)
1830	May-Jun.	Dumas, A.	Baron Taylor, Captain Bellanger, Mayer	(Dumas 1839)
1831	Nov.?	Aucher-Eloy, R.		(Aucher-Eloy 1843)
1833		Geramb, P.M.J.		(Geramb 1899)
1833	Sep.-Oct.	Arundale, F.	Mr Bonomi, Mr Catherwood	(Arundale 1837)
1833	Sep.-Oct.	Bonomi, J.	F. Arundale and Mr Catherwood	(Bonomi 1876)
1835	Mar.	Mellish Chambers, W.	William Overend	(Chambers 1833-1835, 1834-1835)
1836	Mar.-Apr.	Wolff, J.		(Wolff 1839)
1836	Mar.	Stephens, J.L.		(Stephens 1996)
1836/ 1837?		Lord Lindsay	Mr Ramsay	(Anon. 1838)

1839	Jan.-Feb.	Kinnear, J. & Roberts, D.	Mr Pell	(Kinnear 1841; Ballantine 1866)
1840?		Cooley, J.E. & Mr. Sneezebiter		(Cooley 1843)
1840	Mar.	Koller, F.		(Koller 1842)
184-	Mar.	Günnel, J.G.	Seems that he was travelling with Robinson & Smith, but they travelled in 1838!	(Günnel 1847)
1842	May	Fisk, G.		(Fisk 1842)
1843	Mar.-Apr.	Borrer, D.	Dr. Stevenson	(Borrer 1845)
1845	Oct.	Bartlett, W.H.		(Bartlett 1854)
1845	Mar.-Apr.	Lepsius, K.R.		(Wreszinski 1913)
1846	Feb.	Money-Kyrle, W.	Marquis of [Sligo?]	(William Money-Kyrle)
1846?	Mar.-Apr.	Tilt, C.	[North Sinai]	(Tilt 1849)
1847	May	Plowden, W.C./T.C?	He was the great-uncle of J.M.C. Plowden	(Plowden & Plowden 1868)
1848	Feb.	Anonymous traveller		(Anon. 1848-1/2/3)
1850	Mar.	Hindley, A.	Her father, J.R. Anderson, three women and a maid	(Hindley 1850)

1850	Mar.	Anderson, J.R.	Ms A. Hindley, Charles Hindley, Hindley's brother Rev. H.B.Q. Churton, "two young friends, R. and S." (Anderson 1853: 63)	(Anderson 1851, 1853)
1852-1853	Winter-Spring	Stanley, A.P.		(Stanley 1857)
1853	Feb.-Mar.	Graul, K.	Tischendorf	(Graul 1854)
1856	Jan.-Feb.	Bonar, H.	Rev. Thomas Wright of Swinton, Mr Poynder, Mr Beddome	(Bonar 1857)
1860?		Anonymous traveller		(Anon. 1860)
1861		Holland, Rev. F.W.		(Holland 1867)
1862	Feb.	Tyrwhitt, R.S.J	His brother, "a veteran traveller", "another ex-tutor of Christ Church" (Tyrwhitt 1864: 327); his wife and sister joined until Suez; Met	(Tyrwhitt 1864)

			Buckle on the way back	
1862	Feb.-Mar.	Buckle, H.T. & J.S.S. Glennie	They met Tyrwhitt in South Sinai	(Glennie 1863; Glennie 1880)
1863	Jan.-Feb.	Brocklebank, J.	Mr Verhaeghe	(Brocklebank 1865)
1864	Mar.	Mr Ritter		(Anon. 1867)
1865	Feb.-Mar.	Holland, Rev. F.W.		(Holland 1866)
1866	Mar.-Apr.	Wallace, A.	Party of several persons, including an "American lady and gentleman" (Wallace 1868: 68). He met Major MacDonald in Suez, Captain S. and his company in 'Ayn Musa	(Wallace 1868)
1867-1868	Oct.-Jan.	Holland, Rev. F.W.	Mr Wilson, Mr Palmer, Mr Wyatt	(Holland 1868-1; Holland 1868-2)
1867-1868	Oct.-Feb.	Holland, Rev. F.W.		(Holland 1868-2)

1868	Spring	Bauerman, H.		(Bauerman 1869)
1868?	Nov.–Dec.	Schwerdt, H.	Lord Spencer	(Schwerdt 1870)
1868-1869	Nov.-Mar.	Palmer, H.S.	Mr C.W. Wilson, Rev. Holland, Mr Wyatt	(Palmer 1871-1)
1869-1870	Dec.-Jan.	Palmer, H.S.	Mr C.F. Tyrwhitt-Drake	(Palmer 1871-2)
1872	Feb.-Mar.	Maughan, W.C.	Mr C. Ashton & Mr. E.W. Gere	(Maughan 1873)
1874	Feb.-Mar.	Bartlett, S.C.	Rev. Jacob Chamberlain, Rev. E. M. Williams, Edwin J. Bartlett	(Bartlett 1879)
1877	Feb.-Mar.	Scott, R.A.	He travelled together with 5 others	(Scott 1927)
1878	Apr.	Holland, Rev. F.W.		(Holland 1878)
1879	Apr.	Bishop Bird, I.		(Bishop Bird 1886-III/IV/V)
1882	Feb.-Mar.	Field, H.M.	Prof. G.E. Post	(Field 1888)
1882	Mar.	Raboisson, L.A.	Fernand Saglio, Paul de Saint-Chamant, M. l’abbe Hillerau,	(Raboisson 1886)

			Dr Joüon, M. Édouard Le Pomellec, M. Raoul de Sévin, M. Édouard Gast	
1883	Nov.	Hull, E.	Dr. E. Gordon Hull (son), Mr Hart, Mr Reginald Laurence, Mr Bernhard Heilpern	(Hull 1885)
1888?		Wallace, S.E. (Mrs)		(Wallace 1891)
1889	Mar.-Apr.	Carrington Bolton, H.	Mr Henry A. Sim	(Carrington Bolton 1890)
1892	Jan.-Mar.	Smith Lewis, A.	Her twin-sister Mrs Gibson	(Smith Lewis 1898)
1893	Jan.- Feb.	Liebenau, E.V.	Von Waldow, Mr William B. Kaupe, Kaiser	(Liebenau 1896)
1893	Jan.-Mar.	Smith Lewis, A.	Mrs Gibson, Professor Bensly and his wife, Mr. and Mrs. Burkitt, Dr. R. Harris	(Smith Lewis, A. 1898)
1894	Jan.-Mar.	Buxton, E.N.	Buxton, H.M., Buxton, C.E., Buxton, T.	(Buxton 1895) (Father)

1894	Jan.-Mar.	Buxton, H.M., Buxton, C.E., Buxton, T.	Mr E.N. Buxton (father), Mr C., Celestin, J.D.C., Mr W.	(Buxton *et al.* 1895) (Daughter)
1894	Feb.-Mar.	Österreich, O. (Otto Archduke of Austria)	Graf Géza Széchényi, Oberlieutenant Baron Hermann Berg	(Österreich 1895)
1894	Feb.-Mar.	Loti, P.		(Loti 1993)
1895	Jan.-Mar.	Smith Lewis, A.	Mrs Gibson	(Smith Lewis 1898)
1897	Feb.-Mar.	Smith Lewis, A.	Mrs Gibson	(Smith Lewis 1898)
1897/1898??	Jul.	Böttcher, K.		(Böttcher 1898)
1898-1899	Winter/ spring?	Hume, W.F.		(Hume 1901)
Late 1890s/1900?	Spring (Easter)	Clifton, C.T.		(Clifton 1900)
1902	Winter/ spring	Mauchamp, E.		(Mauchamp 1903)
1903	Late Oct.-early Nov.	Schoenfeld, E.D.	Bajumi, Mohammed, Abd-el-Azzis & Hassan-Aly	(Schoenfeld 1907)
1905-1906	Winter	Eckenstein, L.	Petrie, Eckenstein	(Eckenstein 1921)
1906	Mar.	Kergorlay, J.D.	Dominican priests of the	(Kergorlay 1910)

			Biblical school St Etienne (Jerusalem)	
1909?	Mar.	Schneller, D.L.		(Schneller 1910)
1912	Mar.	Sutton, A.W.	Doctor Mackinnon, Miss Waldron; they met with two French ladies, and two divinity professors in Wady Feiran	(Sutton 1913)
1914	Mar.-Apr.	Brockbank, O.	Mr Hensman	(Brockbank 1914)
1921-1923?		Beadnell, H.T.L.	Other researchers	(Beadnell 1926)
1926	Spring (Easter)	Kazantzakis, N.		(Kazantzakis *et al.* 1975; Nomachi 1979)
1928		Gäbelmann, A.	Dr Spohr [North Sinai]	(Gäbelmann 1928)
1929	May	Murray, G.W.		(Murray 1967)
1930	Mar.-Apr.?	Barrois, A.	Several researchers	(Barrois 1932)
1937	Feb.-Mar.	Plowden, J.M.C.		(Plowden 1940)
1943	Apr.	Gotch, P.	His wife, Badia Boulos, Bill Baron, Epy &	(Gotch 1945)

			Harold Edwards, John Moggridge, Wilfred Walton	
1960?	Feb.	Theotokas, G.	Three priests of the Alexadria Patriachat	(Theotokas 1969)
1963		Schlink, Mutter B.		(Schlink 1966)
1966	Summer	Bardtke, H.		(Bardtke 1968)
1969	Spring	Wellard, J.	Several persons	(Wellard 1970)
1969		Bernstein, B.		(Bernstein 1980)
1978	Early spring	Bernstein, B.	Bailey	(Bernstein 1980)
1977-1978	Oct.-Mar.	Nomachi, K.		(Nomachi 1979)
1978	Jun.	Hazleton, L.		(Hazleton 1980)
1979		Bentley, J.	[He went again a few years later]	(Bentley 1985)
1979	Sep.	Eichler, H. & Scheuerbrandt, A.		(Eichler & Scheuerbrandt 1983)
Early 1980s?		Malangre, H.	Group of travellers	(Malangre 1983)
1989	May-Jun.	Hobbs		(Hobbs 1995)

Late 1980s or 1990?		Blot, J.		(Blot 1990)
1992	Winter	Macaire, P.		(Macaire 2012)
1994-1995		Joubert, J.-M.	He was a monk at the Monastery of StK	(Joubert 2004)
1999-2000	Dec.-Jan.	Binder, B.		(Binder & Binder 2000)
2000-2013		Shams, A.		(Shams 2011)

Table 4 List of spellings of the main wadies and mountains that I used in my thesis. On the left is the English spelling, on the right is the Arabic spelling. The Arabic spelling is copied from Burckhardt 1816 and the Survey of Egypt map (1943, No. 6). The English spelling is a loose transliteration of the Arabic.

WESTERN SINAI

North-central route

‘Ayn Musa	عين موسى
Wady Sidr	وادي صِدر
‘Ayn howara/Bir howara	عين هوارة / بيرهوارة
Wady ‘Amara	وادي عمارة
Abu Suweira	ابو صويره
Wady Useit	وادي وسيط
Wady Gharandel	وادي غرندل
Hammam Fara’un	حمام فرعون
Wady Wardan	وادي واردان
Wady Humr	وادي حُمّر
Sarbut el Jemel	سَربوت الجمل
Wady Nasb	وادي النَصب
Wady Suwiq	
Serabit el Qadim	سرابيط القدم
Wady Khamila	وادي خميلة
Wady Baraq	وادي بَرَق
Wady Lebwa	وادي لبوة
Wady BerraH	وادي براح
Wady el Sheikh	وادي الشيخ

South-central route

Wady Tayiba	وادي طيّبه

Wady Shubeiqeh	وادي شبيقه
Abu Zenima	اَبو زنيمه
Plain of el Murkha	مُرخا
Wady Shellal	وادي شلال
Wady Ba’ba’	وادي بعبعه
Wady Baderah	وادي بادره
Naqb Baderah	نقب بادره
Wady Maghara	
Wady Mukatteb	وادي مكتب
El Hessuyeh	الحسيه
Wady Feiran	وادي فيران
Wady ‘Aleyat	وادي عاليّات
Mount Serbal	جبل سربال
Wady Solaf	وادي صلاف
Naqb Hawy	
Plain of El RaHah	الراحه
Southern route	
El Qa’a	القاع
Hammam Musa	حمام سيدنا موسى
El Wady	الوادي
Tor	الطور
Wady Hebran	وادي هبران
Wady ImlaHah	وادي إملاحه
Wady ‘Isleh	وادي عاسله
Umm Shomer	جبل ام شومر

Around the Monastery

Wady Saba'iya	وادي سبعية
Mount Sinai	جبل موسى
Mount Safsafa	
El Arba'in	
Wady Leja	وادي اللجاة

ROUTES BETWEEN THE MONASTERY AND NAKHL

Western route

Wady Ramleh (Bonar 1857: 254)	
Wady SeiH	وادي سيح
Naqb Rweiknah	نقب رويكنه
Tih	التيه
Nakhl	

Eastern route

Wady el Biyar	وادي البيار
Naqb Biyar	نقب بيار
Jebel Edjme	جبل عُجمة

EASTERN SINAI

North-central route

Wady Wutia	
Elwa el 'Ajramiyah	علوالعجرميه
Wady Zeleqah	وادي زلقه
Wady Zarania	
Wady el 'Ayn	وادي العين

Wady Watir	وادي وتير

South-central route

Abu Suweir	ابو صوير
Wady Saal/Sa’al	وادي سال / وادي سعل
Wady Safrah	وادي سفره
‘Ayn HuDrah	عين حضره
Wady Ghazala	
Wady el ‘Ayn	وادي العين
Nuweiba	نويبع

Southern route

Wady Zaghrah	وادي زغره
Wady Nasb	وادي نصب
Dahab	دهب

Table 5 Overview of quotes about extreme weather events

Year	**Month**	**Day**	**Place**	**Quote**	**Extreme event**
1811	Feb.	7	Western Sinai	"...our Bedouins told us that they had seen none [rain] for four or five years..." (Fazakerley 1820: 367)	Ongoing 4-5 year drought
1815	Aug.	4	Monastery of StK	"...there has scarcely been a drop for the last six years." (Turner 1820: 433)	Drought for 6 years
1815	Aug.	8	Wady Feiran	"...owing to the late want of rain..." (Turner 1820: 451)	Drought
1815	Aug.		Monastery of StK	"...for the last six years there has been scarcely any rain at all." (Turner 1820: 482)	Drought for 5-6 years
1816	May	5	Eastern Sinai	"...no rain had fallen during the two last years, in the whole of this eastern part of the peninsula." (Burckhardt 1816: 493)	Drought for 2 years
1816	May	8	Sinai	"...to the north of Djebel Tyh copious rains had fallen during the winter, while to the south of it there had been very little for	Drought for 2 years in the south and east

				the last two years, and in the eastern parts none." (Burckhardt 1816: 505)	
1816	May	23	Eastern Sinai	"This part of Sinai was completely parched up, no rain having fallen in it during the last winter." (Burckhardt 1816: 588)	Drought (winter 1815/1816)
1816	Jun.	5	Western Sinai	"Want of rain is much more frequent in the lower ranges of the peninsula, than in the upper." (Burckhardt 1816: 625)	Drought in the lower areas
1827?	Winter?		Monastery of StK	"They...[the Bedouin]... insistently demanded the monks to send them food and climb Mount Sinai in order to get rain." (Renouard de Bussiere 1829: 257/258) [translation from French]	Drought
1830	May-Jun.		Western Sinai	"...it was the Khamseen" (Dumas 1839: 240)	Khamseen
1831	Spring		Western Sinai	"...The torrent became so strong that it took all my boxes and my papers...there was	Flash-flood?

				nothing left of this beautiful vegetation I had admired before the storm; the torrent had only left stones and silt...” (Aucher-Eloy 1843: 729/730/731) [translation from French]	
1833	Mar.	1	Mount Sinai	“...we had to deal with pieces of ice and snow, which was so high in some places that it took us a lot of effort to force our way through it...From Elias height, we continued with difficulty our way through the snow, incessantly harassed by a northern wind, which blew violently.” (Geramb 1899: 173/174) [translation from German]	Extreme snowfall
1838	Mar.-early Apr.		Western Sinai	“A Samum is approaching, which later, as we experienced, turned into a storm...The sun burns very hot today and the southwestern winds blows also fairly strong...The wind smells foul and	Khamseen

				sulphurous, is thick and heavy and almost choking...The sun is veiled...” (Günnel 1847: 27/28) [translation from German]	
1845	Oct.	Before the 12th	Monastery of StK	“...it had been a trying season for the convent, a severe rain-storm had carried away portions of the gardenwalls...” (Bartlett 1854: 79)	Flash-flood
1848	Feb.	Before the 12th	Between Feiran and the Monastery	“Only a few days ago...one road was streaming down with water, the result of a heavy storm on the mountains...” (Anon. 1848-2: 363)	Flash-flood
1849			Around Monastery of StK	“It snowed...seven days in a row...” (Graul 1854: 219) [translation from German]	Extreme snowfall
1853	Feb.	25	Western Sinai	“Only the wind, which unfortunately blew from southern direction and from minute to minute increased in strength, played wantonly with the drift sand, so that we had to cover our	Khamseen; very strong and hot khamseen in Cairo after the 20th March 1853, where it continued for

				head and face completely despite the oppressive sultriness." (Graul 1854: 197) [translation from German]	six to seven consecutive days, while the longest is normally three to four days (Graul 1854: 233).
1853	Mar.	8	Around Monastery of StK	"The snowstorm, which from time to time took the shape of hail, followed us with almost no interruption for several hours." (Graul 1854: 219) [translation from German]	Extreme snowfall
1855	Summer		Around Monastery of StK	"The summer following the death of Abbas was so hot that the natives thought the Devil had been extra diligent in stoking the fires of hell to receive their khedive. Some of the extra heat escaped to plague the Sinai." (Greenwood 1997: 46)	Extreme heat
1862	late Feb.-early Mar.		Western Sinai	"We have, for instance, to struggle through a sandstorm...walking blindfold; with our	Possibly Khamseen

				heads enveloped in kafeeyehs, or sitting with our faces to the tails of our dromedaries...so incalculably is the feeling of the desert heightened by this tempest of wind and these driving clouds of sand below, and vapour above, apparently mingling with each other." (Glennie 1880: 93/94)	
1863	early Feb.		Mount Sinai	"...the snow, on an average eight inches thick, and in some places knee-deep..." (Brocklebank 1865: 180)	Extreme snowfall
1866	Apr.	3?	Near Wady Feiran	"...a day of sand-storm, produced by the depressing Khamsin wind..." (Wallace 1868: 111)	Possibly Khamseen
1866	Apr.		Nakhl	"...there was nothing but sand, sand, sand all over, and this was owing to the sirocco, which produced a suffocating heat, and raised the blinding dust in clouds, throwing it at times	Possibly Khamseen

				[page break] into the form of driving pillars.” (Wallace 1868: 149/150)	
1867	Dec.	3	Wady Feiran	“I never saw such rain, and the roar of the thunder echoing from peak to peak and the howling of the wind was quite deafening...in a quarter of an hour every ravine and gully in the mountains was pouring down a foaming stream...” (Holland 1868-2: 248)	Flash-flood
1867	Dec.	3	Wady Feiran	“The sayl flooded the wady and raised above its normal level until it reached 5 el” (Shuqair 1916: 84) [5 el. Is about 9 to 13 feet]	Flash-flood
1869-70	Dec.-Jan.		Eastern Sinai	“One old woman roundly abused us for the late drought...” (Palmer 1871-2: 315)	Drought
1870	Jan.		Tih	“...he considered our presence and the recent drought as suspiciously coincident...” (Palmer 1871-2: 325)	Drought

1874	Feb.	20	Mount Sinai	"This year there had been twice the usual amount of snow." (Bartlett 1879: 266)	Extreme snowfall
1877	Feb.	26	Western Sinai	"A whirling sandstorm prevailed...The afternoon found us for a time struggling against the wind. It soon subsided, and the air was dull and close." (Scott 1927: 11)	Possibly Khamseen
1877	Feb.	27	Western Sinai	"Just below us towards the west, half concealed by a driving sandstorm, was the flat desolate plain of El Kaa...Serbal stood out distinct against the Gulf of Suez, and a thick driving sandstorm which swept the desert behind it." (Scott 1927: 44/45)	Possibly Khamseen
1878	Apr.-May?		Eastern Sinai	"I found that little rain had fallen for two years, and that the country was much parched up. The want of water and the constant raids made by the Maazi, and other Arabs from the	Drought

				east of the Arabah, made travelling difficult, but I succeeded in exploring Jebel Mugrah..." (Holland 1878: 455)	
1883	Late Oct.-early Nov.		Western Sinai	"...a party of Bedawins were encamped...when suddenly a great torrent descended from the mountains, flooding the plains, and carrying their tents and goods down into the sea." (Hull 1885: 33)	Flash-flood
1889	Mar.		Western Sinai	"...all wells were very low, and in some places entirely dried up." (Carrington Bolton 1890: 590)	Possibly a drought
1889	Mar.	17	Western Sinai	"The highest evening temperature was...after the Khamsin had blown all day..." (Carrington Bolton 1890: 577)	Khamseen
1889	Mar.?		Western Sinai	"...a third sand-storm...on the plain of El Markha...accompanied by a scorching south wind..." (Carrington Bolton 1890: 581)	Possibly Khamseen

1889	Mar.?		Western Sinai	"...the sand-storm continued...The temperature at 7 P. M. was abnormally high, 84°; just twenty-four hours later it had fallen to 58°, the wind having meanwhile veered around to the north..." (Carrington Bolton 1890: 582)	Possibly Khamseen
1894	Jan.	28	Western Sinai	"There has been very little rain there lately..." (Buxton *et al.* 1895: 102)	Drought/ very little rain
1894	Feb.	Around the 7th	Western Sinai	"...in the storm three weeks ago, and Arab encampment that was pitched not far from this was washed away, and six women and twelve children were drowned." (Buxton 1895 *et al.*: 152)	Flash-flood
1894	Jan.-Feb.		Eastern Sinai	"The first night at Wady Nasb the storm rattled over our canvas roofs...As I peered out into the darkness, it was fitfully illuminated by the flashes, and I wondered whether we should be separated from our breakfast by	Flash-flood

				a raging torrent...Two other camps of Europeans in different parts of the peninsula were invaded by the flood, and some of their possessions lost. We soon heard news of Sbhr's camp, which he had passed three days before. Though his family had had time to escape to the rocks, many of his goats and donkeys had been swept away...We were told of two Arabs who were known to have entered the gorge of wadi Isleh, which we had ascended. The bodies of their camels were found washed out on to the plain; the bodies of the men were never seen again." (Buxton 1895: 147)	
1894	Feb.	21 (result of storm around the 7th?)	Western Sinai	"We hear that Wadi Isleh, which was blocked by the rocks, &c., brought down by the flood, is rendered impassable for camels, so our plans	Flash-flood?

				are rather upset, as we had meant to go back that way." (Buxton *et al.* 1895: 146)	
1894	Feb.	27	Western Sinai	"Five days now without finding water." (Loti 1993: 17)	Possible (ongoing) drought
1894	Mar.	1	Monastery of StK	"Our lonely camp is in sorry disarray, caused by these blasts that threaten to blow it away and this snow that is now a blizzard...our Bedouin constantly brush off the snow collecting in dangerous amounts on our tents." (Loti 1993: 27)	Extreme snowfall (low altitude)
1894	Mar.	1	Area around Monastery of StK	"You have to hold on to your bollowing burnous with two hands...sinking ankle deep in the white drifts...we climb, with our feet bare, our slippers lost, sliding at every step in the snow." (Loti 1993: 28)	Extreme snowfall (low altitude)
1895	Late Feb.		Monastery of StK	"The inhabitants of the Sinai peninsula were at that time almost at their wits' end as to how they could obtain	Drought

				water for their camels and their flocks. Nothing less than a famine was threatened, for not a drop of rain had fallen since March or April of the previous year...” (Smith Lewis 1898: 112/113/114)	
1897	Feb.	11	Western Sinai	“...Wady Hebran had been spoilt by the rain...” (Smith Lewis 1898: 190/191)	Flash-flood?
1897	Jul.	5	Western Sinai	“Does she [the sun] want to boil the whole desert?...but soon she [the desert] had even more to endure...half-transparent, mist-like quicksand flies as thin clouds through it. Soon it becomes denser, heavier, swirlier, sweeping with gusts against the slowly proceeding camels, irritates the eyes, crunches between the teeth...it is difficult to stay in the saddle.” (Böttcher 1898: 191/192) [translation from German]	Possibly Khamseen

1890s or 1900?	Spring		Mount Sinai	"This spring, as all the others in the neighbourhood, with the exception of those at the convent and at our camping ground, dried up during the summer months of the two previous years. This was owing to there having been no rain and very little snow for the last four winters." (Clifton 1900: 18)	Drought/little rain for 4 years
1903	Nov.	8	Monastery of StK	"These first drops are the announcement for a stronger downpour. Amazing! Three days ago, the monks had climbed Djebel Musa [Mount Sinai] in solemn procession, to beg God for rain for the languishing floors of the Bedouin and the prayers are already answered. What an impression will it leave on the children of the desert [Bedouin] who have been used since time immemorial to face with shy respect these proud rising Monastery walls! The	Drought

				increasing rain forces me to enter the tent." (Schoenfeld 1907: 61) [translation from German]	
1903	Nov.	5	Monastery of StK	"...a present in the shape of rain, which had not fallen in these wadies for two years." (Schoenfeld 1907: 55) [translated from German]	Drought for 2 years
1906	Mar.	Evening of the 17	Monastery of StK	"...'The rains intensified during the night from the evening and the sayl grew and large rocks rolled from the mountain to the Monastery from the south. Several rocks stopped on the mountain flanks, others reached the wady of the Monastery and blocked it. The sayl changed direction to the outer house of the Monastery and swept the wall on the southside and the northern entrance away. If the sayl would have continued for another hour, the complete monastery could have possibly	Flash-flood

				been wiped out.'" (Shuqair 1916: 84)	
1907-08			Monastery of StK	"Up to 50 centimetres of snow fell in the winter of 1907-1908 at the monastery, which sits at the usual snowline of 1,600 meters. A monk who had resided there forty-three years described that as a year of 'much snow'." (Hobbs 1995: 10 ref 11)	Extreme snowfall (low altitude)
1909?	Mar.	18	Mount Serbal	"...'I have often been up here, but I have never seen this well dried up. It can only be explained by the three-year drought.'" (Schneller 1910: 137/138) [translation from German]	Drought for 3 years
1914	Apr.	11	Eastern Sinai	"...owing to the three years' drought, the water was no longer fit for them to drink..." (Brockbank 1914: 40)	Ongoing drought since 3 years
1926 or 1927	Feb.-early Mar.		Western Sinai	"A rosy-hued unruffled expanse that looked like the sea stretched out before us for a considerable distance...This vast	Khamseen

				rosy expanse before us was not the sea, it was the desert, that a violent wind was whipping up into heated clouds of crimson. We caught our breath as we entered the sandstorm.” (Kazantkazis *et al.* 1975: 132/133)	
1926 or 1927	Feb.-early Mar.		Western Sinai	“...this rosy area was the desert, which stirred a big storm; its sand clouds glowed rosy. Soon we found ourselves completely in the storm, and our breath faltered. Taema stopped singing, the Bedouin covered themselves in their burnous and covered their mouth and nose...The camels could not keep their balance and turned in a circle. Three hours long...” (Nomachi 1979: 113) [translation from German]	Khamseen
1926 or 1927?	Feb.		Monastery of StK	“Snow had covered our tent and the whole plateau lay before us	Extreme snowfall

				stark white." (Kazantzakis *et al.* 1975: 95)	
1926 or 1927?	Feb.		Mount St Catherine	"...snow had completely covered the mountain…The snow was up to our knees..." (Kazantzakis *et al.* 1975: 122)	Extreme snowfall
1926-36			Eastern Sinai	"...the Arabs consider the period of his observations to have been relatively dry, a qualification apparently corroborated by the meteorological observations made in Palestine between 1926 and 1936." (Gottmann 1939: 515)	"Relatively dry"
1930	Late Mar.		Western Sinai	"The floods of water that sweep the valleys of the plateau of Serabit in winter - the late March rains allowed us to witness this spectacle..." (Barrois 1932: 106/107)	Flash-flood
1930	Apr.		Western Sinai	"...the road was under repair for the fourth time that season." (Barrois 1932: 103)	Flash-flood?

1937	Mar/Apr.?		Eastern Sinai	"Sheikh Suleiman explained...that the rainfall in the west of Sinai had been unusually good this spring..." (Plowden 1940: 198)	Good rainfall (Plowden 1940: 198)
1937	Mar.	3	Western Sinai	"It was a very strange day, warm and still; a sort of mist hung about...There was a very faint rustling or whispering...he explained what it was: a tremendous sandstorm was in progress but some freak of the wind had deflected it into the upper atmosphere where it was passing harmlessly over our heads, whole not a breath of air stirred the palm-leaves around us." (Plowden 1940: 51/52)	Khamseen; The storm took place in the higher atmosphere
1967-1968	Winter		Wady Feiran	"They told us about an approximately 6 meter high flashflood, which in the winter of 1979/68 had rushed down Wady Feiran and had destroyed everything on its way.	Flash-flood

				They had lost many camels at the time, many date palms had been pulled down, and many houses had been destroyed." (Eichler & Scheuerbrandt 1983: 213) [translation from German]	
1968	May		Wady Feiran	"...in May 1968 one such flood (fayadan) carried away hundreds of palm trees, houses, and gardens, laying waste most of a 2-kilometer stretch of Wadi Firan oasis." (Marx 1999: 345)	Flash-flood
1968-1969	Winter		South Sinai	"The worst flood in 30 years in the winter of 1968-1969 destroyed a large number of established orchards." (Perevolotsky 1981: 348)	Flash-flood
1970			Wady Feiran	"...1970...a winter flood..." (Eichler & Scheuerbrandt 1983: 213) [translated from German]	Flash-flood
1972	Dec.		Sinai mountains	"Bedouins relate that a massive December 1972 snowfall remained on the	Extreme snowfall

				ground at elevations as low as 1,800 meters until March and made the important pass route of Abu Jiifa unnegotiable...” (Hobbs 1995: 10)	
1973			Wady Feiran	“...1973 again a winter flood...” (Eichler & Scheuerbrandt 1983: 213) [translated from German]	Flash-flood
1975	Feb.		Wady Feiran	“Another [flash-flood] in February 1975 was almost as disastrous.” (Marx 1999: 345)	Flash-flood
1977	Oct.		Wady Watir	[Picture of Wadi Watir full of water, with the explanation:] “The valley of Wady Watir. If you walk down through the deep Wady Watir, you will come across a water basin...” (Nomachi 1979: 122) [translated from German]	Possibly there had been a flash-flood in Wady Watir earlier that month?
1979			Sinai mountains	“...the first buildings where barely finished, when a catastrophe took place; melting snow from the mountain peaks of the	Possibly extreme snowfall

				Sinai caused a mudslide which ended here in the sea.” (Semsek 2008: 407) [translation from German]	
1979	Sep.	21	Eastern Sinai	“...since three years it has not rained in this area...” (Eichler & Scheuerbrandt 1983: 165) [translation from German]	Ongoing drought since 3 years
1979	Sep.	21	Mount St Catherine	“Measured over three years, an average of 65mm precipitation per year was measured on Mount St Catherine...” (Eichler & Scheuerbrandt 1983: 170) [translation from German]	Drought? 65mm seems less than average
1979	Sep.		Wady Feiran	“In 1979, it had rained for the last time 8 months earlier (February) in Wady Feiran, according to our informant “ (Eichler & Scheuerbrandt 1983: 213) [translation from German]	Drought?
1979	Sep.	25	Area around	“Since approximately 2 years there was famine as a result of	Ongoing drought since 2 years

			Monastery of StK	drought...” (Eichler & Scheuerbrandt 1983: 246) [translation from German]	
Early 1980s?			Monastery of StK	“During the night in the Monastery of StK, which we wanted to leave early in the morning to climb the mountain of Moses and experience the sunrise, there was “rain alarm”...the happiness among the few Arabic half-nomads about the rain was tremendous. The wadies flooded.” (Malangre 1983: 18/19) [translation from German]	Flash-flood?
1987	Oct.	16	Wady Watir	[Flash-flood Wady Watir] (Cools *et al.* 2012)	Flash-flood
1987	Winter		Eastern Sinai	“In very hard winters like that of 1987 the voluminous swimming hole of al-Galt al-Azraq at 1,800 meters in Wadi Tala' freezes solid.” (Hobbs 1995: 11)	Very hard winter
1988	Apr.	1	Wady Watir	[Flash-flood Wady Watir] (Cools *et al.* 2012)	Flash-flood

1988	Oct.	17	Wady Watir	[Flash-flood Wady Watir] (Cools *et al.* 2012)	Flash-flood
1989			Monastery of StK	“Abundant rains in 1989 broke a seven-year drought at the monastery.” (Hobbs 1995: 12)	Drought of 7 years
1989	Apr.		Area around Monastery of StK/Wady Feiran	“...an intense, localized storm dropped so much rain between Shaykh 'Awaad and Abu Sayla, high in the Feiran watershed, that Wadi Feiran was flooded all the way to its mouth at the Gulf of Suez, although no rain fell in Wadi Feiran itself. Local Bedouins who visited Wadi Nugra after the event marveled at how radically its landscape had been transformed. Water had scoured the wadi bed, uprooting and transporting tamarisk and palm trees, stripping leaves from poplars, and ripping weighted shadufbeams and buckets from their	Flash-flood

				garden mountings." (Hobbs 1995: 13)	
1990	Oct.	23	Wady Watir	[Flash-flood Wady Watir] (Cools *et al.* 2012)	Flash-flood
1991	Mar.		Wady Feiran	"In March torrential rains fell in northeastern Egypt, dropping hail on Cairo and flooding western Sinai's watersheds. The settlement of Feiran was damaged heavily and an estimated 150 persons lost their lives there. No rain fell at the monastery." (Hobbs 1995: 14)	Flash-flood
1996	Nov.		Eastern Sinai	"...when...downpour fell over Upper Egypt and the Sinai, another flashflood hit Na'ama Bay and flushed the luxury lodgings up to waist height..." (Semsek 2008: 407) [translation from German]	Flash-flood
1997	Oct.	17-18	Wady Watir	[Flash-flood Wady Watir] (Cools *et al.* 2012)	Flash-flood

1999	Dec.	31	Eastern Sinai	"...24 months of drought..." (Binder & Binder 2000: 25) [translation from German]	Ongoing drought since 2 years
2000	Jan.	4	Eastern Sinai	"...the first rain drops...The first rain since 2 years!" (Binder & Binder 2000: 78) [translation from German]	End of 2 years of drought
2002	Oct.	30	Wady Watir	[Flash-flood Wady Watir] (Cools *et al.* 2012)	Flash-flood
2004	Oct.	24	Wady Watir	[Flash-flood Wady Watir] (Cools *et al.* 2012)	Flash-flood
2008			South Sinai	"Drought" (Matrahazi 2010: 26)	Drought
2010	Jan.	17-18	Wady Watir	[Flash-flood Wady Watir] (Cools *et al.* 2012)	Flash-flood

Appendix 1 Meaning of some geographical names and some of their synonyms

There are several Arabic words, which appear often in the diaries and indicate geographical features, but are not always explained. However, it is essential to understand these words in order to understand the texts. Here follows a list with the most common words and their synonyms:

'Wady' (وادي) = 'valley'

- Waddy (Dumas 1839: 239)
- Wadee (Wilkinson 1847: 217)
- Wadi (e.g. Taylor 1886; Carrington Bolton 1890; Buxton 1895)
- Ouadi (Mauchamp 1903)
- Ouady (Kergorlay 1910: 315)
- Ouadee (Linant in Lewis & MacDonald 2003: 61)

(The "w" sound transcribed differently in English and French, respectively 'w' and 'ou')

'Jebel' (جبل) = 'mountain'

- Jibbel (Niebuhr 1792-1: 191)
- Djabel (El Abbassi 1814-1: 263)
- Djebel (Burckhardt 1816: 568; Kergorlay 1910: 323)
- Gabel (Anon. 1829)
- Dgebal (Arundale 1837: 20)
- Gebel (e.g. Anon. 1867; Baedeker 1885; Bishop 1886-1)
- Dschibbal (Seetzen 1855: 84)
- Jebel (e.g. Hull 1885; Carrington Bolton 1890)
- Jabal (Lewis & MacDonald 2003: 62)

'Hajar' (حجر) = 'Stone' or 'rock'

- Hagar (Montagu 1766: 49)
- Hadjar (Holland 1868-2: 243)
- Hajar (Palmer 1871-1: 250)

- Hajjar (Palmer 1871-1: 278)

'Naqb' (نقب) = 'Pass'

- Nakb (Stanley 1857; Carrington Bolton 1890: 579)
- Nagb (e.g. Stanley 1857: 48; Hume 1901: 14)
- Nugb (e.g. Bartlett 1879: 216; Smith Lewis 1898: 63)

'Ras' (رأس) = literally it means 'head', but in geographical context it means 'Cape'

'Ayn' (عين) = literally it means 'eye', but in geographical terms it means 'well' or 'water source'.

'Bir' (بئر) = 'well', 'water source'

Appendix 2 List of synonyms of wadies, mountains, and places along the main routes.

The first name is the spelling I have adopted (see table 4), followed by the synonyms and chronologically organised according to the references. Note that some travellers, e.g. Bartlett (1854) used different spellings for the same place. This list is not exhaustive.

Western north-central route

ʽAyn Musa

- Ain el Musa (Clayton 1753: 12)
- Aijnm Musa (Niebuhr 1792-1: 183)
- Aaïon Moussa (El Abbassi 1814-2: 85)
- El Aayon Moussa (El Abbassi 1814-1: 266)
- Ayoun Musa (Turner 1820: 419; Renouard de Bussiere 1829: 230; Tyrwhitt 1864)
- Ayn Mousa (Kinnear 1841: 63)
- Ayoun Mousa (Arundale 1837: 15; Wallace 1868: 88)
- ʽAin/'Ayun Musa (Borrer 1845: 297; Anon. 1867: 407; Baedeker 1885: 419)
- Ayn Musa (Günnel 1847: 21)
- Ain Moosa (Wilkinson 1847: 214)
- Ahun Musa (Graul 1854: 192)
- Ayûn Musa (Bartlett 1854: 27)
- ʽAyûn Mûsa (Bartlett 1854: 34)
- Ayûn Mûsa (Borrer 1845: 299; Bonar 1857: 107)
- Ayun Musa (Porter 1858: 11; Holland 1866: 158; Maughan 1873: 82; Sutton 1913: 36; Plowden 1940: 22)
- ʽAyoun Mousa (Stanley 1858: 68)
- Ayún Mûsa (Brocklebank 1865: 160)
- Ain Mousa (Bauerman 1869: 18)
- ʽAyún Músa (Palmer 1871-1: 38)
- Aym Musa (Cook 1880: 30)

- Ayún Músa (Bartlett 1879: 185)
- Aïoun Mouça (Raboisson 1886: 284; Mauchamp 1903: 11)
- ‘Uyûn Musa (Smith Lewis 1898: ii)
- ‘Ayun Musa (Smith Lewis 1898: 24)
- Quellen des Moses (Geramb 1899: 165)
- Ain Musa (War Office 1907)
- Mosesquelle (Schoenfeld 1907: 16)
- Ayun Muβa (Schneller 1910: 44)
- Ain Musa (Scott 1927: 9)
- Ayun Mussa (Schlink 1966: 57)

Wady Sidr

- Sedur (Clayton 1753: 13)
- El Ssador (El Abbassi 1814-2: 85)
- Wady Sûdr (Borrer 1845: 303)
- Wadee Sudr (Wilkinson 1847: 214)
- Sziddir, Sedur, Schedur (Seetzen 1855:119)
- Wady Sûdhr (Bonar 1857: 121)
- Wady/Wadi Sudr (Brocklebank 1865: 169; 95; Wallace 1868: Maughan 1873: 84; Bartlett 1879: 193; Plowden 1940: 26)
- Wady Sudder (Bauerman 1869: 21)
- Ouady Sadour (Raboisson 1886: 292)
- Wady Sidreh (Bishop 1886-1: 173)
- Wady Sadur (Smith Lewis 1898: 12)
- Wady/wadi Sudur (Hull 1885: 33; Sutton 1913: 41; Brockbank 1914: 8)

Wady Wardan

- Vardan (Clayton 1753: 13)
- Warsan (Niebuhr 1792-1: 186)
- Ouadi Ouarsân (Renouard de Bussiere 1829: 236)
- Wady Warden (Borrer 1845: 301)
- Wady Wardân (Bonar 1857: 114)

- Wady Wardau (Cook 1880: 30)
- Uadi Uërdân (Schneller 1910: 58)
- Wady Werdan (Fisk, 142/2; Brockbank 1914: 9)
- Wady Wardan (De Laborde 1838: 80; Anon. 1867: 408; Bartlett 1879: 197; Hull 1885: 37; Scott 1927: 9; Plowden 1940: 43)

Wady ʽAmara

- Wady el Amarah (Borrer 1845: 301)
- Wadi/Wady Amarah (Graul 1854: 197; Bartlett 1879: 198; Plowden 1940: 44)
- Wady Amara (Madden 1829-2: 213; Bauerman 1869: 20)
- Wady ʽAmárah (Palmer 1871-2: 305)
- Wady-El-Amârah (Bonar 1857: 117)
- Wady Amârah (Hull 1885: 37)
- Wady-el-Amara (Brockbank 1914: 10)

ʽAyn howara

- Well of Howara (Burckhardt 1816: 472)
- Howara (Renouard de Bussiere 1829: 232; Arundale 1837: 16)
- Bir Howara (Kinnear 1841: 63)
- fountain Howara (Borrer 1845: 302; Bartlett 1849: 69)
- Hawarah (Borrer 1845: 302)
- Quelle Hawarah (Günnel 1847: 22)
- Howarah (Bartlett 1849: 70)
- Ain Hawarah (Wilkinson 1847: 214; Graul 1854: 197; Porter 1858: 13; Maughan 1873: 85/86; Glennie 1880: 94)
- Ain Howara (Anderson 1853: 73; Holland 1868-2: 255)
- fountain Howârah (Bartlett 1854: 31)
- Ain el Hauára (Seetzen 1855: 117)
- Howârah (Bonar 1857: 118)
- spring of Howarah (Tyrwhitt 1864: 334)

- Howara (Stanley 1857: 37)
- ‘Ain Hawwárah (Palmer 1871-1: 40)
- Ain/Ayn Hawwarah (Bartlett 1879: 198, 202; Plowden 1940: 44)
- Haouarah (Raboisson 1886: 293)
- ‘Ain Howarah (Smith Lewis 1898: 13)
- Hauara (Schneller 1910: 64)
- Ain/Ayn Hawara (Sutton 1913: 46; Schlink 1966: 65)

Abu Suweira

- Abou Szoueyra (Burckhardt 1816: 471; Holland 1868-2: 238)
- Apousfera (Turner 1820: 420)
- abu Suaera (Ehrenberg 1830: 2/3)
- Abousuera (De Laborde 1838: 80)
- Abu Suweirah (Bartlett 1854: 35; Holland 1867: 14; Palmer 1871-1: 217)
- Valley of Swehr (Anon. 1859: 29)
- Bir Aboo Suweirah (Bartlett 1879: 179)

Wady Gharandel

- Gundele (Baumgarten 1732: 401)
- Garondu (Clayton 1753: 14)
- Sarondou (Montagu 1766: 53)
- Karondel (Montagu 1766: 42)
- Vale of Djirandel (Volney 1788: 438)
- Valley of Girondel (Niebuhr 1792-1: 184)
- Wad Corondel (El Abbassi 1814-2: 81)
- Gharendel (Burckhardt 1816: 473)
- Garandel (Turner 1820: 459; De Laborde 1838: 82)
- Wady Garendel (Madden 1829-2: 213)
- Valley of Hirondel (Carne 1826: 253)
- Ouadi-Garandelle (Renouard de Bussiere 1829: 233)
- Corondel (Condor 1831: 111)
- Wady Ghirandel (Arundale 1837: 17)

- Khorandal (Wolff 1839: 309)
- Wady Ghurundel (Borrer 1845: 305; Wilkinson 1847: 214; Anderson 1853: 73; Bartlett 1854: 35; Stanley 1857: 26; Porter 1858: 14; Brocklebank 1865: 169; Wallace 1868: 96; Holland 1869-1: 207; Maughan 1873: 87; Cook 1880: 30; Glennie 1880: 95; Field 1888: 59
- Wady Garantil (Seetzen 1855: 76)
- Wady Gorondel (Seetzen 1855: 117)
- Ghurandel (Bonar 1857: 119)
- Garendal (Anon. 1859: 29)
- Wady/Wadi Gharandel (Anon. 1848-2: 356; Hindley 1850: 12; Anon. 1867: 407; Bauerman 1869: 21; Palmer 1871-1: 19; Bartlett 1879: 208; Hull 1885: 35; War Office 1907; Smith Lewis 1898: 44; Scott 1927: 12; Plowden 1940: 43;)
- Valley of Gherondel (Stephens 1996: 166)
- Wadi-Gharandel (Schoenfeld 1907: 20)
- Oasis of Gharundel (Brockbank 1914: 11)
- Wady/Wadi Gharandal (Sutton 1913: 37; Department of Survey and Mines 1934)

Wady Useit

- Usaitu (Niebuhr 1792-1: 186)
- Wady Oszaita (Burckhardt 1816: 475)
- Usaïtu (Renouard de Bussiere 1829: 236)
- Ussaitu (De Laborde 1838: 84)
- Wady Useit (Borrer 1845: 308; Bartlett 1854: 33; Stanley 1857: 37; Bonar 1857: 131; Brocklebank 1865: 171; Wallace 1868; 98; Palmer 1871-1: 43; Maughan 1873: 87; Glennie 1880: 95; Hull 1885: 37)
- Wadi Waseit (Anon. 1848-2)
- Wady Usseit (Anderson 1853: 73; Holland 1868-2: 255)

- Ouady Ouseit (Raboisson 1886: 298)
- Wadi-Uset (Schoenfeld 1907: 24)
- Uadi Usseet (Schneller 1910: 72)
- Wadi Uset (Sutton 1913: 50)
- Wady Waseiyit (Department of Survey and Mines 1934)
- Wadi Uset (Schlink 1966: 69)

Hammam/Jebel Fara'un

- Gebel Hamam el Faran (Clayton 1753: 14)
- Hamam el Pharaone (Clayton 1753: 50)
- Birque Pharaone (Montagu 1766: 54)
- Jibbel Hammem Faurum (Niebuhr 1792-1: 184)
- Hammam Faraun (Niebuhr 1792-1: 185)
- Hummaum Faroun (George 1811: 327)
- Hamam Firaoun (El Abbassi 1814-2: 81)
- Dsjèbbel Hammam Faraon (Renouard de Bussiere 1829: 234)
- Hamam Pharoon (Madden 1829-2: 215)
- Hammam Pharaoh (De Laborde 1838: 79)
- Jebel Hummam (Borrer 1845: 301)
- Hammam Pharaoon (Wilkinson 1847: 214)
- Djebel Hummam (Bartlett 1854: 35)
- Pharaoh's Baths (Bauerman 1869: 24)
- Hammam Faraoun (Bauerman 1869: 24)
- Jebel Hummam (Holland 1868-2: 256)
- Hammám Far'ún (Palmer 1871-1: 39)
- J. Hammâm Faroûn (Hull 1885: 38)
- Jebel Hammam Farûn (Carrington Bolton 1890: 591)
- Hammam Far'aôn (Smith Lewis 1898: 46)
- Dschebel Hammâm Fir'on (Schneller 1910: 72)
- Jebel Pharun (Sutton 1913: 37)
- Jebel Hammam Faraun (Plowden 1940: 46)
- Hammam-Farun (Schlink 1966: 69)

Wady Shubeiqeh

- Wady Shebeyke (Burckhardt 1816: 475)
- Wadee Shubaykeh (Wilkinson 1847: 214)
- Wadi Schabeikeh (Graul 1854: 199)
- Wady Shubeikeh (Borrer 1845: 309; Bartlett 1854: 37; Bonar 1857: 132; Scott 1927: 15)
- Wady Sebekeh (Kiepert 1859)
- Wady Shebbekeh (Tyrwhitt 1864: 335)
- (Ouady) Shebeikeh (Palmer 1871-1: 20; Bartlett 1879: 211; Raboisson 1886: 300; Smith Lewis 1898: 242)
- Wadi-Schibekeh (Schoenfeld 1907: 24)
- Uadi esch-Schebeke (Schneller 1910: 76)

Wady Humr

- El Hamer (Niebuhr 1792-1: 186)
- Wady Hommar (Burckhardt 1816: 476)
- El-Humer (Renouard de Bussiere 1829: 236)
- Wady Humr (Wilkinson 1847: 214; Bartlett 1854: 37)
- Wady Homr (Kinnear 1841: 67; Kiepert 1859)
- Valley of Hamer (Anon. 1859: 30)
- Wady Hommar (Holland 1868-2: 256)
- Wady Hamr (Palmer 1871-1: 43; Hull 1885: 39; Smith Lewis 1898: 242; War Office 1907)

Sarbut el Jemel

- Sarboot Aljamaal (Wolff 1839: 309)
- Surabut-el-Jemel (Tyrwhitt 1864: 334)
- Sarbont-el-Gemel (Holland 1868-2: 255)
- Sarbut el Gamal (Holland 1869-1: 207)
- Sarabut e Gamnal (Bauerman 1869: 25)
- Sarabit el Jemel (Bartlett 1879: 315)
- Sarbût el-Jemel (Baedeker 1885: 488)
- Sarbout-el-Jamal (Smith Lewis 1898: 241)
- Sarbut el Dschaemael (Schneller 1910: 73)

- Sarbut el Gamal (Department of Survey and Mines 1934)

Debbet el Nusb

- Debbet en-Nusb (Porter 1858)
- Debbet el Qerai (Department of Survey and Mines 1934)

Wady Nusb

- Wady Nasib (Department of Survey and Mines 1934)
- Nasbe (Niebuhr 1792-1: 186)
- Wady Naszeb (Burckhardt 1816: 477)
- Nasba (Turner 1820: 424)
- Wady Nasb (Arundale 1837: 18; De Laborde 1838: 84; Anon. 1867: 407; Bauerman 1869: 26; Palmer 1871-1: 43; Hull 1885: 41; Kergorlay 1910: 314)
- Wady Nûsb (Borrer 1845: 312)
- Wady Nusb (Holland 1868-2: 255)
- Nasib (Department of Survey and Mines 1934)

Wady Suwiq

- Wadi Suwack (Graul 1854: 202)
- Wady Suwuk (Porter 1858: 27; Bartlett 1879: 306)
- Súwig (Palmer 1871-1: 45)
- Wady Sŭwŭk (Bartlett 1879: 306)
- Wady Suwig (Bartlett 1879: 306; Hull 1885: 42)
- Wady Sawiq (Department of Survey and Mines 1934)
- Suwwuq (Barrois 1932: 106)

Serabit el Qadim

- Sarbat al Kardem (Henniker 1824: 249)
- Sarbout el Cadem (De Laborde 1838: 263)
- Sarabeit-el-khadan (Anon. 1834: 867)
- Serabat el Chadem (Kinnear 1841: 68)
- Sûrabit el Khâdim (Borrer 1845: 313)
- Serabut el Khadem (Wilkinson 1847: 214)
- Sarabut el Ghadim (Graul 1854: 202)

- Sarabut el Khadim (Bartlett 1854: 37)
- Sarbût-el-Kedem (Stanley 1857: 28)
- Surâbît el-Khâdim (Porter 1858: 3)
- Serabait-el-Kadem (Anon. 1859: 30)
- Serabit el-Xadim (Kiepert 1859)
- Surâbut-el-Khádem (Tyrwhitt 1864: 332)
- Sarbat-el-Khadem (Anon. 1867: 407)
- Sarabut el Khadem (Bauerman 1869: 26)
- Serâbit-el-Kadim (Holland 1868-2: 251)
- Sarábit el Khásim (Palmer 1871-1: 44)
- Serabild Khadem (Cook 1880: 31)
- Sarabit-el-Kadim (Smith Lewis 1898: 241)
- Serabit el-Khadim (Kergorlay 1910: 313)
- Serabit el Khadem (Plowden 1940: 48)

Wady Khamila

- Chamil (Clayton 1753: 16)
- Wady Chamela (Niebuhr 1792-1: 188)
- Wady Khamyle (Burckhardt 1816: 482)
- Khameila (Wolff 1839: 309)
- Wady Khamila (Graul 1854: 205; Department of Survey and Mines 1934)
- Wady-el-Khumileh (Bonar 1857: 253)
- Wady Khumileh (Porter 1858)
- Wady Khamyleh (Tyrwhitt 1864: 340)
- Wady Chamilé (Bauerman 1869: 31)
- Wady Khamíleh (Palmer 1871-2: 309)
- Wady Khŭmileh (Bartlett 1879: 306)
- Wady Kamileh (Hull 1885: 43)

Wady Baraq

- El Barah (Clayton 1753: 17)
- Barak (Niebuhr 1792-1: 188)
- Vallee de Barak (Renouard de Bussiere 1829: 239)
- Wadee el Berk (Wilkinson 1847: 214)

- Wady el Baraq (Kiepert 1859)
- Wady Berakh (Bonar 1857: 248)
- Wady el-Burk (Porter 1858: 28)
- Wady Bark (Palmer 1871-1: 45; Bartlett 1879: 306)
- Wadi Barak (Baedeker 1885: 521)
- Wady Berk (Hull 1885: 45)
- Wady-el-Bark (Smith Lewis 1898: 241)
- Wady el Beiraq (Department of Survey and Mines 1934)
- Wady Beiraq (Survey of Egypt 1943)

Wady Lebwa

- Leboua (Burckhardt 1816: 483)
- Wady el Loab (Kinnear 1841: 72)
- Wady Lebweh (Graul 1854: 205; Porter 1858: 28; Palmer 1871-1: 45; Bartlett 1879: 305; Hull 1885: 46)
- Wady Lébueh (Kiepert 1859)
- Wady Labwa (Department of Survey and Mines 1934)

Wady BerraH

- Barak (Clayton 1753: 17)
- Wady Berah (Burckhardt 1816: 487; Bonar 1857: 250; Kiepert 1859; Holland 1868-2: 256)
- Wady Berráh (Palmer 1871-1: 47; Hull 1885: 48)
- Wady Berrah (Bartlett 1879: 305)
- Wady Berra (Department of Survey and Mines 1934)

Wady Soleif

- Wady Solèf (Baedeker 1885: 477)
- Wady Slaf (Cook 1880: 31)
- Wady Soleif (Department of Survey and Mines 1934-, RGS546910)

Wady el Sheikh

- Wady Cheick (De Laborde 1838: 258)
- Wady Esh-Sheikh (Borrer 1845: 329)
- Wadee e’ Shekh (Wilkinson 1847: 214)

- Wady el Schech (Seetzen 1855: 76)
- Wady Es-Sheykh (Stanley 1857: 73)
- Wady-esh-Sheikh (Bonar 1857: 195; Maughan 1873: 119)
- Wady Schekh (Cook 1880: 30)
- l'ouady Cheikh (Raboisson 1886: 306)
- Wady esh Sheykh (Bishop 1886-1: 176)
- Wady/Wadi Sheikh (Anon. 1848-2: 415; Hindley 1850: 19; Bartlett 1854: 95; Anon. 1867: 432; Wallace 1868: 113; Clifton 1900: 25)
- Wady-es-Sheikh, Wadi-es-Shech (Schoenfeld 1907: 45/46)
- Wadi Es Sheikh (Holland 1868-2: 253; Palmer 1871-1: 48; Bartlett 1879: 285; Hull 1885: 49; Hume 1901: 15; Sutton 1913: 83)
- Wady Esh-Sheykh (Tywhitt 1864: 340; Scott 1927: 47)
- Wadi Esch-Sheich (Schlink 1966: 95)

Western south-central route

Wady Tayiba

- Wady Taybe (Burckhardt 1816: 475)
- Wady Tebai (Arundale 1837: 17)
- Wady Taibé (De Laborde 1838: 263)
- Taibethal (Günnel 1847: 23)
- Wadi Taibah (Anon. 1848-2: 358)
- Wady Taiyibeh (Bartlett 1849:73; Bartlett 1854: 37; Bonar 1857: 134; Porter 1858: 14; Brocklebank 1865: 171; Maughan 1873: 87; Bartlett 1879: 211; Glennie 1880: 95; Raboisson 1886: 300; War Office 1907)
- Tayibeh (Stanley 1857: 37)
- Wady Taibeh (Kiepert 1859)
- Wady Taibe (Bauerman 1869: 24; Plowden 1940: 58)
- Wady Taiyebeh (Holland 1868-2: 255; Palmer 1871-1: 237)

- Wady Taizibah (Cook 1880: 30)
- Wadi/Wady Tayyibeh (Baedeker 1885: 489; Carrington Bolton 1890: 589; Brockbank 1914: 15; Sutton 1913: 52)
- Wadi-Taiyebeh (Schoenfeld 1907: 24)
- Uadi Tojibe (Schneller 1910: 125)
- Wadi Taijibe (Schlink 1966: 69)
- Wady Tayibeh (Scott 1927: 15)

Abu Zenima

- Ras Zelime (Bartlett 1849: 74)
- Ras Abu Zelima (Bartlett 1854: 38)
- Zelima (Porter 1858: 15)
- Abou Zalima (Wallace 1868: 100/101)
- Abu Zenneh (Holland 1869-1: 207)
- Ras Abu Zenímeh (Palmer 1871-1: 237; Baedeker 1885: 489)
- Ras Selima (Bartlett 1879: 183)
- Ras Abu Zanimeh (Carrington Bolton 1890: 589)
- Abu-Zenimeh (Schoenfeld 1907: 25)
- Ras abu Zenîme (Schneller 1910: 78)
- Ras-Abu-Zenimeh (Brockbank 1914: 13)
- Abu Zenima (Plowden 1940: 59)

Plain of Murkha

- Morkha (Burckhardt 1816: 622/623)
- Wadi El Markhah (Anon. 1848-2: 358)
- Wady-El-Markhâh (Bonar 1857: 136)
- Plain of Murkhâ (Stanley 1857: 37)
- Plain of Murkhah (Bartlett 1849: 74; Bartlett 1854: 40; Porter 1858: 15; Brocklebank 1865: 172; Maughan 1873: 88)
- Marxa (Kiepert 1859)
- Wady Murkha (Wallace 1868: 102)
- Plain of the Marcha (Bauerman 1869: 25)

- Plains of Merkha (Holland 1868-2: 256)
- Plain of El Markha (Palmer 1871-1: 237; Carrington Bolton 1890: 581; Sutton 1913: 52)
- El Murkha (Bartlett 1879: 214)
- El-Marcha (Schoenfeld 1907: 33)
- Ebene el Marha (Schneller 1910: 83)
- Hanak-el-Lakam Plain (Brockbank 1914: 17)
- El Markeyeh (Plowden 1940: 59)

Wady Ba’ba’

- Wady Baba (Bauerman 1869: 25; Holland 1868-2: 251; Brockbank 1914: 17; Plowden 1940: 61)
- Wady Bab’a (Palmer 1871-1: 236)
- Wadi-Baba (Schoenfeld 1907: 33)
- Uadi Ba’ba’a (Schneller 1910: 86)
- Wadi Ba’ba (Sutton 1913: 61)

Wady Shellal

- Wady Shalal (Hindley 1850: 14)
- Wadi Schelal (Graul 1854: 226)
- Wady Shellâl (Bonar 1857: 142; Stanley 1857: 38)
- Wadi-Shelal (Schoenfeld 1907: 33)
- Uadi Schellal (Schneller 1910: 86)
- Wady/Wadi Shellal (Bartlett 1854: 39; Brocklebank 1865: 172; Bartlett 1879: 215; Sutton 1913: 61; Scott 1927: 16)

Naqb Baderah

- Pass of Budrah (Anderson 1853: 74)
- Nukb Buderah (Bartlett 1854: 41)
- Nakb-el-Bûdrah (Bonar 1857: 145)
- Nakb Badera (Stanley 1857: 38)
- Nukb Badereh (Porter 1858: 15; Brocklebank 1865: 173; Maughan 1873: 91)
- Nukb Badera (Tyrwhitt 1864: 356)
- Nûkb-el-Bûdrah (Wallace 1868: 102)

- Nagb el Bédra (Bauerman 1869: 36)
- Nugb Buderah (Bartlett 1879: 216)
- Nakb el-Budra (Baedeker 1885: 490; Field 1888: 87; Carrington Bolton 1890: 582)
- Nagb Bouderah (Raboisson 1886: 303)
- Nugb el Budra (Schneller 1910: 88)
- Nakb el Budera (Sutton 1913: 61)
- Nakb-el-Budrah (Brockbank 1914: 18)

Wady Baderah

- Wady Budrah (Anderson 1853: 75)
- Wady-Bûdrah (Bonar 1857: 145)
- Wady Baderah (Maughan 1873: 89)
- Wadi Budra (Baedeker 1885: 490)
- Wadi-Budra (Schoenfeld 1907: 33)
- Uadi Budra (Schneller 1910: 88)
- Wadi Budera (Sutton 1913: 61)

Wady Maghara

- Megena (Clayton 1753: 46)
- Wady Magara (De Laborde 1838: 88)
- Wadee Maghára (Wilkinson 1847: 217)
- Wady Megâra (Stanley 1857: 28)
- Wady Mughara (Tyrwhitt 1864: 352)
- Wady Megarah (Wallace 1868: 104)
- Wady Mughâra (Holland 1868-2: 251)
- Wady Mughârah (Holland 1878: 455)
- Ouady Magharah (Bonar 1857: 155; Raboisson 1886: 304)
- (Wady) Maghâra (Bartlett 1879: 217; Carrington Bolton 1890: 596)
- Wadi-Maghara (Schoenfeld 1907: 33)
- Magharah (Kergorlay 1910: 313)
- Uadi Marara (Schneller 1910: 90)

- Wady/Wadi Maghara (Anderson 1853: 75; Bartlett 1854: 42; Anon. 1867: 409; Bauerman 1869: 32; Sutton 1913: 65; Brockbank 1914: 18)

Wady Mukatteb

- Gebel el Mokatab (Clayton 1753: 45)
- Gebel El Macaatab (Montagu 1766: 50)
- Jibbel-el-Mokatteb (Niebuhr 1792-1: 197)
- Ouadi Mokkatteb (Renouard de Bussiere 1829: 241)
- Wadi Makatteb (Anon. 1848-2: 363)
- Wady Mokatteb (Arundale 1837: 19; Borrer 1845: 318; Anon. 1848-2: 361; Hindley 1850: 15; Anderson 1853: 75; Bartlett 1854: 47; Stanley 1857: 38; Tyrwhitt 1864: 327; Wallace 1868: 105; Maughan 1873: 91; Bishop Bird 1886-1: 173; Brockbank 1914: 19)
- Wady/Wadi Mukatteb (Bonar 1857: 157; Porter 1858: 14; Brocklebank 1865: 173; Anon. 1867: 409; Palmer 1871-1: 189; Bartlett 1879: 226; Smith Lewis 1898: 49; Sutton 1913: 66; Scott 1927: 19)
- Wady el-Mukatteb (Anon. 1863: 176)
- Wady Mukúttub (Bauerman 1869: 32)
- Wadi-Mokatteb (Schoenfeld 1907: 35)
- Uadi Mukaettaeb (Schneller 1910: 103)

El Hessuyeh

- Hosseye (Burckhardt 1816: 618)
- El Hesue (Bartlett 1854: 51)
- El Hessue (Stanley 1857: 71)
- Hessuye (Anon. 1859: 34)
- Husseyah (Brocklebank 1865: 174)
- El Hessne (Holland 1868-2: 239)
- El Hesweh (Palmer 1871-1: 189; Bartlett 1879: 245)
- El Hiswa (Department of Survey and Mines 1934)

Wady Feiran

- Gebel Faran (Clayton 1753: 43)

- Pharan (Montagu 1766: 48)
- Valley of Faran (Niebuhr 1792-1: 189)
- Vale of Faran (Volney 1788: 348)
- Valley of Farraan (Turner 1820: 450)
- Faran, Feyran (Renouard de Bussiere 1829: 245)
- Waddy Pharan (Dumas 1839: 239)
- Wadee Faran (Wilkinson 1847: 217)
- Wadi Firan (Graul 1854: 223)
- Phirân, Faran (Seetzen 1855: 107)
- Wady Ferran (Bauerman 1869:24)
- Wady Feirán (Palmer 1871-1: 129)
- Ouady Feyran (Raboisson 1886: 304)
- Wady Feirau (Cook 1880: 30)
- Wady/Wadi Feiran (Arundale 1837: 20; Anon. 1848-2: 362; Hindley 1850: 15; Anderson 1853: 78; Bartlett 1854: 34; Holland 1868-2: 248; Wallace 1868: 107; Maughan 1873: 92; Bishop 1886-1: 173; Field 1888: 77; Clifton 1900: 5; Brockbank 1914: 19; Scott 1927: 20)
- Wady/Wadi Feirân (Bonar 1857: 179; Stanley 1857: 30; Tyrwhitt 1864: 327; Hull 1885: 38; Carrington Bolton 1890: 590)
- Oase Firan (Schoenfeld 1907: 32)
- Uadi Firan (Schneller 1910: 105)
- Oasis of Feiran (Sutton 1913: 67)

Mount Serbal

- Le Cerbal (Renouard de Bussiere 1829: 237)
- Serbahl (Henniker 1824: 250)
- Berg Serbähl (Seetzen 1855: 92)
- Serbal (Bartlett 1879: 226)

Wady Solaf

- Wady Soláf (Wilkinson 1847: 214; Palmer 1871-1: 151)

- Wady Solab (Stanley 1857: 73)
- Wady Solâf (Hull 1885: 38)
- Wady Solap (Bishop 1886-1: 176)
- Wadi Selaf (Liebenau 1896: 27)
- Wady Solaf (Smith Lewis 1898: 58)
- Uadi Selaf (Schneller 1910: 162)
- Wady Selaf (Brockbank 1914: 23)
- Wady Solaf (Bartlett 1879: 226; Buxton *et al.* 1895: 146; Scott 1927: 28)
- Wadi Salaf (Sutton 1913: 83)

Naqb Hawy

- Nukb er Rahah = Nukb Hawy = Windy Pass (Borrer 1845: 320)
- Nûkb Hâwy (Borrer 1845: 323)
- Nabk el Haua (Graul 1854: 205)
- Nukb Hawy (Bartlett 1854: 72; Holland 1868-2: 253; Wallace 1868: 113; Brocklebank 1865: 176)
- Nukb Hawi (Bartlett 1854: 93)
- Pass of the wind (Bonar 1857: 206)
- Nukb-el-Howai (Bonar 1857: 203)
- Nagb Hawi (Palmer 1868: 48)
- Nagb Hawa (Palmer 1871: 48; Hume 1901: 14)
- Nugb el Hawa (Bartlett 1879: 226; Bishop 1886-1: 177)
- Nagb-el-Haoua (Raboisson 1886: 306)
- Nugh Hawa (Cook 1880: 30)
- Nakb-el-Hawi (Anon 1867: 427; Carrington Bolton 1890: 579)
- Nabk el Haui (Liebenau 1896: 28)
- Nugb Hawa (Smith Lewis 1898: 63)
- Nakb Hâoua (Mauchamp 1903: 12)
- Nugb el haui (Schneller 1910: 162)
- Nakb el Howa (Sutton 1913: 83)

- Nakb-el-Hawa (Brockbank 1914: 23)
- Nugb Hawy (Scott 1927: 27)

Plain of El RaHah

- Er Rahah (Borrer 1845: 320; Bartlett 1854: 57; Buxton 1895: 154)
- Wady-Er-Rahah (Bonar 1857: 210)
- Er Ráhah (Palmer 1871-1: 126)
- Plain of El Raha (Cook 1880: 30; Brockbank 1914; Department of Survey and Mines 1934)
- Er-Rahah (Smith Lewis 1898: 63; Glennie 1880: 89)
- Raha-Ebene (Schlink 1966: 97)
- Wady Er Raha (Scott 1927: 30)

Western southern route

El Qa'a

- Plain of Kaa (Burckhardt 1816: 610)
- plain of Gaa (De Laborde 1838: 232)
- El-Kâa (Porter 1858: 3)
- plain of el-Kaa (Holland 1867: 14)
- El Ga'ah (Palmer 1871-1: 216)
- El Gaah (Bartlett 1879: 250; Buxton 1895: 141)
- El Gâa (Carrington Bolton 1890: 587)
- El Kaa (Liebenau 1896: 15)
- Gaa (Clifton 1900: 2)
- Plain of El Qa' (Department of Survey and Mines 1934; Survey of Egypt 1943)

Hammam Musa

- Hammam Syedna Musa (Palmer 1871-1: 221/222)
- Jebel Hammam Mousa (Carrington Bolton 1890: 591)

El Wady

- El Waadi (Fazakerley 1820: 379)
- El Wadi (Liebenau 1896: 21)

Tor

- Tor (Niebuhr 1792-1: 216; El Abbassi 1814-2: 74; Turner 1820: 423; Dumas 1839: 173; Bonar 1857: 240; Carrington Bolton 1890: 588; Buxton 1895: 139; Hume 1901: 4)
- Tur (Browne 1799: 178; Anon. 1867: 406; Carrington Bolton 1890: 588)
- Thur or Thor (Milne 1805)
- Toor (Salame 1819: xxxiv)
- Thor (Chambers, Me J 8/1)
- Tûr (Seetzen 1855: 93; Porter 1858: 3; Brocklebank 1865: 162; Holland 1867: 13)
- Tour (Morin 1862: 8)
- Tôr (Tyrwhitt 1864: 327; Stanley 1857)
- Túr (Bauerman 1869: 18)
- Tór (Österreich 1895: 10)
- El Thor (Nomachi 1979: 24)

Wady Hebran

- Wady Hebrân (Stanley 1857: 38)
- Wady Hebram (Anon. 1859: 37)
- Wady Hibran (Holland 1869-1: 211)
- Wady/Wadi Hebran (Bartlett 1879: 226; Buxton 1895: 139; Buxton *et al.* 1895: 152; Liebenau 1896: 20)
- Gebirgsthal Hebran (Böttcher 1898: 194)
- Ouadee ʽAbran (Linant in Lewis & MacDonald 2003: 61)

Wady ʽIsleh

- Wadi es-Sleh (Baedeker 1885: 517; Carrington Bolton 1890: 586)
- Wady Isleh (Buxton 1895: 101)
- Wadi Isleh (Liebenau 1896: 20)
- Wady Isleh (Buxton 1895: 139; Clifton 1900: 2)
- Wadi Es Slei (Sutton 1913: 118)

Umm Shomer

- Om Shomar (Burckhardt 1816: 587)
- Om Shommar (see Burckhardt 1819: lxviii)
- Um-Shomer (Stanley 1857: 23)
- Um Shomer (Buxton 1895: 144)

Around the Monastery of St Katherine

Mount Sinai

- Jibbel Musa (Niebuhr 1792-1: 191)
- Gebel Musa (Turner 1820: 448; Bishop 1886-1: 177)
- Gebel Mousa (Arundale 1837: 23; Hindley 1850: 24; Stanley 1857: 29)
- Jebel Mûsa (Borrer 1845: 332)
- Gibel Musa (Geramb 1899: 175)
- Djebel-Musa (Schoenfeld 1907: 56)
- Dschebel Mussa (Schlink 1966: 94)

The Plain of Elias

- Farsh Eliahu (Hazleton 1980: 32)

Mount Safsafa

- Es Susafeh (Borrer 1845: 330)
- Gebel Susafah/Susafa (Hindley 1850)
- Sasâfeh (Stanley 1857: 35)
- Râs Sassâfeh (Tyrwhitt 1864: 340)
- Rás Sufsáfeh (Palmer 1871-1: 53; Bishop 1886/3: 314)
- Sufsafeh (Maughan 1873: 114)
- Ras Sufsafeh (Bartlett 1879: 268; Scott 1927: 42)
- Rás Sufsàfeh (Hull 1885: 51)
- Ras Suf Safeh (Buxton 1895: 154)
- Ras Sufsafah (Buxton *et al.* 1895: 137; Smith Lewis 1898: 222)
- Gebel Sufsafah (Clifton 1900: 7)
- Djebel-es-Safsafeh (Schoenfeld 1907: 53)
- Jebel Sufsafa (Sutton 1913: 87)
- Safsaf (Brockbank 1914)

- Safsafa (Hazleton 1980: 33)

El Arba'in

- El Erbayn (Renouard de Bussiere 1829: 257)
- Eibereen (Arundale 1837: 33)
- Dem Kloster el Arbain (Seetzen 1855: 87)
- El Arba'im (Brocklebank 1865: 177)
- Arba'in (Palmer 1871-1: 119)
- Arbain (Bartlett 1879: 276)
- Deir el Arbain (Anon. 1885: 659)
- Der el-Arba'in (Baedeker 1885: 514)
- Convent of El Arbain (Buxton *et al.* 1895: 134)
- Deir-El-Arb-Ain (Scott 1927: 42)

Wady Leja

- Wadi Ledja (Burckhardt 1816: 583; Schlink 1966: 81)
- El Ledscha (Seetzen 1855: 85)
- Wady Lejâ (Stanley 1857: 35)
- Wady Lejá (Palmer 1871-1: 119)
- Wady Leja (Holland 1868-2: 242; Bartlett 1879: 226)
- Leja valley (Carrington Bolton 1890: 591)
- Wadi-el-Ledja (Schoenfeld 1907: 53)
- Wady el Leja (Scott 1927: 42)

The well of the Partridges on Mount St Catherine

- The water of the partridges (Clayton 1753: 32)
- Ain el Schennar, Rebhuehner-Quelle (Seetzen 1855: 90)
- Bir Shonnar (Burckhardt 1816: 569)
- Fountain of the Partridge (Fazakerley 1820: 374)

Between the Monastery of St Katherine and Nakhl

Western central route

Wady SeiH

- Wady Sik (Bartlett 1879: 306)

- Wady Seih (Department of Survey and Mines 1934; Survey of Egypt 1943)

Naqb Rweiknah

- Naqb Rakna (Department of Survey and Mines 1934)
- Nakhb-er-Rakineh (Bonar 1857: 255)
- Pass Er Rakineh (Bartlett 1879: 317)
- Pass of Er Rakineh (Field 1888: 204)

Tih

- El-Ti (Niebuhr 1792-1: 183)
- Tyh (Burckhardt 1816: 461; Renouard de Bussiere 1829: 231)
- El Tih (Bartlett 1854: 97)
- Tig-Gebuerges (Seetzen 1855: 54)
- Et-Tih (Bonar 1857: 255)
- Et Tin, et Tih (Anon. 1867)
- Desert of Wanderings (Plowden 1940: 7)

Wady Abu Nuteiganeh

- Wady Abu el Nateigann (Department of Survey and Mines 1934)
- Untaghah (Bonar 1857: 261)
- Abu Nutheigineh (Bartlett 1879: 319)
- Wady Boutchgenah (Cook 1880: 31)

Wady el ʻArish

- Wady El Arish (Bonar 1857: 263; Bartlett 1879: 322)
- Nakhl Mizraim (Palmer 1871-2: 287)

Nakhl

- Nakhel (Burckhardt 1816: 450)
- Nackel (De Laborde 1838: 219)
- Nachel (Seetzen 1855: 57; Kergorlay 1910: 313)
- Nakhl (Anon. 1848-3: 419; Bonar 1857: 269; Palmer 1871-2: 287; Cook 1880: 31)
- Nakhul (Wallace 1868: 150)

- Nukhl (Maughan 1873: 127; Bartlett 1879: 325; Field 1888: 218; Scott 1927: 60)
- Nekhl (War Office 1907)
- Nekle (Schoenfeld 1907: 11)
- Nakel (Kergorlay 1910: 339)
- El Nachel (Gäbelman 1928: 114)

Eastern central route

Wady Biyar

- Wady el Biara (Seetzen 1855: 62)
- El Biyár (Palmer 1871-2: 319)
- Wady Biyar (Hull 1885: 40)

Naqb Biyar

- Nagb el Mirad (Palmer 1871-2: 322)
- Nagb Biyar (Department of Survey and Mines map 1934)

Jebel Ejme

- Gebel el Igma (Survey of Egypt 1943)
- El Ijmeh or Ajmah (Bonar 1857: 262)
- J. Odjmeh (Holland 1868-1: 252)
- Jebel el 'Ejmeh (Palmer 1871-2: 322)
- Jebel el Ojmeh (Baedeker 1885)
- Gebel Egma (Department of Survey and Mines 1934)

Between the Monastery of St Katherine and 'Aqaba

Eastern north-central route

Wady Wutia

- El Wuttaiyah (Koller 1842: 76)
- Pass at Watiyeh (Bartlett 1879: 303)
- El Watiyeh (Hull 1885: 49)
- Pass of El-Wateeyeh (Bishop 1886-1: 176)

Elwa el Ajramiya

- Plain of el Jermiyeh (Koller 1842: 76)
- Elwi 'l'Ajramiyeh (Hull 1885: 55)

- Elwa el Agramiya (Department of Survey and Mines 1934)

Wady Zeleqah

- Wady Selega (Koller 1842: 76)
- Wady Zelegah (Hull 1885: 55)

Wady Zarania

- Wady Saranig (Koller 1842: 76)

Wady el ‘Ayn

Wady el Sauwana

- Wady E'ssauane (Koller 1842: 77)
- Wady Sauwana (Department of Survey and Mines 1934)

Wady Watir

- Wady Outir (De Laborde 1838: 227)
- Wady Weteir (Bartlett 1854: 98)
- Wady Wettir (Stanley 1857: 81)
- El Wetir (Anon. 1867: 435)
- Wady En Wetir (Scott 1927: 52)
- Wadi Watir (Plowden 1940: 217)

Wady Heissi

- Wady el Hessi (Koller 1842: 77/78; Hull 1885: 65)
- Wady el Heisi (Department of Survey and Mines 1934)

Eastern South-central route

Wady/Abu Suweirah

- Abou Szoueyr (Burckhardt 1816: 489)
- Abou/Wady Souwyrah (Stanley 1857: 79)
- Wady Suweireh (Maughan 1873: 130; Brockbank 1914: 35)

Wady Sa’al

- Wady Sal (Burckhardt 1816: 493; Koller 1842: 76; Hindley 1850: 26)
- Szaal (Seetzen 1855: 63)

- Wady Sayal (Stanley 1857: 79)
- Sahal (Anon. 1867: 432)
- Wady Saá'l (Palmer 1871-1: 257)
- Wady Sa'l (Maughan 1873: 132)
- Wady-es-Sal (Brockbank 1914: 35)
- Wady Saal (Scott 1927: 49; Department of Survey and Mines 1934)
- Wadi Sa'al (Bartlett 1879: 289; Plowden 1940: 194)

Wady Safra

- Wady Safran (De Laborde 1838: 227)

'Ayn Hudera

- Hadhra (Burckhardt 1816: 495)
- Ain el Hudhera (Wilkinson 1847: 220)
- Wady Hondra (Hindley 1850: 26)
- El Hŭdhera (Bartlett 1854: 96)
- Spring of Huderah (Stanley 1857: 81)
- Hadhera (Anon. 1867: 432)
- Ain Huthera (Holland 1868-2: 251)
- 'Ain Hudherah (Palmer 1871-1: 260)
- Hudhireh valley (Brockbank 1914: 38)
- Ain el Huderah (Plowden 1940: 197)

Wady Ghazala

- Wady Ghazaleh (Stanley 1857: 81)
- Wady el Ghazaleh (Palmer 1871-1: 260)
- Wady Ghuzaleh/Ghuzelah (Maughan 1873)
- Wady Ghazel (Baedecker 1885: 519)
- Wadi Ghasaleh (Hume 1901: 29)
- Wady Gazileh (Brockbank 1914: 38)

Wady el 'Ayn

- Wady el Ayn (Hindley 1850: 27)
- Wady el Ain (Bartlett 1854: 95; Holland 1868-2: 251; Palmer 1871-2: 316; Hull 1885: 40)
- Wady El-'Ain (Stanley 1857: 81)

- Wady-el-Ain (Maughan 1873; Brockbank 1914: 37)

Nuweiba

- Noweyba (Burckhardt 1816: 517)
- Nouebe (De Laborde 1838: 99)
- Nuebbe (Koller 1842: 77)
- Nuweibia (Wilkinson 1847: 220)
- Nuweybi'a (Stanley 1857: 30)
- Nuweibeh (Brockbank 1914)
- Nuweibe (Plowden 1940: 197)

Detour via Wady Samghi

Wady Samghi

- Wadee e' Sumghee (Wilkinson 1847: 220)
- Wady Sumghy (Stanley 1857: 81)
- Wady Samghi (Baedeker 1885: 518/519)

Eastern southern route

Wady Saba'iya

- Wady Sebaizeh (Holland 1868-2: 245)
- Wady Seba'iyeh (Palmer 1871-1: 137)
- Wady Sebaiyeh (Bartlett 1879: 268)
- Abuh-Zbahije (Österreich 1895: 49)
- Wadi Sebajah (Liebenau 1896: 35)
- Wady Zabaiyeh (Clifton 1900: 6)

Wady Zaghra

- Valley of Zackal (De Laborde 1838: 97)

Wady Nasb

- Wady Nasb (Palmer 1871-1: 143; Buxton 1895: 147; Buxton *et al.* 1895: 108; Hume 1901: 7)
- Wady Nasp (Liebenau 1896: 35)

Dahab

- Dzahab (Montagu 1766: 44)
- Dahab (Seetzen 1855: 89)

'Aqaba

- Achabah (Money-Kyrle 1843-1846)
- Akabah (Ballantine 1866: 119; Borrer 1845: 330)
- El Akaba (Wilkinson 1847: 220)
- Akabar (Tilt 1849: 217)
- Acabah (Hindley 1850: 24)
- 'Akabah (Palmer 1871-1: 287; Hull 1885: 60)
- Aqabah (Mauchamp 1903: 22)
- Akaba (Brockbank 1914: 6)

Appendix 3 Synonyms for the flora of South Sinai

Acacia sp.

- Mimosa (George 1811: 354; Burckhardt 1816: 496; Koller 1842)
- Syale (Burckhardt 1816: 496, 479)
- Sant (Turner 1820)
- Thorny Acacia (Turner 1820: 604; Hull 1885: 47)
- Sial and Seyal (Cailliaud 1821: 31)
- Sunt (Renouard de Bussiere 1829; Bartlett 1879: 249)
- Seneh/lens (Anon. 1834: 867)
- arabischen Akazie (Graul 1854: 189)
- Szeial and el Szanth (Seetzen 1855: 78)
- Seneh (Stanley 1857: 21; Bartlett 1879: 249)
- Mimosa nilotica (e.g. Stanley 1857: 21)
- Sayaleh (Bonar 1857)
- Sayal (Tyrwhitt 1864: 351)
- Sont (Hindley 1850: 17; Stanley 1857: 21; Bartlett 1879: 249)
- Seyal (Kergorlay 1910: 351)

Tamarix sp.

- Athl (Koller 1842: 76)
- Turfeh (Bartlett 1854: 52)
- El tharpha (Seetzen 1855: 76)
- Tarfa" (Stanley 1857: 22)
- Tarfah (Palmer 1871-1: 81)
- Torf (Smith Lewis 1898: 112/113/114)

Zizyphus sp.

- Rhamnus lotus (Burckhardt 1816: 603)
- Nebek (Burckhardt 1816: 603; Bartlett 1849: 60)
- Jujube (Turner 1820: 605)
- Siddra (Turner 1820: 605)

- Thamnus Spina Christi (Turner 1820: 605)
- Nabaks (Renouard de Bussiere 1829: 245)
- Nebbuc (Hindley 1850: 17)
- Nubk (Bonar 1857: 221; Wallace 1868: 108)
- Nub'k (Bonar 1857: 183)
- Nebbk (Tyrwhitt 1864: 346)
- Tree lotus (Tyrwhitt 1864: 346)
- Nebk (Holland 1868-2: 242)
- Nebbuk (Palmer 1871-1: 167)
- Sidr (Palmer 1871-1: 23, 167; Bartlett 1879: 245)
- Christ’s thorn-tree (Baedeker 1885: 77)

Crataegus sp.

- Zarour (Burckhardt 1816: 569)
- Azarolenstrauch or el Saarur (Seetzen 1855: 82)
- Zarat (Palmer 1871-1: 248)

Rethama raetam

- Rethem (Burckhardt 1816: 537; Borrer 1845: 300)
- “Ritt’m” (Anon. 1838: 37)
- Juniper of the Bible (Bartlett 1854: 42)
- Retem, Wild Broom (Stanley 1857: 21)
- “retem bushes” (Bartlett 1879: 186)
- “ratam-bush” (Smith Lewis 1898: 239)

Nitraria retusa

- “Peganum retusum of Forskal” (De Laborde 1838: 82)
- Gharkad (Burckhardt 1816: 474; Palmer 1871-1: 81)
- Ghurkud” (Borrer 1845: 302)
- Guurkud (Bartlett 1849: 70)
- Nitraria tridentate (Porter 1858: 13; Baedeker 1885: 486)

Capparis sp.

- Lassaf (Niebuhr 1792-1: 185)
- Lasaf, asaf, hyssop, ezob of Scripture (Stanley 1857: 23)
- Lussuff (Bonar 1857: 140)
- Lussuf (Bonar 1857: 202)

Appendix 4 Synonyms for the word khamseen

- "Sam, Smum, or Samiel" (Niebuhr 1792-2: 317)
- Kampsin (Wittman 1804: 202)
- Simoum (Burckhardt 1816: 624)
- Khamsyn (Burckhardt 1819: 352)
- Khamsein (Turner 1820: 412)
- Chamsin (Richardson 1822-2: 181)
- Kamsin (Edmonstone 1822: 53; Madden 1829-1: 218)
- Camseen, or Hamseen (Elwood 1830: 118)
- Samum (Günnel 1847: 27)
- Sirocco (Fuller 1839: 165; Wallace 1868: 149)
- Ghamsin (Graul 1854: 230)
- Khamsin (Wallace 1868: 111)