



Changing Urban Environments and the Impact on Coastal Cultural Heritage at Marsa Matruh, Egypt

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Abstract

This paper examines the impact of urban expansion on coastal heritage in and around the port-city of Marsa Matruh on the northwest coast of Egypt. The city is located along a series of lagoons that have offered safe harbor for ships since antiquity. Over the last 80 years Marsa Matruh has developed from a small settlement of a few houses into a large port city that sprawls along the lagoons and further inland. The continuous growth has damaged or destroyed many of the remains of previous human occupation, including ancient harbor facilities. Evidence suggests that people have lived around these lagoons since at least the Bronze Age and a port town developed in the classical period on this important crossroad for transport and trade. Based on previous publications, historical aerial photographs and satellite imagery, this illustrates the range of heritage that once was present, from the ancient settlement, harbor, and rock cut tombs to remains from the two World Wars. It demonstrates how urban expansion has affected those sites and discusses the threats to coastal heritage to the west of Marsa Matruh, where new construction projects have recently emerged.

Keywords Egypt · Remote sensing · Marsa Matruh · Coastal archaeology · Heritage management

Introduction

On the northwest coast of Egypt, along a series of lagoons, lay the ancient port-town of Paraetionium (Paraitonion in Ptolemaic times). The town was surrounded by a busy countryside with fertile lands and cultivated pre-desert areas that were irrigated with complex water management systems (Rieger et al. 2012; Vetter et al. 2013). Its location was

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geographically significant because the northwest coastline of Egypt affords very little opportunity for safe shelter for vessels. The lagoon's natural breakwater assured relatively low-energy conditions in which vessels could anchor (Bates 1927: 126; Hereher 2015: 347; Embabi 2018: 273–274; also reported in antiquity, e.g. Diodorus Siculus 1, 30–31). Additionally, the port town was positioned on the mainland route between Alexandria and Cyrenaica, as well as connecting to the primary route southwest to the oasis of Siwa, thereby becoming an important crossroads for transport and trade links, both inland and at sea.

Today the modern port-city of Marsa Matruh is located where Paraetionium once stood, serving as the capital of the Governorate of Matruh (Fig. 1). It is a substantial and continuously growing city, with approximately 100,000 inhabitants in 2004 according to the government census (El Raey and Mohamed 2006: 2). By 2011, the number had increased to 149,327 (World Bank Group 2018). An additional influx of people comes from tourism, especially during the summer months, when resorts cater to visitors (El Raey and Mohamed 2006: 2). As a result, the environment, landscape and coastal cultural heritage of Marsa Matruh are under severe pressure, despite it being a stable coastline with little erosion. The coastal vulnerability index, which is derived from the geologic and physical characteristics of the coast, is categorized as very low for this area (Hereher 2015; Elbeih et al. 2019; Hzami et al. 2021). Remarkably, not even a century ago Marsa Matruh was no more than a coastal village, described as comprising a cluster of local Bedouin families and a few Europeans (Bates 1915: 717, 1927: 126).

The rapid urban expansion of the modern city of Marsa Matruh led to the damage and destruction of most of the coastal cultural heritage sites that were once present in the area. Based on historical aerial photographs and satellite imagery, as well as published sources and maps, this paper aims to highlight the rich coastal cultural heritage that once existed

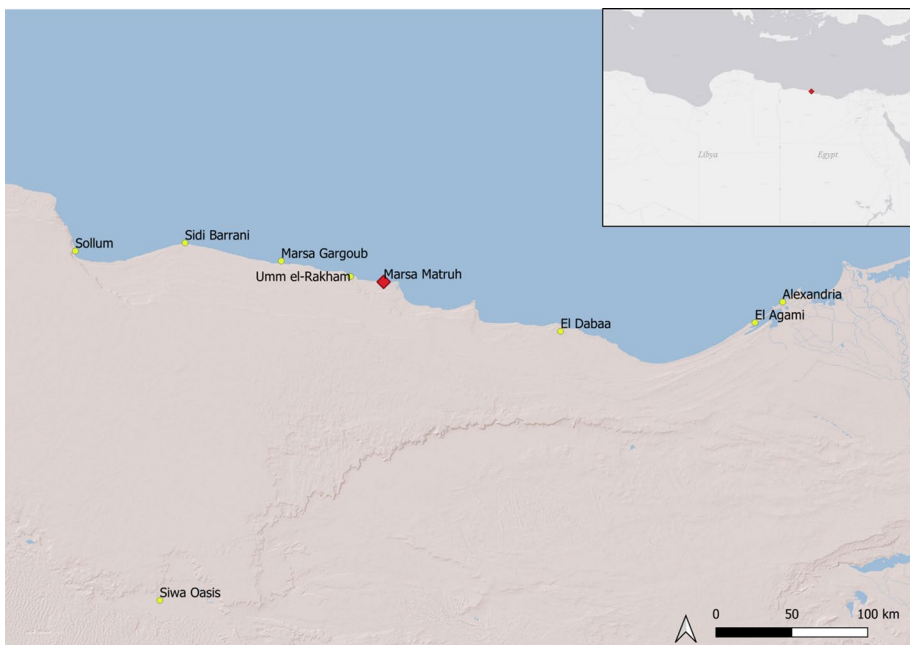


Fig. 1 Location of Marsa Matruh and other locations mentioned in the text (Basemap: © ESRI)

here. Furthermore, by examining three case studies, this contribution will assess the direct impact modern urbanization has had on those sites. Finally, it will explore the drivers and processes of urbanization in this region and the implications this may have on other maritime and coastal heritage that is located along the coast of northwest Egypt.

Historical Background

Human activity in the region can be traced back to the Bronze Age with evidence from Bates' Island (also known as Geziret el-Yehud) in the Eastern Lagoon at Marsa Matruh demonstrating Eastern Mediterranean trade connections from the fourteenth to thirteenth centuries Before Common Era (BCE) (Conwell 1987; White 2002; Hulin 2018). Evidence for water harvesting and management for agricultural production has been found dating from the second millennium BCE onwards, comprising terraces, dams, and embankments (Vetter et al. 2009; Rieger 2019: 15). During the reign of Ramesses II (1279 to 1213 BCE), the western limit of Egyptian territory was established, lying approximately 20 km (kilometers) west of Marsa Matruh at the fortress-town of Zawiyet Umm el-Rakham. This was part of a chain of fortresses established along the western delta and desert to deal with Libyan presence (Hulin and White 2002: 178; Snape and Wilson 2007; Snape 2013).

In the Ptolemaic period, Marsa Matruh (at this point called Paraitonion) was united administratively with Ptolemaic Egypt (White 2002: 2). Some rock-cut tombs appeared to originally have been of Ptolemaic date which were taken over by Roman occupants two or three centuries later (Bates 1927: 156–176; White 1996) but otherwise there is no archaeological evidence for the pre-Roman town. Classical sources, however, inform us that Alexander the Great travelled through Marsa Matruh on his way to the Ammon temple in Siwa in 332 BCE (Bates 1927: 132; Hulin and White 2002: 178).

The town became known as Paraetionium in the Roman period (Bates 1927; White 1996, 2002), which included a relatively extensive urban settlement, a harbor in the West Lagoon, and numerous cemeteries and rock-cut tombs. These features will be discussed further below in the case studies. The wider semi-arid area around Paraetionium was densely inhabited during the Roman period, presenting examples of settlement sites with complex water-harvesting systems (e.g. Wadi Umm el-Ashtan: Vetter et al. 2009). The coastal plain surrounding Paraetionium had (and still has) very fertile land which helped support a large population. Evidence suggests that the first to fourth centuries CE (Common Era) represent the peak in water harvesting and management for agricultural production, enabling surplus production (Rieger et al. 2012; Rieger 2019: 8). In the early Byzantine period Marsa Matruh rose to considerable regional importance and was made the Eparchy of Lower Libya (Bates 1927: 135; White 1996: 65, 2002: 7). It is listed as one of the cities refortified and garrisoned by Justinian (Procopius, *de Aedif.* VI, 2; Bates 1927: 135–136) and a defensive wall has been attributed to this period (530s CE; Fig. 2; Bates 1927: 184). Further archaeological evidence for the Byzantine town is limited to a sixth-century Byzantine chapel and house, both excavated by Bates prior to WWI (Bates 1927: 177–184; Goodchild 1991; Ward-Perkins and Goodchild 2003: 437–439), and a church to the north of the East Lagoon that White tentatively dated as early Coptic (White 1989: 88–93; Bailey 2002: 137–139).

Between antiquity and the onset of WWI, there is little evidence for the story of Marsa Matruh (Marsa Matruh literally meaning “remote anchorage”; Ellis 2018). A captain of the Egyptian Coast Guard Administration who surveyed Marsa Matruh on

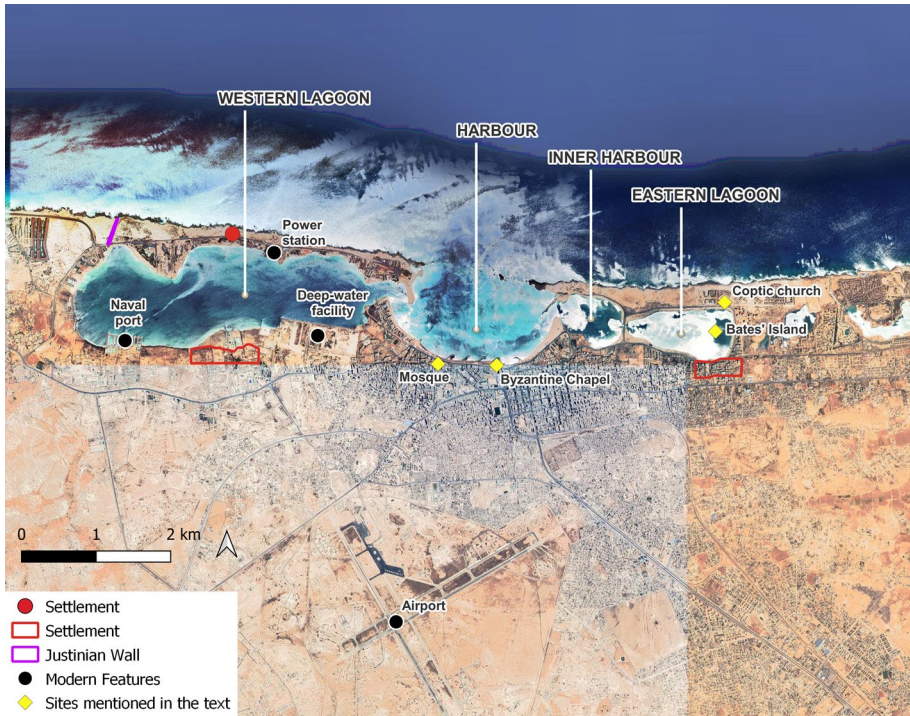


Fig. 2 Cultural heritage sites and modern structures mentioned in the text. Locations of Roman-period settlement sites (Paraetionium) are indicated. (Basemap: © Maxar via Google Earth, 2021)

behalf of the government in early 1895 said, “As there is no sea-transport to Alexandria its shores are now practically deserted, although a few Arabs are to be found encamped in the vicinity, and the harbor is resorted to during the season by the Greek sponge fishers.” (Ellis 2018: 98). A seventeenth-century house for sponge divers was located on Bates’ Island, and with some Arab glazed sgraffito ware, dated from the sixteenth to eighteenth centuries, was recovered along with a gun flint and an iron cannon ball (White 1986; Thorn 2002: 52). There are also some casual mentions from two nineteenth-century European travellers of an Arab gasr (Gasr Medsched) constructed from ancient *spolia* on the site of Marsa Matruh (White 1996: 66). Various Bedouin tribes living in tents, such as the Awlad’Ali, inhabited (and some still inhabit) the coastal region and the western desert from the outskirts of Alexandria to Sollum (Cole 2003; Altorki and Cole 2006).

Marsa Matruh’s strategic significance at sea and on land made it the ideal location as an Allied base for a short campaign in 1915–1916 against the Senussi tribesmen (Evans-Pritchard 1945; Raza 2012). During World War II it again served as an Allied military base, eventually being captured by German forces during the ‘Battle of Mersa Matruh’ in June 1942, only to be recaptured by Allied forces later that year. Heavy bombing and shelling of Marsa Matruh from land, sea, and air continued throughout this period of 1942 (Goodchild 1991: 211, n.38) resulting in extensive destruction of the area.

Urban Development

By the early twentieth century, Marsa Matruh was a small village that comprised approximately twenty white-plastered, single-story houses. It had only 398 fulltime residents as recorded during the 1907 Egyptian census, with an influx of about a thousand Greek sponge fishermen over the summer (White 1996; Ellis 2018: 87). However, the region's high agricultural and economic potential drew the government's attention at the beginning of the twentieth century, which led to several public works projects that were implemented. A 500 m channel was dug in the bay of Marsa Matruh, and the mouth of the inner harbor was dredged. The Sidi 'Awam Mosque, which was inaugurated in 1910, is one of the few buildings still surviving from this period (Ellis 2018: 87, 99).

The expansion of Marsa Matruh between the first half of the twentieth century and today is evident when comparing aerial photographs from 1938 and satellite images from 1976 and 2021 (Fig. 3). Donald White, who excavated at Marsa Matruh from 1985 to 1989, wrote: "Nearly all evidence for ancient suburban spread in the vicinity of the topographically important lagoons that run east towards Ras Alum el-Rum have either been obliterated by modern construction or set off limits by the military authorities" (White 1996: 65). Today the urban sprawl extends along the lagoons in the east and further south-east along one of the major roads leading in the direction of Alexandria (Fig. 2). In the harbor area several modern developments have been added, including a sluice gate system connecting the inner harbor with the Eastern Lagoon, which was installed in 1946, and a concrete deep-water docking facility along the southern shore of the western lagoon that was completed in 1983 (White 1986: 58; White and Gardner 2002: 23–24). The latter has completely destroyed any archaeological remains of the ancient pier and a classical urban settlement reported in the early twentieth century (Fourtau 1914; Bates 1927: 136; Harding-King 1927: 189; White and Gardner 2002). Additionally, dredging of the western lagoon by the Egyptian Navy prior to the mid-1980s would have destroyed any traces of previous maritime activity in the port (Hulin and White 2002: 185, n.133). Naval facilities have been added on the southwest side of the same lagoon and an airport has been enlarged to the south of the town (Fig. 2).

The presence of recreational beaches along the coast became a substantial factor in the rapid expansion of the town as substantial tourist resorts were constructed (Frihy 2009: 1188). According to the Governmental census, 500,000 tourists were estimated to have visited the area in 2004 (El Raey and Mohamed 2006: 2). The wider landscape around Marsa Matruh was altered substantially during the second half of the twentieth century. Agricultural expansion in the 1960s, with support from the government, brought with it the introduction of new crops such as figs, olive trees and almonds. Wells and cisterns in the fertile area around Marsa Matruh were re-dug or newly drilled and the fields were used more intensively (Cole and Altorki 1998).

Methodology

In principle, MarEA's methodology for data collection is based on the systematic investigation and interpretation of open-source satellite imagery available through platforms such as Google Earth. In the case of Marsa Matruh the earliest available imagery that covers the entire area is from 2007, when the city had already expanded extensively.

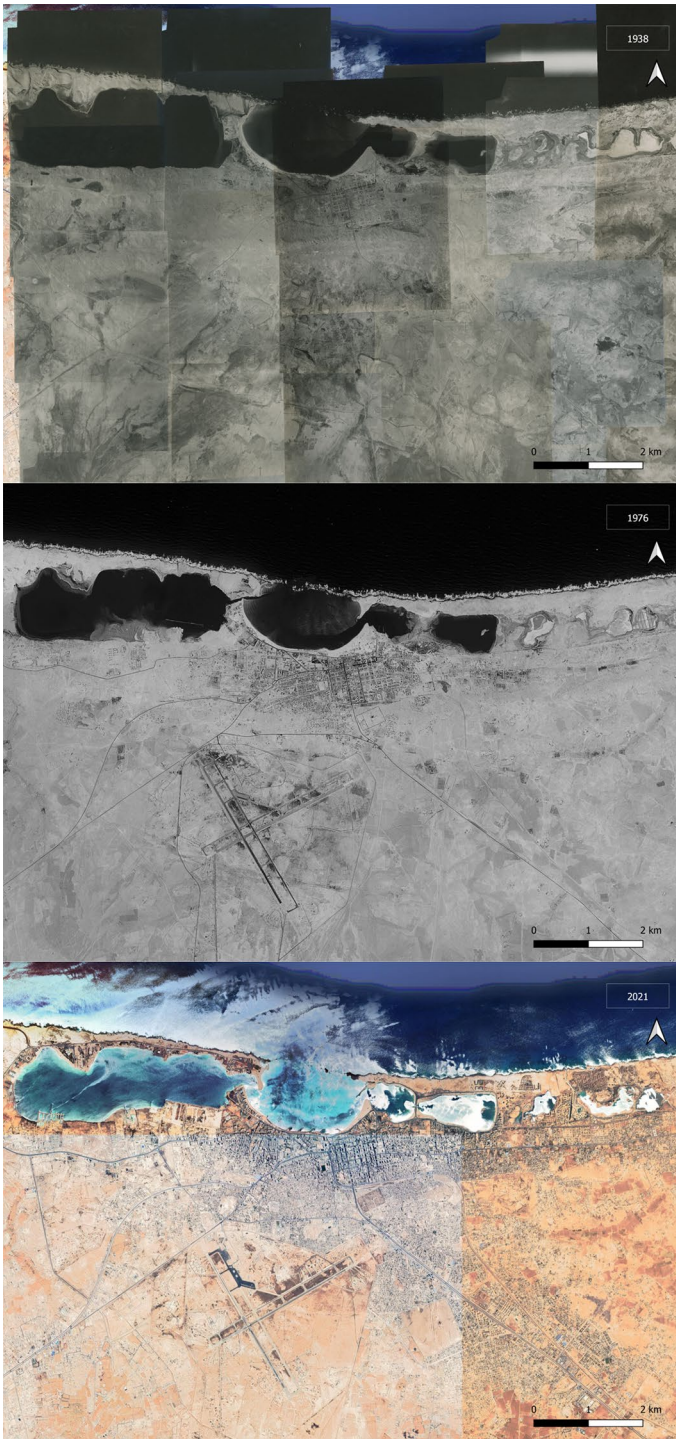
Fig. 3 As visible on the aerial photograph from 1938 (Royal Air Force, sourced and digitized by the EAMENA project) and satellite imagery from 1976 (KH-9 satellite image, data available from the U.S. Geological Survey) and 2021, Marsa Matruh developed from a small settlement into a substantial town within a short period of time, with a large airport and extensive port developments clearly visible (Basemap: © Digital Globe via Google Earth)

Therefore, our knowledge and understanding of Marsa's past had to rely heavily on information that was gathered before the end of the Second World War. This included previously published materials, maps of earlier field surveys and excavations, and 1955 US army maps that indicate the location of 'ruins', cemeteries, tombs and cisterns (P502, NH 35.1–3). These limitations mean that the locations of many of the recorded sites and features are approximate.

In addition to published articles, reports and maps, a wide variety of modern and historical imagery was employed to systematically identify, analyze and document the condition of heritage in and around Marsa Matruh. Historical vertical aerial photographs from the British military were of particular value to our investigation. The images were taken by the 113 Squadron of the Royal Air Force (RAF) using Hawker Hind lighter bomber biplanes from 23 September 1938 through to 1 November 1938 to generate a topographical map of the area (digitized by the Endangered Archaeology of the Middle East and North Africa—EAMENA—project and available through the EAMENA/MarEA database, see Fradley 2019). These images were georectified in GIS, a difficult endeavor given the dramatically changed landscapes between 1938 and today. This invaluable collection of hundreds of photographs that cover approximately 3000 km² provide a glimpse of the landscape before urban expansion took hold. Farms, field systems, cisterns, cemeteries, temporary camps, World War I installations, and buildings long swallowed up by the modern city could be identified and recorded. They also enhanced our understanding of the changes that occurred to the lagoon system caused by both natural and human factors. Declassified analogue satellite images from 1976 obtained by the American reconnaissance mission Hexagon (KH-9), available at a metre to sub-metre resolution further helped to analyze and understand the urban and landscape changes that took place over time.

Previous investigations of the region have been very limited and focused on specific areas in and around Marsa Matruh such as around the harbor lagoons and the coastal ridge (Bates 1927; White 2002) and the fortress-town of Zawiyet Umm el-Rakham, some 20 km west of the modern town (Snape and Wilson 2007; Snape 2013). Oric Bates' seminal work is the starting point for any work around Marsa Matruh but, unfortunately, it was unfinished at the time of his premature death and much remains unanswered or reconstructed from his field notes (White 1996: 61–62, 2002: 5–7). A coastal survey by White and White (1996) investigated possible Bronze Age port locations along the northwest coast, and the Eastern Marmarica Survey which started in 2005 recorded rural sites 50 km east and west as well as 150 km south of Marsa Matruh (Rieger et al. 2012; Möller and Rieger 2013; Vetter et al. 2013). Unfortunately, White was unable to investigate the area around the Western Lagoon due to military restrictions (White and Gardner 2002: 23). Parts of the Roman settlement were apparently excavated by the Egyptian authorities, but the results were never published.

Drawing on all the resources described above enabled us to map, assess, and record the coastal heritage around Marsa Matruh, including its archaeological characteristics, function, overall condition and disturbances (cause, date and effect). This information was then entered into the MarEA/EAMENA database. More information on the MarEA methodology can be found in the introductory paper of this special issue.



Cultural Heritage: Overview of Damage and Threats

Within the 90 km² study area of Marsa Matruh, 342 sites have been identified and recorded, ranging from remains of the ancient town of Paraetonium (such as buildings, docking facilities, and graves/tombs), through to wartime defences and Bedouin temporary camps identified in aerial photographs. It is probable that many more archaeological features existed but were never recorded and are now lost beneath the modern city.

A large proportion of the study area has been subject to urban growth, with the 10–15 km square immediately south of the lagoons on the coastal plain completely built up. Even the ridges between the lagoons and the Mediterranean Sea have suffered from a dramatic increase in buildings due to this being prime real estate for tourist resorts, offering golden beaches on their doorstep and uninterrupted views of the sea. The airport occupies at least 14 km² of the tableland to the south of the Great Ridge, upon which the town has spread, possibly causing topographical changes to the landscape through extensive clearance. Urban growth is clearly predominantly concentrated along arterial roads spreading east and west, as well as southeast and southwest, flanking the airport, and along the course of the railway line to the southeast. The spaces between these routes then become built up as secondary expansion.

Of the 342 sites identified, 217 (63%) have been destroyed, 21 (6%) are in very bad condition and 14 (4%) are considered in poor condition (Fig. 4). Only 5 (1%) sites were recorded as being in a fair condition, while only 3 (<1%) could be considered in good condition. These better preserved sites are located in areas further away from the modern settlement, with the exception of the Sidi El-Awwam Mosque which is located on the harbor edge and is still in use. Nevertheless, sites observed as being destroyed or in very bad

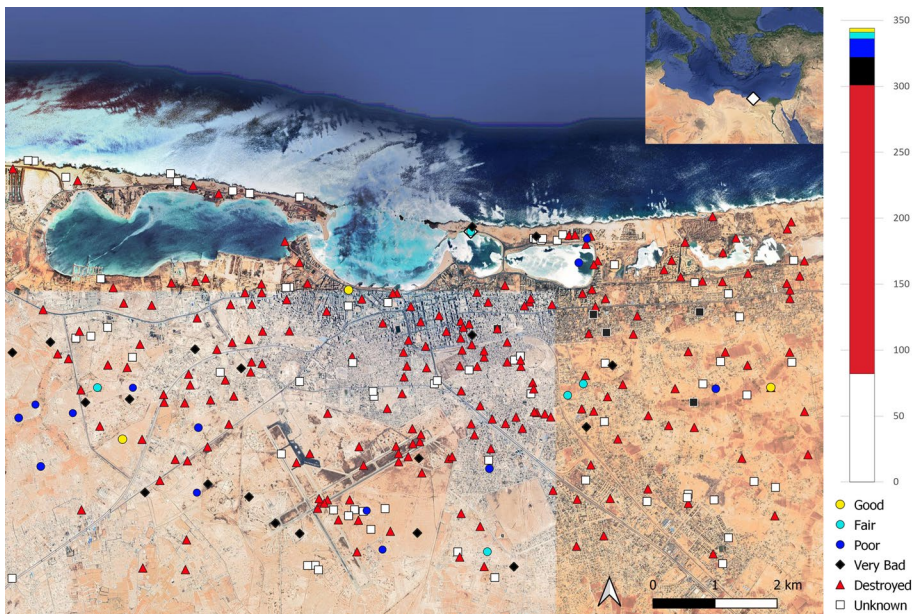


Fig. 4 Distribution of sites in Marsa Matruh study area divided by condition state (Basemap: © Maxar via Google Earth, 2021)

condition are found throughout the study area, demonstrating that even sites further away from the harbor and urban core are not insusceptible to disturbance.

A high proportion have been recorded as being in an unknown condition (82; 24%) due to their uncertain location as they were recorded from maps, such as the 1955 US Army map or the expedition maps of Bates (1927) or White (2002). Completing a condition assessment, therefore, was not possible unless the relevant area was beneath a clearly built-up part of the city. This category is predominantly made up of wells/cisterns (37, 56%) and tombs/graves/burials (26, 39%).

By far the two most dominant causes of disturbance are Building and Development (258; 44%) and Infrastructure/Transport (206, 36%; Fig. 5). There are only pockets of

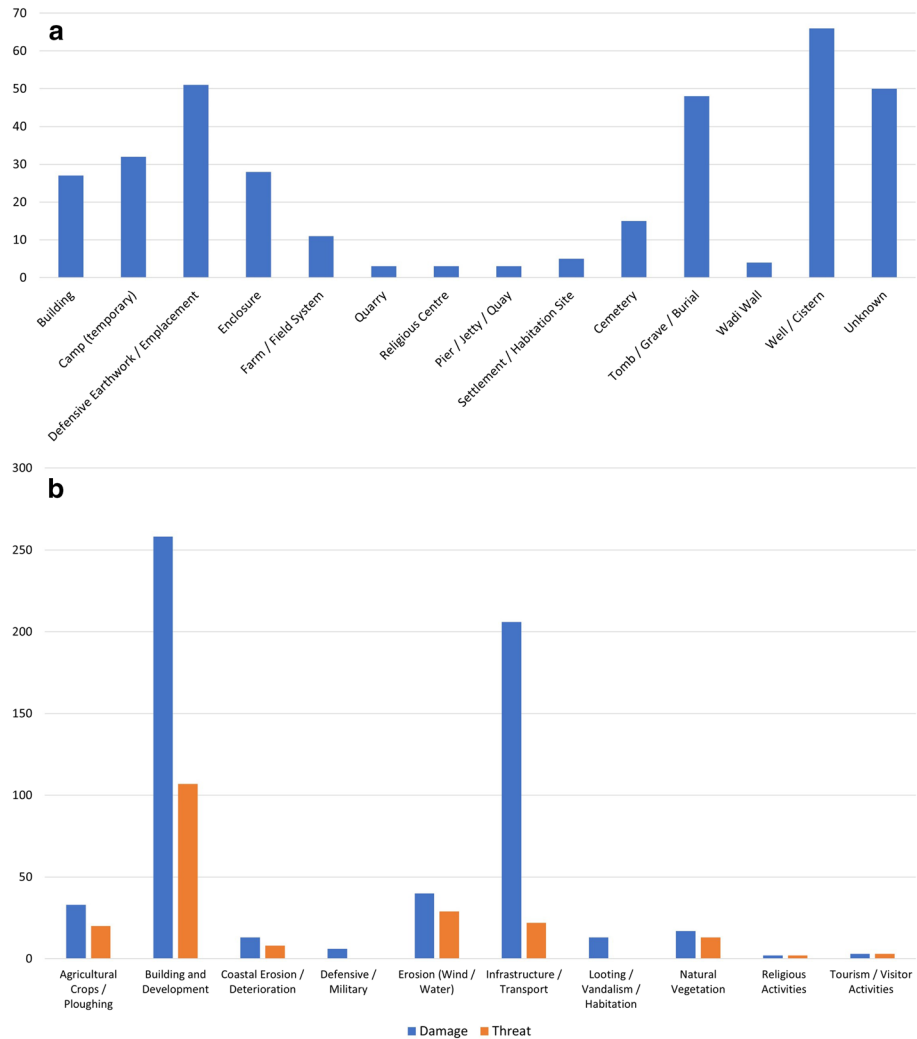


Fig. 5 **a** Main site types around Marsa Matruh. **b** Main types of damage and threats to cultural heritage in the study area

cultivation in the landscape—far less than in the past—as it makes way for urban spread. As a result, Agricultural Crops/Ploughing only constitutes 6% (33) of disturbance and 10% (20) of potential threats to surviving sites. The aerial photographs show that agricultural activity was more prevalent in the 1930s, with 11 farm/field systems on the outskirts of the town, making use of water management features such as wells/cisterns and four instances of wadi walls. Seven of the farm/field systems have been destroyed (3 in very bad condition, 1 unknown) and all the wadi walls have been destroyed.

Very little of the study area remains untouched by development but where sites do survive, erosion (wind/water) is more of a contributing factor (9% (34) as a disturbance, 16% (25) as a threat). Building and Development represents a similar proportion of category when considered as a threat to still-existent sites (60, 40%), whereas Infrastructure/Transport falls to 10% (16). One of the primary reasons for this is that the airport and much of the major road network are already in place and therefore are unlikely to be expanded.

Case Studies

Three case studies from the Marsa Matruh area will now be discussed to highlight the data that has been collected and the sources of data that can help to achieve such analyses. First, the ancient settlement of Paraetionium will be considered to demonstrate how an important archaeological site has been destroyed in recent years; second, rock-cut tombs around Marsa Matruh illustrate the scale of some of the burials that have been lost or are under serious threat of destruction; finally, the WW1 and WW2 military sites around the town illustrate a more recent form of cultural heritage that is frequently ignored.

Ancient Settlement and Harbor Facilities

The first case study focuses on the ancient town and port features of Paraetionium, which was a fairly substantial settlement that spread from the Western Lagoon to the first Eastern Lagoon but has been extensively destroyed by modern construction. Consequently, our knowledge of this important site is nearly completely reliant on documentation carried out in the early twentieth century (Fourtau 1914; Bates 1927), with the exception of the work of the Pennsylvania Expedition in the 1980s (White 1986, 1989, 2002).

Three main areas for the settlement (Fig. 2) were identified during Bates' investigations: (i) along the southern shore of the Western Lagoon (Bates' Site 31); (ii) along the coastal ridge north of the Western Lagoon (Bates' Site 100); and (iii) at the eastern end of the East Lagoon (Bates' Site 54; Fourtau 1914; Bates 1927; Hulin and White 2002: 179). The second of these three locations is described by White as displaying signs that it was once relatively densely built up (White 1986: 56, 1996: 73). It was also the site of the Justinian Wall, a substantial defensive wall across the ridge (Bates' Site 102), leading Bates to refer to this area as "true Paraetionium" because there were no discernible defences at the other two settlement sites (Bates 1927: 136). The Egyptian Antiquities Organisation carried out excavations in this area in the 1980s, investigating "two later Roman period complexes" (White 2002: 3, Pl. 3B) located north of the West Lagoon but, despite being anticipated for several decades, publication of the results of these excavations unfortunately has not appeared and documentation is not known to be available (see White 1986: 51 n.3, 1989: 87 n.4, 1996: 74, 2002: 3). In addition to the town itself, Fourtau referred to traces of habitation along

the lagoon system continuing east from Marsa Matruh, although no further details were provided (Fourtau 1914; White 1996: 67).

The setting for this urban settlement has been described as one “flanked by an agricultural green-belt watered by wells and cisterns” (White 1996: 71). Although there is no longer any visible evidence for this in the immediate area around Marsa Matruh due to urban sprawl, the Eastern Marmarica Survey Project that surveyed the landscape 50 km east and west of the modern city recorded cisterns as well as structures that redirected the run-off of rainwater and a large number of rural settlements such as at the Wadi Umm el-Ashtan, suggesting widespread farming, particularly during the Graeco-Roman period (Vetter et al. 2009, 2013; Rieger et al. 2012).

At this point it is worth noting that the morphology of the lagoon system at Marsa Matruh has changed substantially over time. The Western Lagoon was connected to the central harbor in the past, evidenced by the presence of docking facilities. However, the aerial photographs from 1938 show these two bodies of water separated by a broad sand bank with narrow, natural inlets. Human intervention has since opened up this connection again but it requires regular dredging as a result of continuous accretion (Elhmamy et al. 2019: 11–12). Further change to the morphology of this coastal landscape seems probable. In recent years, the Western Lagoon has suffered from erosion, accretion and water degradation, so it has been proposed that a new navigation channel should be dug between the Western Lagoon and the sea, just to the east of the power plant. Furthermore, this plan involves two new jetties being constructed on the seaward side of this channel, while the existing navigation channel to the central harbor area should be blocked (Elhmamy et al. 2019). The impact on the urban settlement at the west end of this ridge is unlikely to be positive and it would result in the rock-cut tombs in this area being destroyed.

The modern growth of Marsa Matruh has impacted severely on the remains of Paratonium. The sites to the south of the Western Lagoon and at the east end of the Eastern Lagoon have been completely destroyed by construction, the former by port infrastructure developments and the latter by urban expansion. The ridge to the north of the Western Lagoon has also been substantially developed, with the addition of both resort buildings and a power plant. As the extent of the site was not mapped, even approximately, by Bates it is difficult to ascribe damage levels to it. If the Egyptian excavations are published this should become achievable but it may be too late considering the speed of development over the last 35 years since the work was carried out.

Roman harbor facilities were reported in the southeast corner of the West Lagoon consisting of a cut-stone quay or pier with a series of stone jetties projecting into the water (Fourtau 1914; Bates 1927: 131; White 2002: 3). Fourtau also described stone towers at either end of the pier when he visited in 1904 but these seem to have been absent when Bates was at the site nine years later (White 1996: 67, White 2002: 11 n.19). The Western Lagoon is argued to have been the location where Cornelius Gallus trapped and sank Marc Antony’s fleet in 31 BCE after the Battle of Actium (Bates 1927: 131–134; White 1986: 58, 1996: 65; Cassius Dio 51, 9–10; Oros., Hist. adv. pag. 6.19). There is, however, no conclusive archaeological evidence for this due to dredging and the construction of modern naval and commercial harbor facilities during the last century (Hulin and White 2002: 185, n.133).

In the Eastern Lagoon a series of rock-cut steps, which led down to a quay noted by Bates, were excavated by the Pennsylvania Expedition but no quay was found at the bottom. It is unknown whether the feature was covered by the soft sand at the lagoon bottom or has not survived the intervening period (White 1986: 56). The remains of a pier were also suggested to have existed in the Eastern Lagoon, on the northern shore, near to the

remains of the early Coptic Church (Harding-King 1927: 191). But again, no remains of this feature survive or have been recorded in more detail.

Cemeteries and Rock-Cut Tombs

The southern limit of the ancient town is thought to have been demarcated by tombs and cemeteries along, or near to, the Great Ridge, which runs parallel to the coast, approximately 2 km inland (Hulin and White 2002: 179; White 2002: 7, 14). Three large rock-cut tombs were excavated by Bates' team, while eight more were numbered but are now of uncertain location. They were originally Ptolomaic or Roman in date, and later re-used in the Roman and Byzantine periods. Tomb 3 from Site C was thought to have had no known equivalent around Marsa Matruh (Bates 1927: 156–176). Unfortunately, this tomb has been destroyed and is now beneath the modern city.

Several more large rock-cut tombs were recorded by Bates on the ridge north of the West Lagoon, at the eastern end close to the harbor entrance (Fourtau 1914: Fig. 8, 117, marked as a necropolis; Bates 1927; White 2002: 7–10). There is very little discussion of them, apart from mentioning that they were exposed at the time of recording, with evidence of having been used as Bedouin habitation sites (Bates 1927: 156). The erosion and disturbance of some tombs at the coast is highlighted by a record in the field notes of the expedition: “[Site]94. tomb partly rifled, opening on to beach. Three rooms, inner one almost entirely choked, middle part full, outer broken away in part by encroaching sea. All rooms well plastered walls and roof of outer one covered with charcoal scribings of steamers, figures, etc. Apparently recent” (Harding-King 1927: 194). A further rock-cut tomb at the east end of the same ridge clearly depicts similar effects from coastal erosion and modern vandalism but there is no accompanying text for the site (Bates 1927: Pl. 3.2).

At least 10 cemeteries and numerous rock-cut tombs were recorded by Bates and several additional cemeteries have been identified in our analysis of the study area, bringing the total to 15 cemeteries and 42 tombs/graves/burials (Fig. 6). It is highly probable that more tombs would have existed in this region in the past but have not been documented, something Bates himself acknowledged (1927: 176). Twelve (80%) of the 15 recorded cemeteries have been destroyed and the remaining three are in an unknown condition. Of the 48 tomb/grave/burials, 19 have been destroyed, two are in very bad condition, and one is in poor condition; the remaining 26 are unknown. The dominant causes of disturbance for cemeteries and burials follow the overall trend for the study area: Building and Development (53, 40%) and Infrastructure/Transport (50, 37%). The third highest occurring category, however, is one that is often synonymous with tombs and burials: illegal activities (12, 9%). In the past there would have been unquestionably more looting/structural robbing than documented here but we are largely limited to what Bates recorded.

If the subterranean rock-cut tombs survive today, the difficulty in locating them through remote sensing is illustrated by the fact that their entrances are hard to spot, even from the ground, especially if debris and sand have accumulated over time (e.g. T1: Bates 1927: 167). To properly assess these features, an on-the-ground survey would be necessary to complement the remote sensing survey. For example, the Eastern Marmarica Survey reported that rock-cut tombs are common in the area of Wadi Umm el-Ashdan to the east of Marsa Matruh, where the topography allows (Grosskopf and Rieger 2019: 59, Fig. 11) but as they are cut into the face of an escarpment they are not visible unless viewed frontally.

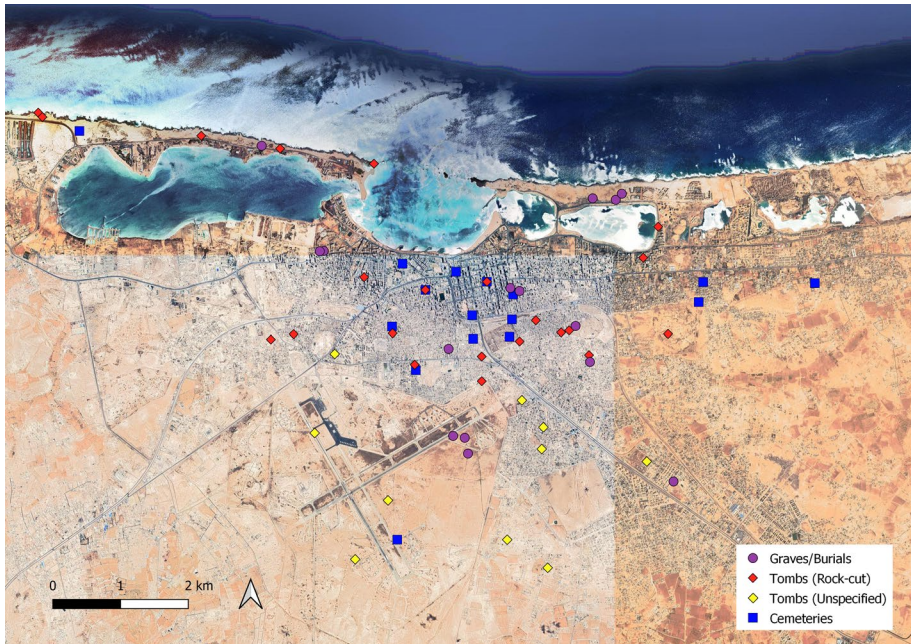


Fig. 6 Distribution of cemeteries and burial sites around Marsa Matruh (Basemap: © Maxar via Google Earth, 2021)

Military Sites

The last case study focuses on military defences from conflict in modern history around Marsa Matruh. This is a form of cultural heritage that is frequently neglected as it does not present impressive ruins or the romanticism of ancient life. Furthermore, it is a type of cultural heritage that can lack a meaningful link to local society by virtue of it being perceived as belonging to an ‘Other’, not fitting with the strong national identity of Egypt. This is especially perceivable when the tension between imperialism and nationalism in the last couple of centuries is considered (see Reid 2002, 2019; Ikram 2011).

We have identified 51 military sites in the study area, which principally formed a wide defensive perimeter around the settlement and the airfield (Fig. 8). The airfield is now the site of the modern airport. They also encompass nearly all the cisterns and wells that have been recorded, highlighting the value of water availability in this arid environment. There is a large concentration of defensive features on the southern and western sides of the town indicating the principal direction of threat from attacking forces.

All but one instance falls into the categories Fortification/Defensive Earthwork (39; 76%) or Emplacement/Foxhole (11; 22%). The one exception is a military bunker located on the ridge north of the inner harbor. The core of the perimeter comprises substantial roughly circular/oval trench systems measuring approximately 100–150 m in diameter (Fig. 7). Amongst these are smaller, linear earthworks (trenches) and emplacements/foxholes (both individual and in small clusters), particularly on the western side. Finally, there are defensive barrier walls extending perpendicularly from either side of several of the main roads leading to Marsa Matruh, controlling access into the town (Fig. 8).



Fig. 7 Example of the Fortification/Defensive Earthwork **a** in 1938 aerial photograph, **b** satellite image from 2021 (© Maxar via Google Earth). **c** Archive photograph of such a defensive earthwork built by the 1st Battalion New Zealand Rifle Brigade at Marsa Matruh (National Army Museum of New Zealand)

The identification of approximately 92% (49/53) of the military defences would not have been possible without the examination of aerial photographs. Some are faintly visible in modern satellite imagery but most have disappeared. Sixty percent of all defensive features have been destroyed (32), with Building and Development (45; 36%) and Infrastructure/Transport (43; 34%) being the dominant causes. Of the surviving features, 60% (12) are in Very Bad condition, with the same causes being responsible for disturbance. The largest threats to the surviving features are Building and Development (23; 39%), Natural (20;

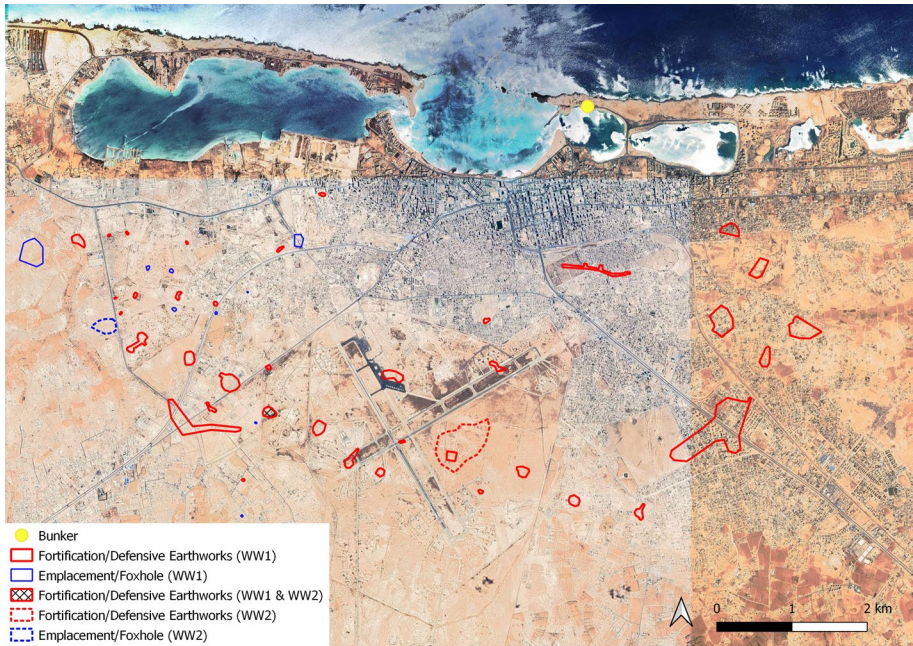


Fig. 8 Distribution of military cultural heritage around Marsa Matruh (Basemap: © Maxar via Google Earth, 2021)

34%) and Infrastructure/Transport (13; 22%). These highlight the threat of continued urban expansion while also indicating that natural erosion is still a contributing factor.

The aerial photographs of Marsa Matruh pre-date the Second World War, thus visible features almost certainly relate to World War One and can probably be connected to the Senussi Campaign of 1915–1916, in which Turkey and Germany attempted to raise the Senussi tribesmen against Allied forces in the region. As a result, Marsa Matruh was used as a forward base by Allied forces for the campaign due to its strategic location close to the Egyptian frontier, while also possessing a good water supply (Evans-Pritchard 1945; White 2002: 2–3; Raza 2012; McGuirk 2013: 22).

WWII military sites are far less apparent in our analysis of the satellite imagery around Marsa Matruh, with only four such sites being recorded. Two are features only visible in more recent imagery: one Fortification/Defensive Earthwork and one Emplacement/Foxhole cluster. The third is a Fortification/Defensive Earthwork, identified in the 1938 aerial photographs, but whose shape has completely changed in later years (as seen in Google Earth imagery) while still maintaining its function. Most probably, this feature was originally built as a WWI earthwork, which was altered and re-used in WWII. The fourth site is a cave that functioned as the headquarters of military operations for German Field Marshal Erwin Rommel during part of the El Alamein campaign. The site was converted into the Rommel Museum, which underwent a seven-year, EGP 2.5 million restoration, reopening in 2017 and is reportedly visited by thousands of tourists, indicating the potential interest in cultural heritage from this era (Al-Youm 2017).

World War Two brought about heavy bombing and shelling of Marsa Matruh from land, sea, and air for a large part of 1942 (Goodchild 1991: 211, n.38). The resulting damage has been estimated at 10% destruction and 20% of buildings damaged (Maugham

1950: 38–41). The harbor's edge and the eastern coastal region suffered some of the heaviest shelling, such as the area around the Coptic church, with the western zone receiving less attention. Despite this, the defensive Justinian Wall recorded by Bates proved difficult to trace in the 1980s, leading White to speculate that it may have been damaged in World War Two (White 1996: 73–74, 2002: 11, n.10). The Late Bronze Age remains on the central spine of Bates' Island also suffered damage from shelling, with the seventeenth-century sponge divers' house also largely destroyed (White 2002: 16).

Although these military features are cultural heritage sites, they themselves almost certainly have been the cause of destruction of some earlier archaeological features. For example, the construction of the substantial defence perimeter probably destroyed numerous sites in the process through clearance and digging, not to mention the disturbance caused by the movement of soldiers and heavy vehicles across the landscape. These cannot be documented given the lack of data on what was present, but speculation is possible. Furthermore, the materials for constructing the WWI barriers—particularly stone—must have had a local source, most probably the burials and/or earlier buildings in the area. For example, the earthwork shown in Fig. 7 is in the same location as a tomb marked on a Pennsylvania Expedition map (White 2002, Plan 4), which is no longer visible and was probably destroyed in constructing this military feature. Additionally, the Byzantine church was almost certainly a victim of such a repurposing activity just over a year after Bates' excavations in 1913–14; it is reported that a “considerable portion” of the building was intact in 1915 but by the end of that year much of the stone had been taken and used in the construction of an adjoining redoubt (Briggs 1918: 123; Goodchild 1991: 202, n.13).

Discussion

Given the extent of urban expansion of Marsa Matruh over the last 80 years it is perhaps not surprising that a large percentage of coastal heritage is now damaged or destroyed. One of the issues is that less impressive archaeological remains such as those that had survived the centuries at Marsa Matruh are not seen as being as valuable as the remains of the pharaonic temples, palaces, tombs and settlements of the Nile valley. Egypt's pharaonic past is a strong part of the country's identity, while other parts of the heritage often fall to the wayside (Ikram 2011). The country's image is dominated by the idea of its pharaonic past, leaving little room for any other kind of heritage (Reid 1992, 1996, 2019; Meskell 2003; Tejjgeler 2013).

It is also important to stress that problems relating to urban expansion are not solely confined to Marsa Matruh but are present along the northwest coast. Over recent decades the country has seen rapid increases in coastal urban populations, with the Egyptian Mediterranean coast experiencing a 62.6% growth. This is driven by two main socio-demographic factors: first, a continuously growing population, predicted to reach 121 million by 2050, and second, rural–urban migration (Hzami et al. 2021: 11). Furthermore, political and management factors severely threaten heritage sites that are ‘in the way’ of development, in particular the low degree with which unauthorized constructions, land squatting, and building permit violations are prosecuted by law and frequently overlooked by the authorities. In fact, some legislative loopholes exist to prevent an unauthorized building from being torn down after its construction (Masoumi et al. 2018). Last but not least, economic drivers play a large part not only in the expansion of towns, but also in the destruction of heritage. The area east of Marsa Matruh between El Dabaa and El Agami in Alexandria has already

undergone substantial development since the late 1980s. This area fell victim to wholesale land selling, resulting in the entire 120 km coastline now almost seamlessly covered with resorts and summer houses. Furthermore, the market value of land near built-up areas is higher compared to agricultural land (Masoumi et al. 2018). Thus, selling land is becoming more attractive.

What has happened to (maritime/coastal) cultural heritage at Marsa Matruh and along the coast to the east is of particular concern, especially when considering Egypt's plan to continue to develop the northwestern coastline towards Sollum at the Libyan border in the government's hope to divert migration movement away from the major cities in the Nile Delta to the fairly 'empty' parts along the coast (Iskander 2020). At the time of writing, a series of small settlements dot the coastal zone along the main route to Libya together with two larger settlements, Sollum and Sidi Barrani. Future plans for this region include domestic housing and new tourist projects, as well as land reclamation projects similar to developments that have taken place east of Marsa Matruh. This is part of Egypt's Vision 2030 and Vision 2052 projects that aim to provide sustainable and inclusive development, considering economic, social and environmental dimensions (Youssef 2017; Pappalardo and La Rosa 2020). However, it appears that the protection of heritage does not play a major part in these plans. This is perhaps best exemplified in the recent naval and commercial port development of Marsa Gargoub, 75 km west of Marsa Matruh (Fig. 9). It was inaugurated in July 2021 and will cover a total of 10 km² on the site of the Hellenistic and Roman port of Chautaiou/Chettai, of which very little is known to date (Mattingly 1996). A further port is planned on the outskirts of Sidi Barrani, c.110 km west of Marsa Matruh, with investment estimated to be €1.6 billion (Youssef 2017; Elbeih et al. 2019). These rapid developments are problematic since the coastline between Marsa Matruh and Sollum has not yet been fully surveyed and underwater investigations have not yet been undertaken. White and White (1996) conducted preliminary investigations of four harbor sites in 1995 (Sollum, Marsa Bomba at Sidi Barrani, Marsa el 'Asi, Marsa Umm El Rakham), predominantly looking for evidence for Bronze-Age harbors. The Eastern Marmarica Project investigated the area 50 km east and west of Marsa Matruh focusing primarily on the Graeco-Roman period. Much of the coastline, however, remains to be thoroughly investigated.

The rapidity of development at Marsa Matruh and subsequent damage to heritage demonstrated above underlines the real urgency to record and protect, where possible, the sites that still exist to the west of the city. The MarEA project, in partnership with the Central Department of Underwater Antiquities, Alexandria, and the Centre for Maritime Archaeology & Underwater Cultural Heritage at Alexandria University obtained permission to carry out a survey in the area between Sidi Barrani and Marsa Matruh. Preliminary remote sensing assessment of the area carried out by MarEA in preparation of fieldwork already shows



Fig. 9 Coastal cultural heritage sites west of Marsa Matruh (Basemap: © Maxar via Google Earth, 2021)

the potential richness in sites along the coast (Fig. 9). Following the initial reconnaissance survey, a number of particularly endangered sites will be identified for more detailed archaeological investigation of both terrestrial and submerged features. While not all sites along the coast can be saved, perhaps some can be protected or, at the very least, recorded in detail before they are lost forever.

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Availability of Data and Materials Available on request.

Code availability Not applicable.

Declarations

Conflict of interest The authors declare that they have no conflict of interest.

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