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Integrating cultural and natural heritage approaches to Marine Protected Areas in the MENA region

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Abstract

Over the past two decades, Marine Protected Areas (MPAs) have emerged as one of the primary legislative initiatives used to protect the marine environment. Additionally, they are recognised as an integral management mechanism used to address Climate Change, and some consider them to be a driver for sustainable community development. To date, these areas have been used primarily to protect the natural environment, but there is both a clear justification and need to integrate cultural heritage into this network of sites. Such an integrated model would allow for the better realisation of the socio-economic development aspirations around MPA designation, and allow for broader inclusivity, and participatory community action and engagement. The integration of both tangible and intangible cultural heritage into these frameworks will support enhanced social cohesion, and a strengthening of place-making.

Key words

Marine Protected Areas, Cultural Heritage, MENA, Tyre, Aqaba

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Introduction

The designation of Marine Protected Areas (MPAs) has emerged as a primary mechanism for coastal and marine protection and conservation over the past decades. The International Union for Conservation of Nature (IUCN) has defined a marine protected area as *an area of land and/or sea especially dedicated to the protection of biological diversity, and of natural and associated cultural resources (and features) and managed through legal or other effective means* [1]. While there had been a series of designations through the 20th century, it was after the 1980s that designation became mainstream. Since that period, a developing global network of MPAs has emerged, currently numbering over 14,000 implemented MPAs (MPAtlas), which the IUCN has promoted to *provide for the protection, restoration, wise use, understanding and enjoyment of the marine heritage of the world in perpetuity through the creation of a global, representative system of marine protected areas and through the management in accordance with the principles of the World Conservation Strategy of human activities that use or affect the marine environment* (General Assembly Resolution 17.38 (1988), reiterated in General Assembly Resolution 19.46 (1994)). A series of primary benefits following designation have been identified. These have traditionally been centred on natural heritage, but are equally applicable to cultural heritage. Climate Change mitigation remains a primary benefit as the protection and restoration of marine systems, mangroves, saltmarshes and seagrasses act as important carbon sinks, and also serve to physically protect the coast and associated ecosystems. MPAs serve a crucial role in the conservation of biodiversity, especially relating to critical habitats of threatened species. They further help maintain viable fisheries and serve to protect habitats and species that are central to sustainable eco-tourism ventures.

However, while the benefits for natural heritage have been extensively studied, the associated benefits for cultural heritage are less explored. This paper will set out a broad framework that highlights the socio-economic benefits of adopting a more inclusive approach towards the cultural heritage resource and highlight future directions for a more integrated approach to management practice at these sites. This may involve the reframing of existing management frameworks to take more cognisance of the cultural heritage resource, or the extension of existing MPA boundaries to include material or built heritage. There is a pressing need to integrate cultural heritage into these networks in the context of increased threats to the cultural heritage resource from climate and environment change, and increased anthropogenic pressures from industry, coastal development, pollution and fishing [2, 3, 4, 5]. **Here, we are specifically interested in Marine Cultural Heritage (MCH), defined by Henderson [6] as all past human action on the coasts as well as directly on the sea. Henderson further argued that the term marine is more inclusive than 'maritime' and is more readily identifiable to other marine user groups.**

In addition, inclusion of cultural heritage can add considerable value to MPA management. Co-management, the inclusion of local people or traditional management, leadership and knowledge are frequently advocated as integral to all stages of the programme design [7, 8, 9]. However, where absent, or poorly developed, this can create problems. For example, inappropriate and ill-considered approaches in certain MPAs in South Africa with a demonstrable weakness in facilitating participatory community engagement with decision making has led to the loss of tenure rights, livelihoods and food insecurity [10]. Integrating locals into decision-making can be more effective, and easily understood, when cultural resources are included within these processes. There is likely to be a greater understanding around resource importance when positioned within human narratives of place and

belonging. Cultural understandings and negotiation around MPA designation can also have a broader societal impact in terms of moving beyond conflict. At the close of the Jordan-Israel conflict in 1994, a section of the peace accord included commitments to protect coastal habitats, improve sea water quality and work towards pollution prevention and control [11]. This transboundary cooperation for planning around a marine protected area became the Red Sea Marine Peace Park, centred on environmental cooperation in the Gulf of Aqaba.

Of course, we recognise that the inclusion of MCH within an MPA does not automatically guarantee resource protection and future stability, and we recognise that MPAs are not without critics. McClanahan *et al* [12] have suggested that when it comes to protecting coral reef systems, MPAs have, at times, been shown to be ineffective due to their failure to produce tangible conservation benefits and that many resource users do not follow the conservation guidelines. In order to overcome some of these issues Edgar *et al* [13] identified five key features of MPAs associated with beneficial conservation outcomes that included good enforcement and regulation, well established, isolated and adopting a full no-take policy. Each of the sites investigated as part of that study and that met these criteria impacted positively on culture, lifeways and a sense of place. The inclusion of both tangible and intangible heritage into these frameworks can only further enhance a site's perceived potential success as coastal communities will strongly identify with the remains of the remote and recent past, shaping identity and enhancing belonging.

MPAs and Cultural Heritage

From a cultural heritage perspective, there are clear benefits in terms of enhanced protection and more sustainable management of the resource, as well as a number of socio-economic advantages. These can be linked to the natural heritage approach where the primary management function would see enhanced protection for cultural heritage resource within an MPA boundary. It also makes sense given that there is overlap between many of the threats facing both natural and cultural heritage; for example, bottom trawling, dredging, pollution and unregulated building/construction. Protection is further enhanced through specific inclusion of culture assets once embedded within wider integrated practice. As with habitats and species attractive to tourism, an MPA rich in cultural assets can provide the base for cultural and nature-based tourism, as well as facilitating educational or aesthetic experiences. Cultural heritage is also a significant base for the social construction of identity, and leads to strong communities with a strong sense of place [14, 15].

A range of benefits and incentives for communities to become involved with the designation and support of these areas can be identified. The advantages of adopting such an approach have been partially realised in the past. In the US it has been recognised that effective marine or coastal management requires a knowledge of place [16]. As a consequence, the National Marine Sanctuary System has integrated ecosystem-based management with maritime cultural landscape frameworks, a conceptual approach defined by Christer Westerdal who argued for a more holistic and historically nuanced approach towards understanding of the totality and complexity of past human cultural activity in the coastal zone [17]. Maritime cultural landscapes then feature the full range of past human utilisation of maritime space, including settlement, industry and belief systems, both on land and underwater, as well as environmental and human change in this zone. Westerdal [17] then created the term maritime cultural landscape as a management strategy to integrate both natural and cultural in a single idea. Such an approach also recognises the relevance and centrality of intangible

cultural heritage. While most management approaches deal primarily with the tangible, physical traces of past cultural activity, it is also fundamental to consider the contribution and importance of intangible heritage to past and current coastal communities. UNESCO has defined this form of heritage as including the *practices, representations, expressions as well as the knowledge and skills that communities, groups and in some cases, individuals recognise as part of their cultural heritage*. The centrality of these forms of heritage has been highlighted at a number of protected areas. At the Japanese World Heritage site of Shirakami-sanchi, it was the community's spiritual connection and place-based identity that primarily supported the conservation efforts around this landscape of incredible natural beauty [18]. At the Qeshm Geopark in southern Iran, a similar sense of place connection and a natural landscape imbued with cultural meaning significantly enhanced conservation efforts amongst the local community and facilitated both naturally and culturally sensitive visitor behaviour [19]. Using Malaysia as a case study, Masud and Kari [20] have demonstrated that the primary motivating factors for communities to become involved in eco-tourism and MPA management are an increased environmental knowledge for sustainable development and perceived socio-economic and cultural impacts.

From a broader socio-economic perspective, MPAs in southern Europe generate an estimated €640,000 per MPA in income to industries that provide services to non-resident recreational users [21]. MPAs can also expand opportunities for research and education by ensuring long-term conservation of marine species and features and through ecosystem services. Fletcher *et al.* [22] found that the most frequently mentioned cultural ecosystem service provided by the Black Sea was related to cultural heritage and identity. A healthy environment is key to many important elements of culture, including aesthetic appreciation, identity and spirituality. For example, some respondents' fathers had been fishermen, which created a sense of identity and interaction with the Black Sea. There is also a range of traditional Turkish poetry, songs and dancing related to the Black Sea and its fish (citation). Pike *et al.* [23] investigated the social value of MPAs in the UK. They concluded that a range of factors influence the social value were linked to a sense of place, and the emotional connection people have to their environment. The extent of community engagement was a key factor in the successful implementation of an MPA, the value of which was further enhanced with subsequent research and educational dissemination. Further, an EU report concluded that *overall welfare benefits of MPAs exceed their total costs* [24].

Given these clear advantages and/or benefits, the question becomes, why is cultural heritage not more widely integrated within the MPA framework? Arguably, this stems more from the general organization of historic environment versus natural heritage management at a national level, and legislative precedent, than actual disadvantages in terms of protection. Sectoral fragmentation has historically plagued coastal and marine management, though it is steadily being redressed through Integrated Coastal Zone Management or Marine Spatial Planning [25]. Even so, there is a tendency for heritage management to be based within government bodies concerned with cultural heritage. Thus, those with responsibility for coastal/marine cultural heritage work alongside their terrestrial counterparts, but at arms' length from those dealing with the natural environment. Similarly, legislative imperatives for protection are also often separated and dealt with by laws pertaining to cultural heritage in isolation. Many of these are decades old, and may still be formulated around concepts such as individual sites, built structures and artefacts which clash with the area-based

protection offered by MPAs. Further, the desire to avoid 'double legislation' may therefore figure at times in decisions not to integrate marine natural and cultural heritage protection.

While MPA designation has traditionally focused on natural heritage, there is increased research focussing on the underwater cultural heritage resource within these areas. There is also a recognition that the declaration of underwater reserves focuses also on maritime heritage [25]. Recent archaeological research in Italy has documented significant archaeological remains within the boundary of the Porto Cesareo Lecce MPA [26], and in the underwater park at Gaiola [27]. In Scotland historic marine protected areas (historic MPAs) are the way that marine historic assets of national importance which survive in Scottish territorial waters are protected under legislation [28] According to HES, the purpose of historic MPAs is to preserve marine historic assets of national importance. Planning permission and marine licences may be required for some types of work and other activities within historic MPAs.

MarEA and MPA

In approaching the greater integration of cultural heritage into MPA practice we identify three guiding principles. The first is that coastal and marine cultural heritage has often been under-considered in terms of an area's resource asset set, with a prioritisation of natural heritage. Unfortunately, there has been a significant disconnect between natural and cultural heritage management in the marine environment, leading to often disjointed and separate legislative and management approaches, and repetition of survey and investigative activity. Secondly, greater consideration and inclusion of cultural heritage into the resource and management planning of MPAs can lead to better understanding and support amongst the local communities for designation. The sense of place, belonging and identity that coastal communities have with their past serves to root them in the present and can encourage a greater respect for the resource and participatory activity. This is true both in the context of tangible and intangible heritage, where sites and material culture, as well as place, can carry special meaning and cultural association for coastal communities. Thirdly, the visibility and appreciation of cultural heritage presents a range of opportunities relating to cultural eco-tourism, education, economic development and the realisation of social capital. Coastal heritage, such as ancient ports, castles and coastal settlement are especially accessible, in comparison to underwater sites, and present a particular set of opportunities for tourism and educational engagement. In order to further realise this potential, and to encourage greater consideration and inclusion of MCH, the Maritime Endangered Archaeology Project (MarEA) is currently involved in a programme of engagement with MPA networks to examine implementation strategies around the more active consideration and integration of MCH into individual area plans.

The first phase of this involves mapping the cultural heritage resource within the MPA network of the Middle East and North Africa (MENA) via a programme of remote sensing survey. Through quantifying the nature and extent of the cultural resource it is anticipated that the project's digital platforms will provide readily available, open access data to MPA managers and encourage deeper engagement with the heritage resource. MarEA is focussing its initial efforts of a number of existing MPA sites to examine whether current management practice could be adopted to facilitate MCH. It is further

examining ways in which existing boundaries could be extended to facilitate greater inclusion of coastal heritage, and areas of potential for future designation and protection.

MarEA methodology

MarEA relies on openly accessible satellite imagery, remote sensing datasets, published and archived reports and literature to identify and assess the condition of coastal and submerged cultural heritage in the MENA region [5]. In a similar vein to the Endangered Archaeology in the Middle East and North Africa (EAMENA) project, MarEA appends all documented site to an open-access database hosted by the University of Oxford [29]. Using a controlled vocabulary, sites are evaluated based on their location, function, archaeological interpretation, and condition. In addition, threats and damages that endanger this cultural heritage resource are described and classified depending on their severity. The inclusion of certainty values corresponding to the classification categories enables an objectively nuanced site documentation approach. Given the spatial extent, long history of research and complex nature of the archaeological record of the MENA region, during the initial two-years of the project, the aim was to conduct a rapid assessment of the coastal zone. This rapid assessment highlighted areas at larger risks from variable threats, natural and anthropogenic, and sites and regions where collaborations with local partners can foster strong working relationships around management of and engagement with MCH. As of 2020, MarEA documented 5609 sites across the coastal and near-shore zone of MENA. These sites range from small enclosures to settlements, fish-traps, shipwrecks, and harbour infrastructure. While our documentation continues, a preliminary analysis of this mapped cultural resource against MPAs in the MENA region engenders valuable insights into the nature and complexity of the resource.

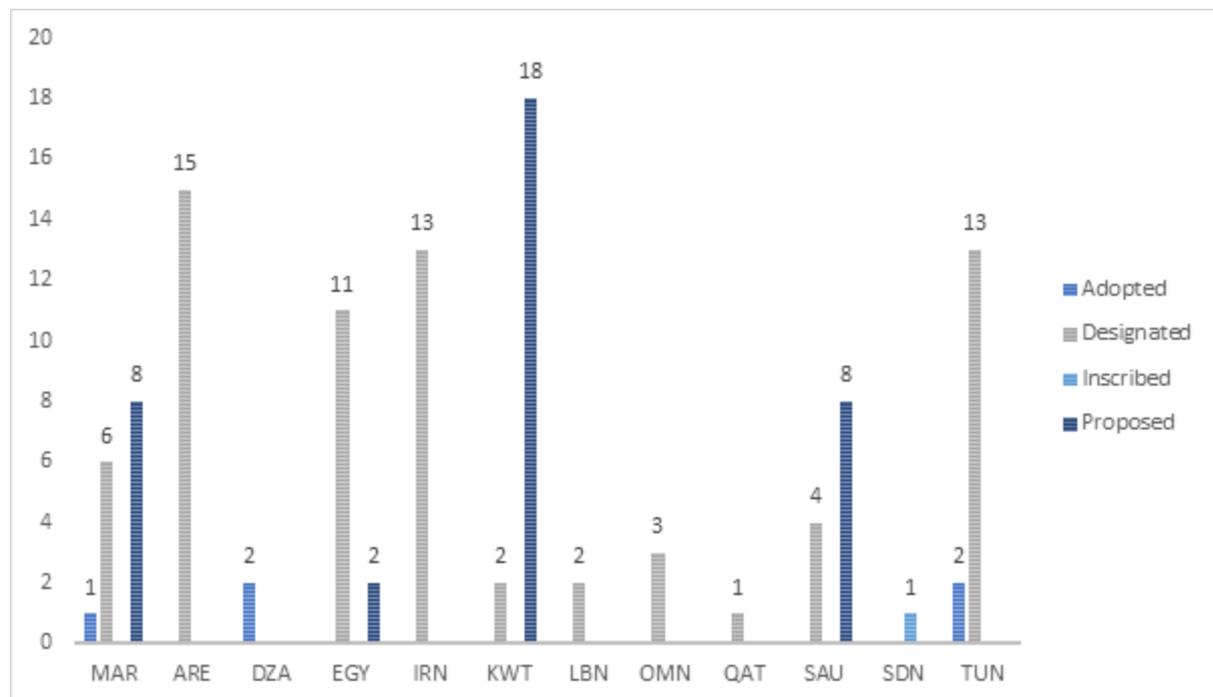


Figure 1- Distribution of MPAs across MENA countries. MAR: Morocco; ARE: Algeria; EGY: Egypt; IRN: Iran; KWT: Kuwait; LBN: Lebanon; OMN: Oman; QAT; Qatar; SAU: Saudi Arabia; SDN: Sudan; TUN: Tunisia.

According to the Marine Protected Atlas (MPAtlas), based on the World Database of Protected Areas [30], there are 112 MPAs in MENA. These range between MPAs that were adopted, designated, inscribed or currently proposed (Figure 1). They (Table 1), vary from international Ramsar Sites to national natural reserves and regional protected areas such as those specified under specific conventions, e.g., the Barcelona Convention [31]. With 63% of total MPAs in MENA designated under various acts, 32% of the datasets reflects proposed MPAs. While the dataset is comprehensive, it does not capture all proposed or recently designated MPAs². In Lebanon, a country of specific focus in this first phase of the project, has designated two existing MPAs, Palm Islands and Tyre Coast Nature Reserve (TCNR). According to Lebanon's marine protected area strategy [32], an additional nine coastal and marine MPAs have been proposed but are currently in the process of becoming designated following necessary field surveys. This growing number of proposed MPAs offers significant potential to connect natural and cultural heritage management strategies and community practices/involvement.

² The MPAtlas.org depends on feedback from the community for accuracy and is constantly being update. The number of MPAs reported on in this paper is likely to change in the future as updates take place.

Designation Type	Countries												Total
	MAR	ARE	DZA	EGY	IRN	KWT	LBN	OMN	QAT	SAU	SDN	TUN	
International	1	4			5	1	1	1			1	10	24
Ramsar Site, Wetland of International Importance	1	3			4	1	1	1				9	20
UNESCO-MAB Biosphere Reserve		1			1							1	3
World Heritage Site (natural or mixed)											1		1
National	13	11		13	8	19		2	1	12		3	82
Biological and Ecological Interest Site	4												4
Biological Reserve	1												1
Coral Reef Area						16							16
Developing Resources Protected Area				1									1
Eco-Park										1			1
Marine Protected Area				1									1
Multiple Use Management Area				6									6
National Park	2			2						1		1	6
Natural Reserve						3							3
Nature Conservation Reserve				1									1
Nature reserve	4							2				1	7
Permanent Hunting Reserve	2												2
Protected Area		11		2	6				1				20
Reserve										3			3
Resource Use Reserve										4			4
Special Nature Reserve										3			3
Wetland Zone of National Importance												1	1
Wildlife Refuge					2								2
Regional	1		2				1					2	6
Specially Protected Areas of Mediterranean Importance (Barcelona Convention)	1		2				1					2	6
Total	15	15	2	13	13	20	2	3	1	12	1	15	112

Table 1- List of MPAs designation types in the MENA region.

Based on MarEA's current documentation, the rapid assessment identified 546 archaeological sites located within MENA's MPAs. Of these sites, 73% represent sites of medium to definite archaeological certainty (Table 2). MarEA evaluates sites based on various sources including satellite imagery. Monuments such as coastal castles will be of definite certainty, for example, but other features may

carry a less definitive identification due to the quality or resolution of the data sources. A small mound at the coast may be a shell midden, or a modern dump of material. It is often only through systematic excavation that assignation of archaeological value can be fully realised. As such this certainty value denotes the likelihood of a site of interest being of an archaeological significance, based on all available information. Similarly, an assessment of threat to the site is also based on an analysis of historic and contemporary remote sensing data, combined with aerial photography and information gleaned from a variety of other sources and online open access social media imagery. Experience has shown that this is a highly effective way of documenting and monitoring change at these locations. The documented sites are distributed in MPAs within the countries of Egypt, Tunisia, Lebanon, Oman and the UAE as on Figure 3. Documented sites types include quarries, middens (including shell middens), fish traps, shipwrecks, quarries, burials, enclosures and harbour related features which represent a range of former activities in the coastal and marine zone.

ARCHAEOLOGICAL CERTAINTY	DAMAGE EXTENT							Total
	1-10%	11-30%	31-60%	61-90%	91-100%	No Visible/Known	Unknown	
DEFINITE	2	16	6	2		6	2	34
HIGH	13	12	10	3	1	199	7	245
MEDIUM	8	18	22	5	2	57	8	120
LOW	10	16	7	1	13	79	20	146
NEGLECTIBLE	1							1
TOTAL	34	61	45	11	16	341	36	546

Table 2- Summary of the archaeological certainty against the damage extent of sites located within known MPAs in the MENA region.

It is worth mentioning, however, that as documentation proceeds, the number of sites intersecting with MPAs, and our knowledge of these, will grow. Of particular interest to our study are the documented threats acting upon these heritage places. As show on Figure 2- natural, building/development and infrastructure/transport threats are the most commonly documented factors that have potential to endanger MCH. Considering measures put in place for ensuring and sustaining protection of MPAs, MCH within those designated areas would benefit from an integrated approach that places equal importance to natural and MCH against common threats. This would guarantee consistent monitoring of both assets, an enhanced protection, and further support the value (tangible and intangible) attributed to MCH and natural resources, and broadening local, national and international interest in MPAs. In our overview of existing provisions, we have highlighted two sites that would benefit from a more inclusive management approach. These examples could then be used as paradigms for the implementation of such approach in a broader geographical context.

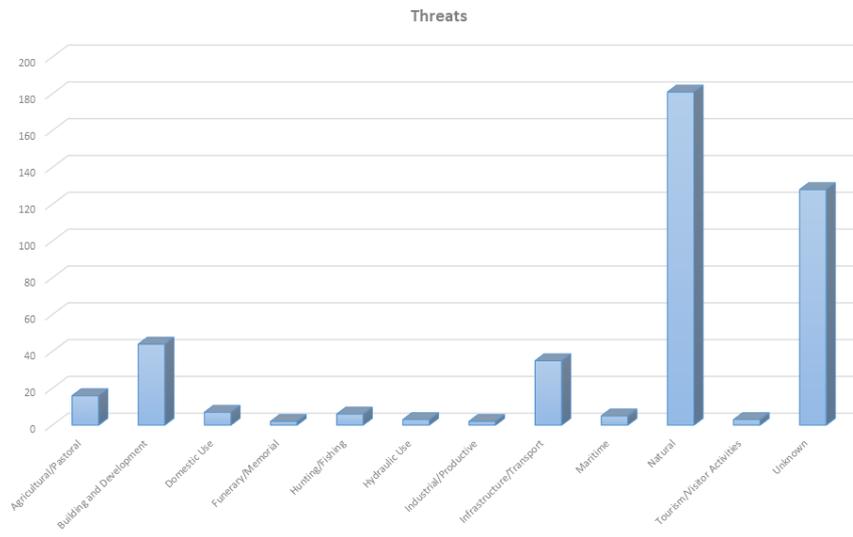


Figure 2- Summary of threats acting upon the heritage resource located within known MPAs across the MENA region. This is based on 546 recorded sites, with the Y-axis representing site numbers. Natural threats are associated with variables like storm damage, wave action and erosion, while unknown threats are represented by visible physical damage to sites, but we have been unable to assign the source for this damage. For example, a partially collapsed wall may have been damaged deliberately, or may have fallen due to age and deterioration.

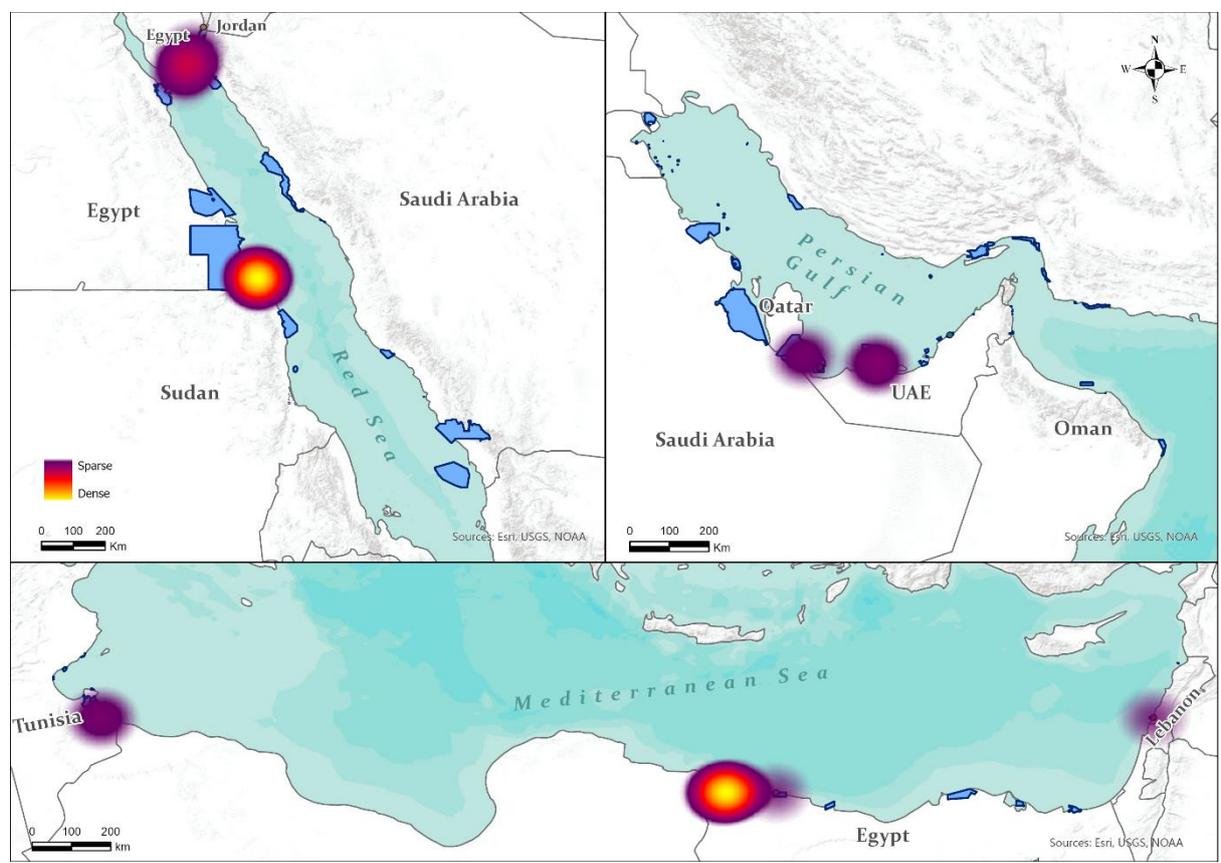


Figure 3- Density of MarEA documented archaeological sites within known MPAs. Note that density here is based on a dynamic representation adapted to the map frame for each of the Red Sea, Mediterranean Sea and the Arabian-Persian Gulf.

Case Studies

Tyre, Lebanon

The Tyre Coast Nature Reserve (TCNR) in Lebanon, was established by law (no.708/98) on the 5 November 1998 [32]. Under the direction of the Ministry of the Environment, a local management team and committee oversee the day-to-day operation of the MPA. The MPA itself that has a terrestrial area of 3.8 km², incorporating a sandy beach, and has a protected marine surface area of 113km² [33]. It is divided into three areas that include a tourist zone with beaches for recreational use and, secondly, a high conservation scientific zone including a dune system important for nesting turtles. A third zone is designated for agricultural use and includes the historic springs of Ras el Ain, a historic water mill and a fresh water estuary, with habitats for frogs and amphibians [34]. The springs were designated as national cultural heritage under the same decree, with its management overseen by the Directorate General of Antiquities (DGA), within the Ministry of Culture.

In 2013, TCNR was subject to a targeted biodiversity survey under the MedMPAnet project. The MedMPAnet project (2009-2014), was part of 'Strategic Partnership for the Greater Marine Ecosystem of the Mediterranean Sea' carried out by the Regional Activity Centre for Specially Protected Areas (RAC/SPA). The project aimed to protect biodiversity at national and international levels [35]. As such, it implemented a rapid natural habitat assessment of the TCNR in 2013, among other areas in Lebanon such as Nakoura and Saida. This assessment identified the uses and threats of considered areas, which extended beyond TCNR marine space to include the area north of Tyre's headland and the lagoon (Figure 4). The assessment identified a number of impacts and threats including coastal urbanisation, fishing and mooring. These threats not only impact natural heritage but also endanger MCH. Tyre's evaluation under the biodiversity survey and in light of impacts, ranked high, suggesting that an integral protection area of assessed zones is favoured. However, given the density of population within the city, the report found that a possible solution is in the implementation of multiuse and buffer protected zones around core areas of interest (Figure 4; [35]). These buffer zones are particularly relevant to Tyre's MCH.

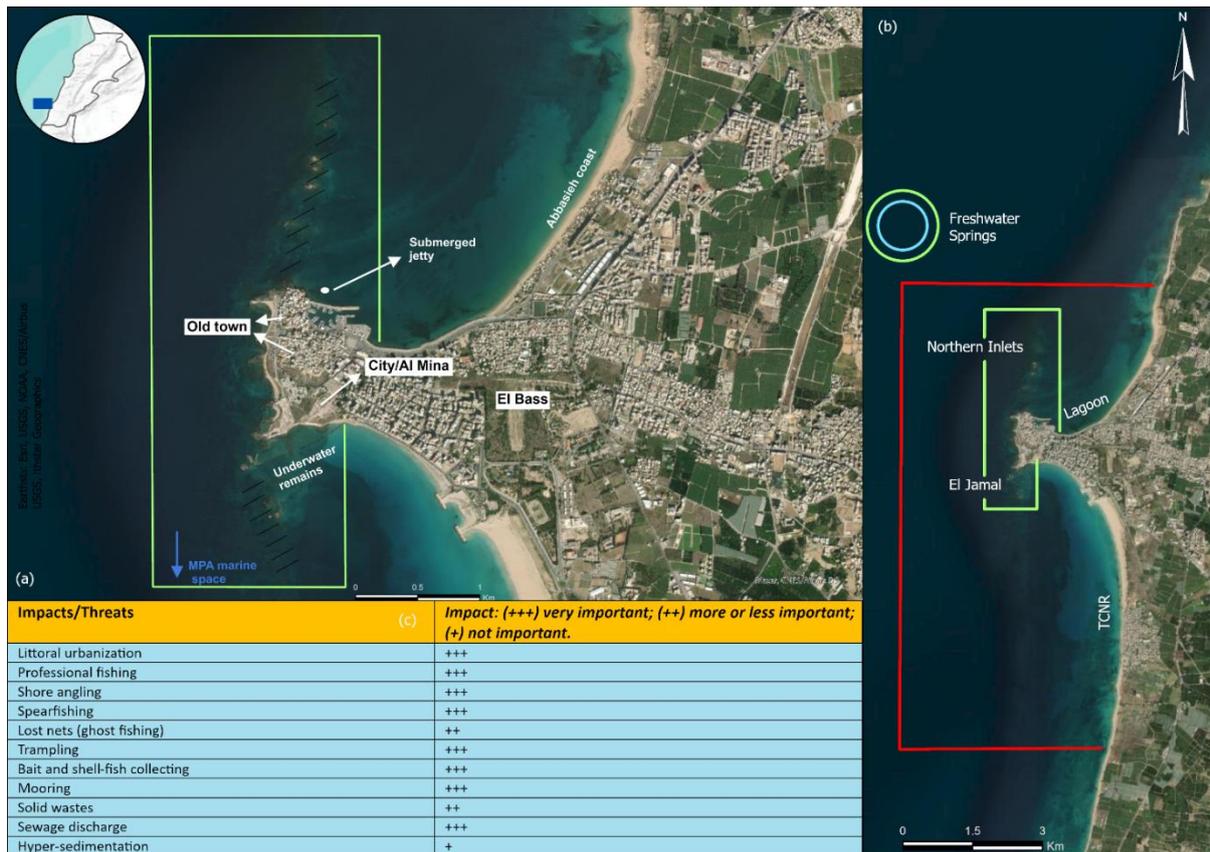


Figure 4- (a) Location of known and most relevant archaeology at Tyre. Dashed black line represents area of high archaeological potential [36]. The territorial zone of the TCNR lies further south of the headland. (b) Suggested protected areas by MedMPANet. Green denotes a buffer zone; red a multiuse zone, and blue a core zone. For Tyre’s headland, no core zone is designated given the proximity of inhabited land. (c) Assessment of threats and impacts acting upon Tyre based on the MedMPANet project. (b) and (c) are reproduced from Figures 9, 46, and Table 7 of RAC/SPA - UNEP/MAP, 2013.

Tyre was designated a World Heritage site in 1984 [37]. It has been subject to numerous archaeological surveys and projects all of which demonstrate its significance from antiquity to the modern era. Its earliest occupation is attested during the Early Bronze Age [38, 39], around the mid-fourth millennium BC, at a time when Tyre was an island located offshore of its adjacent mainland site known as Palaetyrus [40]. Following the construction of Alexander the Great’s tombolo in 332 BCE, that connected the island of Tyre to its mainland counterpart [41], Tyre’s maritime landscape underwent significant natural alterations, including sea-level rise, sedimentation and tectonic activities, and anthropogenic driven changes [42]. The site holds a large assemblage of archaeological remains and features, some of which lie submerged, e.g. now submerged Iron Age jetty and an underwater quarter in the south bay of the headland [43, 44, 45, 46]. International and local research projects have enabled a more detailed documentation and understanding of its archaeology and coastal landscape, yet much of our knowledge of the functioning of this maritime site, its harbour(s) and landscape/seascape alteration remain to be fully explored, especially the wider landscape and marine space south and north of the site, which may be of high archaeological potential.

Tyre is guaranteed protection under the Antiquities Law No. 166/1933 and the Law on Protection of Cultural Property, No 37/2008 [37] and is managed by the DGA. While its designation is paramount for the sustainability of this cultural asset, no exact boundary is defined [47]. Rather, a set of archaeological remains were listed in the nomination dossier: the City Site and the Al Bass Site (Figure

4). The site has come to the World Heritage Committee attention since 1995 with reports about modernisation projects in the historic harbour. Therefore, a buffer zone that would include maritime heritage at Tyre was suggested and ICOMOS further observed that Tell el-Maachouk, Rachidiyeh and Chouakir, east and south of the headland, are to be considered as essential components and incorporated in the property boundary [47]. Conversely, while the known underwater cultural heritage remains at Tyre lie immediately adjacent to the TCNR, they are not currently included within the MPA boundary. Some features, however, would fall within the MedMPANet suggested/potential zoning discussed above (Figure 4), e.g., the northern submerged jetty, but this zoning did not account for MCH in its assessment and as such could be amended for fuller integration. With the World Heritage boundary not defined as of yet and given the remit and desire of the DGA in instating its boundary and defining a buffer zone [48], there are clear opportunities here for an integrated natural and cultural heritage approach that would guarantee protection of Tyre's MCH. This can readily be achieved by extending the MPA boundary (through zoning or other means), following a maritime heritage assessment, to be inclusive of MCH especially since the protection of cultural resources is within the scope of MPA designation. This is particularly important given the range of natural and anthropogenic threats that continue to impact the area and that have been documented by the MarEA project, including overfishing and detrimental fishing techniques as well as the processes associated with climate and environmental change.

Both the legislative and policy frameworks exist within Lebanon to allow for boundary expansion and inclusion of the Tyre underwater cultural remains. As part of the country's strategy towards MPAs, article V dealing with protected landscapes and seascapes defines a protected area as '*where the interaction of people and nature over time has produced an area of distinct character with significant ecological, biological, cultural and scenic value: and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated nature conservation and other values*' [32]. The opening sections of the strategy discuss the need to identify gaps in knowledge, and the relative paucity of data relating to the country's MCH clearly presents opportunities here, while also allowing for the full integration of cultural heritage into existing and future management plans. MarEA is involved in mapping the extension of MCH at Tyre and devising an up-to-date record that has the potential to serve as basis for legislative and managerial initiatives.

Aqaba, Jordan

At the historic port town of Aqaba, Jordan, a national Marine Protected Area was established as part of a state plan to protect the country's near-shore marine environment. The Aqaba Marine Park was created in 1997 and is situated ca. 8 km south of the city of Aqaba. The park serves to protect habitats, species and coral reef systems, as well as facilitating eco-tourism activity, leisure diving, education, and scientific research [49, 50, 51]. Initially, the park was envisaged to be part of a much larger, multi-national MPA, also extending into Israel [52]. Although this 'Red Sea Marine Peace Park' has never fully materialized, many of its guiding principles have been influential in the establishment of the Aqaba Marine Park. The park is currently managed by the Aqaba Special Economic Zone Authority (ASEZA). The establishment and management of the park has been secured in Law no. 32/2000 and Regulation 22/2001. It has recently been declared a national reserve, with the intention of nominating this marine reserve for UNESCO's World Network of Biosphere Reserves [53].

The defining feature of the Aqaba Marine Park is a fringing reef running along much of its length. In the Gulf of Aqaba, these coral reefs and associated fauna are known to be exceptionally diverse [54] but are at the same time at risk from various threats. On the shores of the northern Gulf of Aqaba are two cities: Aqaba in Jordan and Eilat in Israel, which both have large ports and associated industrial sites. Pollutants from these urban and industrial areas threatening the natural environment range

from sewage and phosphate spill [55] to litter – both terrestrial and maritime (Abu-Hilal and al-Najjar 2004; 2009) [56, 57] – and light pollution [58].

Currently the Aqaba Marine Park covers ca. 2.8 km² (Figure 5). From the shoreline, it extends 50 m inland and 350 m into sea, over a length of ca. 7 km [50]. It is situated in a broader area which is earmarked to be developed for tourism [59]. The park is divided into four zones: one strict reserve zone designed for conservation and research; and three intended for recreational use. Park facilities include a visitor centre, formal dive sites – of which some are partly artificial – and associated infrastructure, public beaches, and a marine science station. Protection of the park's marine environment includes the enforcement of regulations of aquatic activities such as diving and boating. In addition, a number of laws and regulations are in place which prohibit pollution, fishing, littering and other harmful activities within the park [50].

The extent of the Aqaba Marine Park does not currently include cultural heritage, which is situated mostly within the urban environment further towards the north (Figure 5). This latter area includes various archaeological sites and monuments of historical importance as well as economic and societal value. A number of settlement mounds (*tells*) situated north of the city centre are of scientific importance, including the Chalcolithic/Bronze Age sites of Tell Magass and Tell Hujayrat al-Ghazlan [60], and the Iron Age site of Tell al-Kheleifeh [61]. Closer to the coast are several Nabataean, Roman, and Early Islamic-period remains pertinent to Aqaba's maritime history. Nabataean Aqaba (or *Aila*) was founded in the 1st century BCE and served as a seaport for trade across the Arabian Peninsula [62]. Scattered remains of the Nabataean settlement have been preserved within the modern city. Aila remained an important port during the Roman period, during which it also became an ecclesiastical centre. Remains of a church, possibly the oldest known so far in the region, have been unearthed at Aqaba [63]. Remains from the subsequent Early Islamic period comprise the well-preserved remains of a fortified town, including a mosque, a street network, and shops [64, 65]. Further south stands the restored medieval to early modern-period Aqaba Castle, which currently houses the Aqaba Museum [66]. In addition to these monuments on land, submerged archaeological remains have been recorded close to the Early Islamic settlement, possibly relating to an ancient harbour [67].

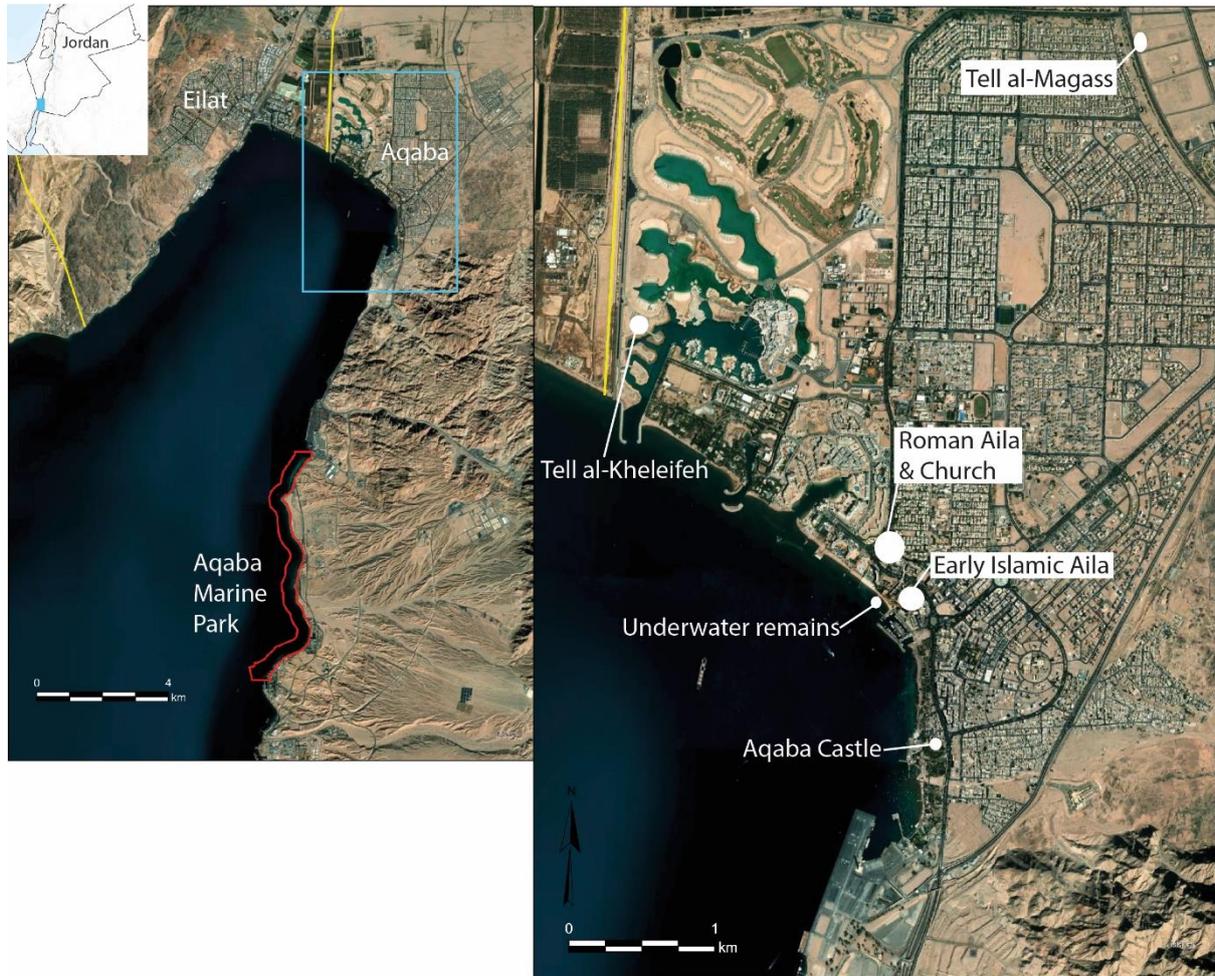


Figure 5: Location of the Aqaba Marine Park in the Gulf of Aqaba (left) and the location of maritime cultural heritage in the Aqaba cityscape (right).

Marine cultural heritage at Aqaba is at risk from anthropogenic threats such as urban sprawl and pollution, as well as natural threats including sea-level rise as a result of climate change, and erosion. Responsibility for the management and protection cultural heritage sites lies with the local branch of the Department of Antiquities (DoA) of Jordan, a department of the Ministry of Tourism and Antiquities, in accordance with Jordan’s Law of Antiquities (Law no. 21/1988, Amended by Law no. 23/2004). Through the efforts of the DoA, many of the archaeological sites have been fenced off, and several of these areas are being promoted and facilitated for tourism, such as the Roman-period church and city wall, and the Early Islamic town. The DoA has also been carrying out the restoration of the Aqaba Castle since 1980 [68]. A number of non-governmental organisations have further aided the protection of these archaeological sites. For example, USAID’s SCHEP programme, in collaboration with the Royal Marine Conservation Society of Jordan and the DoA, ran a project at the site of Early Islamic Aila. It included installing interpretive panels for visitors, establishing a Marine Heritage Unit, organising workshops about maritime heritage, compiling an online interactive eco-tourism map, and other initiatives related to capacity and awareness building [69].

There is considerable overlap between **marine** cultural heritage and natural heritage at Aqaba. The socio-economic value of these resources is clearly understood and efforts are being made to protect both from threats such as urban and industrial pollution, litter, and infrastructural development. This overlap has also been acknowledged by JREDS’ Marine Heritage Unit, who run an awareness and

protection programme around reefs of Aqaba as well as the Early Islamic town [70]. Such initiatives could be expanded more formally by integrating, both geographically and legislatively, natural and cultural heritage sites. This could be beneficial to increase the economic potential of both resources with respect to tourism, to build stronger and more holistic narratives and awareness about the history of Aqaba and its relation to the sea, and to protect submerged marine cultural heritage. Submerged archaeological remains off the coast of the city are currently not protected either by the Aqaba Marine Park or the DoA. Although the nature and extent of these remains are not yet fully known, maritime cultural heritage is clearly not limited to the shore. In order to protect the underwater cultural heritage from mooring boats, pollution, and construction, extending the marine protected area may be considered.

Conclusion

Most MPA designations have centred on natural heritage. While cultural heritage is often mentioned in passing during the appraisal and designation phase, it rarely features prominently in the management plans and activity programmes associated with these places. While this is understandable given the context of the development of this approach to marine management, there is a pressing need to expand the consideration of heritage in existing and future designations. This study has highlighted both the need and potential of integrating MCH into MPA operation in a more active and informed manner. The study arose out of a number of different perspectives. As the MarEA project developed, and as the extent of threat the MCH resource faced became apparent, its project researchers became increasingly concerned with protection and management strategies. While there are documented instances of legislatively protected underwater and coastal cultural heritage sites under various States' heritage laws, these tended to take an immediate site-specific strategy towards protection, as opposed to a more landscape focussed approach. In effect, this involved designating the immediate boundaries of sites like shipwrecks or medieval castles as the extent of the protected area, rather than taking into account the wider natural and cultural landscape context of these sites. MPA designation offers the opportunity to take a wider perspective by including the cultural resource within the broader MPA remit of management, education and community engagement activities.

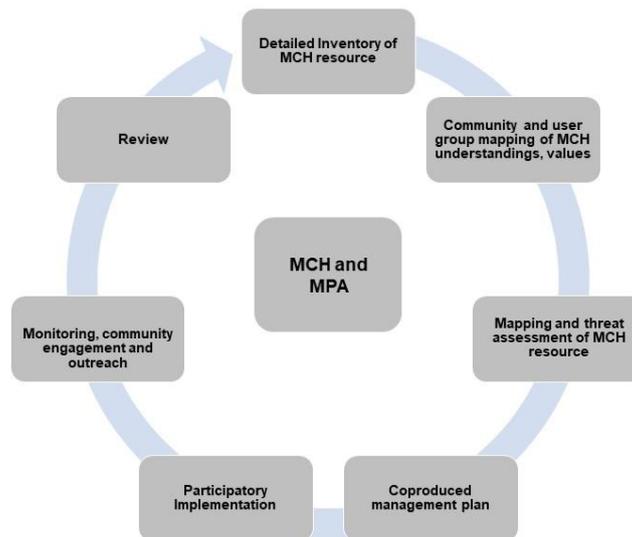


Figure 6: A staged, participatory approach towards the integration of Marine Cultural Heritage into MPA policy and practice.

In recognition of the benefits of adopting a more inclusive approach towards integrating MCH into MPA practice we suggest a model for a staged, participatory framework for the realisation of this objective. This should not be viewed as being exclusive towards natural heritage, but as an integrated stream within MPA consideration and realisation. The first stage of such an approach is the development of a detailed site inventory relating to the nature and extent of the MCH resource at a particular existing or proposed MPA. This would mostly consist of a desk-based appraisal of the resource, and an initial overview of past and existing cultural heritage work at the site.

Once an initial understanding of the resource has been developed, coupled with a detailed analysis of natural and physical environment, the project could move toward a community and user group mapping programme. This stage is designed as a participatory, inclusive engagement process that address the knowledge, understandings, needs and concerns of all parties associated either directly, or indirectly with the MPA. A subsequent mapping and threat assessment phase would follow up on these avenues, and help guide the subsequent development of a co-produced and agreed management plan. Such a plan can only be successful if it is implemented under a participatory framework, and regulated in an agreed manner. Continual monitoring of the resource and its management regime is required, alongside a programme of outreach and engagement that will further support and understanding around the MPA and its goals. All elements of the plan are kept under formal review, and a regular cycle or evaluation needs to be built into the overall framework. It is likely that every five years, the full cycle will need to be rerun.

The United Nations' Convention on Biological Diversity set a 10% target of the ocean to be protected by 2020, while IUCN World Conservation Congress recommended a 30% protection of the oceans by 2030. The UN Sustainable Development Goal 14 supports these commitments with a focus on conserving and sustainability using the oceans, seas and marine resources for sustainable development. Considering these international initiatives and national efforts, ascertaining the distribution of MCH within existing and proposed MPAs is a significant first step toward better integration in practices. In order to realise this approach, a platform for dialogue around reformulating existing MPA plans, and repositioning future plans needs to be formed that takes due cognisance of MCH. This needs to be an inclusive initiative involving all marine users, legislators and stakeholders. The realisation of such an ambition will not only significantly contribute towards, and enhance, the protection of MCH, but will also contribute positively towards MPA perception, use and societal engagement.

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References:

- [1] International Union for Conservation of Nature (IUCN) Protected Areas. <https://www.iucn.org/theme/protected-areas/about> (accessed June 2021).
- [2] E. Perez-Alvaro, Climate change and underwater cultural heritage: Impacts and challenges. *Journal of Cultural Heritage* 21 (2016) 842–848. <https://doi.org/10.1016/j.culher.2016.03.006>
- [3] M. Papageorgiou, Underwater cultural heritage facing maritime spatial planning: Legislative and technical issues. *Ocean and Coastal Management*, 165 (2018) 195–202. doi:10.1016/j.ocecoaman.2018.08.032.
- [4] G. Andreou, L. Blue, C. Breen, C. El Safadi, H. Huigens, J. Nikolaus, R. Ortiz-Vasquez, K. Westley, 2020. Maritime endangered archaeology of the Middle East and North Africa: The MarEA project. *Antiquity*, 94 (2020) 378, E36. doi:10.15184/aqy.2020.196
- [5] L. Reimann, A.T. Vafeidis, S. Brown et al. Mediterranean UNESCO World Heritage at risk from coastal flooding and erosion due to sea-level rise. *Nature Communications* 9 (2018) <https://doi.org/10.1038/s41467-018-06645-9>
- [6] J. Henderson, *Oceans without History? Marine Cultural Heritage and the Sustainable Development Agenda. Sustainability*. 11.18 (2019):5080. doi.org/10.3390/su11185080.
- [7] M. Nursey-Bray, P. Rist, Co-management and protected area management: Achieving effective management of a contested site, lessons from the Great Barrier Reef World Heritage Area (GBRWHA). *Marine Policy*, 33.1 (2009) 118-127.
- [8] G. Kelleher (ed.), *Guidelines for Marine Protected Areas*. World Commission on Protected Areas of IUCN – The World Conservation Union. 1999.
- [9] P. Christie, N.J. Bennett, N.J. Gray, T.A. Wilhelm, N.A. Lewis, J. Parks, N.C. Ban, R.L. Gruby, L. Gordon, J. Day, S. Taei, Why people matter in ocean governance: Incorporating human dimensions into large-scale marine protected areas. *Marine Policy*, 84 (2017) 273-284.
- [10] M. Sowman, J. Sunde, Social impacts of marine protected areas in South Africa on coastal fishing communities. *Ocean & coastal management*, 157 (2018) 168-179.
- [11] M.E. Portman, Y. Teff-Seker, Factors of success and failure for transboundary environmental cooperation: projects in the Gulf of Aqaba, *Journal of Environmental Policy & Planning*, 19.6 (2017) 810-826, DOI: [10.1080/1523908X.2017.1292873](https://doi.org/10.1080/1523908X.2017.1292873)
- [12] T.R. McClanahan, M.J. Marnane, J.E. Cinner, W.E. Kiene, A comparison of marine protected areas and alternative approaches to coral-reef management. *Current biology*, 16.14 (2006) 1408-1413.
- [13] G. Edgar, R. Stuart-Smith, T. Willis, Global conservation outcomes depend on marine protected areas with five key features. *Nature* 506 (2014) 216–220, <https://doi.org/10.1038/nature13022>

- [14] T. Lähdesmäki, T., 2016. Politics of tangibility, intangibility, and place in the making of a European cultural heritage in EU heritage policy. *International Journal of Heritage Studies*, 22.10 (2016) 766-780.
- [15] Y. Whelan, *Heritage, memory and the politics of identity: New perspectives on the cultural landscape*. Routledge, London. 2016.
- [16] B.W. Barr, 2013. Understanding and managing marine protected areas through integrating ecosystem based management within maritime cultural landscapes: Moving from theory to practice. *Ocean & coastal management*, 84 (2013) 184-192.
- [17] C. Westerdahl, The maritime cultural landscape. *International Journal of Nautical Archaeology*, 21 (1992) 5-14.
- [18] K. Kato, 2006. Community, Connection and Conservation: Intangible Cultural Values in Natural Heritage—the Case of Shirakami-sanchi World Heritage Area. *International Journal of Heritage Studies*, 12.5 (2006) 458-473.
- [19] M.H. Esfehiani, J.N. Albrecht, Roles of intangible cultural heritage in tourism in natural protected areas. *Journal of Heritage Tourism*, 13.1 (2018) 15-29.
- [20] M.M. Masud, F.B. Kari. Community attitudes towards environmental conservation behaviour: An empirical investigation within MPAs, Malaysia. *Marine Policy* 52 (2015) 138-144.
- [21] N. Roncin, F. Alban, E. Charbonnel, R. Crec'hriou, R. De La Cruz Modino, J.M. Culioli, M. Dimech, R. Goñi, I. Guala, R. Higgins, E. Lavisce, E. Uses of ecosystem services provided by MPAs: How much do they impact the local economy? A southern Europe perspective. *Journal for Nature Conservation*, 16.4 (2008) 256-270.
- [22] R. Fletcher, R., Baulcomb, C., Hall, S. Hussain, Revealing marine cultural ecosystem services in the Black Sea. *Marine Policy*, 50 (2014) 151–161.
- [23] K. Pike, D. Johnson, S. Fletcher, P. Wright, B. Lee, Social Value of Marine and Coastal Protected Areas in England and Wales. *Coastal Management*, 38 (2010) 412-432.
- [24] EASME EC Executive Agency for Small and Medium-sized Enterprises (European Commission) , ICF Consulting Services Limited , IEEP , PML 10.2826/40733 <https://op.europa.eu/en/publication-detail/-/publication/85897a77-b0c7-11e8-99ee-01aa75ed71a1/language-en/format-PDF/source-search>. Accessed February 2021.
- [25] M. Papageorgiou, Underwater cultural heritage facing maritime spatial planning: Legislative and technical issues. *Ocean and Coastal Management*, 165 (2018) 195–202.
doi:10.1016/j.ocecoaman.2018.08.032.
- [26] C. Alfonso, R. Auriemma, T. Scarano, G. Mastronuzzi, L. Calcagnile, G. Quarta, M. Di Bartolo, M. Ancient coastal landscape of the marine protected area of Porto Cesareo (Lecce, Italy): recent research. *Underwater Technology*, 30.4 (2012) 207-215.

- [27] M. Simeone, C. De Vivo, P. Masucci. An interdisciplinary approach to the preservation of the gaiola archaeological underwater park and the Posillipo Coastline, Bay of Naples (Southern Italy). *International Journal of Heritage in the Digital Era* 1.1_suppl (2012) 373-378.
- [28] **Scottish Government. A consultation on proposals to designate four Marine Protected Areas in Scottish waters. 2019 Available at: <https://consult.gov.scot/marine-scotland/four-new-marine-protected-areas/> Accessed June 2021.**
- [29] L. Rayne, J. Bradbury, D. Mattingly, G. Philip, R. Bewley, A. Wilson, From Above and on the Ground: Geospatial Methods for Recording Endangered Archaeology in the Middle East and North Africa. *Geosciences* 7 (2017) 100. doi:10.3390/geosciences7040100.
- [30] Marine Conservation Institute MPAtlas [On-line]. Seattle, WA. 2020 Available at: www.mpatlas.org [Accessed April 2020].
- [31] United Nations Environment Programme (2019). Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean and Its Protocols. Nairobi.
- [32] H. El Shaer, L. Samaha, G. Jaradi, Lebanon's Marine Protected Area Strategy: Supporting the management of important marine habitats and species in Lebanon. 2012 Beirut, Lebanon, Gland, Switzerland y Malaga, Spain: the Lebanese Ministry of Environment / IUCN.
- [33] TCNR-Leb (Tyre Coast Nature Reserve, Lebanon). 2018. TCNR in brief. Available at : <http://www.tcnr-leb.com/2018/10/26/tcnr-in-brief/> [Accessed December 1, 2020].
- [34] Daleel-Madani. Tyre Coast Nature Reserve. 2020 Available at: <https://daleel-madani.org/civil-society-directory/tyre-coast-nature-reserve> [Accessed December 1, 2020]
- [35] RAC/SPA - UNEP/MAP, Synthesis report of the ecological characterization of the marine areas of Nakoura, Tyre and Saida in Lebanon. By Ramos-Esplá A.A., Bitar G., El-Shaer H., Forcada A., Limam A., Ocaña O., Sghaier Y.R., and Valle C. Ed. RAC/SPA - MedMPAnet Project, Tunis: 2013, 38 p + annexes.
- [36] N. Marriner, C. Morhange, Preserving Lebanon's coastal archaeology: Beirut, Sidon and Tyre. *Ocean and Coastal Management* 51 (2008) 430-441.
- [37] UNESCO World Heritage Centre. World Heritage List. 2020 [online]. Available at: <http://whc.unesco.org/en/list/> [Accessed August 20, 2020].
- [38] P.M. Bikai, *The pottery of Tyre*, 1978 Aris & Philips Ltd, England.
- [39] E.M. Aubet, Tyre before Tyre: the Early Bronze Age Foundation. in A. Gilboa and A. Yasur-Landau (ed.) *Nomads of the Mediterranean: Trade and Contact in the Bronze and Iron Ages. Studies in honor of Michal Artzy*, Brill: Boston, 2020, pp. 14-30.
- [40] N. Jidéjian, *Tyre Through the Ages*. Beirut: Librairie orientale. 1996.
- [41] N. Carayon, *Les ports phéniciens et puniques. Géomorphologie et infrastructures*. 2008 Strasbourg: Université Marc Bloch.
- [42] N. Marriner, J.P. Goiran, C. Morhange, Alexander the Great's tombolos at Tyre and Alexandria, eastern Mediterranean. *Geomorphology* 11. 3-4 (2008) 277-400.

- [43] I. Nouredine, A. Mior, *Archaeological Survey of the Phoenician Harbour at Tyre, Lebanon*, *Bulletin d'archéologie et d'architecture Libanaises*. Beyrouth: Direction Générale des Antiquités. 2013.
- [44] I. Nouredine, J. Sicre, Archaeological Excavations at the Northern Ancient Harbor at Tyre – 2018. Honor Frost Foundation report. 2018 Available at: <https://honorfrostfoundation.org/wp-content/uploads/2019/07/Tyre-2018-webpage-.pdf> [Accessed June 1, 2020].
- [45] A. Badawi, M. Beydoun, N. Carayon, C. Doumet-Serhal, M. El-Amouri, H. Frost, A. Seif, *Mission de recherches géo-archéologiques à Tyr (Liban): Géomorphologie littoral et archéologie sous-marine. Mission UNESCO. Commission du Patrimoine Mondial (no. 700.893.1)*. 2002 Programme franco-libanais CEDRE (no. F60/L58) en accord avec la Direction Générale des Antiquités du Liban.
- [46] L. Semaan, Desk based assessment of maritime archaeological sites on the Lebanese coast. Honor Frost Foundation reports. 2015 Available at: <https://honorfrostfoundation.org/2015/01/01/desk-based-assessment-of-maritime-archaeology-in-lebanon/> [Accessed August 20, 2020].
- [47] ICOMOS (International Council on Monuments and Sites). Addendum Evaluations of Nominations of Cultural and Mixed Properties. ICOMOS report for the World Heritage Committee. 2013. Available at: <https://whc.unesco.org/en/documents/168018> [Accessed December 12, 2020].
- [48] Lebanese Republic. State of Conservation Report: world Heritage site of Tyre. Lebanese Ministry of Culture. 2019 Available at <https://whc.unesco.org/en/soc/3939> [Accessed December 16, 2020]
- [49] M.E. Portman, Zoning design for cross-border marine protected areas: The Red Sea Marine Peace Park case study. *Ocean and Coastal Management*, 50 (2007) 499-522 <http://dx.doi.org/10.1016/j.ocecoaman.2007.02.008>
- [50] UNDP/ASEZA, *State of the Coastal Environment, Report for Aqaba*. Aqaba: ASEZA. 2015.
- [51] M.K. Al-Zibdah, The Aqaba Marine Protected Area - Integration of Marine Science and Resource Management in the Gulf of Aqaba-Red Sea. *International Journal of Marine Science*, 2013, 44 doi: 10.5376/ijms.2013.03.0044.
- [52] M.E. Portman, Y. Teff-Seker, 2016. Remembering the Red Sea Marine Peace Park, in P. Mackelworth (ed.), *Marine Transboundary Conservation and Protected Areas*. London and New York: Routledge, 2016, pp. 89-110.
- [53] Jordan Times, 19-12-2020: <https://www.jordantimes.com/news/local/jordans-first-marine-reserve-step-closer-being-unesco-biosphere-reserve-list>. Accessed May 2020.
- [54] G.J., Hewison, B. Oren, Protecting Sensitive Aquatic Habitats in the Gulf of Aqaba, in D. Sandler, E. Adly and M.A. Al-Khoshman (eds), *Protecting the Gulf of Aqaba: A Regional Environmental Challenge*. Washington DC: Environmental Law Institute, 1993 pp. 119-141.
- [55] A. Abelson, B. Shteinman, M. Fine and S. Kaganovsky, 1999. Mass Transport from Pollution Sources to Remote Coral Reefs in Eilat (Gulf of Aqaba, Red Sea). *Marine Pollution Bulletin* 38(1) (1999) 25-29.
- [56] A.H. Abu-Hilal, T. Al-Najjar, Litter pollution on the Jordanian shores of the Gulf of Aqaba (Red Sea), *Marine Environmental Research* 58 (2004) 39-63 doi:10.1016/j.marenvres.2003.12.003

- [57] A.H. Abu-Hilal, T. Al-Najjar, Marine litter in coral reef areas along the Jordan Gulf of Aqaba, Red Sea. *Journal of Environmental Management* 90 (2009) 1043-1049
doi:10.1016/j.jenvman.2008.03.014
- [58] Y. Rosenberg, T. Doniger, O. Levy, Sustainability of coral reefs are affected by ecological light pollution in the Gulf of Aqaba/Eilat. *Communications Biology* 2 (2019) 289.
<https://doi.org/10.1038/s42003-019-0548-6>
- [59] M. Alaime, Aqaba: an Extra-Territorial City, in M. Ababsa (ed.), *Atlas of Jordan*. 2013, Beirut: Presses de l'IFPO.
- [60] L. Khalil, R. Eichmann K. Schmidt, Archaeological Survey and Excavations at the Wadi al-Yutum and Al-Magass Area Al-Aqaba (ASEYM): A Preliminary Report on the Third and Fourth Seasons Excavations at Tall Hujayrat al-Ghuzlan in 2002 and 2003 Wadi al-Yutum. *Annual of the Department of Antiquities Jordan* 47 (2003) 159-182.
- [61] G.D. Pratico, Nelson Glueck's 1938-1940 Excavations at Tell el-Kheleifeh: A Reappraisal. *Bulletin of the American Schools of Oriental Research* 259 (1985) 1-32.
- [62] S.T. Parker, The Foundation of Ayla: A Nabataean Port on the Red Sea. *Studies in the History and Archaeology of Jordan* 10 (2009) 685-690.
- [63] S.T. Parker, An Early Church, Perhaps the Oldest in the World, Found at Aqaba. *Near Eastern Archaeology* 61 (1998) 254.
- [64] D.S. Whitcomb, Aqaba, 1989-1990. *Syria* 70 (1993) 239-244.
- [65] K. Damgaard, A. Abu-Laban, M. Jennings, P. Lorien and C. Seye, A preliminary report on the 2010 field campaign of the Aylah Archaeological Project. 2010. University of Copenhagen.
- [66] R. Al-Shqour, J. de Meulemeester, D. Herremans, The Aqaba Castle Project. *Studies in the History and Archaeology of Jordan* 10 (2009) 641-655.
- [67] E. Eid, S. Al Fakhri, S. Islam, Aqaba Marine Heritage Project, in J.D.M. Green, B.A. Porter and C.P. Shelton, 2018 *Archaeology in Jordan Newsletter: 2016 and 2017 Seasons*. Amman: American Center of Oriental Research, (2018) 98-99.
- [68] R. Al-Shqour, J. de Meulemeester, D. Herremans, The Aqaba Castle Project. *Studies in the History and Archaeology of Jordan* 10 (2009) 641-655.
- [69] N.I. Aladarbeh, S. Carter, S. Smith and S. Abu Abali, *The Story of SCHEP: Sustainable Cultural Heritage Through Engagement of Local Communities Project 2014-2018*. 2020 Amman: American Center of Oriental Research.
- [70] JREDS. Explore the Mysteries of the Depth of the Gulf of Aqaba 2018 <https://www.jreds.org/en-us/Achievements-Management/ArticleID/2/Explore-the-mysterious-depths-of-the-Gulf-of-Aqaba>. Accessed March 2020.
- [71] E. Scala, J. Lubchenco, K. Grorup-Colvert, C. Novelli, C. Roberts, U.R. Sumaila, Assessing real progress towards effective ocean protection. *Marine Policy* 9.1 (2018) 11-13.

