Updated Protected Area Management Plan for Palm Island Nature Reserve

Prepared by

The Lebanese Committee for Environment & Sustainable Development

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Contents

ACRONYMS

ACCOBAMS	Agreement on Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area
ACNR	Abbasiyeh Coast Nature Reserve
AEWA	African Eurasian Water Bird Agreement
APAC	Appointed Protected Area Committee
CBD	Convention on Biological Diversity
GEF	Global Environment Facility
IBA	Important Bird Area
IUCN-ROWA	International Union for the Conservation of Nature - Regional Office for West Asia
MOA	Ministry of Agriculture
MOE	Ministry of Environment
MP	Management Plan
MPA	Marine Protected Area
MOTPW	Ministry of Transport and Public Works
NCSR	National Council for Scientific Research
NIS	Non-Indigenous Species
PINR	Palm Island Nature Reserve
SPA	Specially Protected Area
SPAMI	Specially Protected Area of Mediterranean Importance
TCNR	Tyre Coast Nature Reserve
UNEP	United Nations Environment Programme

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1. INTRODUCTION

The preparation of an "Updated Protected Area Management Plan for Palm Island Nature Reserve" falls under the framework of the project "Market policy and legislative development for mainstreaming the sustainable management of marine and coastal ecosystems in Lebanon", executed by the International Union for the Conservation of Nature - Regional Office for West Asia IUCN-ROWA, and implemented in partnership with the Lebanese Ministry of Environment (MOE) and with a fund from the Global Environment Facility (GEF) and the United Nations Environment Programme (UNEP) as an implementing agency. The project aims to create an enabling integrated framework for coastal and marine biodiversity management and protection, and to mainstream marine and coastal biodiversity into national plans and coastal zone management plans, with particular focus on the impact of climate change on biodiversity.

The updated Management Plan (MP) for Palm Island Nature Reserve (PINR) aims to provide a sustainable and economically viable policy as well as technological options for the protection and management of key Marine Protected Area (MPA) and their integration into national plans. The updated MP is supposed to set the management approach and goals, together with a framework for decision making, to be applied in PINR over a period of 5 years (2022-2026). Moreover, the management plan should be comprehensive and will address the current and expected future needs and concerns of the MPA. The development of the updated MP for PINR will follow IUCN's management planning guidelines[1] and adapt them to the Lebanese context. Also, it will take into consideration the previous MP for PINR developed for the period 2000-2005. The updated MP will cover the following main sections:

a) Refined management objectives and outputs.
b) Description of the PINR outlining its main features; location and boundaries, natural cultural, historic and socio-economic conditions; current use; legal and management frameworks; organizational structure.
c) Zoning plan and base maps of the site.
d) Identification of the PINR stakeholders.
e) SWOT analysis including constraints and opportunities and threats to conservation management and maintenance in PINR.
f) Five-years operational plan linked to the set objectives with an action plan for each year covering the following activities in PINR: ecotourism, biodiversity monitoring, conservation and restoration, scientific research, awareness, patrolling, protection and enforcement, socio-economic development, etc.).

The updated MP will serve as a tool to define and achieve the mandate of PINR. It will address the current and expected future needs and concerns of PINR and it will provide a mechanism to consider the threats and opportunities as well as a systematic structure of pre-defined steps that address the rationale for the proposed actions and implementation arrangements. Moreover, the updated MP for PINR will help and inform decision makers and other relevant stakeholders to manage PINR in a sustainable way, and to ensure its effective contribution to environmental protection and socio-economic development on the local and national levels. Updating the Management Plan of PINR is an essential step towards ensuring the proper management of this MPA.

This report presents a desk review of PINR based on existing reports and studies. It includes an assessment of gaps and identification of needs for the proper management of PINR, the conservation and sustainable use of its biodiversity, and its sustainable development with focus on the social and economic dimensions. The desk review forms a basis for the field work and stakeholders' consultations, which will be an integral part of the updated MP.

[1] Thomas, Lee and Middleton, Julie, (2003). *Guidelines for Management Planning of Protected Areas*. IUCN Gland, Switzerland and Cambridge, UK. ix + 79pp.

The Palm Islands are public property and were declared protected area by Law No. 121 on 9 March 1992. PINR has several international designations, it was designated an Important Bird Area (IBA) in 1994 by BirdLife International, included on the list of Wetlands of International Importance under the Ramsar Convention in August 2001 (site No. 1079), and a Specially Protected Area of Mediterranean Importance (SPAMI) in 2012 under the 1995 Barcelona Convention. A management plan already exists for PINR (2000-2005); however, the MP needs to be updated in order to address the gaps and to accommodate the current needs of the MPA and the new trends of coastal and marine ecosystem conservation and management, while taking into consideration the social and economic dynamics of the surrounding area.

2. GEOGRAPHICAL AND PHYSICAL CONTEXT

The Lebanese coastline extends over 240 km in length, it constitutes around 8% of the total area of the country and comprises 33% of the total built-up area and hosts 55% of the total population. The Lebanese coastal area is part of the Mediterranean region that is considered a global biodiversity hotspot. It supports an amazing diversity and abundance of marine life and human activities, contributing to the Lebanese economy and offering enormous potential for future economic, social and cultural benefits. The industrial sector is considered the most developed sector on the coast of North Lebanon and it is the main contributor to the coastal economic activity. The array of marine habitats in Lebanese waters, supports a diversity of marine life, represented by Atlanto–Mediterranean species. The total species richness, counted until now along the Lebanese coastline is estimated in the thousands. The list of species not exhaustive until now and being continuously updated, is represented by 208 Macrophytes (Lakkis, 2013; Badreddine *et al*., 2018), including 29 Non-Indigenous Species (NIS) (Bitar *et al*., 2017), and around 1078 invertebrates including 200 NIS (SPA/RAC–UN Environment/MAP, 2018; Badreddine *et al*., 2019; Bitar and Badreddine, 2019; Bitar and Badreddine in Stern *et al*., 2019; Badreddine *et al*., 2020; Badreddine and Bitar, 2020b; Bitar and Badreddine, 2020; Badreddine and Crocetta in Orfinidis *et al*., 2021), and 376 fish, including 76 NIS (Badreddine and Bitar, 2019; Bariche and Fricke, 2020; Badreddine and Bitar 2020b; Bitar and Badreddine in Ragkousis *et al*., 2020; Bariche, M. & Mavruk, S. in: Ragkousis *et al*., 2020. However, several major engineering species are lacking, such as the seagrass Posidonia oceanica (Linnaeus) Delile, and the sea fans Paramuricea clavata (Risso, 1826) and Eunicella spp. (Badreddine, 2018).

Lebanon's coast suffers from strip and winter storms, extraction of sand from beaches, establishment of ports, recreation and encroachment on public lands, which reduces the proportion of marine sediments and leads to sediment environmental scarcity. Small numbers of sandy beaches are left in good condition: Jbeil, Al Maameltein, Beirut and Tyre. Threats to the great potential offered by the coast already exist, such as uncontrolled urban sprawl, increased privatization of the shorefront, reduced public access to the beach, solid waste dumping, wastewater discharges, sea filling and sand extraction (MOE, 2011). Furthermore, the increased interest using of the coastal zone and its resources has led to conflicting interests among different coastal users. If immediate and appropriate measures are not taken to mitigate the impacts generated by natural processes and human activities, the marine environment along the coast and the quality of life of its inhabitants will deteriorate. Sea pollution was best exemplified by the war in July 2006 which caused a devastating oil spill affecting an important part of the Lebanon coastline including the PINR. Subsequent to this, several activities were undertaken to clean up the sea and shoreline, followed by additional measures to maintain healthy and productive sea ecosystems that allow the Lebanese to benefit from the economic, environmental, cultural and recreational services that their sea has to offer. (MOE & IUCN, 2012)

The Lebanese coastline is mainly a rocky shoreline with stretches of sand (20%) and pebbles inhabited by a variety of common and endangered species. The marine and coastal fauna and flora in Lebanon are considered Mediterranean with some subtropical elements. Unfortunately, over the years, the marine and coastal ecosystem in Lebanon has been threatened by a multitude of factors that have caused the loss of species, the fragmentation or destruction of habitats: urban sprawl, industrialization, domestic waste, tourism activities, sand and pebble extraction, sand dredging, sea filling, water pollution, illegal and overfishing. Man-made embankments have destroyed several important biocoenoses, which are vital environments for the spawning and feeding of several

species of coastal and deep-sea fish. In addition, the sea birds suffer also from persecution, illegal fishing using poisonous products such as aluminum phosphide, lannate, in addition to the use of dynamite. On beaches, gull's eggs are stolen by fishermen to use them as aphrodisiac food. Gulls, waders and marine birds are killed by trash accidentally ingested, and in the sea the diving cormorants are caught by fishing nets. These destructive activities are predominantly due to the lack of law enforcement and lack of public awareness. Within its efforts to protect ecosystems and biodiversity in Lebanon, the MOE designated 18 nature reserves covering different natural ecosystems including three coastal and marine protected areas: Palm Island Nature Reserve (PINR) in the north, Tyre Coast Nature Reserve (TCNR) and Abassiyeh Coast Nature Reserve (ACNR) in the south. (Figure 1)

#	Nature Reserve	District – Governorate
1	Palm Island	Tripoli – North Lebanon
2	Karm Chbat	Akkar
3	Horsh Ehden	Zgharta – North Lebanon
4	Tannourine Cedars	Batroun – North Lebanon
5	Bentael	Jbeil – Mount Lebanon
6	Jaj Cedars	Jbeil – Mount Lebanon
7	Yammouneh	Baalbeck
8	Chnanaair	Kesrouane – Mount Lebanon
9	Shouf Biosphere	Shouf – Mount Lebanon
10	Jabal El Sheikh	Rachaya - Hasbaya
11	Nmayrieh	Nabatieh
12	Abbassieh	Sour – South Lebanon
13	Tyre Coast	Sour – South Lebanon
14	Wadi Al Houjair	Marjaayoun – Nabatieh – Bint Jbail
15	Beit Lif	Bint Jbail
16	Ramia	Bint Jbail
17	Debel	Bint Jbail
18	Kafra	Bint Jbail

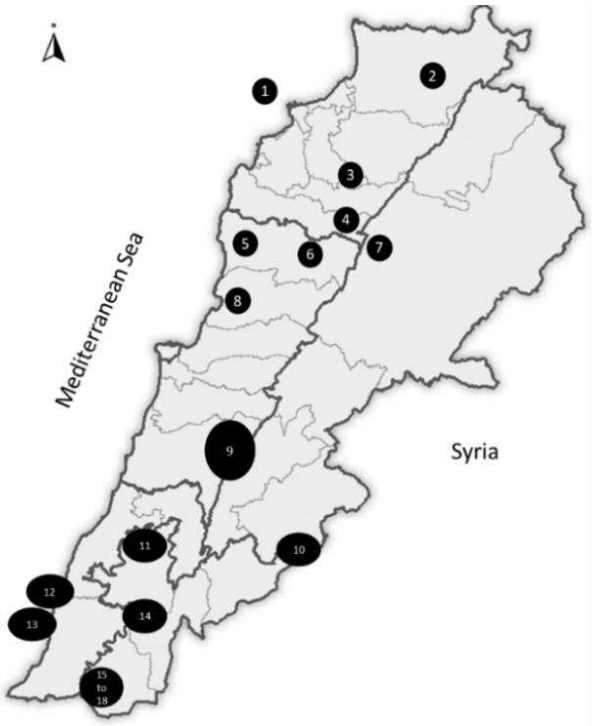

Figure 1. Lebanon's nature reserves map.
Source: (Authors)

2.1. PINR location

PINR lies between longitude 35º 44' 30"- 35º 47' East and Latitude 34º 29' - 34º 30' 33" North. The reserve is situated at 5.5 km from the shore of Tripoli/El-Mina; its overall area (including 500 meters of sea surrounding the islands) is about 4.2 Km^2 distributed as follow: marine area: 3.95 km^2, terrestrial area 25.6 ha, with a perimeter 5.18 km (UNEP, 2011). (Figure 2, Figure 3, Figure 4)

Figure 2. PINR geographical location in North Lebanon

Figure 3. PINR islands in the Meditteranean Sea facing Tripoli

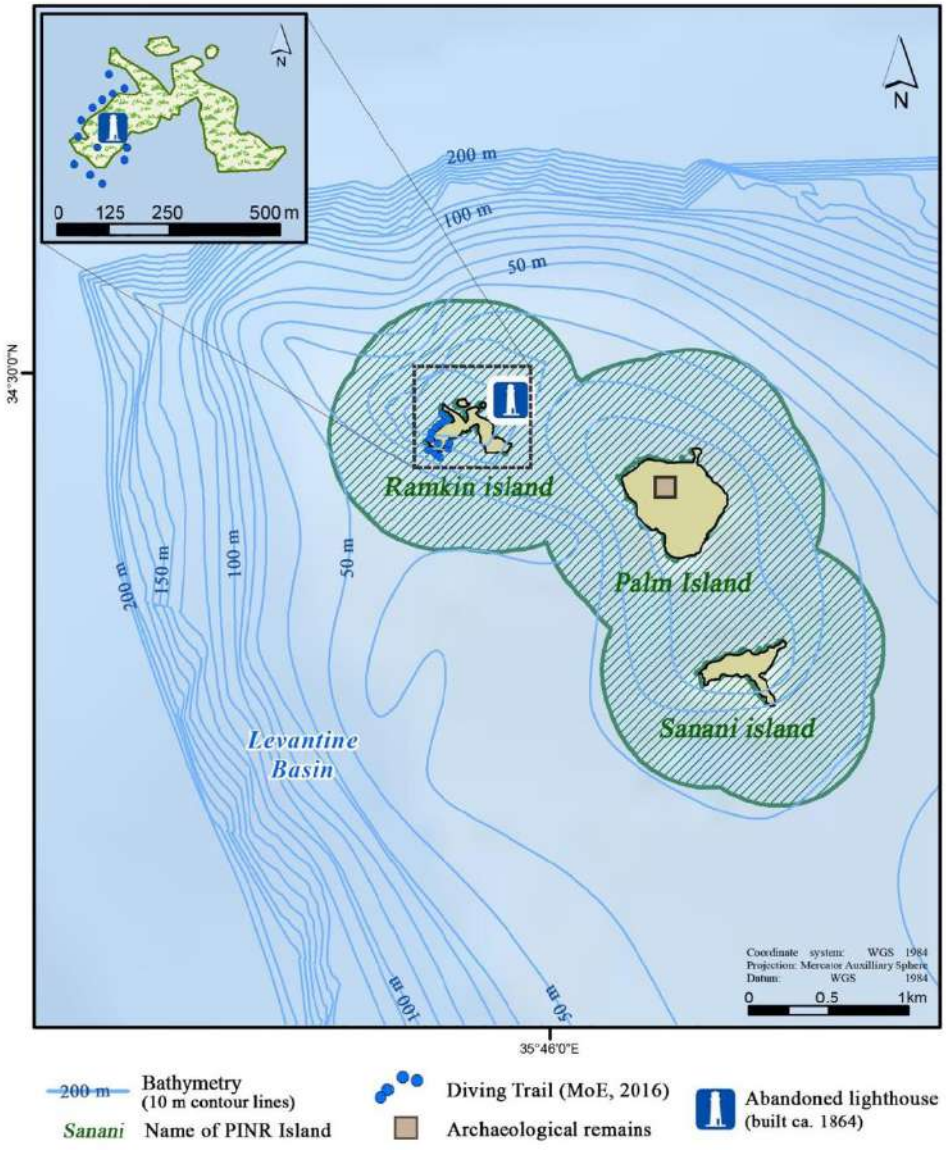

Figure 4. PINR and its surrounding sea belt (in green).
Source: (Noon, 2019)

PINR is the only uninhabited marine reserve in the East Mediterranean area. It represents a mosaic of inter-linked cultural, natural and historic sites, a significant hotspot for the sea crossing birds and a natural history museum for coastal plants. The reserve is a haven for the globally threatened wintering Green Turtle (*Chelonia mydas*), the breeding vulnerable Loggerhead Turtle (*Caretta caretta*), and the critically Endangered Monk seal (*Monachus monachus*). Moreover, the reserve is a nesting site for 10 bird species and a resting site for more than 160 bird species, including internationally threatened species (Ramdan-Jaradi *et al.*, 2007).

2.2. PINR Islands

2.2.1. Palm Island

Palm Island, also known as Jaziret El Nakhl in Arabic or Rabbit Island is the largest of the three islands, covering an area of 200,000 m2 (perimeter 1.78 km) and is flat with no obvious relief; its highest point is only about 6 meters above sea level (Figure 5). The earthen middle separates a rocky shoreline extending from the northwest to south, and a sandy beach extending from the north to the east. The island contains evidence of past periods of human occupation in the form of a fresh water well, old sea salt ponds (or Salinas) and the remains of an old church and bathes carved into rocks that date back to the Crusaders period. A lot of work has been done to rehabilitate the island. The well was cleaned, fenced with wooden material and maintained; the water used to irrigate the 570 palm trees planted on the island (now c.250 are left). A walking trail and a dock for boats have been constructed and areas for research and recreation have been demarcated. (UNEP, 2011)

Figure 5. Rabbit or Nakhl Island.
©Kameel Rayes

Wooden umbrellas, benches, signage, paths, bridges, balconies, resting shelters, and wind mill were installed. This island is opened for visitation in July, August and September since 2000 without visitation permit unless if security reasons are imposed. In 2006, the Palm Island was contaminated with oil from the spill, resulting from the Israeli attack on Jieyyeh oil tanks. Efforts to clean it up from the oil spill extended for two years (2006-2008).

Out of the three islands forming the PINR, Palm Island is the only one that was divided in zones because of its ecosystems and biological diversity (IUCN-AUB, 2015). The three zones are (i) recreational area open for visitors where ecotourism activities are allowed, it includes as well the loggerhead turtle breeding area, (ii) research area open for scientists and researches only, and (iii) a strictly protected area serving as a haven for sea birds breeding. (Figure 6)

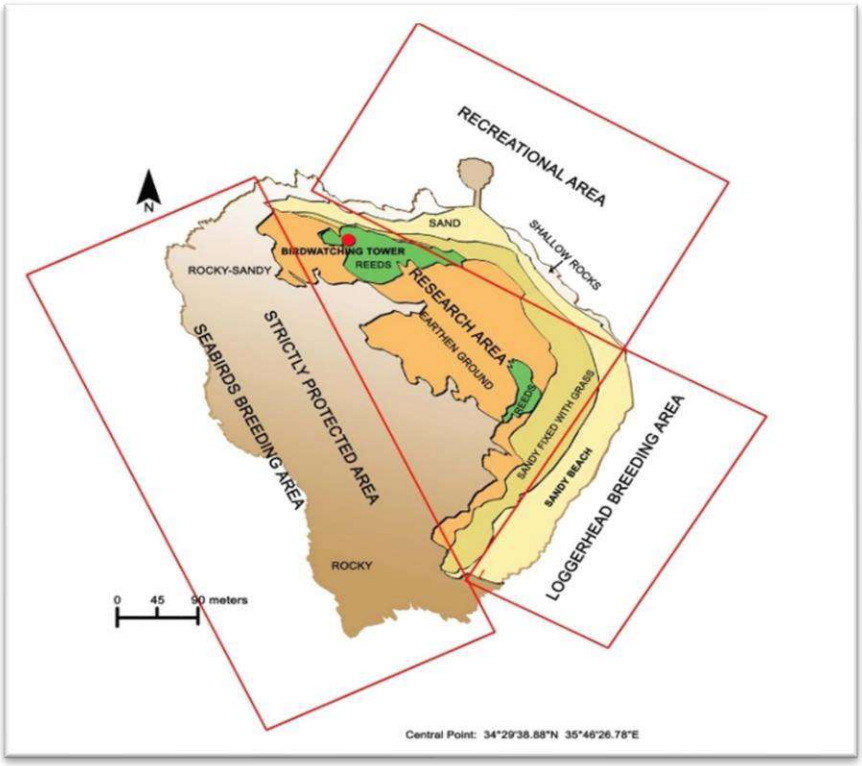

Figure 6. Palm Island zonation into various zones in relation with the land use.
Source: (Ghassan Ramadan-Jaradi in IUCN-AUB, 2015).

2.2.2. Sanani Island

Sanani Island covers an area of 40,000 m^2 (perimeter 1.37 km) southeast of Palm Island. It is mainly rocky with a partially sandy shore that resembles that of Palm Island (UNEP, 2011). This island was cleaned of debris and opened for visitation since August and September 1998 and July, August and September 1999 till it was heavily contaminated with oil in 2006. Efforts to clean it up from the oil spill extended for two years (2006-2008). Presently, attempts to clean the island from recent tars are ongoing. (Figure 7)

Figure 7. Sanani Island.
Source: Google Earth

2.2.3. Ramkine Island

Ramkine Island (also known as Fanar Island) is the smallest island, with an area of 16,000 m^2 (perimeter 2.03 km) is located northwest of Palm Island (Figure 8). Ramkine Island is mostly rocky and rises to about 12 meters above sea level. The island contains the remains of a lighthouse in addition to cannon emplacements and underground galleries that were built early in the nineteenth century (UNEP, 2011).

Figure 8. Ramkine Island.
©Jad Abou Arrage

Following negotiations with the Ministry of Transport and Public Works (MOTPW), a solar powered navigation light has been installed in the tower of the old lighthouse. The island was opened for visitation since July, August and September 1999 until it was heavily contaminated with oil in 2006. Efforts to clean it up from the oil spill extended for two years (2006-2008). Presently, attempts to clean the island from recent tars are ongoing.

2.3. PINR land use and land cover

According to the latest study done by IUCN-ROWA and MOE in 2020 about PINR economic value, and based on previous biodiversity assessment studies, literature review and expertise of Dr. Ghassan Ramadan-Jaradi, the different ecosystems (Table 1), as well as the Land Use Land Cover (LULC) of the reserve was identified and mapped (IUCN-ROWA & MOE, 2020). The "insular" biodiversity assessment study conducted by Ramadan-Jaradi *et al.* (2007), reveals that only 64% of the Palm Island in PINR has a green cover. The most densely covered part is the middle area between the sand and the rock zones as shown in the LCLU map (Figure 9). Concerning Sanani Island, it is a small one characterized by a central hill of soil deposits, circled by rocky extensions that expand down to the shoreline and further under water, with the exception of a small sandy beach on its eastern side (**Error! Reference source not found.**). As for Ramkine Island, it is a block of solid rock raised 5-10 m above sea level (Figure 11).

Table 1. The different ecosystems identified in the three Islands of PINR

Ecosystem		Surface (ha)	Percentage
Terrestrial	Sand dunes and sandy beach	3.84	0.92
	Mixed loamy soil incl. vegetation-reed beds	4.51	1.08
	Earthen Rocks	17.55	4.20
	Total Terrestrial	25.90	6.19
Marine	Sea water	392.00	93.78

Figure 9. Palm Island LULC map.
Source: (IUCN-ROWA & MOE, 2020)

Figure 10. Sanani Island LULC map.
Source: (IUCN-ROWA & MOE, 2020)

Figure 11. Ramkine Island LULC map.
Source: (IUCN-ROWA & MOE, 2020)

3. LEGAL FRAMEWORK

3.1. PINR national designation

Palm Island was declared a nature reserve in 1992 under the issued Law number 121. In 2019, a new law was voted by the Lebanese parliament (law No. 130) determining the legal framework for the establishment and management of terrestrial or marine Protected Areas in Lebanon. The law establishes the following objectives (i) protection of the components of biological diversity, especially those that are threatened, poor, rare, inclined or unique; (ii) reconstruction of the natural biodiversity landscape; (iii) ecosystems preservation; (iv) protection of birds, as well as both sedentary and migratory species; (v) preservation of landscapes and distinctive natural features. The new law classified the protected areas into four main categories (1) nature reserve, under which falls PINR; (2) natural park; (3) natural landmark sites; and (4) Hima (sites including a natural ecosystem and may incorporate another sustainable modified part, i.e., through the sustainable use of natural resources). In addition to the law number 121 of 1992 and number 130 of 2019, there are a number of relevant laws and decrees and initiatives that affect PINR:

- Law number 444/02 (Code of Environment) specifies, under Chapter VIII, the protection, conservation and management of nature and biodiversity,
- Decree No. 8213 dated 24/5/2012 relating to the "Strategic Environmental Assessment for Proposed Policies and Plans and Programs in the Public Sector" or SEA decree.
- Decree No. 8633 dated 7/8/2012 relating to the "Fundamentals of Environmental Impact Assessment" or EIA decree. According to this decree, all major development, infrastructure and industrial projects are subject to EIA or IEE studies including their effects on biodiversity, in order to promote conservation activities and prevent the damage of the surrounding environment by these projects before receiving approval.
- Law number 508/04 is the latest decision for controlling hunting in terms of season, amount and type along with a permit system based on regular testing,
- MOE Decision number 151/1 states the protection of marine turtles, monk seals and dolphins
- MOE Decision number 396 states the protection of marine birds.

- Law, issued as decision No. 2775 dated 1929, relating to the control of marine & coastal fishing and its amendments, in addition to MOA decisions number 346/1, 8/1, 1044/1 and 1045/1 regulating the fishing activities and the protection marine biodiversity.
- Decision of the Minister of Agriculture No. 125/1 dated 23/9/1999 banning the fishing of marine turtles, monk seals and whales as well as selling, use or trade of any derivatives from the mentioned species.
- Decision of the Minister of Agriculture No. 1/385, issued January 26th, 1997, stating that fishing activities are prohibited in all estuaries all year round. The protected area involved extends over 500 m on each side of the estuary, 500 m inside the river and 2 km seawards. All human activities are banned except for those of scientists and the Coast Guard.
- Decision of the Minister of Agriculture No. 93/1 dated 14/3/2008 regulating scuba-diving industry including permitting procedures and safety measures and scuba-diving fishing.

3.2. PINR international designations

Internationally, the conservation of PINR falls within the international approach for the conservation of wetlands as defined by the RAMSAR convention. Lebanon has ratified the Ramsar Convention in 1999 and designated PINR as Ramsar site (or Ramsar Wetland of Special International Importance) under the Ramsar convention number 1079 on the 3rd of August 2001. In accordance with the main objectives of the Ramsar convention, efforts in PINR have focused on (i) maintaining the reserve's ecological characteristics; (ii) using the site's resources in a sustainable manner. Moreover, PINR was designated an Important Bird Area (IBA) in 1994 by BirdLife International, and a Specially Protected Area of Mediterranean Importance (SPAMI) in 2012 under the 1995 Barcelona Convention. On the other hand, PINR management is influenced by several international conventions and agreements that have either been signed or ratified by the Lebanese government. These conventions include:

- The Convention on Biological Diversity (CBD) signed in 1992 and ratified in 1994 (Law No. 360/94).
- The African Eurasian Water Bird Agreement (AEWA) ratified in June 2002 (Law No. 412).
- The Mediterranean Action Plan of the United Nations Environment Programme (UNEP) that was signed and ratified in 1975.
- The UNESCO Convention on the Protection of Cultural and Natural Heritage (Adhesion by the Government of Lebanon in 30/10/1990 through Law No. 19).
- The Barcelona Convention and protocols for protection of the Mediterranean Sea against pollution (signature by the Government of Lebanon on 16/2/1976, accession in 30/6/1977 through legislative decree no. 126) and its amendments (Adhesion on 16/10/2008 through law No. 34).
- The revised Action Plan for the conservation of marine turtles (1999) under Specially Protected Area (SPA) of Barcelona Convention.
- The United Nation Convention on the Law of the Sea that was signed and ratified in 1995.
- The Agreement on Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic area (ACCOBAMS) (Adhesion by the Government of Lebanon on 5/2/2004 through Law No. 571).

3.3. Legal rights

PINR is a state land that is under the mandate of the Ministry of Finance, however due to the diverse uses of the site; the legal rights and mandates are distributed over different institutions, including:

1. MOE is mandated to conserve and manage PINR's biodiversity.
2. Ministry of Agriculture (MOA) is responsible for regulating and controlling fishing activities in the area.
3. MOTPW is mandated over all beaches in Lebanon; and has a responsibility towards sea transport, boats registration and harbors management, including El Mina port. MOTPW is responsible for running the lighthouse installed on Ramkine Island.
4. Ministry of Culture, through the Directorate General of Antiquities, is mandated over all archeological and historical sites of PINR.
5. Municipalities of El Mina and Tripoli have the mandate to offer yearly funds to PINR and to participate in the latter's advisory committee.
6. Ministry of Internal Security and Municipalities for its role to enforce the laws.
7. Ministry of Defense and Lebanese Army are responsible for controlling the coastline and the sea for security reasons and illegal smuggling and human trafficking, in addition to patrolling the area and inhibiting poaching activities.

The existing penalties (Articles 6, 7, 8 and 9 of the Law 121/92) provide the power needed to effectively conserve and protect the PINR and are sufficient to dissuade infractions. (UNEP, 2011)

4. NATURAL HERITAGE AND BIODIVERSITY

4.1. Physiographic characteristics

4.1.1. Geology

The rocky basement of the islands is mainly horizontally bedded marine limestone interpreted as Miocene deposits by M René Wetzel in the geological map of Tripoli (UNEP, 2011). However, no tectonic features are visible in this limestone to distinguish it from the Miocene limestone of Jabal Terbol, Nahr el Kalb, or Achrafieh. With the lack of fossil evidence, and with its regular sedimentation, this limestone could be interpreted to be more likely from the Plio-Quaternary age. The rocks of the intertidal zone are formed from vermetids (species of gastropods and allied) which offer a line of defense to the real limestone rocks against the action of waves and sea storms. The sandy shore and dunes of two of the islands have the peculiarity of a biological origin. It is mostly represented by the skeletons of marine benthic foraminifera, resulting in a very light "sand" with a mixture of tiny gastropod shells and parts of skeletons and spines of echinoderms. The sandy shore differs in extent throughout the year, being reduced during bad weather and influenced by the direction of water currents.

4.1.2. Geomorphology

The limestone presents typical karstic features due to marine and emerged aerial erosion. In both cases open gutters can be seen, wide and open in the case of marine erosion, narrower in higher places. All around the islands there are bare rocky exposures as a result of marine erosion in the form of dissolution and physical action of the waves. Sand dunes form the higher parts of Palm Island and are the location of evidence of human occupation.

4.1.3. Climate and Hydrology

The PINR climate is a Temperate Mediterranean Bioclimatic Stage with thermic variant of cool winter, with an annual rainfall average of 930 mm (UNEP, 2011). Marine waters are mainly represented in a lot of pools on the seaside of the rocky shore. During winter, fresh water fills the narrow pools of the diaclases and some larger pools within the dunes. By digging in the dunes some fresh water can be obtained even in summer. The Palm Island encompasses a freshwater well that was excavated since the Crusader's time whereas the surrounding sea shows several springs of freshwater.

4.1.4. Pedology

Lithosols are mainly represented in rocky sections of the islands, plants finding very few muddy particles at the bottom of gutters. Some muddy deposits maintain superficial sweet waters in the larger pools where dulci-aquatic plants develop in ephemeral wetlands formed from rainwater in winter and spring. The only significant soil development on the islands is developed from aeolian and beach deposited calcareous sands. Much of the western part of Palm Island has significant depths of sandy soils. Soils elsewhere on the island range from non-existent to small-localized accumulations of sandy and organic soils.

4.2. Biological characteristics

The habitats of the islands are of three terrestrial types (rocky, sandy and earthen) and seven marine types (sandy supralittoral, mediolittoral and infralittoral, rocky supralittoral, mediolittoral and infralittoral; and sandy infralittoral with sea grass) (UNEP, 2011). On 12/11/1998, the MOE contracted the National Council for Scientific Research (NCSR) to conduct scientific biological studies in OINR. A summary of the results of the biological inventory of the NCSR was used in the development of the first management plan. In 2004, the MOE contracted the Lebanese University, Faculty of Sciences, to conduct of another project on "Biodiversity Assessment and Monitoring", and in 2007, the American University of Beirut to conduct a project on "Post Oil Spill Biodiversity Assessment and Monitoring". Similarly, the APAC signed a contract with the Cimenterie National to finance the monitoring of marine turtles on PINR and Chekka-Herri beaches. Of the published papers on PINR, only a bird paper was published in 2001 and updated in 2008 in the form of a checklist that was published as leaflet with funding from the Netherlands Embassy. The results have provided enough data for revising earlier evaluation of conservation significance of the PINR.

4.2.1. Fauna

Mammals: PINR is a habitat for only 8 mammal species, 5 of which are flying mammals (bats). Of the bats, Myotis capaccinii bureschi (Long-fingered Bat) is Vulnerable as per the IUCN Red List (Figure 12). The two terrestrial species, the rabbit and the ship rat, are both introduced species. The rabbit was deliberately introduced by man and the rat probably arrived on boats, indeed may continue to be introduced from boats. The Monk Seal, an endangered species at the global level is an occasional visitor to the islands and surrounding waters. Additional species may occur but were not encountered on the various surveys. Further survey and inventory are likely to increase the number of officially recorded species. (Annex 1 PINR Mammals Species List)

Figure 12. Globally Vulnerable Long-fingered Bat: Myotis capaccinii bureschi ©inaturalist.org

Birds: PINR bird species are studied within the framework of the survey and inventory work conducted by Ramadan-Jaradi, G. & Ramadan-Jaradi, M. (2001) as well as Ramadan-Jaradi, G. (2008) under the Project "Common Consensus on the management of PINR" that was financed by the Netherlands Embassy. Additional species may occur but were not encountered on this survey. Further survey and inventory are likely to increase the number of officially recorded species. Among the 173 bird species identified in PINR, 66 are mono-specific and only 2 are species restricted to the Middle East (Annex 2 PINR Birds Species List). This species representation indicates a high proportion of Mediterranean and European migratory species utilizing PINR as a stopover. None of the bird species is restricted to the PINR. Among the bird species identified in PINR, there is 1 globally endangered species, and 6 globally vulnerable species including the Yelkouan Shearwater and the Turtle Dove (Error! Reference source not found., Figure 14). The conservation of all bird species inhabiting the islands significantly or substantially dependent on the conservation of those species elsewhere.

Figure 13. The globally Vulnerable Yelkouan Shearwater. ©Jessica Joachim

Figure 14. The globally Vulnerable Streptopelia Turtur.
©Ghassan Ramadan Jaradi

Reptiles: Reptile Species List summarizes the results of the survey and inventory work conducted by the Lebanese University on behalf of the Protected Areas Project (**Annex 3 PINR Reptiles Species List**). Of the total of 8 species of reptiles recorded for the islands, a total of 3, all turtles, are globally vulnerable and endangered, and nationally threatened, they include the Green Turtle (Figure 16). Additional species of reptiles may occur but were not encountered on this survey. Further survey and inventory are likely to increase the number of officially recorded species. No amphibians were recorded on PINR.

Insects and butterflies: 11 insects and 14 butterflies were identified on PINR (**Annex 4 PINR Insects and Butterflies Species List**).

Marine biodiversity: PINR hosts a wide variety of marine ecosystems represented by vermetid reefs, seagrass meadows, seagrass beds, sponge aggregations, sea pen fields to deep-sea ones such as coralligenous assemblages (Figure 15), rhodolith/maërl beds (MoE/aecid/Tragsa, 2009; Bitar, 2011; Badreddine.pers.obs.).

Figure 15. Key marine ecosystems of Palm Island Nature Reserve (PINR).
A: A large vermetid reef, B: Coralligenous assemblages in the infralittoral zone of the PINR waters.
© Ali BADREDDINE

PINR support a diverse and abundant marine life represented by Atlanto-Mediterranean, and Indo-Pacific species (Table 2 and **Annex 5 PINR Marine Flora Species List, Annex 6 PINR Marine Fauna Species List, Annex 7 PINR Threatened Marine Species List**). Among those species various are considered iconic and threatened (Figure 16, Figure 17).

Table 2. The status of the marine biodiversity in the PINR

Taxa	References			
	Ramsar	MoE/aecid/Tragsa, 2009	Bitar, 2011	Present assessment
CYMODOCEACEAE	1	1	1	0
HYDROCHARITACEAE	0	0	1	0
CHOLOROPHYTA	3 (1)	2 (1)	20 (7)	13 (7)
OCHROPHYTA	8 (2)	5 (1)	12 (2)	1 (3)
RHODOPHYTA	11	3	32 (4)	21 (5)
ANNELIDA	5 (2)	1	55 (4)	11 (4)
ARTHROPODA/CRUSTACEA	0	6	25 (1)	15 (1)
ARTHROPODA/PYCNOGONIDA	0	0	5	0
BRYOZOA	0	0	9	1
CHORDATA	23 (5)	26 (3)	48 (6)	28 (9)
CHORDATA/TUNICATA	2 (2)	-	8 (3)	1 (1)
CNIDARIA	1 (1)	3 (1)	18 (3)	11 (4)
CTENOPHORA	0	0	1 (1)	1 (1)
ECHINODERMATA	1 (1)	2 (0)	8 (2)	5 (2)
FORAMINEFERA	0	0	2 (2)	1 (0)
MOLLUSCA	6 (6)	65 (5)	59 (14)	35 (13)
NEMERTEA	0	0	1	1
PORIFERA	0	0	23	10
SIPUNCULA	0	0	2	2
TOTAL	61 (20)	120 (11)	3 (49)	170 (49)

Source: (Ramsar, MoE/aecid/Tragsa, 2009, Bitar, 2011; Present assessment for the purpose of this MP).

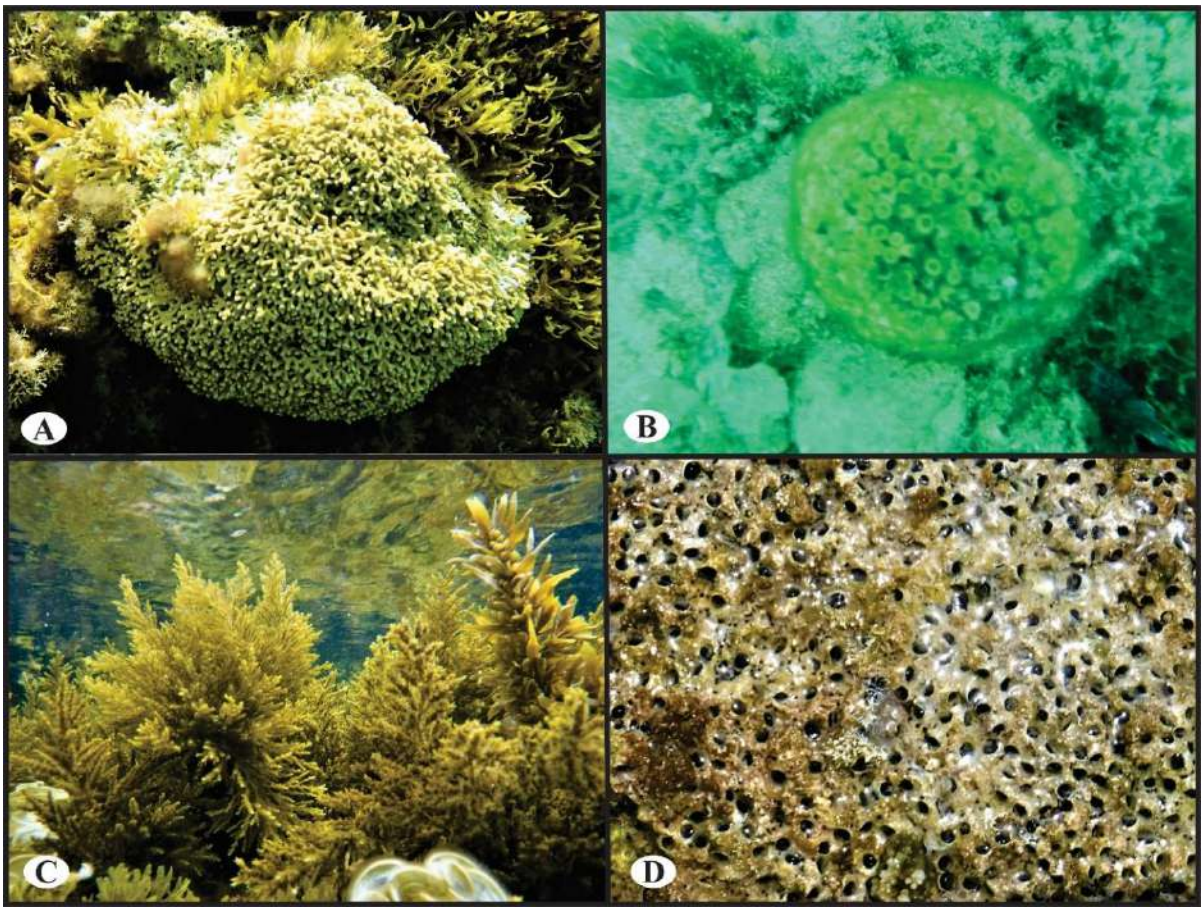

Figure 16. Flag species from the PINR waters.
A: Lithophyllum byssoides, B: Cladocora caespitosa, C: Cystoseira sp. and Sargassum vulgare, and D: Dendropoma anguliferum. © Ali BADREDDINE

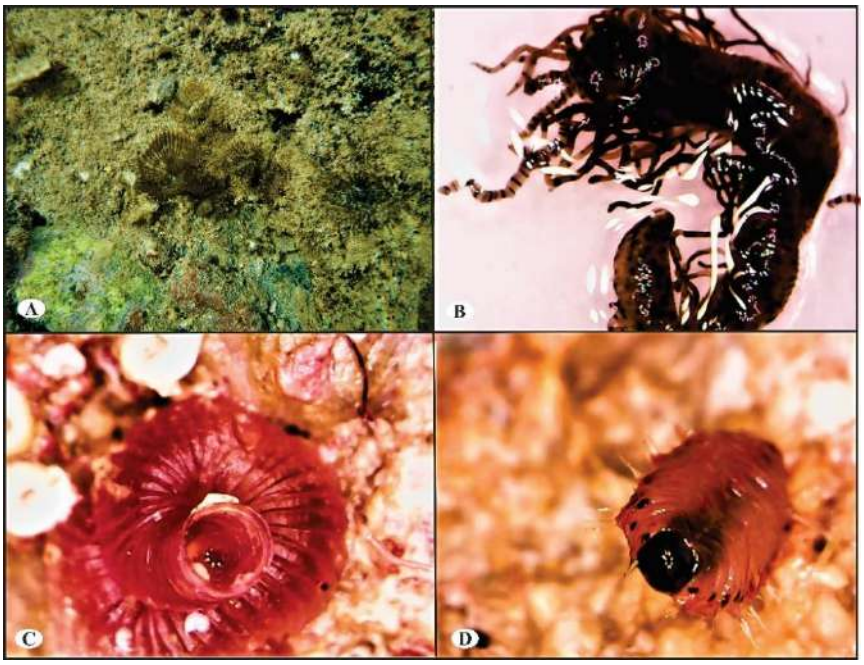

Figure 17. Figure 18. Marine species from the PINR.
A: **Branchiomma* sp., B: **Timarete punctate*, C: **Thylaeodus rugulosus*, D: Eunicedae sp. © Ali BADREDDINE

Marine Turtles: The Mediterranean marine turtle species loggerheads (*Caretta caretta*) highly frequent PINR waters. Females of those species are nesting on the sandy beach of the PINR (around 200 meters long), with an average varying between 3 and 40 nests (Ramsar; SPA/RAC-UNEP/MAP, 2021). In this context, it is recommended to establish a program to promote sea turtles' ecotourism activities within the PINR (SPA/RAC-UNEP/MAP, 2021, and references therein). (Figure 18, Figure 19 and **Annex 8 PINR Marine Turtles Ecotourism Program**)

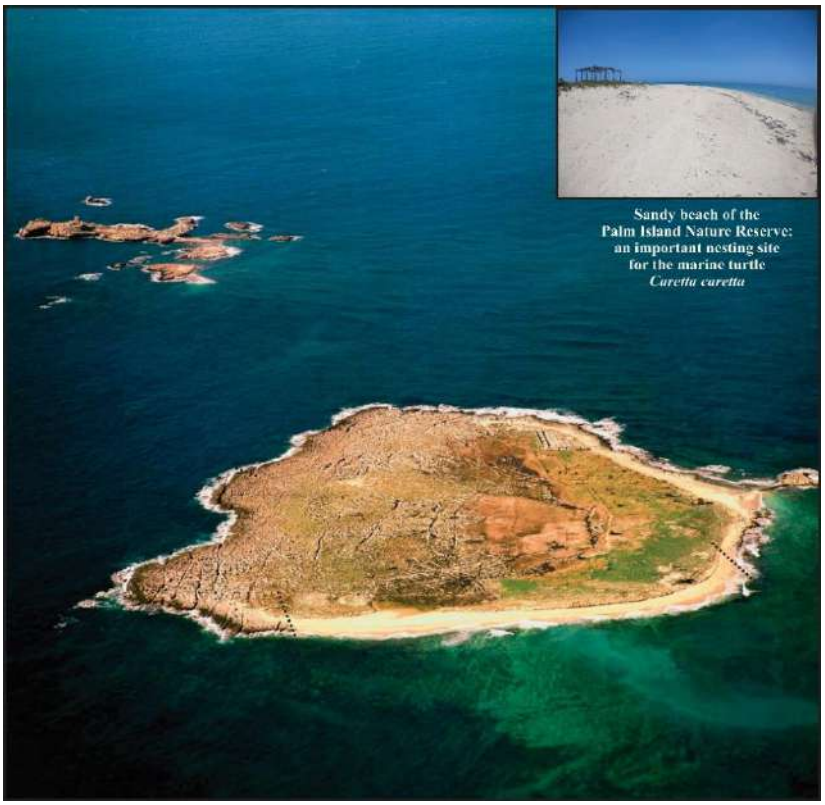

Figure 18. Sandy beach of the PINR: an important nesting site for the marine turtle Caretta caretta

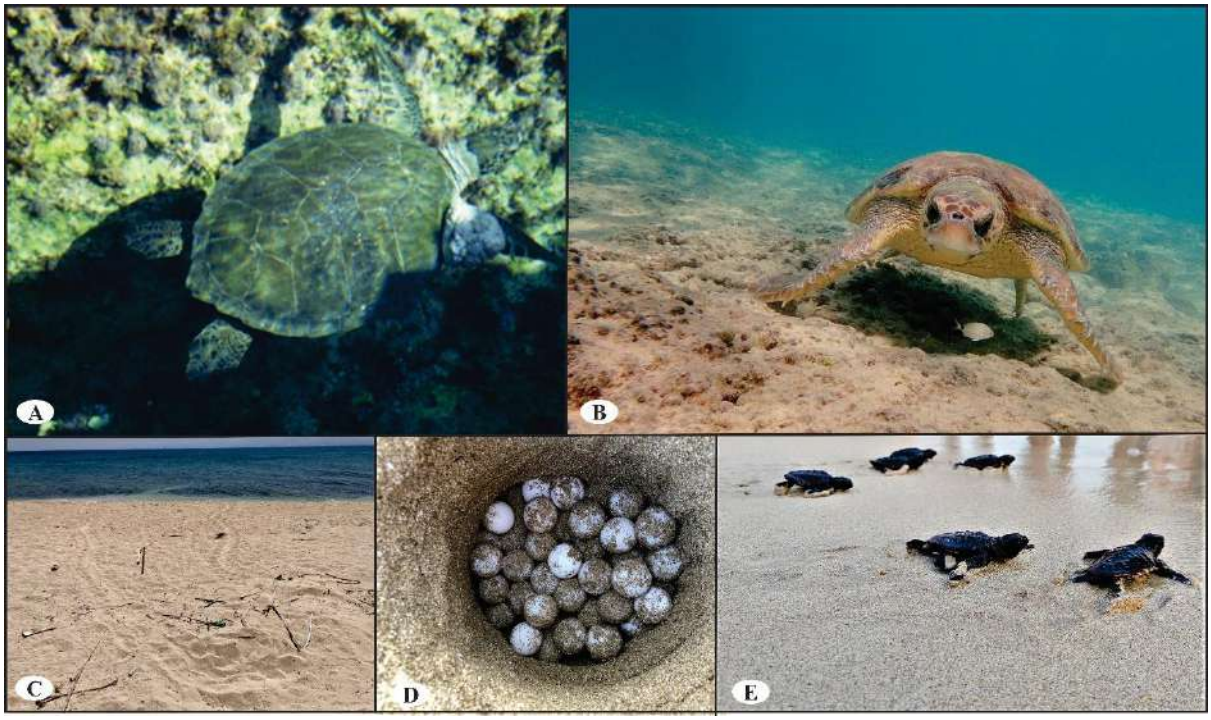

Figure 19. Marine Turtles activities in PINR.
A: The globally Endangered Green Turtle, *Chelonia mydas*. ©Ghassan Ramadan Jaradi
B: Loggerhead *Caretta caretta*, **C:** Emergence nesting track of a loggerhead, **D:** *Caretta caretta* nest, and **E:** *Caretta caretta* hatchlings. © Ali BADREDDINE

4.2.2. Flora

PINR is a habitat to 86 species of plants of which 2 are nationally threatened species, 3 are local endemic species and 2 are nationally rare species. Whilst 16 species are restricted to the Eastern Mediterranean, a total of 48 species are very widely distributed, reflecting the proximity of the islands to the mainland and probably also long-term human introduction of species from other regions. Flora Species List, summarizes the results of the survey and inventory work conducted by the Lebanese University on behalf of the Protected Areas Project. Additional species may occur but were not encountered on this survey. Further survey and inventory is likely to increase the number of officially recorded species. (**Annex 9 PINR Flora Species List**)

4.2.3. Micro-fauna and micro-flora

Foraminifers. This group of marine benthic Protozoaires deserve special mention as they are mainly responsible for the sandy-like deposits of the islands of the reserve, and are also present in corresponding deposits in tiny islands nearer to the seashore. They have been studied by Dr Samira Charabati from the Lebanese University and will be featured in a future paper. Already, not less than eight taxa have been recognized from five orders of Foraminifera, all of them living on the bottom of shallow marine waters of the Tripoli region. The reduced density of the skeleton of the dead foraminifer explains their accumulation on the island seashores, corresponding to local marine currents around the islands.

5. CULTURAL HERITAGE

5.1. History and archaeology

PINR contains various relics of past human occupation and activities. These include on Palm Island, the remains of a church from the time of the Crusades, approximately 1224 AD, a water well thought to date back to the same age as the church. Located on Ramkine Island, there are various buildings associated with an abandoned light-house and canon-mounting sites constructed early in the twentieth century (Figure 20, Figure 21).

Figure 20. French Historic Cannon mounting site- Ramkine.
©Ghassan Ramadan-Jaradi

Figure 21. Roman Time Bath carved in rocks of Palm Islands.
©Ghassan Ramadan-Jaradi

Pottery shards are scattered throughout the sandy section of Palm Island, suggesting the possibility of as yet undiscovered archaeological sites on the island (**Annex 10 PINR historical and archeological brochure**).

5.2. Contemporary sites

The Palm Island contains an old abandoned salinas (sea salt extraction ponds) that represent a cultural practice typical of the northern Lebanese shore that is diminishing nowadays (Figure 22). A modern, solar powered navigation light was installed in about 1998 on the lighthouse structure constructed in the 1960's.

Figure 22. Salinas ruins on Plam Island.
©Jad Abou Arrage

6. STATEMENT OF SIGNIFICANCE

Each of the main heritage attributes identified in the biological inventories was evaluated to establish their relative conservation significance. A number of features of PINR are clearly of great conservation importance, both at the local and national level, and in some cases at the regional (Middle East and/or Mediterranean) and international levels.

6.1. Biodiversity significance

- The habitat of nationally and internationally significant birds which use the islands for resting (176 species), transiting for breeding on mainland (40 species) and heading to PINR to breeding (10 species)
- The habitat of an endemic sub-species of lizard
- The habitat of turtles wintering, visiting and nesting during the summer period
- The Mediterranean Monk Seal that may occasionally find refuge in Ramkine caves
- The habitat of bats using the well and the rocky caves of the islands for breeding
- The habitat of threatened, rare and endemic plants, including medicinal, culinary and aromatic plants
- Sea grass beds for sheltering and breeding of fish around the islands

6.2. Cultural heritage significance

- Church ruins and their historic-associations.
- Salinas ruins representing the traditional ways of extracting salt.
- Lighthouse ruins and associated canon mount site constructed by the French.
- Carved well and bathes at the Crusader's time.
- Pottery fragments that are not studied yet.
- Signs of abandoned agricultural lands

6.3. Visitor opportunities

- Recreational values and opportunities on the beach of Palm Island for swimming, diving, hiking, and enjoying the view to the mainland, which includes snowcapped mountains in winter.
- Educational, recreational and research opportunities related to the natural and cultural values of the islands and surrounding seascape.
- The largely natural and scenic landscape in a region where coastal and shoreline environments are otherwise extensively developed.

6.4. Most important values

The islands of PINR are of most importance because of the natural protection afforded as islands to various species of plants and animals. This contrasts with mainland Lebanon where all coastal areas are very accessible and subject to considerable human and predator impacts. The most important animal habitat value identified in the evaluation process is the importance as a seabird breeding, transit and resting area. This is of national and international significance because of the number of rare and threatened species utilizing the islands. The islands are the main island group in Lebanese waters and as such represent the nationally most important sea bird breeding area in Lebanon.

At the regional (Mediterranean) level, the islands are valued for being an important area for visiting (Green Turtle and Leatherback Turtle) and summer nesting (Loggerhead Turtle). These species of marine turtles have been classified as endangered species at the meeting of contracting parties to the Barcelona Convention held in Greece in October 1998. At the national level, the islands represent a unique opportunity for citizens to visit offshore islands and experience the island environment.

7. MANAGEMENT FRAMEWORK & STAKEHOLDERS MAP

7.1. Management structure

Several institutions and organizations form an integral part of PINR's management framework with different roles and levels of responsibility (Figure 23). Organizations that are mostly in charge for the direct management of PINR, comprising the preparation, the approval, the implementation and the monitoring of the management plan are:

- MOE: overall supervision of the reserve and endorsement of the management plans (the last management plan was prepared for PINR for the period 2000-2005).
- Appointed Protected Area Committee (APAC): appointed through a decision from the MOE to ensure the local management of the reserve under the supervision of the MOE. Article 10 of the Law 121/92, states that a committee of seven volunteers should be assigned with the acceptance of the MOE. The APAC is formed every three years and is responsible for implementing the management plan. The committee should be composed of representatives of both Tripoli and El Mina municipalities, universities, local NGOs and fishermen cooperative representatives. The APAC's mandate and role is administrative, supervisory and financial; its responsibilities and obligations are determined in the appointment decision issues by MOE. Within these responsibilities, the APAC has the authority to investigate any damage that befalls on the reserve and legally pursue the responsible party, it can also appoint guards trained to maintain and protect the area. Other responsibilities include but are not limited to raising public awareness, managing the needs of the reserve and all financial matters.
- IUCN-ROWA: support the preparation of the management plan.
- Local/international experts, and NGOs: support in the preparation of the management plan and conduct scientific studies and research.

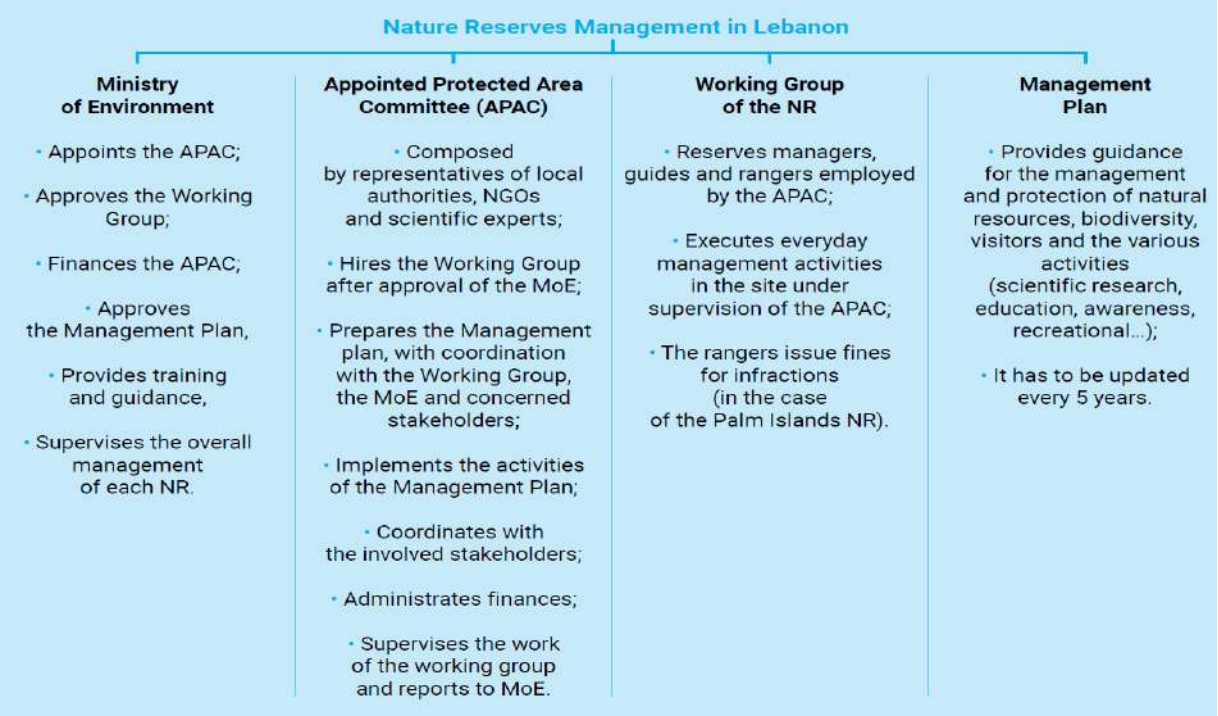

Figure 23. Nature reserves management framework in Lebanon.
Source: (SPA/RAC & MedPAN, 2019)

7.2. Management office and team

With the beginning of the Protected Areas Project in Lebanon, the project appointed the Environment Protection Committee to supervise and develop the PINR for a period of five years (1996-2001), with funding from GEF, provided that the MOE will then supervise the reserve through a Protected Area Committee, appointed by the ministry from the two municipalities of El Mina and Tripoli, in addition to persons interested in ecology and biodiversity. After the end of the five years, the APAC assumed its duties and made its meetings rotate in each of the two municipalities and the Environmental Protection Committee. Hence, the management of PINR by the appointed APAC encountered many challenges related to internal conflicts and attempts to control the decisions of the APAC by its members. Moreover, the APAC was not able so far to rent and equip a management office. Similar to the management office, the APAC was not able to appoint a day-to-day management staff due to the severe economic crisis that emerged in 2019 and still affecting the country. Ideally, PINR's management team should include:

- Site manager mandated to oversee all the work on site and coordinate team work and tasks;
- Administrative assistant hired by the APAC for daily administrative issues and projects coordination;
- Rangers and patrols for protection, monitoring and control of visitors and poachers;
- Eco-guides hired by the APAC for ecotourism activities organization.

7.3. Stakeholders map

Error! Reference source not found. indicates the key, relevant and other stakeholders involved in the governance and management of PINR, as they were determined in the IUCN-ROWA & MOE economic valuation study conducted in 2020 (Figure 24).

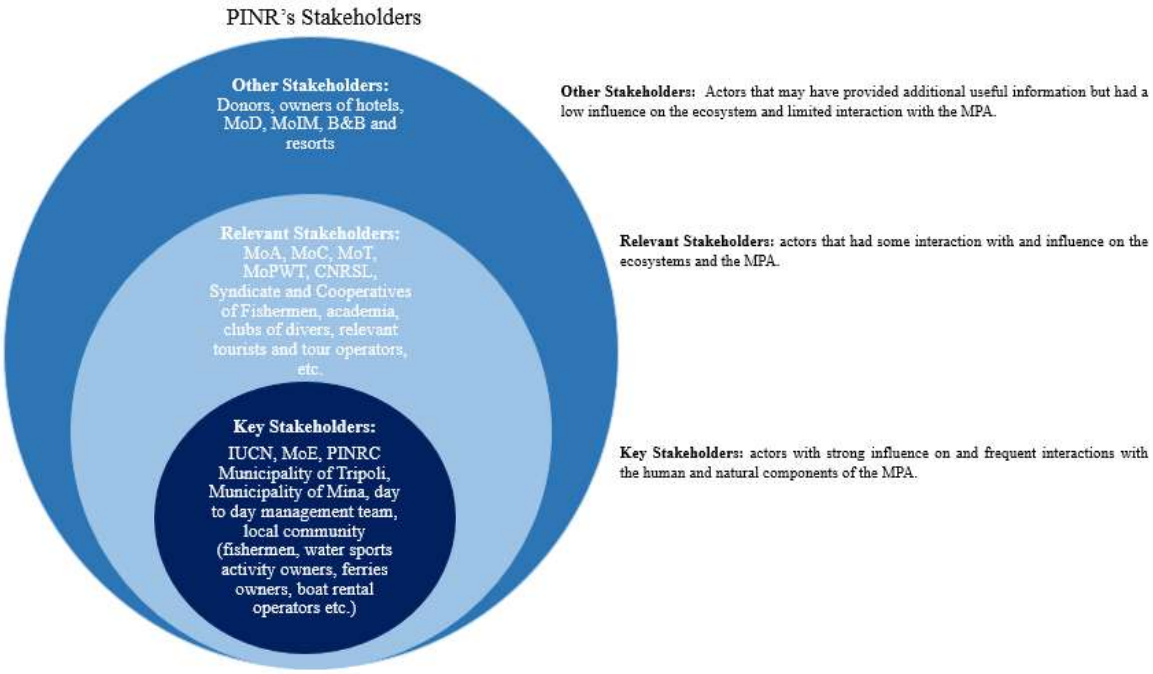

Figure 24. PINR's key, relevant and other stakeholders. Source: (IUCN-ROWA & MOE, 2020)

8. ECOTOURISM POTENTIAL & INFRASTRUCTURE

8.1. Recreational activities and ecotourism

Being 5.5 km from the shore, with only a limited sign of habitation, the islands are a largely natural marine and island landscape in contrast to the highly modified and developed landscapes of the adjacent mainland. As such, the island landscape is recognized as an attractive recreational setting for visitors to escape the crowded coastal cities (Figure 25). There is a long tradition of people from Tripoli visiting the islands for recreation, mainly swimming and diving, particularly in the underwater trail that traverses caves in Ramkine (Figure 26). Proposed management of the reserve will limit the range of acceptable recreational activities but the reserve will remain significant for water-based activities.

Figure 25. Visitors in summer on PINR.
©Ghassan Ramadan-Jaradi

Figure 26. Underwater diving trail at Ramkine Island

Remains and ruins as well as pottery fragments and historical sites indicate that the PINR was inhabited in the past, at least since the time of the Crusaders till the 2nd World War when the islands were occupied by French army. Afterward, a salina and a cafeteria were constructed on Palm Island and a light house was installed on Ramkine island with a family to make it functioning with diesel until late seventies. In the early eighties a group of fighters of the civil war exercised trainings on Palm islands when Israeli chips bombarded its members with cluster bombs. Since 1984 there were no signs of human occupation on PINR. Only excursionists from the local communities enjoyed swimming, diving and fishing. In 1992, the islands were declared nature reserve and closed for protection purposes inhibiting as such any access to islands, except for research. In 1997, the Protected Areas Project re-opened the reserve for visitation only during July-September, a time during which it was concluded that the impact of visitors on the insular biodiversity is at its minimum. The present land use is limited to swimming, diving, hiking, sun bathing, body covering with sand for therapeutic purposes, collecting culinary and medicinal plant species, birdwatching and implementing school and biodiversity research projects. Hunting is not permitted; dynamiting is not allowed but may occur during stormy days so that poachers cannot be discovered or chased during bad sea conditions.

8.2. Education and research sites

Ecotourism has also an important educational and research component related to biodiversity management and conservation. Some of the noteworthy educational, nature study and scientific opportunities at PINR are:

- Bird watching: PINR offers outstanding opportunities for bird watching, particularly seasonal viewing of nesting, migrating and wintering seabirds. Unlike other protected areas, it is the only one which offers sightings of seabirds, shorebirds and sea-crossing migrants.
- Turtles' observation: the islands provide outstanding opportunities for study of Loggerhead turtle breeding and behavior and of Green turtle feeding and wintering.
- Salinas: the old salinas found on Palm Island provide a place to explain the traditional process of salt extraction. Viewing the Salinas functioning, students will learn about salt extraction processes and components.
- Historical: Cultural sites on both Palm and Ramkine Islands provide a reference for some historic events (abandoned cultivated land, old bathes carved in rocks, church, fragment of pottery, cannon sites, etc.).
- Nature study: the reserve as a whole is a natural laboratory to study various habitats and adapted species both on land and in the sea. The diversity of fauna, flora, landscapes and ecosystems and proximity to the city of Tripoli could translate into high educational value for ecological field studies.

8.3. Scenic landscape and seascape

A number of aspects of PINR can be regarded as distinctive scenic landscapes and seascapes, they include:

- The low elevation of Ramkine island together with the old lighthouse structure is said to resemble a ship sailing in the sea (Figure 27).
- The small rocky outcrop emerging from the sea behind the Ramkine island is considered a scenic feature of the islands.
- The snow-capped Mount Lebanon viewed from Palm Island's sandy beach is considered a nationally unique view.
- The gulls standing at sunset on the rocks of Sanani island appear like rows of teeth. (Probably giving rise to the name of the island.)
- The sinking of the sun in the sea and the breaking of rays on the water surface during sunset while walking on the beach.

Figure 27. Ramkine island together with the old lighthouse structure is said to resemble a ship sailing in the sea. ©Jad Abou Arrage

8.4. Infrastructure

8.4.1. Visitor's trail

Terrestrial trail: a 700-meters visitor trial was created in 1998 at the edge of the conservation zone to restrict the passage of the visitors thus reducing the negative human impact on sensitive habitats; it also marks out interesting habitats to the visitors throughout their walk (Figure 28). The terrestail trail infrastructure is still in good state and needs minor maintenance.

Figure 28. Terrestrial trail on PINR. ©Ghassan Ramadan-Jaradi

Underwater: A 400 meters diving trail was installed in 2016 around and in the caves of Ramkine Island with interpretation waterproof plates fixed at depth of 10 meters (Figure 29).

Figure 29. A cave at Ramkine, part of the underwater diving trail. ©Khaled Merhbi

8.4.2. Bird watching hide

A bird hide, was constructed and installed at the border of the conservation zone, to allow for an interesting bird watching experience (Figure 30). The bird watching hide is today in a bad state and needs renovation.

Figure 30. Birdwatching tower built in 2004 on PINR.
©Jad Abou Arrage

8.4.3. Wooden work, benches and umbrellas

- Construction and maintenance of 18 wooden benches.
- Construction of 18 wooden umbrellas and 4 hats with palm leaves topping.
- Construction of a wooden path between the doc and the earthen land of the PINR.
- Construction of balconies and wooden bridges on Ramkine island.

Some of the wooden work, benches, umbrellas are in bad state and need renovation or replacement. (Figure 31)

Figure 31. Destroyed wooden umbrellas and wooden benches on Palm Island by winter storms.
©Jad Abou Arrage

8.4.4. Signage

Interpretative signs have been designed and installed on site. The signs describe the important ecological processes and significant habitats; they contain illustrations and explanations about sandy and rocky beaches habitats, fresh water well, birds, and sea turtles. Moreover, two additional main signs are set at the entrance gates; the first is a mapping sign of the reserve while the second defines the activities that are allowed and those that are prohibited on the site. Trail signs were also prepared for guidance along the different available pathways (Figure 32). The signage plan needs some renovation and maintenance works.

Figure 32. Interpretive signage on Palm Islands.
©Jad Abou Arrage

9. SOCIO-ECONOMIC DIMENSIONS

9.1. Tripoli district socio-economic dynamics

Tripoli District is a small (with a surface area of around 27 km^2), but very densely populated district in the North Governorate of Lebanon. It consists of the city Tripoli – the administrative center of the district and the second largest city in Lebanon after the capital Beirut – and its surrounding neighborhoods of Bahsas and Baddawi, in addition to the cities of El Mina and Al Qalamoun (Figure 33).

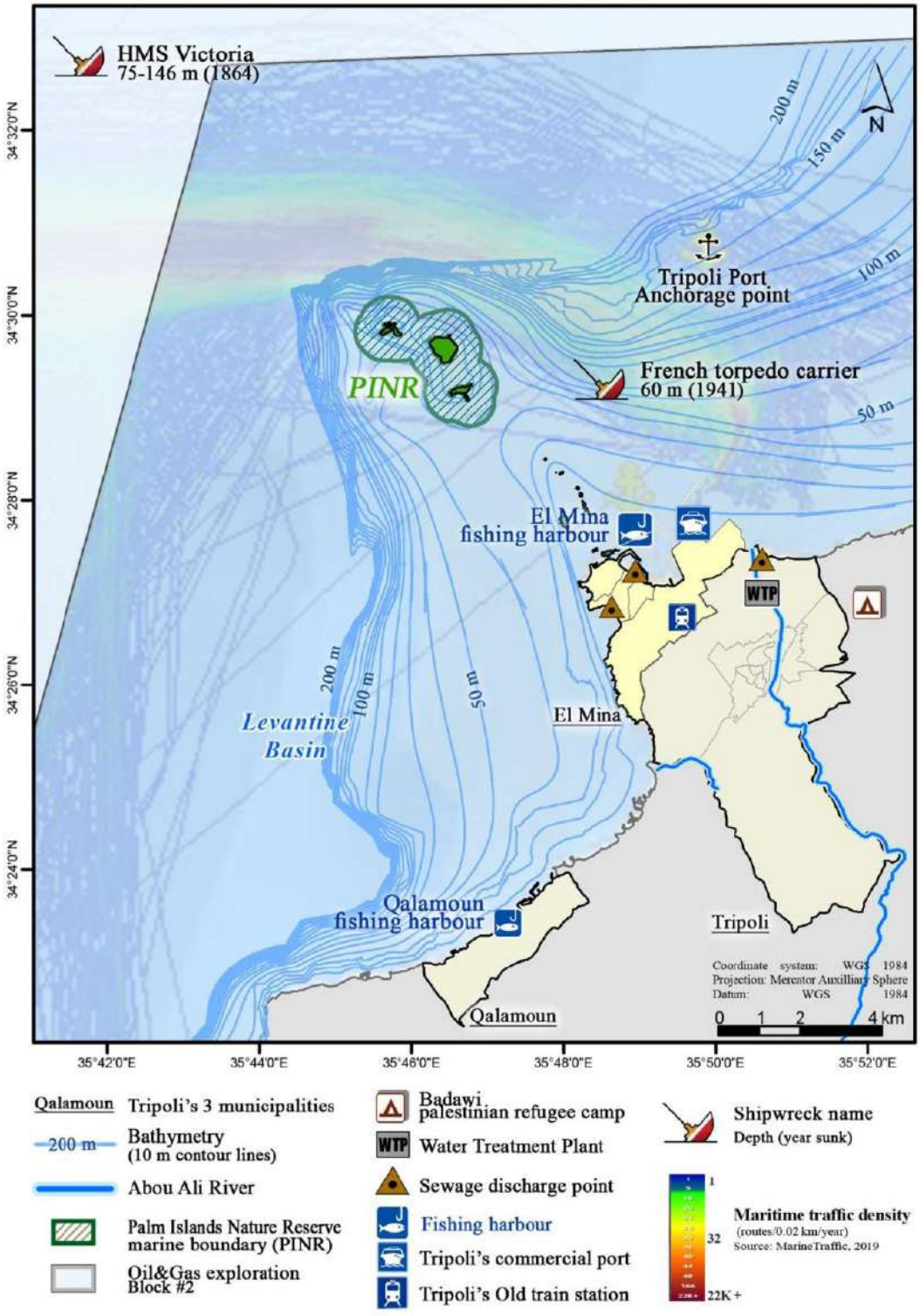

Figure 33. Tripoli district map.
Source: (Noon, 2019)

Transportation and connectivity: The transportation system of Greater Tripoli lacks many facilities as it depends comprehensively on private cars, and shared-taxi is the most dominant mode for public transportation. With the rapid growth in population, urbanization and motorization, the problem of traffic congestion has imposed itself to be a major issue for concerned authorities (JICA, 2001). On the other hand, access to Tripoli from Beirut is relatively easy through the coastal highway linking all the cities and towns of the Lebanese coast. Tripoli has a strategic geographical location on the northern coast of Lebanon. It is located at the crossroad linking the different districts of North Lebanon (Koura, Zgharta, Bcharreh, Minieh-Dannieh) and at a distance of:

- 30 km from the Lebanese-Syrian border in Arida,
- 29 km from the coastal town of Batroun known for its tourism activities,
- 44 km from the historical coastal town of Byblos,
- 62 km from the coastal town of Jounieh,
- 82 km from the capital Beirut,
- 27 km from Halba, the administrative center of Akkar district,
- 45 to 55 km from Akkar mountain villages known for their wild natural areas and forests,
- 35 km from Dannieh mountain villages known for their agricultural lands and high mountains including the highest summit in Lebanon and the Near East "Qornet El Sawda" (or the Black Peak),
- 40 to 46 km from Ehden and Bcharreh mountains known for their scenic landscape, agricultural lands, forests, valleys and cultural heritage that includes one of Lebanon's five World Cultural Heritage Sites "The Qadisha Valley".

As for sea transport Tripoli has the second largest commercial port in the country in addition to one of the largest fishing ports on the Lebanese coast.

Demographics: The vast majority of residents in Tripoli district, or Greater Tripoli, are Sunni Muslim, a small minority Orthodox and Maronite Christians, and a small minority of Alawite Muslims. With the absence of official population census since 1932, it is difficult to determine the exact population of Tripoli district. The official website of the city of Tripoli estimates the population at around 300,000 residents, whereas Tripoli district population is estimated at 500,000 residents, including 70,000 Syrian refugees living in informal settlements and 30,000 Palestinian refugees living in Baddawi refugees camp according to international organizations.

Urban environment: Tripoli suffers from high levels of environmental, visual and acoustic pollution. The city's coastal front has deteriorated considerably as a result of modern development projects. Within the city, the streets and spaces along the Abu Ali River are badly organized and severely polluted. The high reinforced concrete walls constructed after the 1955 floods, within which the river flows, split the ancient city in two. The river itself, which already has low water levels, is polluted by sewage outlets, which open directly onto the river. Users of the vegetable market also use it as their dumping ground for waste and garbage. Inadequate parking facilities, multitudes of street vendors, and the absence of landscaped areas have contributed to the visual and environmental chaos of the city. At the same time, high population densities have strained its severely dilapidated urban infrastructure. The old city lacks adequate lighting and wastewater disposal. The main problem in this case is linkage to houses, which need to be installed by respective property owners, many of whom do not live there. The residents themselves, many of whom are lower income populations cannot afford to link their residences to the main sewage lines. In addition, the city also lacks, proper sanitation and garbage collection; mainly in the area of the vegetable and meat markets. (World Bank & CDR, 2001)

Economic development: The city of Tripoli sits in the midst of an agricultural plain, its economy directly connected to that of the Akkar region and the Syrian hinterland. Prior to the creation of modern Lebanon in 1920, and the integration of the city into the new nation-state, the city of Tripoli functioned as the economic port of the Syrian hinterland. Neglected by successive governments in the post-independence period, Tripoli's major contribution to the city's economy was as the Iraq Petroleum Company terminus, whose pipeline extended from the Kirkuk fields. Even though the pumping of Iraqi crude oil stopped at the beginning of the civil war, the refinery continued to function as a processing center for imported crude oil. However, it was badly damaged during successive conflicts and the site now stands idle.

The other major investment in the city's infrastructure during the pre-war era, was the Rachid Karameh International Fair (known as the Maarad in Arabic), a modern complex designed by the famous architect Oscar Neimeyer to host the International Fair of 1962. Considered an icon of international trends in modern architecture, attempts are underway to rehabilitate and reuse the facility. High-density new development is planned for the area immediately adjacent. More recently, the government sponsored the construction of a sports stadium, one of a series constructed around the country on occasion of the 2000 Asian Cup held in Lebanon. The stadium is seldom used. (World Bank & CDR, 2001)

After the end of the Lebanese civil war in 1990, the central government neglect of north Lebanon in general and Tripoli in particular, has led to considerable increase in poverty as well as sizeable rural-urban migration towards Tripoli and Beirut. In the last decade, political instability and security problems, low levels of education, a high turnover of internal and political refugees and migrants, especially due to the Syrian crisis and refugees' influx to Lebanon, lack of public or private investment, the Covid-19 pandemic, and the economic crisis and financial downturn that the country as a whole is experiencing, have all contributed to various degrees in augmenting poverty (media reports estimate that 60% of Tripoli's residents suffer from poverty), especially around the historic core of the city and among the most underprivileged members of the society including fishermen, workers, youth and women.

Surveys by the Central Bureau of Statistics and the Tripoli Chamber of Commerce indicate that Tripoli continues to suffer from the lack of any large-scale commercial or industrial investment, and the ad hoc growth of small-scale enterprise of five employees or less, most of which rely on manual labor. The majority of these enterprises are located in the historic core of the city or in the areas immediately surrounding it. Small commercial stores are prevalent especially in the various souks such as Souk al-Attarin (Epicerie) Souk al- Bazerkhan, Souk al-Nahasin etc. However, despite the functional designation of their names none of the souks is exclusively occupied by merchants plying one particular trade. Rather they are dominated by a myriad of shops selling clothes, cosmetics, books, leather goods, children's toys, food and household products, miscellaneous popular products as well as the more traditional spice and Arabic medicine traders, coppersmiths, and manufacturers of small wooden objects. Industrial enterprises consist mainly of furniture making, a few coppersmiths and shoemakers, a few chicken poultries, and factories, which manufacture Arabic sweets, biscuits, soap, cheese and dairy products. (World Bank & CDR, 2001).

With the slow revival of a few traditional handicrafts. On the one hand, traditional industries such as shoemaking were transformed to regular stores selling clothes, books and other popular products. On the other hand, hand-made soap, prepared with olive oil is re-gaining popularity, partially due to the efforts of the public and private associations, which began selling it as a traditional Lebanese handicraft. In Tripoli efforts to revive its reputation as the center of soap production are underway on an individual and collective level. Other traditional handicrafts that still exist are facing near extinction. For example, trade in spices and Arabic medicine has also grown but very slowly. Other industries or commercial enterprises also have a city- and region-wide market reach. The vegetable and used clothes markets mentioned earlier are the two most important large-scale commercial venues with a city-wide and region-wide market attraction. At the same time, furniture makers many of whom have been around for decades also have a nation-wide market, albeit a small one. Many of their customers, especially wholesale vendors are based in Beirut. Moreover, despite incremental changes in the techniques of furniture making to meet "modern" taste and perceived demands, the availability of large spaces at low prices has insured their continued presence in the core (World Bank & CDR, 2001).

The influx of refugees and the spillover of conflict from Syria has exacerbated pre-existing constraints, leading to increasing vulnerabilities for both Syrian and Lebanese populations. High levels of poverty are increasing, coupled with the low capacity of governmental institutions and local authorities for service delivery, in addition to the poor infrastructure in Tripoli and its surroundings (ACTED, 2016).

Fisheries: the fisheries sector is among the most vulnerable livelihood sectors in Lebanon and fishermen are among the poorest communities. There are not recent studies and statistics about the sector in Tripoli/El Mina. The latest figures date back to 2005, where Tripoli Harbor Masters issued the highest number of Fishing Vessels Property Notebooks in Lebanon with 957 vessels (about 36% of the total number issued in Lebanon), and 29.6% of the navigation licenses. The majority of the vessels in Tripoli/El-Mina are motorized floukas, and there are only 2 trawlers (MOA, 2005).

In terms of productivity, 38% of the total fish harvested in Lebanon is provided by Tripoli/El Mina fishing port (Pinello & Dimech, 2013). El Mina has one of the most vibrant fish auctions markets in Lebanon.

The fishing techniques are mostly based on passive gears such as gillnets, trammel nets, longlines, purse seine nets and lampara nets. Fishing operations, with the exception of longlines, are mostly carried out at depths of up to 50 meters. Most of the gillnets and trammel nets have small mesh sizes (<20 mm). These gillnets represented more than 50% of the fishing gears used in most part of Lebanese fishing harbors (Pinrello & Dimech, 2013).

The fishing community is organized into 29 cooperatives (among which 8 in north Lebanon) and 5 syndicates (among which 1 in north Lebanon, but cooperative membership covers only some 43% of those involved in the industry. Most of the cooperatives are based in their respective port. There is neither a contract of employment in Lebanon nor any social security cover, which could protect fishermen in case of disability, loss of employment, and retirement (Pinello & Dimech, 2013). Moreover, fishermen are very vulnerable towards all types of risks and crisis with no clear mechanism to support them to cope with or recover in the case of disasters, except for the occasional and sometimes insufficient and inefficient compensations provided by the High Relief Committee.

History and culture: The city of Tripoli was built on two different sites by successive civilizations. The people of Arwad, Saida and Sour first founded Tripoli in the first millennium BC in the area of al-Mina. Remains of Hellenistic (312/311 - 64 B.AD) and Roman Tripoli (64 B.C. - end of 4th Century AD) were uncovered in the same area and can be seen today near the harbor. Of Byzantine (5th to 7th Century AD) and early Islamic Tripoli (645/646-1109 AD) nothing has been found. What is left today of the historic core of Tripoli-Al Mina, was initially built during the Crusader period as a small settlement at the foot of the citadel of St. Gilles. However, only the citadel, the cathedral (known today as al-Mansuri Mosque) and some towers around the peninsula, testify to crusader presence in the city (1109-1289 AD). In 1289 the Mamluks conquered the Crusader city that was situated on the peninsula, razed it to the ground and rebuilt a new city two kilometers to the east at the foot of the citadel and straddling the Abu Ali river. During this period, Tripoli witnessed a substantial growth in its economic and political power. Archaeologists and historians consider it today as the second best preserved Mamluk city after Cairo. Its 40 standing medieval monuments in the old town extend to the foot of the towering Crusader citadel and remain a living testament to the lives and customs of a medieval Islamic city. Under the Ottomans (1516-1918), the city, which became the seat of one of three Wilayets (Governorates), continued to grow albeit at a slower pace. Of this period several khans, mosques and baths dot the historic fabric. Tripoli's historic and cultural sites are varied and distinct. They include a few Crusader and Mamluk towers in the al-Mina area, the St. Gilles citadel, and a series of madrassas, hammams, khans and mosques in the historic core (or what is today known as Mamluk Tripoli). More modern cultural edifices comprise of the Maarad area, designed by Oscar Neimeyer, one of the most important figures in Modern Architecture (World Bank & CDR, 2001).

Tourism: In addition to a distinctive cultural and historic character of Tripoli and its high attractiveness as a cultural and religious tourism destination, the area hosts a fishermen harbor located along El Mina peninsula in addition to the PINR just at around 5.5 km from the harbor. The proximity of Tripoli to touristic hubs and many attractions on the northern coast and mountains, namely Byblos, Batroun, Anfeh, Bcharreh, Ehden, and the Qadisha valley, makes Tripoli a potential node for visitors to the North of Lebanon. On the other hand, Tripoli is known for its culinary heritage and food tourism is a great potential to develop in the area with a wide variety of restaurants, small snacks and street food outlets especially in the old souks offering local and traditional specialties including sea food and local sweets.

As for accommodation, despite being a touristic area, Tripoli lacks hotels and has only two high end guesthouses located in El Mina with some homestay offerings listed on Airbnb. There are no official numbers about the number of international and domestic tourists visiting Tripoli and its different touristic attractions.

9.2. PINR ecosystem services economic value

According to the latest study done by IUCN-ROWA and MOE in 2020 about PINR economic value, all the different ecosystems constituting the reserve function in an integrated way to provide a flow of provisioning, regulating, cultural and supporting services. Figure 34 summarizes the main ecosystem services of PINR.

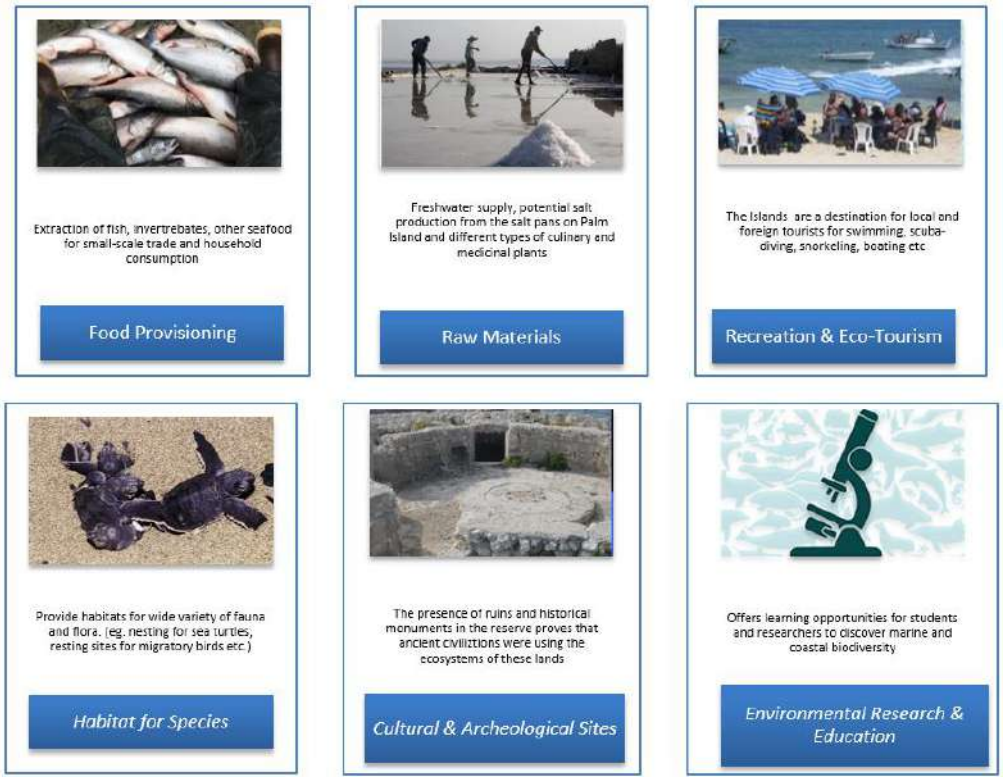

Figure 34. Key ecosystem services in PINR for economic valuation. Source: (IUCN-ROWA & MOE, 2020)

The results of the different valuation techniques and methods used in IUCN-ROWA and MOE report of 2020 showed that the total economic value of PINR is estimated at 6.9 Billion LBP per year distributed as follow:

- Provisioning:
  - **Fisheries = 3,987,090,270 LBP**
  - Medicinal, Ornamental & Culinary = 12,650,337 LBP
- Regulating
  - Coastal Protection & Hazard Mitigation = 185,485,815 LBP
  - Mitigation of Climate Change = 29,319,367 LBP
- Cultural
  - **Recreation & Eco-tourism = 2,153,722,051 LBP**
  - Education and research = 54,571,500 LBP
- Supporting
  - Loggerhead Turtle Conservation = 43,416,000 LBP
  - Sea Mammals Observation = 457,184,048 LBP
  - Birds Watching = 24,843,600 LBP

10.THREATS, GAPS AND MANAGEMENT CONSTRAINTS

10.1. Human activities and threats on PINR habitats

The human activities that impact PINR are generally 4 types (UNEP, 2011):

1. Limited illegal dynamiting for fish harvesting near the islands of the reserve. This behavior has affected the peripheral rocks of the islands which became subject to cracks and drowning;
2. Illegal collection of seashells by divers of neighboring villages from the reserve's surrounding for commercial business. This type of taking destroys the food chain around the reserve and most probably within its boundary;
3. Large number of visitors during the summer recreational time may create pollution and destroy the vegetation cover of the supra-littoral zone, especially those plants which play a role in fixing the dunes, and the anchoring of the huge number of boats in summer time destroys the infra-littoral zone;
4. The introduced rabbits in 1982 cause continuous degradation to the vegetation cover, a matter leading to an exceptional repeated vegetation progressive dynamic.

The PINR shows a high sensitivity towards the visitor's management and the recreational practices. Due to its relatively small size, the PINR is so fragile to the introduction of exotic species (*Washingtonia filifera*, and non-indigenous marine species) and the habitat destruction. The main threats leading to the fragility of the site are illustrated in the following Table 3:

Table 3. The types of threats related to the different habitats and their level of sensitivity

	HABITAT	SENSITIVITY INDEX	THREATS
Terrestrial species	Beach sand, Earthen habitat, Rocky habitat, and Reed beds	High High specific richness Presence of threatened and endemic subspecies Breeding areas for birds, reptiles, bats	Garbage Sand erosion Introduction of exotic plant species like: *Washingtonia filifera* Non-indigenous species Plant picking Oil pollution Habitat destruction Destruction by fire Egging Poaching Reed cutting Destruction by fire Wildlife disturbance
Freshwater species	Freshwater bodies	Medium Presence of rare species	Pollution Garbage Over-extraction -overuse
Seawater species	Seawater and sea bottom	High High specific richness Presence of threatened and endemic subspecies	Oil and Tar pollution Microplastic pollution Garbage and Litter High density anchoring Fish blasting Fish poisoning Jet ski Fishing in no-take zone Bycatch by lost or abandoned nets

10.2. Fate of previous management plan and workshops recommendations

Table 4. Fate of the recommendations of the previous Management (2000) plan, a previous Workshop (2007) and a PINR Monitoring IUCN-AUB Project (2008)
Implementation: 1 (no) to 5 (full implementation)

Recommendations from last Management Plan	Implementation	Explanation
More control needs to be exercised regarding the unauthorized fishing	4	The army facing continuous political tension, partly controlled poaching
Recreation activities should be controlled to not disturb biodiversity	3	Lak of awareness and insufficiency of patrols
Ensure sand beaches protection during Turtles nesting	3	There are always some people that trespass the fence separating recreational zone from turtles breeding zones
The garbage dump on the mainland of Tripoli/El-Mina needs to be stopped to reduce the amount of garbage carried by the sea currents to the islands.	2	Separated from the sea but some overflow reaches the sea
Increase of patrols during the breeding season both for birds and turtles	4	The APAC took decision to close the PINR for visitation during the 2 breeding seasons of Turtles and Birds.
Removal of the rabbits that were introduced in 1984 by misguided animal lovers	2	Since the rabbits hide in underground tunnels, it is impossible to eliminate them completely. Instead, they are reduced periodically.
Control of rats on the islands	5	All rats were removed by the management team and visiting raptors.
The presence of an introduced ornamental palm "*Washingtonia*" is not desirable.	2	The APAC decided to remove them but surprisingly the Kestrels that dominate baby rats and locusts on the islands were found nesting in those trees. As they were introduced since 36 years, they are considered part of the biodiversity provided their number remains stable. Removal of the new shoots of Washingtonia palms from Palm Island is practiced.
Recommendations from a workshop in 2008	**Implementation**	**Explanation**
Prohibit access of excursionists to strictly protected zone	3	The implementation of this recommendation was preceded by applying a zonation in the PINR.
Stop unregulated and regulated pesticides from being used on islands	5	
Keep the site clean from solid waste and other garbage.	4	Daily cleaning is taking place but the visitors are showing irresponsibility
Inhibit nocturnal visits of visitors for recreation	5	Done through Law enforcement
Regulate the research	5	Specific zones representing available ecosystems are booked for researchers, and specific applications for research are also given to be filled by researchers.
Stop shell extraction/gathering	2	Most of poachers park their boats outside the buffer zone of the reserve and dive within the no take zone of the MPA collecting shells
Avoid any type of diurnal or nocturnal disturbance	3	Sometimes the army in charge of keeping order in the MPA is busy with more important national issues.
Create a center of information on the main land at Al Mina city to attract passing people.	1	Lack of funding for the creation of a center of information.
Create eco-touristic activities that may generate incomes for the local community.	2	Weak coordination between Ehden and PINR Reserves
Encourage extraction of biological salt on the Rabbit island.	1	APAC applied for donation from MedFund but there were no positive reply.
Sensitize visitors and local communities	4	Ongoing
Regulate visitation activities	5	Rules and regulations based on the MPA Law were set up.
Control the commercialization of threatened species and their product thereof.	3	Based on a Decision taken by the MOA, Marine Turtles, Monk Seal, and other sea mammals are protected by the Management Staff (currently APAC) of the MAP and the MOA Guards.
Establish an eco-museum on the biodiversity of the site.	1	Lack of funds
Valorize the site for educational purposes	5	Done through leaflets, brochures and seminars.
Recommendations of IUCN, AUB and Dr. G. Ramadan-Jaradi	**Implementation**	**Explanation**
Long-term storage of data is critical to ensure that information does not become lost through time.	2	This requires the appointment of an employee to save the data. No action was taken by the APAC.
Evaluating/interpreting monitoring data for management	3	Not all researchers are keeping words or contributing. Skilled experts are needed to perform statistical analyses.

10.3. Gaps assessment

This Gap Assessment section identifies and summarizes the legal and regulatory gaps in the regime for the conservation and sustainable use of marine and coastal ecosystems in Lebanon (IUCN-ROWA & MOE, 2020).

1. Fragmented legal framework
2. Inadequate Law for a Marine Nature Reserve and for night studies
3. Lack of Enforcement of existing laws and regulations
4. Absence of updated management plan, monitoring protocols, specific guidelines, etc.
5. General master plan of the area which doesn't prioritize the importance of the MPA conservation
6. Data inaccuracy
7. Data is unconsolidated and not readily available
8. Limited benefits from available data in management process
9. Absence of participatory approach in the decision-making process, and in the implementation of management plan
10. Lack of sufficient financial capacity of the MPA.
11. Limited technical capacities of the APAC and MPA's management teams

10.4. Constraints of achieving the vision of the previous management plan

A number of constraints to meeting the management objectives were identified. Some can be readily resolved and others may not be during the life of the plan. The most important constraints identified are listed below.

1. The marine component of the protected area is not large enough to prevent over-exploitation of fish breeding populations surrounding the islands.
2. Confusion and uncertainty regarding the type and extent of responsibilities of various government agencies for the islands.
3. Law enforcement is the duty of Interior Forces "Coastal Guards" but they are not equipped to patrol the PINR whereas the army is assists because it has speed boats.
4. Lack of certainty regarding the financial arrangements for post - project operation of the reserve.
5. Lack of regulation to control activities occurring outside the managed area, which may adversely affect features, resources or activities within the protected islands, e.g. collection of benthos like shells from the environs of the reserve.
6. Funds limitation for research on marine population dynamics, especially of indicator species.
7. The Decree on the protection of turtles and marine mammals has not yet been upgraded to legislation.
8. The Bonn Convention on Conservation of Migratory Species of Wild Animals is signed and ratified by the *Government of Lebanon.*
9. The *Convention on International Trade in Endangered Species* of Wild Fauna and Flora is signed/ratified by the Government of Lebanon.

Table 5. Gaps or challenges facing the implementation of the previous management plan through the actions of its objectives, and future prospects
Percentage of achievement/Action and Priority given to each Action are given following consultations with stakeholders. (Very high [VH], High [H], Medium [M], Low [L])

Action	Achievement percentage	Priority	GAPs or Challenges	Prospects for Future
OBJECTIVE 1: NATURAL HERITAGE				
1.1 Data Base: Establish and maintain a data base system of species which inhabit the reserve and continuously update all available data and information into a GIS database.	0% achieved Action.	VH	Lack of underwater scientific shared studies or reports Management Team without Scientific Coordinator and Manager	- Provide centers of research and university with topics of study needed and provide facilities. - Gather all available information / studies on PINR - Develop an information library detailing type of info, availability, source and location - Incorporate available information into GIS database after the appointment of a scientific coordinator. - Link database to the national centralized information system at MOE. - Adopt multidisciplinary approaches - Adopt ecosystem approach - Develop a land use map for the PINR
1.2 Monitoring: Establish and maintain a monitoring system for species which inhabit the reserve.	20% achieved Action with a monitoring plan developed and implemented to conserve birds.	VH	Obstacles made for security reasons on overnight accommodations Lack of training of Management team on species identification Lack of reference books such as naturalist's guidebooks.	- Develop a protocol for monitoring species inhabiting the reserve. - Train management team on monitoring key ecosystems and identification of species inhabiting the reserve. - Provide team with naturalist's guidebooks - Develop a manual for monitoring species inhabiting the reserve. - Implement small scheme monitoring program on PINR.
1.3 Rare/Threat Species Conservation Plan: Develop and implement a Rare and Threatened Species Plan.	10% achieved Action with an AP for conserving marine turtles.	H	Absence of National Red Lists.	- Develop a Red List for the marine and terrestrial fauna and flora of PINR - Categorize the threat level - Set a strategy for conservation - Implement the plan
1.4 Marine Mammals & Turtles: Seek legal protection of the marine mammals and turtles cited by the relevant international Conventions.	30% achieved Action. The Decision of the Minister of Agriculture protecting the Turtles and sea mammals was upon request from PINR.	VH	Insufficient cooperation of the APAC with the Ministry of Agriculture and Scientific Institutes. Lack of logistic support Lack of awareness programs for government stakeholders and local communities	- Prepare a list of marine mammals and turtles occurring within the waters of Lebanon. - Based on the list, prepare a draft Law protecting the marine mammals and turtles cited by the relevant international Conventions. - Train PINR team for monitoring the marine turtles' activities within the reserve area - Implement a Sea turtles' awareness-raising and education program - Develop sustainable sea turtle eco-tourism program and activties
1.5 Rabbit Control: Complete the eradication of rabbits.	70% achieved Action, but remaining rabbits in tunnels reproduce fast.	M	Risk of affecting non target species Absence of a documented strategy for the eradication of the remaining rabbits.	- Use the eradication methods that are described in the Manual of the Action 1.2. - Ensure non target species are safe - Eradicate rabbits completely within a short time
1.6 Rat Control: Monitor rat population levels and take safe and effective control measures.	100% achieved Action, but rats may return at any time with any boat embarked on PINR.	L	Risk of affecting non target species Absence of a strategy for eradicating the rats Return of rats via boats and other marine vessels	- Establish contacts with protected islands who have experienced the rat issue and learn from them about successful remedy. - Choose the method that adapts to the case and conditions of PINR. - Benefit from best practices of the last campaign of rats' elimination on PINR - Start decimating rat numbers and monitor their trends in relation with action taken.

Action	Achievement percentage	Priority	GAPs or Challenges	Prospects for Future
1.7 Introduced plants: Program the removal of identified introduced plants.	90% achieved Action.	M	There is no agreement on whether the *Washintonia filifera* that was planted on Nakhl island 20 years ago is already part of the ecosystem or not. There is a tendency considering the *Washintonia filifera* as a natural infrastructure (better than wooden umbrellas).	- Do not allow the introduction of any plant species by humans - Any introduced plant species by man should be removed, except for the *Washingtonia filifera* that is more than 30 years old on Rabbit island and that should be assessed before taking a decision. Follow instructions of the Manual in Action 1.2. - Any introduced plant species by natural phenomena (birds, wind, etc) should be subject to assessment by experts prior to deciding on its elimination.
1.8 Staff Training: Conduct staff training workshops to ensure that all staff is familiar with the Management Plan, in particular the practical application of policies for the restoration and maintenance of the ecological integrity of the reserve.	40% achieved Action.	VH	Irregular financial supports or opportunities	Beside the opportunities provided by MOE to train the staff in cooperation with international organization: - Adapt the National PA Capacity Building strategy to PINR - Document previously performed trainings - Record evaluation and impact of the performed trainings - Compare with recommended training needs requirements - Identify required training issues to be undertaken by PA staff. - Identify target persons to be trained within the PINR staff. - Facilitate the rotational participation of APAC & management team members in national and international events/trainings/ workshops covering relevant topics. - Identify local and international interesting training opportunities that meet the identified needs - Follow administrative procedures for registration and application - Ensure at minimum the participation of one event per year - The following training topics are of first priority for PINR: • Networking • Eco-guiding • Team management • Fundraising & projects writing • Promotion of local products • Species identification techniques • Monitoring in marine ecosystem
OBJECTIVE 2: CULTURAL HERITAGE				
2.1 Promotion of Research: Establish contact with relevant research institutions to promote scientific research and investigation of cultural and historical sites and values in Palm Islands Nature Reserve, both on the islands and in the surrounding waters.	35% achieved Action.	H	The cultural heritage of PINR is not a priority for relevant institutes or researchers.	- Develop research portfolio and agenda - Distribute to relevant research institutions - Provide facilities and logistic supports to encourage researchers. - Encourage university students to implement graduation projects on PINR under direction of their professors. - Stimulate the appetite of researchers through providing them with results of others.
2.2 Visitor Access: Identify and demarcate any vulnerable cultural sites which visitors may not be permitted to visit without a guide.	50% achieved Action	M	No challenges except for unavailability of guided tours at all times.	- Appoint a qualified guide. - Review all cultural and historic sites and rank them in term of vulnerability. - Review and update all existing trails. - Develop trail-themes leading to vulnerable sites. - Prohibit any visitation to vulnerable sites without guides.

Action	Achievement percentage	Priority	GAPs or Challenges	Prospects for Future
2.3. Interpretation/Information: In collaboration with the Department of Antiquities and other authorities, prepare information and interpretation on history, archaeology and other cultural features of the reserve.	90% achieved Action.	L	At present, limited available information.	
			The cultural heritage of PINR is a priority for a minority of relevant institutes or researchers.	- Install interpretive and directional trail signage - Train guides and rangers on interpretation with regards to cultural features of the PINR
2.4. Training: Conduct workshops to train all members of the management team and GAC on how to preserve, protect and manage historical, traditional and cultural sites and values.	5% achieved Action with the modest support from the Department of Antiquities.	M	Lack of assistance from relevant experts, institutes and agencies.	- Invite experts from Department of Antiquities, tour operators and students from appropriate universities to provide presentation and explain the art of interpreting cultural sites.
OBJECTIVE 3: EXTERNAL THREAT				
3.1 Garbage pollution: Promote the adoption of a national strategy to phase-out the discharge of litter and toxic compounds in the Mediterranean Sea Area, giving priority to those substances contained in the black and gray lists of the protocol for the *Protection of the Mediterranean Sea against Pollution from Land-Based Sources*. Highlight the importance of this action for Lebanon as a whole and Palm Islands Nature Reserve in particular.	50% achieved Action by an ongoing regenerated garbage and ongoing cleaning.	VH	At the level of PINR, the management team is either absent or unqualified to follow up on this matter. The matter is beyond his capacities.	- Based on issues faced on PINR, participate to the development of the National strategy to phase-out the discharge of litter and toxic compounds in the Mediterranean Sea Area. - Remove all garbage brought to PINR by sea currents in order to not generate environmental problems or cause nuisance to visitors. - Conduct a workshop to sensitize Decision-Makers on damage caused by garbage.
			The APAC may with difficulties provide members to contribute in a national strategy development.	
3.2 Shipping Pollution – boats: Promote the establishment of port reception facilities for the collection of ship and boat generated garbage and of bilge and ballast waters.	50% collection of garbage and ballast facility established in 2019 in cooperation with Tripoli Port personnel.	M	An action that requires an intervention at the national level.	- Conduct a workshop to sensitize Decision-Makers on damage caused by garbage.
			insufficiently aware decision-makers	
3.3 Promote the development of local and regional emergency plans to facilitate rapid and effective response to pollution accidents.	100% achieved Action in 2008 with the development of a National Contingency Plan, to which PINR contributed.	H	An action that requires an intervention at the national level. insufficiently aware decision-makers.	- Based on the 2006 oil disaster, develop a contingency plan to protect the reserve from similar potential incidents. - Seek the use of booms to protect beaches and shores from possible oil contamination.
OBJECTIVE 4: RESEARCH & MONITORING				
4.1 Training/Research and Monitoring: Conduct workshops to train all members of the management team, APAC and Local NGO on theoretical and practical application of the policies applying to the achievement of this objective.	0% achieved Action.	H	Lack of financial support for this particular activity.	- Conduct training workshops to identify potential target areas for further research within and beyond PINR - Conduct training workshops to cover various fields including but not limited to birds, mammals, flora and sensitive/vulnerable areas that require protection, conservation and/or management - Train and assist PINR staff to implement the monitoring program - Provide assistance to the MT, from time to time, of monitoring or upon request.

Action	Achievement percentage	Priority	GAPs or Challenges	Prospects for Future
4.2 Workshops: Conduct workshops for interested researchers to explain research policies and needs for the reserve.	20% achieved Action.	L	Lack of financial support for this particular activity.	- Involve researchers and universities on the required researches for PINR.
4.3 Research Agenda: Prepare a Research Agenda which prioritizes research needs for the reserve.	100% achieved Action.	M	No challenges identified	- Rank researches needed in term of priorities and identify appropriate experts based on CVs, experience and Technical reports.
4.4 Promote Research Agenda: Promote the Research Agenda to research institutions and potential sponsors.	80% completed Action.	L	No challenges identified	- Distribute research agenda to appropriate research institutes, universities and individual experts.
4.5 Research Assessment: Develop processes for assessment and determination of research permit applications.	100% achieved Action.	M	No challenges identified	- Sign a MOU with researchers and their sponsors. - Ensure copies of the conducted research are provided to APAC. - Make copies of conducted researches are accessed by new researchers. - Make copies of conducted researches are accessed by the scientific coordinator and entered into the database.
4.6 Monitor visitor impacts: Set up a monitoring program to monitor the impact of visitor activity on the islands.	50% achieved Action	H	No challenges identified	- Monitor visitors impact on: • Biodiversity • Habitats • Socio-economy of local communities - Carrying capacity of the reserve
4.7 Monitor pollution: Establish monitoring of impact on reserve of industrial discharge and pollution from land-based sources with other parties such as the Ministry of Environment.	50% achieved Action.	M	Presently unqualified or absent management team to follow up on this matter. The constitution of the GAC doesn't provide personnel to contribute in developing the said monitoring program that requires a joint project and a financial support.	- Monitor pollution impact on • Biodiversity • Habitats
4.8 Monitoring: Establish and maintain a monitoring system for species which inhabit the reserve.	20% achieved Action with a monitoring plan developed and implemented to conserve birds.	VH	The Management Team is lacking a scientific coordinator	- Develop a management oriented practical monitoring manual for PINR. - Provide intense hand on training on the developed monitoring program for Management Team (MT). - Provide assistance to the MT over first year of monitoring upon request
OBJECTIVE 5: EDUCATION				
5.1 Education: Develop an Environmental Education Plan.	0% achieved Action	VH	Insufficient financial funds or rarity of Project developers.	- Include educational activities for students and teachers, - Include educational interpretation material to take away by visitors
5.2 Wildlife focus: Promote the importance of islands for wildlife conservation as a prominent education theme.	30% achieved Action.	VH	No challenges identified	- Provide school educational programs and educational events - Give priority to Involvement of local communities in the program and the events - Conduct educational events in local schools targeting different ages and based on interactive sessions composed of local information.
OBJECTIVE 6: INTERPRETATION				
6.1 Interpretive Plan: Develop an Interpretation Strategy which address the most effective way of communicating with the local community and visitors.	0% achieved Action.	H	No challenges identified	- Include interpretive signs with new findings and research outputs. - Highlight unique and most significant features of the islands.

Action	Achievement percentage	Priority	GAPs or Challenges	Prospects for Future
6.2 Interpretation Themes: Develop interpretation themes to guide all personnel engaged in interpretation.	45% achieved Action	M	No challenges identified	- Adopt preferably one theme every year
6.3 Training: Conduct Interpretation training workshops for management personnel and tour guides.	50% achieved Action.	H	No challenges identified	- Involve tour operators in the training workshops. - Training workshops should be conducted at local and national levels to maximize benefits. - Allow management personnel to exchange visits with other reserves to exchange experience
6.4 Accreditation: Explore opportunities for delegating interpretation activities to others who may be accredited (teachers, tour operators etc.) as a cost-effective way of increasing the amount of interpretation available.	15% achieved Action.	M	No challenges identified	- Involve tour operators and MOT in the training workshops. - Invite experience tour guides to participate in the workshops.
OBJECTIVE 7 : VISITOR MANAGEMENT				
7.1 Visitor Management: Prepare a Visitor Management Plan (VIMP).	80% achieved Action.	VH	No challenges identified	- Assign time for visitation and explain the reasons behind them. - Construct simple infrastructure for visitors - Review and update existing trails - Install interpretive and directional signs - Increase benches and umbrellas - Construct information centers: one on island and one on mainland.
7.2 Zoning Plan: Develop a Zoning Plan for the reserve to facilitate protection and appropriate use.	100% achieved Action.	VH	No challenges identified	- Determine the boundaries for breeding birds and breeding turtles as considered vulnerable zones. - Assign a zone for recreation using previous surveys of visitor activities and preferences. - Assign zones for research considering the four main habitats of the PINR: rocky, earthen, sandy and sea.
7.3 Visitor Regulation: Following an appropriate period of experience, review the adequacy of any existing regulations for visitor management, particularly enforcement, and if a need is identified, make a submission to Government on need for new legislation or regulatory powers.	15% achieved Action	VH	No challenges identified	- Review the following issues among others: • Camping • Role of Army and Interior Forces in Law enforcement • Role of Rangers in patrolling and charging violators
7.4 Visitor Conduct: Prepare and promote a Visitor Code of Conduct and promote in appropriate ways.	80% achieved Action.	VH	No challenges identified	- Sign a MOU with boat owners - Give equal chance to boat owners to ferry organized visitor groups, preferably through calls for offers. - Publish visitor code of conduct and distribute to public, promenade boat owners and schools.
7.5 Visitor Amenities: Provide environmentally appropriate toilet facilities and garbage disposal facilities on Palm Island.	90% achieved Action	H	Possibility of vandalism and malicious mischief	- Develop and provide, through proposal or bidding, ideal environmental public toilets for visitors. - Provide rubbish bins in carefully selected places.

Action	Achievement percentage	Priority	GAPs or Challenges	Prospects for Future
				- Sell sponsored garbage plastic bags to visitors as a contribution to cleaning operations
7.6 Guided Tours: Develop a program of guided tours within the reserve.	80% achieved Action.	VH	No challenges identified	- Conduct a carrying capacity study to limit the maximum number of groups - Sign MOU with tour operators - Schedule visits of school and other educational missions
7.7 Facilities Maintenance: Schedule regular maintenance of facilities and litter removal to maintain a clean visitor environment.	100% achieved but ongoing Action	VH	No challenges identified	- Use seasonal (during visitation season) labors for cleaning.
7.8 Unexploded bombs: Identify, clearly demarcate and strictly prohibit visitor access to localities known or suspected to contain unexploded bombs or other explosive devices. Seek assistance of the Lebanese Army to remove any such devices.	100% achieved Action at depth of 20 cm.	VH	No real challenges identified in spite of erosion that my uncover bombs at depth greater than 20 cm.	- Islands were cleaned from cluster bombs in the near past but care should always be given especially for the potential presence of bombs in the sea surrounding the islands. - Divers should be informed to report on any suspected foreign body they may find in the reserve.
7.9 First Aid: Establish first aid services and emergency assistance on Palm Island	70% achieved Action.	M	No challenges identified	- Establish an information center on PINR and use it as a destination for emergencies and first aid.
7.10 Boat Safety: In partnership with boat owners and the Ministry of Transport develop a program to promote visitor safety on boats traveling to and from the reserve.	90% achieved Action.	H	Fluctuation of Law enforcement.	- Contract with boats equipped with safety provisions - On PINR website, turn the attention of visitors to ask for boats that are provided with safety equipment.
7.11 Visitor Safety: Schedule periodic monitoring of sea water quality.	50% performed and ongoing Action.	H	No challenges identified	- with regard to *Streptococci* and *Fecal coliform*. - with regards to oil contamination.
7.12 Handicapped Facilities: Incorporate consideration of the needs of handicapped people in all planning of visitor amenities and facilities. Where such provisions are adopted, promote awareness of the existence of such facilities.	0% achieved Action	H	Handicapped donors may give a high priority to this action.	- Ensure safe access boat-island-boat for handicapped people - Provide special assistance to handicapped when on island
7.13 Tourist Information: Promote establishment of a Tourist Information center on the mainland.	10% achieved Action.	H	Misuse of the existing caravan established for this purpose. Vandalism, malicious mischief and looting.	- Repair the existing information center on mainland. - Fix cameras to detect vandalism.
OBJECTIVE 8: COMMUNITY SUPPORT				
8.1 Community Relation Plan: Develop a Community Relations Plan which includes priority for channeling of any socio-economic benefits to the local community.	50% achieved Action.	VH	Requires external expertise.	- Involve local community in any eco-tourism planning. - Provide local communities with the basic technical and financial tools to endorse alternative business opportunities (training on small enterprises, exploring new job opportunities). - Train Locals on hygiene and hospitality to offer the best services to visitors. - Provide seasonal jobs for locals. - Implement projects using locals from boat renting to employed staff. - Encourage locals to sell handcrafts to PINR visitors.

Action	Achievement percentage	Priority	GAPs or Challenges	Prospects for Future
8.2 Training: Conduct training workshops to train staff and others in community relations and building of community support.	20% achieved Action.	M	No challenges identified	- Investigate the status of the local communities in terms of capacity, resources & facilities; and identify gaps. - Train locals on ways to improve their status.
8.3 Local Awareness: Develop an awareness program for fishermen and local communities to improve public awareness of the need for marine conservation.	90% achieved Action. Although, it is an ongoing Action.	M	No challenges identified	- Conduct workshops for fishermen on the importance of Marine mammals and turtles as well as on the importance of PINR for spawning and sustainable fishing - Produce posters and leaflets to be distributed to fishermen and fish markets promoting marine conservation
OBJECTIVE 9: CAPACITY BUILDING				
9.1 Training: Draft and implement a Training Program for APAC, NGOs and Management Team personnel.	80% achieved but the Action is ongoing.	H	No challenges identified	- Adapt the National PA Capacity Building strategy to PINR. - Facilitate the rotational participation of APAC & management team members in national and international events/trainings/workshops covering relevant topics - Provide intensive training with Red-Cross on First Aid (done) - Provide special training for volunteers, especially at the visitation season.
9.2 EEO: Provide all staff and committee members with a copy of a standard set of EEO (Equal Employment Opportunities) guidelines.	100% achieved but this is an ongoing Action	M	No challenges identified	-Renew this Action following any changes in APAC or staff.
9.3 Performance Agreement: Develop a performance agreement between the APAC and the Reserve Manager.	100% achieved Action.	M	Lack of commitment	-Develop a binding agreement between APAC and the Manager based on the job description related to the manager post.
9.4 Institutional Building: Develop an institution-building strategy for GAC and staff.	100% achieved Action.	M	No challenges identified	- Adhere to job descriptions developed by the MoE - Ensure contractual agreement for MT staff - Create proactive and motivated working environment - Assess the management performance of PINR & accordingly take action - Adopt new policies, procedures and reporting system developed by MoE
9.5 Training: Develop and conduct training workshops for committee members and staff involved in the management of the reserve.	See: 1.8, 2.4, 4.1, 82, 91 training Actions above.	M	Insufficient funds for implementation	- Adapt the National PA Capacity Building strategy to PINR - Facilitate the rotational participation of APAC & management teams members in national and international events/trainings/ workshops covering relevant topics.
OBJECTIVE 10: INFORMATION SERVICES				
10.1 GIS: Develop and maintain a Geographic Information System.	0% achieved Action	H	Lack of expertise and programs in GIS among APAC and Staff.	- Consolidate existing and ongoing results into an interactive GIS database.
10.2 Research Database: Develop and maintain a register and database of all research undertaken or being undertaken in the reserve.	0% achieved Action.	VH	Current absence of scientific coordinator and manager. Otherwise no challenges identified.	- Provide significant and selected data on PINR Website - Provide summaries of researches made on PINR - Provide media information or press releases on the PINR website and via e-mails - Provide in the database information covering the biological, physical, chemical, social and economic elements and their interaction - Provide info on key species, ecosystem function and elements, ecosystem trends as well as site use impacts

Action	Achievement percentage	Priority	GAPs or Challenges	Prospects for Future
OBJECTIVE 11: FINANCIAL STABILITY				
11.1 Business Plan: Develop a 10-year business plan and review at least annually.	50% achieved Action as BP was developed twice but not frequently reviewed.	H	Lack of follow-up initiatives.	Periodically review existing business plan
11.2 Funding Plan: Develop a Funding Plan for the Palm Islands Nature Reserve. (including income generation, sponsorship and donations of money, goods and services).	50% achieved Action as FP was developed twice but not frequently reviewed.	VH	Lack of follow-up initiatives.	Periodically review existing fundraising plan
11.3 Code of Conduct: Develop a 'Code of Conduct' to guide fund raising and income generation to ensure that all such activities are ethical and responsible. The code should include identification of the circumstances in which it would be appropriate and inappropriate to accept funding and other contributions.	50% achieved Action during practicing but there was no written document.	M	No challenges identified	- Investigate into deep reasons behind initiatives from funding agencies and donors. - Find out whether visibility is the main reason behind funding or interest in sustainable conservation. - Exclude donors that are in disagreement with your stakeholders. Otherwise ask donors to settle down their problems with your stakeholders prior to accepting donations.
11.4 Volunteers: Develop a policy and program for the introduction of volunteers. (both as a means of providing opportunities for community involvement in management and to supplement financial resources).	30% achieved Action.		No challenges identified	- Evaluate volunteers based on CVS, vision and experience with reserves. - Equip volunteers with necessary tools satisfying their requirements.
11.5 Sponsorship Agenda: Develop and maintain a Sponsorship Agenda comprising a selection of projects of predetermined priority for which funding is sought.	100% achieved and needs continuous updating for this ongoing Action.	VH	No challenges identified	- Develop project catalogue for management plan Implementation to be presented to donors at any time thereby maximizing fundraising opportunities. - Include in the catalogue a detailed project concept paper for every management plan activity in need of funding. - Deploy proactive networking with national and international funding agencies - Submit regular project proposals for funding

11. PINR 2021-2026 MANGEMENT PLAN

11.1. A vision for the future

The long-term vision for the Palm Islands Nature Reserve is that adopted by the first management plan for PINR and that the PINR will be widely regarded in the Middle East and Mediterranean regions as an outstanding example of a Marine Protected Area because of its success in sustainable conservation of the natural and cultural integrity of the site through the sustainable use of the natural resources and the preservation of social and cultural heritage of the local and surrounding communities. Such a reputation can only be achieved if:

- PINR is recognized as an example of good conservation management in the region.
- All native marine and terrestrial species of plants and animals have been conserved and populations of formerly endangered species are more common.
- All non-indigenous species of terrestrail plants and animals have been eradicated, natural ecological processes operate and the islands are renowned for their contribution to the survival of birds, mammals and reptiles.
- All sources of pollution are controlled, including marine non-indigenous species, and pertinent laws are enforced all along the coast of Lebanon.
- PINR is zoned so as to provide for a variety of levels of protection and of visitor opportunities.
- Visitor management has been refined to ensure that the ecological significance of the protected area is not compromised.
- The visitor environment is clean, more beautiful and provided with appropriate visitor facilities.
- Cultural and historical sites are protected and appropriately managed under the guidance of specialists.
- Opportunities and facilities have been provided for appropriate visitor use and appreciation of the islands and surrounding waters.
- Visitors have access to comprehensive and easily understood information about the natural and cultural history of the islands.
- The Lebanese people are very supportive of the management and managers of the PINR.
- The APAC and its staff have demonstrated the cost effectiveness of protected area management by a joint cooperation between governmental and non-governmental organization and is recognized as a model of delegated management to a local community.
- The APAC and staff are committed to the management of the reserve and work as a harmonious team with NGOs and local authorities, and are supported by the local community.
- The business plan and fundraising plan for PINR proved to be adequate to support management consistent with the management plan.

11.2. Long term objectives

The long-term objectives are:

1. To conserve the integrity of the natural habitats and biodiversity in PINR.
2. To enhance the cultural and natural values of PINR.
3. To achieve sustainable management of the natural resources in PINR.

11.3. Constraints on achieving the long-term objectives

A number of constraints to meeting the management objectives were identified. Some can be readily resolved and others may not be during the life of the management plan. The most important constraints identified are listed below:

- The marine component of the protected area is not large enough to prevent over-exploitation of fish breeding populations surrounding the islands.
- Confusion and uncertainty regarding the type and extent of responsibilities of various government agencies.

- The law enforcement is the duty of the "Coastal Guards" from the Internal Security Forces, but they are not equipped to patrol the PINR whereas the army is assisting as it has speed boats.
- Lack of certainty regarding the financial arrangements for post-project operation of the reserve.
- Lack of regulation to control activities occurring outside the managed area, which may adversely affect features, resources or activities within the protected islands, (collection of benthos like shells from the environs of the reserve) or (between 2007 and 2018, 11 marine turtles were hit by Jet Skis).
- Continuous use of jet skis in the reserve's waters, which exposes marine turtles, Mediterranean seals and dolphins that are globally or regionally threatened, to severe and fatal accidents, as well as exposing other creatures to the same accidents.
- Funds limitation for research on marine population dynamics, especially of indicator species. Research stopped completely between 2017-2021 due to economic crisis in the country.
- Insufficient contributions, funds, and incomes for the recruitment of a management staff (manager, frangers, etc.). Presently one ranger and a number of cleaners are appointed on daily basis during the visitation season. They are paid from the revenues of entrance contribution.
- The Decree on the protection of turtles and marine mammals has not yet been (in 2021) upgraded to Law level.
- Continuous illegal fishing and fish blasting or poisoning in the no-take (buffer) zone of PINR.
- Habitat destruction due to excessive stepping on the grassland or sand fixing plants by visitors.
- Pollution of the beaches and the sea with garbage, plastic bottles and straws, as well as broken glasses on the shores left by irresponsible and uncontrolled visitors.

Moreover, there is always a need to eliminate or minimize constraints from outside the PINR, especially that at least three potential constraints were identified:

- Pollution from dumps that discharge their garbage and toxic compounds into the sea from land-based sources.
- Shipping pollution that originates from marine-based sources (boats).
- Oil spills that may occur due to accidents or military operations (e.g., the storages of oil that were bombarded by Israel in 2006 and contaminated the shores of Lebanon, included PINR).

11.4. Economic trends

PINR serves as an important source of income for several members of the local community. The livelihood of several families depends on two main activities (i) the generation of incomes from the transportation of public visitors, students, researchers, and tourists to and from PINR, and (ii) the generation of incomes from job opportunities on PINR during the visitation season (temporary rangers, cleaners, security personnel, cashiers, and maintenance of infrastructure). Moreover, PINR provides economic benefits related to the provisioning and regulating services of the ecosystem (Cf. Paragrpah 9.2)

11.5. Education and awarness

Most of the constraints facing the objectives of PINR are due to the lack of awareness of the general public on the values and benefits of islands and wetlands ecosystems in general and PINR in particular. During our interviews we understood that many visitors are not well informed about the values of PINR. This is a significant constraint to the protection of the PINR. Despite the production of awareness leaflets and brochures about PINR, only there were a number of boat owners who had monopolized these publications in their favor, so they limited the distribution to their customers in order to show visitors that they are special and love the environment and therefore the reserve, a matter that prevented people of the local community from gaining knowledge and appreciating their islands.

11.6. Threats analysis, causes, impacts and potential mitigation with priorities

Table 6. Threats analysis, causes, impacts, and potential mitigation with priorities for PINR.
Source: Ex-President and Manager of PINR, Ghassan Ramadan-Jaradi.

	HABITAT	THREATS	CAUSES	IMPACT	POTENTIAL MITIGATION	PRIORITY
Terrestrial species	Beach sand, Earthen habitat Rocky habitat Reed beds	Garbage	Lack of awareness	Turtles & habitats harmed	Awareness	1
		Sand erosion	Destruction of plants fixing sand	Loss of biodiversity and habitats.	Interpretation panels	1
		Introduction of non-indigenous species like *Washingtonia filifera*	Misguided introducers	Loss of eco-balance	Elimination	2
		Lessepsian non-indigenous species	External causes Illegal taking	Declined indigenous fauna & flora and values	National control plan of non-indigenous species	2
		Plant picking	External causes	Biodiversity loss	Activate national contingency plan	2
		Oil pollution			Awareness	1
		Habitat destruction	Lack of awareness	Biodiversity degradation	Awareness followed by penalties if illegal behavior is repeated or Law violators are not listening or obeying.	1
		Destruction by fire	Arsons	Decline of biodiversity		
		Egging	Wrong believes	Decrease in birds & turtles		
		Poaching	Low law enforcement	Negative impact on PINR		
		Reed cutting	Illegal practices	Loss of biodiversity habitats	Awareness	1
		Wildlife disturbance	Ignorance	Negative impact on PINR		
Freshwater species	Freshwater bodies	Pollution	Irresponsibility	Eradication of species	Awareness & penalties	1
		Garbage	Lack of education	Loss of biodiversity	Awareness	1
		Sea water inversion	Over-extraction	Loss of freshwater habitats	Regulate use of water	1
Seawater species	Seawater and sea bottom	Oil and Tar pollution	External source	Loss of turtles and habitats	Activate contingency plan	2
		Microplastic pollution	Untreated solid waste and wastewater	Threatened marine life	Contribute declaring PINR a free plastic MPA	2
		Garbage and Litter	Lake of awareness	Turtles & habitats harmed	Awareness and/or penalties	1
		Destruction of bottom	High density anchoring	Loss of foraging & spawning area and CO2 sequestration	Tie each group of boats to a floating dock or fixed pole.	2
		Fish blasting	Demand of rapid and illegal profit.	Decline in fish, incomes, and habitat destruction	Awareness and probation prior to penalty.	1
		Fish poisoning	Demand of rapid and illegal profit	Affecting fish stocks & human health	Awareness and probation prior to penalty.	1
		Killing of marine turtles	Illegal killing & Jet ski	Declining threatened species	Awareness and regulation enforcement.	1

11.7. Identification and justification of the operational objectives

The following table presents the identified operations objectives for PINR and their justification.

Table 7. PINR Operational Objectives.

OPERATIONAL OBJECTIVE	JUSTIFICATION
1. Conserve the fauna and flora and ecological integrity of the PINR through ecosystem management.	PINR is rich in biodiversity of rare and globally threatened species (Monk seal, different species of birds, marine turtles, marine fauna and flora, rare culinary plants) in a variety of distinguished and productive ecosystems that merit attention, protection and sustainable management.
2. Preserve, maintain and manage cultural, historical and traditional sites within PINR.	PINR is renowned for its church of the Crusader's time, fresh water well that dates back to Roman time, historic Cannon mounts that date back to the World War II, remains of the Salinas of early 20th century.
3. Reduce or eliminate garbage and chemical threats to PINR from external and internal activities.	PINR is under threats from poaching, taking eggs of birds and marine turtles, taking chicks of birds from nests, persecuting its non-harmful Whip Snake, fish blasting, fish poisoning, plants picking, and a variety of ways of wildlife disturbing, such as hiking during breeding seasons or littering everywhere on the islands of the reserve.
4. Improve appreciation of PINR through awareness, education, generation of knowledge, interpretation and research.	Awareness is an ongoing activity and needs updated information through research, generation of knowledge and interpretation to sensitize visitors, educate students and appreciate the values of the PINR.
5. Maintain a quality study environment for students and a quality recreational environment for visitors.	Provide security and safety to students and researchers through zoning and ensuring undisturbed areas of studies or repetitively monitored plots.
6. Involve key stakeholders and local communities in the management of PINR.	In environmental and conservation planning, stakeholders typically include government representatives, businesses, scientists, landowners, and local users of natural resources. Local community is thought to increase support for conservation through greater sensitivity to local conditions and perceptions.
7. Ensure the economic viability of PINR and improve the livelihood of the local communities around it, and their participation in its events.	Without sustainability of the management teams, provision of suitable infrastructure on site, implementation of the monitoring program and implementation of the management plan, the economic viability of PINR cannot be ensured and the livelihood of locals cannot be improved.
8. Build capacity and skills of PINT Management Team and its APAC.	Updating the skills and improving the capacities of the members of APAC, managers, rangers, guides and scientific coordinators is the pavement of their ways toward a better sustainable management based on best practices and lessons learnt.
9. Reduce threats where and when appropriate.	Conservation of natural and cultural heritages and conservation planning are based on identification of threats that need to be faced through elimination or mitigation.
10. Raise funds from a number of sources to ensure the effective management of the PINR in the long term.	Financial resources are required to cover the direct and indirect costs associated with PINR, but the overarching aim of raising and allocating financial resources is to contribute towards effective biodiversity conservation.

11.8. Implementation of the management plan

Operational objectives and related Actions (sometimes called prescriptions) are presented below, where they are grouped under projects (sometimes called units of work). Projects can facilitate implementation as each project can be clearly described, individually cost and timetabled. Documentation relating to the project can be used to guide members of staff, or contractors, charged with carrying out the work.

Operational Objective 1

Conserve the fauna and flora and ecological integrity of the PINR through ecosystem management.

Project 1.1. Conserve terrestrial plant species in PINR.

Activity 1.1.1. Develop a monitoring scheme of selected key species (threatened, endangered, and endemic, species).
Activity 1.1.2. Propagate threatened key species in PINR.
Activity 1.1.3. Remove or mitigate all threats and obstacles facing the threatened key marine species and terrestrial plant species in PINR.
Activity 1.1.4. Develop and implement a mitigation or elimination plan on the threat of present non-indigenous species on native biota.

Project 1.2. Conserve the bird population on PINR

Activity 1.2.1. Develop and implement a monitoring protocol and a monitoring manual for the conservation of bird species in PINR.
Activity 1.2.2. Maintain the bird observation tower to promote conservation of birds and birdwatching in PINR.
Activity 1.2.3. Ban bird hunting and effectively monitor bird-hunting activities.
Activity 1.2.4. Remove or mitigate all threats and obstacles facing the threatened key bird species in PINR.
Activity 1.2.5. Develop a strategy for conservation and to restore and rehabilitate threatened or degraded habitats

Project 1.3. Conserve the endangered Loggerhead sea turtle species nesting on PINR

Activity 1.3.1. Develop a monitoring and conservation strategy for Sea Turtles.
Activity 1.3.2. Develop and implement a yearly monitoring plan during the nesting and hatching seasons.
Activity 1.3.3. Reduce the negative impact of the touristic activities on the beach during nesting and hatching seasons.
Activity 1.3.4. Develop awareness campaigns for the conservation of sea turtles.
Activity 1.3.5. Ensure the provision of proper training and knowledge relating to Sea turtles in the Mediterranean.

Project 1.4. Conserve the marine habitats and species

Activity 1.4.1. Ban of fishing in the no-take zone (Buffer zone) of the PINR.
Activity 1.4.2. Increase awareness and enforce Law to protect marine species (Monk seal, dolphins, cetaceans) in PINR.
Activity 1.4.3. Increase awareness and enforce the Law to stop fish blasting and poisoning.
Activity 1.4.4. Conduct awareness campaigns for the conservation of marine habitats.

Project 1.5. Conserve the sandy beaches of PINR

Activity 1.5.1. Develop an action plan for sand protection from erosion and pollution.
Activity 1.5.2. Apply strict ban of access to marine turtle nesting areas.
Activity 1.5.3. Install infrastructure facilities (benches, umbrellas) for visitors in the non-turtle nesting beaches
Activity 1.5.4. Reduce the negative impact of tourists' activities on the beach during the summer through application of carrying capacity principle.

Project 1.6. Eradicate introduced animal species

Activity 1.6.1. Develop a strategy to complete the eradication of the introduced rabbits on PINR
Activity 1.6.2. Develop a strategy for the eradication of the introduced rats on PINR

Project 1.7. Database

Activity 1.7.1. Establish and maintain a data base system of species that inhabit the reserve.

Activity 1.7.2. Continuously update all available data and information into a GIS database

Project 1.8. Staff training

Activity 1.8.1. Conduct staff training workshops to ensure that all staff are familiar with the Management Plan, in particular the monitoring and the activities for the restoration and maintenance of the ecological integrity of the reserve.

Operational objective 2

Preserve, maintain and manage cultural, historical and traditional sites within PINR.

Project 2.1. Access to information

Activity 2.1.1. Provide an office for the APAC and the Management Team.

Activity 2.1.2. Erect panels of interpretation with information on history, archeology and other cultural features of the reserve, with QR codes.

Activity 2.1.3. Cultural and historical sites should not be accessed without guide.

Operational objective 3

Reduce or eliminate garbage and chemical threats to PINR from external and internal activities.

Project 3.1. Garbage from external activities

Activity 3.1.1. Act in line with the Protocol of Barcelona for the Protection of the Mediterranean Sea Against Pollution from Land-Based Sources.

Activity 3.1.2. Promote the establishment of port reception facilities for the collection of ship and boat generated garbage and of bilge and ballast waters.

Activity 3.1.3. Promote the adoption of a national strategy to phase-out the discharge of litter and toxic compounds in the sea.

Activity 3.1.4. Remove garbage brought to PINR by sea currents.

Project 3.2. Garbage from internal activities

Activity 3.2.1. Provide appropriate garbage disposal facilities on PINR.

Activity 3.2.2. Impose trash fees on visitors leaving their garbage in the PINR

Activity 3.2.3. Cooperate with ISF to impose a fine on visitors who throw their garbage into the sea.

Activity 3.2.4. Prepare and promote a Visitor Code of Conduct and promote in appropriate ways.

Activity 3.2.5. Implement awareness campaigns for the local community on solid waste management.

Operational Objective 4

Improve appreciation of PINR through awareness, education, generation of knowledge, interpretation and research.

Project 4.1. Improve appreciation of the PINR.

Activity 4.1.1. Diffuse information on ecosystem services and their monetarized values to the public, local communities, Tour operators.

Activity 4.1.2. Develop a Community Relations Plan which includes priority for channeling of socio-economic benefits to the local community.

Activity 4.1.3. Develop an awareness program for fishermen and local communities to improve public awareness of the need for marine conservation.

Activity 4.1.4. Produce interpretation panels on the site to benefit people, particularly students and subsequently their parents with practical field education.
Activity 4.1.5. Establish a database to provide documented references on PINR to researchers with the aim of whetting their appetites to continue their studies in order to increase the knowledge, and subsequently appreciation of the PINR.

Operational Objective 5

Maintain a quality study environment to students and a quality recreational environment to visitors.

Project 5.1. Maintain a quality study environment to students

Activity 5.1.1. Provide quick permits to students to visit the PINR
Activity 5.1.2. Provide the observatory of birds with photos of most common species on PINR
Activity 5.1.3. Provide security and safety to students through zoning and ensuring undisturbed areas of studies.
Activity 5.1.4. Develop an information brochure for PINR.
Activity 5.1.5. Develop a field bird guide for PINR.

Project 5.2. Maintain a quality recreational environment to visitors

Activity 5.2.1. Clean and maintain at all time the sandy beach free from garbage, empty bottles, debris, and leftovers.
Activity 5.2.2. Provide and maintain at all time the sandy beaches with hats, umbrellas, benches, toilets, rubbish bens, freshwater.
Activity 5.2.3. Keep the trails clean and with benches for resting and contemplating the landscapes and the species on PINR.
Activity 5.2.4. Schedule periodic monitoring of sea water quality.
Activity 5.2.5. Ensure the sea water is always free of pollution and contaminants.

Operational Objective 6

Involve key stakeholders and local communities in the management of PINR.

Project 6.1. Involve key stakeholders in management of PINR.

Activity 6.1.1. Develop an administrative coordination mechanism among all the stakeholders concerned with PINR.
Activity 6.1.2. Promote stakeholder involvement in decision-making and management strategies of PINR.

Project 6.2. Involve local communities in management of PINR.

Activity 6.2.1. Carry out participatory planning and negotiation among stakeholders to develop a strategy for achieving local involvement in PINR management.

Operational Objective 7

Ensure the economic viability of PINR and improve the livelihood of the local communities around it, and their participation in its events.

Project 7.1. Ensure the economic viability of PINR

Activity 7.1.1. Update the business plan of PINR
Activity 7.1.2. Mobilize international and national funding sources for wetland conservation and wise use.
Activity 7.1.3. Organize a yearly donor tour.
Activity 7.1.4. Prepare a feasibility study for PINR
Activity 7.1.5. Develop a strategy to diversify sources of funding for PINR
Activity 7.1.6. Update the fundraising strategy that was developed in 2000

Project 7.2. Improve the livelihood of the local communities

Activity 7.2.1. Develop a Community Relations Plan which includes priority for channeling of socio-economic benefits to the local community.

Activity 7.2.2. Recruit manager, rangers, guides, scientific coordinators and part time labors from the local community.

Activity 7.2.3. Develop awareness material on the benefits and functions of PINR (digital media, print media.

Activity 7.2.4. Develop an awareness program for fishermen and local communities to improve public awareness of the need for marine monitoring and conservation.

Operational objective 8

Build capacity and skills in the Management Team of the PINR and APAC.

Project 8.1. Build capacity and skills in the Management Team

Activity 8.1.1. Conduct training workshops to improve the skills of the management team.

Activity 8.1.2. Develop a performance agreement between the APAC and the Reserve Manager.

Project 8.2. Build capacity and skills in the APAC

Activity 8.2.1. Encourage members of the APAC to attend Capacity Building workshops organized by international agencies (e.g., MedPAN, MedFUND, SPA/RAC, etc).

Operational objective 9

Reduce threats where and when appropriate.

Project 9.1. Reduce the negative impact of the users of the site.

Activity 9.1.1. Develop and implement a plan to control littering on PINR

Activity 9.1.2. Reduce the impact of the tourists' activities on the beach during the summer (carrying capacity of the site, Panels with instructions and directions)

Activity 9.1.3. Conduct regular cleaning campaigns.

Activity 9.1.4. Ban all activities that disturb wildlife (noisy music, stepping on plant fixing sand, collecting plants, animals or parts of them).

Operational objective 10

Raise funds from a number of sources to ensure the effective management of the Palm Islands Nature Reserve in the long term.

Project 10.1. Raise Funds

Activity 10.1.1. Review the business plan every year and update it when it expires.

Activity 10.1.2. Update the funding plan that was developed by IUCN in 2000.

Activity 10.1.3. Develop a program for volunteers to assist management team and reduce expenses.

Activity 10.1.4. Develop and maintain a Sponsorship Agenda comprising a selection of projects of predetermined priority for which funding is sought.

Activity 10.1.5. Develop a yearly research agenda covering the research needs of PINR and distribute it to universities and research centers in order to conduct studies in PINR that highlight the importance of PINR and assist in attracting donors.

11.9. Five years work plan (2021-2026

A list of all activities identified, by objective, tasks per activity, priority rating and approximate cost.
(Very high [VH], High [H], Medium [M], Low [L]), ES (Expert/Scientist), MT (Management Team).

PROJECT 1.1. CONSERVE TERRESTRIAL PLANT SPECIES IN PINR. | **PROJECT PRIORITY 1**

Key issues:
The monitoring protocol and/or manual will include a detailed methodology for monitoring different categories of species as well as bio-physical issues such as:

- Indicators species
- Key fauna flora species
- Reed bed structure
- Sandy, earthen and rocky areas vegetation.

Activity	Tasks	Priority	Resp.	Timeline & Duration	Budget ($)
Activity 1.1.1. Develop a monitoring scheme of selected key species (threatened, endangered, endemic species, etc).	Identify key species on the site Identify the threats attributed to each species Develop a manual for the monitoring of the key species identified. Identify and train staff on monitoring techniques	VH	Scientist Expert	2 months	3,500
Activity 1.1.2. Propagate threatened key species in PINR.	The propagation, restoration or reintroduction should only take place in collaboration with an ecologist knowledgeable in insular ecosystems. A detailed report should be submitted to the Ministry of Environment discussing the purpose and the aim of this project and requesting approval. Continuous and long-term monitoring program should be developed and implemented to assess the success of the reintroduction project. Ensure continuous updating of the ecological database in order to achieve effective management. Ensure adaptive management based on scientific and updated information/data	H H	Scientist Expert Scient. Coord.	Ongoing Ongoing	5,000 2,000
Activity 1.1.3. Remove or mitigate all threats and obstacles facing the threatened key plant species in PINR.	Develop an inventory of existing population of threatened species and maintain accurate list of all identified species and the threats they face. Develop a threatened species database found on site. Identify impact associated with threats to threatened species. Prepare a management-based options to mitigate the impact. Monitor the trend of the species. Provide information on the importance of threatened species to public. Develop and implement a rare and threatened species plan.	VH	ES +MT	Ongoing	5,000
Activity 1.1.4. Develop and implement a mitigation or elimination plan on the threat of present alien invasive species on native biota.	Develop an inventory of existing population of non-indigenous species and maintain accurate list of all identified species. Develop an invasive species database found on site. Identify impact associated with non-indigenous species. Prepare a management-based options to mitigate the impact. Monitor the spread status of the NIS. Provide information on invasive and harmful exotic species to the public.	VH	ES +MT	Ongoing	7,500

PROJECT 1.2. CONSERVE THE BIRD POPULATION ON PINR — **PROJECT PRIORITY 1**

Key issues:

- Conservation of globally endangered bird species
- Increase the awareness of the local community on the importance of PINR habitats and their significance
- Conduct proper monitoring and documentation during the nesting and hatching season (March to June)
- Conservation strategy should tackle all the problems associated with the site.
- Several stakeholders should be involved in drafting this strategy, such as
  - Appointed Protected Area Committee (APAC)
  - Municipality of Mina and Municipality of Tripoli
  - Tour operators
  - Syndicate of fishermen in Mina (in relation with diving birds).

Activity	Tasks	Priority	Resp.	Duration	Budget ($)
Activity 1.2.1. Develop and implement a monitoring protocol and a monitoring manual for the conservation of bird species in PINR.	Identify key species that need to be monitored on the site Identify the threats attribute to each species Develop a manual for the monitoring of the key species identified. Identify and train staff on monitoring techniques Develop habitats maps for monitoring	VH	ES	1 month	7,500
Activity 1.2.2. Maintain the bird observation tower to promote conservation of birds and birdwatching in PINR.	Repair and maintain the bird watching tower annually. Paint woods of the bird tower with natural colors or with drawings of trees or rocks. Provide bird photos inside the tower with tips for identification of commonest (likely to be seen) bird species in PINR.	H	MT	2 weeks	2,500
Activity 1.2.3. Ban bird hunting and effectively monitor bird-hunting activities.	Enforce the Law of Hunting 580 (MOE) and the Decision 396 (MOA) on PINR. Enforce the Decision of the ministry of Agriculture banning hunting of sea birds Monitor Illegally birds killed on PINR, if any.	M	APACMT	Ongoing	15,000
Activity 1.2.4. Remove or mitigate all threats and obstacles facing the threatened key bird species in PINR.	Identify the key threatened bird species on PINR Identify the main threats facing these birds such as garbage, poisoned fish, … Categorize the threat level. Develop and implement a strategy for reducing threats Develop a RedList for the fauna and flora of PINR	VH	ES	Seasonal	15,000
Activity 1.2.5. Develop a strategy for conservation and to restore and rehabilitate threatened or degraded habitats	Review the literature and set the chronology of each key species on PINR. Identify the previous and current statuses of each key species Analyze the threats to the species and the habitat. Develop the strategy for restoration and rehabilitation	H	ES	Seasonal	8,000

PROJECT 1.3. CONSERVE THE ENDANGERED LOGGERHEAD SEA TURTLE SPECIES NESTING ON PINR — **PROJECT PRIORITY 1**

Key issues:

- Conservation of globally endangered sea turtle species
- Increase the awareness of the local community on the importance of sandy beach habitats and their significance
- Conduct proper monitoring and documentation during the nesting and hatchling season (May till August)
- Conservation strategy should tackle all the problems associated with the site.
- Create and maintain a system that identifies a point of contact in agencies involved in sea turtle conservation in Lebanon.
- Several stakeholders should be involved in drafting this strategy, such as
  - Appointed Protected Area Committee (APAC)
  - Municipalities of Mina and Tripoli
  - Fishermen of Tyre
  - Syndicate of fishermen

Activity	Tasks	Priority	Resp.	Duration	Budget ($)
Activity 1.3.1. Develop a conservation and monitoring strategy for Sea Turtles.	A standardized action plan has been compiled by SPA/RAC detailing issues that should be taken into consideration on the national and local levels.	VH	ES	4 months	4,000
Activity 1.3.2. Develop and implement a yearly monitoring plan during the nesting and hatching seasons.	The plan should include the monitoring schedule, methodology, data sheets, and locationmap. Monitoring conducted for year 2004 and 2005 were conducted with the assistance of MEDASSET as well as RAC/SPA for year 2005.	VH	MT	Seasonal (4months)	15,000
Activity 1.3.3. Reduce the negative impact of the touristic activities on the beach during nesting and hatching seasons.	Negative impacts would be detailed in the action plan as well as the monitoring plan. Negative impacts are concentrated on the tourism effect mainly, noise and lighting. Prohibit public visits to the PINR after sunset. Hire part time rangers.	VH	ES	Seasonal (4months)	5,000
Activity 1.3.4. Develop awareness campaigns for the conservation of sea turtles.	During the summer season the awareness campaign should regularly target teenagers visiting the PINR beaches with interactive games. The general public and the local community should be sensitized through the media (television and radio advertisements, social media) and general awareness workshops or seminars.	VH	MT	Ongoing	5,000
Activity 1.3.5. Ensure the provision of proper training and knowledge relating to Sea turtles in the Mediterranean.	The management team as well as individuals assisting in the monitoring should be trained and regularly updated about the conservation of sea turtles in the Mediterranean.	VH	MT	Ongoing	20,000

PROJECT 1.4: CONSERVE THE MARINE HABITATS AND SPECIES					
PROJECT PRIORITY 1					
Key issues ▪ Marine habitat constitutes an important component of the site; however, research is lacking on species available and the monitoring is eagerly needed. ▪ Collaboration with research centers and the academic institutions is necessary to obtain the data for monitoring.					
Activity	**Tasks**	**Priority**	**Resp.**	**Duration**	**Budget ($)**
Activity 1.4.1. Ban of fishing in the no-take zone (Buffer zone) of the PINR.	Enforce the Law of the PINR.	VH	APAC MT CNRS	Yearly ongoing patrols	7,500
Activity 1.4.2. Increase awareness and enforce Decision of the ministry of Agriculture to protect marine species (Marine Tutles, Monk seal, dolphins, cetaceans) in PINR.	Investigate the available laws on the 1) protection of marine mammals and other marine species cited by the relevant international conventions; and 2) on the sustainable use of fisheries. resources in Lebanon.	VH	ES + MT	Ongoing	5,000
Activity 1.4.3. Increase awareness and enforce the Law to stop fish blasting and poisoning.	Sign a MOU with MOA to control fishing using dynamites and poison for fish harvesting. Regularly patrol the PINR sea to prevent attempts to fish dynamiting and poisoning.	VH	APAC MT Fishermen Order	Ongoing	6,000
Activity 1.4.4. Conduct awareness campaigns for the conservation of marine habitats.	Identify key components of the marine habitats Identify key stakeholders to marine environment	VH	ES + MT	Ongoing	5,000

PROJECT 1.5. CONSERVE THE SANDY BEACHES OF PINR					
PROJECT PRIORITY 1					
Key issues: ▪ The sandy beaches are extremely dynamic on PINR under the pressure of currents and eddies.					
Activity	**Tasks**	**Priority**	**Resp.**	**Duration**	**Budget ($)**
Activity 1.5.1 Conserve the sandy beaches of PINR	Prohibit access of visitors to marine turtles nesting areas of sandy beaches Monitor sand dune erosion in the conservation zone of PINR Protect the sand from stepping and sitting on plant-fixing sand by visitors. sift the sand to get rid of debris and shards of sharp glass.	VH	MT	3 months	3,500
Activity 1.5.2. Apply strict ban of access to marine turtle nesting areas.	Place panels at the borders of the Turtle nesting zone with information about the impact of disturbing sea turtles on nesting ground. Based on panels no excuse for trespassers that should be submitted to fees.	VH	MT	3 months	3,000
Activity 1.5.3. Install infrastructure facilities (benches, umbrellas) for visitors in the non-turtle nesting beaches	Ensure that facilities offered to visitors distract the latter away from Turtle breeding areas	VH	MT	3 months	9,000
Activity 1.5.4. Reduce the negative impact of tourists' activities on the beach during the summer through application of carrying capacity principle.	Calculate the carrying capacity of the different zones of PINR Limit the maximum number of visitors allowed to each zone	H	MT	3 months	1,500

PROJECT 1.6. ERADICATE INTRODUCED ANIMAL SPECIES		**PROJECT PRIORITY 2**			
Key issues: Rabbits and Rats are a pest to plants and eggs and chicks of sea birds breeding on PINR					
Activity	**Tasks**	**Priority**	**Resp.**	**Duration**	**Budget ($)**
Activity 1.6.1. Develop a strategy to complete the eradication of the introduced rabbits on PINR	Develop an inventory of existing population of non-indigenous species and maintain an accurate list of all identified species (rabbits and other species if any). Identify impact associated with identified species (rabbits and other species if any). Prepare steps to eliminate the introduced species. Ensure non target species are safe. Monitor the results on Palm Islands after eradication.	VH	MT volunteers	2 Months	3,000
Activity 1.6.2. Develop a strategy for the eradication of the introduced rats on PINR	Develop an inventory of existing population of non-indigenous species and maintain an accurate list of all identified species (rats and other species if any). Identify impact associated with identified species (rats and other species if any). Prepare steps to eliminate the introduced species Establish contacts with protected islands who have experienced the rat issue and learn from them about successful remedy. Choose the method that adapts to the case and conditions of PINR. Start decimating rat numbers and monitor their trends in relation with action taken.	VH	MT volunteers	2 months	2,000

PROJECT 1.7. DATABASE		**PROJECT PRIORITY 2**			
Key issues: In absence of a database, researchers and experts are deprived from a base on which they can build on.					
Activity	**Tasks**	**Priority**	**Resp.**	**Duration**	**Budget ($)**
Activity 1.7.1. Establish and maintain a data base system of species which inhabit the reserve, and continuously update all available data and information into a GIS database.	Gather all available information / studies on PINR - Develop an information library detailing type of info, availability, source and location - Classify the reviewed literature in categories and in Key words for easy access. - Incorporate available information into GIS database - link database to the national centralized information system at MOE. - Adopt multidisciplinary approaches - Adopt ecosystem approach - Develop a landuse map for the PINR	VH	MT Scientists/ Experts volunteers	Yearly Ongoing	20,000
Activity 1.7.2. Continuously update all available data and information into a GIS database.	Keep updating the database, using data provided by researchers and experts in order to achieve effective management	VH	MT Scientists/ Experts volunteers	Ongoing	25,000

PROJECT 1.8. STAFF TRAINING					**PROJECT PRIORITY 2**
Key issues: Staff needs training to understand the management process, and needs updates to catch up with the success elsewhere.					
Activity	**Tasks**	**Priority**	**Resp.**	**Duration**	**Budget ($)**
Activity 1.8.1. Conduct staff training workshops to ensure that all staff are familiar with the Management Plan, in particular, the monitoring and the activities for the restoration and maintenance of the ecological integrity of the reserve.	Adapt the National PA Capacity Building strategy to PINR. Document previously performed trainings. Record evaluation and impact of the performed Trainings. Compare with recommended training needs requirements. Identify required training issues to be undertaken by PA staff (MT and APAC) Identify target persons to be trained within the PINR staff (APAC & MT) Facilitate the rotational participation of APAC & management team members in national and international events/trainings/ workshops covering relevant topics Identify local and international interesting training opportunities that meets the identified needs. Follow administrative procedures for registration and application Ensure at minimum the participation of one event per year. Train staff on understanding the management plan through workshops. Discover the week and strong points of understanding in the different members of the staff. Assign the job of training other members in the future to those skilled with strong points when they were under training. Train and assist PINR staff to implement the monitoring programs. Provide assistance to the MT over first year of monitoring upon request	H	APAC MT Volunteers.	9 months	12,000

PROJECT 2.1. ACCESS TO INFORMATION					**PROJECT PRIORITY 2**
Key issues: In absence of an office for the APAC, there is no proper storage for the acquired information.					
Activity	**Tasks**	**Priority**	**Resp.**	**Duration**	**Budget ($)**
Activity 2.1.1. Provide an office for the APAC and the Management Team.	Supply the office with communication facilities, diary book, and file cabinets	VH	APAC	1 year ongoing	18,000
Activity 2.1.2. Erect panels of biodiversity interpretation and distribute to visitors, produce brochures on history, archeology and other cultural features of the reserve.	Keep all produced documents in the database of the reserve.	VH	APAC MT	Ongoing	25,000
Activity 2.1.3. Cultural and historical sites should not be accessed without guide.	Appoint a guide to interpret the nature and culture and to answer the questions of the visitors.	VH	APAC MT	Ongoing	25,000

PROJECT 3.1. GARBAGE FROM EXTERNAL ACTIVITIES		**PROJECT PRIORITY 2**			
Key issues: Sea currents may bring garbage from neighboring countries on the Mediterranean. Garbage may contaminate the shore (sandy and rocky) of PINR Garbage may be a barrier for the sea turtles to crawl on the on beaches.					
Activity	**Tasks**	**Priority**	**Resp.**	**Duration**	**Budget ($)**
Activity 3.1.1. Act in line with the Protocol of Barcelona for the *Protection of the Mediterranean Sea Against Pollution from Land-Based Sources*.	Based on issues faced on PINR, participate to the development of the National strategy to phase-out the discharge of litter and toxic compounds in the Mediterranean Sea Area.	H	APAC	Ongoing	2.000
Activity 3.1.2. Promote the establishment of port reception facilities for the collection of ship and boat generated garbage and of bilge and ballast waters.	Conduct a workshop to sensitize Decision-Makers on damage caused by garbage, bilge, and ballast water.	H	MT	3 months	15.000
Activity 3.1.3. Promote the adoption of a national strategy to phase-out the discharge of litter and toxic compounds in the sea.	Based on issues faced on PINR, participate to the development of the National strategy to phase-out the discharge of litter and toxic compounds in the Mediterranean Sea Area.	H	APAC	1 month	6.000
Activity 3.1.4. Regularly remove garbage brought to PINR by sea currents.	Remove all garbage brought to PINR by sea currents in order to not generate environmental problems or cause nuisance to visitors. Make sure garbage is not burnt on PINR Make sure garbage is not thrown in the sea, directly from PINR or from transportation boats.	VH	MT	Ongoing	14.000

PROJECT 3.2. GARBAGE FROM INTERNAL ACTIVITIES		**PROJECT PRIORITY 2**			
Key issues: Due to low level in awareness of most of the visitors, the PINR suffers from garbage of leftover food, bottles, broken bottles on rocks, and a variety of artificial objects.					
Activity	**Tasks**	**Priority**	**Resp.**	**Duration**	**Budget ($)**
Activity 3.2.1. Provide appropriate garbage disposal facilities on PINR.	Selling garbage bags to visitors assist in collecting trash and debris, maintain PINR and sea clean.	H	MT	3 months	25,000
Activity 3.2.2. Impose trash fees on visitors leaving their garbage in the PINR	Imposing fees on left garbage is a violation of Law 121 (Don't leave anything and don't take anything).	H	MT	3 months	3,000
Activity 3.2.3. Cooperate with ISF to impose a fine on visitors who throw their garbage into the sea.	All boat owners/drivers are responsible for the cleanness of the sea. They should be punished for throwing any garbage in the sea, even if done by clients.	H	APAC	3 month	3,000
Activity 3.2.4. Prepare and promote a Visitor Code of Conduct and promote in appropriate ways.	A leaflet with codes of conducts and photos expressing the codes is an example of how to sensitize visitors.	VH	MT	Ongoing	6,000
Activity 3.2.5. Implement awareness campaigns for the local community on solid wastemanagement.	Identify the stakeholders that are to be targeted by the awareness campaign.	VH	MT	Ongoing	5,000

PROJECT 4.1. IMPROVE APPRECIATION OF PINR					**PROJECT PRIORITY 2**
Key issues: Many people are still unconvinced by the values of PINR, mostly due to lack of raising awareness. Boat owners focus on their own interests and rarely think on the long-terms.					
Activity	**Tasks**	**Priority**	**Resp.**	**Duration**	**Budget ($)**
Activity 4.1.1. Diffuse information on ecosystem services and their monetarized values to the public, local communities, Tour operators.	Use the study of IUCN-MOE in 2020 ecosystem services and their monetarized values Diffuse information through all national and local media. Simplify the economic data with examples and explanations.	VH	APAC MT	3 months	**4,000**
Activity 4.1.2. Develop a Community Relations Plan which includes priority for channeling of socio-economic benefits to the local community.	Provide local communities with the basic technical and financial tools to endorse alternative business opportunities (training on small enterprises, exploring new job opportunities). Train Locals on hygiene and hospitality to offer the best services to visitors. Provide seasonal jobs for locals. Implement projects using locals from boat renting to employed staff. Encourage locals to sell handcrafts to PINR visitors.	H	APAC MT	Ongoing	4,500
Activity 4.1.3. Develop an awareness program for fishermen and local communities to improve public awareness of the need for marine conservation.	Conduct workshops for fishermen on the importance of Marine mammals and turtles as well as on the importance of PINR for spawning and sustainable fishing Produce posters and leaflets to be distributed to fishermen and fish markets promoting marine conservation	VH	APAC	2 months	3,000
Activity 4.1.4. Produce interpretation panels on the site to benefit people, particularly students and subsequently their parents with practical field education.	A leaflet with codes of conducts and photos expressing the codes is an example of how to sensitize visitors.	VH	MT	Ongoing	2,000
Activity 4.1.5. Establish a database to provide documented references on PINR to researchers with the aim of whetting their appetites to continue their studies in order to increase the knowledge, and subsequently appreciation of the PINR.	Gather all available information / studies on PINR Develop an information library detailing type of info, availability, source and location Incorporate available information into GIS database Link database to the national centralized information system at MOE.	VH	MT	Ongoing	7,000

PROJECT 5.1. MAINTAIN A QUALITY STUDY ENVIRONMENT TO STUDENTS					**PROJECT PRIORITY 2**
Activity	**Tasks**	**Priority**	**Resp.**	**Duration**	**Budget ($)**
Activity 5.2.1. Clean and maintain at all time the sandy beach free from garbage, empty bottles, debris, and leftover food.	Appoint during the visitation season labors to keep clean the recreation zone	VH	MT	5 months	5,000
Activity 5.2.2. Provide and maintain at all time the sandy beaches with hats, umbrellas, benches, toilets, rubbish bens, freshwater	Prior and after every visitation season, repair or maintain all the infrastructure on PINR.	VH	APAC MT	2 months	6,000
Activity 5.2.3. Keep the trails clean and with benches for resting and contemplating the landscapes and the species on PINR.	Maintain and keep the trails clean from weeds On yearly basis maintain the underwater trail and its panels	VH	APAC MT	2 months	4,000
Activity 5.2.4. Schedule periodic monitoring of sea water quality.	With regard to *Streptococci* and *Fecal coliform*.	H	APAC MT, ES	Ongoing	1,500
Activity 5.2.5. Ensure the sea water is always free of pollution and contaminants.	With regards to oil contamination. Seek the use of booms to protect beaches and shores from possible oil contamination.	H	ES	Intermittently	3,000

PROJECT 6.1. INVOLVE KEY STAKEHOLDERS IN MANAGEMENT OF PINR.					**PROJECT PRIORITY 1**
Activity	**Tasks**	**Priority**	**Resp.**	**Duration**	**Budget ($)**
Activity 6.2.1. Carry out participatory planning and negotiation among stakeholders to develop a strategy for achieving local involvement in PINR management.	Valorize the site for ecotourism purposes (Hides for observation, Footpath, hiking, etc) through local stakeholders and local community management. Local involvement in PINR management serves as an important source of income for several members of the local community.	VH H	APACMT APAC MT	Ongoing Ongoing	5,000

PROJECT 6.1. INVOLVE KEY STAKEHOLDERS IN MANAGEMENT OF PINR.					**PROJECT PRIORITY 1**
Activity	**Tasks**	**Priority**	**Resp.**	**Duration**	**Budget ($)**
Activity 6.2.1. Carry out participatory planning and negotiation among stakeholders to develop a strategy for achieving local involvement in PINR management.	Valorize the site for ecotourism purposes (Hides for observation, Footpath, hiking, etc) through local stakeholders and local community management. Local involvement in PINR management serves as an important source of income for several members of the local community.	VH H	APACMT APAC MT	Ongoing Ongoing	5,000

PROJECT 7.1. Ensure the economic viability of PINR					**PROJECT PRIORITY 1**
Activity	**Tasks**	**Priority**	**Resp.**	**Duration**	**Budget ($)**
Activity 7.1.1. Update the business plan of PINR		H	ES	1 month	4,000

Activity 7.1.2. Mobilize international and national funding sources for wetland conservation and wise use.	Organizing fundraising events.	H	APAC	1 month	5,000
Activity 7.1.3. Organize a yearly donor tour.	Provide donors with yearly report of achievement.	H	APAC MT	1 month	2,000
Activity 7.1.4. Prepare an updated feasibility study for PINR		H	ES	2 months	4,000
Activity 7.1.5. Develop a strategy to diversify sources of funding for PINR	Diversify sources of funding through development of fundraising strategies, focus on finding the right balance.	H	ES	2 months	4,000
Activity 7.1.6. Update the fundraising strategy that was developed in 2000		H	ES	2 months	4,000

PROJECT 7.2. IMPROVE THE LIVELIHOOD OF THE LOCAL COMMUNITY		**PROJECT PRIORITY 1**			
Key issues: Experiences have shown that the improved livelihood of local communities support the sustainable management of the protected area.					
Activity	**Tasks**	**Priority**	**Resp.**	**Duration**	**Budget ($)**
Activity 7.2.1. Develop a Community Relations Plan which includes priority for channeling of socio-economic benefits to the local community.	Involve local community in any eco-tourism planning Provide local communities with the basic technical and financial tools to endorse alternative business opportunities (training on small enterprises, exploring new job opportunities). Train Locals on hygiene and hospitality to offer the best services to visitors. Provide seasonal jobs for locals. Implement projects using locals from boat renting to employed staff. Encourage locals to sell handcrafts to PINR visitors.	VH	ES	4 months	4,000
Activity 7.2.2. Recruit manager, rangers, guides, scientific coordinators and part time labors from the local community.	For transparency purposes, announce in media for recruitments of a manager, rangers, guides, scientific coordinator, etc.	H	APAC MOE	12 months	510,000+ 45000
Activity 7.2.3. Develop awareness material on the benefits and functions of PINR (digital media, print media).	Produce posters and leaflets to be distributed to fishermen and fish markets promoting marine conservation.	H	APAC MT	1 month	5000
Activity 7.2.4. Develop an awareness program for fishermen and local communities to improve public awareness of the need for marine conservation.	Conduct workshops for fishermen on the importance of Marine mammals and turtles as well as on the importance of PINR for spawning and sustainable fishing. Produce posters and leaflets to be distributed to fishermen and fish markets promoting marine conservation.	VH	APAC ES	2 months	3000

PROJECT 8.1. BUILD CAPACITY AND SKILLS IN THE MANAGEMENT TEAM		**PROJECT PRIORITY 1**			
Key issues: Lack of experience and skills in management may lead to an “ignorance threat”.					
Activity	**Tasks**	**Priority**	**Resp.**	**Duration**	**Budget ($)**

Activity 8.1.1. Conduct training workshops to improve the skills of the management team.	Adapt the national protected areas capacity building strategy to improve the skills of the management team. Promote rotational participation of APAC & management teams members in national and international events/trainings/workshops covering relevant topics.	VH	MT	2 months	3,000
Activity 8.1.2. Develop a performance agreement between the APAC and the Reserve Manager.		H	APAC	1 month	-

PROJECT 8.2. BUILD CAPACITY AND SKILLS IN THE APAC		**PROJECT PRIORITY 1**			
Key issues: Lack of experience and skills in management may lead to an "ignorance threat".					
Activity	**Tasks**	**Priority**	**Resp.**	**Duration**	**Budget ($)**
8.2.1. Encourage members of the APAC to attend Capacity Building workshops organized by international agencies (e.g., MedPAN, MedFUND, SPA/RAC, etc).	Promote rotational participation of APAC & management team members in national and international events/trainings/workshops covering relevant topics. Adapt the National PA Capacity Building strategy to PINR.	H	APAC	Ongoing	5,000

PROJECT 9.1. REDUCE THREATS WHERE AND WHEN APPROPRIATE.		**PROJECT PRIORITY 1**			
Key issues: It is not important to identify the threats only in a reserve, but also to know when to act to face these threats					
Activity	**Tasks**	**Priority**	**Resp.**	**Duration**	**Budget ($)**
Activity 9.1.1. Develop and implement a plan to control littering on PINR		VH	APAC MT	9 months	$5,000
Activity 9.1.2. Reduce the impact of the tourists' activities on the beach during the summer(carrying capacity of the site, Panels with instructions and directions, code of conducts.)		VH	MT	4 months	$3,500
Activity 9.1.3. Conduct daily cleaning during visitation seasons and regular but spaced cleaning campaigns outside the visitation season.		VH	MT	8 months	$17,000
Activity 9.1.4. Ban all activities that disturb wildlife (noisy music, stepping on plant fixing sand, collecting plants, animals or parts of them).		VH	MT	3 months	$5,500

PROJECT 10.1. RAISE FUNDS.		**PROJECT PRIORITY 1**			
Activity	**Tasks**	**Priority**	**Resp.**	**Duration**	**Budget $**
Activity 10.1.1. Review the business plan every year and update it when needed.		H	ES	1 month	2,500

Activity 10.1.2. Update the funding plan that was developed by IUCN in 2000.	Periodically review existing fundraising plan.	H	ES	2 months	2,500
Activity 10.1.3. Develop a program for volunteers to assist management team and reduce expenses.	Evaluate volunteers based on CVS, vision and experience with reserves. Equip volunteers with necessary tools satisfying their requirements.	H	APAC	3 months	7,500
Activity 10.1.4. Develop and maintain a Sponsorship Agenda comprising a selection of projects of predetermined priority for which funding is sought.	Develop project catalogue for management plan Implementation to be presented to donors at any time thereby maximizing fundraising opportunities. Include in the catalogue a detailed project concept paper for every management plan activity in need of funding. Deploy proactive networking with national and international funding agencies Submit regular project proposals for funding.	1	ES	3 months	4,000
Activity 10.1.5. Develop a yearly research agenda covering the research needs of PINR and distribute it to universities and research centers in order to conduct studies in PINR that highlight the importance of PINR and assist in attracting donors.	Keep a research agenda updated Income generation should include sponsorship, donations of money, goods and services.	1	ES	3 months	3,000
					1,019,000

11.10. PINR management plan review and monitoring

The Site manager will review the management plan of PINR in light of new information derived from new studies and research as well as from the monitoring programs. Annual reviews will determine whether the site is being managed in accordance with the plan; five-year reviews will be applied to ensure that the objectives are being achieved and remain relevant.

There will be three levels of review: (i) project achievement, (ii) annual review of the operational objectives and (iii) five-years review for the long-term objectives.

ANNUAL PROJECT EVALUATION (73 activities)

Table 8. Annual project evaluation

	ACTIVITY	STATUS*	FINANCIAL RESOURCES USED	CONSTRAINTS/ CHALLENGES
1.	Activity 1.1.1. Develop a monitoring scheme of selected key species (threatened, endangered endemic species).			
2.	Activity 1.1.2. Propagate threatened key species in PINR.			
3.	Activity 1.1.3. Remove or mitigate all threats and obstacles facing the threatened key plant species in PINR.			
4.	Activity 1.1.4. Develop and implement a mitigation or elimination plan on the threat of present alien invasive species on native biota.			
5.	Activity 1.2.1. Develop and implement a monitoring protocol and a monitoring manual for the conservation of bird species in PINR.			
6.	Activity 1.2.2. Maintain the bird observation tower to promote conservation of birds and birdwatching in PINR.			
7.	Activity 1.2.3. Ban bird hunting and effectively monitor bird-hunting activities.			
8.	Activity 1.2.4. Remove or mitigate all threats and obstacles facing the threatened key bird species in PINR.			
9.	Activity 1.2.5. Develop a strategy for conservation and to restore and rehabilitate threatened or degraded habitats			
10.	Activity 1.3.1. Develop a conservation strategy for Sea Turtles.			
11.	Activity 1.3.2. Develop and implement a yearly monitoring plan during the nesting and hatching seasons.			
12.	Activity 1.3.3. Reduce the negative impact of the touristic activities on the beach during nesting and hatching seasons. Activity 1.3.4. Develop awareness campaigns for the conservation of sea turtles.			
13.	Activity 1.3.5. Ensure the provision of proper training and knowledge relating to Sea turtles in the Mediterranean.			
14.	Activity 1.4.1. Ban of fishing in the no-take zone (Buffer zone) of the PINR.			
15.	Activity 1.4.2. Increase awareness and enforce Law to protect marine species (Monk seal, dolphins, cetaceans) in PINR.			
16.	Activity 1.4.3. Increase awareness and enforce the Law to stop fish blasting and poisoning.			
17.	Activity 1.4.4. Conduct awareness campaigns for the conservation of marine habitats.			
18.	Activity 1.5.1. Develop an action plan for sand protection from erosion and pollution.			
19.	Activity 1.5.2. Apply strict ban of access to marine turtle nesting areas.			
20.	Activity 1.5.3. Install infrastructure facilities (benches, umbrellas) for visitors in the non-turtle nesting beaches			
21.	Activity 1.5.4. Reduce the negative impact of tourists' activities on the beach during the summer through application of carrying capacity principle.			
22.	Activity 1.6.1. Develop a strategy to complete the eradication of the introduced rabbits on PINR			
23.	Activity 1.6.2. Develop a strategy for the eradication of the introduced rats on PINR			
24.	Activity 1.7.1. Establish and maintain a data base system of species which inhabit the reserve.			
25.	Activity 1.7.2. Continuously update all available data and information into a GIS database			
26.	Activity 1.8.1. Conduct staff training workshops to ensure that all staff are familiar with the Management Plan, in particular the monitoring and the activities for the restoration and maintenance of the ecological integrity of the reserve.			
27.	Activity 2.1.1. Provide an office for the APAC and the Management Team.			
28.	Activity 2.1.2. Erect panels of interpretation and distribute to visitor brochures on history, archeology and other cultural features of the reserve.			
29.	Activity 2.1.3. Cultural and historical sites should not be accessed without guide.			

	ACTIVITY	STATUS*	FINANCIAL RESOURCES USED	CONSTRAINTS/ CHALLENGES
30.	Activity 3.1.1. Act in line with the Protocol of Barcelona for the Protection of the Mediterranean Sea Against Pollution from Land-Based Sources.			
31.	Activity 3.1.2. Promote the establishment of port reception facilities for the collection of ship and boat generated garbage and of bilge and ballast waters.			
32.	Activity 3.1.3. Promote the adoption of a national strategy to phase-out the discharge of litter and toxic compounds in the sea.			
33.	Activity 3.1.4. Remove garbage brought to PINR by sea currents.			
34.	Activity 3.2.1. Provide appropriate garbage disposal facilities on PINR.			
35.	Activity 3.2.2. Impose trash fees on visitors leaving their garbage in the PINR			
36.	Activity 3.2.3. Cooperate with ISF to impose a fine on visitors who throw their garbage into the sea.			
37.	Activity 3.2.4. Prepare and promote a Visitor Code of Conduct and promote in appropriate ways.			
38.	Activity 3.2.5. Implement awareness campaigns for the local community on solid waste management.			
39.	Activity 4.1.1. Diffuse information on ecosystem services and their monetarized values to the public, local communities, Tour operators.			
40.	Activity 4.1.2. Develop a Community Relations Plan which includes priority for channeling of socio-economic benefits to the local community.			
41.	Activity 4.1.3. Develop an awareness program for fishermen and local communities to improve public awareness of the need for marine conservation.			
42.	Activity 4.1.4. Activity 4.1.4. Produce interpretation panels on the site to benefit people, particularly students and subsequently their parents with practical field education.			
43.	Activity 4.1.5. Establish a database to provide documented references on PINR to researchers with the aim of whetting their appetites to continue their studies in order to increase the knowledge, and subsequently appreciation of the PINR.			
44.	Activity 5.1.1. Provide permits in a quick way to students to visit the PINR			
45.	Activity 5.1.2. Provide the observatory of birds with photos of most common species on PINR			
46.	Activity 5.1.3. Provide security and safety to students through zoning and ensuring undisturbed areas of studies.			
47.	Activity 5.1.4. Develop an information brochure for PINR.			
48.	Activity 5.1.5. Develop a field bird guide for PINR.			
49.	Activity 6.1.1. Develop an administrative coordination mechanism among all the stakeholders concerned with PINR.			
50.	Activity 6.1.2. Promote stakeholder involvement in decision-making and management strategies of PINR.			
51.	Activity 6.2.1. Carry out participatory planning and negotiation among stakeholders to develop a strategy for achieving local involvement in PINR management.			
52.	Activity 7.1.1. Update the business plan of PINR			
53.	Activity 7.1.2. Mobilize international and national funding sources for wetland conservation and wise use.			
54.	Activity 7.1.3. Organize a yearly donor tour.			
55.	Activity 7.1.4. Prepare a feasibility study for PINR			
56.	Activity 7.1.5. Develop a strategy to diversify sources of funding for PINR			
57.	Activity 7.1.6. Update the fundraising strategy that was developed in 2000			
58.	Activity 7.2.1. Develop a Community Relations Plan which includes priority for channeling of socio-economic benefits to the local community.			
59.	Activity 7.2.2. Recruit manager, rangers, guides, scientific coordinators and part time labors from the local community.			
60.	Activity 7.2.3. Develop awareness material on the benefits and functions of PINR (digital media, print media.			
61.	Activity 7.2.4. Develop an awareness program for fishermen and local communities to improve public awareness of the need for marine conservation.			
62.	Activity 8.1.1. Conduct training workshops to improve the skills of the management team.			
63.	Activity 8.1.2. Develop a performance agreement between the APAC and the Reserve Manager.			
64.	Activity 8.2.1. Encourage members of the APAC to attend Capacity Building workshops organized by international agencies (e.g. MedPAN, MedFUND, SPA/RAC, etc).			

	ACTIVITY	STATUS*	FINANCIAL RESOURCES USED	CONSTRAINTS/ CHALLENGES
65.	Activity 9.1.1. Develop and implement a plan to control littering on PINR			
66.	Activity 9.1.2. Reduce the impact of the tourists' activities on the beach during the summer (carrying capacity of the site, Panels with instructions and directions)			
67.	Activity 9.1.3. Conduct regular cleaning campaigns.			
68.	Activity 9.1.4. Ban all activities that disturb wildlife (noisy music, stepping on plant fixing sand, collecting plants, animals or parts of them).			
69.	Activity 10.1.1. Review the business plan every year and update it when it expires.			
70.	Activity 10.1.2. Update the funding plan that was developed by IUCN in 2000.			
71.	Activity 10.1.3. Develop a program for volunteers to assist management team and reduce expenses.			
72.	Activity 10.1.4. Develop and maintain a Sponsorship Agenda comprising a selection of projects of predetermined priority for which funding is sought.			
73.	Activity 10.1.5. Develop a yearly research agenda covering the research needs of PINR and distribute it to universities and research centers in order to conduct studies in PINR that highlight the importance of PINR and assist in attracting donors.			

ANNUAL REVIEW

Table 9. Annual review plan

OPERATIONAL OBJECTIVES	INDICATOR TYPE	VALUE OF INDICATOR	MEANS OF VERIFICATION	ANALYSIS
Objective 1: Conserve the fauna and flora and ecological integrity of the PINR through ecosystem management.	Decrease in illegal killing of birds.	Number of Illegally killed birds	Weekly report from the manager/ranger	
	Decrease in number of hunters	Number of hunters per week	Weekly report from the manager/ranger	
	Decrease in illegal trespassers into theconservation zone	Number of trespassers.	Weekly report from the manager/ranger	
	Decrease in size of fishing	Measure the harvest size	Seasonal report	
	Decrease in number of fishermen/boats in the waters of PINR	Number of fishermen fishing in no-take area.	Seasonal report	
	Increase in the number of turtle nests onsite (to a certain limit because of the carrying capacity of the beaches)	Number of turtles/seasons	Seasonal report	
	Increase in the number of successful hatchlings	Number of hatchlings/seasons	Seasonal report	
Objective 2: Preserve, maintain and manage cultural, historical and traditional sites within PINR.	Decrease in illegal trespassers into theconservation zone Increase in number of legal visitors to cultural sites.	Number of trespassers.	Weekly report from the manager/ranger	
Objective 3: Reduce or eliminate garbage and chemical threats to PINR from external and internal activities.	Increase in ecotourism. Decreased size of garbage generated.	Number of visitors/seasons Size of garbage	Seasonal Report from manager/ranger Seasonal Report from manager/ranger	
Objective 4: Improve appreciation of PINR through awareness, education, generation of knowledge, interpretation and research.	Increased number of responsible visitors	Number of visitors	Monthly report from the manager/ranger	
	Increased frequency of visited interpretation panels	Number of visitors reading interpretation panels	Progress report by the management team	
	Increase in number of research visits	Number of researchers	Progress report by the managementteam	
	Proposal writing	Number of proposals written	Number of projects accepted	
	Increase in number of visitors	Number of visitors	Weekly report from the manager/ranger	
Objective 5: Maintain a quality study environment to students and a quality recreational environment to visitors.	Increase number of students.	Number of students visiting the PINR	Monthly report from the manager/ranger	
	Increase in number of recreationists	Number of recreationists	Monthly report from the manager/ranger	
Objective 6: Involve key stakeholders and local communities in the management of PINR.	Communication APAC – Stakeholders	Number of meetings or contacts	Monthly report of APA Surveys Participation of local community inmanaging the PINR	
	Communication APAC – Local community	Number of meetings or contacts	Monthly report of APAC	
	Participation in workshop	% Representability of local community/stakeholders in workshop	Monthly report of APAC	
Objective 7: Ensure the economic viability of PINR and improve the livelihood of the local communities around it, and their participation in its events.	Traditional products sold to visitors	Number of purchasers	Monthly report from the manager/ranger	
	Number of people from local community involved in the management of PINR	Number of people from local community	Monthly report from the manager/ranger	
	Increase interest in events by locals	Number of locals attending events	Yearly report by APAC	
Objective 8: Build capacity and skills in the Management Team of the PINR and APAC.	Number of capacity building workshops.	Participants' evaluation	Evaluation forms	
Objective 9: Reduce threats where and when appropriate.	Mitigation of threats	Number of key threats mitigated or eliminated	Yearly report of APAC	
Objective 10: Raise funds from a number of sources to ensure the effective management of the Palm Islands Nature Reserve in the long term.	Income	Participants' evaluation	Evaluation forms Yearly report of APAC	

FIVE-YEARS REVIEW

Table 10. Five-years review plan

IDEAL OBJECTIVES	INDICATOR TYPE (IMPACT-BIOPHYSICAL)	VALUE OF INDICATOR	MEANS OF VERIFICATION	ANALYSIS
CONSERVE THE INTEGRITY OF THE NATURAL ECOSYSTEMS IN PINR	• Number of contacts with relevant research institutions to promote scientific research • Increase in number of sea turtles nesting, hatching and hatchlings. • Increase in seabirds breeding in PINR • Number of training sessions, workshops, on conservation of fauna and flora of PINR	• Number of contacts is an indicator of research promotion. • Number of nests in the nesting season • Number of nests is an indicator of healthy ecosystems (sea, rocks, sands). • Number of hatchlings • Total number of seabirds nesting on PINR • Capacity building of trainees	• Monitoring hatchlings leaving nests • Monitoring of sea turtles • Monitoring of sandy beaches and rocky shores. • Monthly reports • Quarterly reports	
ENHANCE THE CULTURAL AND NATURAL VALUE OF PINR	• Raise awareness of the natural importance ofthe site. • Advertise the cultural values of PINR • Promote ecotourism. • Number of cultural and historical sites visited with guides • Number of interpretation panels on history, archaeology and other cultural features of the reserve. • Number of training sessions, workshops, on protection of archaeological and historical assets of PINR	• Number of visitors • Responsible visits to cultural and historical sites. • Interest in archeology and history indicates diversification of visitor's categories • Capacity building of trainees	• APAC database • Monthly reports	
ACHIEVE SUSTAINABLE MANAGEMENT OF THE NATURAL RESOURCES IN PINR	• Generation of incomes • Donations • Fundraising • Number of projects from the sponsorship agenda funded • Number of volunteers joined the MT • Number of natural eco-tourits visited the PINR	• Amount collected from sale • Amount received from donors • Amount obtained from projects • Additional incomes and jobs supported • Controlled and well managed PINR • Sublime relationship with the PINR	• Monitoring of incomes generated • Monitoring of biodiversity trend. • Monitoring of projects outcomes. • Successful completion of projects funded • Quarterly reports • Number and categories of visitors interested in biodiversity of PINR	

MONITORING OF IMPLEMENTATION

The Appointed Protected Area Committee (APAC) will be responsible, on behalf of the Ministry of Environment, for regular review of the implementation of the management plan.

The Appointed Protected Area Committee will be required to report to the MOE, advising the results of their assessment of progress and making any recommendations that it sees as necessary to improve the progress in implementation.

The Appointed Protected Area Committee for the reserve, in collaboration with the MOE recognizes that Monitoring and evaluation are essential components of project Management Plan. Regular monitoring enables the project to anticipate risks and identify the necessary changes to be made into project plans as well. Monitoring and evaluation are also needed to be accountable to stakeholders.

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Annex 1 PINR Mammals Species List

SCIENTIFIC NAME	English Name	Status	Arabic Name
VESPERTILIONIDAE			
Rhinolophus euryale judaicus	Mediterranean Horseshoe	NT	عماش صغير
Myotis blythi omari	Lesser Mouse-Eared Bat	LC	وطواط عمري
Myotis capaccinii bureschi	Long-Fingered Bat	VU	وطواط طويل الأصابع
Myotis natteri hoveli	Natterer's Bat	LC	وطواط نترر
Pipistrellus kuhli ikhawanius	Kuhl's Pipistrelle	LC	خفاش كوهلي
LEPORIDAE			
Oryctolagus cuniculus	Domestic Rabbit		أرنب منزلي
MURIDAE			
Rattus norvegicus norvegicus	Brown Rat		جرذون شائع
PHOCIDAE			
Monachus monachus	Mediterranean Monk seal	EN	فقمة البحر المتوسط

Source: (Tohme & Tohme, 2005), Updated by Dr. Ghassan Ramadan-Jaradi in 2021 for the purpose of this MP.

(1) NT= Near Threatened

(2) VU= Vulnerable

(3) EN= Endangered

Annex 2 PINR Birds Species List

Key abbreviations are used to indicate the species status, a question mark indicating uncertain status. Lower case abbreviations (eg r, sb, s, wv and pm) indicate that the species is uncommon or rare at the relevant season.

R	Resident with definite breeding records
SB	Breeding summer visitor
S	Non-breeding summer visitor
WV	Winter visitor
PM	Passage migrant
FB	Formerly bred (no breeding records since 1987)
v	Vagrant
e	Extinct in Lebanon

After the scientific name, the following abbreviations denote threatened species as per the IUCN Red List categories for 2007. (EN): Endangered. (VU): Vulnerable. (NT): Near Threatened.

Classification order:

The classification order of species and nomenclature follow the OSME Region List (ORL).

1. Coturnix coturnix Common Quail فري sb, PM
2. Anser albifrons Greater White-fronted Goose أوز أبيض الجبهة الكبير pm, wv
3. Tadorna tadorna Common Shelduck بط شهرمان pm, wv
4. Anas strepera Gadwall بط سماري ?wv, ?pm
5. Anas penelope Eurasian Wigeon بط صواي pm
6. Anas platyrhynchos Mallard بط خضيري pm, wv, s
7. Anas clypeata Northern Shoveler بط أبو مجرفة pm
8. Anas acuta Northern Pintail بط أبو زلة PM, wv
9. Anas querquedula Garganey حذف صيفي PM
10. Anas crecca Eurasian Teal حذف شتوي pm, wv
11. **Aythya ferina (VU) Common Pochard حمراوي pm**
12. Aythya nyroca (NT) Ferruginous Duck حمراوي أبيض العينين ?pm
13. Mergus serrator Red-breasted Merganser بلقشة حمراء الصدر v
14. Calonectris d. diomedea Scopoli's Shearwater جلم ماء سكوبولي PM, WV
15. **Puffinus yelkouan (VU) Yelkouan Shearwater جلم ماء البحر المتوسط PM, WV**
16. Puffinus gravis Great Shearwater جلم ماء كبير v
17. Oceanodroma leucorhoa Leach's Storm Petrel طائر نوء ليتش v
18. Tachybaptus ruficollis Little Grebe غطاس صغير pm
19. Podiceps cristatus Great Crested Grebe غطاس كبير متوج pm
20. Phoenicopterus roseus Greater Flamingo نحام كبير pm
21. Platalea leucorodia Eurasian Spoonbill أبو ملعقة pm
22. Ixobrychus minutus Little Bittern واق صغير pm
23. Nycticorax nycticorax Black-crowned Night Heron غراب الليل PM
24. Ardeola ralloides Squacco Heron واق صغير أبيض pm
25. Bubulcus ibis Cattle Egret بلشون البقر - أبو قردان pm
26. Ardea cinerea Grey Heron مالك الحزين الرمادي PM, WV
27. Ardea purpurea Purple Heron مالك الحزين الأرجواني pm
28. Ardea alba Great Egret بلشون كبير أبيض pm
29. Egretta garzetta Little Egret بلشون صغير أبيض PM, wv
30. Pelecanus onocrotalus Great White Pelican بجع أبيض PM
31. **Pelecanus crispus (VU) Dalmatian Pelican بجع أشعث pm**
32. Morus bassanus Northern Gannet أطيش الشمال wv
33. Phalacrocorax pygmeus Pygmy Cormorant غراب البحر القزمي pm, s
34. Phalacrocorax carbo Great Cormorant غراب البحر الكبير WV, PM, s
35. Falco naumanni Lesser Kestrel صقر عويسق pm, s
36. Falco tinnunculus Common Kestrel عوسق - صقر الجراد sb
37. Falco vespertinus (NT) Red-footed Falcon صقر اللزيق pm

38. Falco eleonorae Eleonora's Falcon صقر اليونورا pm
39. Falco subbuteo Eurasian Hobby صقر البيدق - شويهين pm, s
40. Falco biarmicus Lanner Falcon صقر حر pm, s
41. Falco cherrug (EN) Saker Falcon صقر الغزال pm, wv
42. Falco peregrinus Peregrine Falcon pm, شاهين ?wv
43. Falco pelegrinoides Barbary Falcon شاهين مغربي v
44. Pandion haliaetus Osprey عقاب السمك النساري ?pm
45. Haliaeetus albicilla White-tailed Eagle عقاب البحر أبيض الذنب v
46. Neophron percnopterus (EN) Egyptian Vulture شوحة مصرية pm
47. Circus aeruginosus Western Marsh Harrier مرزة البطائح pm
48. Circus cyaneus Hen Harrier مرزة الدجاج pm
49. Circus macrourus (NT) Pallid Harrier مرزة باهتة pm
50. Aquila clanga (VU) Greater Spotted Eagle عقاب سفعاء كبيرة v
51. Crex crex (NT) Corncrake طائر السلوى pm
52. Porzana parva Little Crake مرعة صغيرة pm
53. Porzana porzana Spotted Crake مرعة رقطاء pm
54. Gallinula chloropus Common Moorhen دجاجة الماء pm
55. Fulica atra Eurasian Coot غر - صلندة سوداء pm
56. Grus grus Common Crane كركي اعتيادي PM, wv
57. Burhinus oedicnemus Eurasian Stone-curlew كروان pm,?sb
58. Haematopus ostralegus Eurasian Oystercatcher آكل المحار pm
59. Himantopus himantopus Black-winged Stilt كرسوع PM
60. Recurvirostra avosetta Pied Avocet نكات pm
61. Vanellus vanellus Northern Lapwing طيبط - غنيج pm
62. Vanellus spinosus Spur-winged Lapwing قطقاط شوكي الجناح pm
63. Pluvialis squatarola Grey Plover قطقاط رمادي pm, wv
64. Charadrius hiaticula Common Ringed Plover زقزاق مطوق PM, wv, s
65. Charadrius dubius Little Ringed Plover زقزاق مطوق صغير PM, s
66. Charadrius alexandrinus Kentish Plover زقزاق اسكندري pm, s
67. Charadrius leschenaultii Greater Sand Plover زقزاق الرمل الكبير pm
68. Lymnocryptes minimus Jack Snipe جهلول صغير pm, wv
69. Gallinago media (NT) Great Snipe شنقب - شكب كبير pm
70. Gallinago gallinago Common Snipe شكب - شنقب pm, wv
71. Limosa limosa (NT) Black-tailed Godwit بقويقة سوداء الذيل pm
72. Numenius phaeopus Whimbrel كروان الماء الصغير pm
73. Tringa totanus Common Redshank طيطوي أحمر الساق pm, wv
74. Tringa stagnatilis Marsh Sandpiper طيطوي البطائح pm
75. Tringa nebularia Common Greenshank طيطوي أخضر الساق PM, wv
76. Tringa ochropus Green Sandpiper طيطوي أخضر PM, wv
77. Tringa glareola Wood Sandpiper طيطوي الغياض PM
78. Actitis hypoleucos Common Sandpiper طيطوي اعتيادي PM, wv, s
79. Arenaria interpres Ruddy Turnstone قنبرة الماء pm
80. Calidris minuta Little Stint دريجة صغيرة PM
81. Calidris temminckii Temminck's Stint دريجة تمنك pm
82. Calidris ferruginea Curlew Sandpiper طيطوي مقوس المنقار pm, s
83. Calidris alpina Dunlin دريجة PM, wv
84. Limicola falcinellus Broad-billed Sandpiper طيطوي عريض المنقار pm
85. Philomachus pugnax Ruff حجوالة PM, wv
86. Phalaropus lobatus Red-necked Phalarope فلروب أحمر الرقبة pm
87. Glareola pratincola Collared Pratincole أبو اليسر المطوق pm
88. Glareola nordmanni (NT) Black-winged Pratincole أبو اليسر أسود الجناح pm
89. Larus canus Common Gull نورس اعتيادي WV, pm, s
90. Larus audouinii (NT) Audouin's Gull نورس أودويني FB, pm
91. Larus marinus Great Black-backed Gull نورس أسود الظهر كبير pm
92. Larus michahellis Yellow-legged Gull نورس أصفر الأرجل R, PM, WV, S
93. Larus cachinnans Caspian Gull نورس قزويني wv,?pm
94. Larus fuscus fuscus Lesser Black-backed Gull نورس أسود الظهر صغير PM, WV, s

95. Larus ichthyaetus Great Black-headed Gull نورس أسود الرأس كبير pm,wv
96. Larus ridibundus Common Black-headed Gull نورس ضاحك - نورس أسود الرأس اعتيادي PM, WV
97. Larus genei Slender-billed Gull نورس مستدق المنقار pm, wv
98. Larus minutus Little Gull نورس صغير pm, WV
99. Rissa tridactyla (VU) Black-legged Kittiwake نورس كيتيويك v
100. Sterna bengalensis Lesser Crested Tern خطاف البحر المتوج الصغير FB, e
101. Sterna sandvicensis Sandwich Tern خطاف البحر الساندويتشي pm, wv
102. Sterna hirundo Common Tern خطاف البحر الاعتيادي FB, PM
103. Sternula albifrons Little Tern خطاف البحر الصغير أبيض الجبهة FB, pm
104. Chlidonias hybrida Whiskered Tern خطاف المستنقعات الملتحي pm
105. Chlidonias leucopterus White-winged Tern خطاف المستنقعات أبيض الجناح pm
106. Stercorarius pomarinus Pomarine Skua كركر بوماريني ?pm, ?wv
107. Stercorarius parasiticus Arctic Skua كركر قطبي ?pm, ?wv
108. Streptopelia turtur (VU) European Turtle Dove ترغل ?sb, PM
109. Clamator glandarius Great Spotted Cuckoo وقواق أرقط كبير pm, wv
110. Cuculus canorus Common Cuckoo وقواق - قيقب - كوكو PM
111. Athene noctua Little Owl بومة صغيرة r
112. Caprimulgus europaeus European Nightjar سبد أوروبي - أبو عمي - ملهي الرعيان PM
113. Apus apus Common Swift خطف (سمامة) أسود PM
114. Apus pallidus Pallid Swift خطف (سمامة) باهت ?sb, pm
115. Alcedo atthis Common Kingfisher صياد السمك - رفراف PM, wv, s, ?r
116. Ceryle rudis Pied Kingfisher صياد السمك الأبقع pm
117. Upupa epops Eurasian Hoopoe هدهد sb, PM, wv
118. Jynx torquilla Eurasian Wryneck لواء pm
119. Lanius collurio Red-backed Shrike صرد أحمر الظهر PM
120. Lanius senator Woodchat Shrike صرد أحمر الرأس PM
121. Lanius nubicus Masked Shrike صرد مقنع pm
122. Oriolus oriolus Eurasian Golden Oriole صفراية pm
123. Hirundo rustica Barn Swallow سنونو PM, wv
124. Ptyonoprogne rupestris Eurasian Crag Martin خطاف الشواهق sb, PM
125. Delichon urbicum Common House Martin خطاف الضواحي PM
126. Cecropis daurica Red-rumped Swallow سنونو أحمر العجز pm
127. Melanocorypha calandra Calandra Lark قبرة مطوقة - مطوق pm
128. Calandrella brachydactyla Greater Short-toed Lark قبرة قصيرة الأصابع كبيرة pm
129. Calandrella rufescens Lesser Short-toed Lark قبرة قصيرة الأصابع صغيرة pm
130. Alauda arvensis Eurasian Skylark قبرة السماء pm, wv
131. Cisticola juncidis Zitting Cisticola هازجة مروحية الذنب wv
132. Prinia gracilis Graceful Prinia هازجة رشيقة SB
133. Locustella luscinioides Savi's Warbler هازجة سافي pm
134. Acrocephalus arundinaceus Great Reed Warbler هازجة القصب الكبيرة pm
135. Iduna pallida Eastern Olivaceous Warbler خنشع زيتوني باهت pm
136. Hippolais languida Upcher's Warbler خنشع شجري pm
137. Hippolais icterina Icterine Warbler خنشع ليموني pm
138. Phylloscopus trochilus Willow Warbler نقشارة الصفصاف pm
139. Phylloscopus collybita Common Chiffchaff نقشارة PM, wv
140. Phylloscopus sibilatrix Wood Warbler نقشارة الأحراج PM
141. Sylvia atricapilla Eurasian Blackcap خوري وشماس - تيان sb, PM, wv
142. Sylvia curruca Lesser Whitethroat دخلة بيضاء الزور الصغرى pm
143. Sylvia crassirostris Eastern Orphean Warbler دخلة الحدائق PM
144. Sylvia communis Common Whitethroat دخلة بيضاء الزور PM
145. Sylvia melanocephala Sardinian Warbler دخلة سردينيا pm, wv
146. Sylvia rueppelli Rüppell's Warbler دخلة روبللي pm
147. Sylvia melanothorax Cyprus Warbler دخلة قبرص pm
148. Turdus merula Eurasian Blackbird شحرور pm, wv
149. Turdus philomelos Song Thrush سمنة مغردة pm, wv
150. Luscinia svecica Bluethroat هزار أزرق الزور pm
151. Luscinia luscinia Thrush Nightingale عندليب pm

152. Luscinia megarhynchos Nightingale هزار أوروبي pm
153. Phoenicurus ochruros Western Black Redstart حميراء سوداء sb, PM, wv
154. Phoenicurus phoenicurus Common Redstart حميراء اعتيادية pm
155. Oenanthe isabellina Isabelline Wheatear أبلق أشهب pm
156. Oenanthe oenanthe Northern Wheatear أبلق الشمال pm
157. Oenanthe cypriaca Cyprus Wheatear أبلق قبرص v, ?pm
158. Monticola saxatilis Rufous-tailed Rock Thrush سمنة الصخور محمرة الذنب pm
159. Muscicapa striata Spotted Flycatcher آكل الذباب الأرقط PM
160. Ficedula albicollis Collared Flycatcher آكل الذباب المطوق pm
161. Motacilla flava Western Yellow Wagtail ذعرة صفراء pm
162. Motacilla flava feldegg 'Black-headed Wagtail' ذعرة صفراء مسودة الرأس PM
163. Motacilla citreola Citrine Wagtail ذعرة صفراء الرأس pm
164. Motacilla cinerea Grey Wagtail ذعرة رمادية pm, wv
165. Motacilla alba White Wagtail ذعرة بيضاء sb, PM, WV
166. Anthus campestris Tawny Pipit جشنة باهتة sb, PM, wv
167. Anthus similis Long-billed Pipit جشنة طويلة المنقار wv
168. Anthus cervinus Red-throated Pipit جشنة محمرة الزور pm
169. Anthus spinoletta Water Pipit جشنة الماء pm
170. Emberiza calandra Corn Bunting درسة الذرة PM
171. Emberiza hortulana Ortolan Bunting درسة أرطلان PM
172. Emberiza caesia Cretzschmar's Bunting درسة كرتزشمار pm
173. Emberiza melanocephala Black-headed Bunting درسة سوداء الرأس PM

Annex 3 PINR Reptiles Species List

SCIENTIFIC NAME	English Name	Status	Arabic Name
DERMOCHELYIDAE			
Dermochelys coriacea	Leather-back Turtle	VU	سلحفاة جلدية الظهر
CHELONIIDAE			
Caretta caretta	Logger-head Turtle	VU	سلحفاة ضخمة الرأس
Chelonia mydas	Green Turtle	EN	سلحفاة خضراء
GEKKONIDAE			
Hemidactylus turcicus	Turkish gecko		أبو بريص
Ptyodactylus puiseuxi	Tree gecko		أبو بريص الشجر
LACERTIDAE			
Lacerta laevis laevis	Wall lizard		سحلية الحيطان
SCINCIDAE			
Mabuya vittata	Vital's skink		سقنقور حيوي
COLUBRIDAE			
Coluber jugularis asianus	Large whipe snake		حنش آسيوي أفعى

Source: (Hraoui Bloquet, 2005) (Status updated by Dr. Ghassan Ramadan-Jaradi in 2021)

(1) NT= Near Threatened

(2) VU= Vulnerable

(3) EN= Endangered

Annex 4 PINR Insects and Butterflies Species List

Insects list				
Order	Family	Scientific name	Density	Abundance
Coleoptera	Tenebrionidae		Very high	Common
Coleoptera	Tenebrionidae		Medium	Uncommon
Coleoptera	Tenebrionidae		Medium	Uncommon
Coleoptera	Tenebrionidae	*Tentyria sp.*	Medium	Common
Coleoptera	Curculionidae		Low	Rare
Coleoptera	Scarabeidae	*Oxythyria noemi* (Reich,1856)	Very high	Uncommon
Hemiptera	Miridae	*Euryopicoris nitidus* (Meyer-Dur, 1843)	Low	Rare
Hemiptera	Miridae	*Dionconotus cruentatus*(Brulle)	*	
Hymenoptera	Vespidae		Low	Common
Orthoptera	Acrididae		Very high	Common
Orthoptera	Tettigonidae		Very high	Common

Source: (Merheb, 2005)

Butterflies list			
Family	Sub-Family	Scientific name	English name
PAPILIONIDAE	Papilioninae	*Papilio machaon syriacus*	Swallowtail
PIERIDAE	Pierinae	*Pieris brassicae catoleuca*	Large White
		Pieris rapae leucosoma	Small White
		Pieris napi dubiosa	Green-veined White
		Colotis fausta fausta	Salmon Caper Butterfly
	Dismorphiinae	*Leptidea sinapis? Sinapis*	Wood White
NYMPHALIDAE	Nymphalinae	*Precis hierta crebrene*	Yellow Pansy
		Vanessa cardui cardui	Painted Lady
		Melitaea phoebe telona	Knapweed Fritillary
	Satyrinae	*Pseudotergumia pisidice pisidice*	Sinai Grayling
		Ypthima asterope asterope	African Ringlet
LYCAENIDAE	Lampidinae	*Lampides boeticus boeticus*	Long-tailed Blue
HESPERIIDAE	Hesperiinae	*Adopoaea hyrax hyrax*	Levantine Skipper
		Borbo borbonica zelleri	Zeller's Skipper

Source: (Ramadan-Jaradi, 2005).

Annex 5 PINR marine flora species LIST

List of marine flora from the PINR waters cited on Ramsar; MoE/aecid/Tragsa, 2009; Bitar, 2011, and updated for the purpose of the MP
The species nomenclature was updated based on World Register of Marine Species
*: Non-indigenous species
Bold: Species observed during the rapid assessment for the purpose of this MP

Taxa	References			
	Ramsar	MoE/aecid/Tragsa, 2009	Bitar, 2011	Present assessment
CYMODOCEACEAE				
Cymodocea nodosa (Ucria) Ascherson, 1870	X	X	X	
HYDROCHARITACEAE				
Halophila stipulacea (Forsskål) Ascherson, 1867			X	
CHOLOROPHYTA				
***Anadyomene stellata* (Wulfen) C.Agardh, 1823**			X	X
Bryopsis sp.			X	
***Bryopsis plumosa* (Hudson) C.Agardh, 1823**				X
***Caulerpa prolifera* (Forsskål) J.V.Lamouroux, 1809**			X	X
***Caulerpa racemosa var. lamourouxii f. requienii* (Montagne) Weber Bosse, 1913**			X	X
***Caulerpa scalpelliformis* (R.Brown ex Turner) C.Agardh, 1817**			X	X
Cladophora sp.			X	
***Cladophoropsis membranacea* (Hofman Bang ex C.Agardh) Børgesen, 1905**			X	X
Codium sp.			X	
***Codium bursa* (Olivi) C.Agardh, 1817**			X	X
***Codium parvulum* (Bory ex Audouin) P.C.Silva, 2003**			X	X
***Codium taylorii* P.C.Silva, 1960**			X	X
Enteromorpha sp.	X	X		
Flabellia petiolata (Turra) Nizamuddin, 1987			X	
Halimeda tuna (J.Ellis & Solander) J.V.Lamouroux, 1816			X	
Palmophyllum crassum (Naccari) Rabenhorst, 1868		X	X	
***Pseudobryopsis myura* (J.Agardh) Berthold, 1904**			X	X
***Ulva intestinalis* Linnaeus, 1753**	X		X	X
***Ulva lactuca* Linnaeus, 1753**			X	X
Ulva rigida C.Agardh, 1823			X	
***Valonia macrophysa* Kützing, 1843**	X		X	X
OCHROPHYTA				
Colpomenia sinuosa (Mertens ex Roth) Derbès & Solier, 1851		X	X	
Cystoseira sp.	X	X		X
Cystoseira amentacea (C.Agardh) Bory de Saint-Vincent, 1832			X	
***Cystoseira compressa* (Esper) Gerloff & Nizamuddin, 1975**	X		X	X
***Dictyota dichotoma* (Hudson) J.V.Lamouroux, 1809**				X
***Dictyota fasciola* (Roth) J.V.Lamouroux, 1809**		X		
***Dictyota spiralis* Montagne, 1846**			X	X
***Dictyopteris polypodioides* (A.P.De Candolle) J.V.Lamouroux, 1809**	X		X	X
Dilophus sp.	X			
***Halopteris scoparia* (Linnaeus) Sauvageau, 1904**	X		X	X
Halopteris filicina (Grateloup) Kützing, 1843			X	
***Padina boergesenii* Allender & Kraft, 1983**	X		X	X
***Padina pavonica* (Linnaeus) Thivy, 1960**	X	X	X	X
***Ralfsia verrucosa* (Areschoug) Areschoug, 1845**			X	X
***Sargassum vulgare* C.Agardh, 1820**		X	X	X

Taxa	References			
	Ramsar	MoE/aecid/Tragsa, 2009	Bitar, 2011	Present assessment
Sargassum trichocarpum **J.Agardh, 1889**				X
Stypopodium schimperi **(Kützing) Verlaque & Boudouresque, 1991**	X		X	X
Treptacantha rayssiae **(Ramon) M.Mulas, J.Neiva & Á.Israel**				X
RHODOPHYTA				
Acanthophora nayadiformis **(Delile) Papenfuss, 1968**			X	X
Amphiroa cryptarthrodia Zanardini, 1843			X	
Amphiroa rigida **J.V.Lamouroux, 1816**			X	X
Asparagopsis taxiformis **(Delile) Trevisan de Saint-Léon, 1845**			X	X
Botryocladia botryoides **(Wulfen) Feldmann, 1941**				X
Caulacanthus ustulatus (Mertens ex Turner) Kützing, 1843			X	
Ceramium diaphanum (Lightfoot) Roth, 1806			X	
Ceramium echionotum J.Agardh, 1844			X	
Chondracanthus acicularis **(Roth) Fredericq, 1993**				X
Ellisolandia elongata **(J.Ellis & Solander) K.R.Hind & G.W.Saunders, 2013**	X	X	X	X
Galaxaura rugosa **(J.Ellis & Solander) J.V.Lamouroux, 1816**			X	X
Ganonema farinosum **(J.V.Lamouroux) K.C.Fan & Yung C.Wang, 1974**			X	X
Gelidium spinosum (S.G.Gmelin) P.C.Silva, 1996			X	
Hildenbrandia rubra **(Sommerfelt) Meneghini, 1841**			X	X
Hypnea musciformis **(Wulfen) J.V.Lamouroux, 1813**			X	X
Jania rubens **(Linnaeus) J.V.Lamouroux, 1816**	X		X	X
Laurencia obtusa **(Hudson) J.V.Lamouroux, 1813**		X	X	X
Liagora viscida (Forsskål) C.Agardh, 1822			X	
Lithophyllum byssoides (Lamarck) Foslie, 1900	X		X	
Lithothamnion corallioides (P.Crouan & H.Crouan) P.Crouan & H.Crouan, 1867)	X			
Lithophyllum incrustans **Philippi, 1837**			X	X
Lithophyllum stictiforme (J.E. Areschoug) Hauck, 1877			X	
Lobophora variegata **(J.V.Lamouroux) Womersley ex E.C.Oliveira, 1977**	X		X	X
Mesophyllum expansum (Philippi) Cabioch & M.L.Mendoza, 2003	X			
Mesophyllum lichenoides (J.Ellis) Me.Lemoine, 1928	X		X	
Nemalion elminthoides **(Velley) Batters, 1902**				X
Neogoniolithon brassica-florida **(Harvey) Setchell & L.R.Mason, 1943**	X		X	X
Palisada perforata **(Bory) K.W.Nam, 2007**			X	X
Peyssonnelia spp.	X	X	X	
Peyssonnelia squamaria (S.G.Gmelin) Decaisne ex J.Agardh, 1842	X			X
Phymatolithon lenormandii (Areschoug) W.H.Adey, 1966			X	
Pterocladiella capillacea **(S.G.Gmelin) Santelices & Hommersand, 1997**			X	X
Rhodymenia ardissonei (Kuntze) Feldmann, 1937			X	
Schottera nicaeensis **(J.V.Lamouroux ex Duby) Guiry & Hollenberg, 1975**			X	X
Tenarea tortuosa (Esper) Me.Lemoine, 1910	X		X	
Titanoderma pustulatum (J.V.Lamouroux) Nägeli, 1858			X	
Tricleocarpa fragilis (Linnaeus) Huisman & R.A.Townsend, 1993			X	
Womersleyella setacea **(Hollenberg) R.E.Norris, 1992**				X
Zanardinia typus (Nardo) P.C.Silva, 2000			X	

* Based on the rapid assessment done for the purpose of the MP, 7 marine species belong to 3 zoological groups were reported for the first time in the PINR. Those species are represented by the Chlorophyta *Bryopsis plumosa*, Ochrophyta *Treptacantha rayssiae*, Rhodophyta *Botryocladia botryoides*, *Chondracanthus acicularis*, *Nemalion elminthoides*, *Peysonnelia squamaria*, and the non-indigenous *Womersleyella setacea*.

Annex 6 PINR marine fauna species LIST

List of marine fauna from the PINR waters based on Ramsar; MoE/aecid/Tragsa, 2009; Bitar, 2011, and updated for the purpose of the MP
The species nomenclature was updated based on World Register of Marine Species
*: Non-indigenous species
Bold: Species observed during the rapid assessment for the purpose of this MP*

Taxa	References			
	Ramsar	MoE/aecid/Tragsa, 2009	Bitar, 2011	Present assessment
ANNELIDA				
Arabella iricolor (Montagu, 1804)			X	
****Branchiomma* spp.**				X
**Branchiomma bombyx* (Dalyell, 1853)			X	
Branchiomma lucullanum (Delle Chiaje, 1828)			X	
Branchiosyllis exilis (Gravier, 1900)			X	
**Ceratonereis mirabilis* Kinberg, 1865			X	
Chrysopetalum debile (Grube, 1855)			X	
***Eunice* spp.**				X
Eunice vittata (Delle Chiaje, 1828)			X	
Euratella salmacidis (Claparède, 1869)			X	
Eurysyllis tuberculata Ehlers, 1864			X	
Eusyllis kupfferi Langerhans, 1879			X	
Eusyllis lamelligera Marion & Bobretzky, 1875			X	
Exogone breviantennata Hartmann-Schröder, 1959			X	
Filograna sp.			X	
***Haplosyllis spongicola* (Grube, 1855)**				X
Harmothoe gilchristi Day, 1960			X	
***Hermodice carunculata* (Pallas, 1766)**		X	X	X
Hydroides minax (Grube, 1878)	X			
Hydroides pseudouncinata Zibrowius, 1968			X	
Hypsicomus stichophthalmos (Grube, 1863)			X	
Hilbigneris gracilis (Ehlers, 1868)			X	
Inermosyllis balearica (San Martín, 1982)			X	
Josephella marenzelleri Caullery & Mesnil, 1896			X	
Leodice harassii (Audouin & Milne Edwards, 1833)			X	
Lepidonotus squamatus (Linnaeus, 1758)			X	
Lysidice natalensis Kinberg, 1865	X			
Lysidice ninetta Audouin & H Milne Edwards, 1833			X	
***Lumbrinereis* sp.**			X	X
Oxydromus agilis (Ehlers, 1864)			X	
Palola siciliensis (Grube, 1840)			X	
Pileolaria militaris Claparède, 1870			X	
***Platynereis dumerilii* (Audouin & Milne Edwards, 1833)**			X	X
Phyllodoce sp.			X	
Polyophthalmus pictus (Dujardin, 1839)			X	
Protula sp.			X	
Perinereis cultrifera (Grube, 1840)	X		X	
****Pseudonereis anomala* Gravier, 1899**	X		X	X
Pseudopotamilla reniformis (Bruguière, 1789)			X	
Simplaria pseudomilitaris (Thiriot-Quievreux, 1965)			X	
***Spirobranchus kraussii* (Baird, 1864)**			X	X
Spirobranchus lamarcki (Quatrefages, 1866)			X	

Taxa	References			
	Ramsar	MoE/aecid/Tragsa, 2009	Bitar, 2011	Present assessment
Spirorbis (Spirorbis) marioni Caullery & Mesnil, 1897			X	
**Spirobranchus tetraceros* (Schmarda, 1861)	X		X	X
Sphaerosyllis pirifera Claparède, 1868			X	
***Syllis* spp.**				X
Syllis armillaris (O.F. Müller, 1776)			X	
Syllis bella (Chamberlin, 1919)			X	
Syllis corallicola Verrill, 1900			X	
Syllis ferrani Alós & San Martín, 1987			X	
Syllis garciai (Campoy, 1982)			X	
Syllis gracilis Grube, 1840			X	
Syllis hyalina Grube, 1863			X	
Syllis jorgei San Martín & López, 2000			X	
Syllis mayeri Musco & Giangrande, 2005			X	
Syllis prolifera Krohn, 1852			X	
Syllis variegata Grube, 1860			X	
Terebella lapidaria Linnaeus, 1767			X	
Thelepus cincinnatus (Fabricius, 1780)			X	
***Timarete punctata* (Grube, 1859)**				X
Trypanosyllis zebra (Grube, 1860)			X	
Vermiliopsis striaticeps (Grube, 1862)			X	
Websterinereis glauca (Claparède, 1870)			X	
ARTHROPODA/ CRUSTACEA				
***Acanthonyx lunulatus* (Risso, 1816)**			X	X
***Alpheus* sp.**			X	X
Atergatis roseus (Rüppell, 1830)			X	
Balanus trigonus Darwin, 1854			X	
Calcinus tubularis (Linnaeus, 1767)			X	
Carcinus aestuarii Nardo, 1847		X		
Cestopagurus timidus (P. Roux, 1830 [in P. Roux, 1828-1830])			X	
***Charybdis (Charybdis) hellerii* (A. Milne-Edwards, 1867)**			X	X
Chondrochelia savignyi (Kroyer, 1842)			X	
***Chthamalus montagui* Southward, 1976**		X	X	X
***Chthamalus stellatus* (Poli, 1791)**			X	X
***Clibanarius erythropus* (Latreille, 1818)**			X	X
***Cymodoce* spp.**				X
Dardanus calidus (Risso, 1827 in [Risso, 1826-1827])		X	X	
Dromia personata (Linnaeus, 1758)			X	
***Dynamene* spp.**				X
***Eriphia verrucosa* (Forskål, 1775)**			X	X
***Eurydice* sp.**		X		
Eurynome aspera (Pennant, 1777)			X	
Lepidonotus squamatus (Linnaeus, 1758)			X	
***Ligia italica* Fabricius, 1798**				X
Maja squinado (Herbst, 1788)			X	
Microjaera anisopoda Bocquet & Levi, 1955			X	
Ochthebius quadricollis Mulsant, 1844		X		
***Pachygrapsus marmoratus* (J.C. Fabricius, 1787)**			X	X
***Pachygrapsus transversus* (Gibbes, 1850)**				X
***Palaemon elegans* Rathke, 1836**			X	X
Pagurus sp.		X		
***Perforatus perforatus* (Bruguière, 1789)**			X	X

Taxa	References			
	Ramsar	MoE/aecid/Tragsa, 2009	Bitar, 2011	Present assessment
Pilumnus hirtellus (Linnaeus, 1761)			X	
Stenopus spinosus Risso, 1827 *in* [Risso, 1826-1827]			X	
Tanais dulongii (Audouin, 1826)			X	
Verruca spengleri Darwin, 1854			X	
***Xantho poressa* (Olivi, 1792)**				X
ARTHROPODA/ PYCNOGONIDA				
Ammothella appendiculata (Dohrn, 1881)			X	
**Anoplodactylus digitatus* (Böhm, 1879)			X	
Anoplodactylus pygmaeus (Hodge, 1864)			X	
Tanystylum conirostre (Dohrn, 1881)			X	
Trygaeus communis Dohrn, 1881			X	
BRYOZOA				
Adeonella pallasii (Heller, 1867)			X	
Margaretta cereoides (Ellis & Solander, 1786)			X	
Parasmittina egyptiaca (Waters, 1909)			X	
Parasmittina rouvillei (Calvet, 1902)			X	
Parasmittina serruloides Harmelin, Bitar & Zibrowius, 2009			X	
Reteporella grimaldii (Jullien, 1903)			X	
***Schizoporella errata* (Waters, 1878)**			X	X
Schizoretepora hassi Harmelin, Bitar & Zibrowius, 2007			X	
Smittina nitidissima (Hincks, 1880)			X	
CHORDATA				
Aidablennius sphynx (Valenciennes, 1836)			X	
***Alepes djedaba* (Forsskål, 1775)**			X	X
***Anguilla anguilla* (Linnaeus 1758)**				X
***Anthias anthias* (Linnaeus, 1758)**				X
***Apogonichthyoides pharaonis* (Bellotti, 1874)**			X	X
Atherina boyeri Risso, 1810			X	
Auxis rochei (Risso, 1810)			X	
Balistes capriscus Gmelin, 1789	X	X	X	
Boops boops (Linnaeus, 1758)	X	X		
Bothus podas (Delaroche, 1809)			X	
***Coris julis* (Linnaeus, 1758)**	X	X	X	X
***Chromis chromis* (Linnaeus, 1758)**	X	X	X	X
Dasyatis pastinaca (Linnaeus, 1758)			X	
***Dentex dentex* (Linnaeus, 1758)**	X	X	X	X
Diplodus annularis (Linnaeus, 1758)			X	
Diplodus cervinus (Lowe, 1838)	X	X	X	
Diplodus sargus (Linnaeus, 1758)	X	X		
***Diplodus vulgaris* (Geoffroy Saint-Hilaire, 1817)**	X	X		X
***Enchelycore anatina* (Lowe, 1838)**			X	X
Engraulis encrasicolus (Linnaeus, 1758)			X	
Epinephelus costae (Steindachner, 1878)			X	
***Epinephelus marginatus* (Lowe, 1834)**	X	X	X	X
**Fistularia commersonii* Rüppell, 1838			X	
Gobius sp.			X	
Gobius bucchichi Steindachner, 1870			X	
Gobius cobitis Pallas, 1814			X	
**Hippocampus kuda* Bleeker, 1852			X	
***Lagocephalus sceleratus* (Gmelin 1789)**				X
***Lithognathus mormyrus* (Linnaeus, 1758)**			X	X

Taxa	References			
	Ramsar	MoE/aecid/Tragsa, 2009	Bitar, 2011	Present assessment
Madracis phaerensis **(Heller, 1868)**				X
Microlipophrys nigriceps (Vinciguerra, 1883)			X	
Mullus surmuletus **Linnaeus, 1758**		X	X	X
Muraena helena Linnaeus, 1758		X		
Mycteroperca rubra (Bloch, 1793)	X	X		
Oblada melanura (Linnaeus, 1758)	X	X		
Pagrus pagrus (Linnaeus, 1758)			X	
Parablennius sanguinolentus (Pallas, 1814)			X	
Parablennius gattorugine (Linnaeus, 1758)			X	
Parexocoetus mento (Valenciennes, 1847)			X	
*****Pempheris vanicolensis* Cuvier, 1831	X	X	X	X
Pomadasys stridens (Forsskål, 1775)			X	
*****Pterois miles* (Bennett, 1828)				X
Remora sp.	X			
Sarpa salpa **(Linnaeus, 1758)**			X	X
*******Sargocentron rubrum* (Forsskål, 1775)	X			X
Sciaena umbra **Linnaeus, 1758**			X	X
Scorpaena maderensis **Valenciennes, 1833**	X	X	X	X
Scorpaena porcus **Linnaeus, 1758**		X	X	X
Seriola dumerili **(Risso, 1810)**				X
Serranus cabrilla **(Linnaeus, 1758)**	X	X		X
Serranus scriba **(Linnaeus, 1758)**	X	X		X
****Siganus luridus*** **(Rüppell, 1829)**	X	X	X	X
****Siganus rivulatus*** **Forsskål & Niebuhr, 1775**	X	X	X	X
Sphyraena sp.			X	X
Sparisoma cretense **(Linnaeus, 1758)**	X	X	X	X
Stephanolepis diaspros **Fraser-Brunner, 1940**	X	X	X	X
Symphodus mediterraneus (Linnaeus, 1758)	X	X	X	
Symphodus ocellatus (Linnaeus, 1758)			X	
Symphodus roissali (Risso, 1810)			X	
Symphodus tinca **(Linnaeus, 1758)**	X	X	X	X
Stomias boa (Risso, 1810)			X	
Syngnathus spp.			X	
Thalassoma pavo **(Linnaeus, 1758)**	X	X	X	X
****Torquigener flavimaculosus*** **Hardy & Randall, 1983**	.		X	X
Tripterygion tripteronotum (Risso, 1810)			X	
Xyrichtys novacula **(Linnaeus, 1758)**		X	X	X
CNIDARIA				
Actinia mediterranea **Schmidt, 1971**		X	X	X
Aglaophenia sp.			X	
Anemonia viridis **(Forsskål, 1775)**			X	X
Apolemia sp.			X	
Astrangia sp.			X	
Cladostephus spongiosus f. verticillatus (Lightfoot) Prud'homme van Reine, 1972		X		
Cladocora caespitosa (Linnaeus, 1767)			X	
Clavularia sp.			X	
Cornularia cornucopiae (Pallas, 1766)			X	
Cotylorhiza tuberculata **(Macri, 1778)**				X
Eudendrium sp.			X	
****Macrorhynchia philippina*** **Kirchenpauer, 1872**	X	X	X	X
Madracis pharensis (Heller, 1868)			X	

Taxa	References			
	Ramsar	MoE/aecid/Tragsa, 2009	Bitar, 2011	Present assessment
***Oculina patagonica* de Angelis, 1908**			X	X
***Pelagia noctiluca* (Forsskål, 1775)**				X
***Pennaria disticha* Goldfuss, 1820**			X	X
***Phyllangia americana mouchezii* (Lacaze-Duthiers, 1897)**			X	X
***Phyllorhiza punctata* von Lendenfeld, 1884**				X
Polycyathus muellerae (Abel, 1959)			X	
***Rhizostoma pulmo* (Macri, 1778)**			X	X
***Rhopilema nomadica* Galil, Spanier & Ferguson, 1990**			X	X
Telmatactis cricoides (Duchassaing, 1850)			X	
CHORDATA/TUNICATA				
Cystodytes dellechiajei (Della Valle, 1877)			X	
***Herdmania momus* (Savigny, 1816)**	X		X	X
**Phallusia nigra* Savigny, 1816*	X		X	
Polycarpa pomaria (Savigny, 1816)			X	
Pycnoclavella aurilucens Garstang, 1891			X	
Pyura dura (Heller, 1877)			X	
Pyura microcosmus (Savigny, 1816)			X	
**Rhodosoma turcicum* (Savigny, 1816)			X	
CTENOPHORA				
***Mnemiopsis leidyi* A. Agassiz, 1865**			X	X
ECHINODERMATA				
Amphipholis squamata (Delle Chiaje, 1828)			X	
***Arbacia lixula* (Linnaeus, 1758)**			X	X
Brissus unicolor (Leske, 1778)			X	
***Diadema setosum* (Leske, 1778)**				X
Echinocyamus pusillus (O.F. Müller, 1776)		X		
***Holothuria (Panningothuria) forskali* Delle Chiaje, 1823**				X
***Holothuria (Platyperona) sanctori* Delle Chiaje, 1823**			X	X
Oestergrenia digitata (Montagu, 1815)		X		
Ophiactis spp.				
Ophiactis macrolepidota Marktanner-Turneretscher, 1887			X	
**Ophiactis savignyi* (Müller & Troschel, 1842)			X	
Paracentrotus lividus (Lamarck, 1816)			X	
***Synaptula reciprocans* (Forsskål, 1775)**	X		X	X
FORAMINEFERA				
Foraminefera sp.				X
**Amphistegina lobifera* Larsen, 1976			X	
**Heterostegina depressa* d'Orbigny, 1826			X	
MOLLUSCA				
Abra sp.		X		
Acanthicardia sp.		X		
***Acanthochitona fascicularis* (Linnaeus, 1767)**			X	X
Alvania sp.		X		
Antalis sp.		X		
Alvania amatii Oliverio, 1986		X		
***Aplysia dactylomela* Rang, 1828**			X	X
***Aplysia fasciata* Poiret, 1789**				X
Aplus dorbignyi (Payraudeau, 1826)			X	
Arca noae Linnaeus, 1758		X	X	
Barbatia barbata (Linnaeus, 1758)		X		
Berthella ocellata (Delle Chiaje, 1830)			X	

Taxa	References			
	Ramsar	MoE/aecid/Tragsa, 2009	Bitar, 2011	Present assessment
Bittium sp.		X		
***Bittium reticulatum* (da Costa, 1778)**		X	X	X
Bulla striata Bruguière, 1792		X	X	
***Bolma rugosa* (Linnaeus, 1767)**			X	X
****Brachidontes pharaonis* (P. Fischer, 1870)**	X	X		X
Brachidontes ustulatus (Lamarck, 1819)			X	
Calliostoma zizyphinum (Linnaeus, 1758)		X		
Cantharus sp.		X		
Cardites antiquatus (Linnaeus, 1758)		X		
****Cellana rota* (Gmelin, 1791)**				X
Cerithium sp.				
Cerithium protractum Bivona Ant. in Bivona And., 1838		X		
****Cerithium scabridum* Philippi, 1848**		X	X	X
Cerithiopsis pulvis (Issel, 1869)		X		
Chama sp.		X		
****Chama pacifica* Broderip, 1835**			X	X
Chiton magnificus Deshayes, 1827			X	
***Columbella rustica* (Linnaeus, 1758)**		X	X	X
****Conomurex persicus* (Swainson, 1821)**	X	X	X	X
Conus sp.		X		
***Conus ventricosus* Gmelin, 1791**		X	X	X
***Dendropoma anguliferum* (Monterosato, 1878)**	X		X	X
Diadora sp.		X		
Dizoniopsis coppolae (Aradas, 1870)		X		
Dosinia lupinus (Linnaeus, 1758)		X		
Littorina sp.		X		
***Echinolittorina punctata* (Gmelin, 1791)**				X
****Elysia grandifolia* Kelaart, 1858**			X	X
Emarginula sp.		X		
Episcomitra cornicula (Linnaeus, 1758)		X	X	
Epitonium turtonis (W. Turton, 1819)			X	
Ergalatax sp.		X		
****Ergalatax junionae* Houart, 2008**			X	X
Ergalatax martensi (Schepman, 1892)		X		
***Felimare picta* (Philippi, 1836)**			X	X
****Gafrarium pectinatum* (Linnaeus, 1758)**				X
***Gibbula* sp.**			X	X
Glycymeris glycymeris (Linnaeus, 1758)		X		
****Goniobranchus annulatus* (Eliot, 1904)**			X	X
Haedropleura flexicosta Monterosato, 1884		X		
Hexaplex trunculus (Linnaeus, 1758)			X	
****Hypselodoris infucata* (Rüppell & Leuckart, 1830)**			X	X
Irus irus (Linnaeus, 1758)			X	
Janthina janthina (Linnaeus, 1758)		X		
Jujubinus striatus (Linnaeus, 1758)		X		
Lepidochitona caprearum (Scacchi, 1836)			X	
Lima lima (Linnaeus, 1758)		X	X	
Limaria tuberculata (Olivi, 1792)				
Lithophaga lithophaga (Linnaeus, 1758)			X	
Loripes orbiculatus Poli, 1795		X		
Lucinella divaricata (Linnaeus, 1758)		X		

Taxa	References			
	Ramsar	MoE/aecid/Tragsa, 2009	Bitar, 2011	Present assessment
Luria lurida (Linnaeus, 1758)			X	
Macteola sp.				
**Malleus regula* (Forsskål in Niebuhr, 1775)	X		X	
Mangalia sp.		X		
***Melarhaphe neritoides* (Linnaeus, 1758)**				X
Modiolus auriculatus (Krauss, 1848)		X		
Modulus sp.			X	
**Murex forskoehlii* Röding, 1798			X	
Muricopsis cristata (Brocchi, 1814)		X	X	
Mytilaster minimus (Poli, 1795)			X	
Mytilus sp.		X		
Nassarius sp.		X		
Neverita josephinia Risso, 1826			X	
Ocenebra edwardsii (Payraudeau, 1826)		X	X	
***Octopus vulgaris* Cuvier, 1797**			X	X
Ostrea edulis Linnaeus, 1758		X		
Ostrea stentina Payraudeau, 1826		X		
Parvicardium scriptum (Bucquoy, Dautzenberg & Dollfus, 1892)		X		
Parvicardium trapezium Cecalupo & Quadri, 1996		X		
Patella caerulea Linnaeus, 1758		X		
Patella pellucida Linnaeus, 1758			X	
***Patella rustica* Linnaeus, 1758**			X	X
***Patella ulyssiponensis* Gmelin, 1791**			X	X
Petaloconchus glomeratus (Linnaeus, 1758)			X	
Petriola sp.		X		
***Pinctada imbricata* Röding, 1798**	X	X	X	X
***Pisania striata* (Gmelin, 1791)**			X	X
***Phorcus turbinatus* (Born, 1778)**		X	X	X
**Purpuradusta gracilis* (Gaskoin, 1849)			X	
Raphitoma sp.		X		
Rhinoclavis kochi (Philippi, 1848)		X		
Rissoa similis Scacchi, 1836		X		
Rissoina bertholleti Issel, 1869		X		
***Sepia officinalis* Linnaeus, 1758**			X	X
Smaragdia viridis (Linnaeus, 1758)		X		
Smilophora sp.		X		
Spondylus sp.		X		
Spondylus groschi Lamprell & Kilburn, 1995			X	
***Spondylus spinosus* Schreibers, 1793**		X	X	X
Steromphala albida (Gmelin, 1791)		X		
Stramonita haemastoma (Linnaeus, 1767)		X	X	
Striarca lactea (Linnaeus, 1758)		X		
Tarantinaea lignaria (Linnaeus, 1758)			X	
Tarantinaea lignaria (Linnaeus, 1758)			X	
Tanea undulata (Röding, 1798)		X		
**Thylaeodus rugulosus* (Monterosato, 1878)				X
Tonna galea (Linnaeus, 1758)			X	X
Taranis sp.		X		
Tornus sp.		X		
Tricolia speciosa (Megerle von Mühlfeld, 1824)		X		
Trimusculus mammillaris (Linnaeus, 1758)			X	

Taxa	References			
	Ramsar	MoE/aecid/Tragsa, 2009	Bitar, 2011	Present assessment
Tritia reticulata (Linnaeus, 1758)			X	
***Trochus erithreus** Brocchi, 1821*			X	X
***Vermetus triquetrus** Bivona-Bernardi, 1832*	X		X	X
***Venus verrucosa** Linnaeus, 1758*		X		X
Vericardia sp.		X		
Williamia gussoni (Costa O. G., 1829)			X	
NEMERTEA				
Nemertea sp.				X
Notospermus geniculatus (Delle Chiaje, 1828)			X	
PORIFERA				
***Agelas oroides** (Schmidt, 1864)*			X	X
***Axinella polypoides** Schmidt, 1862*			X	X
Chelonaplysilla erecta (Row, 1911)			X	
***Chondrilla nucula** Schmidt, 1862*			X	X
***Chondrosia reniformis** Nardo, 1847*			X	X
***Clathrina** spp.*				X
***Cliona** spp.*				X
Cliona parenzani Corriero & Scalera-Liaci, 1997			X	
Cliona viridis (Schmidt, 1862)			X	
***Crambe crambe** (Schmidt, 1862)*				X
Erylus sp.			X	
Ircinia variabilis (Schmidt, 1862)			X	
Liosina blastifera Vacelet, Bitar, Carteron, Zibrowius & Pérez, 2007			X	
Merlia normani Kirkpatrick, 1908			X	
Niphates toxifera Vacelet, Bitar, Carteron, Zibrowius & Pérez, 2007			X	
Oscarella sp.			X	
Petrosia (Petrosia) ficiformis (Poiret, 1789)			X	
***Phorbas** spp.*				X
Phorbas tenacior (Topsent, 1925)			X	
Phorbas topsenti Vacelet & Pérez, 2008			X	
***Sarcotragus** spp.*				X
Sarcotragus fasciculatus (Pallas, 1766)			X	
Sarcotragus spinosulus Schmidt, 1862			X	
Semicassis saburon (Bruguière, 1792)			X	
Spirastrella cunctatrix Schmidt, 1868			X	
***Spongia (Spongia) officinalis** Linnaeus, 1759*			X	X
Sycetusa sp.			X	
Vosmaeropsis sp.			X	
SIPUNCULA				
***Aspidosiphon (Aspidosiphon) misakiensis** Ikeda, 1904*			X	X
***Phascolosoma (Phascolosoma) stephensoni** (Stephen, 1942)*			X	X

* Based on the rapid assessment done for the purpose of the MP, 14 marine species belong to 5 zoological groups were reported for the first time in the PINR. Those species are represented by the Annelida *Haplosyllis spongicola*, and the non-indigenous *Timarete punctata*, Arthropoda *Ligia Italica*, *Pachygrapsus transversus*, and *Xantho poressa*, Chordata/ fish, the two non-indigenous *Lagocephalus sceleratus* and *Pterois miles*, Cnidaria *Cotylorhiza tuberculata*, and *Phyllorhiza punctata* Mollusca *Echinolittorina punctata*, *Melaraphe neritoides*, and the three non-indigenous **Tylaeodus rugulosus*, **Gafrarium pectinatum*, and **Cellana rota*.

Annex 7 PINR threatened marine species LIST

Species are listed that are either included on Annex II or III of the SPA/BD Protocol of the Barcelona Convention, and/or have been assessed by IUCN as threatened (i.e., Vulnerable (VU), Endangered (EN), or Critically Endangered (CR) or Near Threatened (NT) in the Mediterranean Sea.

Phylum	Species	Listed on Annex II (SPA/ BD Protocol)	Listed on Annex III (SPA/ BD Protocol)	IUCN Red List Threat Status in the Mediterranean
Arthropoda	*Scyllarus arctus*		x	
Arthropoda	*Maja squinado*		x	
Chordata	*Epinephelus marginatus*		x	EN
Chordata	*Anguilla anguilla*		x	CR
Chordata	*Sciaena umbra*		x	NT
Echinodermata	*Cladocora caespitosa*	x		
Echinodermata	*Paracentrotus lividus*		x	
Mollusca	*Dendropoma anguliferum*	x		
Mollusca	*Lurida lurida*	x		
Mollusca	*Tonna galea*	x		
Magniolophyta	*Cymodocea nodosa*	x		
Ochrophyta	*Cystoseira* genus (except *Cystoseira compressa*)	x		
Ochrophyta	*Sargassum trichocarpum*	x		
Porifera	*Axinella polypoides*	x		
Porifera	*Sarcotragus foetidus*	x		
Porifera	*Spongia (Spongia) officinalis*		x	
*Rhodophyta	*Lithophyllum byssoides*	x		
*Rhodophyta	*Tenarea tortuosa*	x		
Rhodophyta	*Neogognolithon brassica-florida*			

*It is worth noting that the tree coral *Dendrophyllia ramea* was only reported around Tripoli area (Aguilar *et al.*, 2018). *D. ramea* is included on Annex II of the SPA/BD Protocol of the Barcelona Convention

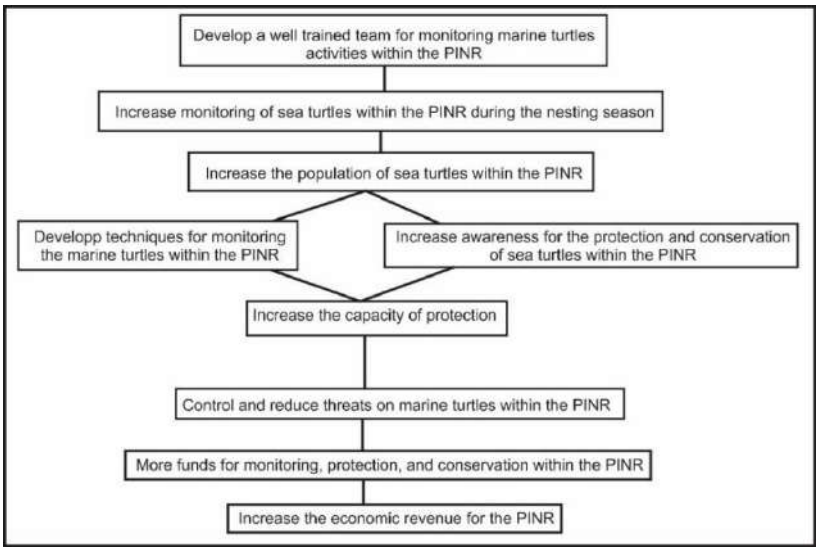
* *Lithophyllum byssoides*, and *Tenarea tortuosa* are only limited in this area of Lebanon

N.B: PINR waters are also characterized by species with an economical value such as the Chordata, **Alepes djedaba Atherina* boyeri, *Boops boops*, *Diplodus sargus, Diplodus vulgaris, Epinephelus costae*, *Epinephelus marginatus*, **Fistularia* commersonii, *Lithognathus mormyrus*, *Mycteroperca rubra*, *Oblada melanura*, *Sarpa salpa*, *Scorpaena maderensis*, *Scorpaena porcus*, **Siganus luridus*, **Siganus rivulatus*, *Sparisoma cretense*, *Xyrichthys novacula*, and Mollusca **Pinctada imbricata*, **Spondylus spinosus*, *Sepia officinalis*.

Annex 8 PINR MARINE TURTLES ECOTOURISM PROGRAM

The proposed ecotourism program aims to establish a sustainable activity allowing to guarantee the balance between ecotourism activities and protection/conservation of sea turtles within PINR. In this context, the proposed program should include actions for:

- Developing a well-trained team for monitoring the marine turtles' activities within PINR
- Implementing a sea turtles' awareness-raising and education activities
- Developing sustainable sea turtle ecotourism program



1. Developing a well-trained team for monitoring the marine turtles' activities within PINR

Create a solid, trained, well equipped team, within the PINR. This team should be led by the marine turtle national expert, and acquires the methods/ and all the necessary techniques to monitor sea turtles during mating, nesting, and hatchling season, and even work with injured/ stranded sea turtles. It is recommended that the selected team are good speakers to promote the ecotourism program within the PINR. From a publicity point of view, PINR team should present this program for schools, universities, private sectors, NGOs within Tripoli, and many localities arounb Lebanon.

2. Implementing a sea turtles' awareness-raising and education activities

It is firstly important to note that an awareness campaign for the protection and conservation of marine turtles in Lebanon have been already launched in 2019 (SPA/RAC-UN Environment/MAP, 2021).

Within the PINR, some actions are recommended:

- Launch/ or promote website (e.g., The PINR website), and also using social medias platforms to share friendly and easy information about sea turtle life (mating, reproduction, monitoring process during the sea turtle's nesting/ hatchling season, main threats, advises allowing to help sea turtles accidently bycatch/ or injured), and some updates of the activities/ or results of sea turtles monitoring survey in the PINR by publishing sea turtles' hatchlings videos, photos. Finally, and most importantly, is to use this option to announce upcoming sea turtles' activities (e.g., agenda including the time of sea turtle nesting/ hatchling) within the PINR.
- Share posters, brochures, and infos on sea turtles
- Enhance the communication with local community (e.g., eco volunteers, fishermen, and NGOs)
- Allow local community an opportunity to work with conservation and ecotourism projects in the area
- Facilitate logistic measurements for all visitors of the PINR, especially the marine turtles' team, during the marine turtles' activities within the PINR.

3. Developing sustainable sea turtle ecotourism program

Within the PINR, ecotourism of sea turtles should be based on "sea turtle watching". Therefore, two types of "sea turtle watching" within the PINR are recommended:

3.1. Sea turtle viewing in beach

It is recommended first to define, delineate the turtle foraging ground in the marine zone of the PINR. Subsequently, sea turtle viewing in beach can involve a variety of activities such as SCUBA diving, snorkeling, and boating, in the turtle reef of the PINR. It can also include boat tours (e.g., small-scale: kayaks and small rented motorboats/large-scale: catamarans and glass-bottom boats).

To enhance this activity, it is recommended to

- Use the PINR website to announce attractive publicity
- Collaborate with local diving centers in Tripoli. Professional divers can help locate sea turtles within the marine zone of the PINR, and assist in the publicity by sharing sea turtles' photos/videos with visitors.
- Facilitate logistics measurement for the visitors

From a precaution point of view, tours should be led by the trained team, who trained, and possess knowledge about how to lead tourists to optimal turtle viewing areas.

3.2. Sea turtle hatcheries

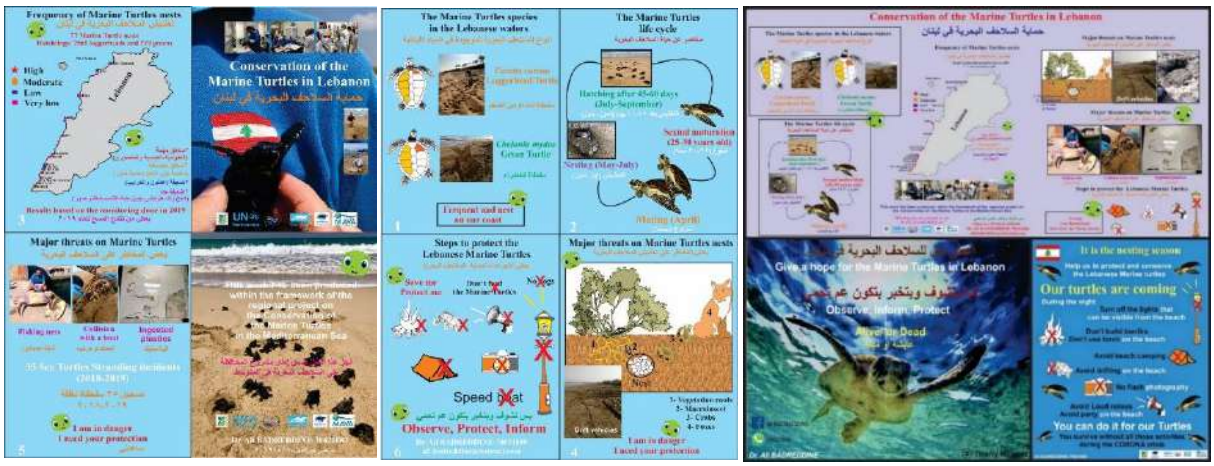
Hatcheries ensure more marine turtles eggs hatch than otherwise, and they increase the chances of hatchlings entering the sea. Sea turtle hatcheries based on watching sea turtle hatchlings, is an attraction for tourists. Its provides revenue, coming from entrance fees, donations and sale of souvenirs (if it is possible to make it in the future), that can be used as an income for local community, and for sea turtle conservation within the PINR. From another side, and away of the hatchery, it is recommended the organization of sea turtles hatchlings events within the PINR. Therefore, some actions are recommended:

- Develop the PINR beach (e.g., adding sea turtles' statues) to attract visitors.
- Publish publicity within the PINR and Tripoli area (e.g., "it is sea turtle nesting/ hatchling season, come and join us for the protection and conservation of our sea turtles' friends"- "Come and enjoy sea turtles in the PINR")

From a long-term maintenance of the program and guarantee its sustainability, some actions are recommended:

- Set up a guide program: the guide program should be based on a short summer course for local community given by the PINR trained team, including the marine turtle national expert. It should provide training skills needed to guide tourists, as well as conservation information learning basic information on the topics listed below:
- A handbook on marine conservation and turtle biology is an additional educational resource. Within the handbook, messages should include: (1) details on seasonality and species availability for sea turtles viewing, (2) biology and ecology of the species, (3) the possible effects of tourism, both positive and negative, on the species, and (4) applicable codes of conduct for interacting with the species.
- Cooperate with NGOs and conservation groups that strongly influence and local involvement, making them more equipped to accomplish positive tasks such as workshops, education campaigns, and sea turtles monitoring.
- From an evaluating point of view, it is highly recommended to share with the inhabitants and tourists an evaluation questionnaire, in order to know regarding the programs and initiatives for the conservation of sea turtles. This step should be done regularly, and every year. In this context, it is important to encourage, promote visitors to donate for program to conserve sea turtles (e.g., the launched web site, and social media can help a lot concerning this point).
- Organize many events addressed to schools, college and university students, to share with them the guide programs, and present them the sea turtles work within the PINR by using fun and entertainment methods (e.g., activities within the PINR/ games/ gifts)
- Encourage Lebanese researchers to make all kinds of studies dealing with social-economical evaluation in the PINR, especially after the establishment of ecotourism program.
- Continue the successful cooperation between the PINR, the MoE and national organization such as SPA/RAC, European Union, and IUCN, to grant project allowing to protect and conserve the sea turtles in the PINR and all Lebanese coast.
- Organize many workshops/trainings, in cooperation with Mediterranean experts, allowing to train/ or to share with the PINR team, students, and researchers the techniques to monitor the sea turtles. As well as, national workshops should discuss the challenges sea turtles face from light/ or noise pollution and emphasized available technologies to solve those problems. As an expecting result, an official "Sea Turtle Policy Statement" should be adopted within the PINR, with guidelines for implementing "turtle-friendly" lighting/ or noising at their facilities. This widespread and well-known management strategy should help at mitigating tourism pressure within the PINR.

Examples of brochures, and posters for publication within the PINR



The proposed program should cover an implementation period of five? years, after which an evaluation of the achievements (e.g. actions/ recommendations), should be done. In this context, and for a better establishment of the proposed program, an implementation table is proposed (Table 1).

PINR Marine Turtles Ecotourism Pogram - Implementation table

Action	Timeline	Involved stakeholders
Develop a well-trained team within the PINR	2021-2025	PINR team- NGOs- GOs-National Marine turtle expert
Sea turtles awareness-raising and education	On going	PINR team- NGOs- GOs-National Marine turtle expert
The ecotourism program based on sea turtles within the PINR	2021-2025	PINR team- National Marine turtle expert
Sea turtle viewing in beach	2022-2025	PINR team- Municipality of Tyre -National Marine turtle expert
Sea turtle hatcheries	2022-2025	PINR team- National Marine turtle expert
Launch/ or promote a website (e.g., The PINR website)	On going	PINR team- National Marine turtle expert
Set up a guide program	2022-2024	PINR team- National Marine turtle expert
Organize national/ international seminars/ workshops	2023-2025	PINR team- Municipality of Tyre -National Marine turtle expert- MoE
Opportunities for Mediterranean volunteers	2025	PINR team- National Marine turtle expert

Source : SPA/RAC-UNEP/MAP, 2021. Conservation of the Marine Turtles in Lebanon. Results of the 2020 monitoring of the Marine Turtles along the Lebanese coast. By Badreddine, A., Samaha, L., Abderrahim, M., Limam, A., & Ben-Nakhla, L. Ed. SPA/RAC. Conservation of Marine Turtles in the Mediterranean Sea project. Tunis: pages 37.

Annex 9 PINR Flora Species List

Scientific Name	English Name	Arabic Name
Poaceae (gramineae)		**نجيليات**
Bromus fasciculatus	Fascicled brome	ثرغول حزمي
Dactylis glomerata	Orchard grass	ثيل عمران
Lagurus ovatus	Ovate hare's-tail	ذنب الارنب
Phragmites communis	Reed	قصب المكانس
Polypogon monspeliensis	Annual beard-grass	شعر الفار
Taeniatherum (=Elymus) farctus	Stuffed elymus	ثنيتروم ملىء
Cyperaceae		**سعديات**
Carex divisa	Bracteate marsh-sedge	سعادى مقسوم
Araceae		**قلقاسيات**
Arisarum vulgare veslingii (4)	Friar's-cowl	قبوع الراهب
Juncaceae		أسليات
Juncus bufonius	Toad rush	اسل علجومي
Liliaceae		**زنبقيات**
Allium sativum	Garlic	ثوم زراعي
Allium ampeloprasum	Wild leek	كرات بري
Scilla autumnalis	Autumn squill	بصل الحية
Urginea maritima	Sea-squill	بصيلة
Amaryllidaceae		**نرجسيات**
Pancratimum maritimum (1)	Sand lily	زنبق بحري
 Sand Lily, Pancretium maritimum. ©Ghassan Ramadan-Jaradi		
Iridaceae		**سوسنيات**
Gynandriris sisyrinchium	Crocus-rooted iris	سوسن الخنازير
Urticaceae		**قراصيات**
Parietaria cretica	Cretan pellitory	حائطية كريت
Aristolochiaceae	Aristolochiaceae	زروندیات

Aristolochia parvifolia (3) (4)	Small-leaved birthwort	زراوند صغير الورق
CHENOPODIACEAE		**سرمقيات**
Arthrocnemum macrostachyum (1) (3)	Glasswort	شمام
Halimione portulacoides	False purslane	بنت البحر
CARYOPHYLLACEAE		**قرنفليات**
Arenaria leptoclados	Slender-branched sandwort	رملية نحيلة الأغصان
Cerastium glomeratum	Clustered mouse-ear-chickweed	قرناء متجمعة
Minuartia mesogitana (4)	Mount mesogis sandwort	منورتية ميسوجسيية
Minuartia thymifolia syriaca (2)	Thyme-leaved sandwort	منورتية سعترية الورق
Silene colorata	Cloven-petalled catchfly	سيلينة ملونة
RANUNCULACEAE		**حوذانيات**
Anemone coronaria cyanea	Blue crown anemone	شقائق النعمان
Anemone coronaria phoenicea	Red crown anemone	شقائق النعمان
Ranunculus asiaticus	Persian crowfoot	كف الضبع
PAPAVERACEAE		**خشخاشيات**
Fumaria densiflora	Dense-flowered fumitory	زويتة
Fumaria gaillardotii (4)	Gailardot's fumitory	شاهترج غيردوه
Glaucum flavum	Sea poppy	ماميتا صفراء
Papaver rhoeas	Corn poppy	خشخاش منثور
Papaver syriacum (4)	Syrian poppy	خشخاش سوري
Papaver umbonatum	Bossed poppy	خشخاش احدب
CAPPARIDACEAE		**كبريات**
Capparis spinosa (4)	Spiny caper	كبر شائك
BRASSICACEAE (CRUCIFERAE)		**صليبيات**
Cakile aegyptia	Egypian sea-rocket	رشاد البحر
Enarthrocarpus arcuatus (4)	Curved enarthrocarpus	شلوة مقوسة
Matthiola tricuspidata	Trifid stock	منثور ثلاثي
CRASSULACEAE		**مخلدات**
Sedum litoreum	Coastal stonecrop	حيون ساحلي
Sedum sediforme	Tall stonecrop	طعم القط
ROSACEAE		**ورديات**
Poterium spinosum	Spiny burnet	بلان شائك
FABACEAE (PAPILIONACEAE)		**فراشيات**
Astragalus baeticus	Andalusian milk-vetch	استراغالس اندلسى
Lotus cytisoides	Downy birdsfoot-trefoil	لوطس لزاني
Melilotus indicus	Indian melilot	حندقوق هندي
Ononis reclinata mollis (4)	Reclinate restharrow	حطيبة
Trifolium campestre	Hop trifoil	نفل حقلي
Trifolium resupinatum	Reversed clover	نفل منقلب
OXALIDACEAE		**حماضيات**
Oxalis pes-caprae	Bermuda buttercup	حميضة
GERANIACEAE		**غرنوقيات**
Geranium molle	Dove's-foot geranium	غرنوق لين
EUPHORBIACEAE		**فربينيات**
Euphorbia helioscopia	Sun spurge	فربيون الشمس
Euphorbia paralias	Coast spurge	فربيون ساحلي
Euphorbia peplis	Purple spurge	زرق
Euphorbia peploides	False petty-sperge	فربيون فرفخي
Euphorbia peplus	Petty-spurge	فرفخ
Mercurialis annua	Annual mercury	حلبوب حولي
FRANKENIACEAE		**فرنكينيات**
Frankenia hispida (4)	Hispid sea-heath	فرنكنية قاسية الوبر
MALVACEAE		**خبازيات**

Lavatera trimestris	Queen mallow	لفتيرة فصلية
LYTHRACEAE		**حنائيات**
Lythrum hyssopifolia	Grass-poly	رجل الحمامة
APIACEAE (UMBELLIFERAE)		**خيميات**
Crithmum maritimum	Rock samphire	شمرة البحر
Eryngium maritimum	Sea holly	شنداب البحر
Smyrnum olusatrum	Common alexanders	كرفس بري
PRIMULACEAE		**ربيعيات**
Anagallis arvensis caerulea	Field pimpernel	أناغالس الحقول
Anagallis arvensis phaenicea (4)	Field pimpernel	أناغالس الحقول
PLUMBAGINACEAE		**رصاصيات**
Limonium angustifolium	Narrow-leaved sea-lavender	أريل احمر
Limonium sieberi (4)	Sieber's sea-lavender	ليمونيوم سيبر
GENTIANACEAE		**جنطيانيات**
Centaurium pulchellum	Pretty centaury	قنطريون قتيبة
Centaurium spicatum	Spiked centaury	حشيشة العقرب
Centaurium tenuiflorum	Slender-flowered centaury	قنطريون دقيق الزهر
BORAGINACEAE		**حمحميات**
Heliotropium hirsutissimum	Hairy heliotrope	إكرير أزب
Heliotropium lasiocarpum (4)	Wolly-fruited heliotrope	إكرير وبر الثمر
LAMIACEAE (LABIATAE)		**شفويات**
Lamium amplexicaule	Great henbit	لميوم معانق
Lamium moschatum (4)	Musky archangel	لميوم مسكي
Melissa inodora (2)	Scentless balm	ترنجان عديم الرائحة
Sideritis montana	Mountain ironwort	فقاح جبلي
Stachys annua ammophila (2)	Annual woundwort	قرطوم حولي
SOLANACEAE		**باذنجانيات**
Solanum luteum alatum	Yellow nightshade	حيصل اصفر
PLANTAGINACEAE		**حمليات**
Plantago lagopus	Round-headed plantain	ودنة
RUBIACEAE		**فويات**
Valentia muralis	Wall valantia	فلنتية الحيطان
Valentia hispida	Hispid valantia	فلنتية
CAMPANULACEAE		**بوقيات**
Campanula stellaris (4)	Starry bellflower	جريس نجمي
ASTERACEAE (COMPOSEAE)		**مركبات**
Anthemis chia	Chian chamomile	بهار خيوس
Crepis sancta (4)	Holly hawkweed	سراغة مقدسة
Inula crithmoides	Golden samphire	طيون النحر
Dittrichia (Inula) viscosa	Viscous inula	طيون
Senecio leucanthemifolius	Oxeye groundsel	شرونة بيضاء
Senecio vernalis	Spring groundsel	بابونج الطير
Sonchus asper glaucescens (4)	Rough sow-thistle	خرم مر

List of plants on Palm Islands Nature Reserve (by Prof. Dr. Georges Tohmé). Arabic names are mainly extracted from the "Dictionnaire étymologique de la flore du Liban" (Nehmé, 2000).

"+" indicates species that were not previously mentioned in the NCSR study in 1999 (cf. text).

(1) refers to nationally threatened species T
(2) refers to endemic species E
(3) refers to nationally rare species R
(4) refers to wholly or partially restricted species to East Mediterranean area. EM

Annex 10 PINR historical and archeological brochure

آثار الكنيسة الرومانية على جزيرة النخل أو الأرانب

بالقرب من الكنيسة توجد قنوات من الواضح أنها حفرت في الصخر وتتجمع بها مياه الأمطار لتشكل مورداً للمياه العذبة.

Near the church there are channels that have been carved in the rock. They collect rainwater as a source of fresh water.

وكذلك يوجد حوض هو أيضاً محفور في الصخر ويمكن الوصول إليه بوساطة بضعة درجات صخرية كما يبدو في وسط الصورة.

There is also a water basin carved into the rocks and accessed through few rocky steps as it is seen in the center of the photgraph above.

ويسمح الموقع بالتقاط عينات مختلفة من الفخاريات والسيراميك التي يعود تاريخها إلى ما بين أواخر العصر الروماني والعصور الوسطى.

The site allows the collection of various pottery and ceramics fragments of the period extending between late Roman and Middle Ages.

عملية الإقتلاع اليدوية المركزة لجذور القصب أدت إلى كشف أهم غرف الكنيسة.

Extensive manual uprooting of reed beds (subterranian web of rhizomes) led to the discovery of the most important rooms of the church

ساحة الكنيسة الرئيسية وهي تنتمي إلى نظام العصور الوسطى ويبدو حجر من أواخر العصر الروماني (ضمن الدائرة البيضاء).

The main courtyard of the medieval system with a stone from the tardive Roman time (within the white circle).

حفريات الإنقاذ المعتمدة على إزالة جذور القصب بينت أن هذه الأخيرة كانت قد تسببت بتآكل بعض الجدران المكونة من الحجار الرملية. حتى أن قطع الأعمدة التي كانت ضمن الجدران أصبحت مكشوفة.

The rescue excavation, which is mainly limited to the removal of the roots of reeds has shown that they have eroded some of the sandstone walls, so that the drums of columns that are meant to be recessed into the walls are now exposed.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