FINAL REPORT

BIODIVERSITY ASSESSMENT AND MONITORING IN THE PROTECTED AREAS/ LEBANON LEB/95/G31

PALM ISLANDS NATURE RESERVE

August 2004

MINISTRY OF ENVIRONMENT

LEBANESE UNIVERSITY
FACULTY OF SCIENCE

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INTRODUCTION & EXECUTIVE SUMMARY OF THE PROJECT

The Protected Areas Project (PAP) that is financed by the Global Environment Facility (GEF) through the United Nations Development Program (UNDP) and under the execution of the Ministry of Environment (MOE) in Lebanon has an overall objective to conserve endemic and endangered wildlife and their habitats, incorporate wildlife conservation as an integral part of sustainable human development and strengthen the institutional capacity of government agencies and non-governmental organizations.

The three reserves (Al Chouf Cerdar, Horsh Ehden and Palm Islands) which formed the nucleus of the PAP possessed each a management plan. Aammiq Swamp and Tyre Coast are currently developing their respective plans. However, the already developed plans have used, in their planning process, two essential steps to begin with "understanding the resources (Vegetation, animals, landscapes, cultural values) and valuing the resources (What is important, what is most important)" and without which the process wouldn't be able to advance one more step. The survey and inventory work conducted by the National Council for Scientific Research (NCSR) on behalf of the Protected Areas Project provided the planners with information on the natural heritage of these sites and prepared the floor to Aammiq and Tyre to launch their process too. Based on the survey and inventory, the Green Line initiated a small monitoring scheme also on behalf of the protected Areas Project in these same sites.

During the last seven years, promising efforts were made in the five sites cited above in order to reach the main objective set by the PAP: several remedial actions were stepped up and many tools of relevance to conservation were tested.

The objective will be achieved more readily if significant additional actions are implemented. More specifically the PAP is intended:

1. To highlight the importance and viability of protection in the five sites,
2. To provide a well-documented scientific database of their natural assets,
3. To establish a baseline for monitoring of key species, key habitats and progress on activities.

These will inevitably improve the implementation of the conservation measures, enhance the capacities of the research society to handle ecological and socio-economic data and identify future research needs; and promote participatory actions.

Being aware of all these positive revenues, the PAP has put, through UNDP, a "request for proposal" (RFP) to develop a biodiversity assessment and monitoring study for each of the following sites: Palm Islands Nature Reserve, Tyre Nature Reserve, Horsh Ehden Nature Reserve, Al-Chouf Cedar Nature Reserve and Aammiq Wetland.

Subsequently, The UNDP engaged the Faculty of Sciences of the Lebanese University on behalf of the MOE in order to perform services in respect of Biodiversity Assessment and

Monitoring in the above 5 sites, in accordance with a Professional Consulting Contract signed between UNDP/MOE and LU on 4/8/03.
On their turn, the Faculty of Sciences and its Team are aware that the development of a biodiversity assessment and monitoring study in the protected areas is a task that increases people's skills, knowledge and awareness about their natural heritage. It develops the necessary expertise to address challenges, fosters attitudes, motivations, and commitments to make informed decisions and take responsible action. Increased knowledge based on solid scientific data could be a part of an overall strategy to reach key community leaders, like teachers, school board members, elected officials, business owners, news media, etc., since it can effectively help support outreach goals, and ultimately affect change and motivate action on behalf of biocoenoses and their habitats. Preparation of maps and development of databases which inform the management teams of the protected areas on the available key species and habitats and on how, where and when to see them, appreciate them and monitor them is an effective tool of conservation.
In accordance with the above mentioned contract, the Faculty of Sciences submitted to the MOE an **Inception Report** on 19/8/03 that is aiming at securing integration and providing detailed instructions for the implementation of the Project, both at the Project level, as well as at the level of each individual activity and each expert.
The objective of the Inception Report is to define:

- The methodologies, tools and techniques to be applied,
- The Terms of Reference (TORs) and work schedule for each expert of the team and,
- The Workplan and Timetable of the activities to be implemented.

On 4/11/03, the Faculty submitted to the MOE the **First Progress Report** which aimed at reflecting achievements related to the following activities:

- Revise all the previous biodiversity assessment work/research conducted within these five areas;
- Propose methodology to limit the study to a selected number of species that demonstrates the ecological interest of the site, based on the existing research work and literature;
- Identify the habitats within the sites (physical, biological and quality characteristics) with reference to the classical nomenclature (CORINE, EU Manual of Habitat Interpretation).

Following the submittal of the First Progress Report, the MOE organized a meeting between the consultant team and the local management teams that took place at the Ministry on 18/12/03. At the same day, the Faculty received the comments of the Ministry on both Inception and First Progress Reports. The mentioned comments as well as the outputs of the meeting emphasized the fact that there is a need for:

- Field researches to be also conducted in the spring time so that all seasons are covered for the reasons indicated in the methodology of the inception report.
- Inclusion of mega-insects such as Dragonflies, Damselflies and Butterflies, etc.

- Species-species and species-habitats to be given major attention and consideration.
- More explanation of the reasoning used to select species in the filter phases.
- More information exchange between local management teams and consultant team.

Subsequently, an outcoming consensus consisted in a *sensu lato* agreement upon these raised comments.

The Second Progress Report which is meant to be submitted to MOE on 5/3/04 was instead submitted on 7/6/04. It is supposed to reflect achievements related to the following activities:

i. Report on the chronology of the selected number of species if literature exists;
ii. Conduct field assessment within the sites to verify the different status of the selected number of species and document sightings through sampling, photography and/ or other approved scientific procedures;
iii. Rank the species in terms of priority (Rare, Endemic, Noteworthy, Most Threatened and Invasive species);
iv. Relate these species to the corresponding habitats;
v. Identify specific distribution: spatial (zonation/ location) and temporal (seasonal/ activity);
vi. Identify status of the community: densities/ abundance/ dominance/ dynamics;
vii. Identify nature and importance of threats on these species;
viii. Provide detailed information for the selected key species and communities.

This Final Report includes the final outputs of the previous activities, and reflects achievements related to the following activities:

- Based on findings, include the cover in %, the height of layers and the dominant species in each layer with habitat description;
- Determine changing dynamics and the level of sensitivity of the habitats based on findings, field research and literature (natural evolution processes – nature and importance of threats dysfunctions – major human-induced deteriorations);
- Analyze the nature of major gradients, identification of the main mechanisms (soil/vegetation-exploitation relationships, habitat/biocenosis-exploitation relationship, fertility, salinity, erosion capacity, various impacts;
- Develop recommendations for urgent conservation actions and sustainable management practices specific to each site;
- Develop appropriate mitigation measure for the identified impacts on the entire ecosystem;
- Propose site-specific strategies and indicators for monitoring, taking into account previous work conducted (GreenLine, MedWet Coast…);
- Conduct at least two consultation workshops with concerned stakeholders to discuss findings;
- Identify further research profiles based on fieldwork and findings.

A. PALM ISLANDS NATURE RESERVE

A.1 GENERAL PRESENTATION OF THE SITE

A.1.1 Location

The Palm Islands Nature Reserve 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 500m of sea surrounding the islands) is about 4.2 Km^2.

A.1.2 Legal status

The Palm Islands are public property and declared protected area by Law 121 on 9 March 1992. The reserve is also a Ramsar site, Specially Protected Area and Important Bird Area.

A.1.3 Description

Palm Islands Nature Reserve comprises three flat sandy-rocky islands (see general features in Figure 1 below):

Palm Island (also known as Rabbit Island or Nakhl Island)
Palm Island is the largest of the three islands, covering an area of 200.000 m^2 and is flat with no obvious relief; its highest point is only about 6m above sea level. 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 salinas and the remains of an old church that date back to the Crusader period.
There are signs of recent work that has been done to rehabilitate the island. The well was cleaned and the water used to irrigate 570 palm trees planted on the island. A walking trail and a dock for boats have been constructed and areas for research and recreation have been demarcated.

Sanani Island
Sanani Island covers an area of 40.000 m^2 southeast of Palm Island. It is mainly rocky with a partially sandy shore that resembles that of Palm Island.

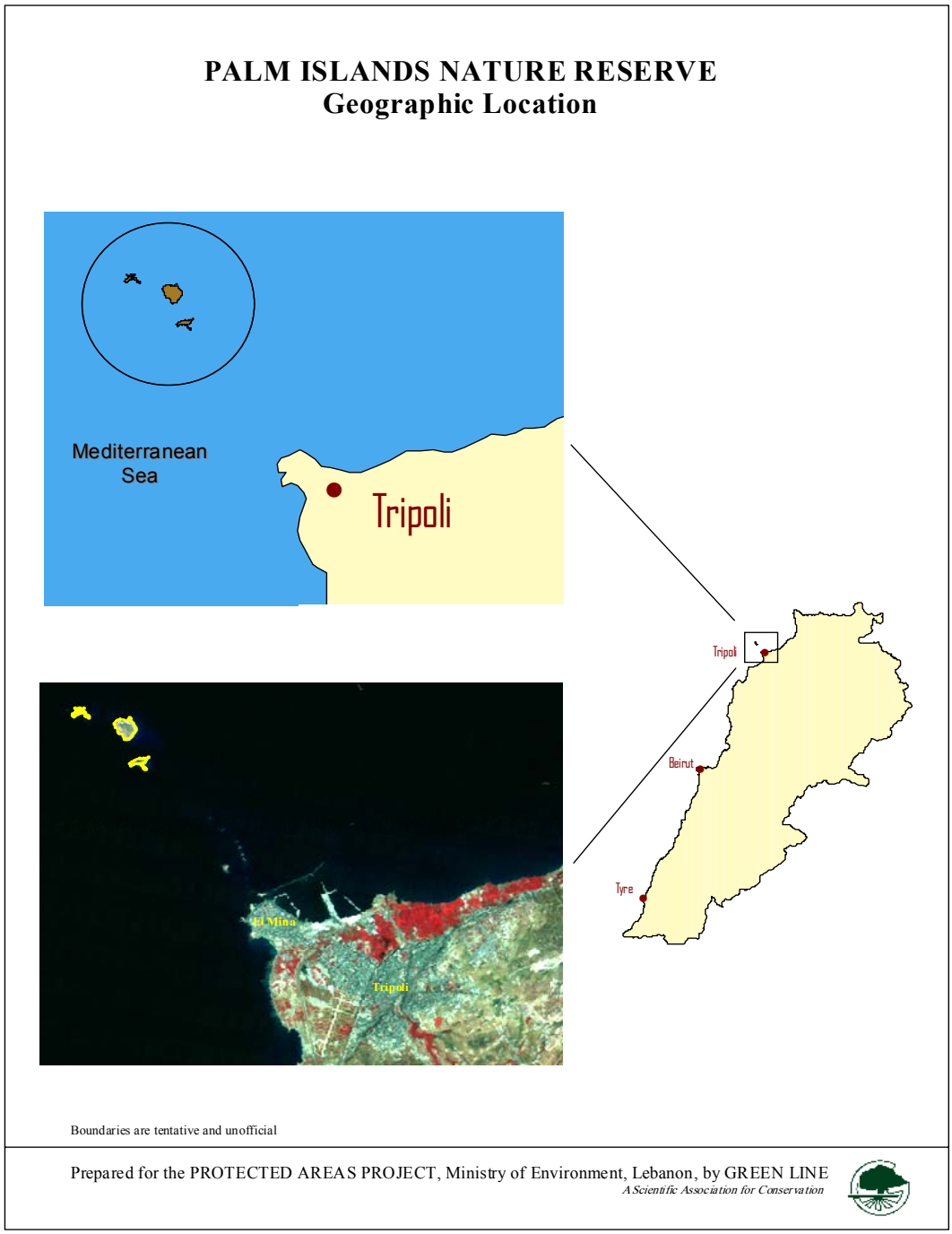


Figure 1: General Features of Palm Islands Nature Reserve

Ramkine Island (also known as Fanar Island)
The smallest island, with an area of 16,000 m^2 is located northwest of Palm Island. 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 twentieth century. Recently, solar powered navigation light has been installed in the tower of the old lighthouse.

A.1.4 Abiotic characteristics

A.1.4.1 Physiographic characteristics

A.1.4.1.1 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. However, no tectonic features are visible in this limestone to distinguish it from the Miocene limestone of Jabal Terbol, Nahr el Kalb, or Ashrafieh. 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 "sandy" shore and dunes of two of the islands has the peculiarity of a biological origin. It is mostly represented by the skeletons of marine benthic foraminifera, resulting in very light "sand" with an admixture 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 (Ghassan Ramadan-Jaradi, *pers. comm*. in Palm Islands Nature Reserve Management Plan).

A.1.4.1.2 Geomorphology

Geomorphologically, 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.

A.1.4.1.3 Hydrology

Marine waters are mainly represented in a lot of pools on the seaside of the rocky shore. During winter, sweet (fresh) water fills the narrow pools of the diaclases and some larger pools within the dunes. By digging in the dunes some sweet water can be obtained even in summer.

A.1.4.1.4 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 eolian 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.

A.1.4.1.5 Climatology

The Palm Islands Nature Reserve climate may be fairly described as Mediterranean. The prevailing wind which bring abundant rain comes from the west and south west (85% of the time). The wind blows from the east and northeast the rest of the time (15% of the time). Rainfall is concentrated in the winter months from October through April and apparently rainless the other months of the year. The annual rainfall average is 930 mm, and the mean annual temperature is 19.6° C. The mean daily maximum temperature is 29.8º C in August whereas the mean minimum temperature in January is 9.3º C. The absolute temperature ranges from -0.8° C in January to 39.3° in May. The mean relative humidity lies around 72% (Service Meteo/ Ministry of Public Work and Transport).
The pluviothermic quotient of Emberger at Palm Islands is 155 and indicates that the site is located in the Temperate Mediterranean Bioclimatic Stage with thermic variant of cool winter.

A.1.5 Biotic characteristics

The Palm Islands Nature Reserve is of important natural heritage value due to the fact that it constitutes the only islands of significance in the country. Its ecological functions are numerous: It attracts nesting, migrating and wintering bird populations of global concern, constitutes one of the apparently last refuges in Lebanon for the globally threatened Monk Seal. The fauna and the flora of this site are of noticible richness, e.g. the number of bird species that were recorded at the tiny Palm Islands Reserve makes 40% of the total national avifauna. The flora, invertebrtes, herpetofauna, etc. show a certain level of endemism to the region and certain particularities of biogeographical interest.
The flora and fauna lists of Palm Islands are represented in the Annexes 1-8 far below. Hereinafter, the text deals only with a limited number of selected species of faunal and floral special interest (threatened, rare, endemic, noteworthy, introduced, etc…). Their selection is based on a methodology and criteria described in the annex 9.

A.1.5.1 FLORA

Floristic exploration in Lebanon has long history but nothing was specific to Palm Islands till probably 1974 when Tohmé & Neuschwander attempted to place their ornithological study in an ecological context by listing briefly some species of the islands' vegetation. Since then, few scholars have contributed to the knowledge of the islands' flora. The most recent and extensive botanical researches on this site were conducted, on behalf of the

Ministry of Environment (Protected Areas Project), by (Georges Tohmé) the National Council for Scientific Research (NCSR) in 1999 and (Elasa Sattout & Salma Talhouk) the Green Line NGO in 2001. They both resulted in a list of 86 species distributed over 35 families. As per the NCSR study, the Palm Islands Nature Reserve is habitat to 73 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 (cf. Table 1). The GreenLine study has generated a list of 36 species of which 13 are added to the species that were previously identified by NCSR. These new species are marked with "+" in the Table 1 below.

Addendum: It is worthy to note that in 1984, the Government Appointed Committee that was formed to manage the protected islands had planted few *Washingtonia filifera* on Nakhl island. The Environment Protection Committee that was in charge to manage the reserve between 1997-2001 also planted more than 500 shoots of *Phoenix dactylifera* on the same island in 1998. The latter was represented during mid twentieth century by only three Date palm trees *Phoenix dactylifera*.

A.1.5.1.1 The floristic species

A.1.5.1.1.1 Selected species

The new findings of the surveys as well as the information obtained from stakeholders, mainly local management team of the protected site incurred slight improvement of the selected species list that was reached at the fine-filter phase.
Only six species are selected: The most threatened and rare or endemic *Aristolochia parvifolia, Arthrocnemum macrostachyum* and *Melissa inodora* species, the *Pancratimum maritimum* which is threatened and searched at the same time by locals for its ornamental and other values, the *Phoenix dactylifera* which is attached to the dream of the local community who wishes to have a stand of these trees similar to that of coconut trees in tropical islands, and the introduced *Washingtonia filifera* which may become suppressive of other plants or probably invasive on the island.

The field research and the **dialogue management team – consultant team** have lead to the addition of three more plant species. These are:

Rock samphire	*Crithmum maritimum*	Shummar Bahri
Sea poppy	*Glaucum flavum*	Mamitha Safra
Sea-squil	*Urginea maritime*	Ansal Bahri

Under abundance:
- 5 : indicate that more than 3/4 of the habitat is covered by the species.
- 4 : indicate that between ½ and ¾ of the habitat is covered by the species.
- 3 : indicate that between ½ and ¼ of the habitat is covered by the species.
- 2 : indicate that 1/20 of the habitat is covered by the species.

- 1 : weak cover.
- + : very weak cover.
- 0 : selected from literature according to the selection criteria but not found during the field surveys.

A.1.5.1.1.1.1 Rare (2)

Species	English Name	Local Name	Localization		Abundance
			Habitat	GPS	
Aristolochia parvifolia	**Small-leaved birthwort**	Zarawand Saghir el Warak	Earthen land		2.2
Arthrocnemum macrostachyum	**Glasswort**	Al Shou'e	Rocky shore		+

A.1.5.1.1.1.2 Endemic (1)

Species	English Name	Local Name	Endemism	Localization		Abundance
				Habitat	GPS	
Melissa inodora	**Scentless balm**	Trinjan bedoun Riha	To Lebanon	Sandy shore		2.2

A.1.5.1.1.1.3 Noteworthy (6)

Species	English Name	Local Name	Value	Localization		Abundance
				Habitat	GPS	
Crithmum maritimum	**Rock samphire**	Shummar Bahri	Medicinal	Rocky shore		3
Glaucum flavum	**Sea poppy**	Mamitha Safra	Medicinal	Earthen land		1
Melissa inodora	**Scentless balm**	Trinjan bedoun Riha	Medicinal	Sandy shore		2.2
Pancratimum maritimum	**Sand lily**	Zanbak el Bahr	Economic/ Ornemental	Sandy shore		1
Urginea maritime	**Sea-squil**	Ansal Bahri	Economic/ Rodenticide	Sandy shore		
Phoenix dactylifera	**Palm tree**	Nakhl	Economic/ Social	Earthen land		+

A.1.5.1.1.1.4 Introduced (Alien invasive) (1)

Species	English Name	Local Name	Origin	Localization		Abundance
				Habitat	GPS	
Washingtonia filifera	**California fan palm**	Nakhl Mirwahi	America	Sandy shore		+

1.5.1.1.1.5 Threatened (3)

Species	English Name	Local Name	Level of threat	Localization		Abundance
				Habitat	GPS	
Aristolochia parvifolia	**Small-leaved birthwort**	Zarawand Saghir el Warak	Regional	Earthen land		2.2
Arthrocnemum macrostachyum	**Glasswort**	Al Shou'e	National	Rocky shore		+
Pancratimum maritimum	**Sand lily**	Zanbak el Bahr	Nationall	Sandy shore		1

A.1.5.1.1.1.6 Specific distribution: spatial (zonation/ location) and temporal (seasonal/ activity) of selected species

R = rare; S = scarce; U = uncommon or localized; C = common; Fl = flowering period (3-5 = March-May); A = annual; V = Perennial (vivace); T = tree or sub-tree; H = herb.

Species	R	S	U	C	Fl	A	V	T	H
Aristolochia parvifolia			+		3-5		+		+
Arthrocnemum macrostachyum		+			4-10		+		+
Crithmum maritimum			+		6-10	+			+
Glaucium flavum				+	2-8		+		+
Melissa inodora		+			5-9		+		+
Pancratium maritimum		+			8-10		+		+
Urgina maritima				+	7-10		+		+
Phoenix dactylifera			+		Spring			+	
Washingtonia filifera			+					+	

A.1.5.1.1.1.7 Useful information about the selected species

Genus, Latin	***Aristolochia***
Species, Latin	***parviflora***
Author	Sibth, & Smith
	
	Photo: G. & H. Tohmé
Family	ARISTOLOCHIACEAE
Common name, English	Small-leaved birthwort
Common name, Arabic	Zarawand saghir al-waraq
Chorotype	East Mediterranean Region
Life form Raunkiaer	Geophyte
Summer shedding	Ephemeral
Succulence	Non-succulent
Salt resistance	Glycophyte
Habitat or affinity to Vegetation formation	Stony fields, from sea shore to Qannoubine and Hermel
Synanthropy	Grows only in natural habitat
Chronology	Prior to the NCSR report in 1999, this species had never been mentioned on Palm Islands. It was also recorded there by Tohmé & Tohmé (2002).
Usage	In the past, the Small-leaved birthwort was incorporated in a medicine for the treatment of epilepsy.
Status	Not common
Identification	Short leaves, corolla very narrow brown red

Genus, Latin	***Arthrocnemum***
Species, Latin	***macrostachyum***
Author	(Del.) Ung-Sternb.
	
	Photo: G. & H. Tohmé
Family	CHENOPODIACEAE
Common name, English	Long-spiked glasswort
Common name, Arabic	Shu’
Chorotype	Mediterranean
Life form Raunkiaer	Phanerophyte perennial
Summer shedding	Flowering time April-October
Succulence	Succulent
Salt resistance	Glycophyte
Habitat or affinity to Vegetation formation	Seashore
Synanthropy	Grows in salty places
Chronology	First mentioned on Palm Islands by Tohmé et *al.* (1973) under a synonymous name *A. glaucum.* Also it was cited by the NCSR report (1999) and Sattout (2001). It is worthy to note that Mouterde (1966) stated the disappearance of the sites in which the species was seen on the Lebanese coast.
Usage	Found on rocks and collected to be used as chutney food. *Appreciated for being a source of natural iodine.*
Status	Rare because of Urban development
Identification	Articulated stem up to 1 m.

Genus, Latin	***Crithmum***
Species, Latin	***maritimum***
Author	L.
	
	Photo by G. Tohmé
Family	APIACEAE
Common name, English	Rock samphire
Common name, Arabic	Shoumar bahri
Chorotype	From Atlantic seashores to Mediterranean and Black Sea
Life form Raunkiaer	Perennial phanerophyte
Summer shedding	Leaves all summer
Succulence	Succulent
Salt resistance	Yes
Habitat or affinity to Vegetation formation	Rocks near seashore
Synanthropy	Grows in Natural habitats
Chronology	Cited in the NCSR report (1999) and Sattout (2001).
Usage	Conserved in vinegar or eaten directly as salad. Highly searched by people for its iodine richness and considered a threatened species.
Status	Threatened because it is edible used as salad
Identification	Flowers white-greenish

Genus, Latin	***Glaucium***
Species, Latin	***flavum***
Author	Crantz
	
	Photo by G. Tohmé
Family	PAPAVERACEAE
Common name, English	Sea poppy
Common name, Arabic	Mamitta safra
Chorotype	Atlantic to Mediterranean, Black Sea and North America
Life form Raunkiaer	Bi-annual or perennial chamaephyte
Summer shedding	Leaves and flowers during summer time
Succulence	Leaves thick
Salt resistance	Yes
Habitat or affinity to Vegetation formation	Sandy seashore
Synanthropy	Grows only in natural habitats
Chronology	Listed from Palm Islands in the NCSR Report (1999).
Usage	The juice of this species is used as eye-drops for the treatment of conjunctivitis and other diseases of eyelids. Also it makes part of eyeliner components.
Status	Common along the coast
Identification	Yellow petals 2.5 – 3.5 cm

Genus, Latin	***Melissa***
Species, Latin	***inodora***
Author	Bornm.
	
	Photo: G. & H. Tohmé
Family	LAMIACEAE
Common name, English	Scentless balm
Common name, Arabic	Turunjan ‘adim ar-ra’ihat
Chorotype	Endemic to Lebanon
Life form Raunkiaer	Perennial phanerophyte
Summer shedding	Flowering time May-September
Succulence	Not-succulent
Salt resistance	Glycophyte
Habitat or affinity to Vegetation formation	Sandy stone and sandy soils
Synanthropy	Grows in natural habitats
Chronology	Prior to the NCSR report in 1999, this species was never reported from Palm Islands.
Usage	Sometimes used as substitute to the Common balm Melissa officinalis to treat heart diseases. It may be crushed and mixed with boiled apple, parsley powder and other powder to cure from “Malikholia”. Not well studied yet.
Status	Not uncommon
Identification	Glabrescent plant with whitish flowers

Genus, Latin	***Pancratimum***
Species, Latin	***maritimum***
Author	L.
	
	Photo by G. Tohmé
Family	AMARYLLIDACEAE
Common name, English	Sea daffodil, Sea pancratium lily
Common name, Arabic	Zanbaq el Bahr
Chorotype	Mediterranean
Life form Raunkiaer	Geophyte
Summer shedding	Ephemeral
Succulence	Non-succulent
Salt resistance	Glycophyte
Habitat or affinity to Vegetation formation	Mediterranean strand vegetation, in sandy soils
Synanthropy	Grows only in natural habitats. Planted in house-garden away from the sea at about 300 m altitude above Naqoura (Tohmé)
Chronology	The Sand lily was first documented in 1999 (NCSR report) on the beach of the PINR and by Tohmé & Tohmé (2002)
Usage	Picked for its beautiful flower. It may be managed commercially in the reserve; especially that it is expected to disappear on the mainland coastal area where it suffers from urbanization.
Status	Found along the coast. Not uncommon. Flowering time is one month earlier (August) on Islands than on continent (Tohmé 2002)
Identification	The aromatic white flower reaches 12 cm (see also photo)

Genus, Latin	***Urginea***
Species, Latin	***maritima***
Author	(L.) Baker
	
	Photo: G. & H. Tohmé
Family	LILIACEAE
Common name, English	Sea-squill
Common name, Arabic	Bussaylah
Chorotype	Mediterranean
Life form Raunkiaer	Geophyte
Summer shedding	Ephemeral
Succulence	Non-succulent
Salt resistance	Glycophyte
Habitat or affinity to Vegetation formation	Rocks or sandy areas from the seashore to 1000 m
Synanthropy	Grows only in natural habitats
Chronology	Cited in the NCSR report (1999). Mouterde (1966) mentioned the sites in which the species was seen on the Lebanese coast and in low hills of Akkar. Tohmé & Tohmé (*personnel comm*.) found this plant in high mountains (c.1200 m) in Lebanon and Anti-Lebanon.
Usage	Also called “Basal-al-far” since its bulb is uprooted to be used as rat or mouse poison
Status	Not uncommon
Identification	Bulb up to 18 cm leaf up to 100 cm long and 10 cm large

Genus, Latin	***Phoenix***
Species, Latin	***dactylifera***
Author	(L.)
	
	Photo: Dr. Ghassan RAMADAN-JARADI
Family	ARECACEAE (PALMAE
Common name, English	Date palm
Common name, Arabic	Nakhl
Chorotype	Saharo-Arabian
Life form Raunkiaer	phanerophyte, tree
Summer shedding	perenating
Succulence	Non-succulent
Salt resistance	grows in salty and non-salty habitats
Habitat or affinity to Vegetation formation	Near springs in arid areas
Synanthropy	mostly natural, also synanthropic
Chronology	Only three small sub-stands occurred on the Rabbit (Nakhl-Palm) Island in the past. The tree was first mentioned in literature by Stenhouse (1904) and seems to be planted long time ago at an unknown date. In 1998, more than 500 shoots were planted on the same island.
Usage	Appreciated for its fruits and products thereof.
Status	Isolated
Identification	See photo

Genus, Latin	***Washingtonia***
Species, Latin	***filifera***
Author	Wendl.
	
	http://www.unict.it/.../
Family	ARECACEAE (PALMAE
Common name, English	California fan-palm
Common name, Arabic	Nakhl Mirwahi
Chorotype	American
Life form Raunkiaer	phanerophyte, tree
Summer shedding	perenating
Succulence	Non-succulent
Salt resistance	Glycophyte
Habitat or affinity to Vegetation formation	Ornamental tree escaped from cultivation into abandoned orchards and other opened habitats in urban and ruraln areas
Synanthropy	obligate synanthropic
Chronology	This American species was introduced by misguided environmentalists in 1994.
Usage	unknown or ornamental.
Status	Isolated
Identification	See photo

A.1.5.1.2 The vegetal communities

There are three main plant communities on the islands:

4. Plants associated with rocky areas such as Spiny caper, Glasswort, Rock samphire, etc.
5. Plants associated with sandy area such as Sand lily, Coast spurge, Field pimpernel, Trifid stock, etc.
6. Plants associated with wet soil or wetland areas such as Toad rush, Pretty centaury, Grass-poly, etc.

This site is only 0-12 m. above sea level. According to Corine Classification (1999), the reserve belongs to the "Thermo-Mediterranean Level" category which encompasses Mediterranean habitats up to 500 m. altitude.

A.1.5.1.2.1 Characteristics

A.1.5.1.2.1.1 Physical: the site is an open flat insular marine biosystem that is subject to severe wind factors strengthened by very small surface area. Fresh water is either of no direct access (well) or simply limited to small temporary ponds of rain water in winter and spring seasons. Detailed climatic data is given above.

A.1.5.1.2.1.2 Biotic: despite the fact that the reserve is heavily visited during day times by locals during summer season it is considered uninhabited site. In addition it is generally a treeless area with mainly annual herbs and deprived from any top trophic chain predator. The main significant characteristics of the reserve are aves, sea turtles, new races (varieties) of lizards, endemic plants and a submerged spawning area.

A.1.5.1.2.1.3 Quality: direct human impact on the reserve is very low even during the visitation period where it is generally of no apparent significance. Indirect impact originates from waste brought to the islands by sea currents of water.

A.1.5.1.2.1.4 Habitats & Vegetal formations: The habitats of the Palm Islands are micro-habitats if compared to those of Corine classification. The overall site responds to the description given to the "Annual vegetation of drift lines' habitat (code 1210) under the group of "Sea cliffs and stony or shingle beaches" where the association of the following plants is the main characteristic of the formation in Mediterranean areas: *Glaucum flavum, Matthiola tricuspidata, Euphorbia paralias, Euphorbia peplis* and *Eryngium maritimun.* The *Cakile aegyptia* may replace *Cakile maritima* since the islands are on the easternmost part of the Mediterranean.

Whatsoever, it is probably of more convenience to describe the small habitats of the reserve as follows:

- The rocky shoreline formation with association of *Arthrocnemum macrostachyum, Crithmum maritimum, Inula crithmoides, Frankenia hispida, Limonium angustifolium, Limonium sieberi.*
- The sandy beach formation with association of *Euphorbia paralias, Euphorbia peplis, Cakile aegyptiaca, Eryngium maritimum, Pancratium maritimum.*

The earthen and stony formation with association of *Papaver rhoeas, Papaver syriacum,Aristolochia parvifolia, Campanula stellaris, Glaucium flavum, Minuartia thymifolia syriaca, Anemone coronaria.*

A.1.5.1.2.1.4.1 Cover and stratification

The table below gives several parameters delimiting the identity of the three communities, including covers and stratificatons:
R = rare; S = scarce; U = uncommon or localized; C = common; Fl = flowering period (3-5 = March-May); A = annual; V = Perennial (vivace); T = tree or sub-tree; H = herb; A-D = abundance-dominance, Tl= Tall ligneous>2m, Sh= Shrub<2m.

	Species	**R**	**S**	**U**	**C**	**Fl**	**A**	**V**	**T**	**H**	**A-D**	**Tl**	**Sl**	**Herbace-ous**	**Cover**
ROKY AREA	*Crithmum maritimum*			+		6-10	+			+	3			20-50 cm	25%
	Inula crithmoides			+		8-11		+	+		2		40-80 cm		5%
	Limonium angustifolium			+		6-12		+		+	1			30-80 cm	2%
	Limonium sieberi			+		5-11		+		+	1			20-60 cm	2%
	Frankenia hispida		+			6-10		+	+		+		10-30 cm		1%
	Arthrocnemum macrostachyum		+			4-10		+		+	+		Up to 1m		1%
SANDY	*Cakile aegyptia*				+	12-6	+			+	2.8			15-60 cm	20%
	Euphorbia paralias					3-9		+		+	2			30-50 cm	5%
	Euphorbia peplis				+	3-9	+			+	2			±5 cm	5%
	Eryngium maritimum			+		6-9		+		+	1			20-50 cm	2%
	Pancratium maritimum		+			9-10		+		+	1			30-45 cm	2%
EARTHEN	*Campanula stellaris*					3-5	+			+	3.1			10-40 cm	30%
	Aristolochia parvifolia			+		3-5		+		+	2.2			10-30 cm	8%
	Papaver rhoeas				+	3-6	+				2			20-90 cm	5%
	Papaver syriacum				+	2-5	+			+	2			20-80 cm	5%
	Anemone coronaria				+	12-4		+		+	1			7-35 cm	4%
	Glaucium flavum				+	2-8		+		+	1			30-60 cm	4%
	Minuartia thymifolia syriaca		+			2-4	+			+	+			10-15 cm	2%

A.1.5.1.2.1.4.2 Qualitative evaluation of the habitats

A.1.5.1.2.1.4.3 Dynamic and ecological succession

The vegetal formations of Palm Islands Nature Reserve show an exceptional repeated progressive dynamic. This is considerably due to the degradation caused by the introduced rabbits and the subsequent tendency of plant formations to recover and attain the climax stages.

A.1.5.1.2.1.4.4 Evaluation of the degree of artificialization

The artificialization is observed as a result of the recent human intervention (planted palm trees in geometric lines).

A.1.5.1.2.1.4.5 Spatial structure of the communities

The spatial structure of the communities is well projected on the maps.

A.1.5.1.2.1.4.6 Regeneration rate of the high ligneous formations

The only high ligneous formation of the Palm Islands Nature Reservre is basically based on Phragmites. This formation is of very high regeneration rate that may reach up to 100%.

A.1.5.2 MAMMALS

Mammal explorations in the country were shy and almost limited to around the middle of the twentieth century. They are fragmentary and provided little information on the mammals of Lebanon. Many species and sub-species were lacking or not yet mentioned in Lebanon till early seventieth. Between 1980 and 1985, Tohmé, G. and Tohmé, H. produced alone 33% of the known published papers on the Lebanese mammals. Whatsoever, the only documented data of the mammals of Tyre Beach Reserve apparently appeared in the report of Tohmé, H. that was prepared, on behalf of the Protected Areas Project at the Ministry of Environment, in 1999 by the NCSR. This report which was based on inventory and surveys, together with post-report period sightings, produced a list of 8 mammals as shown in the Annex (2). These are distributed over 4 families, 5 of which are flying mammals that are generally considered threatened at both global and regional levels (bats). 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. Based on only one documented sighting in 1997 (Ghassan Ramadan-Jaradi, *pers. comm*. in Palm Islands Nature Reserve Management Plan), the globally threatened Monk Seal is apparently an occasional visitor to the islands and surrounding waters.

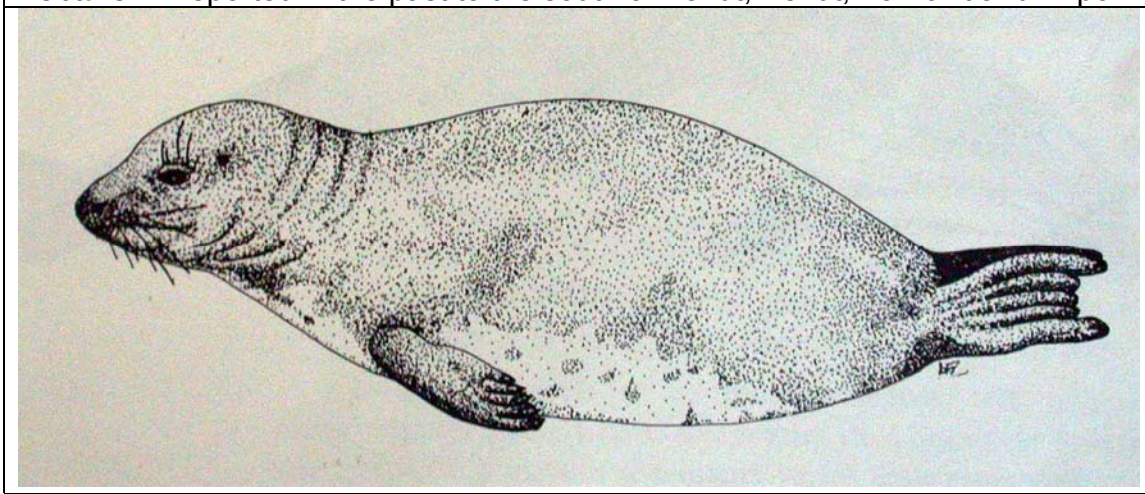
1.5.2.1 The Mammal species

1.5.2.1.1 Selected species

The used methodology and criteria to limit the study to a certain number of species are indicated in the Annex 2. Three species were selected to be a target for monitoring and evaluation. These are: *Oryctolagus cuniculus*, *Rattus norvegicus norvegicus* and *Monachus monachus.*

Species	English Name	Local Name	Priority	Localization		Abundance
				Habitat	GPS	
Oryctolagus cuniculus	**Domestic Rabbit**	Arnab	Alien Invasive	All over Rabbit or Nakhl Island		High
Rattus norvegicus norvegicus	**Brown Rat**	Jirzoun	Alien Invasive	All over the three islands		High
Monachus monachus	**Mediterranean Monk Seal**	Foqmah	Globally Threatened	In water around the reserve		Extremely low to occasional

A.1.5.2.1.2 Useful information and details about the selected species

Monachus monachus **Mediterranean Monk Seal**
distribution
Middle East: At one time, the Mediterranean monk seal occupied a wide geographical range. Colonies were found throughout the Mediterranean, the Marmara and Black seas. The species also frequented the Atlantic coast of Africa, as far south as Mauritania, Senegal and the Gambia, as well as the Atlantic islands of Cape Verde, Madeira, the Canary Islands and the Azores. More recently, however, the species has disappeared from most of its former range, with the most severe contraction and fragmentation occurring during the last 50 years. Nations and island groups where the monk seal has been extirpated during the 20th century include mainland France and Corsica, Spain and the Balearic Islands, Italy, Sicily and the Toscana archipelago, and Egypt, Palestine, **Lebanon** and Tunisia. The species is also thought to be on the brink of extinction in the Marmara and Black Seas and the Adriatic coasts and islands of Croatia. Despite sporadic sightings, the species also appears effectively to be extinct in Sardinia. As a result of this range contraction, the monk seal has been virtually reduced to two populations, one in the eastern Mediterranean and the other in the Northeast Atlantic, off the coast of Northwest Africa.
Lebanon: Reported in the past to the south of Beirut, Beirut, Aamchit and Tripoli.

Drawing: G. & H. Tohmé
population
In its areas of distribution, this animal numbers between 300-500 individuals and continues to decline. **In Lebanon**: Vagrant.
Chronology: Nowadays, this seal is very occasionally recorded around the islands of the reserve (1 individual seen by the management team in 1997, 2 individuals reported by the fishermen in 2000 and 2002). According to fishermen of the local community and their unwritten sightings, the Monk Seal occurred few times on the islands (undocumented records). In fact the submerged caves of Ramkine Island offer this species an appropriate place for breeding or sheltering during difficult times. Therefore, the monitoring of the seal may reveal it breeding

or attempting to breed. Otherwise, it may reveal the reasons of its rarity and subsequently the needed actions to increase its presence and numbers.
identification
Little information is available on this now reclusive species. The Mediterranean monk seal male averages 2.4 m in length and weighs approximately 315 kg. Females are slightly smaller, weighing approximately 300 k. Adults are generally brown or grey on the back, and lighter on the belly. A white patch is common on the underside of the belly, and other irregular light patches are not uncommon. Older males tend to be black. Pups are born from 88-103 cm in length and weigh 16-18 kg. Unlike the Caribbean and Hawaiian monk seals, the Mediterranean monk seal pups are born with a white or yellow patch on the belly of the otherwise black, woolly coat. Males and females are thought to reach sexual maturity between 5 and 6 years, although some females may mature as early as 4 years. Pups are born over much of the year although peak pupping occurs in September and October. Monk seal pups can swim and dive at about two weeks of age and are weaned at about 16-17 weeks. Monk seals are thought to forage in nearshore waters for fish and octopus. Individuals may live for 20-30 years in the wild.
habitat
The Mediterranean monk seal has been virtually extirpated from much of its original habitat by human encroachment and females now pup only in caves in remote and relatively undisturbed areas.

Domestic Rabbit *Oryctolagus cuniculus*

A population of around** 400 semi-wild individuals **is currently found to be established and breeding in borrows in the earthen parts of Nakhl Island. The foraging area exceeds the breeding ground to cover all the habitats of the Nakhl Island. Away from their tunnels, the rabbits find in the bushes and the reed beds a preferred refuge from persecutors and a shelter of choice during their resting time.

Brown Rat *Rattus norvegicus norvegicus*

This species is mainly nocturnal. Hence is the difficulty to count its individuals or to identify its distribution in the reserve. However, all the diurnally detected signs of its presence, including burrows and fecal waste, indicate that it is found in all habitats of the three islands of the reserve, whereas the estimated number of the rats is about** 1200 individuals**.

A.1.5.3 BIRDS

There is a relative paucity of ornithological information on Palm Islands Nature Reserve (also known as Rabbit Islands or Nakhl Islands). Available information is scanty, conflicting and/ or inadequate. Throughout the past 100 years (1893-1995), there were only very few visits and studies in this region. Among these it is worth mentioning the following: J.A. Stenhouse (July 4th 1893 and June 20th 1895), P.A.D. Hollom (May 9th 1956), G. Tohmé & J. Neuschwander (April 3rd and 15th and early August 1973) and several visits by G. Tohmé & J. Neuschwander during 1974 (Tohmé *com. Verb*.). All these short-term studies provided a list consisting of 22 bird species only.

Results reported in a published paper by Ramadan-Jaradi, G. & Ramadan-Jaradi, M. (2001) are based on all previous ornithological works as well as on the systematic and continuous observations (often twice monthly) in this protected area throughout April 1995 - end 2000. These observations have provided enough data to chart breeding, wintering and migration patterns for 154 species. Of these, 139 occur in migration (96 species) and/ or in winter, while 15 are vagrant or with uncertain status. Of the migrating species, 8 are proved to breed in the area and 1 may breed (Turtle Dove *Streptopelia turtur*) though there is no direct evidence. Of the remaining 4 species, 2 are resident breeders (Yellow-legged Gull *Larus cachinnans* and Graceful Warbler *Prinia gracilis*), one is apparently resident (Little Owl *Athene noctua*) but without direct evidence of breeding, and one is obviously extirpated (Lesser Crested Tern *Sterna bengalensis*) not only from the reserve but also from Lebanon. The resulting list of species is shown in the systematic list of the Annex 3.

However complete the above list may be, it must be kept in mind that there are still many gaps in the information about the species because some of our surveys were thwarted by the vagaries of the weather, most notably sea storms and by delays in obtaining permissions to visit the islands. Thus, the visits were not quite evenly distributed along the year. Consequently, the periods given for passages are not necessarily representative of the real dates of their arrival and departure but the periods during which these birds were contacted.

During the period 1893-2000, certain changes have occurred in the islands' ornithological scene which, deserve attention:

Firstly, four species (*Larus audouini, Sterna bengalensis, Sterna hirundo* and *Sterna albifrons*) were published by Stenhouse (1904) as breeding but stopped to do so, at least from 1956 onward. Furthermore, one of these species (*S. bengalensis*) apparently ceased from appearing in Lebanon. The extirpation of these four species from the islands is not surprising since insular communities are known to be very susceptible to persecution, disturbance and development. All these factors (hunting, egging, feeding on nestling, recreational, commercial and agricultural activities, military occupation, fishing with dynamite near the islands, *etc*.) prevailed in the area prior to its declaration a protected area. Only the Yellow-legged Gull *Larus cachinnans* obtaining, throughout the year, ample food from human waste resisted. This was not the case of the extirpated species which, mostly rely on natural food.

Secondly, the total islands community exhibited in 1996-2000 over trice as many breeding species as past studies had shown. Other than the extirpated birds, the Yellow-legged gull L*arus cachinnans*, the Tawny Pipit *Anthus campestris* and the White Wagtail *Motacilla alba* formed alone, prior to this longer-term study, the breeding bird list of the islands as apparently not all potential breeding areas were exhaustively searched. The contrast between the past and the present increased dramatically as a result of the bird massacre during the seventies and eighties thus dropping the breeding populations to almost null.

However, the richness (10 breeding species) of the reserve remains relatively low, most probably due to the insularity (Ramadan-Jaradi, 1989) accentuated by the alteration of the vegetation cover by rabbits, the low variety of climates and habitats and the exposure of the flat islands to wind and particularly sea storms. Nevertheless, the breeding birds (up to50% of the breeding individuals) of the reserve brave these constraints by nesting in protected sites such as holes and borrows (Pallid Swift, Crag Martin, Hoopoe, *etc*.), while the other half breeds either in sheltered ground nests (Tawny Pipit, Quails, *etc*.) or in low scrubs or shrubs (Graceful Warbler).

Thirdly, the large number of migrating birds at the reserve (135 species) was not wholly surprising too. Tohmé & Neuschwander (1974) have already speculated about the importance of Palm Islands for migrants. However, the fact that 37% of migrants of Lebanon (Ramadan-Jaradi & Ramadan-Jaradi,1999) are passing by and over the islands poses once again several questions as regards to origin, destination and the routes they take from Eurasian breeding grounds to Africa and *vice versa*. Hence, there is a necessity of establishing a permanent bird ringing centre on the protected area.

The use of the reserve by many migrants as a suitable feeding and resting sites, particularly by 42 species known to breed afterward on Lebanese mainland (Ramadan-Jaradi & Ramadan-Jaradi, 1999); together with the fact that 5 threatened species at global level, 5 threatened at regional level and 2 restricted species to Middle East; occur here, make it clear that the Palm Islands Reserve is of unique national and regional significance.

Remarkable in the group of migrants is the scarcity of many species whose arriving dates are relatively earlier than those of mainland. In this sense, the islands prove to be among the first stop-over areas for many sea-crossing species of broad migration front. Similarly, the rarity of winterers, particularly passerines, indicates that the islands are unsuitable in winter not only because of their small surface area but also because of their exposure to severe climatic factors and scarcity of food.

It is worth mentioning that the broad-winged soaring raptor species migrate along the coastal strip and high over the mountains, and therefore it would not be unexpected to pass over the islands. However, this was not the case for the Eagle *Aquila clanga* because its appearance followed a sudden storm which, deviated it slightly from its usual Levant migration route. Conversely, the remaining raptor species recorded, Harriers *circus,* Falcons *Falco* and to some extent Egyptian Vulture *Neophron percnopterus* are more active migrants, and thus do not necessarily avoid sea crossings.

1.5.3.1 The Bird Species

1.5.3.1.1 Selected species

The used methodology and criteria to limit the study to a certain number of species are indicated in the Annex 9 far below. However, 14 species of birds are selected:

1.5.3.1.1.1 **Rare (5)**

Species	English Name	Local Name	Localization		Abundance
			Habitat	GPS	
Crex crex	**Corncrake**	Salwa	All over non rocky habitats		5-6 individuals/ year
Gallinago media	**Great Snipe**	Chikkobkbir	Earthen habitat		About 12 individuals/ year
Larus audouinii	**Audouin's Gull**	Nawras	Anywhere		Less than 10 records in spring
Ptyonoprogne rupestris	**Crag Martin**	Snounou el Sokhour	Rocky areas		5-6 breeding pairs
Hippolais languida	**Upcher's Warbler**	-	Earthen habitat		Less than 10 records/ year

1.5.3.1.1.2 **Endemic (0)**

Species	English Name	Local Name	Endemism	Localization		Abundance
				Habitat	GPS	

1.5.3.1.1.3 **Noteworthy (9)**

Species	English Name	Local Name	Value	Localization		Abundance
				Habitat	GPS	
Ardea cinerea	**Grey Heron**	Malek el Hazeen	The only national significant wintering population	All over but mainly rocky areas		Medium (16-20 individuals per year, mainly in winter)
Coturnix coturnix	**Quail**	Firri	Gamebird/ Economic	Earthen land		High (c.80 ind./year)
Philomachus pugnax	**Ruff**	-	The second national significant wintering population	All over		High (70-80 ind./ year

Larus cachinnans	**Yellow-legged Gull**	Nawras kabir	The only national breeding population/ Indicator of pollution/ Target for birdwatchers	All over		Very High. 16 breeding pair and hundreds on passage and winter
Anthus campestris	**Tawny Pipit**	-	-Bioindicator –Excellent population for birdwatching	Earthen lands		Few breeding pairs (c.15)
Motacilla alba	**White Wagtail**	Mirtayzeh	-Bioindicator –First breeding records for over one century	Sandy and earthen habitats		Low (2 breeding pairs and c.50 ind. seen on passage)
Phoenicurus ochruros	**Black Redstart**	Hmeira	Indicator of good management	Earthen and Sandy habitats		Low Less than 15 individuals
Prinia gracilis	**Graceful Warbler**	-	Excellent for birdwatching and education	Reed beds and nearby		High c.20 breeding pairs
Sylvia atricapilla	**Blackcap**	Khoury(M) Shimmas(F) or Tayyan	Excellent for birdwatching, education and management indicator	Earthen habitats		Medium 6-7 pairs and tens counted on migration

1.5.3.1.1.4 **Introduced (Alien invasive) (0)**

Species	English Name	Local Name	Origin	Localization		Abundance
				Habitat	GPS	

1.5.3.1.1.5 **Threatened (4)**

Species	English	Local	Level of	Localization	Abundance

	Name	Name	threat	Habitat	GPS	
Crex crex	**Corncrake**	Salwa	Global	All over		Very Low 5-6 individuals/ year
Gallinago media	**Great Snipe**	Choukkob Kabir	Global	All over		Low About 12 individuals/ year
Larus audouinii	**Audouin's Gull**	Nawras	Global/ near threatened	Anywhere		Very Low Less than 10 records in spring
Hippolais languida	**Upcher's Warbler**	-	Regional	All over		Very Low Less than 10 records/ year

A.1.5.1.1.6 Useful information and details about the selected species

***Ardea cinerea* Grey Heron**
Distribution
Middle East: Resident to widespread migrant and winter visitor.
Lebanon: Passage migrant and winter visitor. Sighted at Aaichyeh, Aammiq, Azour, Beirut, Nahr Beirut, Qaraoun, Tanayel and Tripoli.
 Drawing: http://www.birdguides.com
Population
The European population is at least 117,000-128,000 pairs. Russian population 20000-25000 Turkish population 2000-5000. **In Lebanon**: 21 wintering birds at Palm Islands and singletons elsewhere.
Chronology: First recorded on Palm Islands by Ramadan-Jaradi & Ramadan-Jaradi (1999 and 2001). They also reported the first national wintering records of the species from the same islands. Whilst the number of passing birds doesn't show any significant variation, the number of winterers increased progressively from 4 to 21 individuals during the last 5 years.
Identification
Its huge size, pale grey plumage and distinctive shape distinguish it from all other birds. The adult is whiter on the neck than the juvenile and has longer black tufts hanging down its nape.
Habitat
Broad passage across Lebanon's habitats. Winters along rivers, estuaries, lakes, marshes and islands.

***Coturnix coturnix* Quail**

Distribution
Middle East: Breeding summer visitor, widespread on passage and few overwinter.
Lebanon: Common passage migrant over most of the country. Few overwinter, mainly in the Beqaa valley. Recorded at Aammiq, Aichyeh, Aramta, Beirut, Beqaa Valley, Jiyeh, Joub Jannine, Kfarhouneh, Khaldeh, Mlikh, Ryhan, Tripoli, Palm Islands.
 Drawing: http://www.birdguides.com
Population
650 000-900 000 breeding pairs common across Europe but rare in the north. **In Lebanon**: The passing birds are in thousands whilst the winterers are very few and the summer breeders are widely fluctuating due to excessive hunting pressure.
Chronology: First mentioned on Nakhl Island by Hollom (1959) who saw quail-wings in the colony of the nesting gulls. The second record was by NCSR (1999) and the third record which is also the first breeding record on the Nakhl Island is given by Ramadan-Jaradi & Ramadan-Jaradi (1999, 2001). At present, the Common Quail is known as common passage migrant and scarce summer breeder.
Identification
The Quail is a tiny gamebird most likely to be mistaken for a half-grown young Partridge, but the male has a black and white head pattern which is mimicked in a duller brown version by the female. If you are lucky enough to flush one you'll see a dumpy, hump-backed, narrow-winged gamebird skimming low over the vegetation with quick, shallow wing-beats. More usually though, you'll hear its diagnostic call.
Habitat
Breeds in arable fields and long grass.

***Crex crex* Corncrake**

Distribution
Middle East: Widespread on passage throughout region.
Lebanon: Uncommon passage migrant over the country with peaks of up to six birds. Recorded at Aammiq, Beirut, Palm Islands, Tyre.
 Drawing: http://www.birdguides.com
Population
87-97,000 breeding pairs widespread but uncommon across Europe and rare in the north. **In Lebanon**: The yearly recorded birds are apparently not exceeding a dozen.
Chronology: First noted at Palm Islands by Ramadan-Jaradi & Ramadan-Jaradi (1999) in 1995, 1996, 1997 and 1998; NCSR (1999) and by Ramadan-Jaradi & Ramadan-Jaradi (2001) as migrant with regular appearance in May and with peaks up to six individuals.
Identification
If you are lucky enough to catch a glimpse it will probably be of a bird flying weakly away, with its rufous wings standing out and with its legs dangling behind it. Birds seen on the ground are quite distinctive, particularly the yellow bill and legs, grey facial stripes, dark back and rufous wings. They could almost be a cross between a Partridge and a Water Rail. (The distinctive call of the Corncrake is usually the only contact you will have in the European breeding ground with this elusive and declining species.)
Habitat
Found in cultivated lands, meadows and other open grassy lands.

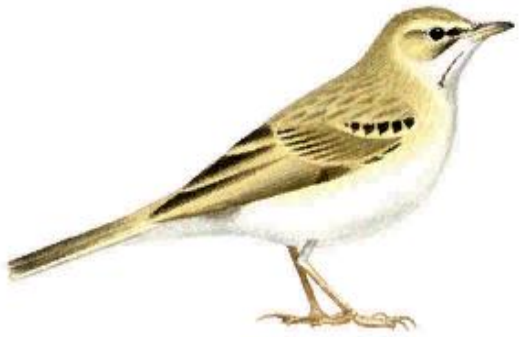
Philomachus pugnax **Ruff**
Distribution
Middle East: Very widespread on passage and in winter throughout region.
Lebanon: common to abundant passage migrant and scarce winter visitor. Very small numbers oversummer. Recorded at Aammiq, Beirut, Beqaa Valley, Cheikh Zennad, Damour, Palm Islands.
 Drawing: http://www.birdguides.com
Population
100-140,000 'pairs' in Europe plus over a million in European Russia. **In Lebanon**: The passing birds are in thousands whilst the winterers are very few and the summer non breeders are very few or casual.
Chronology: First recorded on Palm Islands by NCSR (1999) and then by Ramadan-Jaradi & Ramadan-Jaradi (2001). Data is not sufficient to track species evolution or dynamism on the site.
Identification
Ruffs are taller and leggier than Dunlins, the males being about the size of a Redshank, the females, known as Reeves, being Wood Sandpiper-sized. In all plumages they look rather fat-bodied but small-headed and short-billed, and their upperparts are usually well-patterned with brown and buff. The juveniles show an immaculate scaly pattern above. Ruff leg colours vary, so don't be surprised to find one with legs as red as a Redshank. And look out for birds showing signs of summer plumage, especially white-headed, white-chested males looking quite unlike anything in most bird books. In flight they look relatively long-winged with a narrow pale wing bar but striking white oval patches in the sides of the tail.
Habitat
Most likely to occur on passage on wetlands. Winters on estuaries, marshes and islands.

Gallinago media **Great Snipe**

Distribution
Middle East: Scarce to rare passage migrant.
Lebanon: uncommon to rare but regular passage migrant. Recorded at Aammiq, Beirut, Beqaa Valley, Faraya, Palm Islands, Tyre.
 Drawing: http://www.birdguides.com
Population
The European population is 21-34,000 pairs. **In Lebanon**: There are about 26 records of this species at least during the last 40 years.
Chronology: First noted at Palm Islands by Ramadan-Jaradi & Ramadan-Jaradi (1999) and NCSR (1999). Data is not sufficient to track species evolution or dynamism on the site.
Identification
Great Snipe are bigger and podgier than Common Snipe, more like a Woodcock in shape. They look altogether more barred than a Snipe due to the extensively barred underparts and the rows of black and white lines across the rufous wing coverts. The white edges to these coverts also show up in flight as narrow white lines bordering a dark central wing panel. Their heavy build, dark belly and level, not towering, flight separates them from Snipe and the white markings in the wings and tail eliminate Woodcock.
Habitat
Most likely to occur on passage on flat, wet, open areas often close to wetlands.

Larus audouinii **Audouin's Gull**
Distribution
Middle East: Some small colonies South Turkey, Cyprus, and formerly bred Nakhl Island off Tripoli. Most disperse in winter; accidental or rare coasts of East Mediterranean.
Lebanon: rare passage or dispersal. Recorded at Palm Islands and Cheikh Zennad.
 Drawing: http://www.birdguides.com
Population
About 13,400 breeding pairs with most of these found at just two Spanish locations, the Ebro Delta and the Chafarinas islands. Other small colonies are also found in Corsica, the Balearic Islands and the eastern Mediterranean including Cyprus and Greece. **In Lebanon**: There are 9 records of this species at least during the last 100 years.
Chronology: First recorded on Palm Islands as breeder with 15 pairs in 1895 by Stenhouse (1904). Hollom (1959) saw no birds there in May 1956. In October 1958, three were there in October (Flach 1959). In April 1973, 17 were seen on Palm Island by Tohmé & Neuschwander (1974) and 10 on Palm, Sanani and Ramkine Islands in August 1997 Ramadan-Jaradi & Ramadan-Jaradi (1999). There is increase in numbers in recent years, probably due to conservation effort (*Pers. obs*.).
Identification
Audouin's Gulls are most similar to Yellow-legged Gulls but are smaller and neater looking with a long, sloping forehead and a longer, more attenuated rear end. The adults always look neater than Yellow-legged Gulls perhaps because of the way the dark eye and deep red bill contrast more vividly with the white head. Notice too that the grey of the mantle merges gradually into the white of the neck. The brown head of a juvenile Audouin's Gull is plainer than on a Yellow-legged Gull and the grey legs and distinctive shape will confirm its identity. As these birds pass into first winter plumage they develop grey mantles with distinctive dark scalloping. In flight, the adults have a striking black wedge in the forewing, more extensive than on a Yellow-legged Gull and with less black at the tips and the juveniles have a more solid black tail bar.
Habitat
Breeds colonially on salt-pans and rocky islets but most frequently seen resting on sandy beaches.

***Ptyonoprogne rupestris* Grag Martin**
Distribution
Middle East: Breeds mainly northern parts of region. Migrant and winter visitor to most parts of region.
Lebanon: Summer breeder and probably resident. Also passage migrant and winter visitor. Sighted at Aammiq, Aichyeh, Aramta, Arz Al Chouf , Bcharreh, Beirut, Beqaa, Dalhou, Faqra,, Faraya,, Hermon, Jounieh, Litany River, Mlikh, Moltaqa Al Nahrein, Nahr Al Jouz, Nahr el Kelb, Nahr Ibrahim, Palm island.
 Drawing: http://www.birdguides.com
Population
130-230,000 breeding pairs across southern Europe. Spain and Portugal support the largest populations. **In Lebanon**: Scattered small colonies in suitable habitats.
Chronology: First mentioned from Palm Islands by Ramadan-Jaradi & Ramadan-Jaradi (1999) as passage migrant and summer breeder too; and then by NCSR (1999) and Ramadan-Jaradi & Ramadan-Jaradi (2001).
Identification
Crag Martins are chunky brown birds, like big fat Sand Martins but with dusky, not white underparts, no breast band and with underwing coverts which are significantly darker than the rest of the wing. Additionally, look for the white spots which are visible when the birds spread their relatively square-ended tails. At rest the duller underparts and lack of a breast band are good identification features but the exceptionally long wings are also noteworthy.
Habitat
Breeds mostly in mountainous areas, nesting on cliffs, under bridges or on buildings, sometimes even in towns.

Anthus campestris **Tawny Pipit**
Distribution
Middle East: Summer breeder mainly in northern parts of region; migrant throughout region and winterer Arabia with a few Cyprus to Egypt.
Lebanon: Scarce summer breeder; common passage migrant and uncommon winter visitor. Sighted at Aammiq, Aichyeh, Ainata, Anti-Lebanon, Aramta, Arz Al Chouf , Beirut, Hermon, Kfarhouneh, Laqlouq, Mlikh, Mouth of Damour River, Palm island, Qaraoun, Rachaya, Ryhan.
 Drawing: http://www.birdguides.com
Population
520-770,000 breeding pairs with more than half of Europe's population found in Spain. Also found in large numbers in France, Italy, Greece and Turkey. **In Lebanon**: Scattered small numbers in suitable habitats.
Chronology: First recorded on Palm Islands by Tohmé & Neuschwander (1974) as breeding with only one pair seen, and then by NCSR (1999),and by Ramadan-Jaradi & Ramadan-Jaradi (1999 and 2001) who found it also breeding with few pairs.
Identification
The almost complete lack of streaks on the underparts is one of the best ways to tell a Tawny Pipit which also looks bigger and leggier than other pipits. The pale sandy plumage, bold eyestripe and prominent line of black feathers on the median coverts are also useful features. Juveniles are similar to Richard's Pipits, but are slimmer with a distinctive dark line from the bill to the eye.
Habitat
Summer visitor to sandy or stony heaths.

Motacilla alba **White Wagtail**
Distribution
Middle East: Resident and partial migrant mainly in northern parts of region and the Levant. Widespread migrant and winter visitor throughout region.
Lebanon: Scarce summer breeder but common passage migrant and winter visitor. Sighted at Aammiq, Aichyeh, Beirut, Beqaa Valley, Damour, Jiyeh, Kfarhouneh, Nahr el Kalb, Nahr Ibrahim, Palm island, Qaraoun, Sannine, Sidon.
 Drawing: http://www.birdguides.com
Population
In Europe, common and widespread retreating from the north in winter. **In Lebanon**: Scattered small numbers in suitable habitats.
Chronology: First record of the species was obtained by Stenhouse (1904) who noted it breeding on Nakhl Island. Furthermore, it was recorded by NCSR (1999) and Ramadan-Jaradi & Ramadan-Jaradi (1999). Its breeding was reconfirmed by Ramadan-Jaradi & Ramadan-Jaradi (2001).
Identification
Unmistakable with its bold black, grey and white plumage and long, frequently wagged tail. Male has black back, while female is slate grey. Some races are much greyer.
Habitat
Occurs in a wide variety of open places including fields, farmyards, parks, meadows, and shows a preference to the vicinity of water.

Phoenicurus ochruros **Black Redstart**
Distribution
Middle East: Breeds mainly in Levant; otherwise widespread migrant and winterer throughout region.
Lebanon: Resident and summer breeder; common passage migrant and winter visitor. Sighted at Aammiq, Aichyeh, Ain Zhalta, Aqoura, Aramta, Baabda, Barouk, Beaufort Castle, Beirut, Beqaa, Bteghrine, Byblos, Damour, Deir Kalat, Faraya, Hermon, Kfarhouneh, Litany, Maasser Chouf, Mairuba, Metn, Mlikh, Nahe el Kalb,, Palm island, Qaraoun, Qartaba, Ryhan, Sannine, Tyre, Zaarour.
 Drawing: http://www.birdguides.com
Population
3-6 million breeding pairs in much of Europe. **In Lebanon**: Unknown number of breeding pairs in suitable habitats.
Chronology: First observed on Palm Islands by NCSR (1999) and Ramadan-Jaradi & Ramadan-Jaradi (2001). Data is not sufficient to track species evolution or dynamism on the site.
Identification
Black Redstarts have similar quivering red tails to Redstarts but the males are otherwise sooty-grey in colour apart from a blacker face and breast and a variable white panel in the wing. Females can be told from Redstarts because they are always duller with uniformly dark underparts from bill to legs.
Habitat
Breeds in towns and villages and in mountainous scree or sea cliffs. Winters on rocky shores, beaches, stony ground and around buildings.

Prinia gracilis **Graceful Warbler**
Distribution
Middle East: Widespread breeder
Lebanon: Resident breeder. Sighted in all places below 1000 meters of altitude and in the Beqaa Valley.
 Drawing: http://www.birdguides.com
Population
500 breeding pairs in southern Turkey, part of a larger Middle-eastern and Asian population. **In Lebanon**: More than 5000 pairs counted..
Chronology: First noted at Palm Island by Ramadan-Jaradi & Ramadan-Jaradi (1999 and 2001) and NCSR (1999) as breeding and common. The numbers of individuals appear to be stable from year to another.
Identification
Their small size and streaky brown plumage means they are only likely to be confused with Fan-tailed Warblers but Graceful Warbler have much longer tails marked below with horizontal pale bands rather than spots around the edges. Also, Graceful Warblers have a much plainer face, with no obvious supercilium and their upperparts are not so boldly streaked.
Habitat
Breeds in towns and villages and in mountainous garrigues and near marshes. Resident in areas of long grass, reeds or rushes, sometimes close to water.

Hippolais languida Upcher's Warbler
Distribution
Middle East: Breeds in hilly areas in southern Turkey such as on the plateau areas above Durnalik and Isikli, near Gaziantep.
Lebanon: common migrant breeder from late April–late July, mainly in montane garrigue, ravines and olive groves and orchards. Scarce to uncommon on passage in late April–early June and early August–late October.
 Drawing: http://www.birdguides.com
Population
1 000 breeding pairs in southern Turkey, part of a larger population found in the Middle East, and further afield in Afghanistan. **In Lebanon**: common migrant breeder from late April–late July, mainly in montane garrigue, ravines and olive groves and orchards. Scarce to uncommon on passage in late April–early June and early August–late October
Chronology: First noted at Palm Islands by NCSR (1999) and Ramadan-Jaradi & Ramadan-Jaradi (2001) on passage.
Identification
In plumage, there's not much difference between Upcher's and the much commoner Olivaceous Warbler although its worth looking for the darker tail and relatively darker wings of the Upcher's which contrast with the paler upperparts. With care you may also notice that the tips of the tertials are unevenly spaced on an Upcher's Warbler, as if there's one missing. The most obvious difference between the two species is in build, since Upcher's looks distinctly big-headed and bull-necked whereas the Olivaceous is the slimmest most pointed-looking of all the Hippolais Warblers. Also, Upcher's sometimes waves its dark tail around in circular motions, a habit shared with the Olive-tree Warbler but not the Olivaceous.
Habitat
Breeds in rocky, hilly areas with sparse bushes although they also occur lower down in orchards and olive groves.

Sylvia atricapilla **Blackcap**
Distribution
Middle East: Breeding summer visitor; otherwise, very widespread on passage and scarce winterer north to 38ºN.
Lebanon: Common summer breeder, passage migrant and winter visitor. Sighted in Aammiq, Aichyeh, Aramta, Azour, Beirut, Bekaa, Dalhoun, Ehden, Hermon, Kfarhouneh, Mlikh, Nakhl island, Palm Island, Ryhan, Tannourine, Tripoli.
 
Drawings: http://www.birdguides.com
Population
19-25 million breeding pairs of this ubiquitous bird across Europe. **In Lebanon**: Not counted yet.
Chronology: First noted on Nakhl Island by Hollom (1959). But the first national breeding record was obtained from Palm Islands by Ramadan-Jaradi & Ramadan-Jaradi (1999). The species was also recorded as passage migrant by NCSR (1999), Ramadan-Jaradi & Ramadan-Jaradi (1999) and Ramadan-Jaradi & Ramadan-Jaradi (2001).
Identification
The Blackcap is unmistakable thanks to the neat black cap of the male or the reddish brown cap of the female enlivening an otherwise dull grey body.
Habitat
Breeds in wooded areas with thick undergrowth. Winters in parks and gardens.

A.1.5.4 REPTILES AND AMPHIBIANS

No herpetological work has been conducted on Palm Islands Nature Reserve before 1998 but a preliminary study concerning the geographic distribution of reptiles in Lebanon with some ecological notes, was published by Hraoui-Bloquet (1981). Some old monographs are also known for the region (Lebanon and Syria): Angel, 1936; Boulanger, 1923; Lortet, 1883; Muller and Wettstein, 1933; Werner, 1939; Wettstein, 1928. More recent work on the Lebanese herpetofauna has been published by Bosch (1998) and Bosch et al (1998).

In 1998, a scientific paper was published by Hraoui-Bloquet, S., Sadek, R. and Yammine-Saad, R. on the reptiles of Palm Islands Reserve, followed by another report in 1999 by Hraoui-Bloquet, S. that was based on conducted surveys during a project implemented by the NCSR on behalf of the Protected Areas Project at the Ministry of Environment.

These works have resulted in a species list shown in the Annex (4) below:

Addendum: None of the available studies or the conducted surveys proved the presence of amphibians on Palm Islands despite the presence of small freshwater pools on the largest of islands which persist until the end of June. It seems that the dry weather during the spring and the summer creates a hostile place for the survival of amphibians.

1.5.4.1 The Herpetofauna Species

1.5.4.1.1 Selected species

The used methodology and criteria to limit the study to a certain number of species are indicated in the Annex 9 far below. However, 4 species of herpetofauna are selected by the filter: the Loggerhead that breeds on the three islands of the reserve; and the Green Turtle which is simply rare winterer in the water near or within the sea belt of the protected area. Also it retains the Wall Lizard which contributes in the reduction of many insects, constitutes an interesting isolated element for scientific research, and provides food for the snake. The latter is retained as it is considered a barrier to any potential installation of small rodents such as domestic mice.

1.5.4.1.1.1 Rare (2)

Species scientific name	**Species English name**	**Species local name**	**Habitat localisation**	**GPS Localisation**	**Abundance**
Chelonia mydas	**Green turtle**	Soulhafat khadra'a	Sea water around islands		Very low Up to c.25 sighted
Caretta caretta	**Logger-head turtle**	Soulhafat kabirat al raa's	Sea water around islands & sandy beach only for nesting		Low Between 13 and 36 nests found

1.5.4.1.1.2 **Endemic (0)**

Species	English Name	Local Name	Endemism	Localization		Abundance
				Habitat	GPS	

1.5.4.1.1.3 **Noteworthy (4)**

Species: scientific name	**Species: English name**	**Species: local name**	**Value**	**Habitat localisation**	**GPS localisation**	**Abundance**
Caretta caretta	**Logger-head turtle**	Sulhafat kabirat al raa's	-Plankton control by young & Jelly fish Control by juveniles and adults	Sea water around islands & sandy beach only for nesting		Low Between 13 and 36 nests found
Chelonia Mydas	**Green turtle**	Sulhafat Khdra'a	Plankton control (by young) and alga control by juveniles & adultes	Sea Water		Very low Up to c.25 sighted
Hierophis jugularis	**Black snake**	Hannach Aswad	Control of young rodents & lizards	Ruins, old Salinas, and rocky parts of Palm island. Not observed yet on the other two islands		Medium. Also identified through shaded skin and sparse skeletons
Lacerta laevis laevis	**Wall lizard**	Shouhliat al Hait	Pest control	All islands, mainly in rocky parts as well as in the ruins and old Salinas of Palm island.		High Hundreds were observed in most habitats

1.5.4.1.1.4 **Introduced (Alien invasive) (0)**

Species	English Name	Local Name	Origin	Localization		Abundance
				Habitat	GPS	

1.5.4.1.1.5 **Threatened (2)**

Species: scientific name	**Species: English name**	**Species: local name**	**Level of threat**	**Habitat localiastion**	**GPS localisation**	**Abundance**
Chelonia myda	**Green turtle**	Sulhafat Khdra'a	Globally	Sea Water		Low Between 13 and 36 nests found
Caretta caretta	**Logger-head turtle**	Sulhafat kabirat al ra'as	Globally	Sea water around islands & sandy beach only for nesting		Very low Up to c.25 sighted

A.1.5.4.1.1.6 Useful information and details about the slected species

Chelonia mydas **Green Turtle**
distribution
Middle East: This marine species is internationally and regionally threatened. Rare in the Middle East. It frequents the Lebanese shore and also occurs in Syria , Palestine, Egypt…)
Lebanon: Some females were recorded laying their eggs on sandy beaches of the Lebanese territories (including the area beyond the south of Tyre Reserve).
 Photo: Mona Khalil
population
Abundance: Very rare in countries of the Middle East. **In Lebanon**: uncommon and population size is unknown.
Chronology: This turtle was reported from the reserve in NCSR report (1999) as non breeding species due to absence of some nesting requirements. Also cited in the management plan of the reserve as winterer off islands shore.
identification
They are called green turtles because of the color of the flesh. *Chelonia mydas* are one of the largest turtles ranging from 71 to 153 centimeters. They can weigh up to 205 kilograms. They have limbs that are paddle-like, which are used to swim. Their heads seem small compared to their body size. Males are larger than females and the tail is longer, extending well beyond the shell. Green turtles cannot pull their heads inside of their shells. Plates of carapace are juxtaposed. Forelimbs are modified as oar-like flippers. Four pairs of pleurals. Cervical scute

is not in contact with first pleural. One pair of prefrontal scales. First vertebral is in contact with first marginal. Greenish or olive brown above, sometimes melanistic, becoming slate gray to black.

habitat

Green sea turtles live in sea waters. The only time they emerge from the water is when they are nesting. The only time males are not at sea is when they were first born. When it is time to mate they migrate from several hundred miles across the sea to where they hatched. Female green turtles use the same beaches to nest as their mothers and grandmothers. Green turtles are mostly herbivorous. They spend most of their time feeding on algae in the sea and the grass that grow in shallow waters. As juveniles, they eat plants and other organisms such as: jellyfish, crabs, sponges, snails, and worms. As adults, they are strictly herbivorous

Caretta caretta **Logger-head Turtle**
distribution
Middle East: This marine species is internationally and regionally threatened. Hence, its rarity in the Middle East. It frequents the Lebanese shore and also occurs in Syria , Palestine, Egypt, Turkey…)
Lebanon: Some females were recorded laying their eggs on sandy beaches of the Lebanese territories (including Tyre).
 http://www.ecofac.org/Tortues
population
Abundance: Not uncommon in countries of the Middle East. **In Lebanon**: moderately abundant but the population size is unknown.
Chronology: First mentioned as breeder on the Palm island in the July report of the management team to the Ministry of the Environment (1997). Its nests were also observed on the tiny sandy beach of Ramkine island by the same team in 1998. Persecuted by man and globally threatened species. S. Hraoui-Bloquet (1998) described it as nesting on Palm island only. Subsequently it was reported by S. Hraoui-Bloquet (1999), R. Sadek (2000) and Demirayak *et al* (2001).
identification
Loggerheads have a characteristic large head, with more massive jaws and muscles than other sea turtles. First vertebral plate is not in contact with marginals. Forelimbs modified as oar-like flippers. Five pairs of pleurals, first pleural in contact with cervical scute. Bridge with 3 inframarginals. Elongated carapace with medial vertebral ridge.

habitat

Adults and juveniles feed in shallow waters of the continental shelves, often in water only a few tens of meters deep. They spend much of their time around reefs, or along the bottom. Adults sometimes travel for thousands of kilometers. Hatchlings and young juveniles do not dive, staying near the surface, often in association with mats of floating seaweed. Loggerheads are frequently found in bays and estuaries, and may enter river mouths.

Females nest on sandy beaches, usually just above the average high tide line. Many females nest at the same beach year after year, but a few nest a different beaches from one season to the next.

. During the reproduction period (mainly July-August) females go out the sea to lay eggs at night on sandy beaches. Loggerheads are mainly carnivorous. They eat a wide variety of marine animals, including sponges, jellyfish, crabs, clams, fish, squid, and oysters. They have powerful jaws which enable them to crush the hard shells of some prey. They do ocasionally eat algae and other plants as well.

***Lacerta laevis laevis* Wall Lizard**

distribution

Middle East: The range of this species extends over Lebanon, Palestine and Syria.

Lebanon: This species is common and widespread in Lebanon From the sea shore to 1800 m of altitude. It is terrestrial, often observed on walls and in trees searching insects for diet. The *Lacerta laevis laevis* is apparently a different race (variety) from its relatives on the mainland but not to the point that allows it be considered a subspecies yet (Hrawi et al., 1998).

Photo: Dr. Ghassan RAMADAN-JARADI

population

Abundance: Uncommon in countries of the Middle East. **In Lebanon**: this species is highly abundant.

Chronology: Very common in Lebanon as well as on the islands of the reserve. It was mentioned on the islands in 1998 by S.Hraoui-Bloquet *et al*., in 1999 by S. Hraoui-Bloquet, in 2000 by R. Sadek and in 2002 by S. Hraoui-bloquet et al.

identification

The Wall Lizard has fingers without lateral fringes, collar well marked, femoral pores present, tail long. The color is very changing and variable. The ground color will be dark or light brown, brown olive with tow large dark cross bars pattern on each side, ventral scales are white or blue or light yellow. The color of the population of palm island is homogeneous. It always has a mediodorsal pattern of dark crossbars. This species presents big similarity with *Lacerta muralis* of Europe.

habitat

Inhabits forests, (it doesn't like open areas), cultivated lands, rocks, trees, walls, ruins. It is diurnal, insectivorous and partly herbivorous. On the islands, the *Lacerta laevis laevis* is found in the sandy area where suitable refuges such as wood and other wreckage or trash are available but the rocky area is apparently more suitable for the species.

***Hierophis jugularis* Large whipe snake (Black snake, Hannash asswad)**

distribution

Middle East: The range of this species extends over Lebanon, Syria, Palestine, Northern Iraq and Southern Turkey.

Lebanon: This snake is very common and widespread in Lebanon, it is recorded from sea shore to 1800m of altitude.

Photo: Dr. Riyad Sadek

population

Abundance: Unknown abundance in the countries of the Middle East. **In Lebanon**: this species is abundant.

Chronology: First reported from the reserve by S. Hraoui-Bloquet *et al.* (1998), S. Hraoui-Bloquet (1999), R. Sadek (2000) as *Coluber jugularis asianus,* and S. Hraoui-Bloquet *et al* (2002) as *Hierophis jugularis.*

identification

It is a non venomous colubridae. Adult size can reach 300 cm, pupil of eye rounded, tail long, adults uniformly black, sub-adult brownish black, throat and belly sometimes salmon red. It is diurnal and its diet is mainly small mammals, lizards, birds,…

habitat

Inhabits a wide variety of habitats.

A.1.5.6 MICROFAUNA

A.1.5.6.1 The terrestrial insects

This part concerns the terrestrial insects or others which are at their terrestrial stage of life, with particular attention given to the mega-insects. The field study was carried out in the Palm Islands Nature Reserve site by Mr. Bashar Merheb who was guided by several enthomologists, mainly Dr.Hani Abdul Noor and Dr. Ali Bayan. All photos of insects are taken by Mr. Bashar Merheb whereas some of the observed specimens (marked with [*]) were examined in the Entomology museum-Lebanese university-Section II.

The encountered insects at Palm Islands figure in the Annex 5 where the identification of insects is sometimes limited to the family level only. This is due to lack of specialized experts. However, the species identification is compensated here by photos taken from the studied site.

Order	Family	SC. name	density	abundance
Coleoptera	Tenebrionidae Length 1.8 mm		Very high, especially on the sandy shore	common
Coleoptera	Tenebrionidae Length 9.0 mm, Mainly under litter and wood pieces		medium	uncommon

Coleoptera	Tenebrionidae Length 1 cm		Medium Under decaying wood and litter	uncommon
Coleoptera	Tenebrionidae Length 2 cm.	 *Tentyria sp.*	Medium to high on sandy area under litter and between plants.	common
Coleoptera	Curculionidae Length 6 mm.		low	Rare
Coleoptera	Scarabeidae Length 1.2 cm		Very high	uncommon

		 Photo: Ghassan RAMADAN-JARADI *Oxythyria noemi* (Reich,1856)		
Hemiptera	Miridae Length	 *Euryopicoris nitidus* (Meyer-Dur, 1843)	low	Rare
Hemiptera	Miridae	 *Dionconotus cruentatus*(Brulle)	*	

Hymenoptera	Vespidae Length 1 cm		low	common
Orthoptera	Acrididae Length 1 cm		Very high	common
Orthoptera	Tettigonidae Length 2-3 cm		Very high	common

A.1.5.6.2 The butterflies

The determination of the butterflies of Palm Islands is the output of a combined effort that was exerted by all members of the team of experts when every time one butterfly is seen, photographed or described it was compared to the content of the plates that are offered by T. Larsen in his book "Butterflies of Lebanon" (1974). The list of the Palm Islands' butterflies figures in the Annex 6.

A.1.5.7 MARINE BIODIVERSITY

A.1.5.7.1 The Fish

Virtually, nothing was found on fish in literature, except for the information that constituted the report of Environment Protection Committee to UNESCO CAIRO Office in 2001 and which was produced by Dr. Ghazi Bitar (in Ramadan-Jaradi et al. 2001)*.

A total of 25 fish species were recorded. They belong to 13 families, out of which 3 families are best represented: Sparidae, Labridae and Serranidae. The inventory encompasses 5 lessepsian species of Indopacific origin: *Siganus luridus, S. rivulatus, Sargocentrum rubrum, Pempheris vanicolensis & Stephanolepis diaspros.*

Five nectobenthic dominant and abundant species are of halieutic importance: *Siganus luridus, S. rivulatus, Sargocentrum rubrum, Diplodus sargus* et *D. vulgaris.* Of which 3 species are lessepians.

Among the identified ichtyofauna : *Oblada melanura, Boops boops, Dentex dentex, Diplodus sargus, Diplodus sp., Thalassoma pavo, Coris julis, Symphodus mediterraneus, Symphodus tinca, Sparisoma cretense, Serranus cabrilla, S. scriba, Mycteroperca rubra data deficient, Epinephelus marginatus near threatened, * Sargocentrum rubrum, * Siganus luridus, * S. rivulatus, * Pempheris vanicolensis, Scorpaena maderensis, * Stephanolepis diaspros, Chromis chromis, Muges n.d., Muraena helena, Gobius n.d., Balistes carolinensis.*

For the benthos fauna and flora, it is noticed that :

1. Lessepian species are represented and well established.
2. Some species are found in the reserve but not somewhere else on the Lebanese coast.

A.15.7.2 The Foraminifera. This group of marine benthic Protozoaires deserves 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 (U.L.) and will feature 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.

A.1.6 Ecological interest of the site

Palm Islands Nature Reserve is a unique ecosystem in Lebanon since it is formed from the only islands offshore the Lebanese coast. Apparently, it is the only uninhabited insular reserve in the easternmost Mediterranean corner. Subsequently, its natural heritage is of great value for two main reasons:

- it represents the only insular ecological characteristics in the country and,
- it contains plant representatives of the disappeared littoral flora from Lebanon's coast.

The reserve is highly diversified over a relatively small terrestrial area not exceeding 25.5 ha., and a total area (terrestrial and marine) not exceeding 400 ha. It is characterized by being:

- a habitat for nationally and internationally significant birds which use the islands for resting, transiting and breeding.
- a habitat of an endemic sub-species of lizard.
- a habitat of turtles wintering, visiting and nesting during the summer period.
- a place for Mediterranean Monk Seal that may occasionally finds refuge in Ramkine caves.
- a habitat of bats using the well for breeding.
- a habitat for threatened, rare and endemic plants, including species of medicinal plants.
- a place of sea grass beds for sheltering and spawning of fish around the islands.
- a largely natural and scenic landscape in a region where coastal and shoreline environments are otherwise extensively developed.

A.1.7 Impact on the site by each exploitation/ production system

A.1.7.1 Agriculture

N/A

A.1.7.2 Pasture

N/A and not allowed by law.

A.1.7.3 Fishing and egging

Fishing: despite the fact that fishing is not allowed by law within a sea belt of 500 meters around the islands, there is some poaching using individual fishing lines; but the worthiest is that some fishermen use dynamites for fishing around the islands, usually very early in the morning and during stormy days. Such illegal practices cause damage to the spawning populations of fish near the islands shores and destroy to the edging rocks which may, under the effect of explosions, have cracks and become crashable under the impact of waves.

Egging: another way of poaching is egging that is practiced by some fishermen who believe that turtle's eggs are aphrodisiac. This habit is most probably superstitious and in decline. However, increased surveillance patrols and awareness will inevitably contribute to the conservation of marine turtles.

A.1.7.4 Eco-tourism

The eco-tourism is presently limited to some birdwatching activities and few educational visits by students, mainly from the schools of the nearest towns. These activities are apparently well guided by the management team in collaboration with all stakeholders so that the impact of the visitors on the site is practically negligible.

But the islands are also opened for recreational visits -without permits- during July, August and September with the hope that visitors may be sensitized by the management team during their presence on islands. However, the garbage left by visitors on the site is removed by the management team and its quantity decreases slightly from year to another indicating as such a gradual raise of awareness. Practically the islands are never totally cleaned and the remaining garbage constitutes a source of attraction for insects and their predators such as lizards, but also constitutes a source of food for Yellow-legged Gulls which dominate the islands during the breeding season without even leaving a place for the Audouin's Gull to nest as it was the case prior to the seventies.

A.1.7.5 Exploitation of the resources

With the exception of the agriculture and pasture effect on Aammiq, the remaining activities are relatively of unoticible impact on the environment and the biodiversity of this site. In fact:

- the hunting pressure was considerably reduced during the last year as a result of cooperation and understanding between the owners of the land and the managing team. However, poaching is still occurring and the efforts done to reduce it are active.
- the cutting of wood fore combustion is not exercised within the site and people are satisfied with the collection of dead branches along the Ash tree avenue of Riachi river. Thus, some of the hollowed large trunked ash trees were used in the near past as barbecuing places, especially during windy days. Today, these practices are almost stopped.
- the collection of medicinal and other economically wild plant species is not frequent at Aammiq and therefore has a minimal impact on the site.

A.1.7.6 Industrialization - urbanisation

N/A

A.1.7.7 Water management

The site is supplied with freshwater from the only existing well on the Rabbit Island. This well provided irrigation water during 1997-1999 for the c.500 Date Palm shoots that were planted there and showed increased salinity at the end of the dry season. It is expected that in the few coming years, water will be used for after swimming showers and will then need to be well managed.

A.1. 8 Sensitivity level of the different habitats used by the selected species

HABITAT	KEY SPECIES	SENSITIVITY	THREATS
Rocky	*Crithmum maritimum* *Inula crithmoides* *Limonium angustifolium* *Limonium sieberi* *Frankenia hispida* *Arthrocnemum macrostachyum* *Ardea cinerea* *Philomachus pugnax* *Larus audouinii* *Larus cachinnans* *Ptyonoprogne rupestris* *Lacerta laevis laevis* *Hierophis jugularis*	Sensitivity index=high -Vital habitats for the breeding of gulls. - Diversified micro-habitats - Presence of threatened species - Refuge for hundreds of species	Chemical Pollution Degradation and modifications of habitats Barbecuing. Dynamiting Garbage left by visitors Garbage brought by sea currents Nest destruction by visitors Oil slick Persecution Poaching Rabbits Rats
Earthen	*Campanula stellaris* *Aristolochia parvifolia* *Papaver rhoeas* *Papaver syriacum* *Anemone coronaria* *Glaucium flavum* *Minuartia thymifolia syriaca* *Coturnix coturnix* *Crex crex* *Gallinago media* *Anthus campestris* *Phoenicurus ochruros* *Prinia gracilis* *Hippolais languida* *Sylvia atricapilla*	Sensitivity index=High - High specific richness -Vital habitats for the survival of several species species - Presence of threatened species - Refuge for certain species	Barbecuing Fragmentation of habitats Degradation of habitat due to rabbits Degradation of habitat due to visitors Destruction by fire Garbage Poaching Pollution Rats Reed beds cutting Stepping over by pedestrians
Sandy	*Cakile aegyptia* *Euphorbia paralias* *Euphorbia peplis* *Eryngium maritimum* *Pancratium maritimum* *Crex crex* *Philomachus pugnax* *Larus audouinii* *Larus cachinnans*	Sensitivity index=High - Presence of threatened or rare species - Refuge for certain species	Barbacuing Degradation (Destruction of the habitat or sandy coast). Destruction by feet of visitors Egging Flower collection

	Motacilla alba *Prinia gracilis* *Caretta caretta*		Garbage Habitat destruction by rabbits Habitat destruction by visitors Persecution Poaching Pollution Rats
Surrounding sea water and submerged caves	- *Chelonia mydas* - *Caretta caretta*	Sensitivity index=High - Presence of threatened or rare species	- Deliberate killings (fishers still consider the species a pest and a competitor for increasingly scarce resources) - Destruction of habitat and tourism pressure - Dynamiting - Oil slick - Pollution - Sensitivity to human disturbance - Species' low reproductive rate, Bycatch Garbage (plastic bags) Habitat Degradation

A.1.9 Constraints and opportunities for the conservation

A.1.9.1 Main constraints

- The law of the reserve is not always enforced or partly enforced.
- The small area of the islands increases its fragility.
- The small area of the islands makes the carrying capacity smaller.
- The reserve is heavily visited on week-ends of summer.
- There is lack of awareness, especially on the conservation of biodiversity.
- Freshwater resources are very limited.
- The management team capacities are below the minimum level.
- The situation of the reserve at about 5 kms from the shore makes its surveillance difficult at nights and during stormy days.
- The reserve is sometimes used by smugglers.
- The reserve receives garbage from distant areas that are beyond the control of the managing team, usually with water currents.
- There is lack of support from decision makers.
- There are severe climatic conditions.
- The facilities for visitation are incomplete.

A.1.9.2 Main opportunities

- Highly desired area for eco-tourism and education
- Highly desired area for scientific research and projects studies.
- Highly desired area for relaxation
- Highly desired area for biological salt extraction.
- Highly desired sea for in or under water activities.
- Absence of inhabitants and low density of workers if any.
- Inexistent polluting industrial activities.
- Traditional line fishing activity is negligible.
- High potentiality for resource-generating activities.
- Presence of cultural sites (church, well, canon sites,…).
- Presence of and potential solar energy.
- Clean and clear sea water

A.1.10 Socio-economic impacts of taken measures

A.1.10.1 Economically

- Investment in the field of eco-tourism (birdwatching, fauna observing, tour-guiding, scuba diving, etc.).
- Investment in solid waste control.
- Investment in biological salt extraction.
- Investment in new alternatives.

A.1.10.2 Socially

- Deprive locals from free access rights during ¾ of the year.
- Regulate the use of freshwater among visitors
- Provide locals with work opportunities

A.1.11 Proposed conservation management actions

A.1.11.1 Short term

A.1.11.1.1 Protection:

- Put in place a responsible and wise use measures in the site;
- Protect the biodiversity from all types of visitors or species introduction;
- Stop immediately all kinds of fishing (mainly dynamiting, shells extraction,…);

- Prohibit the access of excursionists to the strictly protected zone;
- Limit and canalize the access to the sensitive places of the site.
- Stop unregulated and regulated pesticides from being used on islands.
- Ban illegal taking and poaching.
- Keep the site clean from solid waste and other garbage.
- Inhibit any nocturnal activity.
- Regulate the research night visits
- Avoid any type of diurnal or nocturnal disturbance.

A.1.11.1.2 Rehabilitation

- Eradicate all domestic rabbits so that the plants will grow again with balanced interactions.
- Plan to reduce the rats and study their impacts on the islands.
- Reduce rubbish (or keep clean from garbage) in order to reduce the obstacles that are facing the installation of the Audouin's Gull and the nesting of marine turtles.

A.1.11.1.3 Valorisation/ Added value

- Create a center of information on the main land at Al Mina city to attract passing people.
- Create a package of activities to include Islands in the morning and Ehden in the afternoon.
- Create eco-touristic activities that may generate incomes for the local community.
- Encourage extraction of biological salt on the Rabbit island.
- Build environmentally a birdwatching tower that may resists against stormy weather.
- Establish an artificial lake with water from the existing well.

A.1.11.2 Mid term

A.1.11.2.1 Protection:

- Sensitise visitors and local communities
- Regulate visitation activities.
- Rationalize the exploitation of water.
- Control the commercialization of threatened species and their product thereof.

A.1.11.2.2 Rehabilitation

- Maintain the diversity of the habitat through conservation of reedbeds and avoidance of any alien species introduction.

A.1.11.2.3 Valorisation/ Added value:

- Establish an eco-museum on the biodiversity of the site.
- Valorise the site for biological salt extraction.
- Valorise the site for educational purposes
- Valorise the site for ecotourism purposes (Hides for observation, Footpath and equestrian path) through local community management.

A.1.12 Zonation of the space

A.1.12.1 Strictly potected zones

. The rocky area to the south of the Rabbit island
. The southern half of the earthern area.
. The eastern sandy beach that is used by turtles for nesting

A.1.12.2 Zones with limited access

. The northern half of the earthen area
. The reedbeds.
. The trail ends with observatory hides

A.1.12.3 Zones with free access

. The northern sandy beach area of the Rabbit island
. The trails (unpaved tracks).
. The cultural sites (church, well,…)
. The rocky zones of Ramkine and Sanani islands.

A.1.13 Site-specific strategies and indicators for monitoring

A.1.13.1 Site-specific strategies

The technology that is used in biodiversity monitoring varies from plants to animals and from animal species to another. Accordingly we propose a strategy for monitoring based on a medium monitoring program which provides the technology to be used in the Palm Islands Nature Reserve.

The table below summarizes the strategic steps that are to be taken in a logical framework:

Issue/ General question	Water physico-chemical deterioration, degradation of wilderness, overpumping, pollution, plants picking, poaching, dynamiting, species introduction. Consequences: loss of habitats, reduction of feeding, breeding, spawning, resting areas, disturbance and poaching.
Issue/ Specific question	Decrease in number of the species individuals, including the selected species.
Objectives	Follow up the variation in numbers, especially for the selected species
Hypothesis	With improved situation and favorable conditions, the affected species will increase in number and the selected threatened or rare species could find shelter and security in the site.
Methods	Seasonal recording Regular monitoring and study of behavior during the flowering, spawning, wintering, breeding seasons, etc.
Feasibility	The necessity to train people on monitoring activities
Pilot study	Use the present study as study/reference (benchmark). It could be handled to members of the management team to insure monitoring sustainability
Sampling	Count species and individual on trimestrial basis and increase the effort of observation during breeding/multiplication season.
Sample analysis	Elaborate matrix to express results Project data (species/ individuals) on maps of habitats.
Report preparation	Analyze data at the end of each annual cycle and compare them with previous data (study/reference). Discuss the reasons of variations in relation to different parameters (mainly management measures).
Management actions and project evaluation	Evaluate the outputs of monitoring and formulate appropriate conservation measures

A.1.13.2 Ecological monitoring - Indicators

Target group for monitoring	**Key elements**	**Indicators**	**Method**	**Means**
Mammals	1. *Oryctolagus*	• Population	- Trimestrial	. Binoculars are

	cuniculus 2. *Rattus norvegicus norvegicus* 3. *Monachus monachus*	size • Area of the available appropriate habitat • Size of the specific ecological niche available • Number of burrows • Habitats occupied by each species • Species movement • Distribution areas	surveys - The rats are mainly nocturnal and therefore difficult to see. However, the best time to see them is in the early morning or at dusk where they often feed in the open at dawn and retire to the cover of burrows when it becomes warm or when human activity increases. Looking for droppings will often show the best places to watch, and there are many other signs of animal presence such as remains of eaten prey and tracks left in mud and perhaps sand. Remember that most mammals, have very sensitive noses- choose a spot down-wind from the place where you expect to see them. The rodents like the	very helpful. They allow you to watch from a distance, without disturbing the animals. . Use a torch, if possible with a red glass. . Night camera . Mammal traps .Light projector . GPS

			rabbit are particularly difficult to see. Many come out only at night but even the diurnal ones generally stick to dense cover like reedbeds on the Rabbit island. - As for the Monk seal, its monitoring necessitate direct sightings and/ or questioning the fishermen.	
Birds	1. *Anthus campestris* 2. *Ardea cinerea* 3. *Coturnix coturnix* 4. *Crex crex* 5. *Gallinago media* 6. *Hippolais languida* 7. *Larus audouinii* 8. *Larus cachinnans* 9. *Motacilla alba* 10. *Philomachus pugnax* 11. *Phoenicurus ochruros* 12. *Prinia gracilis* 13. *Ptyonoprogne rupestris* 14. *Sylvia atricapilla*	- Diversity index - Number of nesting couples - Size of populations - Number of wintering individuals - Number of passing birds - Frequency of roosting birds -Distribution per habitat - Sectorial geographic distribution - Density	- Surveys every 15 days mainly from March to May. -To monitor birds there are several techniques which differ with the species and habitats. But certain techniques are necessary to achieve success. Birds are most active in the morning and evening, and may rest or shelter from the heat of the sun during the day. The most rewarding times to see them are therefore from sunrise until 10 AM and again after 3 PM; and	Binoculars 10x50 or 7x48 or 8x42 - Telescope 20-60 x 80 - Note book - Tape recorder - Camera. - Field guide book - GPS

			in order to see some marshy or rare birds one needs to remain until dusk. To avoid alarming the birds, it is essential to approach slowly and silently, avoiding any sudden movement. If one is on foot, a slow walk round a likely bird spot may reveal all but the most secretive species. In case of more than one observer, one person may advance while others observe. Birds should not be alerted to the observer's presence at all.	
Herpetofauna	1. *Caretta caretta* 2. *Chelonia Mydas* 3. *Hierophis jugularis* 4. *Lacerta laevis laevis*	- Density of populations - Evolution of numbers -Species localization - Number of individuals - Density of populations - Distribution of species	- 4 spring census - 4 summer census - 4 autumn census -Few traces are left by reptiles, through the few that can be found are useful indicators, such as cast or 'sloughed' snake skins. Lizards often lie out on the same stone each day when basking in the	- Binocular 8x40 - Broad beamed lamp - Soft forceps - ¼ litre glass jars - vinegar - net "fauchoir" - GPS

			sun. Such a stone is likely to be covered with their droppings. These are easily mistaken for bird droppings, being dark at one end and whitish at the other. There is every chance that they will be found in the same place, or within a meter or so, on successive day. However, there are exceptions to this. Some reptiles, for example, tends to shift their quarters after mating, frequently by a kilometer or so, but come spring and it will be found back at the previous year's courtship ground. In general, reptiles and amphibians are much easier to approach than most mammals and it is often possible to get near enough to examine them in detail. Most species usually sleep through the winter but the spring, when they come out of hiding and begin courtship, is a good time to look	

			for them. In the summer they become more retiring and more difficult to find. Early morning searches are most productive for seeing species that are regularly active by day but searching with a broad-beamed lamp: rainy evenings are best for this. Because they can be approached closely, it is tempting to try to catch reptiles but they are delicate animals and even slight damage may seriously reduce their chances of survival. A lizard will shed its tail if grasped by it and, although the animal can grow a new one, it will be at a serious disadvantage while doing so, especially since the process requires a great deal of protein. If handling cannot be avoided it should be done with great care.It goes without saying that venomous snakes, if any, should not be handled in any	

			circumstances. Monitoring with the quadrat method or surveying at night are two rewarding methods implicating the search under stones and the use of traps.	
Entomological groups	Scarabeidae Carabidae Staphylinidae Tenebrionidae Tipulidae Pentatomidae Pyrhocoridae Acrididae Gryllidae Tetrigidae Meloidae Cantharidae Oedemeridae	- Diversity of taxonomic groups - Density of populations - Abundance and larva quality	- Three sampling per year: Spring/ Summer and Autumn Use of Barber traps in different habitats. Threshing or beating branches of trees and shrubs to collect insects underneath. Mowing of herbaceous layer. Surveys on monthly basis from March to June and in the beginning of November.	- Soft forceps - Insect aspirator - ¼ liter glass jars. - Net fauchoir - GPS
Flora	1. *Aristolochia parvifolia* 2. *Arthrocnemum macrostachyum* 3. *Melissa inodora* 4. *Pancratimum*	-Study of dynamic of change - Locality of the species - Distribution	Transect method involving 4 seasonal missions per year or	GPS Topographic map Aerial photo Digital camera

	maritimum 5. *Phoenix dactylifera* 6. *Urginea maritime* 7. *Washingtonia filifera*	of the species - Density - Density of the vegetal community - Occupied area - Cover% - Stratification	trimestrial inspection all year round	

A.1.13.3 Socio-economic monitoring- Indicators

Nature of monitoring	Key elements	Indicators	Method	Means
	Eco-ouristic activity	# of visitors/month # of locals involved in eco-tourism and recreation Quantity of waste left by visitors/ day Degree of satisfaction for the local community	Questionnaire Interview	Vehicle

A.1.14 Favorable and unfavorable elements to biodiversity

Favorable elements to biodiversity	Unfavorable elements to biodiversity
Vegetal biodiversity • Endemic 1 • Rare 2 • Threatened 3 • Notworthy 7 • Biotopes 4 ***Animal biodiversity*** • Endemic 1 • Rare 8 • Threatened 7 • Notworthy 15 • Biocenosis 6	Collection Fire Loss of wetlands Habitat transformation Excessive pumping Lack of infrastructure allowing local community participatory approach Lack of job in domains other than the exploitation of natural resources Frequentation Pollution Poaching Fishing

A.1.15 Identified Environmental values

Value	Asset	Limiting factors
High rate of threatened species	• Uninhabited islands • Willigness for protection	• High frequentation by visitors • Garbage • Law awareness level
Exceptional eco-tourism potentiality	• Location of site as advanced in the sea for the sea crossing birds. • Hotspot site • Only insular landscape in Lebanon	• Illegal fishing • Poaching • Oil slick Pollution • Lack of law enforcement

A.1.16 Management measures and threat/ hazard mitigation

Target	Management measures/ threat mitigation
Phyto-ecology - Protect the aquatic plants of the rain water bodies - Protect the reed beds - Protect the existing palm trees - Protect plants of the three habitats (rocky, earthen and sandy).	***Management actions*** **Protection** - Raise awareness of visitors - Reduce plant picking - Regulate reedbed management - Promote sustainable conservation principles **Rehabilitation** - Regulate water pumping from well; - Predict ground water fluctuation through a study of the water table and aquifers in the site; - Eliminate all rabbits from the Rabbit Island - Reduce the rat population **Valorisation** - Promote eco-tourism through improved access to micro hotspots, managed recreational zones, equestrian surveillance patrols if any, reconstruction of trails for pedestrians, etc. - Create alternatives for camping and barbecuing.
Entomofauna	***Management actions*** **Protection** - R aise awareness of visitors - Protect from collectors **Rehabilitation** - Stop using pesticide **Valorisation** - Promote eco-tourism through improved access to micro hotspots, managed recreational zones, equestrian surveillance patrols if any, reconstruction of trails for pedestrians, etc. - Create alternatives for camping and barbecuing.

Herpetofauna	***Management actions*** **Protection** - Raise awareness of visitors - Reduce poaching - Regulate reedbed burning - Enforce the law of the reserve **Rehabilitation** - Stop using pesticide **Valorisation** - Promote eco-tourism through improved access to micro hotspots, managed recreational zones, equestrian surveillance patrols if any, reconstruction of trails for pedestrians, etc. - Create alternatives for camping and barbecuing.
Avifauna	***Management actions*** **Protection** - Raise awareness of visitors - Reduce poaching and illegal taking - Stop egging - Regulate reedbed management - Enforce the law of the reserve - based on the fact that Palm Islands Reserve is already declared Ramsar site, impose when necessary a wise use of resources and protection of threatened species - Ban all sorts of fishing activities within the reserve area and in a belt of 500 meters around the islands. **Rehabilitation** - Inhibit the use of pesticides - Create artificial freshwater bodies. - Regulate water pumping; - Predict ground water fluctuation through a study of the water table and aquifers in the site. - Eliminate the rabbits - Reduce the rats **Valorisation** - Promote eco-tourism through improved access to micro hotspots, managed recreational zones,

	equestrian surveillance patrols if any, reconstruction of the trails for pedestrians; - Create alternatives for camping and barbecuing; - Build a Birdwatching tower or bird hides.
Mammals	***Management actions*** **Protection** - Raise awareness among visitors - Reduce poaching and illegal taking - Regulate reedbed burning - Enforce the law of the reserve - based on the fact that Palm Islands Reserve is already declared Ramsar site, impose when necessary a wise use of resources and protection of threatened species **Rehabilitation** - Inhibit the use of pesticides on the islands - Regulate water pumping; - Keep area clean from garbage **Valorisation** - Promote eco-tourism through improved access to micro hotspots, managed recreational zones, equestrian surveillance patrols, development of trails for pedestrians; - Create small patches of bushy areas to facilitate a safe animal movement; - Create alternatives for camping and barbecuing; - Build an elevated hide to watch nocturnal and diurnal species

A.1.17 Needs for Complementary studies

A.1.17.1 Ecological studies

- Monitor the dynamism of the different vegetal communities with regards to the annual variation of precipitation.
- Localization, estimation of numbers and dynamism of the Audouin's Gull populations.
- The relation between rain water in rock cavities and breeding bird species.
- The relation between the vegetal stratification and bird breeding success.
- The size and distribution of the Yellow-legged Gull within the site.
- The present phenological distribution of some bird species within the site such as Prinia Warbler, Blackcap Warbler, etc.
- Phenological monitoring of habitats and animal communities.
- Micro-distribution of snake species
- Study of the entomofauna and its role within the trophic chain of the site.
- Conduct studies on marine biodiversity (including habitats).

A.1.17.2 Socio-economic studies

- Socio-economic impact of the proposed conservation measures.
- The impact of visitors on the biodiversity of the site.
- The impact of the awareness inputs on the local population.
- The quantity of garbage left by visitors as an indicator of awareness level.
- The success of conservation measures in relation with the participatory management level.
- The effect of poaching on the sensitized local community.
- Conduct studies on sea organisms in the fish market of Al Mina.

ANNEXES

ANNEX 1: List of plants on Palm Islands Nature Reserve. 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

(2) refers to endemic species

(3) refers to nationally rare species

(4) refers to wholly or partially restricted species to East Mediterranean area.

SCIENTIFIC NAME	**English Name**	**Arabic Name**
POACEAE (GRAMINEAE)	**Poaceae**	**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 مليء
CYPERACEAE	**Cyperaceae**	**سعديات**
Carex divisa	Bracteate marsh-sedge	سعادى مقسوم
ARACEAE	**Araceae**	**قلقاسيات**
Arisarum vulgare veslingii (4)	Friar's-cowl	قبوع الراهب
JUNCACEAE	**Juncaceae**	**أسليات**
Juncus bufonius	Toad rush	اسل علجومي
LILIACEAE	**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	**Amaryllidaceae**	**نرجسيات**
Pancratimum maritimum (1)	Sand lily	زنبق بحري
IRIDACEAE	**Iridaceae**	**سوسنيات**
Gynandriris sisyrinchium	Crocus-rooted iris	سوسن الخنازير

URTICACEAE	**Urticaceae**	**قراصيات**
Parietaria cretica	Cretan pellitory	حائطية كريت
ARISTOLOCHIACEAE	Aristolochiaceae	زرونديات
Aristolochia parvifolia (3) (4)	Small-leaved birthwort	زراوند صغير الورق
CHENOPODIACEAE	**Chenopodiaceae**	سرمقيات
Arthrocnemum macrostachyum (1) (3)	Glasswort	شمام
Halimione portulacoides	False purslane	بنت البحر
CARYOPHYLLACEAE	**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	**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	**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	**Capparidaceae**	**كبريات**
Capparis spinosa (4)	Spiny caper	كبر شائك
BRASSICACEAE (CRUCIFERAE)	**Brassicaceae**	**صليبيات**
Cakile aegyptia	Egypian sea-rocket	رشاد البحر

Enarthrocarpus arcuatus (4)	Curved enarthrocarpus	شلوة مقوسة
Matthiola tricuspidata	Trifid stock	منثور ثلاثي
CRASSULACEAE	**Crassulaceae**	**مخلدات**
Sedum litoreum	Coastal stonecrop	حيون ساحلي
Sedum sediforme	Tall stonecrop	طعم القط
ROSACEAE	**Rosaceae**	**ورديات**
Poterium spinosum	Spiny burnet	بلان شائك
FABACEAE (PAPILIONACEAE)	**Fabaceae**	**فراشيات**
Astragalus baeticus	Andalusian milk-vetch	استراغالس اندلسي
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	**Oxalidaceae**	**حماضيات**
Oxalis pes-caprae	Bermuda buttercup	حميضة
GERANIACEAE	**Geraniaceae**	**غرنوقيات**
Geranium molle	Dove's-foot geranium	غرنوقي لين
EUPHORBIACEAE	**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	**Frankeniaceae**	**فرنكينيات**
Frankenia hispida (4)	Hispid sea-heath	فرنكنية قاسية الوبر

MALVACEAE	**Malvaceae**	**خبازيات**
Lavatera trimestris	Queen mallow	لفتيرة فصلية
LYTHRACEAE	**Lythraceae**	**حنائيات**
Lythrum hyssopifolia	Grass-poly	رجل الحمامة
APIACEAE (UMBELLIFERAE)	**Apiaceae**	**خيميات**
Crithmum maritimum	Rock samphire	شمرة البحر
Eryngium maritimum	Sea holly	شنداب البحر
Smyrnum olusatrum	Common alexanders	كرفس بري
PRIMULACEAE	**Primulaceae**	**ربيعيات**
Anagallis arvensis caerulea	Field pimpernel	أناغالس الحقول
Anagallis arvensis phaenicea (4)	Field pimpernel	أناغالس الحقول
PLUMBAGINACEAE	**Plumbaginaceae**	**رصاصيات**
Limonium angustifolium	Narrow-leaved sea-lavender	أريل احمر
Limonium sieberi (4)	Sieber's sea-lavender	ليمونيوم سيبر
GENTIANACEAE	**Gentianaceae**	**جنطيانيات**
Centaurium pulchellum	Pretty centaury	قنطريون قتيبة
Centaurium spicatum	Spiked centaury	حشيشة العقرب
Centaurium tenuiflorum +	Slender-flowered centaury	قنطريون دقيق الزهر
BORAGINACEAE	**Boraginaceae**	**حمحميات**
Heliotropium hirsutissimum	Hairy heliotrope	إكرير أزب
Heliotropium lasiocarpum (4)	Wolly-fruited heliotrope	إكرير وبر الثمر
LAMIACEAE (LABIATAE)	**Lamiaceae**	**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	**Solanaceae**	**باذنجانيات**
Solanum luteum alatum	Yellow nightshade	حيصل اصفر

PLANTAGINACEAE	**Plantaginaceae**	**حمليات**
Plantago lagopus	Round-headed plantain	ودنة
RUBIACEAE	**Rubiaceae**	**فويات**
Valentia muralis	Wall valantia	فلنتية الحيطان
Valentia hispida	Hispid valantia	فلنتية
CAMPANULACEAE	**Campanulaceae**	**بوقيات**
Campanula stellaris (4)	Starry bellflower	جريس نجمي
ASTERACEAE (COMPOSEAE)	**Asteraceae**	**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

ANNEX 2: List of mammals on Palm Islands Nature Reserve.

(1) refers to globally threatened species
(2) refers to locally threatened species
(3) refers to wholly or partially restricted species to East Mediterranean area.

SCIENTIFIC NAME	**English Name**	**Arabic Name**
VESPERTILIONIDAE		
Rhinolophus euryale judaicus (1) (3)	Mediterranean Horseshoe	عماش صغير
Myotis blythi omari (3)	Lesser Mouse-Eared Bat	وطواط عمري
Myotis capaccinii bureschi (1)	Long-Fingered Bat	وطواط طويل الأصابع
Myotis natteri hoveli (2) (3)	Natterer's Bat	وطواط نترر
Pipistrellus kuhli ikhawanius (1) (3)	Kuhl's Pipistrelle	خفاش كوهلي
LEPORIDAE		
Oryctolagus cuniculus	Domestic Rabbit	أرنب منزلي
MURIDAE		
Rattus norvegicus norvegicus	Brown Rat	جرذون شائع
PHOCIDAE		
Monachus monachus (1) (2)	Mediterranean Monkseal	فقمة البحر المتوسط

ANNEX (3): List of bird species on Palm Islands Nature Reserve (Ramadan-Jaradi & Ramadan-Jaradi, 2001).

Dates and names of observers are given for vagrants and extirpated species where available. The following abbreviations are used to indicate the species status. A question mark indicates uncertain status. Three stars (***) denote threatened species at global level, two stars (**) indicate threatened species at regional level and one star (*) indicates species that are wholly or largely restricted to the Middle East (after Evans 1994). A plus (+) shows species that were previously recorded in the reserve. Lower case abbreviations, e.g. 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 records within the last 20 years)
V =Vagrant
E =Extinct in Lebanon

Species name is followed first by the species' present status (between brackets) in the reserve and then by the species' known status at the national level (Ramadan-Jaradi & Ramadan-Jaradi, 1999).

Little Grebe *Tachybaptus ruficollis* (pm) R, pm, wv
Extremely rare. One 7 Sep. 96, two 13 Nov. 97, one 4 Apr. 98 and one 5 Sep. 2000.

Great Crested Grebe *Podiceps cristatus* (pm) wv, pm, s
Extremely rare. One 16 Sep. 95, one 13 Sep. 96 and one 25 Oct. 97.

Cory's Shearwater *Calonectris diomedea* (pm, wv) PM, wv
Fairly widespread and not uncommon offshore islands. Seen between 8 Mar. - 29 Apr. and 14 Aug. - 28 Sep. Also large but occasional flocks recorded 6 - 17 Jan. 96, 14 Feb. 97 and 17 Jan. 98.

Yelkouan Shearwater *Puffinus yelkouan* (PM, wv) PM, wv
Common passage migrant in usually small numbers 4 Aug. - 7 Sep. (c.200 off Palm Islands second half Sep. 1998) and 12 Mar. - 25 Apr. Far fewer wintering birds 13 Nov. - 20 Feb.

Leach's Storm Petrel *Oceanodroma leucorhoa* (v) v
Once 12 Oct. 96 near Ramkine island (Ramadan-Jaradi & Ramadan-Jaradi, 1999).

Gannet *Morus bassanus* (wv) wv
Rare but regular offshore islands 22 Nov. - 11 Apr.

Great Cormorant *Phalacrocorax carbo* (wv,pm,s) wv, pm,s
Not uncommon but regularly recorded in small numbers 12 Oct. - 5 Apr. Also non breeding singles seen 5 May and 27 Jun. 96, 2 Jun. and 24 Jul. 97, 3 Jul. 98 and 1 Jul.99.

Pygmy Cormorant *Phalacrocorax pygmeus* *** (pm,s) wv, pm, s
Rare and irregular. One 16 - 19 May 96; one 10 Jun., 7 Jul. 3 Sep. 97 and two 29 Apr. 2000.

White Pelican *Pelecanus onocrotalus* (pm) pm
Four 3 - 4 and six 18 Sep. 97; forty three flying north 20 Mar.; one 25 Apr.,twenty two 23 May 98 and sixteen 7 Oct. 99.

Dalmatian Pelican *Pelecanus crispus**** (pm) pm
Very rare. Two offshore islands 4 Apr. 95, one Palm island 11 Nov. 96 and three flew north 6 Apr. 97.

Little Bittern *Ixobrychus minutus* (pm) SB, pm, wv
Two 16 Sep. 95, one 12 Oct. and 1 Nov. 96, three 6 Apr. 97, and one 4 and 23 Apr.98.

Night Heron *Nycticorax nycticorax* (PM) sb, PM
About sixty over Palm island 26 May 96, one dead 6 Apr. 97, nine 8 May 97 and twenty-five 14 Aug. 98.

Squacco Heron *Ardeola ralloides* (pm) pm, wv
Very rare. Seven 13 Nov. 97, three 17 Apr. 98 and two 21 May 98.

Cattle Egret *Bubulcus ibis* (pm) pm
Apparently irregular visitor. Four 18 Mar. 96, one 28 Aug. 97 and two 4 Apr. 98.

Little Egret *Egretta garzetta* (PM,wv) PM, wv
Common and regular passage migrant, often in small numbers, 8 Mar. - 16 Jun. and 14 Aug. - 13 Nov. Also scarce winterer 21 Dec. - 9 Feb.

Great White Egret *Egretta alba* (pm) pm, wv, s
Only three sightings: two18 - 28 Sep. 95, one 12 Oct. 96 and six 23 Apr. 98.

Grey Heron *Ardea cinerea* (PM,WV) PM, WV
Seen various dates in small numbers (4 - 7) from 21 Aug. to 25 May with peaks up to 21.

Purple Heron *Ardea purpurea* + (pm) pm
Often singeltons 16 Mar. - 2 Jun. More regularly observed 28 Aug. - 18 Nov. Previously recorded only once 9 Apr. 56 by Hollom (1956).

Spoonbill *Platalea leucorodia* (pm) pm
Apparently rare passage migrant: nine Palm island 17 Mar. 95, one 9 Sep. 97, two over Ramkine island 4 Apr. 98 and one 4 Oct. 2000.

Greater Flamingo *Phoenicopterus ruber* (v) v, ?pm
Status uncertain or vagrant: two adults Palm island 10 May 95, one Juvenile Sanani island 12 Aug. 95 and single pink feather Palm island 20 Mar. 98. Previously, a total of two shot and stuffed by hunters in springs 86 and 89.

White-fronted Goose *Anser albifrons* (pm) wv, pm
Not uncommon passage migrant. All records belong to flocks flying over or offshore islands. Seen 13 - 20 Nov. and 9 - 22 Mar.

Shelduck ***Tadorna tadorna*** (pm) pm, wv
Recorded only on passage and in small numbers: 16 Sep. and 18 Nov. 95, 11 Apr. 96, 8 May 97 and 22 Mar. 98.

European Wigeon *Anas penelope* (pm) PM, wv
Uncommon passage migrant 10 Oct. - 18 Nov. and 16 Feb. - 8 May.

Teal *Anas crecca* (pm,wv) PM, WV
Uncommon but regular passage migrant 8 Mar. - 22 Nov. and 16 Sep. - 20 Nov. Also recorded 5 - 21 Dec. 97, 17 Jan., 10 - 25 Feb. 98 and 8-10 Jan. 99.

Mallard *Anas platyrhynchos* + (pm,wv) PM, WV
Recorded in small numbers 18 Sep. - 3 Apr. Previously seen once 4 Jul. 1893 by Stenhouse (1904).

Pintail *Anas acuta* (PM, wv) PM, WV, s
Quite common on passage but scarce in winter. Observed 20 Oct. - 25 Apr.

Garganey *Anas querquedula* (PM) PM
Fairly common passage migrant 8 Mar. - 17 May and to less extent 14 Aug. - 18 Sep.

Shoveler *Anas clypeata* (pm) PM, wv
Apparently very scarce passage migrant. Recorded only on five occasions: three 8 Mar. 96, up to five 16 - 19 Mar. 97, two 2 Oct. 97, 20, 1 - 5 Apr. 98 and two 29 Oct. 2000.

Pochard *Aythya ferina* (pm) pm, wv
Very rare passage migrant. Two 2Nov.95, one 12 Oct. 96, two 22 Mar. 98 and one 7 Mar. 99.

Ferriginous Duck *Aythya nyroca* ** (pm) pm, wv, s
Apparently extremely rare passage migrant. One spring record Palm island 12 Mar. 98.

Red-breasted Merganser *Mergus serrator* (v) -
Only one record of two males and one female off Palm island 2 Mar. 99 (Ramadan-Jaradi and Bara, *unpubl*.)

Common Merganser *Mergus merganser* (v) -
Six females and one male recorded Palm island 7 Mar. 98 (Bara, 1998)

White-tailed Sea Eagle *Haliaeetus albicilla** (v) v
One single sighting: one adult Palm island 11 Oct. 96 (Ramadan Jaradi & Ramadan Jaradi, 1999).

Egyptian Vulture *Neophron percnopterus*** (pm) FB, PM
Apparently extremely rare and irregular passage migrant. An immature on the light-house of Ramkine island 6 Jun. 96, and one adult Palm island 3 and 18 Sep. 97.

Marsh Harrier *Circus aeruginosus* (pm) ?FB, PM, wv
Quite rare passage migrant. One 3 Apr. and 20 Apr. 96, one 19 Mar. and two 18 Sep. 97, and one 22 Mar. 98.

Spotted Eagle *Aquila clanga* (v) pm
One recorded occasionally over Palm island 16 Nov. 96. Probably deviated from its usual Levant migration route by the easterly of the previous day.

Osprey *Pandion haliaetus* (pm) pm
Singles observed regularly 4 - 23 Apr. and 16 Sep. - 11 Oct.

Lesser Kestrel *Falco naumanni**** (pm) FB, pm, s
Recorded twice: 11 Mar.- 17 Apr. 99 and 26 Oct. 2000.

Red-footed Falcon *Falco vespertinus* (pm) pm
Rather scarce passage migrant. Singeltons seen 16 Sep. 96, 20 Apr. and 5 May 96, 29 Apr. and 2 Oct. 97.

Lanner *Falco biarmicus*** (pm) pm, wv, ?sb
Observed thrice: one 2 Nov. 95, one 25 Oct. and one 13 Nov. 97.

Saker Falcon *Falco cherrug*** (pm, wv) pm, wv
Very scarce passage migrant and winter visitor. Two 14-21 Mar. 99 and one 2-23 Jan. 2000.

Peregrine Falcon *Falco peregrinus* (pm, ?wv) ?FB, pm, wv
One winter record 10 Dec. 96 and three passage records: one 6 Apr., one 18 Sep. 97, and one 1 - 4 Apr. 98.

Quail *Coturnix coturnix* + (sb,PM) sb, PM, wv
Common passage migrant 16 Feb. - 21 May and 7 Sep. - 18 Nov. Few breeding summer visitors occur Mar. - early Jun. (family of 5 chicks 21 Apr. 98).

Spotted Crake *Porzana porzana* (pm) PM, wv
Regular but scattered spring passage 14 Mar. - 5 May. Scarcer 6 Sep. - 17 Oct.

Spotted Crake *Porzana parva* (pm) pm
Annually recorded and exclusively in autumn and in small numbers 18 Sep. - 6 Oct.

Corncrake *Crex crex**** (pm) pm
Regularly observed during May, normally with peaks up to 6 individuals.

Moorhen *Gallinula chloropus* (pm) R, PM, wv
Extremely rare passage migrant: two 4 Apr. 95, one 5 - 17 Apr. 98 and one 29 Mar. 2000.

Coot *Fulica atra* (pm) R, PM, WV
Scarce passage in small numbers 18 Sep. - 6 Oct. and 3 - 25 Apr.

Crane *Grus grus* (pm) pm
Very rare autumn passage 12 Oct. - 18 Nov. and uncommon 8 Mar. - 4 Apr. with peaks up to 65 individuals.

Oystercatcher *Haematopus ostralegus* (v) v
Two occasional records: one 5 May 95 and one 24 May 98.

Black-winged Stilt *Himantopus himantopus* + (PM) PM
Common and abundant passage migrant 8 Mar. - 20 May and 15 Aug. - 25 Oct.

Avocet *Recurvirostra avosetta* (pm) pm
Scarce but regular passage in ones or twos 8 Mar. - 10 May and 9 Aug. - 13 Sep.

Collared Pratincole *Glareola pratincola* + (pm) pm
Quite uncommon passage migrant 4 Apr. - 23 May and 21 Aug. - 2 Nov.

Black-winged Pratincole *Glareola nordmanni** (pm) pm
Rare passage 6 Apr. - 21 May and 13 Sep. - 6 Oct.

Little Ringed Plover *Charadrius dubius* (PM, s) PM, s
Fairly common spring passage 22 Mar. - 5 May and scarcer 14 Aug. - 11 Oct. Very few non breeding birds oversummer Jun. - late Jul.

Ringed Plover *Charadrius hiaticula* + (PM,wv,s) PM, wv, s
Commonly recorded 19 Mar. - 7 Jun. and 14 Aug. - 25 Oct. Scarce winter visitor 22 Nov. - 8 Mar. Very few non breeding singeltons oversummer Jun. - Jul.

Kentish Plover *Charadrius alexandrinus* (pm,s) pm, s
Scarce passage migrant 12 Mar. - 21 May (with peaks up to 10 second half Apr.) and 9 Aug. - 20 Nov. Few non breeding oversummer Jun. - Jul.

Greater Sand Plover *Charadrius leschenaulti* (pm) pm
Rare passage migrant in small numbers 8 Mar. - 29 Apr. and 27 Jul. - 18 Sep.

Grey Plover *Pluvialis squatarola* + (pm,wv) pm, wv
Very scattered records 28 Aug. - 23 May.

Spur-winged Plover *Hoplopterus spinosus* (pm) pm
Rare passage migrant 22 Mar. - 10 Jun. and 9 Aug. - 20 Oct.

Lapwing *Vanellus vanellus* (pm) PM, WV
Uncommon on passage across islands. Recorded in small numbers 16 Sep. - 11 Oct. and 18 Mar. - 20 Apr.

Little Stint *Calidris minuta* (PM) PM
Widespread and common passage migrant 8 Mar. - 21 May and 9 Aug. - 20 Oct.

Temminck's Stint *Calidris temminckii* (v, ?pm) pm
Extremely rare passage migrant or vagrant. One single observation 17 Apr. 98.

Curlew Sandpiper *Calidris ferruginea* (pm, s) pm, s
Few individuals seen 14 Aug. - 17 Oct. and more regularly 20 Apr. - 8 May. Very small numbers oversummer Jun. - Jul.

Dunlin *Calidris alpina* (PM,WV) PM, WV
Common passage migrant 14 Aug. - 13 Nov. and to less extent 6 Apr. - 21 May. Also regular in fair numbers Dec. - Feb.

Ruff *Philomachus pugnax* (PM,wv) PM, wv, s
Common and abundant passage migrant 16 Feb. - 25 May and 9 Aug. - 13 Nov. Also two winter records 10 - 12 Feb. 98.

Common Snipe *Gallinago gallinago* (pm,wv) pm, wv
Rare but regular passage migrant and winter visitor. Singeltons seen 18 Sep. - 19 Mar.

Great Snipe *Gallinago media*** (pm) pm
Few scattered but quite regular sightings between 22 Mar. and 14 May.

Black-tailed Godwit *Limosa limosa* (pm, ?v) pm
Apparently extremely rare passage migrant. Recorded once 17 Apr. 98.

Whimbrel *Numenius phaeopus* + (pm) pm
Scarce but regular passage migrant 4 - 23 Apr. and 28 Aug. - 17 Oct.

Redshank *Tringa totanus* + (pm) pm
Scarce and regular 8 Mar. - 29 Apr. and 4 Aug. 21 Dec.

Marsh Sandpiper *Tringa stagnatilis* (pm) pm, ?wv
At least up to four 8 - 11 Sep. 98 and fourteen 28 Sep. 99.

Greenshank *Tringa nebularia* (PM, wv) PM, wv
Apparently common passage migrant and scarce winter visitor. Recorded 8 Mar. - 29 Apr., 19 Jul. - 25 Oct. and 11 Jan. - 20 Feb.

Green Sandpiper *Tringa ochropus* (PM, wv) PM, wv
Common passage migrant 20 Feb. - 26 Jun. and 3 Aug. - 17 Oct. Also some overwinter in very small numbers 6 Jan. - 20 Feb.

Wood Sandpiper *Tringa glareola* (PM) PM
Common and abundant passage migrant 12 Feb. - 23 May and 15 Aug. - 2 Nov.

Common Sandpiper *Actitis hypoleucos* + (PM,wv,s) PM, wv, s
Common passage 16 Mar. - 21 May and 14 Aug. 18 Nov. Scarcer in winter 7 Dec. - 20 Feb. Few non breeding oversummer 10 Jun. - 24 Jul.

Turnstone *Arenaria interpres* (pm) pm
Very few records of singles on six occasions between 16 Feb. and 8 May. Also one 2 Oct. 98 and six 7 Sep. 2000.

Arctic Skua *Stercorarius parasiticus* (v,?pm) v, ?pm
Only one record 21 Feb. 98 on Palm island (Bara, 1998).

Great Black-headed Gull *Larus ichthyaetus* (v,?pm) v
One sighted Palm island 1 - 4 Apr. 98.

Little Gull *Larus minutus* (pm,wv) pm, wv
Scattered records of singles among flocks of other gull species between 7 Sep. and 10 May.

Black-headed Gull *Larus ridibundus* (PM,WV) PM, WV
Common and abundant passage migrant and winter visitor with peaks up to c.2200. Seen 21 Aug. - 29 Apr.

Slender-billed Gull *Larus genei* (pm,wv) pm, wv
Two 13 Dec. 95, one 2 Feb. 97, up to four 17 Jan. 98, seven 22 Mar. - 25 Apr. 98 and three 3 Feb. 99.

Audouin's Gull *Larus audouini**** + (v,?pm) FB, v, ?pm
Vagrant or most probably extremely rare passage migrant: ten 23 Aug. 97, two 1-4 Apr. 98, one 25 Apr. 98 and one juvenile 6 Jul. 2000. Formerly bred on Palm island (Stenhouse 1904).

Mew Gull *Larus canus* (WV,pm,s) WV, pm, s
Scarce passage migrant 8 - 19 Mar. and 2 Nov. - 16 Dec. Also quite common winter visitor 24 Dec. - 26 Feb., with few non breeding oversummer 6 Jun. - 19 Jul.

Lesser Black-backed Gull *Larus fuscus* (PM, WV,s) PM, WV, s
Common and abundant passage migrant 12 Mar. - 25 May and 14 Aug. - 2 Nov. Also common winterer 11 Nov. - 8 Mar.

Yellow-legged Gull *Larus cachinnans* +(R,PM,WV,S)R, PM,WV, S
Fairly common passage migrant with peaks up to c. 500 from 12 Mar. to 25 May and 9 Aug. to 1 Nov. Also quite common winterer 13 Nov. - 20 Feb. with few non breeding oversummer May - Jul. The reserve is the only refuge for the breeding population in Lebanon which is today of c.65 individuals. Of which only c.14 pairs breed annually.

Great Black-backed Gull *Larus marinus* (pm) pm, wv
Recorded once: one off Palm island 5 May 96 (Ramadan-Jaradi & Ramadan-Jaradi, 1999)

Lesser Crested Tern *Sterna bengalensis* + (e) FB, e
Has bred on Palm island in 1895 (Stenhouse 1904). No further records since then up to-day.

Sandwich Tern *Sterna sandvicensis* (pm,wv) pm, wv
very rare passage migrant and winter visitor 9 Aug. - 17 Apr.

Common Tern *Sterna hirundo* + (PM) FB, PM
Formerly bred Palm island (Stenhouse 1904). Now a common passage migrant 5 Apr. - 23 May and 14 Aug. - 6 Oct. Also five recorded 21 Feb. 98 (Bara, 1998).

Little Tern *Sterna albifrons* + (v) FB, v
Formerly bred Palm Island (Stenhouse 1904). Now one single record 4 Apr. 98.

Whiskered Tern *Chlidonias hybridus* (pm) sb, pm
Apparently scarce passage migrant: one 4 Apr. 95, one 21 Aug. 96, one 6 Apr. 97, two 8 May 97, one 18 Sep. 97, and one 17 Apr. 98.

White-winged Black Tern *Chlidonias leucopterus* (pm) PM
Few singles scarcely seen 19 Mar. - 14 May and 12 - 25 Oct.

Turtle Dove *Streptopelia turtur* (?sb, PM) sb, PM
Common and abundant passage migrant 22 Mar. - 7 Jun. and 23 Aug. - 18 Nov. Seen in May in pairs and one heard singing but without direct evidence of breeding.

Great Spotted Cuckoo *Clamator glandarius* (pm) FB, pm, ?sb
Very rare passage migrant: one 7 Sep. 96, one 16 Mar. 97, and one 1 Apr. 98. Also recorded Palm island 21 Feb. 98 (Bara, 1998).

Cuckoo *Cuculus canorus* (PM) sb, PM
Quite common passage migrant 8 Mar. - 5 May and 3 - 18 Sep.

Little Owl *Athene noctua* (?r) R
Presumably rare resident (although no records in Jan. - Feb.). Recorded regularly during breeding season and heard singing at least in two localities but no direct evidence of nesting.

Nightjar *Caprimulgus europaeus* (pm) FB, PM, ?sb
Scattered records of singles 12 Mar. - 23 May. Also one 6 - 17 Oct. 96, one 1 Jul. - 18 Sep. 97 and two 11 Sep. 20 Oct. 2000.

Swift *Apus apus* (PM) SB, PM
Common and abundant passage migrant 26 Feb. - 10 May and to less extent 15 Jun. - 18 Nov.

Pallid Swift *Apus pallidus* (sb, pm) sb, pm
A small colony of breeding summer visitors found nesting in Ramkine island (Ramadan-Jaradi & Ramadan-Jaradi, 1997). Otherwise, uncommon passage migrant 12 Feb. - 14 May and 27 Jun. - 18 Sep.

Kingfisher *Alcedo atthis* (PM, wv, s, ?r) PM, wv, s, ?r
Singles recorded throughout the year but without direct evidence of breeding. Numbers are supplemented 8 Mar. - 5 May and 14 Aug. - 22 Nov.

Hoopoe *Upupa epops* + (sb, PM, wv) R, sb, PM, wv
Breeding confirmed. Quite uncommon breeding summer visitor to islands. Found nesting during May 98 in borrows of rabbits. Also common on passage 8 Mar. - 29 Apr. and 15 Aug. - 2 Nov. Very few overwinter Dec. - Jan.

Wryneck *Jynx torquilla* (pm) pm
Only one record 12 Mar. 98. Probably overlooked at other times.

Calandra Lark *Melanocorypha calandra* (pm) r, PM, wv
Scarce but regular passage migrant in fairly small numbers 20 Feb. - 6 Apr. and 18 Sep. - 18 Nov.

Greater Short-toed Lark*Calandrella brachydactyla* (pm) sb,PM,wv
Quite rare passage migrant 7 Sep. - 20 Nov. and 8 Mar. - 17 Apr.

Lesser Short-toed Lark *Calandrella rufescens* (pm) sb, pm, wv
Only spring scattered but regular records 4 Apr. - 8 May.

Skylark *Alauda arvensis* (pm, wv) FB, PM, WV, s
Uncommon passage migrant and winter visitor 6 Oct. - 11 Apr.

Crag Martin *Ptyonoprogne rupestris* (sb, pm) sb, PM, wv, ?r

Small population of breeding summer visitors found nesting 11 Apr. - 2 Jun. (Ramadan-Jaradi & Ramadan-Jaradi, 1999). Also small flocks and singles recorded 26 Feb. - 23 Apr. and 18 Sep. - 20 Nov.

Swallow *Hirundo rustica* (PM, wv) SB, PM, wv
Common and widespread passage migrant 12 Feb. - 21 May and 9 Jul. - 13 Nov. Also very scarce winter visitor Dec. - Feb.

Red-rumped Swallow *Hirundo daurica* (pm) sb,pm
Uncommon and very scattered on passage 16 Mar. - 17 Apr. and 3 - 28 Sep.

House Martin *Delichon urbica* (PM) SB, PM
Fairly common on passage 9 Feb. - 21 May and much less 13 Sep. - 25 Oct.

Tawny Pipit *Anthus campestris* (sb, PM, wv) sb, PM, wv
Breeds in moderate numbers (Apr. - mid-Jul.). Also abundant and regular passage migrant 20 Feb. - 8 May and 15 Aug. - 25 Oct. Very few overwinter 18 Nov. - 16 Feb.

Long-billed Pipit *Anthus similis* (wv) r
Only recorded as winter visitor in very small numbers 17 Jan. - 20 Feb.

Red-throated Pipit *Anthus cervinus* + (pm) PM
Scarce spring passage migrant 8 Mar. - 13 Apr. and to less extent 18 Sep. - 6 Oct.

Water Pipit *Anthus spinoletta* (pm, wv) PM, wv
Scarce passage migrant 14 Feb. - 17 Apr. and scarcer 13 Sep. - 18 Nov.

Yellow Wagtail *Motacilla flava* (pm) sb, PM
Small numbers recorded on passage 8 Mar. - 6 Jun. and 3 Sep. - 20 Oct.

Citrine Wagtail *Motacilla citreola* (v) v, ?pm
One single record 5 Apr. 98.

Grey Wagtail *Motacilla cinerea* (pm, wv) sb, pm, wv
Uncommon passage migrant and scarce winter visitor 13 Sep. - 17 Apr.

White Wagtail *Motacilla alba* + (sb,PM,WV) sb, PM, WV, s
Breeding reconfirmed. Scarce and irregular breeding summer visitor in very small numbers to islands where formerly bred early last century (Stenhouse 1904). Also abundant passage migrant and winter visitor 18 Sep. - 5 Apr.

Thrush Nightingale *Luscinia luscinia* (pm) pm
Recorded thrice: one 16 Sep. 95, one 27 Jul. 97 and one 21 May 98.

Bluethroat *Luscinia svecica* (pm) PM, wv

Apparently extremely rare on passage: at least two 12 - 20 Mar. 98, one 2 Apr. 99 and two 5 Apr. 2000.

Black Redstart *Phoenicurus ochruros* (sb, PM, wv) R, sb, PM, wv
Scarce but regular breeding summer visitor. Also occur commonly on passage 20 Feb. - 17 Apr. and 12 Oct. - 22 Nov. Few individuals overwinter Dec. - Feb.

Redstart *Phoenicurus phoenicurus* (pm) sb, PM
Uncommon passage migrant 18 Mar. - 27 May and 13 Sep. - 18 Nov.

Isabelline Wheatear *Oenanthe isabellina* (pm) SB, PM
Scarce and scattered passage migrant 23 Feb. - 11 Apr. and 14 Aug. - 2 Nov.

Wheatear *Oenanthe oenanthe* (PM) SB, PM, wv
Rather uncommon passage migrant 26 Feb. - 5 May and commoner 21 Aug. - 13 Nov.

Cyprus Pied Wheatear *Oenanthe cypriaca* (v) v, ?pm
Only one record 14 Mar. 97 (Ramadan-Jaradi & Ramadan-Jaradi, 1999).

Rock Thrush *Monticola saxatilis* (pm) SB, pm
Apparently irregular passage migrant: one juvenile 7 Sep. 96, at least two 18 Sep. 97 and one 5 Apr. 98.

Blackbird *Turdus merula* (pm, wv) R, pm, wv
Very scarce passage migrant and winter visitor to islands. Irregularly recorded in ones or twos 12 Oct. - 8 Mar.

Song Thrush *Turdus philomelos* (pm, ?wv) PM, wv
Very uncommon passage migrant 6 Oct. - 2 Nov. and 20 Feb. - 3 Apr., and very scarce winter visitor 22 Nov. - 26 Feb.

Fan-tailed Warbler *Cisticola juncidis* (wv) r
One 24 Dec. 96, at least four 14 - 20 Feb. 97 and two 17 Jan. 98.

Graceful Warbler *Prinia gracilis* (R) R
Very common breeding resident all over where vegetation is found.

Savi's Warbler *Locustella luscinioides* (pm) sb, pm
Very scarce passage migrant across islands 19 Mar. - 25 Apr. and 21 Aug. - 6 Oct.

Great Reed Warbler *Acrocephalus arundinaceus* (pm) SB, PM
Rather uncommon and scattered passage migrant 12 Mar. - 13 Apr. and much less 9 Aug. - 17 Oct.

Olivaceous Warbler *Hippolais pallida* (pm) SB, PM
Uncommon but regular passage migrant 14 Mar. - 5 May and 21 Aug. 28 Sep.

Upcher's Warbler *Hippolais languida** (pm) SB, pm
Scarce to uncommon passage migrant 23 Apr. - 2 Jun. and 14 Aug. to 7 Sep.

Icterine Warbler *Hippolais icterina* (pm) pm
Scarce passage migrant occurring in small numbers 17 Apr. - 10 May and 28 Aug. - 2 Oct.

Sardinian Warbler *Sylvia melanocephala* (pm, wv) R, PM, WV
Uncommon passage migrant and winter visitor 13 Sep. - 29 Apr.

Rüppell's Warbler *Sylvia rueppelli* + (pm) ?sb, pm
Scattered and scarce spring passage 14 Mar. - 20 Apr. Previously recorded 4 Jul 1893 by Stenhouse (1904).

Orphean Warbler *Sylvia hortensis* + (PM) SB, PM
Quite common passage migrant 5 Mar. - 8 May and 24 Jul. - 6 Oct.

Lesser Whitethroat *Sylvia curruca* (pm) SB, PM, ?wv
Very rare passage migrant 8 Mar. - 29 Apr. and 16 Sep. - 12 Oct.

Whitethroat *Sylvia communis* + (pm) SB, PM
Common passage migrant 26 Feb. - 10 May and 23 Aug. - 13 Nov.

Blackcap *Sylvia atricapilla* + (sb, pm, wv) SB, PM, WV
Uncommon breeding summer visitor (Ramadan-Jaradi & Ramadan-Jaradi, 1997), and uncommon passage migrant and winter visitor 4 Aug. - 25 May.

Wood Warbler *Phylloscopus sibilatrix* (pm) FB, PM
Quite common passage migrant 22 Mar. - 10 May and 28 Aug. - 17 Oct.

Chiffchaff *Phylloscopus collybita* (PM, wv) PM, WV
Common passage migrant and scarce winter visitor 12 Sep. - 14 May.

Willow Warbler *Phylloscopus trochilus* (pm) PM
Rarely but regularly recorded 14 Mar. - 21 Apr. and 21 Aug. - 18 Nov.

Spotted Flycatcher *Muscicapa striata* (PM) SB, PM
Common on migration 17 Apr. - 8 May and 3 Sep. - 2 Oct.

Collared Flycatcher *Ficedula albicollis* (pm) PM
Only two spring records: one 6 Apr. 97 and one 22 Mar. 98.

Red-backed Shrike *Lanius collurio* (PM) SB, PM
Common passage migrant 11 - 29 Apr. and 16 Sep. - 17 Oct.

Woodchat Shrike *Lanius senator* (pm) sb, PM
Uncommon passage 14 Mar. - 3 Apr. and 13 - 28 Sep.

Masked Shrike *Lanius nubicus* (pm) SB, PM
Scarce passage migrant 8 Mar. - 6 Apr. and 3 - 28 Sep.

Ortolan Bunting *Emberiza hortulana* (pm) sb, PM
Uncommon and scattered passage migrant 22 Mar. - 23 Apr. and 21 Aug. - 12 Oct.

Cretzschmar's Bunting *Emberiza caesia* (pm) sb, PM
Uncommon passage migrant 8 - 19 Mar. and 3 - 28 Sep.

Black-headed Bunting *Emberiza melanocephala* (PM) SB, PM
Rather common passage migrant 13 Apr. - 25 May and fewer 7 Sep. - 12 Oct.

Corn Bunting *Miliaria calandra* (PM) R, PM, WV
Quite common passage migrant 5 Mar. - 1 Apr. and 11 Oct. - 18 Nov.

ANNEX 4: List of reptiles on Palm Islands Nature Reserve.

1. refers to globally threatened species
2. refers to regionally threatened species
3. refers to endemic species
4. refers to nationally rare species

SCIENTIFIC NAME	**English Name**	**Arabic Name**
DERMOCHELYIDAE		
Dermochelys coriacea coriacea (1)	Leather-back Turtle	سلحفاة جلدية الظهر
CHELONIIDAE		
Caretta caretta caretta (1) (4)	Logger-head Turtle	سلحفاة ضخمة الرأس
Chelonia mydas mydas (1) (4)	Green Turtle	سلحفاة خضراء
GEKKONIDAE		
Hemidactylus turcicus	Turkish gecko	أبو بريص
Ptyodactylus puiseuxi		
LACERTIDAE		
Lacerta laevis laevis (2) (3)	Wall lizard	سحلية الحيطان
SCINCIDAE		
Mabuya vittata	Vital's skink	سقنقور حيوي
COLUBRIDAE		
Coluber jugularis asianus		أفعى حنش آسيوي

ANNEX 5: List and summary status of the observed insect species on Palm Islands Nature Reserve.

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

ANNEX 6: List of 14 Butterfly species that were reported from Palm Islands Nature Reserve with mention to occurrence in other habitats or sites.

Butterflies found on Palm Islands Reserve					
No	**Scientific Name**	**English Name**	**Sub-Family**	**Family**	**Place**
1	*Papilio machaon syriacus*	Swallowtail	Papilioninae	PAPILIONIDAE	Hazmiye, Palm Islands, Aammiq
2	*Pieris brassicae catoleuca*	Large White	Pierinae	PIERIDAE	Palm Islands, Aammiq
3	*Pieris rapae leucosoma*	Small White	Pierinae	PIERIDAE	Hazmiye , Palm Islands , Terbol , Beqaa, Aammiq
4	*Pieris napi dubiosa*	Green-veined White	Pierinae	PIERIDAE	Laklouk , Hammana , Antelias , sea level, Jbeil, Cedar Mountain, Hazmiye, Palm Islands
5	*Colotis fausta fausta*	salmon Caper Butterfly	Pierinae	PIERIDAE	Palm Islands, Aammiq
6	*Leptidea sinapis ? Sinapis*	Wood White	Dismorphiinae	PIERIDAE	Jisr el-Qadi, Aabadiye, Yarze, Palm Islands
7	*Precis hierta crebrene*	Yellow Pansy	Nymphalinae	NYMPHALIDAE	Palm Islands
8	*Vanessa cardui cardui*	Painted Lady	Nymphalinae	NYMPHALIDAE	Bellan Island
9	*Melitaea phoebe telona*	Knapweed Fritillary	Nymphalinae	NYMPHALIDAE	Hazmiye, Palm Islands
10	*Pseudotergumia pisidice pisidice*	Sinai Grayling	Satyrinae	NYMPHALIDAE	Palm Islands, sea level
11	*Ypthima asterope asterope*	African Ringlet	Satyrinae	NYMPHALIDAE	Hazmiye, Palm Islands
12	*Lampides boeticus boeticus*	Long-tailed Blue	Lampidinae	LYCAENIDAE	Palm Islands, Laklouk, Aammiq
13	*Adopoaea hyrax hyrax*	Levantine Skipper	Hesperiinae	HESPERIIDAE	Hazmiye , Palm Islands
14	*Borbo borbonica zelleri*	Zeller's Skipper	Hesperiinae	HESPERIIDAE	Aarida , Palm Islands

ANNEX 7 Methodology and criteria for the selection of species

A methodology to limit the study of flora and fauna to a number of species that demonstrates the ecological interest of the site was drawn upon literature and existing data surveys, taking into account the needs of on-going conservation programs and the practical availability of biodiversity datasets. It consisted of evaluating the state and trends of biological diversity at the species level. Recognizing the substantial limitations with regard to the current level of information and details of existing Lebanese data at the species-site level, the working research group suggested a methodology which requires the implementation of three different phases of analysis modules:

- "Coarse filter" analysis: this phase selects the species that are globally threatened, regionally threatened, nationally threatened, endemic, rare species and noteworthy (keystones, flagship species, indicators, medicinal species, alien invasive species and species of special concern), where:

Endemic species: is limited only to the site (endemic to the site), to the country (endemic to Lebanon), to the region (endemic to the Middle East, Levant region or East Mediterranean Region).

Rare species: is rare in the area and at national level.

Noteworthy species: is a species of special interest: economic value, cultural value for local people, medicinal plants, aromatic plants, fodder plants, wild-relative plants, dominant plants, very abundant species, introduced species (see below Alien), pest species, etc.

Threatened species: is threatened according to national, regional and/or international Red data lists.

Alien species: is exotic or introduced (purposely or accidentally) invasive or potential invasive species (Alien are also considered Noteworthy).

- "Mid-coarse filter" analysis: this second phase checks the species that are selected in the previous phase in term of vulnerability and accessibility. For example, a globally threatened species that is protected in its distribution range and occurs accidentally in a study site is of lower significance than another globally threatened species found to be limited in its distribution to this site. However, it is worth to note that the identification of the species that is in most need of conservation action can also be done by monitoring the numbers and distribution of the species in question. In this phase, it is preferable to only deal with the most endangered, locally or nationally rare, endemic, and noteworthy species.

- **"Fine filter"** analysis: this third phase addresses the requirements of the species of the "mid-coarse filter" that are considered to be of special management significance; mainly in relation to the study site (the hypothesis calling for the need to often protect the species beyond the limits of the site is recognized).

A.1.5.1.2 Criteria for species selection

The process used in the filter modules at the first progress level to limit the number of the selected species is based on literature and other collected data which are far from being sufficient. The selected species are then reviewed on the light of consultant team – management teams meetings, compilation of baseline information on the selected or target species, assessment of threats, information about utility, and verification of their status and their populations' level during the field work. Having in mind that the list of the selected species is not final and recognizing that there may be many species which would be of high importance and be significantly threatened to warrant inclusion in the project, the target species will remain under a fine tuning process according to the following selection criteria for specific species which intend to select species carefully that have the highest priority in terms of their value to people and environment, but at the same time considering their amenability to in situ conservation and monitoring with respect to ecosystem approach, representativeness of the study sites, utility and complementarities between the different protected areas:

Criterion 1: Status of Threat: a list of all species that are threatened at global, regional, national and local levels as well as the endemic and rare species is to be drawn up and be a part of the coarse filter.

Criterion 2: Environmental Importance: a list of all species that are noteworthy such as the keystones, flagship species, bio-indicators, medicinal, alien invasive species and other species of special or economic importance is also to be drawn up and be part of the coarse filter.

Criterion 1.2: Level of Threat: under this criterion, the list of species derived from the criterion 1 should then be prioritized as follows:

1.2.1- International Priority: threatened species of the IUCN Red List from critically endangered to near threatened through endangered and vulnerable are to be given high priority and subsequently included in the mid-coarse filter as the most threatened species.

1.2.2- National Priority: threatened species according to country inventories, including endemic species from regional to local through national endemism are to be given highest level of concern and subsequently included in the mid-coarse filter.

1.2.3- Human Impacts: species that are impacted by over exploitation, over collection, over use, persecution, pollution, drainage, over hunting, destruction or degradation of their habitats or lands, etc. are to be classified under second level of threat and be incorporated in the mid-coarse filter.

1.2.4- Biotic Factors: all species which are introduced, non native, alien invasive, heavy predators, pests, etc. are to be given third level of concern and be contained in the mid-coarse filter.

1.2.5- Abiotic factors: all species those are sensitive to habitat changes due to floods, drought, soil movement or erosion, etc. are to be classified under fourth level of threat and then be included in the mid-coarse filter.

Criterion 2.1: Level of Environmental Importance: under this criterion, the list of species derived from the criterion 2 should then be prioritized as follows:

2.1.1- Economic Importance: all species of direct use (single or multipurpose use) for food (edible plants, game birds, etc.), shelter (trees, commensalisms, symbiosis, etc.), firewood, etc. and all species of indirect use (single or multipurpose use) for providing products thereof such as oil, honey, genetic improvement (wild relatives), medicine, research tool, etc. are to be given highest value and be then incorporated in the mid-coarse filter.

2.1.2- Environmental Services: species which play a key role in the pollination, fixation of soil, forestation (Keystone species), ecological balance, maintenance of trophic chains and webs, providing habitats for other biodiversity, etc. are to be given a second level of priority and be then contained in the mid-coarse filter.

2.1.3- Educational Services: all species which constitute a prominent educational value or attraction for researchers are to be given a third level of priority and should be included in the mid-coarse filter.

2.1.4- Cultural & Traditional Value: species which constitute a value for local needs such as Flagship species, related species to religion's believes, popular medicinal species, related species to superstitions, etc. are to be given a fourth level of priority and be included in the mid-coarse filter.

2.1.5- Bio-indication Value: all species that provide obvious bio-indication character should be given a fifth level of priority and be included in the mid-coarse filter.

2.1.6- Socio-economic Value: species which play a role in generation of incomes through different activities (bird watching, scuba diving, tree adoption, etc.) are to be given a sixth level of priority and be included in the mid-coarse filter.

2.1.7- Potential Value: all species that are identified to be of future value for investment, marketing, provision of genes, medicine, etc. are to be considered and given a seventh level in the mid-coarse filter.

Criterion 3: Conservation Significance: all species that are selected using the criteria 1.2 and 2.2 for inclusion in the mid-coarse filter are to be subjected to a scoring approach in which the species attaining highest scores (points are optional and in correlation with the levels of threats and importance) are to be retained by the fine-filter, provided they respond to the following sub-criteria:

Criterion 3.1: Global & Regional Strategies: all species for which the conservation and monitoring contribute to the global or regional strategies on biodiversity conservation are to be place on the highest rank of priorities.

Criterion 3.2: Sustainability Consideration: all species of likelihood of sustainable conservation success are to be ranked at the second level of priorities.

Criterion 3.3: Uniqueness Consideration: all species that are strictly limited to the study site are given the third rank of prioritization. Species which are of conservation value but covered in other sites are omitted for duplication avoidance.

Criterion 3.4: Accessibility Consideration: all species that are of no easy access are to be given the lowest scoring points. They mainly include vagrant, erratic and occasional species; species for which the conservation is not dependant on the study site, etc. Species of equal qualifications but of lowest accessibility are of lowest priority.

Finally and due to the complexity of the selection criteria' application to the potential species, the fine-filter species list was preferably drawn up in consultation with relevant stakeholders, mainly the local management teams.

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