



Ministry of Environment



## **FINAL REPORT**

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

### **TYRE BEACH NATURE RESERVE**

August 2004

**MINISTRY OF ENVIRONMENT**

**LEBANESE UNIVERSITY  
FACULTY OF SCIENCE**

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## **FINAL REPORT**

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

### **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 Cedar, 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. TYRE BEACH NATURE RESERVE**

### **A.1 GENERAL PRESENTATION OF THE SITE**

#### **A.1.1 Location**

The Tyre Beach Reserve lies between longitude 35° 12' East and Latitude 33° 17' North at c.1-15 m of altitude, in the vicinity of Tyre city and the Palestinian Rachidieh camp (Figure 1). It covers an area of c.3.8 km<sup>2</sup>.

#### **A.1.2 Legal status**

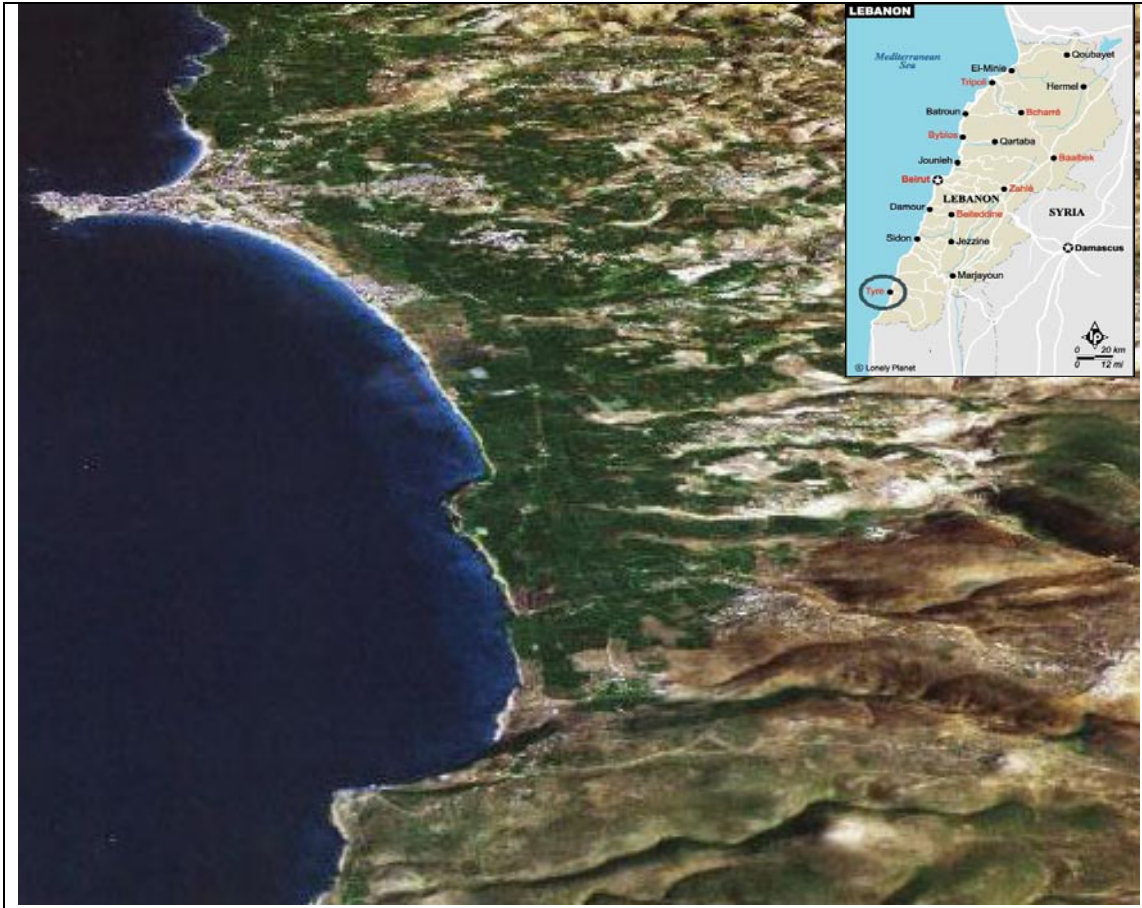
The Tyre Beach Reserve is principally a government property and protected by the law No. 708 of 5 November 1998 that declared the beach of Tyre and the area of Ras Al Ain a Nature Reserve. However, the reserve benefits from the coverage of Ramsar Convention since the accession of Lebanon to it in 1999 and the declaration of Tyre Beach Reserve a Ramsar Site.

#### **A.1.3 Description**

The reserve is formed of two parts, both along the beach of Tyre: the first part extends between Tyre city and Rachidieh to the south. The second part extends further to the south from Rashidyah to Ras Al Ain Pools. Rashidyah is a Palestinian refugee camp lying alongside the principal road to the beach. The legal protection of the reserve is given in respect to the diversity of ecosystems found here. Accordingly, the following biosystems are deemed a part of the natural reserve:

- The sandy beach that is part of the best preserved stretch of sandy coastline in southern Lebanon. It has considerable scenic and recreational value.
- Ras Al Ain (the area that is rich in freshwater) with its natural artesian wells which are an important heritage site and give rise to a number of notable freshwater habitats.
- The surrounding agriculture area which is irrigated by raised concrete channels leading from the artesian wells (known by locals as springs), and ditches running along the fields boundaries. The main irrigated cultivation is of vegetables. Palm and citrus plantations occur further back, with walls around the field and plantation perimeters or else windbreaks of cane *Arundo donax* or cypress trees *Cupressus sempervirens*.

Tyre Beach Nature Reserve is a Marine/ Coastal wetland with permanent shallow marine waters, sandy and rocky shores and sand flats. In the close vicinity of the reserve, there are the Roman Arc of Triumph and the Roman Hippodrome, which are currently managed by the government.



**Figure 1:** Location of Tyre Beach Nature Reserve (circled) with aerial view.

## **A.1.4 Abiotic characteristics**

### **A.1.4.1 Physiographic characteristics**

#### **A.1.4.1.1 Geology**

The beach and the sand dunes are made up of a mixture of quartz and carbonate sands which are locally lithified to give beach rock. In places limestone gravels occur. The underlying geology is very significant as it controls the existence of the artesian springs. The main rock units are a sequence of porous and fissured Lower and Middle Cretaceous limestone which are overlain by a sequence of Late Cretaceous chalks and marls. These in turn are overlain by a sequence of Lower Tertiary limestone. The entire

sequence is gently dipping and broken by local faulting some of which seems to be relatively recent (C. Walley, unpubl.).

#### **A.1.4.1.2 Geomorphology**

The reserve is situated on a sandy area of the Quaternary age. Some of the sand dunes became sandstone. Remarkably, most of the remaining dunes are free and mobile, as the sparse, scattered vegetation is unable to fix them.

Sand predominates on the stretch of beach nearest to Tyre. Towards Ras Al Ain, it is interspersed with pebbly areas and rocky shelves and the gravel gets gradually closer to the beach, where the remaining sand is either represented by hummocks or used by farmers.

A point of significance is that the area is a bay in which new materials are mainly brought by waves and sea currents.

#### **A.1.4.1.3 Hydrology**

The lower and middle Cretaceous limestone forms the aquifer that provides the majority of the region's water, although private wells tap the water of the upper Eocene sediments. The capping of the largely impermeable Late Cretaceous has allowed the development of artesian wells where the water rises above ground level under natural pressure. At Ras Al Ain there are three artesian wells whose walls were built by the Phoenicians, as well as other small springs. The water at the wells rises up to 5 m. above the ground level. The wells have a supply of 1500 l/sec (C. Walley, unpubl.) and serve the irrigation needs of the surrounding farmland, provide some of the drinking water needs of the region and also drain into the sea by a small channel through the beach.

What is of interest is that the freshwater allowed the practice of agricultural activities on a humid soil near the shore.

#### **A.1.4.1.4 Pedology**

What is remarkable is that despite the salty soil where in a few remaining areas vegetation is still typically halophytic, nearby there are normal (non-halophyte) herbs that grow on organic and mineral poor soil due to the joint effect of rain and springs. It is possible, therefore, to see on some sand dunes, freshwater plants that usually characterize inland areas.

#### **A.1.4.1.5 Climatology**

The annual rainfall average is 654 mm, and the mean annual temperature is 20.5° C. The mean daily maximum temperature is 30.7° C in August whereas the mean daily minimum temperature in January is 9.8° C. The absolute temperature ranges from -0.3° in January to 44.5° in May. The mean relative humidity lies around 78% (Service Météo/ Ministry of Public Work and Transport). As for the winter storm-wave heights, they are much

higher at Tyre than along the northern coast of Lebanon due to the much greater fetch across the southern part of the eastern Mediterranean for absence of the protection of Cyprus. The pluviothermic quotient of Emberger at Tyre is 106.7 and indicates that the site is located in the Temperate Mediterranean Bioclimatic Stage with thermic variant of cool winter.

### **A.1.5 Biotic characteristics**

Being one of the most beautiful and scenic sandy beaches in Lebanon, Tyre beach reserve is a mixture of marine and terrestrial ecosystems made from agriculture lands, coastal sand dunes, wide sandy beaches, marshes and springs. These springs feed 1500 l / sec into the three striking pools of Ras Al Ain. The pools provide a freshwater habitat and the off-flow creates small areas of marshland attractive to amphibian and water birds such as ducks, crakes, coots, etc. The inflow of fresh water from the springs into the sea creates brackish water, especially productive and rich in aquatic species. The reserve's beach has special significance as a nesting site for the globally endangered marine turtles. In the agricultural zone, measures are being taken to implement environmentally sound cultivation methods. The flora and fauna lists of Tyre Beach 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**

The flora of the Tyre area is partly covered by Mouterde's 1966, 1970 and 1983 flora of Lebanon. 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. Since then no more botanical reports, on this site, were published or known. Only Tohmé continued his field botanical studies at Tyre during the last three years in order to obtain confirmation on the status of certain species. His recent new findings are published in Tohmé, G. & Tohmé, H. (2002). Few of them are included here and the others will make part of the final report of the present project. The list of Tyre Beach Reserve species (Annex 1) includes 275 species distributed over 50 families. In addition, it shows that the reserve is habitat to six regionally and nationally threatened species, four endemic and 10 rare species, whilst 59 species are restricted to the Eastern Mediterranean area. It is also worthy to indicate that in the list of Tyre Beach plants, several bio-indicator species as well as 25 medicinal species were recognized. Details on Bio-indicators and species of special concern such as those visited by bees or used as fodder, etc. can be found in the original report of the NCSR (1999).

#### **A.1.5.1.1 The floristic species**

##### **A.1.5.1.1.1 Selected species**

The selected species through the fine filter are presented here. The new findings of the surveys as well as the information obtained from stakeholders, mainly local management teams of protected sites incurred, in most cases, slight improvement of the selected

species list whilst the field studies, especially in the spring season have lead to a better fine-tuning of it.

Under abundance:

- 5 : indicate that more than 3/4 of the habitat is covered by the species.
- 4 : indicate that between 1/2 and 3/4 of the habitat is covered by the species.
- 3 : indicate that between 1/2 and 1/4 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 Rare (2)

Species	English Name	Local Name	Localization		Abundance
			Habitat	GPS	
<i>Ficus sycomorus</i>	<b>Sycomore</b>	Jummeiz	sand-dune	N 33° 15' 419'' E 35° 12' 813''	(+) 4 trees only
<i>Pancratium maritimum</i>	<b>Sand lily</b>	Zinbaq bahri	sand-dune	N 33° 15' 333'' E 35° 12' 813''	(+) Few plants

#### A.1.5.1.1.2 Endemic (1)

Species	English Name	Local Name	Endemism	Localization		Abundance
				Habitat	GPS	
<i>Astragalus berytheus</i>	<b>Beirut milk-vetch</b>	Astragalus Beirut	Leb.+Pal. sea-shore	sand-dune	N 33° 15' 333'' E 35° 12' 813''	(+) Rare

#### A.1.5.1.1.3 Noteworthy (6)

Species	English Name	Local Name	Value	Localization		Abundance
				Habitat	GPS	
<i>Alcea setosa palmata</i>	<b>Bristly hollyhock</b>	Khatmi	Medicinal plant	agricultural soil's plants	N 33° 13' 670 E 35° 12' 841	2,8
<i>Crithmum maritimum</i>	<b>Rock samphire</b>	Shummorat el bahr	Leaves are edible	pebble, sand and rocks	N 33° 13' 716 E 35° 12' 689	2,8

<i>Eryngium creticum</i>	<b>Cretan eryngo</b>	Qarsa'anna	Non-prickly leaves are edible	agricultural soil's plants	N 33° 13' 670 E 35° 12' 841	2,8
<i>Glaucum flavum</i>	<b>Sea poppy</b>	Mamita safra	Medicinal plant	pebble, sand and rocks	N 33° 13' 716 E 35° 12' 689	1
<i>Salsola kali</i>	<b>Saltwort</b>	El Qili	Economical value	sand-dune	N 33° 15' 333 E 35° 12' 813	2,8
<i>Nasturium officinale</i>	<b>Common water-cress</b>	Qorra	stems and leaves are edible	ponds and streams	N 33° 13' 683 E 35° 13' 062	2

#### A.1.5.1.1.4 Introduced (Alien invasive) (1)

Species	English Name	Local Name	Origin	Localization		Abundance
				Habitat	GPS	
<i>Physalis peruviana</i>			Tropical	agricultural soil's plants	N 33° 13' 670 E 35° 12' 841	2

#### 1.5.1.1.5 Threatened (2)

Species	English Name	Local Name	Level of threat	Localization		Abundance
				Habitat	GPS	
<i>Ficus sycomorus</i>	<b>Sycomore</b>	Jumme iz	Important	sand-dune	N 33° 15' 419'' E 35° 12' 813''	(+) rare
<i>Pancreatum maritimum</i>	<b>Sand lily</b>	Zinbaq bahri	Medium (plucking and grazing)	sand-dune	N 33° 15' 333'' E 35° 12' 813''	1

#### 1.5.1.1.6 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
1. <i>Physalis peruviana</i>			+		5-12	+			+
2. <i>Pancreatum maritimum</i>			+		5-11	+			+
3. <i>Ficus sycomorus</i>	+				3-5		+	+	


4. <i>Astragalus berytheus</i>	+			2-3	+			+
5. <i>Nigella arvensis mutica</i>			+	5-8	+			+
6. <i>Salsola kali</i>			+	5-9	+			+
7. <i>Alcea setosa palmata</i>			+	5-12	+			+
8. <i>Ammi visnaga</i>		+		4-7	+			+
9. <i>Crithmum maritimum</i>			+	6-10	+		+	
10. <i>Eryngium creticum</i>			+	5-9				
11. <i>Glaucum flavum</i>			+	2-8		+		+
12. <i>Nasturium officinale</i>			+	2-7	+			+
13. <i>Salvia sclarea</i>		+		5-7		+		+
14. <i>Urginea maritima</i>			+	7-10		+		+
15. <i>Verbena officinalis</i>			+	1-12		+		+





#### A.1.5.1.1.7 Useful information about the selected species

Genus, Latin	<i>Alcea</i>
Species, Latin	<i>setosa</i>
Author	(Boiss) Alef.
	
	Photo by G. & H. Tohmé
Family	MALVACEAE
Common name, English	Bristly hollyhock
Common name, Arabic	Khoutmi
Chorotype	East Mediterranean Region
Life form Raunkiaer	Perennial herb
Summer shedding	Leaves and flowers during summer and autumn
Succulence	Non-succulent
Salt resistance	Glycophyte
Habitat or affinity to Vegetation formation	Waste grounds and road sides
Synanthropy	Grows in natural habitats. It is planted as an ornamental and medicinal plant in gardens
Chronology	First listed from Tyre Beach Reserve by the NCSR Report (1999).
Usage	Seeds (reduced to powder) were used in aromatic baths for headache and to fight insomnia and in cases of strong migraine. It was (and still) used for coughs, in decoction to drink, and as expectorant to stop colds.
Status	Abundant and very common
Identification	Striated calyx, it reaches 2 m high


Genus, Latin	<i>Astragalus</i>
Species, Latin	<i>beryteus</i>
Author	Boissier & Blanche.
Family	FABACEAE
	
	Photo by G. & H Tohmé
Common name, English	Beirut milk-vetch
Common name, Arabic	Astrghalous beyrout
Chorotype	Localized Jaffa to Beirut
Life form Raunkiaer	Annual Chamaephyte
Summer shedding	Ephemeral
Succulence	Non-succulent
Salt resistance	Glycophyte
Habitat or affinity to Vegetation formation	Sands at coastal areas
Synanthropy	Grows only in natural habitats
Chronology	Mentioned on the sand of Tyre beach Reserve only by Mouterde (1970). Georges and Henriette Tohmé couldn't see it during the verification field trips to Tyre. Instead they saw it at Bir Hassan-Beirut.
Usage	very beautiful flower that must be protected for ornamentation and to preserve biodiversity.
Status	It becomes very rare because of urban development
Identification	Purple pink flowers 12-16 mm


Genus, Latin	<i>Eryngium</i>
Species, Latin	<i>creticum</i>
Author	Lam.
	
	Photo by G. & H. Tohmé
Family	APIACEAE
Common name, English	Cretean eryngo
Common name, Arabic	Qours'anni
Chorotype	Aegean sea to East Mediterranean Region
Life form Raunkiaer	Perennial chamaephyte
Summer shedding	Blue branches during summer
Succulence	Non-succulent
Salt resistance	Yes
Habitat or affinity to Vegetation formation	All kinds of soils and Mediterranean strand vegetation
Synanthropy	Grows in natural habitats
Chronology	Reported from Tyre by Mouterde in 1970.
Usage	The non-prickly winter leaves are considered a delicacy as a salad.
Status	Well known since many years, very common and abundant
Identification	Widely branched with corymbs 30-60 cm high


Genus, Latin	<i>Crithmum</i>
Species, Latin	<i>maritimum</i>
Author	L.
	
	Photo by G. & H. 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	Reported from Tyre region by Post (1890)
Usage	The thick leaves are edible and largely used in salad, especially in early spring. The plant is sometimes found to be conserved in vinegar in order to be used in other times of the year.
Status	Threatened because it is edible used as salad
Identification	Flowers white-greenish

Genus, Latin	<i>Ficus</i>
Species, Latin	<i>sycomorus</i>
Author	L.
	
	Photo by G. & H. Tohmé
Family	MORACEAE
Common name, English	Sycamore
Common name, Arabic	Al-Joumayz
Chorotype	Center Africa and East-Mediterranean Region
Life form Raunkiaer	Perennial phanerophyte
Summer shedding	Branched tree
Succulence	Non-succulent
Salt resistance	Yes
Habitat or affinity to Vegetation formation	Coastal areas, especially in towns like Tripoli, Beirut and Saida.
Synanthropy	Planted in the past
Chronology	First reported from Tyre Reserve by Georges and Henriette Tohmé (NCSR Report, 1999).
Usage	<i>Highly appreciated traditionally for its ripe fruits.</i>
Status	It becomes rare because of urban development
Identification	Fruits in grapes on leafless branches





Genus, Latin	<i>Glaucium</i>
Species, Latin	<i>flavum</i>
Author	Crantz
	
	Photo by G. & H. 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 Tyre Beach 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	<i>Nasturium</i>
Species, Latin	<i>officinale</i>
Author	R. Br.
	
	Photo by G. & H. Tohmé
Family	BRASSICACEAE
Common name, English	Common water-cress
Common name, Arabic	Qourra
Chorotype	All temperate regions of North hemisphere
Life form Raunkiaer	Perennial chamephyte
Summer shedding	Evergreen
Succulence	Non-succulent
Salt resistance	Glycophyte
Habitat or affinity to Vegetation formation	Immerged in water places at least at its base
Synanthropy	Grows in Natural habitats
Status	It is threatened because it is over collected
Chronology	Listed for the first time from Tyre Beach in the NCSR Report (1999).
Usage	Rich in vitamins and used green in salad provided it is well cleaned.
Identification	Immerged plant white flowers

Genus, Latin	<i>Pancratium</i>
Species, Latin	<i>maritimum</i>
Author	L.
	
	Photo by G. & H. 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	Listed at Tyre by G. & Henriet. NCSR report (1999)
Usage	Picked for its beautiful flowers. Parts of the plant: venemous
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	<i>Physalis</i>
Species, Latin	<i>peruviana</i>
Author	L.
	
	Photo by G. & H. Tohmé
Family	SOLANACEAE
Common name, English	Bladder cherry
Common name, Arabic	Alkakinj
Chorotype	Tropical origin
Life form Raunkiaer	Perennial herb, chamaephyte
Summer shedding	Branches with leaves
Succulence	Non-succulent
Salt resistance	Glycophyte
Habitat or affinity to vegetation formation	Fertile plowed sandy fields. More present on coastal areas.
Synanthropy	Grows in gardens with vegetables. It is considered as a weed
Chronology	Listed it in the NCSR report (1999). Mouterde (1983) reported its disappearance from Lebanon since 1969.
Usage	It is considered as bad weed in agriculture. But, in other countries, it is used as a medicinal plant for kidney diseases and to prepare jam. Fruit is rich in Vitamin C.
Status	It was mentioned as disappeared from Lebanon by Mouterde 1983. Now it is spread in plowed field, sometimes abundant.
Identification	Fruit a berry enveloped by a developed calyx

Genus, Latin	<i>Salsola</i>
Species, Latin	<i>kali</i>
Author	L.
	
	Photo by G. & H. Tohmé
Family	CHENOPODIACEAE
Common name, English	Pricklet saltwort
Common name, Arabic	Alkali
Chorotype	Black Sea, Mediterranean to Afghanistan
Life form Raunkiaer	Annual Chamaephyte
Summer shedding	Leaves and flowers during summer
Succulence	Downy leaves and bracts are succulent
Salt resistance	Yes
Habitat or affinity to Vegetation formation	Sandy seashores and river banks
Synanthropy	Grows only in natural habitats
Chronology	First listed from Tyre Beach Reserve in the NCSR Report (1999).
Usage	It was used to prepare soap and their ashes were exported, before the First World War, from Lebanon to Italy and France for this purpose.
Status	Found along the coast
Identification	Upper leaves are spiny

#### A.1.5.1.2 The vegetal communities

This site is only 0-15 m. above sea level. According to Corine Classification (1999), the reserve belongs to the "Thermo-Mediterranean Level" of vegetation which encompasses Mediterranean habitats up to 500 m above sea level.

#### **A.1.5.1.2.1 Characteristics**

**A.1.5.1.2.1.1 Physical:** the site is an open narrow coastal ribbon between 200-500 m wide and approximately 4 km long. It includes the poorly stabilized dunes between the main road and the sea, the beach which is broadest to the north, but more fertile near Ras Al Ain, and the cultivated areas that are based on sandy fertile soil and irrigated either through raised concrete channels leading from the artesian wells or by ditches running along the fields boundaries. Influenced by the direct effect of the sea, the reserve is impacted by high humidity, sea breeze and waves (see climatic data above).

**A.1.5.1.2.1.2 Biotic:** the reserve is influenced by its proximity to the city, its irrigated farming, and its recreational attraction in summer times when wooden cafes are erected in the vicinity of the Rest House. The sand dunes which have scattered vegetation are used as pasture for small herds of cattle. The latter are also led to the freshwater sources on or near the beach. The most important animal habitat value identified in the evaluation process is the importance of the reserve as a seabird transit and resting area. This is of national significance and may also have international significance because of the number of rare and threatened species utilizing the reserve.

At the regional (Mediterranean) level, the reserve is valued for being an important area for visiting (Green Turtle and Leatherback Turtle) and summer nesting (Loggerhead Turtle). These species of marine turtles have been classified as endangered species at the meeting of contracting parties to the Barcelona Convention held in Greece in October 1998.

The reserve is almost treeless and deprived from large mammals.

**A.1.5.1.2.1.3 Quality:** direct human impact on the Tyre beach reserve is presently rather negative than positive. Despite the fact that the traditional farming practices are probably still sympathetic with the conservation needs, the other activities are of anti-conservation quality, e.g. when the bulldozers prepare the land on yearly basis to set up temporary wooden cafes or when using the back dunes of the beach area as dumping sites or wooden charcoal production sites, especially in the vicinity of Ras Al Ain, etc.

**A.1.5.1.2.1.4 Habitats & Vegetal formations:** According to Corine classification, the Tyre Beach Reserve lies under "Sand Dunes of Mediterranean Coast" type and belongs to "Dunes with *Euphorbia terracinea*" habitat (code 2220) where the grassland communities contain both *Euphorbia* and *Silene* species. But the reserve is characterized by the artesian wells or pools (semi-standing water) and the course of water towards the sea (running water) as well as the tiny marshy area with pebbles (still water) along the way of the water course. Such small wetland is difficult to match with any of Corine classification of natural habitats. For this reason and for the purpose of this study it would be suitable to divide the plant formations at Tyre Beach Reserve into four formation categories:

- **Formation of beach plants:** it is subdivided into two formations:
  1. **Formation of rock plants,** with *Arthrocnemum macrostachyum*, *Crithmum maritimum*, *Limonium graecum*, *Limonium sinuatum*.
  2. **Formation of sand and pebble plants,** with *Atriplex halimus*, *Convolvulus secundus*, *Echium angustifolium*, *Euphorbia paralias*, *Euphorbia peplis*, *Glaucium flavum*, *Ipomoea stolonifera*, *Otanthus maritimus*, *Pseudorlaya pumila*.  
A representative-site involving an area near the mouth of Ras el Ain stream at N 33° 13' 716'' E 35° 12' 689'' and about 3m altitude has a community which appeared to be chiefly characterized by *Atriplex halimus*, *Convolvulus secundus*, *Crithmum maritimum*, *Echium angustifolium*, *Euphorbia paralias*, *Euphorbia peplis*, *Glaucium flavum*, *Ipomoea stolonifera*, *Limonium graecum*, *Limonium sinuatum*, *Otanthus maritimus* and *Pseudorlaya pumila*.
- **Formation of sand dunes plants,** primarily with *Cakile aegyptiaca*, *Cyperus kalli*, *Matthiola tricuspidata*, *Muscari maritimum*, *Pancremium maritimum*, *Salsola kali*, *Silene colorata decumbens*; and secondarily with *Astragalus berytheus*, *Cakile aegyptiaca*, *Cyperus kalli*, *Daucus aureus*, *Daucus littoralis*, *Echium angustifolium*, *Emex spinosa*, *Eryngium maritimum*, *Hypocrepis multisiliquosa*, *Lagonychium farctum*, *Lagurus ovatus*, *Matthiola tricuspidata*, *Muscari maritimum*, *Pancremium maritimum*, *Plantago albicans*, *Plantago squarrosa*, *Polygonum maritimum*, *Salsola kali*, *Silene colorata decumbens*, *Trifolium scabrum*, *Trigonella cylindracea*, *Vulpia membranacea*.  
In a representative but clean site at N 33° 15' 333'' E 35° 12' 813'' and about 2m altitude, the main species of this community are represented by *Cakile aegyptiaca*, *Cyperus kalli*, *Inula graveolens*, *Muscari maritimum*, *Nigella arvensis mutica*, *Pancremium maritimum*, *Salsola kali* and *Silene colorata decumbens*
- **Formation of cultivated land plants,** with *Adonis annua*, *Convolvulus pentapetaloides*, *Medicago scutellata*, *Nigella arvensis mutica*, *Ononis hirta*, *Physalis peruviana*, *Salvia hierosolymitana*, *Salvia verbenaca serotina*, *Trigonella spinosa*, *Vicia hybrida*.  
In a representative sample site which was selected near Ras El Ain ponds at N 33° 13' 670 E 35° 12' 841 and c.6m altitude, the plants associated to this community are chiefly made from *Adonis annua*, *Cyperus rotundus*, *Ononis hirta*, *Physalis peruviana*, *Salvia verbenaca serotina*, *Trigonella spinosa* and *Vicia hybrida*
- **Formation of Ras Al Ain wetland plants,** with *Carex divisa*, *Carex extensa*, *Cyperus alopecuroides*, *Cyperus laevigatus*, *Ipomoea palmata*, *Lemna gibba*, *Vigna luteola*.  
An investigated sample area at N 33° 13' 683 E 35° 13' 062 and c.6m altitude provided a plant community composed of *Arundo donax*, *Carex divisa*, *Cyperus alopecuroides*, *Cyperus laevigatus*, *Ipomoea palmate* and *Vigna luteola*.
- **Formation of near-water plants,** with mainly *Arum hygrophilum*, *Epilobium hirsutum*, *Lycopus europaeus*, *Lythrum salicaria*, *Mentha aquatica*, *Mentha pelagium*, *Salix alba*, *Veronica anagallis-aquatica*. Other less important species may be added to this formation such as: *Alopecurus venticosus*, *Arum hygrophilum*, *Dipsacus laciniatus*, *Drabopsis verna brachycarpus*, *Epilobium*

*hirsutum*, *Hordeum hystrix*, *Lycopus europaeus*, *Lythrum salicaria*, *Mentha aquatica*, *Mentha pelagium*, *Myosotis caespitosa*, *Polygonum lapathifolium nodosum*, *Potentilla reptans*, *Pulicaria dysenterica*, *Salix alba*, *Scirpus tuberosus*, *Veronica anagallis-aquatica*.

#### A.1.5.1.2.1.4.1 Cover and stratification

The table below gives several parameters delimiting the identity of the four communities, including covers and stratifications:

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	Shrub<2m	Herbaceous	Cover
PE BB	<i>Crithmum maritimum</i>			+		6-10	+		+		2,8		20-50cm		15
LE & SA	<i>Euphorbia paralias</i>					3-9		+		+	2,8			30-50 cm	15
	<i>Otanthus maritimus</i>			+		5-11	+			+	2,8			30-50 cm	15
ND	<i>Limonium sinuatum</i>			+		5-7		+		+	2,6			20-50 cm	21
PL	<i>Echium angustifolium</i>					2-9		+		+	2,2			Long ±5cm	8
AN TS	<i>Ipomoea stolonifera</i>		+			4-10		+		+	1,			30-50 cm	4
	<i>Euphorbia peplis</i>				+	3-9	+			+	1,			Long ±5cm	4
	<i>Limonium graecum</i>			+		6-12		+		+	1			20-40 cm	3
	<i>Glaucium flavum</i>				+	2-8		+		+	1			30-60 cm	2
	<i>Convolvulus secundus</i>			+		4-7		+		+	1			30-60 cm	2
	<i>Atriplex halimus</i>			+		5-12		+	+		+			±100 cm	1
	<i>Pseudorhiza pumila</i>		+			3-5	+			+	+			10-30 cm	1
SA ND	<i>Inula graveolens</i>				+	7-12	+			+	3,2			30-80 cm	30
DU NE	<i>Cakile aegyptiaca</i>			+		12-6	+			+	2,8			15-60 cm	15
	<i>Salsola kali</i>			+		5-9	+			+	2,8			Up to 1m	15
PL	<i>Silene colorata</i>			+		2-5	+			+	2,2			20-40 cm	8
AN TS	<i>decumbens.</i>														
	<i>Nigella arvensis mutica</i>			+		5-6	+			+	1			10-15 cm	5
	<i>Cyperus kalli</i>				+	4-9		+		+	1			10-40 cm	4
	<i>Muscari maritimum</i>			+		3-4		+		+	1			10-20 cm	4
	<i>Pancreatum maritimum</i>			+		5-11	+			+	1			30-40 cm	4

AG	<i>Trigonella spinosa</i>			+		2-4	+		+	2,8			±10 cm	15
RIC	<i>Vicia hybrida</i>				+	2-5	+		+	2,8			20-60 cm	15
UL	<i>Cyperus rotundus</i>			+		5-12		+	+	2,8			15-60 cm	15
TU														
RA	<i>Adonis annua</i>				+	2-6	+		+	2,2			10-40 cm	8
L	<i>Physalis peruviana</i>			+		6-9		+	+	2			40-100 cm	5
	<i>Ononis hirta</i>			+		4-5	+		+	1			10-30 cm	4
SO	<i>Salvia verbenaca</i>			+		11-6		+	+				30-60 cm	1
IL	<i>serotina</i>													
PL														
AN														
TS														
PO	<i>Arundo donax</i>			+		7-11		+	+	3,2			2-6 m	30
ND														
&	<i>Cyperus alopecuroides</i>				+	1-12		+	+	3			±100 cm	25
ST														
RE	<i>Cyperus laevigatus</i>		+			1-12		+	+	2,2 5			10-50 cm	10
AM														
S	<i>Carex divisa</i>			+		2-7		+	+	2,2			25-80 cm	8
	<i>Ipomoea palmata</i>		+			9-11		+	+	1			1-2 m	5
PL														
AN	<i>Vigna luteola</i>		+			5-9		+	+	+			±10 m	2
TS														

#### 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 Tyre show regressive dynamics due to the extension of the agricultural activities over the area surrounding the ponds of Ras El Ain, the increase of pollution and garbage and because of the regular flattening of the dunes and the turning of the sand by the bulldozers for kiosk distribution over certain areas.

##### A.1.5.1.2.1.4.4 Evaluation of the degree of artificialization

The artificialization is observed as a result of the past human intervention (natural artesian wells turned into pools) and recent human interference (extension of agriculture areas, flattening of sand dunes, garbage, grass burning, construction of artificial lake, planting trees, etc.). However, the degree of artificialization ranges from medium to low and tends to remain at low level if appropriate conservation measures are taken and adopted.

##### 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 main high ligneous formations of the Tyre Beach Nature Reserve are mainly based on *Ipomoea palmata*, *Vigna luteola*, *Arundo donax* and *Crithmum maritimum*. These formations are of high regeneration rate that may reach up to 70-80%.

#### 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 until 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 Nature 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, produced a list of eight mammals. With more observation efforts during 2003 – 2004, the list presently indicates that Tyre Beach is habitat for only 13 mammal species distributed over 8 families (Annex 2 far below). Two of which are flying mammals that are generally considered threatened at both global and regional levels (bats). In addition, one more mammal is found to be globally threatened too, the *Meles meles canescens*. In addition, there is one very rare species in Lebanon, the *Acomys dimidiatus* and 8 restricted species to east Mediterranean area. Two of the mammals of Tyre Beach are pest species and indicators of organic waste accumulation, the domestic rat and mouse.

### 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 9. Eight species were selected to be a target for monitoring and evaluation. These are: the most threatened and rarest species *Vormela peregusna syriaca* for the fact that it is declining due to heavy persecution and loss of habitat, *Acomys dimidiatus* because of its rarity and fragmentation of its habitat, *Pipistrellus kuhli ikhawanius* and *Rhinolophus euryale judaicus* due to their beneficial role they play in feeding on flying insects, *Erinaceus europaeus concolor* which is an insectivorous of excellence that feeds on eggs and larvae of insects found in the soil and controls outbreaks of insects harmful to flora; and finally the most specialized predators of sea turtle eggs: *Vulpus vulpus palaestina* and *Rattus norvegicus norvegicus*. To these species the Egyptian Fruit-bat *Rousettus aegyptiacus aegyptiacus* is added for the role it plays in plant pollination.

##### 1.5.2.1.1.1 Rare (1)

Species	English Name	Local Name	Localization		Abundance
			Habitat	GPS	
<i>Acomys dimidiatus</i>	<b>Spiny Mouse</b>	Far chawki	Semi-arid area	Not seen inside the Reserve's boundary	Extremely low

##### 1.5.2.1.1.2 Endemic (4)

Species	English Name	Local Name	Endemism	Localization		Abundance
				Habitat	GPS	
<i>Pipistrellus kuhli ikhawanius</i>	<b>Kuhl's Pipistrelle</b>	Khaffach Kuhli	Middle East	Caves in adjacent hills and ravines.		Scarce
<i>Rhinolophus euryale judaicus</i>	<b>Mediterranean Horseshoe</b>	Watwat	Middle East	Caves in adjacent hills and ravines.		Very high
<i>Vormela peregusna syriaca</i>	<b>Marbled Polecat</b>	Zorban	Middle East	Various habitats from sea level to 1450 m.		Low
<i>Vulpus vulpus palaestina</i>	<b>Red Fox</b>	Thaalab	Middle East	Various habitats from sea level to 2000 m.		Scarce

#### 1.5.2.1.1.3 Noteworthy (6)

Species	English Name	Local Name	Value	Localization		Abundance
				Habitat	GPS	
<i>Erinaceus europaeus concolor</i>	<b>Hedgehog</b>	Quonfoz	Economic Bio-indicator	Plowed field		Common
<i>Pipistrellus kuhli ikhawanius</i>	<b>Kuhl's Pipistrelle</b>	Khaffach Kuhli	Economic	Caves in adjacent hills and ravines.		Scarce
<i>Rhinolophus euryale judaicus</i>	<b>Mediterranean Horseshoe</b>	Watwat	Economic	Caves in adjacent hills and ravines.		Very high
<i>Rousettus aegyptiacus aegyptiacus</i>	<b>Egyptian Fruit-bat</b>	Watwat el Fwakeh	Pollinator	Caves in adjacent hills and ravines.		High
<i>Vulpus vulpus palaestina</i>	<b>Red Fox</b>	Thaalab	Bio-indicator	Adjacent hills		Scarce
<i>Rattus norvegicus norvegicus</i>	<b>Brown Rat</b>	Jarzoun	Bio-indicator	Near houses and sea shore		Very high

#### 1.5.2.1.1.4 Introduced (Alien invasive) (0)

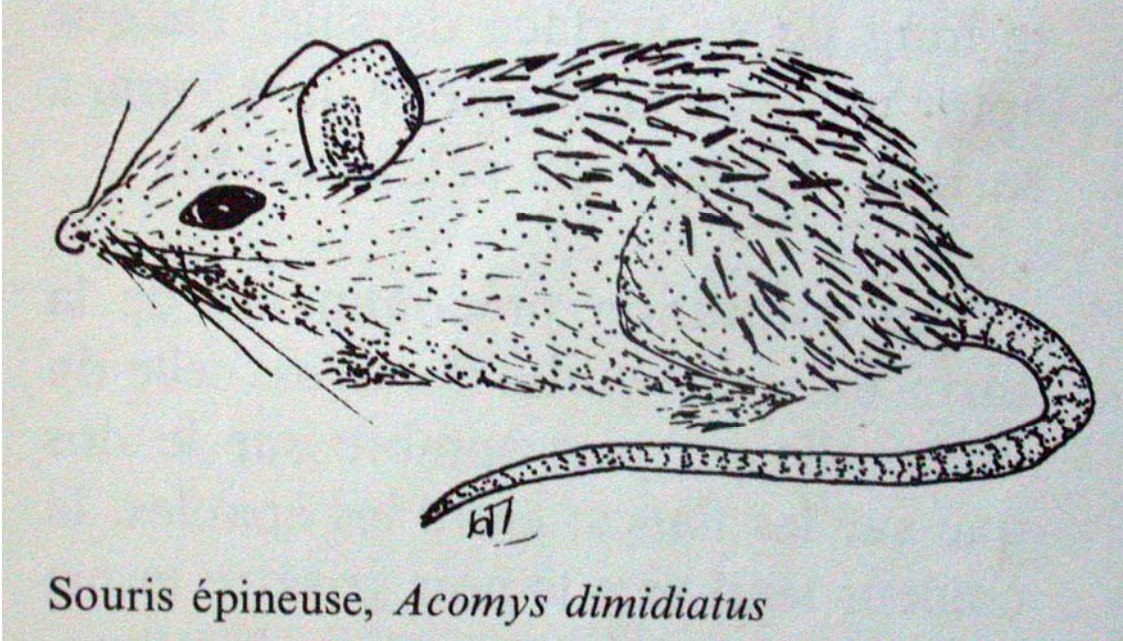
Species	English Name	Local Name	Origin	Localization		Abundance
				Habitat	GPS	

#### 1.5.2.1.1.5 Threatened (3)



Species	English Name	Local Name	Level of threat	Localization		Abundance
				Habitat	GPS	
<i>Pipistrellus kuhli ikhawanius</i>	<b>Kuhl's Pipistrelle</b>	Khaffach Kuhli	Threatened at Global & Regional levels	Caves in adjacent hills and ravines.		Scarce
<i>Rhinolophus euryale judaicus</i>	<b>Mediterranean Horseshoe</b>	Watwat	Threatened at Global & Regional levels	Caves in adjacent hills and ravines.		Very high
<i>Vormela peregusna syriaca</i>	<b>Marbled Polecat</b>	Zorban	Threatened at Global & Regional levels	Various habitats from sea level to 1450 m.		Low

#### A.1.5.2.1.1.6 Useful information and details about the selected species


<i>Acomys dimidiatus dimidiatus</i> <b>Spiny Mouse</b>
<b>Distribution</b>
This species ranges from Western Sahara and Nigeria to Egypt, E. Africa, Cyprus, southern Asia Minor, Iran and Pakistan. Europe, NW Africa reaching eastern China. In the Middle East they are found in Jordan, Palestine, and Oman.
<b>Lebanon:</b> Spiny Mouse is reported in Tyre and Joya.
 <p>Souris épineuse, <i>Acomys dimidiatus</i></p>
Drawing by Dr. H. Tohmé.
<b>Population:</b>
It is wide spread in its region. In <b>Lebanon:</b> status unknown
<b>Chronology:</b> First recorded from near Tyre by Lewis and Atallah (1967). The geographical repartition covers different countries from Kenya to Iran and to Algeria.
<b>Identification:</b>
This is a rather robust Spiny Mouse with the tail sub equal with the head and body. The scales of the tail are large and easily visible. The pelage over the posterior back from the mid-dorsal region to the root of the tail and extending laterally to the upper flanks is composed of rigid spines. The hairs on the anterior back are stiff but not bristly. Elsewhere the pelage is composed of fine hair. The coat color is sandy fawn.
<b>Habitat</b>
It favors all kind of rocky areas and is capable of living in very arid steppe-desert as well as well vegetated hills.

<i>Erinaceus europaeus concolor</i> <b>Hedgehog</b>
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<b>Distribution</b>
<b>Middle East:</b> The subspecies is Widespread in most countries of the Middle East. The species is also found elsewhere in Africa and Asia and from the central Europe to the Caspian sea.
<b>Lebanon:</b> Common in Lebanon, especially in the coastal plain. Its habitat do not apparently exceed 1300 meters. Reported from Hadath, Kfarchima, Bsaba, Nahr Ibrahim, Saida, Jaj, Laqlouq, Baalbek, Zahleh, Chmistar, Sarafand, Tamnine Tahta, Barouk, Mokhtara, Rihane, Jezzine, Farayya, Koura and Tyre.

Photo: Mounir Abi Saeed
<b>Population</b>
In its areas of distribution, this animal is well represented. <b>In Lebanon:</b> Common.
<b>Chronology</b>
First reported and photographed from Aammiq by Ghassan Ramadan-Jaradi (autumn, 2000; pers. comm.).
<b>Identification</b>
The Hedgehogs have rounded bodies up to 13 in. (33 cm) long, very short tails, and pointed snouts; their backs and sides are covered with stiff spines and their undersides with coarse hair. They are usually brown and yellow in color. When frightened, a hedgehog rolls itself into a tight ball with its spines pointing outward; when rolled up it is invulnerable to almost any predator.
<b>Habitat</b>
The Hedgehog is well represented in cultivated or semi-desert areas. Also found in Pine and olive groves as well as in forest edges, gardens and parks.



<i>Rousettus aegyptiacus</i> <b>Egyptian Fruit bat</b>
<b>Distribution</b>
The Egyptian Fruit Bats are widely distributed from SE. of Iran, Kishim Island in the Gulf through to Arabia, Turkey, Cyprus, and Africa where it is widely distributed from Egypt and Eritrea west to Ghana and South to Angola and the Cape. In the Middle East they are found in Jordan, Palestine, West Bank, Iraq, Syria, UAE.
<b>Lebanon:</b> They are reported in Beirut, Antelias, Akkar, Karm Saddeh.

Photo: Mounir Abi Saeed
<b>Population:</b>
This species is abundant in its area of distribution. <b>In Lebanon:</b> Abundant.
<b>Chronology:</b> Reported by Tohmé & Tohmé (1999) in the sky of Tyre.
<b>Identification:</b>
These are large, heavy built bats. They got short ears, powerful legs, long and powerful thumbs, the second digit bear a small terminal claw. Coat color is brown to light brown in color.
<b>Habitat</b>
They live in big caves.

<i>Rhinolophous euryale judiacus</i> <b>Mediterranean HorseShoe</b>
<b>Distribution</b>
The Mediterranean horseshoe bat ranges from Portugal east and north to east France, Iran; it is also present in Morocco and Tunisia. In the Middle East they are found in Jordan, Palestine, West Bank, Iraq, and Syria.
<b>Lebanon:</b> They are reported in Chnannir, Aaraya, S. Beqaa, Beit-Eddine, Moukhtara, Akkar.
<b>Population:</b>
This species is abundant in its area of distribution. <b>In Lebanon:</b> At risk due to agricultural practices.
<b>Chronology:</b> Reported by Tohmé & Tohmé (1999) in the sky of Tyre.
<b>Identification:</b>
These are a medium-sized horseshoe bats. The first phalanx of the fourth finger in each wing is distinctly short, hardly more than a third of the length of the second. The pelage is soft and dense. The color is variable some individuals are more grayish others brownish and always the under parts are lighter in color.
<b>Habitat</b>
They live in big caves.

<b>Genus <i>Pipistrellus</i>. <i>P. pipistrellus</i> &amp; <i>P. kuhlii</i> Common &amp; Kuhl's Pipistrelle</b>
<b>Distribution</b>
The Pipistrelle bat is distributed in Europe and Africa. In the Middle East they are found in Jordan, Palestine, West Bank, Iraq, Syria, Kuwait, Saudi Arabia, and UAE.
<b>Lebanon:</b> Common Pipistrelle is reported in Ammiq swamp, Mashghara while Kuhl's bat is reported throughout the country.

Photo by Ghassan RAMADAN-JARADI
<b>Population:</b>
This species is abundant in its area of distribution. <b>In Lebanon:</b> At risk due to agricultural practices.
<b>Chronology:</b> Reported by Tohmé & Tohmé (1999) in the sky of Tyre.
<b>Identification:</b>
These are small Vespertilionid bats. The wings are relatively narrow, only the tip of the tail projects from the interformal membrane, the outer border of which is supported by well developed calcars. The pelage is fine, dense and silky.
<b>Habitat</b>
They live in crevices in the walls and roofs of buildings.

<i>Vulpes vulpes palasteina</i> <b>Red Fox</b>
<b>Distribution</b>

The red Fox is very widely distributed with a range that includes Europe, Asia, Palaearctic Africa and N. America. The species is found in all the countries of the middle east.

**Lebanon:** The red fox is very abundant in Lebanon and is found throughout the country.



Photo: Mounir Abi Saeed

**Population:**

This species is abundant in its area of distribution. **In Lebanon:** Abundant

**Chronology:** Known in the region since ages

**Identification:**

The Red Fox got a long bushy tail with white spot at the end. The ears are relatively tall with elongated muzzle. The coat color is reddish or yellowish brown.

**Habitat**

The red fox is remarkably adaptable predator which is found in almost all available types of habitat.

<i>Vormela peregusna syriaca</i> <b>Marbled Polecat</b>
<b>Distribution</b>
Vormela peregusna ranges from the steppe and subdesert zones in Bulgaria and Romania to western China, south to Palestine, Israel, Lebanon, Syria and Turkey
<b>Lebanon:</b> First reported from Tyre by Tohmé & Tohmé (1999). The nearest documented record is by Louis and Atallah (1968) from Saida.

Photo: <a href="http://www.lenzopark.spb.ru/spec/r_spec6.shtml">http://www.lenzopark.spb.ru/spec/r_spec6.shtml</a>
<b>Population</b>
This species is of low abundance in its area of distribution and regionally threatened. <b>In Lebanon:</b> Uncommon
<b>Chronology:</b> First reported from Tyre by Tohmé & Tohmé (1999). The nearest documented record is by Louis and Atallah (1968) from Saida.
<b>Identification:</b>
Vormela peregusna brown and completely variegated with buff yellowish irregular lines and patches, with a yellowish white stripe extending laterally to the forehead. The tail is the same as in dorsal coloration with a dominant buff yellowish band in the mid-region of the tail, ending in the blackish terminal tip with longer hairs than the rest of the tail. Underparts and limbs are blackish brown.
<b>Habitat</b>
Various habitats from sea level to about 1450m.



### A.1.5.3 BIRDS

In the Ornithology of Lebanon, Tyre had been mentioned 42 times between 1864 and 1998 by only eight authors. They produced all together a list of 42 bird species recorded only from Tyre alone. The bird study that was carried out at Tyre by the NCSR in 1999 on behalf of the Protected Areas Project produced a list of 204 species. Since then the site was visited by Ramadan-Jaradi & Ramadan-Jaradi on regular basis and produced new and more significant records (see the list of Tyre bird species in Annex 3).

#### 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, 24 species of birds are selected but 6 of the noteworthy species (Graylag Goose, Shelduck, European Wigeon, Gadwall, Pintail and Shoveler) were omitted from the list of selected species due to their confirmed rarity during the implemented field activity. The remaining 18 species belong to 8 orders and 14 families:

##### 1.5.3.1.1.1 Rare (4)

Species	English Name	Local Name	Localization		Abundance
			Habitat	GPS	
<i>Botaurus stellaris</i>	<b>Bittern</b>	Waq	Reedbeds & Fields		Less than 5 records
<i>Crex crex</i>	<b>Corncrake</b>	Salwa	Cereal and other cultivated lands		5-6 individuals / year
<i>Glareola nordmanni</i>	<b>Black-winged Pratincole</b>	-	Cultivated wet fields and fringes of the marsh		5-6 records
<i>Gallinago media</i>	<b>Great Snipe</b>	Chikkob kbir	Cultivated wet fields		About 7 individuals/ year

##### 1.5.3.1.1.2 Endemic (5)

Species	English Name	Local Name	Endemism	Localization		Abundance
				Habitat	GPS	
<i>Glareola nordmanni</i>	<b>Black-winged Pratincole</b>	-	Middle East	All over		Low 5-6 records
<i>Pycnonotus xanthopygos</i>	<b>Bulbul</b>	Boulboul	Middle East	All over		Low

						c.23 pairs in orchards only
<i>Hippolais languida</i>	<b>Upcher's Warbler</b>	-	Middle East	All over		Low
<i>Sylvia mystacea</i>	<b>Ménétries's Warbler</b>	-	Middle East	All over		Low
<i>Serinus syriacus</i>	<b>Syrian Serin</b>	Na'ar souri	Middle East	All over		Medium

### 1.5.3.1.1.3 Noteworthy (11)

Species	English Name	Local Name	Value	Localization		Abundance
				Habitat	GPS	
<i>Ciconia ciconia</i>	<b>White Stork</b>	Liqlaq	Birdwatching, pest control and relative abundance	All over, especially meadows		High Few Hundreds
<i>Anas crecca</i>	<b>Teal</b>	Farfour	Gamebird and relative abundance	Waterbodies		Medium More than 30 indiv.
<i>Anas platyrhynchos</i>	<b>Mallard</b>	Sharif	Gamebird and relative abundance	Waterbodies		Medium Tens
<i>Anas querquedula</i>	<b>Garganey</b>	Farfour Saifi	Gamebird	Waterbodies		Low 16 individuals
<i>Coturnix coturnix</i>	<b>Quail</b>	Firri	Gamebird	Cultivated Fields		Very High Some Hundreds
<i>Streptopelia turtur</i>	<b>Turtle Dove</b>	Tirghal	Gamebird	Cultivated Fields, Trees		Medium 38 counted but should be more
<i>Melanocorypha calandra</i>	<b>Calandra Lark</b>	Matwaq	Gamebird	All over		Medium

						Scattered tens
<i>Pycnonotus xanthopygos</i>	<b>Bulbul</b>	Boulboul	Cagebird	Tree areas		Medium  c.23 pairs in orchards
<i>Acrocephalus arundinaceus</i>	<b>Great Reed Warbler</b>	-	Bioindicator	Reedbeds and vegetation bordering water.		Medium  More than 10 pairs recorded
<i>Sturnus vulgaris</i>	<b>Starling</b>	Zarzour	Gamebird	All over		Medium  Tens
<i>Serinus syriacus</i>	<b>Syrian Serin</b>	Na'ar Soury	Birdwatching Bioindicator	All over		Medium  Tens

#### 1.5.3.1.1.4 Introduced (Alien invasive) (2)


Species	English Name	Local Name	Origin	Localization		Abundance
				Habitat	GPS	
<i>Anas platyrhynchos</i>	<b>Domesticated Mallard</b>	Bat	Domestic stock			Extremely low  c.12 individuals
<i>Alectoris chukar</i>	<b>Captive Chukar Partridge</b>	Hajal	Mount Lebanon			Occasional  One individual


#### 1.5.3.1.1.5 Threatened (7)


Species	English Name	Local Name	Level of threat	Localization		Abundance
				Habitat	GPS	
<i>Falco naumanni</i>	<b>Lesser Kestrel</b>	-	Global	All over		Very Low  4 pairs nesting at the border of the

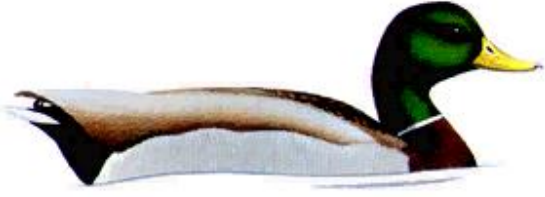
						reserve
<i>Crex crex</i>	<b>Corncrake</b>	Salwa	Global	All over		Low Low 5-6 records
<i>Glareola nordmanni</i>	<b>Black-winged Pratincole</b>	-	Regional	Cultivated Fields		Low Low 5-6 records
<i>Pycnonotus xanthopygos</i>	<b>Bulbul</b>	Boulboul	Regional	All over		Low c.23 pairs in orchards
<i>Botaurus stellaris</i>	<b>Bittern</b>	Waq	Regional	All over		Low Eleven records
<i>Ciconia ciconia</i>	<b>White Stork</b>	Laqlaq	Regional	All over		High Few Hundreds
<i>Serinus syriacus</i>	<b>Syrian Serin</b>	Na'ar Soury	Regional	All over		Medium Tens

#### A.1.5.1.1.6 Useful information and details about the selected species


<b><i>Botaurus stellaris</i> Great Bittern</b>
<b>Distribution</b>
<b>Middle East:</b> Uncommon to scarce resident and partial migrant in the region.
<b>Lebanon:</b> Recorded at Aammiq, Anjar, Beirut, Bhamdoun, Damour , Nahr el Kalb and Tyre.

Drawing: <a href="http://www.birdguides.com">http://www.birdguides.com</a>
<b>Population</b>
The European population is estimated at 10,000-12,000 pairs. Russian population 10000-30000 Turkish population 30-500. <b>In Lebanon:</b> About a dozen of individuals recorded during the last century.
<b>Chronology:</b> First mentioned at Tyre by Ramadan-Jaradi & Ramadan-Jaradi (1999) and NCSR (1999). Prior to 1999, the species apparently passed unnoticed due to scarcity and secrecy habits. Nowadays, the species is noted as scarce passage migrant.
<b>Identification</b>
When a Bittern does show itself, it appears as a rather chunky brown heron with somewhat owl-like plumage. In flight it has the pointed head and bill and long straggly legs of a heron but its broad, brown arched wings again recall an owl.
<b>Habitat</b>
Winters in marshes and reedbeds around lakes and fishponds.

<b><i>Ciconia ciconia</i> White Stork</b>
<b>Distribution</b>
<b>Middle East:</b> Breeding summer visitor and common passage migrant.
<b>Lebanon:</b> Abundant and regular on both passages, over whole country. Recorded at Aaichyeh, Aammiq, Ainata, Azour, Beirut, Beiteddine, Beqaa Valley, Bikfaya, Byblos, Dalhoun, Damour, Deir Mimas, Fatre, Harissa, Hasrout, Jamhour, Jounieh, Krak des Chevaliers, Nabatyeh, Niha, Qaraoun, Rayhan, Tripoli and Tyre.

Drawing: <a href="http://www.birdguides.com">http://www.birdguides.com</a>
<b>Population</b>
The European population is estimated at about 100,000 pairs. Russian population 3500-4000 Turkish population 15000-35000. <b>In Lebanon:</b> Regular on passage with daily peaks between 30-10000 individuals.
<b>Chronology:</b> First mentioned at Tyre by Ramadan-Jaradi & Ramadan-Jaradi in NCSR (1999). It appears to be only a passage migrant. The White Stork may breed there if not persecuted by man.
<b>Identification</b>
It is unmistakable, with a white body, mostly black wings, red legs and a long red bill.
<b>Habitat</b>
Feeds mostly in fields and meadows.

<b><i>Anas crecca</i> Teal</b>
<b>Distribution</b>
<b>Middle East:</b> Local resident, widespread passage migrant and winter visitor throughout most inland waters of region.
<b>Lebanon:</b> widespread and common passage migrant and winter visitor. Bred in the past near Baalbek. Sighted from Aammiq, Beirut, Litany River, Palm Islands, Qaraoun, Rachaya, Tanayel and Tyre.

Drawing: <a href="http://www.birdguides.com">http://www.birdguides.com</a>
<b>Population</b>
More than a million birds winter in north-west Europe. European breeding population about 350,000 pairs. Russian population 775000-1170000 Turkish population 100-1000. <b>In Lebanon:</b> There are about 500 winterers.
<b>Chronology:</b> First recorded at Tyre by Ramadan-Jaradi & Ramadan-Jaradi in NCSR (1999) as passage migrant only. During the field observations it was noticed that the species is a common winterer too.
<b>Identification</b>
The drake has a grey body, dark head and white line along the body like a male Wigeon but the Teal is much smaller and with an obvious yellow, almost white, triangular patch at the rear end. The female often has to be identified by her small size and plain grey bill but look out for the green patch in the speculum and the pale line along the edge of the tail. In flight, Teal are fast and agile, their small size, dark body and pointed wings making them appear almost like waders. Many books recommend the green speculum (that's the coloured panel in the secondaries) as the best field mark but, more realistically, look for a short but broad white line across the inner wing, more conspicuous than on any other duck.
<b>Habitat</b>
Winters on reservoirs, pools, estuaries and marshes.


<b><i>Anas platyrhynchos</i> Mallard</b>
<b>Distribution</b>
<b>Middle East:</b> Resident, partial migrant and very widespread winter visitor to most inland waters of the region.
<b>Lebanon:</b> widespread and common passage migrant and winter visitor. Reported from Aammiq, Anjar, Beirut, Litany River, Palm island, Qaraoun, Riachi River, Tanayel and Tyre.

Drawing: <a href="http://www.birdguides.com">http://www.birdguides.com</a>
<b>Population</b>
European population over 2 million pairs Russian population 650000-800000 Turkish population 5000-20000. <b>In Lebanon:</b> Counts are lacking but the species is common and seen sometimes in flocks of about 100 individuals.
<b>Chronology:</b> First recorded at Tyre by Ramadan-Jaradi & Ramadan-Jaradi in NCSR (1999) as passage migrant only. During the field observations it was noticed that the species is a common winterer too.
<b>Identification</b>
The Mallard is one of the commonest ducks. Some Mallards have been domesticated and so you may also see Mallard-like hybrids showing bewildering colours from khaki brown to pure white. The displaying male Mallard shows his colours very clearly as well as the diagnostic curly black uppertail feathers. The female Mallard is the standard dabbling duck against which all the others should be compared. Mallard in flight can be told by their relatively large size, the contrastingly dark-chested appearance of the males and the fact that the white borders on either side of the dark blue speculum are both equally obvious.
<b>Habitat</b>
Winters on any fresh and saltwater bodies. .

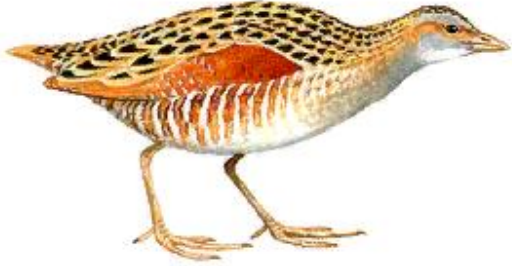



<b><i>Anas querquedula</i> Garganey</b>
<b>Distribution</b>
<b>Middle East:</b> Breeding summer visitor. Otherwise very widespread on passage throughout region.
<b>Lebanon:</b> Widespread and common passage migrant through most wetlands. Sighted from Aammiq, Beirut, Palm Islands, Qaraoun and Tyre.

Drawing: <a href="http://www.birdguides.com">http://www.birdguides.com</a>
<b>Population</b>
The minimum European population is estimated at 80,000-90,000 pairs. Russian population 570000-960000 Turkish population 500-1000. <b>In Lebanon:</b> Counts are lacking but the species is common and seen sometimes in great numbers peaking at about 6000-10000 birds per day.
<b>Chronology:</b> First recorded at Tyre by Ramadan-Jaradi & Ramadan-Jaradi in NCSR (1999) as passage migrant only. It may breed if not persecuted and disturbed.
<b>Identification</b>
The male Garganey is most striking, with a huge, extended white stripe over each eye. Females are harder to identify, but compared with the similarly small Teal they have a more obvious pale eye stripe, pale throat and pale spot at the base of the bill. This gives the whole head a more contrasting, 'stripey' look. In flight, the Garganey is agile like a Teal but the males have obvious pale blue forewing patches. In females the forewing can be grey but this can be barely noticeable. Look instead at the white borders to the speculum. In a Teal the front bar in the middle of the wing would be widest but in Garganey these lines are either of equal width or are widest on the trailing edge, more like a Pintail. The Garganey has a more contrasting black and white underwing pattern than Teal.
<b>Habitat</b>
Summer and passage visitor to well-vegetated water bodies and marshes.


<b><i>Falco columabrius</i> Merlin</b>
<b>Distribution</b>
<b>Middle East:</b> Scarce on passage and widespread winter visitor in most northern parts of region.
<b>Lebanon:</b> Uncommon passage migrant and scarce and localized winter visitor. Recorded at Aammiq, Arz el Chouf, Beirut, Beqaa Valley, Bustan, Chbouq, Damour, Hermel.

Drawing: <a href="http://www.birdguides.com">http://www.birdguides.com</a>
<b>Population</b>
10-17,000 breeding pairs across Scandinavia, Iceland and the British Isles. <b>In Lebanon:</b> Real counts are replaced by samplings. There are about 20 records of the species whilst the number of winterers didn't exceed 2 individuals.
<b>Chronology:</b> First noted at Tyre by Ramadan-Jaradi & Ramadan-Jaradi (2002). The same authors found it breeding at Tyre archeological area in May 2002. This globally threatened species was previously considered a former breeder in Lebanon at Baalbek.
<b>Identification</b>
The Merlin has the pointed wings of a Kestrel but is smaller and shorter tailed with dark duller plumage. It flies with great speed and agility using quick shallow wing-beats. At close range its moustache is less obvious than on any other falcon. Adult males are slatey-blue above with a black tip to the tail: females and immatures are a dull dark brown above, heavily streaked below.
<b>Habitat</b>
Winters on open moorland, estuaries and marshes.

<b><i>Coturnix coturnix</i> Quail</b>
<b>Distribution</b>
<b>Middle East:</b> Breeding summer visitor, widespread on passage and few overwinter.
<b>Lebanon:</b> Uncommon and localised migrant. 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 and Tyre.

Drawing: <a href="http://www.birdguides.com">http://www.birdguides.com</a>
<b>Population</b>
650 000-900 000 breeding pairs common across Europe but rare in the north. <b>In Lebanon:</b> The passing birds are in thousands whilst the winterers are very few and the summer breeders are widely fluctuating due to excessive hunting pressure.
<b>Chronology:</b> First recorded at Tyre by Ramadan-Jaradi & Ramadan-Jaradi in NCSR (1999) as passage migrant only. It may breed if protected.
<b>Identification</b>
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.
<b>Habitat</b>
Breeds in arable fields and long grass.


<b><i>Crex crex</i> Corncrake</b>
<b>Distribution</b>
<b>Middle East:</b> Widespread on passage throughout region.
<b>Lebanon:</b> Uncommon passage migrant over the country with peaks of up to six birds. Recorded at Aammiq, Beirut, Palm Islands, Tyre.

Drawing: <a href="http://www.birdguides.com">http://www.birdguides.com</a>
<b>Population</b>
87-97,000 breeding pairs widespread but uncommon across Europe and rare in the north. <b>In Lebanon:</b> The yearly recorded birds are apparently not exceeding a dozen.
<b>Chronology:</b> First noted at Tyre by Ramadan-Jaradi & Ramadan-Jaradi (2002). Data is not sufficient to track species evolution or dynamism on the site.
<b>Identification</b>
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.)
<b>Habitat</b>
Found in cultivated lands, meadows and other open grassy lands.

<b><i>Glareola nordmanni</i> Black-winged Pratincole</b>
<b>Distribution</b>
<b>Middle East:</b> Localized breeding summer visitor E Turkey, elsewhere normally scarce on passage, chiefly through E Mediterranean countries.
<b>Lebanon:</b> uncommon to rare passage migrant. Recorded at Aammiq, Dalhoun, Palm Islands, Saida and Tyre.

Drawing: <a href="http://www.birdguides.com">http://www.birdguides.com</a>
<b>Population</b>
50-100 pairs breed in Europe, plus up to 11,000 in Russia. <b>In Lebanon:</b> There are about 8 records of this species at least during the last 33 years.
<b>Chronology:</b> First reported from Tyre by Ramadan-Jaradi & Ramadan-Jaradi in NCSR (1999) as passage migrant.
<b>Identification</b>
Black-winged Pratincoles get their name from their completely dark underwings, lacking the copper coverts of a Collared Pratincole, but in the strong Mediterranean light, all pratincoles usually look dark below anyway. The presence or absence of the white trailing edge of the secondaries is usually easier to determine; if this is lacking, the bird will be a Black-winged Pratincole. At rest they are even harder to separate but Black-winged Pratincoles are darker brown above and even in full breeding plumage show hardly any red at the base of the bill. Also, the tails of both adults and juveniles are shorter, falling well short of the wing tip at rest.
<b>Habitat</b>
Most likely to occur on passage on flat, dry, open areas often close to wetlands.


<b><i>Gallinago media</i> Great Snipe</b>
<b>Distribution</b>
<b>Middle East:</b> Scarce to rare passage migrant.
<b>Lebanon:</b> uncommon to rare but regular passage migrant. Recorded at Aammiq, Beirut, Beqaa Valley, Faraya, Palm Islands, Tyre.

Drawing: <a href="http://www.birdguides.com">http://www.birdguides.com</a>
<b>Population</b>
The European population is 21-34,000 pairs. <b>In Lebanon:</b> There are about 26 records of this species at least during the last 40 years.
<b>Chronology:</b> First recorded at Tyre by Van Dyck (1881) and then by Ramadan-Jaradi & Ramadan-Jaradi in NCSR (1999) as passage migrant only.
<b>Identification</b>
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.
<b>Habitat</b>
Most likely to occur on passage on flat, wet, open areas often close to wetlands.


<b><i>Streptopelia turtur</i> Turtle Dove</b>
<b>Population</b>
<b>Middle East:</b> Chiefly summer breeder and migrant.
<b>Lebanon:</b> Fairly widespread but uncommon summer breeder and very common passage migrant across the country. Recorded at Aammiq, Aichyeh, Aramta, Arz el Chouf, Barouk, Beirut, Damour, Deir el Qamar, Hermel, Kefraya, Kfarhouneh, Khaldeh, Mlikh, Palm Islands, Qaa, Qaraoun, Sit Chawaneh and Tyre.


Drawing: <a href="http://www.birdguides.com">http://www.birdguides.com</a>
<b>Population</b>
About 2 million breeding pairs across most of Europe. Perhaps also as many as 5 000 000 in Turkey alone. <b>In Lebanon:</b> There are about 500 pairs in three localities: Qaa, Hermel and eastern slopes of Jabal Barouk..
<b>Chronology:</b> First recorded at Tyre by Ramadan-Jaradi & Ramadan-Jaradi in NCSR (1999) as passage migrant only.
<b>Identification</b>
Turtle Doves are similar in size and shape to a Collared Dove although they have a shorter tail, more pointed wings and a more darting agile flight. The chequered black and rufous upper parts are diagnostic and easily seen. Look also for their darker underwing, the narrow white border around the tail and the black and white collar patches like the gill slits of a dog-fish.
<b>Habitat</b>
Breeds in young woodlands, copses, hedgerows and scrub.


<b><i>Melanocorypha calandra</i> Calandra Lark</b>
<b>Distribution</b>
<b>Middle East:</b> Resident, partial migrant and winter visitor.
<b>Lebanon:</b> Local breeding resident. Abundant on passage. Smaller numbers overwinter in in the Beqaa Valley, low bordering hills and Tyre.

Drawing: <a href="http://www.birdguides.com">http://www.birdguides.com</a>
<b>Population</b>
Between 1 and 3 million pairs in Spain. Elsewhere in Europe the bird is scarce with just small populations in France, Italy, and some south-eastern European countries. <b>In Lebanon:</b> There are about 1000 pairs in the western Beqaa only: It is recorded from Aammiq, Anti-Lebanon, Beqaa Valley, Hermon, Marjaayoun Valley and Palm Islands and Tyre.
<b>Chronology:</b> First mentioned from Tyre by Ramadan-Jaradi & Ramadan-Jaradi in NCSR (1999).
<b>Identification</b>
Calandra Larks often look too big to be larks so at first glance you might think they are waders or even small birds of prey! At rest, the large size, massive conical bills and prominent black neck patches quickly eliminate all the other larks except Bimaculated Lark. Calandras can be separated from this species by their plainer faces, white outer feathers and white trailing edge to the wings.
<b>Habitat</b>
Resident in dry open areas, especially extensive rolling plains, cultivated lands and meadows.





<b><i>Pycnonotus xanthopygos</i> Bulbul</b>
<b>Distribution</b>
<b>Middle East:</b> Resident breeder.
<b>Lebanon:</b> Very common and widespread breeding resident in most scrub and wooded habitats, from sea-level to c. 1000 metres, and locally in Beqaa. It is recorded from Aammiq, Aichyeh, Aley, Aramta, Azour, Beirut, Dalhoun, Kfarhouneh, Mlikh, Qaraoun, Ryhan, Saida, Tanayel, Baabda and Tyre.

Drawing: <a href="http://www.birdguides.com">http://www.birdguides.com</a>
<b>Population</b>
5 000 breeding pairs are found in Turkey, part of a larger breeding population in the Middle East. <b>In Lebanon:</b> There are about 2000 pairs in the coastal strip only.
<b>Chronology:</b> First mentioned at Tyre by Tristram (1864) and then by Ramadan-Jaradi & Ramadan-Jaradi in NCSR (1999) as resident breeder.
<b>Identification</b>
If you see a bulbul in the Middle East with a yellow vent then you can be sure it is a Yellow-vented Bulbul and you should notice that it also has a pale ring around the eye and a more contrastingly black head compared with a Common Bulbul.
<b>Habitat</b>
Resident in tall bushes or trees such as in riversides, parks, orchards and gardens.

<b>Hippolais languida Upcher's Warbler</b>
<b>Distribution</b>
<b>Middle East:</b> Breeds in hilly areas in southern Turkey such as on the plateau areas above Durnalik and Isikli, near Gaziantep.
<b>Lebanon:</b> 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: <a href="http://www.birdguides.com">http://www.birdguides.com</a>
<b>Population</b>
1 000 breeding pairs in southern Turkey, part of a larger population found in the Middle East, and further afield in Afghanistan. <b>In Lebanon:</b> 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
<b>Chronology:</b> First recorded at Tyre by Ramadan-Jaradi & Ramadan-Jaradi in NCSR (1999) as passage and probable breeder.
<b>Identification</b>
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.
<b>Habitat</b>
Breeds in rocky, hilly areas with sparse bushes although they also occur lower down in orchards and olive groves.

<b><i>Sylvia mystacea Menetries Warbler</i></b>
<b>Distribution</b>
<b>Middle East:</b> In this region it is restricted to south-east Turkey where, from Birecik eastwards, it seems to be the commonest of the dark-headed <i>Sylvia</i> warblers.
<b>Lebanon:</b> The breeding was confirmed at Dalhoun (south of Beirut) during the springs 2000 and 2001 with at least four pairs in a degraded garrigue area of c.500 hectares (Ramadan-Jaradi and Ramadan-Jaradi, 2002).

Drawing: <a href="http://www.birdguides.com">http://www.birdguides.com</a>
<b>Population</b>
1 100 breeding pairs southern Turkey. A larger population is found in Turkmeniya and Uzbekistan. <b>In Lebanon:</b> There are no statistics for breeding pairs. It is recorded from Anti-Lebanon, El Qaa, Aammiq, Assi,, Dalhoun, Kfarhouneh, Aichyeh, Ryhan, Aramta, Mlikh.
<b>Chronology:</b> First recorded at Tyre by Ramadan-Jaradi & Ramadan-Jaradi in NCSR (1999) as passage migrant. Apparently a probable breeder too ( <i>pers. obs.</i> ).
<b>Identification</b>
Most adult males show only a subtle hint of pink underneath so, with their grey upperparts and black hood, they look very similar to Sardinian Warblers. Notice though that the black hood becomes greyer towards the nape, that the tertials are relatively plain and that the black tail is constantly waved around as uncontrollably as the wagging tail of a dog. Females don't look as obviously 'hooded' as female Sardinian Warblers and their delicately coloured upperparts, plain sandy-brown with hints of grey, are much more reminiscent of female or juvenile Subalpine warblers. Menetries's Warbler, however looks dumpier in shape with shorter wings and a shorter-looking, more rounded head and the way it shakes its tail means you can't fail to notice that it is mainly black, unlike a Subalpine.
<b>Habitat</b>
Breeds in areas of dense undergrowth such as in hedgerows and on the sides of wadis.

<b><i>Acrocephalus arundinaceus</i> Great Reed Warbler</b>
<b>Distribution</b>
<b>Middle East:</b> Breeding summer visitor. Otherwise widespread migrant and few winters.
<b>Lebanon:</b> Common migrant breeder and common on passage over much of the country. It is reported from Aammiq, Damour, Khaldeh, Litani River, Qaraoun and Tyre.

Drawing: <a href="http://www.birdguides.com">http://www.birdguides.com</a>
<b>Population</b>
1-10 million breeding pairs in Italy, France, Spain, Portugal, Turkey and the Balkans. <b>In Lebanon:</b> There are no statistics for breeding pairs. It is recorded from Aammiq, Ain Zhalta, Beqaa, Bikfaya, Deir el Qamar, Palm Islands, Qaraoun and Tyre.
<b>Chronology:</b> First recorded at Tyre by Ramadan-Jaradi & Ramadan-Jaradi in NCSR (1999) as passage migrant and probable breeder.
<b>Identification</b>
Easily located by its 'zitting' song. If you look at where the song is coming from you'll be lucky to see more than just a dot jerking erratically through the air. If you do get a decent view you'll find a rather scraggy looking bird, heavily streaked with a short dumpy body and wings and a little spike of a tail tipped with prominent white spots.
<b>Habitat</b>
Breeds and winters in marshy areas, ditches and dykes, especially near the coast.

<b><i>Sturnus vulgaris</i> Starling</b>
<b>Distribution</b>
<b>Middle East:</b> Resident to partial migratory to winterer.
<b>Lebanon:</b> Common on passage over much of the country and widespread abundant winter visitor. Reported from Aammiq, Aramta, Beirut, Beqaa, Kanntari, Kfarhouneh, Mlikh, Ryhan and Tyre.

Drawing: <a href="http://www.birdguides.com">http://www.birdguides.com</a>
<b>Population</b>
35-50 million breeding pairs across most of Europe except Spain, southern Italy and Greece. In Lebanon: there are flocks of thousands in the Beqaa in winter.
<b>Chronology:</b> First noted at Tyre by Ramadan-Jaradi & Ramadan-Jaradi in NCSR (1999) as passage migrant. There were scattered sightings throughout the last 10 years.
<b>Identification</b>
Starlings have mainly black bodies and yellow bills like Blackbirds but they are smaller and fatter with more pointed heads and longer, more pointed wings. Their plumage is always speckled although in summer the markings on the breast are replaced by iridescent tones of green and blue. Juveniles start off as plain brown with a black bill and characteristic shape.
<b>Habitat</b>
Winters in cities, gardens and farmland.

<b><i>Serinus syriacus</i> Syrian Serin</b>
<b>Distribution</b>
<b>Middle East:</b> Resident, dispersive, migrant to partial migratory and winterer.
<b>Lebanon:</b> Resident augmented by migrants and winterers. Reported from Aammiq, Aichyeh, Ain Zhalta, Ainata, Anti-Lebanon, Aramta, Azour, Baalbek, Barouk, Bcharre, Bmouhreh, Ehden, Hermon, Jaj, Jebel Barouk, Kammouha:, Kefraya, Kfarhouneh, Masser El Schouf, Mlikh, Ryhan, Tannourine, Tyre and Yammouna.

<b>Population</b>
Numbers of this Middle Eastern bird are not known. Instead, the average number of breeding pairs in suitable habitats of Lebanon is 14 (between 8.29 and 20.7).
<b>Chronology:</b> First noted at Tyre by Ramadan-Jaradi & Ramadan-Jaradi in NCSR (1999) as visitor.
<b>Identification</b>
Relatively paler and tail slightly longer than in European Serin. Yellowish washed with grey on the upper parts, head and chest. The front and the ocular circle as well as the upper tail and the wing bares are more yellowish.
<b>Habitat</b>
Nests on hill's slopes with shrubs, bushes, cedar or juniper trees. Winters at lower altitudes in bottom of valleys or in cultivated lands.

#### A.1.5.4 REPTILES AND AMPHIBIANS

Apparently there is no major herpetological work conducted at Tyre Beach Reserve prior to 1999. Instead, there is one comprehensive paper on the distribution of the herpetofauna species over the Lebanese territories (including Tyre), that was published by Hraoui-Bloquet et al (2002). 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. Bosch (1998) and Bosch et al (1998) have published recent work on the Lebanese herpetofauna.

These works together with recent field work have resulted in a species list shown in Annex 4 far below:

#### 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 Annex 9 far below. However, 8 species of herpetofauna are selected (one amphibian of the order Anura and 7 reptiles of the orders Chelonia and Squamata). These species are distributed over seven families.

##### 1.5.4.1.1.1 Rare (3)

Species	English Name	Local Name	Localization		Abundance
			Habitat	GPS	
<i>Chelonia mydas</i>	<b>Green turtle</b>	Soulhafat khadra'a	National Sea water		Very low
<i>Caretta caretta</i>	<b>Logger-head sea turtle</b>	Soulhafat kabirat al raa's	National Sea water		low
<i>Chalcides ocellatus ocellatus</i>	<b>Ocellated skink</b>	Skankour zouami	Sandy beach		low

##### 1.5.4.1.1.2 Endemic (1)

Species	English Name	Local Name	Endemism	Localization		Abundance
				Habitat	GPS	
<i>Acanthodactylus shreiberi syriacus</i>	<b>Shreiber's lizard</b>	Souhlia Shreiber	Regional	In sandy costal beach (in Lebanon)		High (in this beach)

## 1.5.4.1.1.3 Noteworthy (7)

Species	English Name	Local Name	Value	Localization		Abundance
				Habitat	GPS	
<i>Rana bedriagae</i> ( <i>R.levantina</i> )	<b>Levant frog</b>	Dofdaa Charki	Pest control & bio- indicator Edible	Water		High
<i>Mauremys</i> <i>casgica rivulata</i>	<b>Caspian mauremys</b>	Sulhafat amid	Pest control & bio- indicator	Stream- Water		Medium
<i>Chelonia Mydas</i>	<b>Green turtle</b>	Sulhafat Khdra'a	-Planktonic control by young -Algae control by juveniles and adults - Edible (body & eggs) - Ornamental shell	Sea Water		Very Low
<i>Caretta caretta</i>	<b>Logger- head turtle</b>	Sulhafat Dakhmat al ra'ass	-Planktonic control by young -Jelly fish Control by juveniles and adultes - Edible (body & eggs) - Ornamental shell	Sea Water		Low
<i>Laudakia stellio</i> <i>stellio</i>	<b>Hardun (Agama)</b>	Hardun	Pest control	Rocky part (in Rass Al Ain) & near trees of the reserve.		Low



<i>Chalcides ocellatus ocellatus</i>	<b>Ocellated skink</b>	Skinkour zouami	Pest control	In sandy beach		Low
<i>Acanthodactylus shreiberi syriacus</i>	<b>Shreiber's lizard</b>	Suhliat Shreiber	Pest control	In Sandy beach		High






#### 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 (4)

Species	English Name	Local Name	Level of threat	Localization		Abundance
				Habitat	GPS	
<i>Chelonia myda</i>	<b>Green Marine turtle</b>	Sulhafat Khdra'a	Globally	Sea Water		Very low
<i>Caretta caretta</i>	<b>Logger-head marine turtle</b>	Sulhafat kabirat al ra'as	Globally	Sea Water		Low
<i>Chalcides ocellatus ocellatus</i>	<b>Ocellated skink</b>	Skankour Zouami	Regionally	Sandy Beach		Very low
<i>Acanthodactylus shreiberi syriacus</i>	<b>Shreiber's lizard</b>	Suhliat shreiber	Regionally	Sandy Beach		High (In this Beach)


#### A.1.5.4.1.1.6 Useful information and details about the selected species

<b><i>Rana bedriagae</i> Levant Frog</b>	
 <b>distribution</b>	
<b>Middle East:</b> The distribution of this species is not well known, in the north it occupies whole Anatolia, probably parts of Thracia (Greece), the frogs from El-Fayum (near Cairo) belongs to this taxon, but their extension to the South and East are unknown. This species is very common in Syria, Palestine, Jordan, Palestine.	
<b>Lebanon:</b> Common and widespread. This species is dependent of fresh water for its reproduction, for its metamorphosis, for juveniles and for adults. It is observed from sea shore to 1800m of altitudes.	
	
Photo by Akos Baracsy	
 <b>population</b>	
The population size of this species is not well known in the Middle East, <b>In Lebanon:</b> Common and widespread but population size is unknown.	
<b>Chronology:</b> The species was mentioned by Hraoui-Bloquet in NCSR (1999) at Tyre under the scientific name <i>Rana esculenta</i> and by R. Sadek (2000) under the scientific name <i>Rana Leventina</i> . In 2002, it was described by Hraoui-Bloquet et al. under the name <i>R. bedriagae</i> .	
 <b>identification</b>	
A member of the water frog group with green to brown backs, this taxon is very similar to <i>Rana ridibunda</i> . They are distinct mostly in frequency differences of electrophoretic alleles (e.g a-GDH:b (a slow allele) is predominant compared to the a (a fast allele) <i>Rana ridibunda</i> ) and voice parameters. Snout is obtusely pointed. Prominent dorso-lateral glandular ridge from above tympanum to groin. Dorsum brownish or greenish (highly variable), irregularly blotched with large black spots, cross bars on limbs, black marbling on rear sides of thighs. Some individuals with yellowish to pinkish vertebral stripe. Venter white, more or less marbled dark gray.	
 <b>habitat</b>	
Strongly aquatic, inhabits lakes, pools or slowly flowing streams with much vegetation. Stays in close proximity of water bodies and prefers low plains or marshes. Sometimes seen in strong currents. A gregarious and diurnal species, but can forage also in the nighttime. Main diet is insects.	

<i>Mauremys caspica rivulata</i> <b>Caspian mauremys</b>	
 <b>distribution</b>	
<b>Middle East:</b> fresh water inhabitant in: Lebanon, Syria and Palestine	
<b>Lebanon:</b> Fresh water inhabitant, basins, ponds and streams, rivers...from the coast level, in Tyre (at Ras El Ain), to 800 m of altitude, in the Bekaa valley (Aammiq, the marsh region) and Litani etc...It is not very common in Lebanon and not widespread. Breeds on the edges of rivers.	
	
Photo by Jeroen Speybroeck	
 <b>population</b>	
The population size of this species is not well known in the Middle East, <b>In Lebanon:</b> abundance is medium.	
Chronology: This freshwater turtle was cited at Ras El Ain of Tyre for the first time by Lortet (1883) as abundant species. In 1999, it was described by S. Hraoui-Bloquet as a small population, and then in 2002 by S. Hraoui-Bloquet <i>et al.</i> to give it a new name <i>Mauremys caspica rivulata</i> .	
 <b>identification</b>	
Plastron rigid, without hinge; carapace low arched; sides of head with 2 or more narrow longitudinal light stripes on sides of head.	
 <b>habitat</b>	
in vicinity and in permanent fresh water: streams, rivers, ponds, reeds beds...It is active during the day. Its diet is mostly insects.	

<i>Laudakia stellio stellio</i> <b>Hardun</b>	
 <b>distribution</b>	
<b>Middle East:</b> This species is widespread in Lebanon, Syria, Palestine, Egypt, Jordan, Iraq, Turkey ...	
<b>Lebanon:</b> Widespread and very common. Lives in rocky areas and woodlands inhabitant. Breed on land in spring. Occurs from sea shore up to 2200 m. of altitude.	
	
Photo by Per Blomberg	
 <b>population</b>	
The population size of this species is not well known in the Middle East, <b>In Lebanon:</b> the abundance is high. This arboreal species is persecuted in Lebanon mainly by apiculturists.	
<b>Chronology:</b> It was cited for the first time at Tyre by Hraoui-Bloquet in NCSR (1999), and then in 2002 by S. Hraoui-Bloquet <i>et al.</i>	
 <b>identification</b>	
The body and head compressed, gular fold, dorsolateral folds, toes compressed, scales of tail arranged in spiny rings. Spiny and keeled dorsal and dorsolateral scales, ventral scales smooth. Color is grey with black and creamy dorso vertebral blotches.	
 <b>habitat</b>	
Rocky areas and woodlands (maquis, garrigue, fruit trees...) Diet mostly insects (it likes bees and it is not appreciated by apiculturists) and sometimes it eats fruits (cherry , black berries...).	



<b><i>Chelonia mydas</i> Green Turtle</b>
<b>X distribution</b>
<b>Middle East:</b> 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...)
<b>Lebanon:</b> 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
<b>W population</b>
<b>Abundance:</b> Very rare in countries of the Middle East. <b>In Lebanon:</b> uncommon and population size is unknown.
<b>Chronology:</b> This species was first cited by Hraoui-Bloquet in NCSR (1999) occurring in the sea water of Tyre as a non breeding turtle. In 2001, F. Demirayak <i>et al.</i> mentioned it breeding in the beaches of the southernmost areas of Lebanon.
<b>A identification</b>
They are called green turtles because of the color of the flesh. <i>Chelonia mydas</i> 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:** Described by Hraoui-Bloquet in NCSR (1999) as frequent in the water of the Tyre reserve but never mentioned as breeder there. The studies which were undertaken along the Lebanese coast in 2000 confirmed this status. In 2004, it was found breeding on Tyre Beach.

#### **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 occasionally eat algae and other plants as well.



<b><i>Chalcides ocellatus ocellatus</i> Ocellated skink</b>
 <b>distribution</b>
<b>Middle East:</b> The range of this species extends from the Algerian Sahara, through Egypt and Sinai, from Greece through Turkey....in Arabian Peninsula including, Yemen, Oman, United Arab Emirate, Saudi Arabia, Syria, Lebanon Israel, Jordan...
<b>Lebanon:</b> Only at low altitude. In the costal zone it is recorded from Beirut, Tripoli, Khaldi. Saida and Tyre where it lives in sandy habitat. The distribution of this skink in Lebanon is very limited. This species is threatened in Lebanon due to the pressure of urbanization in the costal zones.

Photo: Dr. Ryad Sadek
 <b>population</b>
<b>Abundance:</b> Not uncommon in countries of the Middle East. <b>In Lebanon:</b> this species is very rare. It is threatened due the disappeared of its habitat, the sandy beaches.
<b>Chronology:</b> This species was first cited at Tyre by Hraoui-Bloquet in NCSR (1999) and then by Hraoui-Bloquet <i>et al.</i> (2002), precisely at Ras El Ain area.
 <b>identification</b>
Lower eyelid with transparent disc, scales bordering ear not pointed or elongate. Body more or less elongated, limbs short. Color is light brown bright with a pattern of short light streaks (ocellae) bordered by dark pigment.
 <b>habitat</b>
Frequents the coastal sandy areas where it feeds on insects.

<b><i>Acanthodactylus shreiberi syriacus</i> Shreiber's Lizard</b>	
<b>X distribution</b>	
<b>Middle East:</b> The range of this species extends over Lebanon, Palestine and Cyprus.	
<b>Lebanon:</b> Only at low altitude. In the costal zone it is recorded from Beirut, Khaldeh, Tyre, Abbasieh and Mansouri where it lives in sandy habitats., Khaldi. The distribution of this lizard in Lebanon is very limited. This species is threatened in Lebanon due to the pressure of urbanization in the costal zones.	
	
Photo: Dr. Ryad Sadek	
<b>Ww population</b>	
<b>Abundance:</b> Uncommon in countries of the Middle East. <b>In Lebanon:</b> this species is rare but its density is high in the patchy habitats where it is encountered. It is threatened due the disappearance of its habitat, the sandy beaches.	
<b>Chronology:</b> First recorded by Hraoui-Bloquet in NCSR (1999) and in Hraoui-Bloquet <i>et al.</i> (2002).	
<b>id identification</b>	
In this lizard species the occipital shield is absent, lower eyelid scaly, distinct collar, digits sub-cylindrical with lateral denticulation or fringes, femoral pores present. The ground color is similar to the color of sand where it lives.	
<b>🌿 habitat</b>	
Frequents the coastal sandy areas where it feeds on insects during day time.	

### A.1.5.5 MICROFAUNA

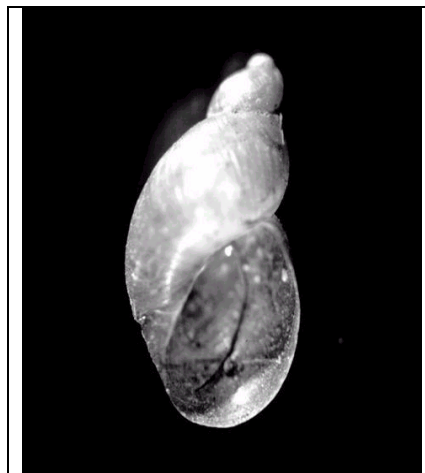
The group of freshwater and sub-freshwater invertebrates deserves special attention, especially at Ras Al Ain ponds that include the well which curves into the rock and which retains natural character. Also of interest is the marshy area, which is created by some levees along the way of the ditch that is draining the running water from the wells to the sea. In fact, nothing was known about the aquatic fauna of this area (Dia, A. *Pers. comm.*). Sightings made over recent visits, between November 2003 and May 2004, using Surber nets, entomologic nets and forceps in main and secondary ditches (altitude: 15-20m, length: 1 km, width: 1-1.5 m, Temperature of water: 21°-23° C) show that the microfauna is impoverished and includes 6 species distributed over 6 genera (Annex 5): Four of them are Gasteropods where one *Physella acuta* is polluo-resistant and found in the lower part of the stream with 5 individuals and a second *Succinea elegans* found in the small marsh that is situated near the stream with 10 individuals. The other two gasteropods are the *Melanopsis praemorsa buccinoida* (10 individuals) and *Theodoxus jordani* (30 individuals) and were found at the outlet of the source. A species of Hirudinea *Dina lineata concolor* with 4 individuals was found to proliferate in this site. One insect *Platycnemis dealbata* of the group Odonata was captured at an adult stage (2 males and 2 females) whereas the larvae of zygopterous Odonata were collected from aquatic vegetation.

As per Dia, the impoverishment in microfauna of aquatic habitat at Tyre reserve is due to the agricultural management and the proximity of the site (source and streams) to the sea. Also Dia considers that none of the encountered species is threatened, endemic or nationally rare. Only the *Succinea elegans* is apparently noteworthy.

### 1.5.5.1 The invertebrate species

#### 1.5.5.1.1 Useful information and details about the slected species

*Succinea (Oxyloma) elegans* Risso (Gastropoda)



**Distribution**

Mediterranean France: Argens et Mosson Rivers.

**Distribution in Lebanon**

Nahr El Kalb, Ras El Aïn (Tyre)..

**Habitat**

It lives in the submerged vegetation of the small marshes that are in the vicinity of streams.

**Population**

Considered as common in this small marsh of Ras El Ain since there were 10 collected individuals in two samplings.



**Identification**

Spiraled shell formed of three convex rounds. Shell opening is dextreous and the last round is developed. Apex is obtus and the opening is oval-otriangular. Simple and sharp peristoma.




### A.1.5.5.2 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 Tyre site by Mr. Bashar Merheb who was guided by several entomologists, 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 Tyre figure in the Annex 6 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		density	abundance
Coleoptera	Tenebrionodae Length:9mm.		low	Rare
Coleoptera	Tenebrionodae Length: 1.7 cm.		low	Rare









Coleoptera	Cantharidae Length: 1-1.2 cm.	 <p>Photo by B. Merheb</p>	medium	common
Coleoptera	Bostrichidae Length: 3 mm.	 <p>Photo by B. Merheb</p>	medium	uncommon
Coleoptera	Cicindellidae Length: 1.2 cm	 <p>Photo by B. Merheb</p> <p>Gen. <i>Cicindella</i></p>	Very high	uncommon




Coleoptera	Scarabeidae Length: 1.5 cm	 <p>Photo by B. Merheb</p>	low	Rare
Coleoptera	Scarabeidae Length: 1.5 cm.	 <p>photo by B. Merheb</p> <p><i>Tropinota squalida</i>(Pilosa,Bruille1832)</p>	*	
Coleoptera	Scarabeidae Length: 1.2 cm.	 <p>photo by B. Merheb</p> <p><i>Oxythyrea</i></p>	*	




		<i>albopicta</i> (Motchulsky1854)		
Coleoptera	Carabidae Length: 8 mm.	 <small>Photo by B. Merheb</small>	low	Rare
Coleoptera	Coccinellidae Length 3mm	 <i>Chilicorus bipustulatus</i> (Linnaeus1758)	low	Rare
Coleoptera	Cocinellidae Length 8mm.	 <i>Coccinella septempunctata</i> <a href="http://www.dierinbeeld.nl/animal">http://www.dierinbeeld.nl/animal</a>	low	Rare
Coleoptera	Cerambycidae Length 1 cm	 <small>photo by B. Merheb</small>	low	Rare



Coleoptera	Cerambycidae Length: 5-12mm	 <p data-bbox="619 775 874 831"><i>Certallum ebulinum</i> (Linnaeus1767)</p>	medium	uncommon
Coleoptera	Curculionidae Length: 6 mm	 <p data-bbox="683 1155 820 1178">Photo by B. Merheb</p>	low	Rare
Diptera	Tipulidae 5-8 mm		low	uncommon

Diptera	Bibionidae Length: 1 cm	 <p>Photo by B. Merrheb</p>	medium	common
Diptera	Ceratopogonidae Length: 1 cm	 <p>Photo by B. Merrheb</p>	high	Common
Hemiptera	Lygaidae Length: 1.7 cm	 <p>Photo by B. Merrheb</p> <p><i>Spilostethus pandurus</i>(Scopoli11763)</p>	low	common

Hemiptera	Lygidae Length: 7-10 mm	 <p>Photo by B. Merheb</p>	low	Rare
Hemiptera	Coreidae Length 1 cm	 <p>Photo by B. Merheb</p>	low	Rare
Hemiptera	Pentatomidae Length: 7 mm	 <p>Photo by B. Merheb</p>	medium	uncommon

Hemiptera	Pyrrhocoridae Length: 1 cm	 <p>Photo by B. Merheb</p> <p><i>Pyrrhocoris apterus</i>(Linnaeus1758)</p>	medium	common
Hymenoptera	Vespidae Length: 1cm	 <p>Photo by B. Merheb</p>	low	Rare
Orthoptera	Acrididae Length 2 cm.	 <p>Photo by B. Merheb</p>	low	common

### **A.1.5.5.3 The butterflies**

The determination of the butterflies of Tyre is the output of a combined effort that was exerted by all members of the team of experts when every time a 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 Tyre Beach reserve butterflies figures in the Annex 7.

### A.1.5.6 MICROFLORA

The algae constitute the essential component of microflora that is known as the primary producer of organic matter in aquatic habitats. Algae occupy the first compartment in the food chain or the base of the trophic pyramid. They constitute the source of food for aquatic animals. In the standing or still water such as marshes, algae are found fixed on other aquatic sessile plants. Otherwise, they are microscopic (e.g. *Chara*) and form an extensive cover on top of water.

Prior to 2001, virtually, nothing was found on algae of Tyre Beach Reserve in literature. Mouterde (1970) provided some data on aquatic plants that were afterwards updated by Tohmé et al. (1999). Slim and Nasreddine (2001) published an exhaustive list of Ras Al Ain ponds algae that is shown in Annex 8 below. The list encompasses 19 species and deprived from endemic species. The Cyanophyta is represented by 7 species whilst the Bacillophyta is represented by 12 only. Six of the latter group are also found at Aammiq Swamp. These are: *Achmanthes minutissima*, *Cocconeis placentula*, *Cymatopleura solea*, *Navicula pupula var. capitata*, *Nitzschia palea* and *Surirella ovata var. salina*. As for the evaluation and prioritization of these species, the author of this section suggests allocating, for instance, a high priority to the rare species and bio-indicators, mainly those which indicate a state of pollution or changes in the salinity of water. Further ecological and biological studies will certainly lead to a better assessment, and subsequently to improve the use of these species for conservation purposes.

#### A.1.5.6.1 The Microflora Species

The used methodology and criteria to limit the study to a certain number of species are the same as indicated above for the flora species and in Annex 9. However, 14 species of microflora are selected. These are prioritized as follows:

##### A.1.5.6.1.1 Rare (5)

Species	Value	Importance	Localization		Abundance
			Habitat	GPS	
<i>Merismopedia tenuissima</i>					
<i>Oscillatoria agardhii</i>					
<i>Paracapsa siderophila</i>					
<i>Wollea saccata</i>					
<i>Gomphonema truncatum</i>					

##### A.1.5.6.1.2 Endemic (0)

Species	English Name	Local Name	Endemism	Localization		Abundance
				Habitat	GPS	

**A.1.5.6.1.3 Noteworthy (6)**

Species	English Name	Value	Importance	Localization		Abundance
				Habitat	GPS	
<i>Microcystis flos-aquae</i>						
<i>Achnanthes minutissima</i>						
<i>Cocconeis placentula</i>						
<i>Cyclotella meneghiniana</i>						
<i>Nitzschia palea</i>						
<i>Surirella ovata</i>						

**A.1.5.6.1.4 Introduced (Alien invasive) (1)**

Species	English Name	Local Name	Origin	Localization		Abundance
				Habitat	GPS	
<i>Hyphomorpha antillarum</i>						

**A.1.5.6.1.5 Threatened (2)**

Species	Value	Importance	Level of threat	Localization		Abundance
				Habitat	GPS	
<i>Cymbella minuta</i>						
<i>Cymatopleura solea</i>						

**A.1.5.6.1.6 Useful information and details about selected species**



### **A.1.6 Ecological interest of the site**

Tyre Beach Reserve may be considered rare of its kind in Lebanon and subsequently has a great natural heritage value. Its biodiversity derives from several elements that are grouped in a small area of 3.8 km<sup>2</sup> only. These elements form a mosaic of habitats and include the only coastal dunes in the country associated with their dune fixing plants, the lentic and lotic juxtaposed waterbodies, the wide sandy beach that is of great attraction to marine turtles, the agriculture area, the Al Ain spring, streams and marshes which are located at few meters from the sea. The site is also of interest for the conservation of the dune-fixing plants and the varied fauna that is cited under “selected species”, especially the crane bird species, marine turtles, skinks and the wild mammals visiting the reserve. The reserve provides the needed cover to the sea crossing birds at the moment of their arrival to the land and represents a place for the classical role and function of littoral wetlands such as primary production, macroflora, birds (ecologically) and pasture (economically).

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

#### **A.1.7.1 Agriculture**

The practiced agricultural activities at Tyre are of different types but mainly: fodderculture and vegetable/ legumeculture. The latter is partly dominated by organic farming practices. However parts of the agricultural zone are still using fertilizing products which may reach the streams that are more or less connected to the marshy areas and as such changing the water quality and the bordering plants in favour of biodiversity loss. Unregulated, uncontrolled and missused pesticides are apparently still occurring and negatively affecting the whole food chain within the site. It is worthy to mention that any extension of agricultural areas will inevitably be on the account of the natural landscape and the natural marshy areas. Hence there is need to regulate the agricultural activities within the reserve.

#### **A.1.7.2 Pasture**

Pasture activity is nowadays regularly practiced mainly with cattles in some moody selected areas of the site. The heavy feet of cattles can less or more crash down the new shoots of the wild rare plant species or can have an effect on the microfauna and on the populations of the land nesting bird species such as larks, ducks, quails, etc. Furthermore, even when the number of livestock heads involved in grazing is small, the continuous pasture activity that is practiced in a reserve of very small surface can easily be qualified as an overgrazing.

#### **A.1.7.3 Fishing, frogging and egging**

The fishing activity that is of relevance to the Tyre Beach Reserve’s site is not studied yet and therefore can’t be assessed or appraised. Some primitive frogging activities using fishhooks may be rarely noticed along the streams’ sides. Such activities are still qualified traditional and harmless as far as the target is only *Rana badriagae*. Of concern is the matter of egging (taking eggs from nests of birds or marine turtles) which occurs discretely when some people visit the site for this purpose. There are rumors among the inhabitants that eggs of marine turtles are yearly taken by poachers but the egging from bird’s nests was confirmed when an old man showed us his basket filled with snails and few bird eggs.

#### A.1.7.4 Eco-tourism

The eco-tourism is presently limited to some birdwatching activities and few educational visits by locals. The recreational activities that are taking place each summer on parts of the sand dunes after being flattened by bulldozers are apparently geared up towards an organized activity.

#### A.1.7.5 Exploitation of the resources

With the exception of the egg activity as well as the agricultural, pastoral and recreational effects on Tyre Beach Reserve, the remaining activities are relatively of unnoticeable impact on the environment and biodiversity of this site. In fact:

- the illegal hunting is still taking place even near the army guard tower at Ras Al Ain.
- the charcoal production is reduced but also still occurring within the reserve site.
- the planting of introduced trees in the reserve indicates the need for more cooperation between the Governmental Appointed Committee and the Management Team.
- the collection of medicinal and other economically wild plant species is not frequent at Tyre Beach Reserve and therefore has a minimal impact on the site.

#### A.1.7.6 Industrialization - urbanisation

The Tyre Beach Nature Reserve is virtually free from any significant human agglomeration. Only the Rachidyeh Palestinian camp which separates the reserve into two parts offers questions about the integrity of the reserve.

#### A.1.7.7 Water management

The area is supplied with water from Ras Al Ain ponds (artesian wells) and doesn't apparently have problems of water supply or distribution among the farmers. Only the water surplus which is quickly reaching the sea could be managed to create for example a shallow marsh with outlet to the sea. Such marsh will inevitably add to the value of the reserve through waterfowl attraction.

#### A.1.8 Sensitivity level of the different habitats used by the selected species

The site undoubtedly shows a high sensitivity towards the urban management and the agricultural practices. Due to its small size, the site is so fragile to the introduction of exotic species, the flattening of dunes (habitat destruction) and other threats as indicated below:

HABITAT	PLANT KEY SPECIES	SENSITIVITY	THREATS
-Beach sand, pebble and rock Habitat -Sand dunes -Agricultural Habitat -Water Habitat	<i>Oenothera drumondi</i> <i>Pancreatum maritimum</i> <i>Ficus sycomorus</i> <i>Astragalus berytheus</i> <i>Euphorbia berytha</i> <i>Lemna paucicostata</i> <i>Alcea setosa palmate</i> <i>Ammi visnaga</i> <i>Crithmum maritimum</i> <i>Eryngium creticum</i> <i>Glaucum flavum</i> <i>Nasturium officinale</i> <i>Salvia sclarea</i> <i>Urginea maritime</i> <i>Verbena officinalis</i>	Sensitivity index=high - High specific richness - Presence of threatened and endemic species - Refuge for rare and persecuted species	Extension of agricultural areas Garbage Sand erosion Habitat artificialization Introduction of exotic plant species Charcoal production Plant picking Chemical pollution Habitat destruction

HABITAT	MAMMAL KEY SPECIES	SENSITIVITY	THREATS
All over	<i>Erinaceus europaeus concolor</i> <i>Rousettus aegyptiacus</i> <i>aegyptiacus</i> <i>Pipistrellus kuhli ikhawanius</i> <i>Rhinolphus euryale judaicus</i> <i>Vulpus vulpus palaestina</i> <i>Vormela peregusna syriaca</i> <i>Rattus norvegicus norvegicus</i> <i>Acomys dimidiatus</i>	Sensitivity index=Medium  - Refuge for rare and persecuted species.	- Deliberate killings & persecution by man - Destruction of habitat - Pollution and pesticides,

HABITAT	BIRD KEY SPECIES	SENSITIVITY	THREATS
Waterbodies	<i>Botaurus stellaris</i> <i>Anas crecca</i> <i>Anas platyrhynchos</i> <i>Anas querquedula</i> <i>Acrocephalus arundinaceus</i>	Sensitivity index=Medium - Presence of rare species	Fragmentation Pollution Garbage Hunting
Reed beds or water edge vegetation	<i>Botaurus stellaris</i> <i>Acrocephalus arundinaceus</i>	Sensitivity index=Medium - Vital for breeding activities	Reed cutting Destruction by fire Degradation Fragmentation Pollution
Sand dunes	<i>Coturnix coturnix</i> <i>Streptopelia turtur</i> <i>Pycnonotus xanthopygos</i> <i>Serinus syriacus</i>	Sensitivity index=Above medium - Refuge for regionally threatened species	Barbecuing Hunting Garbage Pollution Degradation
Cultivated Fields	<i>Ciconia ciconia</i> <i>Falco naumanni</i> <i>Coturnix coturnix</i> <i>Crex crex</i> <i>Glareola nordmanni</i> <i>Gallinago media</i> <i>Streptopelia turtur</i> <i>Melanocorypha calandra</i> <i>Sturnus vulgaris</i> <i>Serinus syriacus</i>	Sensitivity index=High - Presence of threatened species	Pollution Garbage Monotony

HABITAT	HERPETOFAUNA KEY SPECIES	SENSITIVITY	THREATS
Sea water and Sandy beach	- <i>Chelonia mydas</i> - <i>Caretta caretta</i>	Sensitivity index=High - Presence of threatened species	Degradation Pollution Garbage Egging
Sandy Beach	- <i>Acanthodactylus shreiberi syriacus</i> - <i>Chalcides ocellatus ocellatus</i>	Sensitivity index=Medium - Presence of rare species	Degradation Pollution Habitat destruction
Rocky part, Part with trees and bushes	- <i>Laudakia stellio stellio</i>	Sensitivity index=Very low - Presence of persecuted species	Tree cutting Chemical Pollution Persecution (Killing)
Waterbodies	- <i>Rana bedriagae</i> - <i>Mauremys capica rivulata</i>	Sensitivity index=low - Presence of persecuted species	Pollution Garbage Drainage for agricultural extension Over-taking

### A.1.9 Constraints and opportunities for the conservation

#### A.1.9.1 Main constraints

- Weak law enforcement.
- Part of the sand dune habitat is destroyed and deformed during summer time.
- The extension of the agricultural area is likely to happen on the basis of increased demand on organic legumes.
- There is lack of awareness, especially on the precautions to be taken when using pesticides, the negative impact of introduced species, the importance of natural landscapes, the priority for in-situ conservation, etc....

#### A.1.9.2 Main opportunities

- Highly desired area for eco-tourism and education
- Highly desired area for biological or organic farming
- Presence of threatened species that deserve protection.
- Low density of inhabitant and workers.
- Inexistence of serious polluting aquatic activities.
- Frogging and egging activities are negligible.
- High potentiality for resource-generating activities.

### A.1.10 Socio-economic impacts of taken measures

#### A.1.10.1 Economically

- Investment in the fields of eco-tourism (birdwatching, fauna observing, tour-guiding, etc.).
- Investment in education of school children
- Investment in solid waste control.
- Investment in organic farming.
- Investment in new alternatives.

**A.1.10.2 Socially**

- Deprived locals from free access rights
- Deprived shepherders from pasture areas
- Regulated use of natural resources among locals
- Locals provided 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 wild (including aquatic) plants from over-exploitation;
- Prohibit the access of excursionists to the marshy area;
- Stop any draining activities, especially in the marsh area;
- Limit and canalize the access to the sensitive places of the site.
- Ban the hunting and all forms of species taking on the site the year round.
- Stop the frogging activities.
- Prohibit the eggng activities
- Stop unregulated and regulated pesticides from reaching water bodies (including streams).
- Keep the site clean from solid waste and other garbage.

**A.1.11.1.2 Rehabilitation**

- Prepare a feasibility study for the reintroduction of some flosistic and faunistic species to the site
- Ban the cutting of reedbeds in spring time.

**A.1.11.1.3 Valorisation/ Added value**

- Create a center of information on the main entrance leading up to the birdwatching hide.
- Replace the metallic birdwatching hide with wooden and more aerated one.
- Create a package of activities to include reserve-archeology areas.
- Create eco-touristic activities that may generate incomes for the local community (e.g. guided tours).
- Increase the marshy area or induce flooded areas on the sides of the lower streams.
- Make from organic farming a tool for education and awareness.
- Design and fix a hide for birdwatching at the excavated pool near Ras Al Ain and keep the immediate surrounding area wild.

**A.1.11.2 Mid term****A.1.11.2.1 Protection:**

- Sensitise visitors and local communities
- Regulate agriculture and pastoral 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 agricultural monotony.

**A.1.11.2.3 Valorisation/ Added value:**

- Establish an eco-museum on the biodiversity of the site.
- Valorise the site for biological agriculture purposes
- 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 protected zones**

- . The real marshy area.
- . The ponds and the streams
- . The sand dunes

**A.1.12.2 Zones with limited access**

- . The excavated pond
- . The reedbeds.
- . Around the birdwatching hides.
- . The cultivated land
- . The trail ends with observatory hides
- . The sandy beach which is used by marine turtles for nesting.

**A.1.12.3 Zones with free access**

- . The recreational area during summer time only.
- . The trails (existing or potential)(unpaved tracks).
- . The cultivated land

### 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 Tyre Beach 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/ alteration of wilderness, pollution. Consequences: loss of habitats, loss of biodiversity, reduction of feeding, breeding, 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, wintering, breeding seasons, etc.
Feasibility	The necessity to train people on monitoring activities
Pilot study	Use the present study as study/reference or 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	Key elements	Indicators	Method	Means



monitoring				
Mammals	<p><i>Acomys dimidiatus</i></p> <p><i>Erinaceus europaeus concolor</i></p> <p><i>Pipistrellus kuhli ikhawanius</i></p> <p><i>Pipistrellus kuhli ikhawanius</i></p> <p><i>Rattus norvegicus norvegicus</i></p> <p><i>Rhinolphus euryale judaicus</i></p> <p><i>Rousettus aegyptiacus aegyptiacus</i></p> <p><i>Vormela peregusna syriaca</i></p> <p><i>Vulpus vulpus palaestina</i></p>	<ul style="list-style-type: none"> <li>• Population size</li> <li>• Size of the available appropriate habitat</li> <li>• Size of the specific ecological niche available</li> <li>• Number of burrows</li> <li>• Habitats occupied by each species</li> <li>• Species movement</li> <li>• Distribution areas</li> </ul>	<p>- Trimestrial surveys</p> <p>- - These mammals 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 woodland when it becomes warm or when human activity increases.</p>	<p>. Binoculars are very helpful. They allow you to watch from a distance, without disturbing the animals.</p> <p>. Use a torch, if possible with a red glass.</p> <p>. 4x4 vehicle</p> <p>. Night camera</p> <p>. Mammal traps</p> <p>. Light projector</p>
<p>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 snow. Remember that most mammals have very sensitive noses-choose a spot down-wind from the place where you expect to see them. During dawn watch you may also be lucky enough to see one of the more strictly nocturnal animals getting home late, perhaps a wolf or a wild cat. This goes equally for the more elusive carnivores, like otter. The small rodents like the Levant vole are particularly difficult to see. Many come out only at night but even the diurnal ones generally stick to dense cover. However, they can sometimes be seen at night by regularly putting down bait, such as seeds of any kind, at a suitable spot. Voles can sometimes be found under logs (which should always be carefully replaced).</p> <p>Questioning of villagers and shepherders, etc.</p>				
Birds	<p><i>Acrocephalus arundinaceus</i></p> <p><i>Anas crecca</i></p> <p><i>Anas platyrhynchos</i></p>	<ul style="list-style-type: none"> <li>- Diversity index</li> <li>- Number of nesting couples</li> <li>- Size of populations</li> <li>- Number</li> </ul>	<p>- Surveys every 15 days mainly from March to May.</p> <p>-To monitor birds there are several techniques which differ with the</p>	<p>Binoculars 10x50 or 7x48</p> <p>- Telescope 20-60 x 80</p> <p>- Note book</p> <p>- Tape recorder</p>

	<i>Anas querquedula</i> <i>Botaurus stellaris</i> <i>Ciconia ciconia</i> <i>Coturnix coturnix</i> <i>Crex crex</i> <i>Falco naumanni</i> <i>Gallinago media</i> <i>Glareola nordmanni</i> <i>Hippolais languida</i>  <i>Melanocorypha calandra</i>  <i>Pycnonotus xanthopygos</i>  <i>Serinus syriacus</i>  <i>Streptopelia turtur</i>  <i>Sturnus vulgaris</i>  <i>Sylvia mystacea</i>	of wintering individuals - Number of passing birds - Frequency of roosting birds -Distribution per habitat - Sectorial geographic distribution - Density	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 in order to see some marshy or rare birds one needs to remain until dusk. Raptors and other soaring birds become active usually after 10 AM. This is due to the fact that they are dependent on ascending air which helps them to soar and economize energy during their flight.	- 4x4 vehicle - Camera. - Field guide book
<p>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.</p> <p>- Birds should not be alerted to the observer's presence at all. One may use a car which can make a most useful mobile hide, as birds may accept the arrival of a car if the passengers remain still and do not open and slam the doors.</p>				
Herpetofauna	1. <i>Chameleo chameleon restricta</i> 2. <i>Rana bedriagae</i>	- Density of populations - Evolution	- 4 spring census - 4 summer	- Binocular 8x40 - Broad

	<p>(<i>R.levantina</i>)          3.<i>Mauremys caspica rivulata</i>          4.<i>Laudakia stellio</i>          5.<i>Hierophis jugularis</i>          6.<i>Malpolon monspessulanus insignitus</i></p>	<p>of numbers          -Species localization          - Number of individuals          - Density of populations          - Distribution of species</p>	<p>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.</p>	<p>beamed lamp          - Soft forceps          - 4x4 vehicle          - ¼ litre glass jars          - vinegar          - net          "fauchoir"</p>
<p>Lizards often lie out on the same stone each day when basking in the 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.</p> <p>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. At spring time, especially frogs and toads can be located by their voices. Each species has its own distinctive call, ranging from the echoing croak to the soft, mournful piping. The continuous rustling of a tortoise ploughing through dense herbage can soon be recognized as different from the intermittent scrabbling of a foraging lizard.</p> <p>Because they can be approached closely, it is tempting to try to catch reptiles and amphibians 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 and amphibians should be held only with wet hands to protect their soft, usually moist skins. It goes without saying that venomous snakes should not be handled in any circumstances.</p> <p>- Monitoring with the quadrat method or surveying at night are two rewarding methods implicating the search under stones and the use of traps.</p>				
<p>Entomological groups &amp; Hydrobiology</p>	<p>Scarabeidae          Carabidae          Staphylinidae          Tenebrionidae          Tipulidae          Pentatomidae          Pyrhocoridae          Acrididae          Gryllidae          Tetrigidae</p>	<p>- Diversity of taxonomic groups          - Density of populations          - Abundance and larva quality</p>	<p>- Three sampling per year: Spring/ Summer and Autumn          Use of Barber traps in different habitats.          Threshing or beating branches of</p>	<p>- 4x4 vehicle          - Soft forceps          - Insect aspirator          - ¼ liter glass jars.          - Net fauchoir</p>

	Meloidae Cantharidae Oedemeridae		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.	
Flora	<i>Alisma plantago-aquatica</i> <i>Exoacantha heterophylla</i> <i>Hydrocotyle ranunculoides</i> <i>Mentha pulegium</i> <i>Merendera sobolifera</i> <i>Nasturium officinale</i> <i>Scirpus tuberosus</i> <i>Sideretis remota</i> <i>Typha laxmannii</i>	-Study of dynamic of change - Locality of the species - Distribution of the species - Density  - Density of the vegetal community - Occupied area - Cover% - Stratification	Transect method involving 4 seasonal missions per year or trimestrial inspection all year round	4x4 vehicle GPS Topographic map Aerial photo Digital camera
Habitats Hydrology	Marshy habitat	- Indicators of water quality and pollution (Level of water and Level of pollution)	-Classical physico-chemical analysis -Trimestrial measurement -Occasional measurement -Flood period	Material for sampling and analyzing water and mud.

#### A.1.13.3 Socio-economic monitoring- Indicators

Nature of monitoring	Key elements	Indicators	Method	Means
	Cultivation activity	Size of cultivated areas Productivity/ speculation Area of non-cultivated land	Questionnaire Interview	Vehicle

		# of employees/ hectar		
	Grazing activity	# of heads/ type Period and degree of grazing # of birth given/ year	Questionnaire Interview	Vehicle
	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
<p><b>Vegetal biodiversity</b></p> <ul style="list-style-type: none"> <li>• Endemic 1</li> <li>• Rare 2</li> <li>• Threatened 2</li> <li>• Notworthy 6</li> <li>• Biotopes 7</li> </ul> <p><b>Animal biodiversity</b></p> <ul style="list-style-type: none"> <li>• Endemic 9 (excl. invertebrates)</li> <li>• Rare 8</li> <li>• Threatened 14</li> <li>• Notworthy 24</li> <li>• Biocenosis 6</li> </ul>	<p>Extension of agriculture area.</p> <p>Collection/ picking</p> <p>Grazing</p> <p>Fire</p> <p>Loss of wetlands</p> <p>Habitat transformation</p> <p>Lack of infrastructure allowing local community participatory approach</p> <p>Lack of job in domains other than the exploitation of natural resources</p> <p>Frequentation</p> <p>Pollution</p> <p>Poaching</p> <p>Hunting</p> <p>Introduced species</p>

#### A.1.15 Identified Environmental values

Value	Asset	Limiting factors
High rate of threatened species	<ul style="list-style-type: none"> <li>• Very weak urbanism</li> <li>• Willigness of land owners for protection</li> </ul>	<ul style="list-style-type: none"> <li>• High frequentation by farmers</li> <li>• Fire</li> <li>• Pesticide</li> </ul>
Exceptional eco-tourism potentiality	<ul style="list-style-type: none"> <li>• Hotspot site</li> <li>• Unique remnant landscape</li> </ul>	<ul style="list-style-type: none"> <li>• Hunting</li> <li>• Poaching</li> <li>• Pollution</li> <li>• Fire</li> </ul>

### A.1.16 Management measures and threat/ hazard mitigation

Target	Management measures/ threat mitigation
<p><b><i>Phyto-ecology</i></b></p> <ul style="list-style-type: none"> <li>- Protect the aquatic plants of the marsh zone and water bodies</li> <li>- Protect the reed beds</li> <li>- Protect the dune-fixing plants</li> <li>- Protect the bank's plants of the streams</li> </ul>	<p><b><i>Management actions</i></b></p> <p><b>Protection</b></p> <ul style="list-style-type: none"> <li>- Raise awareness of visitors</li> <li>- Reduce poaching</li> <li>- Regulate pasture</li> <li>- Regulate reedbed burning</li> <li>- Enforce the law declaring the site a reserve</li> </ul> <p><b>Rehabilitation</b></p> <ul style="list-style-type: none"> <li>- Avoidance of agricultural monotony.</li> <li>- Feasibility study for the reintroduction of some flosistic species</li> <li>- Predict ground water fluctuation through a study of the water table and aquifers in the site;</li> </ul> <p><b>Valorisation</b></p> <ul style="list-style-type: none"> <li>- Promote eco-tourism through improved access to micro hotspots, managed recreational zones, equestrian surveillance patrols, development of trails for pedestrians, etc.</li> <li>- Create neighboring or bordering areas as alternative places for camping and barbecuing.</li> </ul>
<p><b><i>Entomofauna</i></b></p>	<p><b><i>Management actions</i></b></p> <p><b>Protection</b></p> <ul style="list-style-type: none"> <li>- R aise awareness of visitors</li> <li>- Protect from collectors</li> </ul> <p><b>Rehabilitation</b></p> <ul style="list-style-type: none"> <li>- Keep pollution away from waterbodies</li> </ul> <p><b>Valorisation</b></p> <ul style="list-style-type: none"> <li>- Promote eco-tourism through improved access to micro hotspots, managed recreational zones, equestrian surveillance patrols, development of trails for pedestrians, etc.</li> </ul>

	<ul style="list-style-type: none"> <li>- Create neighboring or bordering areas as alternative places for camping and barbecuing.</li> </ul>
<i>Herpetofauna</i>	<p><b>Management actions</b></p> <p><b>Protection</b></p> <ul style="list-style-type: none"> <li>- Raise awareness of visitors</li> <li>- Reduce poaching</li> <li>- Regulate pasture</li> <li>- Regulate reedbed burning</li> <li>- Protect the water edges mainly for Anoura</li> <li>- Enforce the law of the reserve.</li> </ul> <p><b>Rehabilitation</b></p> <ul style="list-style-type: none"> <li>- Avoidance of agricultural monotony.</li> </ul> <p><b>Valorisation</b></p> <ul style="list-style-type: none"> <li>- Promote eco-tourism through improved access to micro hotspots, managed recreational zones, equestrian surveillance patrols, development of trails for pedestrians, etc.</li> <li>- Create neighboring or bordering areas as alternative places for camping and barbecuing.</li> </ul>
<i>Avifauna</i>	<p><b>Management actions</b></p> <p><b>Protection</b></p> <ul style="list-style-type: none"> <li>- Raise awareness of visitors</li> <li>- Reduce poaching and illegal taking</li> <li>- Regulate or canalize grazing</li> <li>- Regulate reedbed burning</li> <li>- Ban hunting activities within the site and in a belt of 500 meters around the site.</li> </ul> <p><b>Rehabilitation</b></p> <ul style="list-style-type: none"> <li>- Avoid empty pesticide bottles or containers from falling in water bodies;</li> </ul> <p><b>Valorisation</b></p> <ul style="list-style-type: none"> <li>- Promote eco-tourism through improved access to micro hotspots, managed recreational zones, equestrian surveillance patrols, development of trails for pedestrians;</li> </ul>

	<ul style="list-style-type: none"> <li>- Create neighboring or bordering areas as alternative places for camping and barbecuing;</li> <li>- Build a Birdwatching tower.</li> </ul>
<i>Mammals</i>	<p><b>Management actions</b></p> <p><b>Protection</b></p> <ul style="list-style-type: none"> <li>- Raise awareness of visitors</li> <li>- Reduce poaching and illegal taking</li> <li>- Regulate or canalize grazing</li> <li>- Regulate reedbed burning</li> <li>- Enforce the law of the reserve</li> <li>- Ban hunting activities within the site and in a belt of 500 meters around the site.</li> </ul> <p><b>Rehabilitation</b></p> <ul style="list-style-type: none"> <li>- Avoid empty pesticide bottles or containers from falling into water bodies;</li> </ul> <p><b>Valorisation</b></p> <ul style="list-style-type: none"> <li>- Promote eco-tourism through improved access to micro hotspots, managed recreational zones, equestrian surveillance patrols, development of trails for pedestrians;</li> <li>- Create small patches of bushy areas to facilitate a safe mammal movement;</li> <li>- Create neighboring or bordering areas as alternative places for camping and barbecuing;</li> <li>- Build an elevated hide to watch nocturnal mammal species</li> </ul>



## **A.1.17 Needs for Complementary studies**

### **A.1.17.1 Ecological studies**

- Study of the dynamism of the little known or unknown vegetal species.
- Monitor the dynamism of the different vegetal communities in water and water edges with regards to the annual variation of water table.
- Localization, estimation of numbers and dynamism of *Chelonia mydas* and *Caretta caretta* populations.
- Tracking the migration routes of the two breeding marine turtles.

Study of the avifauna structure within the site.

- The nature and amplitude of the annual hydrological variation of waterbird habitats.
- The relation between the vegetal stratification and bird breeding success.
- The impact of the agricultural practices on the ground bird breeding species.
- Study of the *Acomys* population and dynamism.
- Phenological monitoring of habitats and animal communities.
- Micro-distribution of skink species
- Study of the entomofauna and its role within the trophic chain of the site.

### **A.1.17.2 Socio-economic studies**

- Socio-economic impact of the proposed conservation measures.
- The impact of organic farming on the generation of incomes.
- The impact of hunters on the threatened species and the awareness level of the local population.
- The hydrology of the hydrographic web in the area for wise and sustainable use purposes.
- Study of the demand on the recreational activities within the site.
- Study of the impact of management on the local community.

## ANNEXES

**ANNEX 1:** List of plants of Tyre Beach Reserve. Arabic names are mainly extracted from the "Dictionnaire étymologique de la flore du Liban" (Nehmé, 2000).

- (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.

ZOSTERACEAE	Zosteraceae (Eel-grass)	زستيرة
<i>Cymodocea major</i>	Greater cymodocea	حامول البحر
POACEAE (GRAMINEAE)	Gramineae	النجيليات
<i>Aegilops ligustica</i> (4)	Ligurian goat-grass	دوسر
<i>Aegilops peregrina</i>	Foreign goat-grass	دوسر رحال
<i>Alopecurus anthoxanthoides</i> (4)	Fox-tail	ذيل الثعلب
<i>Alopecurus myosuroides</i>	Black-grass	ذيل الفأر
<i>Ammochloa palaestina</i>	Palestine ammochloa	عشبة الرمل
<i>Ammophila arenaria</i>	Sandreed	سيط
<i>Andropogon distachyus</i>	Beard-grass	رُكيب
<i>Arundo donax</i>	Cane	قصب
<i>Bromus fasciculatus</i>	Fascicled brome	ترغول حُزمي
<i>Bromus madritensis</i>	Madrid brome	ترغول مدريد
<i>Bromus scoparius</i>	Twiggy brome	مكس
<i>Catapodium rigidum</i>	Hard poa	كتنبوم
<i>Cutandia memphitica</i>	Memphis cutandia	خافور
<i>Cutandia philistaea</i> (4)	Palestine cutandia	خافور فلسطيني
<i>Dactylis glomerata</i>	Orchard-grass	ثيل عمران
<i>Hordeum bulbosum</i>	Bulbous barley	شعير بصلي
<i>Hyparrhenia hirta</i> (1)	Shaggy hyparrhenia	صفصوف
<i>Imperata cylindrica</i>	Blady-grass	حلفاء
<i>Lagurus ovatus</i>	Ovate hare's-tail	ذنب الأرنب
<i>Lolium multiflorum</i>	Many-flowered ray-grass	زوان متعدد الزهور
<i>Lolium rigidum</i>	Rigid ray-grass	زوان قاس
<i>Lophochloa phleoides</i>	Cat's-tail	ذنب القط
<i>Paspalidium geminatum</i>	Twin paspalidium	نسيلة
<i>Phalaris minor</i>	Lesser Canary-grass	بشنة صغيرة
<i>Phalaris paradoxa</i>	Paradoxial Canary-grass	بشنة، خرفار
<i>Saccharum spontaneum</i>	Wild sugar-cane	غزار
<i>Stipa capensis</i>	Mediterranean needle-grass	حلفة
<i>Vulpia membranacea</i>	Membranous fox-grass	فلبية غشائية
CYPERACEAE	Cyperaceae	سعديات
<i>Carex divisa</i>	Bracteate marsh-sedge	سعادى مقسوم
<i>Carex extensa</i>	Long-bracted sedge	سعادى مداد

<i>Cyperus alopecuroides</i>	Foxtail cyperus	سعد الحصر
<i>Cyperus kalli</i>	Kalli cyperus	قلي
<i>Cyperus laevigatus</i>	Smooth cyperus	سعد أملس
<b>ARACEAE</b>	<b>Araceae</b>	<b>اللوفيات</b>
<i>Biarum pyrami</i>	Pyrame's biarum	لوف بيرام
<b>LEMNACEAE</b>	<b>Lemnaceae</b>	<b>عدسيات الماء</b>
<i>Lemna gibba</i> (1)	Gibbous duckweed	لمنة حدياء
<i>Lemna paucicostata</i> (1) (3)	Few-ribbed duckweed	ليخ
<b>JUNCACEAE</b>	<b>Juncacea</b>	<b>أسليات</b>
<i>Juncus fontanesii</i>	Fontanesi' rush	أسل فونتنين
<i>Juncus maritimus</i>	Sea rush	أسل بحري
<b>LILIACEAE</b>	<b>Liliaceae</b>	<b>زنبقيات</b>
<i>Allium carmeli</i> (2)	Carmel garlic	ثوم الكرمل
<i>Allium neopolitanum</i>	White garlic	ثوم الابيض
<i>Asparagus stipularis</i>	Thorny asparagus	هليون
<i>Asphodelus microcarpus</i>	Common asphodel	أشراس
<i>Muscari maritimum</i>	Sea muscari	بلبوس البحر
<i>Ornithogalum densum</i>	Dense star-of-Bethlehem	صاصل كثيف
<i>Ornithogalum narbonensis</i>	Narbonne star-of-Bethlehem	صاصل نربون
<i>Urginea maritima</i>	Sea-squill	بصيلة
<b>DIOSCOREACEAE</b>	<b>Dioscoreaceae</b>	<b>ديوسقوريات</b>
<i>Tamus communis</i>	Common black-bryony	جرموع
<b>IRIDACEAE</b>	<b>Iridaceae</b>	<b>سوسنيات</b>
<i>Crocus hyemalis</i> (3) (4)	Winter crocus	زعفران شتوي
<b>ORCHIDACEAE</b>	<b>Orchidaceae</b>	<b>سحلبيات</b>
<i>Ophrys attica</i>	Attic ophrys	سحلبية أتكأ
<i>Orchis collina</i> (1)	Fan-lipped orchid	سحلب الروابي
<i>Orchis papilionacea</i> (1)	Butterfly orchid	زر العدرا
<b>URTICACEAE</b>	<b>Urticaceae</b>	<b>قراصيات</b>
<i>Parietaria judaica</i>	Basil-leaved pellitory	حشيشة القراز
<b>MORACEAE</b>	<b>Moraceae</b>	<b>التوتيات</b>
<i>Ficus sycomorus</i> (1) (3)	Sycomore	جميز
<b>POLYGONACEAE</b>	<b>Polygonaceae</b>	<b>فصيلة عصا الراعي</b>

<i>Emex spinosa</i>	Spiny dock	فجل الجبل
<i>Polygonum maritimum</i>	Sea knotweed	قرذب بحري
<i>Polygonum persicaria</i>	Redleg	قرذب دراقني
<i>Polygonum salicifolium</i>	Willow-leaved knotweed	زلفة
<i>Rumex conglomeratus</i>	Globular dock	حميض
<b>CHENOPODIACEAE</b>	<b>Chenopodiaceae</b>	<b>سرمقيات</b>
<i>Arthrocnemum macrostachyum</i> (3)	Glasswort	شمام
<i>Atriplex halimus</i>	Sea-purslane	سرمق بحري
<i>Chenopodium murale</i>	Wall goosefoot	رمرام
<i>Salsola kali</i>	Prickly saltwort	القلي
<b>AMARANTHACEAE</b>	<b>Amaranthaceae</b>	<b>قطيفيات</b>
<i>Alternanthera sessilis</i>	Sessile globe-amaranthe	أنتاب
<i>Amaranthus albus</i>	White amaranth	قطيفة بيضاء
<i>Amaranthus graecizans silvestris</i> (2)	Greek amaranth	قطيفة يونانية
<i>Amaranthus hybridus chlorostachys</i>	Hybrid amaranth	قطيفة هجينة
<b>AIZOACEAE</b>	<b>Aizoaceae</b>	<b>غاسوليات</b>
<i>Mesembryanthemum nodiflorum</i>	Egyptian fig-marigold	غاسول
<b>CARYOPHYLLACEAE</b>	<b>Caryophyllaceae</b>	<b>قرنفليات</b>
<i>Minuartia decipiens damascena</i> (4)	Deceptive sandwort	منورتيه خادعة
<i>Paronychia argentea</i>	Silvery nailwort	حريت فضي
<i>Silene colorata decumbens</i>	Cloven-petalled catchfly	سيلينة ملونة
<i>Silene macrodonta</i> (4)	Large-toothed catchfly	سيلينة كبيرة الأسنان
<i>Silene nocturna</i> (4)	Night catchfly	سيلينة ليلية
<i>Silene oliveriana</i> (4)	Olivier's catchfly	سيلينة اولفييه
<i>Silene succulenta</i>	Succulent catchfly	خبيزة البحر
<i>Spergularia bocconii</i>	Boccone's spurrey	سبير غولة بكون
<i>Spergularia marina</i>	Sea spurrey	سبير غولة بحرية
<i>Vaccaria pyramidata</i>	Pyramidal cow-basil	بقرية هرمية
<i>Velezia rigida</i>	Rigid velezia	دبيقه
<b>BERBERIDACEAE</b>	<b>Berberidaceae</b>	<b>برباريسيات</b>
<i>Bongardia chrysogonum</i>	Golden rod	عرف الديك
<b>RANUNCULACEAE</b>	<b>Ranunculaceae</b>	<b>حوذانيات</b>
<i>Adonis annua</i>	European pheasant's-eye	ناب الجمل
<i>Nigella arvensis mutica</i> (4)	Field nigella	شونيز الحقول
<i>Nigella ciliaris</i> (4)	Ciliate nigella	شونيز مهدب
<i>Ranunculus cornutus</i> (4)	Horned buttercup	حوذان قرني
<i>Ranunculus scandicinus</i> (4)	Shepherd's- needle buttercup	حوذان مشيطي
<b>PAPAVERACEAE</b>	<b>Papaveraceae</b>	<b>خشخاشيات</b>
<i>Fumaria judaica</i> (4)	Judean fumetory	شاهترج اليهودية

<i>Glaucium flavum</i>	Sea poppy	ماميتا صفراء
<i>Papaver dubium laevigatum</i>	Pale-red poppy	خشخاش محير
<i>Papaver rhoeas strigosum</i>	Corn poppy	خشخاش منثور
<i>Papaver syriacum</i> (4)	Syrian poppy	خشخاش سوري
<b>BRASSICACEAE (CRUCIFERAE)</b>	<b>Brassicaceae</b>	<b>صليبيات</b>
<i>Brassica rapa</i>	Turnip	لفت
<i>Cakile aegyptia</i>	Egyptian sea-rocket	رشاد البحر
<i>Enarthrocarpus arcuatus</i> (4)	Curved enarthrocarpus	شلوة مقوسة
<i>Erucaria hispanica</i>	Pink mustard	سليح
<i>Lobularia maritima</i>	Sea lobularia	لبالاريا بحرية
<i>Maresia nana</i> (4)	Dwarf maresia	ماريزيه قزمة
<i>Matthiola tricuspidata</i>	Trifid stock	منثور ثلاثي
<i>Nasturium officinale</i>	Common water-cress	قرة
<i>Raphanus raphanistrum</i>	Wild radish	فجل بري
<i>Raphanus sativus</i>	Garden radish	فجل زراعي
<i>Ricotia lunaria</i>	Egyptian honesty	سيلان
<i>Sinapis arvensis orientalis</i>	Charlock	خردل الحقول
<b>RESEDACEAE</b>	<b>Resedaceae</b>	<b>بليجاويات</b>
<i>Reseda alba</i>	White mignonette	ذيل الخروف
<b>CRASSULACEAE</b>	<b>Crassulaceae</b>	مخلدات
<i>Sedum schizolepis</i>	Cut-scaled stonecrop	حبيون
<b>MIMOSACEAE</b>	<b>Mimosaceae</b>	<b>أقاييات</b>
<i>Acacia cyanophylla</i>	Cassia	أقاييا
<i>Lagonychium farctum</i>	Stuffed lagonychium	عقيل
<b>FABACEAE (PAPILIONACEAE)</b>	<b>Fabaceae</b>	<b>فراشييات</b>
<i>Astragalus baeticus</i>	Andalusian milk-vetch	استراغالس اندلسي
<i>Astragalus berytheus</i> (4)	Beirut milk-vetch	استراغالس بيروت
<i>Hippocrepis multisiliquosa</i>	Many-podded horseshoe-vetch	نمت متعدد الخردال
<i>Hippocrepis unisiliquosa</i>	Common horseshoe-vetch	نمت احادي الخردلة
<i>Lotus cytisoides</i>	Downy birdsfoot-trefoil	لوطس لزانى
<i>Lotus edulis</i>	Edible lotus	لوطس مأكول
<i>Lotus ornithopodioides</i>	Claw-podded birdsfoot-trefoil	لوطس ربيداني
<i>Lotus villosus</i>	Shaggy birdsfoot-trefoil	لوطس وبر
<i>Medicago marina</i>	Sea medick	فصة بحرية
<i>Medicago minima</i>	Least medick	فصة قزمة
<i>Medicago scutellata</i>	Snail medick	فصة قصعية
<i>Medicago tuberculata</i>	Tuberclad medick	فصة عسقولية
<i>Melilotus indicus</i>	Indian melilot	حندقوق هندي
<i>Melilotus siculus</i> (3)	Sicilian melilot	حندقوق صقلية
<i>Melilotus sulcatus sulcatus</i>	Grooved melilot	حندقوق مثلم

<i>Ononis hirta</i>	Shaggy restharrow	شبرق
<i>Ononis variegata</i>	Variegated restharrow	شبرق مرقش
<i>Ononis viscosa breviflora</i>	Viscous restharrow	شبرق لزج
<i>Pisum arvense</i>	Field pea	بسلة الحقول
<i>Psoralea bituminosa</i>	Bitumen pea	حومان
<i>Scorpiurus subvillosus</i>	Hairy caterpillar	عقربية وبرة
<i>Trifolium campestre</i>	Hop trifoil	نفل حقلي
<i>Trifolium clusii</i>	Cherler's clover	نفل كلوزي
<i>Trifolium dichroanthum</i> (4)	Two-colored clover	نفل ذو لونين
<i>Trifolium nigrescens petrisavii</i> (4)	Blackish clover	نفل مسود
<i>Trifolium purpureum</i>	Purple clover	نفل ارجواني
<i>Trifolium resupinatum</i>	Reversed clover	نفل منقلب
<i>Trifolium scabrum</i>	Rugged clover	نفل أحرش
<i>Trifolium spumosum</i>	Bladder trifoil	نفل مزيد
<i>Trifolium tomentosum</i>	Tomentose clover	نفل لبدى
<i>Trifolium xerocephalum</i> (4)	Dry-headed clover	نفل جاف الراس
<i>Trigonella cylindracea</i> (4)	Cylindrical fenugreek	حلبة اسطوانية
<i>Trigonella spinosa</i> (4)	Spiny fenugreek	حلبة شائكة
<i>Vicia galeata</i>	Helmeted vetch	بيقية مخوذة
<i>Vicia hybrida</i>	Hairy yellow vetch	بيقية هجينة
<b>Geraniaceae</b>	Geraniaceae	غرناقيات
<i>Erodium laciniatum pulverulentum</i>	Cut-leaved stork's-bill	جزاب
<i>Geranium molle</i>	Dove's-foot geranium	غرناقي لين
<b>Linaceae</b>	Linaceae	كتانيات
<i>Linum pubescens</i> (4)	Downy flax	كتان أزغب
<b>Rutaceae</b>	Rutaceae	سذابيات
<i>Haplophyllum buxbaumii stenophyllum</i> (4)	Buxbaum's haplophyllum	هبلوفلوم بكسبوم
<b>Oxalidaceae</b>	Oxalidaceae	حماضيات
<i>Oxalis pes-caprae</i>	Bermuda buttercup	حميضة
<i>Oxalis pes-caprae plenum</i>	Red bermuda buttercup	حميضة مكبسة
<b>Euphorbiaceae</b>	Euphorbiaceae	فربيونيات
<i>Euphorbia aleppica</i>	Aleppo spurge	فربيون حلب
<i>Euphorbia arguta</i> (4)	Toothed spurge	فربيون حاد
<i>Euphorbia berythea</i> (2)	Beirut spurge	فربيون بيروت
<i>Euphorbia gaeniculata</i> (3)	Knee-jointed spurge	لين الحماره
<i>Euphorbia paralias</i>	Coast spurge	فربيون ساحلي
<i>Euphorbia peplis</i>	Purple spurge	زرق
<i>Euphorbia peplus</i>	Petty-spurge	فرغخ
<i>Euphorbia terracina</i>	Terracina spurge	فربيون ترتشينا
<i>Mercurialis annua</i>	Annual mercury	حلوب حولي
<i>Ricinus communis</i>	Common palma-christi	خروع
<b>Malvaceae</b>	Malvaceae	خيازيات
<i>Alcea setose palmata</i>	Bristly hollyhock	ختمية

<i>Lavatera cretica</i>	Cretan tree-mallow	خبيزة نوار
<i>Malvella sherardiana</i>	Sherard's malvella	خببيزة شررد
<b>Frankeniaceae</b>	Frankenia	فرنكينيات
<i>Frankenia pulverulenta</i>	Dusty sea-heath	حمرة
<b>Cistaceae</b>	Cistaceae	لاذنيات
<i>Fumana arabica</i>	Arabian fumana	فومانا عربية
<i>Helianthemum stipulatum</i>	Stipulate sunrose	مداهين أذني
<b>Lythraceae</b>	Lythracea	حنائيات
<i>Lythrum hyssopifolia</i>	Grass-poly	رجل الحمامة
<i>Lythrum junceum</i>	Rushy lythrum	فرنديل أسلي
<b>Onagraceae</b>	Onagraceae	أخدريات
<i>Ludwigia stolonifera</i> (3)	Stoloniferous ludwigia	لدفيغية
<i>Oenothera drummondii</i>	Drummond's oenothera	شب الليل أول مرة من لبنان في 03/2/6
<b>Apiaceae (Umbelliferae)</b>	Apiaceae	خيمييات
<i>Ainsworthia trachycarpa</i> (4)	Common ainsworthia	أنسورثية شائعة
<i>Ammi visnaga</i>	Tooth pick	خلة بلدية
<i>Apium graveolens</i>	Celery	كرفس
<i>Bupleurum fontanesii</i>	Desfontaines' hare's-ear	دبيق
<i>Bupleurum nodiflorum</i> (4)	Sessile-flowered hare's-ear	حلباب عقدي الزهر
<i>Chaetosciadium trichospermum</i> (4)	Hairy-seeded chervil	شيتيسيديوم
<i>Crithmum maritimum</i>	Rock samphire	شمرة البحر
<i>Daucus aureus</i> (3)	Golden carrot	الدوقو الذهبي
<i>Daucus littoralis</i> (4)	Coastal carrot	الدوقو الساحلي
<i>Eryngium creticum</i> (4)	Cretan eryngo	قرصعة
<i>Eryngium maritimum</i>	Sea holly	شنداب البحر
<i>Helosciadium nodiflorum</i>	Marshwort	جزر عفاريت
<i>Lagoecia cuminoides</i>	Bastard cumin	قردمان
<i>Pimpinella cretica</i> (4)	Cretan burnet-saxifrage	بسباس
<i>Pseudorlaya pumila</i>	Dwarf false-orlaya	شومر الجبل
<i>Tordylium aegyptiacum</i> (4)	Egyptian hartwort	شرعوب
<b>Plumbaginaceae</b>	Plumbaginaceae	رصاصيات
<i>Limonium graecum</i> (4)	Greek sea-lavander	ليمنيوم يوناني
<i>Limonium sinuatum</i>	Sinuate sea-lavender	ليمنيوم متعرج
<i>Plumbago europea</i>	Leadwort	البهق
<b>Convolvulaceae</b>	Convolvulaceae	محموديات
<i>Convolvulus arvensis</i>	Field bindweed	لبلاب الحقول
<i>Convolvulus betonicifolius</i>	Betony-leaved bindweed	لبلاب قسطنطيني الورق
<i>Convolvulus dorycnium oxysepalus</i> (4)	Dorycnium bindweed	لبلاب دوركنيوم
<i>Convolvulus pentapetaloides</i>	Five-lobed bindweed	لبلاب خماسي الفصوص

<i>Convolvulus secundus</i> (4)	One-sided bindweed	لبلاب وحيد الجانب
<i>Ipomoea palmata</i> (3)	Palmate morning-glory	بننت الباشا
<i>Ipomoea stolonifera</i>	Coast morning-glory	أثمان
<b>Boraginaceae</b>	Boraginaceae	حمحميات
<i>Echium angustifolium</i> (4)	Narrow-leaved viper's-bugloss	أخيوم ضيق الورق
<i>Hormuzakia aggregata</i>	Clustered hormuzakia	لسان النعجة
<b>Verbenaceae</b>	Verbenaceae	فصيلة رعي الحمام
<i>Phyla nodiflora</i>	Sessile-flowered frog-fruit	فيلة عقدية الزهر
<b>Lamiaceae (Labiatae)</b>	Lamiaceae	شفويات
<i>Calamintha incana</i> (4)	Hoary calamint	كلمنتة مبيضة
<i>Lamium amplexicaule</i>	Great henbit	لميوم معانق
<i>Marrubium vulgare</i>	Common white-horehound	حشيشة الكلب
<i>Mentha microphylla</i>	Small-leaved mint	نعنع صغير الورق
<i>Molucella spinosa</i>	Spiny Molucca-balm	مصيص
<i>Salvia hierosolymitana</i> (4)	Jerusalem sage	قويسة القدس
<i>Salvia pinnata</i> (4)	Wing-leaved sage	قويسة ريشية
<i>Salvia sclarea</i>	Clary	كف الدب
<i>Salvia verbenaca serotina</i>	Wild clary	قويسة لسان الثور
<i>Satureia thymbra</i>	Summer savory	ثمبرة
<i>Stachys neurocalycina</i> (4)	Nerved-calyxed woundwort	قرطوم معرق الكأس
<i>Stachys obscura</i> (4)	Dark woundwort	قرطوم داكن
<i>Teucrium polium</i>	Poley	جعدة
<b>Solanaceae</b>	Solanaceae	باذنجانيات
<i>Datura metel</i>	Hairy thorn-apple	بقم
<i>Nicandra physalodes</i>	Apple-of-Peru	نيقندرة فيزالس
<i>Physalis peruviana</i>	Physalis of Peru	فيزالس البيرو
<i>Withania somnifera</i>	Clustered withania	سم الفار
<b>Scrophulariaceae</b>	Scrophulariaceae	خنزيريات
<i>Antirrhinum majus angustifolium</i>	Lion's mouth	تم السمكة
<i>Antirrhinum orontium</i>	Lesser snapdragon	سيسم
<i>Scrophularia umbrosa</i>	Shade figwort	خنازيرية الظلال
<i>Verbascum galilaeum</i> (4)	Galilee mullein	بوصير الجليل
<i>Verbascum orientale</i>	Oriental mullein	بوصير شرقي
<i>Verbascum tripolitanum</i> (4)	Tripoli mullein	بوصير طرابلس
<i>Veronica anagallis-aquatica</i>	Water pimpernel	فيرونيكة حبق الماء
<i>Veronica syriaca</i> (4)	Syrian speedwell	فيرونيكة سورية
<b>Orobanchaceae</b>	Orobanchaceae	جعفيليات
<i>Orobanche aegyptiaca</i> (4)	Egyptian broomrape	جعفيل مصري
<i>Orobanche camptolepis</i> (4)	Bent-scaled broomrape	جعفيل منحنى الحرافش
<i>Orobanche crenata</i>	Scalloped broomrape	ذكر الفول
<i>Orobanche grisebachii</i> (4)	Grisbach's broomrape	جعفيل غريزبخ
<i>Orobanche nana</i>	Dwarf broomrape	جعفيل قزم
<i>Orobanche pubescens</i>	Downy broomrape	جعفيل أزغب



<b>Plantaginaceae</b>	Plantaginaceae	حمليات
<i>Plantago afra</i>	African plantain	بزر قطونا
<i>Plantago albicans</i>	Silvery plantain	مسيق
<i>Plantago lagopus</i>	Round-headed plantain	ودنة
<i>Plantago major</i>	Greater plantain	مصاصه
<i>Plantago squarrosa</i> (4)	Leafy-spiked plantain	زبد
<b>Rubiaceae</b>	Rubiaceae	فويات
<i>Galium cassium</i>	Cassius bedstraw	غالسيوم الأقرع
<i>Galium divaricatum</i>	Spreading bedstraw	غالسيوم متشعب
<i>Galium judaicum</i>	Judean bedstraw	غالسيوم اليهودية
<i>Galium setaceum</i>	Bristled bedstraw	دحريج
<i>Galium tricornutum</i>	Tricornutum bedstraw	غالسيوم مثلث الزوايا
<i>Valantia hispida</i>	Hispid valantia	فلنتية
<b>Caprifoliaceae</b>	Caprifoliaceae	بلسانيات
<i>Lonicera etrusca</i>	Etruscan honeysuckle	لونيسره أتروريا
<b>Dipsacaceae</b>	Dipsacaceae	دبساسيات
<i>Cephalaria joppensis</i>	Jaffa cephalaria	سيوان يافا
<i>Cephalaria syriaca phoeniciaca</i>	Syrian scabious	سيوان سوري
<b>Cucurbitaceae</b>	Cucurbitaceae	قرعيات
<i>Bryonia syriaca</i> (4)	Syrian bryony	فانشرا سورية
<b>Campanulaceae</b>	Campanulaceae	بوقيات
<i>Campanula strigosa</i> (4)	Strigose bellflower	جريس شانك الزغب
<b>Asteraceae (Compositae)</b>	Asteraceae	المركبات
<i>Aetheorhiza bulbosa</i>	Bulbous hawk's-beard	بيض الأرض
<i>Ambrosia maritima</i> (3)	Sea ambrosia	غبيرة
<i>Anthemis palestina</i> (4)	Palestine chamomile	بهار فلسطيني
<i>Artemisia monosperma</i> (4)	Sand wormwood	عادر
<i>Carduus argentatus</i> (4)	Silvery plumed-thistle	خرفيش صغير
<i>Carlina lanata</i>	Purple carline	كرلينة صوفية
<i>Centaurea iberica meryonis</i> (4)	Iberian knapweed	قنطريون ايبيريا
<i>Centaurea procurrans</i> (4)	Procumbent knapweed	قنطريون ممتد
<i>Chrysanthemum myconis</i>	Mico's chrysanthemum	قوقحان ميكو
<i>Crepis aculeata</i> (4)	Prickly hawkwood	سراغة شانكة
<i>Eclipta prostrata</i> (3)	Prostrate eclipta	سعدة مفترشة
<i>Erigeron bonariensis</i>	Buenos Aires fleabane	أريغارون بونس أيرس
<i>Erigeron canadense</i>	Canadian fleabane	أريغارون كندي
<i>Eupatorium cannabinum syriacum</i> (2)	Syrian hemp-agrimony	أوبتريوم سوري
<i>Filago pyramidata</i>	Pyramidal cotton-rose	قطينة هرمية
<i>Hedypnois cretica monspeliensis</i>	Cretan hedypnois	هدينويس كريت
<i>Hedypnois rhagadioloides tubiformis</i>	Nipplewort hedypnois	سرة الكبش
<i>Helichrysum sanguineum</i> (4)	Blood-red everlasting	خالدة حمراء
<i>Inula graveolens</i>	Heavy-sented inula	طيون عبق

<i>Launaea tenuiloba</i> (2)	Slender-lobed launaea	سليحة الجمال
<i>Notobasis syriaca</i>	Syrian thistle	لحلاح
<i>Onopordum carduiforme</i> (4)	False plumed-thistle	راس الشيخ
<i>Otanthus maritimus</i>	Sea cottonweed	اذنية بحرية
<i>Picris amalecitana</i> (4)	Amalek ox-tongue	مرير عمالق
<i>Scolymus maculatus</i>	Spotted golden-thistle	سكوليمس مبقع
<i>Senecio gallicus</i>	French groundsel	شرونة فرنسية
<i>Senecio leucanthemifolius</i>	Oxeye groundsel	شرونة بيضاء
<i>Senecio vernalis</i>	Spring groundsel	شرونة ربيعية
<i>Silybum marianum</i>	Lady's-thistle	شوك مريم
<i>Varthemia iphionoides</i> (4)	Common varthemia	فرتمية شائعة

**ANNEX 2:** List of mammals at Tyre Beach Reserve.

- (1) refers to globally threatened species  
 (2) refers to locally threatened species  
 (3) refers to endemic species  
 (4) refers to wholly or partially restricted species to East Mediterranean area  
 (5) rare species

<b>SCIENTIFIC NAME</b>	<b>English Name</b>	<b>Arabic Name</b>
<b>ERINACEIDAE</b>		
<i>Erinaceus europaeus concolor</i> (4)	<b>Hedgehog</b>	كبابة الشوك
<b>PTEROPODIDAE</b>		
<i>Rousettus aegyptiacus aegyptiacus</i>	<b>Egyptian Fruit-Bat</b>	رداسة مصرية
<b>RHINOLOPHIDAE</b>		
<i>Rhinolophus euryale judaicus</i> (1, 4)	<b>Mediterranean Horseshoe</b>	عماش صغير
<i>Pipistrellus kuhli ikhawanius</i> (1, 4)	<b>Kuhl's Pipistrelle</b>	خفاش كوهلي
<b>CANIDAE</b>		
<i>Canis aureus syriacus</i> (4)	<b>Jackal</b>	ابن اوى
<i>Vulpus vulpus palaestina</i> (4)	<b>Red Fox</b>	الثعلب
<b>MUSTELIDAE</b>		
<i>Vormela peregusna syriaca</i> (1, 4)	<b>Marbled Polecat</b>	الظربان
<i>Meles meles canescens</i> (1)	<b>Badger</b>	الغريير
<b>SPALACIDAE</b>		
<i>Spalax leucodon ehrenbergi</i> (4)	<b>Mole-Rat</b>	الخلد
<b>MURIDAE</b>		
<i>Rattus norvegicus norvegicus</i>	<b>Brown Rat</b>	جرذون شائع

<i>Mus musculus praetextus</i>	<b>House Mouse</b>	الفأرة
<i>Acomys dimidiatus</i> (4) (5)	<b>Spiny Mouse</b>	فأر شوكي
<b>CRICETIDAE</b>		
<i>Meriones tristrami tristrami</i> (4)	<b>Jird</b>	جرذ ترسترام

**ANNEX (3):** List of bird species at Tyre Beach Reserve (Ramadan-Jaradi & Ramadan-Jaradi, in lit.).

Dates and names of observers are given for vagrants and species that were known in the past or recently discovered by the author of this ornithological section. 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). Lower case abbreviations, e.g. r, sb, s, wv and pm indicate that the species is uncommon or rare at the relevant season at Tyre Beach Reserve.

- 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 by the species' present status at Tyre Beach Reserve only.

1. **Little Grebe** *Tachybaptus ruficollis* **pm**
2. **Black-necked Grebe** *Podiceps nigricollis* **pm**
3. **Mediterranean Shearwater** *Puffinus yelkouan* **v**  
First recorded by Van Dyck in 1904.
4. **Great Cormorant** *Phalacrocorax carbo* **pm**
5. **Pygmy Cormorant** *Phalacrocorax pygmeus* \*\*\* **v**
6. **White Pelican** *Pelecanus onocrotalus* **PM**  
First recorded by Tristram (1882)
7. **Dalmatian Pelican** *Pelecanus crispus*\*\*\* **?v**  
First recorded by Tristram (1882)
8. **Bittern** *Botaurus stellaris*\*\* **pm**
9. **Little Bittern** *Ixobrychus minutus* **pm, wv**
10. **Night Heron** *Nycticorax nycticorax* **pm**
11. **Squacco Heron** *Ardeola ralloides* **pm**
12. **Cattle Egret** *Bubulcus ibis* **pm**
13. **Little Egret** *Egretta garzetta* **PM**
14. **Great White Egret** *Egretta alba* **PM**
15. **Grey Heron** *Ardea cinerea* **PM**
16. **Purple Heron** *Ardea purpurea* **pm**  
First recorded by Bourne (1958)
17. **Black Stork** *Ciconia nigra* **pm**
18. **White Stork** *Ciconia ciconia*\*\* **PM**
19. **Glossy Ibis** *Plegadis falcinellus* **pm**
20. **Spoonbill** *Platalea leucorodia* **pm**
21. **Greater Flamingo** *Phoenicopterus ruber* **pm**

22. **Graylag Goose** *Anser albifrons* pm  
 23. **Shelduck** *Tadorna tadorna* pm  
 24. **European Wigeon** *Anas penelope* pm  
 25. **Gadwall** *Anas strepera* pm  
 26. **Teal** *Anas crecca* PM, WV  
 27. **Mallard** *Anas platyrhynchos* PM, WV  
 28. **Pintail** *Anas acuta* pm  
 29. **Garganey** *Anas querquedula* PM  
 30. **Shoveler** *Anas clypeata* pm, wv  
 First recorded by Flach (1959)  
 31. **Red-crested Pochard** *Netta rufina* v  
 First recorded by Ramadan-Jaradi & Ramadan-Jaradi (1999) in 1995.  
 32. **Pochard** *Aythya ferina* pm  
 33. **Ferruginous Duck** *Aythya nyroca* \*\* v  
 34. **Tufted Duck** *Aythya fuligula* pm  
 35. **Honey Buzzard** *Pernis apivorus*\*\* PM  
 First recorded by Tristram in 1882  
 36. **Black-winged Kite** *Elanus coeruleus*\*\* v  
 First recorded by Tristram in 1863  
 37. **Black Kite** *Milvus migrans* pm  
 38. **Red Kite** *Milvus milvus* v  
 39. **Egyptian Vulture** *Neophron percnopterus*\*\* pm  
 40. **Griffon Vulture** *Gyps fulvus*\*\* v  
 41. **Short-toed Eagle** *Circaetus gallicus* PM  
 42. **Marsh Harrier** *Circus aeruginosus* PM  
 43. **Hen Harrier** *Circus cyaneus* pm  
 44. **Pallid Harrier** *Circus macrourus* pm  
 45. **Montagu's Harrier** *Circus pygargus* pm  
 46. **Goshawk** *Accipiter gentilis* pm  
 47. **Sparrowhawk** *Accipiter nisus* pm  
 48. **Levant Sparrowhawk** *Accipiter brevipes*\*\* PM  
 49. **Common Buzzard & Steppe Buzzard** *Buteo buteo* pm  
 50. **Long-legged Buzzard** *Buteo rufinus* pm, wv  
 51. **Lesser Spotted Eagle** *Aquila pomarina*\*\* pm  
 52. **Steppe Eagle** *Aquila nipalensis* pm  
 53. **Golden Eagle** *Aquila chrysaetos* pm  
 54. **Verreaux's Eagle** *Aquila verreauxii* v  
 First recorded by Ramadan-Jaradi & Ramadan-Jaradi in 1996  
 55. **Booted Eagle** *Hieraaetus pennatus* pm  
 56. **Bonelli's Eagle** *Hieraaetus fasciatus* pm  
 57. **Osprey** *Pandion haliaetus* pm  
 58. **Lesser Kestrel** *Falco naumanni*\*\*\* sb, pm  
 First recorded by Ramadan-Jaradi & Ramadan-Jaradi (2001)  
 59. **Kestrel** *Falco tinnunculus* pm, wv  
 60. **Red-footed Falcon** *Falco vespertinus* pm  
 61. **Merlin** *Falco columbarius* pm

62. **Hobby** *Falco subbuteo* **pm**
63. **Lanner** *Falco biarmicus*\*\* **pm**
64. **Eleonora's Falcon** *Falco eleonorae* **pm**
65. **Saker Falcon** *Falco cherrug*\*\* **pm**
66. **Peregrine Falcon** *Falco peregrinus* **pm, wv**
67. **Quail** *Coturnix coturnix* **PM**
68. **Water Rail** *Rallus aquaticus* **pm, wv**
69. **Spotted Crake** *Porzana porzana* **pm**
70. **Little Crake** *Porzana parva* **pm**
71. **Baillon's Crake** *Porzana pusilla* **pm**
72. **Corncrake** *Crex crex*\*\*\* **pm**  
First recorded by Flach (1959)
73. **Moorhen** *Gallinula chloropus* **pm, wv**
74. **Coot** *Fulica atra* **R, PM, WV**
75. **Crane** *Grus grus* **pm, wv**
76. **Black-winged Stilt** *Himantopus himantopus* **pm**
77. **Stone Curlew** *Burhinus oediconemus* **pm**  
First recorded by Falch (1959) in 1958)
78. **Collared Pratincole** *Glareola pratincola* **pm**
79. **Black-winged Pratincole** *Glareola nordmanni*\* **pm**
80. **Little Ringed Plover** *Charadrius dubius* **pm**  
First recorded by Ramadan-Jarad & Ramadan-Jaradi (1999)
81. **Ringed Plover** *Charadrius hiaticula* **pm**
82. **Kentish Plover** *Charadrius alexandrinus* **pm**  
First recorded by Carruthers in 1904
83. **Greater Sand Plover** *Charadrius leschenaulti* **pm**
84. **Dottrel** *Charadrius morinellus* **pm**  
First recorded by Ramadan-Jaradi & Ramadan-Jaradi in 1995
85. **Golden Plover** *Pluvialis apricaria* **pm**
86. **Grey Plover** *Pluvialis squatarola* **pm**
87. **Spur-winged Plover** *Hoplopterus spinosus* **?sb, pm**  
First seen by Flach (1959) in 1958
88. **Lapwing** *Vanellus vanellus* **pm, wv**
89. **Little Stint** *Calidris minuta* **pm**
90. **Temminck's Stint** *Calidris temminckii* **pm**
91. **Curlew Sandpiper** *Calidris ferruginea* **pm**
92. **Dunlin** *Calidris alpina* **pm**
93. **Ruff** *Philomachus pugnax* **pm**
94. **Jack Snipe** *Lymnocyptes minimus* **pm, wv**
95. **Common Snipe** *Gallinago gallinago* **pm, wv**
96. **Great Snipe** *Gallinago media*\*\* **pm**  
First recorded by Van Dyck in 1881
97. **Black-tailed Godwit** *Limosa limosa* **pm**
98. **Whimbril** *Numenius phaeopus* **pm**
99. **Redshank** *Tringa totanus* **pm, wv**  
First recorded by Carruthers in 1904

100. **Marsh Sandpiper** *Tringa stagnatilis* pm  
 101. **Greenshank** *Tringa nebularia* pm, wv  
 102. **Green Sandpiper** *Tringa ochropus* pm  
 103. **Wood Sandpiper** *Tringa glareola* pm  
 104. **Common Sandpiper** *Actitis hypoleucos* pm  
 105. **Turnstone** *Arenaria interpres* v  
 106. **Sooty Gull** *Larus hemprichii*\* v  
 Only one record by Flach (1959)  
 107. **Great Black-headed Gull** *Larus ichthyaetus* v  
 108. **Little Gull** *Larus minutus* pm, wv  
 109. **Black-headed Gull** *Larus ridibundus* PM, WV  
 110. **Slender-billed Gull** *Larus genei* v  
 111. **Great Black-backed Gull** *Larus marinus* v  
 First recorded by Flach (1959)  
 112. **Lesser Black-backed Gull** *Larus fuscus* PM, WV, s  
 113. **Yellow-legged Gull** *Larus cachinnans* PM, WV  
 First recorded by Tristram in 1864  
 114. **Armenian Gull** *Larus armenicus* v  
 First recorded by Ramadan-Jaradi & Ramadan-Jaradi in 1996  
 115. **Gull-billed Tern** *Gelochelidon nilotica* v  
 First recorded by Tristram in 1864  
 116. **Sandwich Tern** *Sterna sandvicensis* pm, wv  
 117. **Common Tern** *Sterna hirundo* PM  
 118. **Little Tern** *Sterna albifrons* v  
 119. **Whiskered Tern** *Chlidonias hybridus* pm  
 120. **White-winged Black Tern** *Chlidonias leucopterus* pm  
 121. **Turtle Dove** *Streptopelia turtur* pm  
 122. **Palm Dove** *Streptopelia senegalensis* R  
 First recorded by Ramadan-Jaradi & Ramadan-Jaradi (1999)  
 123. **Great Spotted Cuckoo** *Clamator glandarius* v  
 124. **Cuckoo** *Cuculus canorus* pm  
 125. **Barn Owl** *Tyto alba* r  
 126. **Little Owl** *Athene noctua* r  
 First recorded by Tristram (1865)  
 127. **Short-eared Owl** *Asio flammeus* wv  
 First recorded by West (1954)  
 128. **Nightjar** *Caprimulgus europaeus* pm  
 129. **Swift** *Apus apus* SB, PM  
 First recorded by Ramadan-Jaradi & Ramadan-Jaradi (1999)  
 130. **Pallid Swift** *Apus pallidus* pm  
 131. **Alpine Swift** *Apus melba* PM  
 132. **Little Swift** *Apus affinis* pm  
 133. **Kingfisher** *Alcedo atthis* ?r  
 First recorded by Tristram (1865). No breeding proof till today in Lebanon.  
 134. **Pied Kingfisher** *Ceryle rudis* v



- First recorded by Tristram (1884)
135. **European Bee-eater** *Merops aptaster* PM
136. **Roller** *Coracias garrulus* pm
137. **Hoopoe** *Upupa epops* PM  
First recorded by Tristram (1964)
138. **Wryneck** *Jynx torquilla* pm
139. **Calandra Lark** *Melanocorypha calandra* PM
140. **Bimaculated Lark** *Melanocorypha bimaculata* pm
141. **Greater Short-toed Lark** *Calandrella brachydactyla* PM
142. **Lesser Short-toed Lark** *Calandrella rufescens* pm
143. **Crested Lark** *Galerida cristata* r
144. **Wood Lark** *Lullula arborea* wv
145. **Skylark** *Alauda arvensis* PM
146. **Sand Martin** *Riparia riparia* PM
147. **Crag Martin** *Ptyonoprogne rupestris* pm
148. **Swallow** *Hirundo rustica* PM
149. **Red-rumped Swallow** *Hirundo daurica* pm
150. **House Martin** *Delichon urbica* PM
151. **Tawny Pipit** *Anthus campestris* pm
152. **Tree Pipit** *Anthus trivialis* pm
153. **Yellow Wagtail** *Motacilla flava* PM
154. **Grey Wagtail** *Motacilla cinerea* pm, wv
155. **White Wagtail** *Motacilla alba* PM, wv, s
156. **Bulbul** *Pycnonotus xanthopygos*\* R
157. **Dunnock** *Prunella modularis* pm
158. **Rufous Bush Robin** *Cercotrichas galactotes* pm
159. **Robin** *Erithacus rubecula* WV
160. **Thrush Nightingale** *Luscinia luscinia* pm
161. **Nightingale** *Luscinia megarhynchos* pm
162. **Bluethroat** *Luscinia svecica* PM, wv
163. **White-throated Robin** *Irania gutturalis*\* pm  
First recorded by Ramadan-Jaradi & Ramadan-Jaradi (1996)
164. **Black Redstart** *Phoenicurus ochruros* pm, WV
165. First recorded by Macfarlane (1978)
166. **Redstart** *Phoenicurus phoenicurus* pm
167. **Whinchat** *Saxicola rubetra* pm
168. **Stonechat** *Saxicola torquata* pm, wv  
First recorded by Macfarlane (1978)
169. **Isabelline Wheatear** *Oenanthe isabellina* pm
170. **Wheatear** *Oenanthe oenanthe* PM, wv
171. **Desert Wheatear** *Oenanthe deserti* pm
172. **Fieldfare** *Turdus pilaris* pm, wv
173. **Song Thrush** *Turdus philomelos* pm
174. **Mistle Thrush** *Turdus viscivorus* pm
175. **Graceful Warbler** *Prinia gracilis* R
176. **Grasshopper Warbler** *Locustella naevia* v

- First recorded by Flach (1978)
177. **Savi's Warbler** *Locustella luscinioides* pm
178. **Moustached Warbler** *Acrocephalus melanopogon* pm
179. **Sedge Warbler** *Acrocephalus schoenobaenus* pm
180. **Marsh Warbler** *Acrocephalus palustris* pm  
First recorded by Flach (1959)
181. **European Reed Warbler** *Acrocephalus scirpaceus* pm
182. **Great Reed Warbler** *Acrocephalus arundinaceus* PM
183. **Olivaceous Warbler** *Hippolais pallida* PM
184. **Upcher's Warbler** *Hippolais languida*\* ?sb, pm
185. **Ménétries's Warbler** *Sylvia mystacea*\* pm
186. **Sardinian Warbler** *Sylvia melanocephala* ?r, sb, PM, wv
187. **Rüppell's Warbler** *Sylvia rueppelli* pm
188. **Orphean Warbler** *Sylvia hortensis* PM
189. **Barred Warbler** *Sylvia nisoria* pm
190. **Lesser Whitethroat** *Sylvia curruca* ?sb, PM, ?wv
191. **Whitethroat** *Sylvia communis* ?sb, PM
192. **Garden Warbler** *Sylvia borin* pm
193. **Blackcap** *Sylvia atricapilla* PM
194. **Bonelli's Warbler** *Phylloscopus bonelli* pm
195. **Wood Warbler** *Phylloscopus sibilatrix* pm
196. **Chiffchaff** *Phylloscopus collybita* PM, wv
197. **Willow Warbler** *Phylloscopus trochilus* pm  
First recorded by Flach (1959)
198. **Spotted Flycatcher** *Muscicapa striata* PM
199. **Red-breasted Flycatcher** *Ficedula parva* pm
200. **Semi-collared Flycatcher** *Ficedula semitorquata* pm
201. **Collared Flycatcher** *Ficedula albicollis* pm
202. **Pied Flycatcher** *Ficedula hypoleuca* pm
203. **Palestinian Sunbird** *Nectarinea osea* R  
First recorded by Carruthers (1910) in 1904
204. **Golden Oriole** *Oriolus oriolus* sb, pm
205. **Isabelline Shrike** *Lanius isabellinus* pm, wv
206. **Red-backed Shrike** *Lanius collurio* PM
207. **Woodchat Shrike** *Lanius senator* PM
208. **Masked Shrike** *Lanius nubicus* sb, PM
209. **Hooded Crow** *Corvus corone cornix* visitor
210. **Starling** *Sturnus vulgaris* wv
211. **Sparrow** *Passer domesticus* R
212. **Spanish Sparrow** *Passer hispaniolensis* pm, wv
213. **Chaffinch** *Fringilla coelebs* pm
214. **Syrian Serin** *Serinus syriacus*\* visitor
215. **Greenfinch** *Carduelis chloris* r, PM, WV
216. **Goldfinch** *Carduelis carduelis* visitor
217. **241. Siskin** *Carduelis spinus* wv
218. **Yellowhammer** *Emberiza citronella* wv

219. **Ortolan Bunting** *Emberiza hortulana* **pm**  
220. **Reed Bunting** *Emberiza schoeniclus* **wv**  
221. **Black-headed Bunting** *Emberiza melanocephala* **PM**  
222. **251. Corn Bunting** *Miliaria calandra* **pm**

**ANNEX 4:** List of amphibians and reptiles at Tyre Beach 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

<b>SCIENTIFIC NAME</b>	<b>English Name</b>	<b>Arabic Name</b>
<b>ANURA</b>		
<i>Bufo viridis</i> (2)	<b>Green toad</b>	علجوم أخضر
<i>Rana levantina</i> (2)	<b>Levant frog</b>	ضفدع شرقي
<i>Hyla savignyi</i> (2)	<b>Common tree-frog</b>	ضفدع الشجر
<b>TRIONYCHIDAE</b>		
<i>Trionyx triunguis</i> ?(2)	<b>Terrapin</b>	سلحفاة مياه عذبة
<b>DERMOCHELYIDAE</b>		
<i>Dermochelys coriacea coriacea</i> ?(1)	<b>Lather-back turtle</b>	سلحفاة جلدية الظهر
<b>CHELONIDAE</b>		
<i>Caretta caretta caretta</i> (1) (4)	<b>Logger-head turtle</b>	سلحفاة ضخمة الرأس
<i>Chelonia mydas mydas</i> (1)	<b>Green turtle</b>	سلحفاة خضراء
<b>EMYDIDAE</b>		
<i>Mauremys caspica</i> (2)	<b>Caspian mauremys</b>	سلحفاة أميد
<b>GEKKONIDAE</b>		
<i>Hemidactylus turcicus</i> (2)	<b>Turkish gecko</b>	أبو بريص
<b>AGAMIDAE</b>		
<i>Laudakia stellio stellio</i>	<b>Agama</b>	حردون
<i>Lacerta laevis laevis</i> (2)	<b>Wall lizard</b>	سحلية الحيطان

<b>LACERTIDAE</b>		
<i>Acanthodactylus shreiberi</i> (2) (3)	<b>Shreiber's lizard</b>	سحلية شريبر
<b>SCINCIDAE</b>		
<i>Chalcides ocellatus ocellatus</i> (2)(4)	<b>Ocellated skink</b>	سقتقور زئمي
<i>Mabuya vittata</i>	<b>Vital's skink</b>	سقتقور حيوي
<b>COLUBRIDAE</b>		
<i>Coluber rubriceps</i> (2)	<b>Small whipe snake</b>	أفعى نشايبه
<i>Coluber najadum</i> (2)	<b>Dahl's whipe snake</b>	أفعى كرباجية
<i>Malpolon monspessulana</i> (2)	<b>Montpellier snake</b>	أفعى مونبلييه
<i>Natrix tessellata tessellata</i> (2)	<b>Dice snake</b>	أفعى الزهر

**ANNEX 5: List of invertebrates at Tyre Beach Nature Reserve**

	<b>Abundance</b>	<b>Habitat</b>
<b>Mollusks</b>		
<b>Gastropods</b>		
<i>Succinea (Oxyloma) elegans</i> Risso	(10 individus)	Marsh
<i>Theodoxus jordani</i> (Sow.)	(30 individus)	Spring tributary
<i>Melanopsis praemorsa buccinoida</i> Olivier	(10 individus)	Spring tributary
<i>Physella(physa) acuta</i> Drap.	(5 individus)	Stream
<b>Odonates</b>		
<i>Platycnemis dealbata</i> Sélys	(2 mâles,2 femelles)	Stream
<b>Hirudinées</b>		
<i>Dina lineata concolor</i> Ann.	(4 individus)	Stream

**ANNEX 6: List and summary status of the observed insect specimens at Tyre Beach Reserve.**

<b>Order</b>	<b>Family</b>	<b>Scientific name</b>	<b>density</b>	<b>abundance</b>
Coleoptera	Tenebrionodae Fig1	<i>Pimelia sp.</i>	low	Rare
Coleoptera	Tenebrionodae Fig3		low	Rare
Coleoptera	Cantharidae Fig40		medium	common
Coleoptera	Bostrichidae Fig39		medium	uncommon
Coleoptera	Cicindellidae Fig31	Gen. <i>Cicindella</i>	Very high	uncommon
Coleoptera	Scarabeidae Fig20		low	Rare
Coleoptera	Scarabeidae Fig27	<i>Tropinota squalida</i> (Pilosa, Bruille 1832)	*	
Coleoptera	Scarabeidae Fig26	<i>Oxythyrea albopicta</i> (Motchulsky 1854)	*	
Coleoptera	Carabidae Fig16		low	Rare
Coleoptera	Coccinellidae Fig33	<i>Chilicorus bipustulatus</i> (Linnaeus 1758)	low	Rare
Coleoptera	Cocinellidae Fig34	<i>Coccinella septumpunctata</i>	low	Rare
Coleoptera	Cerambycidae Fig30		low	Rare
Coleoptera	Cerambycidae Fig28	<i>Certallum ebulinum</i> (Linnaeus 1767)	medium	uncommon
Coleoptera	Curculionidae Fig(35)		low	Rare
Diptera	Tipulidae Fig(43)		low	uncommon
Diptera	Bibionidae Fig(45)		medium	common
Diptera	Ceratopogonidae Fig(44)		high	Common
Hemiptera	Lygidae Fig(53)	<i>Spilostethus pandurus</i> (Scopoli 1763)	low	common
Hemiptera	Lygidae Fig50		low	Rare
Hemiptera	Coreidae Fig52		low	Rare
Hemiptera	Pentatomidae Fig55		medium	uncommon
Hemiptera	Pyrrhocoridae Fig54	<i>Pyrrhocoris apterus</i> (Linnaeus 1758)	medium	common
Hymenoptera	Apidae	<i>Apis mellifera</i>	Very high	common
Hymenoptera	Vespidae Fig65		low	Rare
Orthoptera	Acrididae Fig 74		low	common

**ANNEX 7: list of butterflies (32 species) of Tyre Beach Nature Reserve with mention to occurrence in other habitats or sites.**

Butterflies of Tyre Beach Reserve					
No	Scientific Name	English Name	Sub-Family	Family	Place
1	<i>Papilio machaon syriacus</i>	Swallowtail	Papilioninae	PAPILIONIDAE	Hazmiye, Tyre, Aammiq
2	<i>Pieris brassicae catoleuca</i>	Large White	Pierinae	PIERIDAE	Hazmiye, Tyre, Aammiq
3	<i>Pieris rapae leucosoma</i>	Small White	Pierinae	PIERIDAE	Hasmiye , Tyre , Terbol , Beqaa, Aammiq
4	<i>Pieris napi dubiosa</i>	Green-veined White	Pierinae	PIERIDAE	Laklouk , Hammana , Antelias , sea level, Jbeil, Cedar Mountain, Hazmiye, Tyre
5	<i>Pontia daplidice daplidice</i>	Bath White	Pierinae	PIERIDAE	Hazmiye, Tyre
6	<i>Colotis fausta fausta</i>	salmon Caper Butterfly	Pierinae	PIERIDAE	environs of Tyre, sea level, Tyre, Aammiq
7	<i>Anthocharis cardamines phoenissa</i>	Orange Tip	Pierinae	PIERIDAE	Hazmiye, Tyre, Aammiq
8	<i>Leptidea sinapis ? Sinapis</i>	Wood White	Dismorphiinae	PIERIDAE	Jisr el-Qadi, Aabadiye, Yarze, Tyre
9	<i>Danaus chrysippus chrysippus</i>	Plain Tiger	Danainae	NYMPHALIDAE	Batroun, Tyre, Aammiq
10	<i>Limenitis reducta reducta</i>	Southern White Admiral	Nymphalinae	NYMPHALIDAE	Hazmiye, Tyre, Aammiq
11	<i>Precis hierta crebrene</i>	Yellow Pansy	Nymphalinae	NYMPHALIDAE	near Tyre
12	<i>Vanessa atalanta atalanta</i>	Red Admiral	Nymphalinae	NYMPHALIDAE	Tyre, Aammiq
13	<i>Aglais urticae turcica</i>	Tortoiseshell	Nymphalinae	NYMPHALIDAE	Jabal Kesrouan, Tyre
14	<i>Melitaea phoebe telona</i>	Knapweed Fritillary	Nymphalinae	NYMPHALIDAE	Hazmiye, Tyre



Butterflies of Tyre Beach Reserve					
No	Scientific Name	English Name	Sub-Family	Family	Place
15	<i>Melitaea deserticola macromaculata</i>	Desert Fritillary	Nymphalinae	NYMPHALIDAE	Bouarej, Hazmiye, Tyre, Aammiq
16	<i>Pseudotergumia pisidice pisidice</i>	Sinai Grayling	Satyrinae	NYMPHALIDAE	Tyre, sea level
17	<i>Maniola telmessia telmessia</i>	Eastern Meadow Brown	Satyrinae	NYMPHALIDAE	Hazmiye, Tyre, near Halba, Aammiq
18	<i>Ypthima asterope asterope</i>	African Ringlet	Satyrinae	NYMPHALIDAE	Hazmiye, Tyre
19	<i>Pararge aegeria aegeria</i>	Speckled Wood	Satyrinae	NYMPHALIDAE	Hazmiye, Tyre, Aammiq
20	<i>Strymonidia (Satyrium) spini melantho</i>	Blue-spot Hairstreak	Theclinae	LYCAENIDAE	near Damour, Aammiq, Tyre
21	<i>Deudorix (Virachola) livia livia</i>	Pomegranate Hairstreak	Theclinae	LYCAENIDAE	Tyre, sea level
22	<i>Lycaena (Thersamonia) thersamon kurdistanica</i>	Lesser Fiery Copper	Lycaeninae	LYCAENIDAE	Hazmiye, Tyre, Aammiq
23	<i>Apharitis acamas acamas</i>	Levantine Leopard Betterfly	Aphnaeinae	LYCAENIDAE	Tyre, sea level
24	<i>Lampides boeticus boeticus</i>	Long-tailed Blue	Lampidinae	LYCAENIDAE	Tyre, Laklouk, Aammiq
25	<i>Azanus jesous gamra</i>	African Babul Blue	Everinae	LYCAENIDAE	AUB Campus, Tyre, sea level
26	<i>Chilades galba galba</i>	Small Desert Blue	Plebejinae	LYCAENIDAE	Aarida, Sea Level, Aammiq
27	<i>Aricia agestis agestis</i>	Brown Argus	Plebejinae	LYCAENIDAE	Hazmiye, Tyre, Aammiq
28	<i>Spialia orbifer hilaris</i>	Orbiferous Skipper	Pyrginae	HESPERIIDAE	15 km E. of Damour, Tyre
29	<i>Carcharodus alceae alceae</i>	Hollyhock Skipper	Pyrginae	HESPERIIDAE	Tyre , sea level
30	<i>Adopoea hyrax hyrax</i>	Levantine Skipper	Hesperiinae	HESPERIIDAE	Hazmiye , Tyre

<b>Butterflies of Tyre Beach Reserve</b>					
<b>No</b>	<b>Scientific Name</b>	<b>English Name</b>	<b>Sub-Family</b>	<b>Family</b>	<b>Place</b>
31	<i>Gegenes pumilio pumilio</i>	Pigmy Skipper	Hesperiinae	HESPERIIDAE	Hazmiye , Tyre, Aammaiq
32	<i>Borbo borbonica zelleri</i>	Zeller's Skipper	Hesperiinae	HESPERIIDAE	Aarida , sea level, Tyre

**ANNEX 8: List of algae of Tyre Beach Nature Reserve**  
**Rare (5)**

Merismopedia tenuissima  
 Oscillatoria agardhii  
 Paracapsa siderophila  
 Wollea saccata  
 Gomphonema truncatum

**Endemic (0)**

**Noteworthy(6)**

Microcystis flos- aquae  
 Achnanthes minutissima  
 Cocconeis placentula  
 Cyclotella meneghiniana  
 Nitzschia palea  
 Surirella ovata

**Introduced (1)**

Hyphomorpha antillarum

**Threatened (2)**

Cymbella minuta	Very Low
Cymatopleura solea	Very Low

## ANNEX 9 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 placed 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.

## REFERENCES

### FLORA REFERENCES

- Abi-Saleh B. & Nasser N. & Rami H. & Safi N. & Safi S. & Tohmé H. – (1996)** La flore terrestre. *Etude de la diversité biologique du Liban ; Projet GF / 6105-92-72. Publication n°3.*
- Abou-Chaar C. (1991)** *The woody plants of A.U.B. campus.* Beirut: American University of Beirut.
- ECODIT-IAURIF (1997)** Regional environmental assessment Report on the coastal zone of Lebanon. *Government of Lebanon Council for Development and Reconstruction.*
- Edgecombe W.S. (1970)** *Weeds of Lebanon.* Beirut: American University of Beirut.
- Lys P. & Ades J. (1956)** *Petite flore illustrée du Liban.* Beirut : Faculté Française de Médecine.
- Mouterde P. (1966-1970-1983)** *Nouvelle flore du Liban et de la Syrie.* 3 vols + 3 atlas. Beirut : Dar El-Machreq (Imprimerie Catholique).
- Nehmé M. (1977)** *Fleurs sauvages du Liban.* 3 versions (Arabic, 1981; English, 1978). Beirut : Conseil National de la Recherche Scientifique.
- Nehmé M. (2000)** Dictionnaire étymologique de la flore du Liban. *Librairie du Liban Editeurs, Beyrouth.*
- Polunin O. & Huxley A. (1955)** *Flowers of the Mediterranean.* London: Chatto and Windus.
- Post G.E. (1932)** *Flora of Syria, Palestine and Sinai.* 2d Edition, 2 vols. Beirut: American University of Beirut.
- Tohmé G. & Tohmé H. (1985)** *Ecologie du Liban. Faits et exemples (en arabe, titre en français).* *Publications de l'UL n° 15.* 216 p. et plusieurs photos en couleur.
- Tohmé G. (1993)** *La médecine populaire et les plantes médicinales au Liban. Premier Congrès international – Plantes médicinales et phytothérapie.* Tunis 19-20 mai 1993.
- Tohmé G. & H. (2001)** *Recherche sur le statut actuel de la flore du Liban.* Beirut: Lebanese Science Journal, Vol 2, No 1: 3-15.
- Tohmé G. & H. (2002)** *A Thousand and One Flowers of Lebanon.* Beirut: Publications of the LEBANESE UNIVERSITY, Natural Sciences Section 22. 309 pp. (in English, title in French and Arabic)
- Tohmé G., Tohmé H., Hrawi S., Karakira M., Slim, K. and Gèze R. (1999)** Report on Five protected areas in Lebanon. *National Council for Scientific Research.* (Project UNDP n° Leb.95-G31-AIG-99).
- Polunin O. & Huxley A. (1955)** *Flowers of the Mediterranean.* London : Chatto and Windus.
- Post G.E. (1932)** *Flora of Syria, Palestine and Sinai.* 2d Edition, 2 vols. Beirut : American University of Beirut.



**Tohmé G. & Tohmé H. (1985)** Ecologie du Liban. Faits et exemples (en arabe, titre en français). *Publications de l'UL* n° 15. 216 p. et plusieurs photos en couleur.

**Tohmé G. (1993)** La médecine populaire et les plantes médicinales au Liban. *Premier Congrès international – Plantes médicinales et phytothérapie*. Tunis 19-20 mai 1993.

**Tohmé G. & H. (2001)** *Recherche sur le statut actuel de la flore du Liban*. Beirut : Lebanese Science Journal, Vol 2, No 1 : 3-15.

**Tohmé G. & H. (2002)** *A Thousand and One Flowers of Lebanon*. Beirut: Publications of the LEBANESE UNIVERSITY, Natural Sciences Section 22. 309 pp. (in English, title in French and Arabic)

**Tohmé G., Tohmé H., Hrawi S., Karakira M., SLIM, K. and Gèze R. (1999)** Rapport on Five protected areas in Lebanon. *National Council for Scientific Research*. (Project UNDP n° Leb.95-G31-AIG-99).

## MAMMAL REFERENCES

- Allen, G.M. (1915)** Mammals obtained by the Phillips Palestine Expedition *Bull. Mus. Comp. Zool.*, Harvard, 59: 1-14.
- Atallah S. I. (1965)** Species of the Subfamily *Microtine (Rodentia)* in Lebanon. M.S. Thesis AUB Lebanon, 1-32.
- Atallah S. I. (1977-1978)** Mammals of the Eastern Mediterranean Region: Their Ecology, Systematics and Zoogeographical Relationships. *Saugetierkundliche Mitteilungen*, t. 25 (4): 241-320 & t. 26 (1): 1-50.
- Atallah, S. I. & Harrison, D. L. (1967)** New Records of Rodents, Bats and Insectivores from the Arabian Peninsula. *J. Zool. London*, 153: 311-319.
- Atallah, S. I. (1970)** Bats of the genus *Myotis (Vespertilio)* in Lebanon. *Univ. Conn. Occas. Papers (Biol. Ser.)* I, 4: 205-212.
- Bate, D.M.A. (1945)** Notes on Small Mammals from the Lebanon Mountains, Syria. *Ann. Mag. Nat. Hist.* (11) (12): 141-158.
- Burton, J.A. & Pearson, B. (1987)** Collins guide to the Rare Mammals of the World. *Collins, 8 Grafton Street, London W1*
- El-Hage T. (1979)** *Étude systématique et écologique du peuplement dulcicole d'Ammiq*. Publications de l'Université Libanaise. Sc. Nat. XI, 102 pp.
- El-Maalouf I.I. (1911)** *Histoire de la ville de Zahlé* (en arabe). Zahlat-el-Fatat Publ. 298 pp.
- Harrison D. L. (1964, 1968, 1972)** *The Mammals of Arabia* vol I, pp. 1-192, vol II, pp 193-381, vol III pp. 382-670 Ernest Benn Limited London.
- Harrison, D.L & Lewis, R.E. (1961)** The Large Eared Bats of the Middle East with Description of a New Subspecies. *J. Mammal.* 42,3:372-380.
- Harrison, D.L & Lewis, R.E. (1964)** A Note on the Occurrence of the Weasel *Mustela nivalis* L. 1766 (*Carnivora Mustelinae*) in Lebanon. *Zeit. Fur. Saugetierk* 29: 3, 179-181.
- Kumerloeve, H. (1975)** Die Saugetiere (Mammalia) der Turkei. Die Saugetiere (Mammalia) Syrens und der Libanon. *Veröffentlichungender Zoologischen staatssammlung*. Munchen Band 18. 69-225.
- Lewis R. E. & Harrison D. L. (1962)** Notes on the Bats from the Republic of Lebanon. *Proc. Zool. Soc. London*, 138: 473-486.
- Lewis, R.E., Lewis, J.H., Atallah, S.I. (1967)** A review of Lebanese Mammals: Lagomorpha and Rodentia. *J. Zool. Lond.* 153.
- Lewis, R.E., Lewis, J.H., Atallah, S.I. (1968)** A review of Lebanese Mammals: Carnivora, Pinnipedia, Hyracoidea and Artiodactyla. *J. Zool. Lond.* 154, 517-531.
- Tohmé G., Nahas-Zahreddine, G. & Neuschwander J. (1975)** Quelques nouvelles données sur le statut actuel du loup *Canis lupus pallipes* au Liban. *Mammalia* t. 39, n° 3.
- Tohmé G. & Tohmé H. (1980)** Contribution à l'étude du porc-épic *Hystrix indica indica* Kerr, 1792 (Rodentia). *Mammalia*, t. 44, pp 523-529.
- Tohmé H. & Tohmé G. (1981)** Quelques données anatomiques sur le porc-épic *Hystrix indica indica* Kerr, 1792 (Rodentia). *Mammalia*, t. 45 n.3, pp 363-371.
- Tohmé G. & Tohmé H. (1981)** Extinct and Disappearing Animals in Lebanon. *Biology International (IUBS)*. Paris, n° 4.

**Tohmé, G. & Tohmé, H., (1983)** Quelques nouvelles données sur le statut actuel de l'hyène *Hyaena hyaena syriaca* Mat., 1900 (Carnivora) au Liban. *Mammalia* t.47, n.3, pp 345-351.

Tohmé H. & Tohmé G. (1983) **Quelques nouvelles données sur le statut actuel des musaraignes au Liban (*Insectivora : Soricidae*)**. *Mammalia* t. 47, n° 3, pp. 353-357. Paris.

**Tohmé G. & Tohmé H. (1985)** Ecologie du Liban. Faits et exemples (en arabe, titre en français). *Publications de l'UL* n° 15. 216 p. et plusieurs photos en couleur.

**Tohmé G. & Tohmé H. (1985)** Les Mammifères sauvages du Liban. *Publications de l'UL* n° 16. 189 p. Illustrations en couleur.

**Tohmé H., Ramadan-Jaradi, G., Abdul-Nour H., Assi F. & Hraoui-Bloquet S. (1996)** La faune terrestre. *Etude de la diversité biologique du Liban ; Projet GF / 6105-92-72. Publication n°4.*

**Tohmé G., Tohmé H., Hrawi S., Karakira M., SLIM, K. and Gèze R. (1999)** Report on Five protected areas in Lebanon. *National Council for Scientific Research*. (Project UNDP n° Leb.95-G31-AIG-99).

**Tohmé, G. & Tohmé, H., (2000)** Quelques nouvelles données sur le statut actuel des Felidae au Liban et plus particulièrement du chat des marais *Felis chaus* Gùldenstaedt, 1776. *Mammalia* t. 64, n° 2, 2000 : 247-249.,

**Tristram, H. B. (1884)** The Survey of Western Palestina. Fauna and Flora. *Committee of the Palestine Exploration Fund Publ., London*, 455 pp.

**BIRD REFERENCES**

- Aharoni, J. (1926)** Die Brutvögel Palästinas. *Beitr. Fortpfl. Biol. Vögel* 2: 49–51.
- Aharoni, J. (1931)** Brutbiologisches aus der Syrischen Wüste und dem Libanon. *Beitr. Fortpfl. Biol. Vögel* 7: 161–166, 222–226.
- Balmer, D. & Betton, K. (2002a)** Around the Region. *Sandgrouse* 24: 76-80.
- Balmer, D. & Betton, K. (2002b)** Around the Region. *Sandgrouse* 24: 156-160.
- Balmer, D. & Betton, K. (2003)** Around the Region. *Sandgrouse* 25: 76-80.
- Bara, T. (1998)** Selected records from Cheikh Zennad, a coastal wetland in north-west Lebanon. *Sandgrouse* 20: 40–45.
- Bara, T. (2002)** Bird notes from Lebanon, including two new species. *Sandgrouse*, 24: 44-45.
- Bara, T. (2003)** The first Radde's Accentor *Prunella ocularis* in Lebanon. *Sandgrouse*, 25: 69.
- Beale, C.M. (2000)** Notes on the birds of Lebanon, autumn-winter 1999. *Sandgrouse* 22: 122-124.
- Beale, C.M. & Ramadan-Jaradi, G. (2001)** Autumn routes of migrating raptors and other soaring birds in Lebanon. *Sandgrouse*, 23: 124-129.
- Beaman, M. & Madge, S. (1998)** *The Handbook of Bird Identification for Europe and the Western Palearctic*. Christopher Helm, London.
- Benson, S. V. (1970)** *Birds of Lebanon and the Jordan area*. International Council for Bird Preservation, Cambridge & Warne, London.
- Blondel, J. (1975)** L'analyse des peuplements d'oiseaux, éléments d'un diagnostic écologique. *Terre et Vie* 29: 533–589.
- Blondel, J., Ferry, C. & Frochot, B. (1981)** Point counts with unlimited distance. *Studies in Avian Biol.* 6: 414–420.
- Bourne, W.R.P. (1959)** Notes on autumn migration in the Middle East. *Ibis* 101: 170–176.
- Bradshaw, C.G. & Kirwan, G.M. (2000)** Around the Region. *Sandgrouse*, 22: 156-160.
- Busuttil, S. & Flumm, D. (1998a)** Seawatching at Ras Beirut, Lebanon in spring 1997. *Sandgrouse* 20: 142-143.
- Busuttil, S. & Flumm, D. (1998b)** The first Semi-collared Flycatcher *Ficedula semitorquata* records in Lebanon. *Sandgrouse* 20:147-148.
- Carruthers, D. (1910)** On a collection of birds from the Dead sea and north-western Arabia, with contributions to the ornithology of Syria and Palastine. *Ibis* (IX) 4: 475-491.
- Cawkell, E.M. (1944)** Notes on some birds in the Beirut area littoral. *Bull. Zool. Soc. Egypt, Syria-Palest. Suppl.*, 6: 23-25.
- Cramp, S. and Simmons, K. E. L. (eds.) (1977)** *The birds of the Western Palearctic*. Vol. 1. Oxford University Press.
- Cramp, S. and Simmons, K. E. L. (eds.) (1980)** *The birds of the Western Palearctic*. Vol. 2. Oxford University Press.
- Cramp, S. (ed.) (1985)** *The birds of the Western Palearctic*. Vol. 4. Oxford University Press.
- Cramp, S. (ed.) (1988)** *The birds of the Western Palearctic*. Vol. 5. Oxford University

Press.

**Cramps, S. & Perrins, C.M. (Eds.) (1994)** *The Birds of the Western Palearctic*. Vol. 8. Oxford University Press.

**Evans, M. I. (1994)** *Important Bird Areas in the Middle East*. BirdLife International (BirdLife Conservation Series No. 2), Cambridge.

**Flach, B. (1959)** Höstobservationer i Libanon. *Fauna och Flora* 1959: 161–180.

**Hardy, E. (1946)** Probable nesting of the Rose-coloured Pastor in Lebanon in 1945. *Ibis* 88: 398.

**Hollom, P. A. D. (1959)** Notes from Jordan, Lebanon, Syria and Antioch. *Ibis* 101: 183–200.

**Khairallah, N. H. (1986)** Four unusual records from the Lebanon. *Orn. Soc. Middle East Bull.* 16: 16–17.

**Khairallah, N.H. (1991)** Notes on the autumn raptor migration over the Lebanon in 1981. *Sandgrouse* 13: 34–41.

**Kirwan, G.M. (1997)** Around the Region. *Sandgrouse* 19: 156-160.

**Kirwan, G.M. (1999)** Around the Region. *Sandgrouse* 21: 188-192.

**Kirwan, G.M. (2001)** Around the Region. *Sandgrouse* 23: 76-80.

**Kumerloeve, H. (1960)** On the occurrence and breeding of the Palestine Sunbird, *Cinnyris osea osea* (Bonaparte), in Beirut. *Alauda* 28: 30-33.

**Kumerloeve, H. (1962)** Notes on the birds of the Lebanese Republic. *Iraq Nat. Hist. Mus. Publ.* 20–21: 1–81.

**Kumerloeve, H. (1967–1969)** Recherches sur l'avifaune de la République Arabe Syrienne essai d'un aperçu. *Alauda* 36: 1–26, 190–207; 37: 43–58, 114–134, 188–205.

**Kumerloeve, H. (1972)** Liste comparée des oiseaux nicheurs de Turquie méridionale, Syrie, Liban. *Alauda* 40: 353–366.

**Macfarlane, A. M. (1978)** Field notes on the birds of Lebanon and Syria, 1974–1977. *Army Bird-watching Soc. Per. Publ.* 3.

**MacLaren, P.I.R. (1944)**: *Zool. Soci. Egypt Bull.* 6, 1944.

**Nevins, J. (1960)** Partial check-list of the birds of Lebanon. Unpubl. manuscript.

**Ramadan-Jaradi, G. (1996a)** *Étude de la diversité biologique du Liban. Les Oiseaux*. Projet GF/6105-92-72. Publ. No. 4: 13–26.

**Ramadan-Jaradi, G. (1996b)** *Étude de la diversité biologique du Liban. Les Oiseaux*. Projet GF/6105-92-72. Publ. No. 9: 95–102.

**Ramadan-Jaradi, G. & Ramadan-Jaradi, M. (1997)** Notes on some breeding birds of Lebanon. *Sandgrouse* 19: 122-125.

**Ramadan-Jaradi, G. & Ramadan-Jaradi, M. (1999)** An updated checklist of the birds of Lebanon. *Sandgrouse*, 21: 132-170.

**Ramadan-Jaradi, G. & Ramadan-Jaradi, M. (2001)** The avifauna of Palm Islands Nature Reserve in Lebanon 1893-2000. *Lebanese Science Journal*, Vol. 2, No.1: 17-35.

**Ramadan-Jaradi, G. & Ramadan-Jaradi, M. (2002)** Population size of the Syrian Serin *Serinus syriacus* and other ornithological records from Lebanon. *Lebanese Science Journal*. Vol. 3, No.1: 27- 35.

**Shirihai, H., Khoury, F., Al-Jabour, S. & Yosef, R. (2000)** The first Pink-backed Pelican in Jordan. *Sandgrouse*, 22: 127-130.

**Shoubridge, R. (1945)**: *Middle East Biol. Sch. Spec. Bull.* 1, 1945.

- Stenhouse, J. H. (1904)** The birds of Nakhil island on the coast of Syria. *Ibis* (VIII) 4: 29–32.
- Tohmé, G. and Neuschwander, J. (1974)** Nouvelles données sur l'avifaune de la République Libanaise. *Alauda* 13: 243–258.
- Tohmé, G. and Neuschwander, J. (1978)** Nouvelles précisions sur le statut de quelques espèces nicheuses ou migratrices de l'avifaune libanaise. *L'Oiseau* 48: 319–327.
- Tohmé, G. and Tohmé, H. (1986)** *The birds of Lebanon* (in Arabic). Lebanese University, Sec. Sci. Nat. No. 17.
- Tohmé G., Tohmé H., Hrawi S., Karakira M., SLIM, K. and Gèze R. (1999)** Rapport on Five protected areas in Lebanon. *National Council for Scientific Research*. (Projet UNDP n° Leb.95-G31-AIG-99).
- Tornielli, A. (1957)** Osservazioni dall'automobile sugli uccelli del Medio Oriente. *Riv. Ital. Orn.* 27: 100–112.
- Tristram, H. B. (1864)** Report on the birds of Palestine. *Proc. Zool. Soc. London* 426–456.
- Tristram, H. B. (1882)** Ornithological notes of a journey through Syria, Mesopotamia, and southern Armenia in 1881. *Ibis* (IV) 6: 402–419.
- Wallace, D. I. M. (1984)** Selected observation from Lebanon, Syria and Jordan in the springs of 1963 and 1966. *Sandgrouse* 6: 24–27.

**HERPETOFAUNA REFERENCES**

**DEMIRAYAK, F., SADEK, R., HRAOUI-BLOQUET, S., & KHALIL, M., 2001:** Marine turtle nesting activity assessment on the Lebanon coast. Phase I: Survey to identify sites and fishery interaction. Rapport presented to MEDASET-RACSPA pp.1-48

**DEMIRAYAK, F., SADEK, R., HRAOUI-BLOQUET, S. & KHALIL, M. 2001:** Marine Turtle nesting activity assessment on the Lebanon coast. *Zool in the Middle East*. In press

**EI HAGE, T. 1986 :** Aammiq wetland: Etude systématique et écologique du peuplement dulcicole d'Aammiq, Aquatic flora of Aammiq Wetland. B. List of vertebrates . Appendix 5, p. 35.

**HRAOUI-BLOQUET, S. 1981:** Les reptiles du Liban, nomenclature et notes écologiques. *Ecol. Med.* N.7 (2), 93-101

**HRAOUI-BLOQUET, S. 1996:** Etude de la diversité biologique du Liban: La faune terrestre (Amphibiens et Reptiles). Programme des (PNUE) et Ministère de l'Agriculture. Pub. N° 4, p. 5-12.

**HRAOUI-BLOQUET, S. and SADEK, R., 1999:** Reproductive cycle of *Acanthdactylus schreiberi* in the South of Lebanon. *Congress 1999, Crète (Grèce) 10<sup>th</sup> OGM-SHE*.

**HRAOUI-BLOQUET, S. & SADEK, R., 2001:** Reproduction des Tortues marines sur les côtes sablonneuses du Liban. *Congress 2001, 11<sup>th</sup> OGM – SHE* (Slovenia).

**HRAOUI-BLOQUET, SADEK, R. and YAMMINE-SAAD, R. 1998:** Reptiles from Palm Islets, off Tripoli (North Lebanon). Miaud C. et Guyétant R. (Eds) *Le Bourget du lac, France, S.E.H.* p. 207-213.

**HRAOUI-BLOQUET, S., SADEK, R. et GEZE, R. 2001:** Les Amphibiens du Liban: Inventaire, repartition géographique et altitudinale. *Bull. Soc. Herp. Fr.* 96 p. 18-24.

**HRAOUI-BLOQUET, S., SADEK, R. SINDACO, R. and VENCHI, A. 2002:** The Herpetofauna of Lebanon: new data on distribution. *Zoology in the Middle East.* 27, p. 35-46.

**HRAOUI-BLOQUET, S. & SADEK, R. In Press:** Marines Turtles of Lebanon, preliminary records. Submitted to the Journal: *Zoology in the Middle East.*

**JARADI, Gh., SADEK, R. & ABI SAID M. 2000:** Protected Areas project: Fauna monitoring Manuel Part II. Green line association . Liban pp. I, 1-21; II, 1-17; III, 1-7.

**SADEK, R., 1986:** Aammiq wetland: A list of reptiles and amphibians actually observed or likely to be present in and around the Aammiq wetland. Appendix 6, p. 36

**SADEK, R., HRAOUI-BLOQUET, S. and SABEH, M., 1997:** Distribution and ecology of *Acanthdactylus schreiberi* in South of Lebanon. *Third world congress of herpetology (Prague)*.

**THOME G., TOHME H., HRAWI S., KARAKIRA M., SLIM, K. and GEZE, R. (1999):** Report on Five protected areas in Lebanon. *National Council for Scientific Research.* (Project UNDP n° Leb.95-G31-AIG-99).

## HYDROBIOLOGY REFERENCES

- El Hage, T. (1979):** Etude systématique et écologique du peuplement dulcicole d'Aammiq. *Pub. Univ. Liban, Sci. Nat.*, 11: 1-62.
- Dia, A. (1994)** Cycle des principaux paramètres physico-chimiques des eaux du bassin inférieur du Litani (Littoral Sud du Liban). *Bull. Scientifique Libanais*, 7(1): 11-25.
- Dia, A. & Botosaneau, L. (1980)** Une stactobia nouvelle du Liban (Tricoptera, Hydroptilidae), ses stades aquatiques et leurs constructions. *Bijdr. Dierk.*, 50 (2): 369-374.
- Dia, A. & Botosaneau, L. (1983)** Six espèces nouvelles de Tricopteres du Liban. *Bull. Zool. Mus. Amsterdam*, 9 (14): 125-135.
- Dia, A. & Henry, J.P. (1984)** Nouvelles données sur les Aselides du Liban (Crustacea, Isopoda). *Annls Limnol.*, 20 (3): 193-198.
- Giani (N.), Martinez-Ansemil (E.).** Moubayed (Z.) et Dia (A.) 1982.- Les Oligochètes aquatiques du liban. I. Neoaulodrilus libanus n.g. n. sp. et Nais iorensis, Pataridze. *Annls Limnol.*, 18(2): 179-190.
- Giani (N.) et Martinez-Ansemil (E.).** 1983.- Les Oligochètes aquatiques du Liban. IV. Epirodilus moubayedii n. sp. (Tubificidae, Rhyacodrilinae). *Annls Limnol.*, 19 (2): 87-92.
- Moubayed (Z.) 1985.-** Les Chironomides (Diptera) du Liban. III. Hydrobeanus dentistylus n. sp. (Orthoclaadiinae). *Bull. Soc. Hist. Nat. Toulouse*, 121: 73-76.
- Moubayed (J.). 1992.-** On the genus Polypedilum Kieffer, 1912 from Lebanon. Description of Chironomidae).- *Spixiana* 15(2): 197-205 München. three new species (Dipt.,
- Schmidt (Er.). 1938.-** Odonaten aus Syrien und Palastina. *Sitzber. Akad. Wiss. Wien, Math-naturw.*, Klasse Sitzungs, Abt. 1, 147 (5/10): 135-150.
- Sélys-Longchamps (E. De.). 1887.-** Odonates de l'Asie Mineure et révision de ceux des autres parties de la faune paléarctique (dite européenne). *Ann. Soc. entomol. Belg.*, 31: 1-85.
- Tohmé G., Tohmé H., Hrawi S., Karakira M. and Jeez R. (1999)** Rapport on Five protected areas in Lebanon. *National Council for Scientific Research*. (Project UNDP n° Leb.95-G31-AIG-99).
- Wagner (R.) 1932 / 1982 -** Notes on Thaumaleidae (2). Redescription of *Thaumalia libanica* Edwards. *Aquatic Insects*, 8:82.



**MICROFLORA REFERENCES**

**El Hage, T. (1979):** Etude systématique et écologique du peuplement dulcicole d'Aammiq. *Pub, Univ. Liban, Sci. Nat.*, 11: 1-62.

**Slim, K. (1994)** Etude des algues épiphytes de la mare d"Ammiq (Bekaa, Liban). *Bull. Soc. Sci. Bretagne*, 56: 125-135

**Tohmé G., Tohmé H., Hrawi S., Karakira M., Slim, K. and Jeez R. (1999)** Rapport on Five protected areas in Lebanon. *National Council for Scientific Research*. (Projet UNDP n° Leb.95-G31-AIG-99).