

Designation date: 04/06/12

Ramsar Site no. 2041

Information Sheet on Ramsar Wetlands (RIS) – 2009-2012 version

Available for download from http://www.ramsar.org/ris/key_ris_index.htm.

Categories approved by Recommendation 4.7 (1990), as amended by Resolution VIII.13 of the 8th Conference of the Contracting Parties (2002) and Resolutions IX.1 Annex B, IX.6, IX.21 and IX. 22 of the 9th Conference of the Contracting Parties (2005).

Notes for compilers:

1. The RIS should be completed in accordance with the attached *Explanatory Notes and Guidelines for completing the Information Sheet on Ramsar Wetlands*. Compilers are strongly advised to read this guidance before filling in the RIS.
2. Further information and guidance in support of Ramsar site designations are provided in the *Strategic Framework and guidelines for the future development of the List of Wetlands of International Importance* (Ramsar Wise Use Handbook 14, 3rd edition). A 4th edition of the Handbook is in preparation and will be available in 2009.
3. Once completed, the RIS (and accompanying map(s)) should be submitted to the Ramsar Secretariat. Compilers should provide an electronic (MS Word) copy of the RIS and, where possible, digital copies of all maps.

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Designation date

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Site Reference Number

2. Date this sheet was completed/updated:

26/3/2012

3. Country: Egypt

4. Name of the Ramsar site:

The precise name of the designated site in one of the three official languages (English, French or Spanish) of the Convention. Alternative names, including in local language(s), should be given in parentheses after the precise name.

Wadi El Rayan Protected Area ()

5. Designation of new Ramsar site or update of existing site:

This RIS is for (tick one box only):

- a) Designation of a new Ramsar site ; or
b) Updated information on an existing Ramsar site

6. For RIS updates only, changes to the site since its designation or earlier update:

a) Site boundary and area

The Ramsar site boundary and site area are unchanged:

or

If the site boundary has changed:

- i) the boundary has been delineated more accurately ; or
ii) the boundary has been extended ; or
iii) the boundary has been restricted**
and/or

If the site area has changed:

- i) the area has been measured more accurately ; or
ii) the area has been extended ; or
iii) the area has been reduced**

** **Important note:** If the boundary and/or area of the designated site is being restricted/reduced, the Contracting Party should have followed the procedures established by the Conference of the Parties in the Annex to COP9 Resolution IX.6 and provided a report in line with paragraph 28 of that Annex, prior to the submission of an updated RIS.

b) Describe briefly any major changes to the ecological character of the Ramsar site, including in the application of the Criteria, since the previous RIS for the site:

7. Map of site:

Refer to Annex III of the *Explanatory Note and Guidelines*, for detailed guidance on provision of suitable maps, including digital maps.

a) A map of the site, with clearly delineated boundaries, is included as: see Appendices 1 & 2

- i) a hard copy (required for inclusion of site in the Ramsar List): ;
ii) an electronic format (e.g. a JPEG or ArcView image) ;
iii) a GIS file providing geo-referenced site boundary vectors and attribute tables .

b) Describe briefly the type of boundary delineation applied:

e.g. the boundary is the same as an existing protected area (nature reserve, national park, etc.), or follows a catchment boundary, or follows a geopolitical boundary such as a local government jurisdiction, follows physical boundaries such as roads, follows the shoreline of a waterbody, etc.

The proposed Ramsar Site is the same as Wadi El Rayan Protected Area which is located between longitudes 30°00' N & 30°18' E and geopolitical boundaries in the Fayoum Governorate (Egypt) in the Western Desert of Fayoum depression and lies 140 km south west of Cairo Egypt.

8. Geographical coordinates (latitude/longitude, in degrees and minutes):

Provide the coordinates of the approximate centre of the site and/or the limits of the site. If the site is composed of more than one separate area, provide coordinates for each of these areas.

The site consisted from core zone (represented by Wadi El Rayan lakes). The Lake divided into two basins Upper Wadi El-Rayan Basin located between longitudes 30°25'53.0" & 30°31'10.9" E and latitude 29°11'30.0" & 29°17'14.0" N. Lower Wadi El-Rayan Basin located between longitudes 30°21'08.6" & 30°25'58.8" E and latitude 29°05'10.3" & 29°12'46.8" N. Buffer zone Wadi El-Rayan protected area is situated between longitude 29°00' 00" & 29°24' 11" E and latitude 30°00' 00" & 30° 18' 00" N.

The central point is 30°00' N & 30°18' E. **[The centre point looks, on the maps provided and on Google Earth, to be about 29°12'N 030°18'E. This should be confirmed with the AA. (DCP)]**

See Appendix (1 &2)

9. General location:

Include in which part of the country and which large administrative region(s) the site lies and the location of the nearest large town

Wadi El-Rayan Protected Area is located about 140 km southwest of Cairo in the Fayoum Governorate. The administrative area of Fayoum Governorate is almost 6,000 km², of which 1,804 km² are inhabited. The governorate is now administratively divided into six parts (marakez) namely; Fayoum, Ibhsway, Itsa, Senoures, Tamiya and Yiussif El-Sidik. The last part is the nearest city to Wadi El Rayan.

See Appendices (1&2)

10. Elevation: (in metres: average and/or maximum & minimum)

The mean elevation of the site is 43 m below sea level

11. Area: (in hectares)

The total area of the protected area is 175,790 hectares.

12. General overview of the site:

Provide a short paragraph giving a summary description of the principal ecological characteristics and importance of the wetland.

Wadi El-Rayan is a desert area situated in the Fayoum Governorate of the Western Desert of Egypt. The area has a special historical significance as a major crossroad that was used for many centuries by travelers between the Nile Valley and the oases of the Western Desert. Remains of human settlements from Egyptian and Roman-Greek eras are found in the area.

In April, 1973 two lakes were created in the lower portion of Wadi El Rayan sub-depression to channel out excess agricultural drainage water in order to slow-down the increase of the water-table in the Fayoum main depression and in the Qarun lake. About one year later, water started to settle and accumulate in the first basin and overflow to the second basin in 1978. The creation of a large body of water in this hyper-arid area had a striking ecological impact: new species of plants, mammals, birds and invertebrates moved to Wadi El Rayan area.

Nowadays, Wadi El-Rayan depression holds two main lakes connected by swampy channel. The first one has an area of about 48.0 km² and the second of about 45.9 km². The connecting area between the two lakes is characterized by permanent shallow water that provides conditions for continuous cover by emergent aquatic macrophytes; thus leading to swamp formation. The first lake is completely filled with water and is surrounded by dense vegetation. The second lake is changing all the time, where newly flooded areas are continuously added at the southwestern side of this lake. To the west of the lakes of Wadi El Rayan is a further, shallower, sandy depression that supports three natural springs and extensive desert scrub. The main source of the Lake water is the agricultural drainage water which inflows through El-Wadi Drain, underground water and some natural sulphured water spring and fish farms.

The lakes have a biological diversity: around 164 species of birds have been spotted here. here are rare kinds of ducks, eagles, falcons, hornbills, macaws, swans and parakeets including many wild plants . The lake houses more than 29 kinds of fish, including mullets, tilapias. Wadi El Rayan has a special

importance as a resting-place for the migratory bird species passing Egypt. In 1999, Bird Life international recognized the international importance of the Wadi El Rayan Lakes for bird conservation by including it on its list of Important Bird Areas IBA. The latter are defined as places of international significance for the conservation of birds at the global, regional or sub-regional level.

See Appendices (2&3)

13. Ramsar Criteria:

Tick the box under each Criterion applied to the designation of the Ramsar site. See Annex II of the *Explanatory Notes and Guidelines* for the Criteria and guidelines for their application (adopted by Resolution VII.11). All Criteria which apply should be ticked.

1 • 2 • 3 • 4 • 5 • 6 • 7 • 8 • 9

14. Justification for the application of each Criterion listed in 13 above:

Provide justification for each Criterion in turn, clearly identifying to which Criterion the justification applies (see Annex II for guidance on acceptable forms of justification).

Criterion 2: A wetland should be considered internationally important if it supports vulnerable, Endangered or critically endangered species or threatened ecological communities.

Wadi El Rayan Protected Area represents one of the most important habitats for certain bird species of national, regional and international importance. The area holds reasonable number of wintering nearthreatened Ferruginous Duck (*Aythya nyroca*) and Pallid Harrier *Circus macrourus* which are considered “Near Threatened” worldwide by IUCN (2011). The area is considered as main destination for migratory Lanner, Peregrine Falcons which cross the area during autumn migration.

Several threatened mammals are now very rare or endangered, including the slender horned gazelle, *Gazella leptoceros* which Esxisted until mid 1980s but has probably become locally extirpated. *Gazella dorcas* is still found in the area in small numbers, but rapidly declining. Both *Vulpes zerda* and *Allactaga tetradactyla* are scarce due to illegal hunting (IUCN, 2011).

Common name	Scientific name	IUCN Category (2011)
Flower's Shrew	<i>Crocidura floweri</i>	Endangered
Rhim or slender-horned gazelle	<i>Gazella leptoceros</i>	Endangered
Dorcas gazelle	<i>Gazella dorcas</i>	Vulnerable
Four-toed jerboa	<i>Allactaga tetradactyla</i>	Data Deficient
Fennec fox	<i>Vulpes zerda</i>	Data Deficient
Striped hyaena	<i>Hyaena hyaena</i>	Near Threatened

Criterion 3: A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.

Wadi El Rayan Wetlands is one of the most biologically significant wetlands in the western desert. The lakes and springs play a critical role in the life cycles of a remarkable diversity of species, including 29 fish species, 164 bird species, 24 mammal species, 14 reptile species, 38 plant species (WRPA Summary Statistics Sheet).

15. Biogeography (required when Criteria 1 and/or 3 and /or certain applications of Criterion 2 are applied to the designation):

Name the relevant biogeographic region that includes the Ramsar site, and identify the biogeographic regionalisation system that has been applied.

a) biogeographic region:

Wadi El Rayan lies within **Sahara ecoregion** which is the world's largest hot desert, located in northern Africa. It stretches from the Red Sea to the Atlantic Ocean. The vast Sahara encompasses several ecologically distinct regions. The Sahara desert ecoregion covers an area of 4,619,260 km² (1,791,500 square miles) in the hot, hyper-arid center of the Sahara, surrounded in the north, south, east, and west by desert ecoregions with higher rainfall and more vegetation

b) Biogeographic regionalisation scheme (include reference citation):

The area located in the sahara ecoregion which is part of the Palearctic. Physically, the Palearctic is the largest ecozone.

WWF Ecoregion (see bibliography)

16. Physical features of the site:

Describe, as appropriate, the geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; downstream area; general climate, etc.

El Fayoum province consists of four main depressions (Nile Valley, El-Fayoum, Hawara and El-Raiyan) surrounded by the limestone plateau of Eocene Age Rock units exposed in El- Fayoum region range from Eocene to Quaternary Ages.

The subsurface stratigraphic column is capped by the Quaternary sediments that are widely distributed over the entire area of El- Fayoum province and composed of varied grain sizes of sand and gravel intercalated with silt and clay, these deposits directly overly the thick and extensive Eocene Age limestone deposits. The depositional environments and sequence succession of the underlying limestone resulted in the accumulation of thick Quaternary deposits in this region.

The climate is typically Saharan, hot and dry with scanty winter rain and bright sunshine throughout the year. The direction of the wind is, for most of the year, from the North, varying North-West or North-East. Precipitations rate averages 10.1 mm annually, the highest rainfall occurs in December (40% off annual rainfall) and the lowest (0%) in August. Potential evapotranspiration rate is extremely high in all months of the year, resulting in a mean annual aridity index of 0.004. Relative humidity averages 51%, ranging from 39% in May to 64% in December for most of the year. The light winds are mainly from north, varying northwest or northeast.

The net radiation ranged between 34.0 W/m² in December and 199.7 W/m² in July. As Wadi El-Rayan Lake located in about 40 m altitude, the air pressure is relatively high and has small amplitude (1009.0 mb in July -1018.6 mb in January). Winds are from all directions, but are often from the north, north-northeast, north-northwest and southerly east and west in most time. The recorded wind shows great variability from month-to-month (minimum value 2.1 m/s in December and maximum value 5.4 m/s in June). The relative humidity varied between 36.8% in June and 57.7% in November.

17. Physical features of the catchment area:

Describe the surface area, general geology and geomorphological features, general soil types, and climate (including climate type).

Wadi El Rayan Lakes is bordered from its most sides by the desert; no villages and no agricultural lands. Recently, many fish farms established in the eastern region of the connected channel. The Upper Basin has oval shape of 10.5 km length and 8.5 km maximum width, with total surface area of 48.0 km². The Lower Basin is pear shaped of 13.7 km length and 5.3 km maximum width, with total surface area of 45.9 km². The lakes are open water, with patches of aquatic plants. Most of those plants cover the Upper basin's shoreline, especially in the south border and also near the connected channel zone. The Lower Basin is open water, with no patches of aquatic plants especially in the south. Sandy Oval Islands are located in the south of the Lower Basin (Appendix 3)

The bottom deposits of Wadi El Rayan Lakes consist of sand fractions as main fraction with gravel and mud of different ratios at the most parts of the lakes especially at the southern part of the second lake except at the west of the first lake. The mean size of the sediment ranged between medium silt and very coarse sand. The organic matter increases westward in the first lake with increasing fine fractions and decreases southward in the second lake with increasing sand fraction.

The water temperature was ranged from 12.7 °C in January to 28.1°C in July. The corresponding air temperature ranged between 14.6 °C and 31.0 °C. Water temperature exhibited little variance between the sites and reflected the air temperatures, it is varied between 14.18°C in December to 28.83°C in August.

The transparent water indicates absence of plankton, while turbid water signified plankton and or suspended particles. The transparency in the first Lake ranged from 1.2 m– 3.5 m with an average of 1.7 m in relation to El Wadi Drain (0.1 m – 0.15 m, with an average of 0.14 m) while in the second lake, it ranged from 1.4 m – 6 m, with an average of 3.03 m.

Salinity in the first Lake is roughly constant in spite of the fact that it showed slight fluctuation with time, on the other side, salinity of the second lake exhibits progressive increase from 2.41‰ in 1984-1985 to 14.3 ‰ in 2010. The horizontal distribution of water salinity in the first lake is relatively small, while the horizontal gradient of water salinity in the second lake is obvious.

Some Physicochemical characteristics of Wadi El Rayan Lakes and its feeding drain are shown in the following table:

	NH ₃ µg/l	NO ₂ µg/l	NO ₃ µg/l	TP µg/l	SiO ₂ mg/l	EC mS/cm	DO mg/l	BOD mg/l	COD mg/l
First Lake	123.8	12.0	95.0	38.7	212.6	8.15	7.70	4.34	7.08
Second Lake	99.3	9.6	75.8	37.6	231.6	10.82	7.28	3.71	11.80
El Wadi Drain	200.6	75.3	1368.3	255.2	968.4	3.17	7.60	3.44	3.84

18. Hydrological values:

Describe the functions and values of the wetland in groundwater recharge, flood control, sediment trapping, shoreline stabilization, etc.

About 30% of the irrigation water leaves the Fayoum depression as drainage water to Qarun and Wadi Rayan Lakes. About 30% of the drainage water flows towards Wadi Rayan Lakes through a tunnel. The lakes received about 266 million cubic meters of agriculture drainage water per year from El Wadi Drain. This led to the formation of an immense reservoir for agriculture wastewater in the western desert and the lakes finally contained 2 billion cubic meters of water.

Groundwater appears to be continuously seeping from a number of sub-surface springs at the lake bottom. A gently sloping sand-plain extends from the lakeshore northwards and upwards to reach sea level at 7 km north of the shoreline.

19. Wetland Types

a) Presence:

Circle or underline the applicable codes for the wetland types of the Ramsar “Classification System for Wetland Type” present in the Ramsar site. Descriptions of each wetland type code are provided in Annex I of the *Explanatory Notes & Guidelines*.

Marine/coastal: A • B • C • D • E • F • G • H • I • J • K • Zk(a)

Inland: L • M • N • O • P • Q • R • Sp Ss • Tp Ts • U • Va •

Vt • W • Xf • Xp • Y • Zg • Zk (b)

Human-made: 1 • 2 • 3 • 4 • 5 • 6 • 7 • 8 • 9 • Zk(c)

b) Dominance:

List the wetland types identified in a) above in order of their dominance (by area) in the Ramsar site, starting with the wetland type with the largest area.

Q -- Permanent saline/brackish/alkaline lakes

Y -- Freshwater springs; oases.

Sp -- Permanent saline/brackish/alkaline marshes/pools.

20. General ecological features:

Provide further description, as appropriate, of the main habitats, vegetation types, plant and animal communities present in the Ramsar site, and the ecosystem services of the site and the benefits derived from them.

Wadi El-Rayan depression holds two main lakes, at different elevations, connected by swampy channel. The connecting area between the two lakes is characterized by permanent shallow water that provides conditions for continuous cover by emerged aquatic macrophytes; thus leading to swamp formation.

The main habitat types as follows:

Sabkhas: Sabkhas extend south of the Lower Lake and at Wadi Muelah. This area is locally called Warshet El-Melh. In the spring area, there is also Sabkhas called Sabkhat El-Malahah, in the area between upper and middle spring.

Sand Sheets: Along the study area, sand sheets are well presented around both the upper and lower lakes, in the spring area and in the south of the fossil area.

Sand Dunes: There is only longitudinal dunes and vegetated linear dune in different parts of Wadi el rayan.

Wetlands: Wetlands are represented by Wadi El Rayan lakes and connecting channel in addition to water falls.

Oases: Springs area of Wadi El Rayan represents an excellent and rare example of an uninhabited Saharan oases (IUCN, 1999).

Desert areas: It is represented in Wadi el rayan by arid areas and limestone plateaus (hills) extending in different areas of Wadi el rayan.

Is a common diurnal snake.

21. Noteworthy flora:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 14, Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

i. Phytoplankton

A total of 107 species of Phytoplanktons were identified represented by three groups namely Chlorophytes, Cyanoprokaryots and Diatoms. Marine taxa still dominated the phytoplankton communities, with no change of their percentage occurrence since the last studies of Anonymous (1997 and 2006). Diatoms were most represented, 53 species with percentage occurrence of 50% of total recorded species were recorded. The average of total phytoplankton, cyanoprokaryotes and diatoms densities was highest in the western area when compared to the middle and eastern areas. The average of dinophytes was highest in the middle area compared to western and eastern areas (Appendix 5).

ii. Vegetation

The vegetation communities inside Wadi EL-Rayan Protected Area were monitored by the staff of the protected area for the first time on the year 1999. The third monitoring report of 2002 presented by the protected area staff, included a new monitoring program for vegetation in the area and the results recorded 38 wild plant species in Wadi el rayan different habitats.

Of these wild plant species, 14 were found inside the spring area supporting the presence of mammal communities as Gazelle (*Gazella dorcas dorcas*), Fennec fox (*Fennecus zerdá*), red fox (*Vulpes vulpes aegyptica*), Ruppel's fox (*Vulpes ruppelli ruppelli*), Egyptian golden jackal (*Canis aureus lupaster*), African wild cat (*Felis sylvestris libyca*) and others. The most representative species inside the protected area that have been identified are:

1. *Phragmites australis*: found to be more distributed around the two lakes with less representation inside the spring area.
2. *Tamarix nilotica*: distributed on the borders of the wetlands around the lakes, inside the spring and Rowayan areas, then at the Fossil area.
3. *Albahi graecorum*: More distributed inside the spring area.
4. *Salsola imbricata subsp. gaetula*: More distributed inside the Fossil area with complete dryness of its community inside the fossil area on the period of winter 2003.
5. *Desmostachya bipinnata*: the main community was found to be at the spring area.
6. *Nitraria retusa*: a significant abundance was mainly covering the spring area, with less abundance at the area south of the lower lake.
7. *Phoenix dactylifera*: occupied mainly the Rowayn and spring area and with minimum occurrence around the 2 lakes.

22. Noteworthy fauna:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 14. Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc., including count data. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

i. Zooplankton:

The total zooplankton density showed an obvious increase from 52000 Individuals m⁻³ in 1993 to 107000 Individuals m⁻³ in 2003, followed by a slight re-decrease to 85000 Ind m⁻³ in 2010 at the First Wadi El-Rayan lake. The second lake exhibits an opposite trend, zooplankton standing crop was decreased from 48000 Individuals m⁻³ in 1993 to 23000 Individuals m⁻³ in 2003, followed by a sharp increase to maximum of 343000 Ind m⁻³ in 2010. Contrarily to standing crop, the diversity within zooplankton populations gradually decreased to reach a minimum value in 2010 (Appendix 6).

ii. Zoobenthos:

The population density of total macrobenthos in Wadi El-Rayan lakes has been remarkably increased from 1676 ind.m⁻² in 1989 to 15529 ind.m⁻² in 1994, followed by a severe drop to 6199 and 105 organisms/.m⁻² in 2006 and 2008, respectively. It reincreased again in 2011. The biomasses of total macrobenthos showed a gradual increase in 1989 to a maximum in 1995, followed by a severe drop in 2006 and 2008 (unpublished NIOF reports on Wadi El Rayan Ecosystem). It increased again in 2011. The previous finding means a slight recovery of benthic fauna of the lake during the last years. The macrobenthos community structure sustained great changes, particularly at the second lake, so more detail studies are recommended for a continuous monitoring of these organisms which will be of a great help in planning and management of this lake (Appendix 7).

iii. Fish and Fisheries:

A total of 29 fish species were recorded in Wadi El Rayan Lakes. Tilapias represented by four major species namely: *Tilapia zillii*, *Oreochromis aureus*, *Oreochromis niloticus* and *Sarothodon galailus*. Six species of mullet could be identified in the catch (*Mugil cephalus*, *Liza ramada*, *Liza sliens*, *Liza aurata*, *Chelon labrousus* and *Liza craniata*). Nile Perch (*Latus niloticus*) and Grass-carp, Silver-carp, Sea-bass, Claris, *Bagrus* spp. and other species were caught in little amounts (Appendix 8).

iv. Birds

Fayoum depression represents one of the important wintering breeding habitats for water and shore birds. Wadi El Rayan possesses significant value for breeding water birds in both national and international levels (which is mainly due to holding in regular bases significant number of wintering waterbirds populations and species with international concern). Wadi El Rayan lakes are important sites for wintering ducks and shorebirds and for the migration of Palearctic birds, ranging from passerine species to herons, storks, and birds of prey. In addition they have been colonized by some resident species, such as purple gallinule (*Porphyrio porphyrio*).

The common species are Slender-billed Gull almost 1000 individuals. This represents the number of individuals recorded in the two lakes. The same situation applies for Little Egret but the recorded number of individuals is 30 % more than the number of Little Egret in the two lakes. 17 Spoonbill were recorded in the fish farm ponds, with only 5 in the second lake and non in the first lake, indicating that these species prefer fish ponds to lakes (Appendix 9).

v. Mammals

25 types of wild mammals were recorded including white deer, the Egyptian deer, fennec fox (sand fox), red fox and others (Appendix 10).

23. Social and cultural values:

- a) Describe if the site has any general social and/or cultural values e.g., fisheries production, forestry, religious importance, archaeological sites, social relations with the wetland, etc. Distinguish between historical/archaeological/religious significance and current socio-economic values:

Fisheries production

The total annual catch of Wadi El-Rayan lakes developed from 1653 tons in 1999 to 2055 tons in 2008, with an average of 1606.9 tons per year. The dominant species is tilapias which contributed to about 41.9 % of the average annual catch, then Mullet (17.8%) and Grass carp (15.7%). On the other hand, fishes like Nile Perch, *Bagrus* spp. and Claris represented about 8.5%, 5.8% and 2.8 % respectively of the annual lakes landing. Others species contributed with less than 1.0% of the catch. These species included Silver-Carp and Sea-bass

Natural heritage resources

i. Paleontology

Fayoum contains some of Egypt's best fossil deposits laid down 30-40 million years ago, and marine sedimentary cretaceous period 70 million years ago in the ancient Libyan River. This includes some of international importance, which modern scholars have called "the best known Paleocene site in Africa". The Eocene Birket Qarun formation yields a diversity of reptile and mammal fossils, and in the rocks of the Pliocene are fossils of land animals, crocodiles and tortoises and petrified wood.

Fifteen types of animal trail fossils (ichnofossils) have been identified and classified. These consist of communal nesting social insects like termites and ants, burrowing invertebrates, worms and excavators. Gebel Qatrani contains the "most important assemblage as yet described from fluvial rocks of the world". Also, further evidence that the area was a coastal plain at one time is found along the base of the Gebel Qatrani Formation at Madwar al-Bighal, consisting of Mangrove rhizoliths. The petrified wood is scattered in different areas in the north area of Lake Qarun and has very diverse and beautiful samples.

Thirteen different bird fossil families have been identified in Fayoum, out of which only two are extinct. These birds include ospreys (Pandionidae) and the gigantic shoebilled stork (Balaenicipitidae). Other bird

fossils discovered include the jacanas, herons, egrets, rails (Rallidae), cranes (Gruidae), flamingos (Phoenicopteridae), storks (Ciconiidae), cormorants (Phalacrocoracidae), and an ancient eagle named Accipitridae.

ii. Fossils

Wadi Al-Hitan "Whales Valley" is a paleontological site. It was designated a UNESCO World Heritage Site in July 2005 for its hundreds of fossils of some of the earliest forms of whale, the archaeoceti (a now extinct sub-order of whales). The site reveals evidence for the explanation of one of the greatest mysteries of the evolution of whales: the emergence of the whale as an ocean-going mammal from a previous life as a land-based animal. No other place in the world yields the number, concentration and quality of such fossils, as is their accessibility and setting in an attractive and protected landscape. This is why it was added by the UNESCO to the list of protected World Heritage sites.

The fossils found at the site may not be the oldest but their great concentration in the area and the degree of their preservation is to the extent that even some stomach contents are intact. The presence of fossils of other early animals such as sharks, crocodiles, sawfish, turtles and rays found at Wadi El-Hitan makes it possible to reconstruct the surrounding environmental and ecological conditions of the time, adding to its justification to be cited as a Heritage site.

The first fossil skeletons of whales were discovered in the winter of 1902-3. For the next 80 years they attracted relatively little interest, largely due to the difficulty of reaching the area. In the 1980s interest in the site resumed as four wheel drive vehicles became more readily available. Continuing interest coincided with the site being visited by fossil collectors, and many bones were removed, prompting calls for the site to be conserved. The remains display the typical streamlined body form of modern whales, yet retaining some of the primitive aspects of skull and tooth structure. The largest skeleton found reached up to 21 m in length, with well-developed five-fingered flippers on the forelimbs and the unexpected presence of hind legs, feet, and toes, not known previously in any archaeoceti. Their form was serpentine and they were carnivorous. A few of these skeletal remains are exposed but most are shallowly buried in sediments, slowly uncovered by erosion. Wadi El-Hitan provides evidences of millions of years of coastal marine life.

iii. Archaeological sites

During the Old Kingdom (c. 2686- 2181 B.C.) Fayoum was known as Ta-she, or She-resy (the Southern Lake) and was dedicated to the crocodile god Sobek. The first real pyramid of Egypt was built at the border of Fayoum in Meidum and several Middle Kingdom kings built their pyramids in the shadow of this great example. The Middle Kingdom saw an enormous bloom of life in Fayoum. Efforts to control the swampy area resulted in some magnificent buildings and statuary. Today there are only traces of the pedestals of two giant statues that once stood in Biahmu.

During Greek times (332- 30 B.C.) Fayoum was known as "the Marsh," before it was named the Arsinoite nome by Ptolemy Philadelphus in honor of his second wife (and sister). It was divided into a number of *merides* (districts), including Heracleides in the north, Themistos in the west, and Polemon in the south. New settlements grew throughout Fayoum including Karanis, Bacchias. Under Greek rule there were 114 villages in Fayoum (only sixty existed in 1809).

There was rivalry between villages and sometimes open hostility. They stole crops, good soil, and water rights from each other, just like Greek city states, medieval European towns, and modern nations everywhere. By the time of Ptolemy Euergetes II, Fayoum was in decline. The land was being reclaimed by the desert as canals clogged and the population diminished. The Greeks, under Ptolemy II, populated Fayoum with Greek veterans, Macedonians and other foreigners who began systematically improving the irrigation methods. They used Greek inventions such as the Archimedes's screw and the sakiya to irrigate the farmlands.

During the Roman Period (30 B.C.-A.D. 323), Egypt had to produce one third of the grain needed by Rome each year and Fayoum, with nearly ten percent of the cultivable total, earned the epithet "breadbasket of the Roman empire." Eventually Rome exacted too much from the farmers of Fayoum. Always rebellious, its population declined and the people, unpaid and overtaxed, were forced into

serfdom. In 165, a plague descended on Egypt and the major villages in Fayoum suffered considerably. By the third and fourth centuries, communities like Philadelphia and Bacchias stood abandoned. By the middle of the third century (323- 642) there was a large Christian community in Fayoum. Thirty-five monasteries existed during the Middle Ages, many secluded in the surrounding deserts.

The “Fayoum Portraits” are the first known art of Portraits discovered in Fayoum. These globally renowned paintings are life-like and once bandaged in place over the faces of mummies, dating usually between the 1st and 3rd centuries A.D. Most of these portraits have now been detached from their mummies. Yet, they provide a wealth of information about the clothing, adornment and physical characteristics of Egypt's wealthier inhabitants.

Many ancient mosques and water constructions (i.e. bridges) were built in Fayoum during the Islamic era (642- 1798). The hanging mosque and Qaitbay Mosque are good examples for the Islamic building style in Fayoum. Two major ancient routes have been identified in Fayoum, the first is oldest paved road in the world dated as Old Kingdom, with a possibility of a Neolithic age and the second is the route of the Alexander the Great to Siwa.

Agriculture

The agriculture land of the Fayoum Governorate covers an area of about 330000 acres. The agricultural production based on fruit trees represents 8.6% of the cultivated fruit land of Egypt. The fruit trees include figs, olive, palm trees as well as the other traditional crops such as vegetables, cotton, and wheat which are produced mostly for local consumption

Tourism

Multiple forms of touristic activities exist in Wadi El Rayan. These include environmental, natural and tourism desert, tourism safaris, sports tourism and medical tourism, ecotourism and cultural tourism. Fayoum is a representative example of the Oases of the great North African Sahara desert in its form, origin, geologic formation, culture and ecosystem. The strategic location of Fayoum as a separate Oasis on the western boundaries of the Nile Valley gives it the opportunity to be the gateway to the region of the North Africa desert

Fayoum benefits significantly from its nearby location to Cairo and its easy access along several well paved highways for local and international tourists and permits the practice of water sports and fishing.

b) Is the site considered of international importance for holding, in addition to relevant ecological values, examples of significant cultural values, whether material or non-material, linked to its origin, conservation and/or ecological functioning?

If Yes, tick the box and describe this importance under one or more of the following categories:

- i) sites which provide a model of wetland wise use, demonstrating the application of traditional knowledge and methods of management and use that maintain the ecological character of the wetland:
 - ii) sites which have exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland:
 - iii) Sites where the ecological character of the wetland depends on the interaction with local communities or indigenous peoples:
 - iv) Sites where relevant non-material values such as sacred sites are present and their existence is strongly linked with the maintenance of the ecological character of the wetland:
-

24. Land tenure/ownership:

a) Within the Ramsar site:

Some land is owned by the government and the other lands and fish farms owned by private sectors. The existing land ownership and authority of the shorelines of Wadi El Rayan Lakes in the Fayoum governorate are shared among several government jurisdictions and governed by different laws, Ministerial and Prime Ministerial decrees including:

- Prime ministerial decree no.943 for the year 1989 according to law No. 102/1983 of the protected areas in Egypt for declaration of Wadi El Raiyan as multiple use protected areas managed by Egyptian Environmental Affairs Agency (EEAA) ·
- The decree of the Minister of Agriculture no. 1054, for the year 1986 for the allocation of 1000 feddan in Wadi Raiyan for land reclamation projects managed by Agriculture Development Authority ADA.
- Supreme Council of Antiquities SCA.
- The Fayoum governorate - Authority of state ownership

b) In the surrounding area:

The land is owned by the government.

25. Current land (including water) use:

a) Within the Ramsar site:

Fisheries: Fishing activities in the lakes were not organized until 1980. From 1976 to 1980, Experimental fishing had been carried out for three months each year (December to February). During that period, fishing activities were supervised by El-Fayoum fish cooperative Society. The main fishing gears used are trammel net (Bolti net), with oaring boats.

The total annual catch of Wadi El-Rayan two lakes developed from 1653 tons in 1999 to 2624 tons in 2009. The dominant species is tilapias which contributed with about 41.9 % of the average annual catch, then Mullet (17.8%) and Grass carp (15.7%). In the other hand, fishes like Nile Perch, Bugrus spp. and Claris represented by about 8.5%, 5.8% and 2.8 % respectively from the annual lakes landing. Others species contributed with less than 1.0% of the catch. These species included Silver-Carp and Sea-bass

b) in the surroundings/catchment:

The Wadi El Rayan has a population of 12,000 residents. The main human activities in the area are:

- Agriculture: The settlers in Wadi el rayan generally cultivate olive trees and fruit trees such as Guava, Grapes and Palm Dates which need long period (years) before bearing fruits, and are called long term crops. Other crops cultivated which do not need a long time for production include vegetablesuch as tomato, cereal, medicinal plants. In additional. There are many common weeds in summer and winter crops.
- Tourism is also an important economic activity in Fayoum Governorate. The Governorate hosts a number of touristic attractions including cultural heritage sites (such as Pharoenic, Roman, Coptic, Islamic historical attractions) and ecological attractions (including the lakes of Wadi El Rayan Natural Protectorates, and the desert habitats).
- There are also many land use activities in the area including fish farms.

26. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects:

a) within the Ramsar site:

1) Salinity

Wadi El-Rayan lakes receive a higher agricultural and wastewater drainage water from El-Wadi Drain. The rate of water inflow into the Wadi El-Rayan lake system is less than the total rate of water use and evaporation and this places the future of the lake system in jeopardy. Accordingly the salinity increases leading to the problems of ecosystem, particularly the second lake. The salinity in the first Lake is roughly constant in spite of the fact that it showed slight fluctuation with time (1.52‰ in 1975 to 1.6 ‰ in 2011). On the other hand, the salinity of the second lake increased progressively from 2.41‰ in 1984-1985 to 14.3 ‰ in 2010.

This increase in salinity presented a series of threats to the biodiversity and species population of fishes and is likely to diminish its importance for waterbirds. It has also threatened socioeconomic systems in the governorate.

2) Reduction in water supply:

Increasing reduction in water discharge caused (in some nearshore waters, especially around the second Lake) a dramatic increase in rooted aquatic plants. It also decreased the size of lakes.

3) Illegal hunting:

Illegal hunting and especially falcon-catching are still evident, despite the efforts of the EEAA to control the problem. The growing number of fishermen and fish-farms causes increased disturbance to wintering waterbirds. The recently established tarmac road, encircling the two lakes of Wadi El Rayan, has made the area more accessible, drastically increasing the opportunities for illegal hunting and habitat destruction.

b) in the surrounding area:

The greatest threats to the surrounding area comes from a land-claim project which aims at cultivating 15,000 feddan of desert, right in the centre of Wadi El Rayan Protected Area. Fish-farming, taking place in and around the lakes is a potential source of water-pollution.

Other than the agricultural industry, the petroleum industry has also made a move into the protectorate. North of the protectorate, just past its main entrance, are the operations of the Qarun Petroleum Company. Moreover, by virtue of Law 22/2005, the Ministry of Petroleum authorized contracts for the Edison International Company to prospect for petroleum in the oil field north of Wadi el-Rayan.

27. Conservation measures taken:

a) List national and/or international category and legal status of protected areas, including boundary relationships with the Ramsar site:

Wadi El Rayan was declared a Protected Area (1759 km²) by Prime Ministerial Decree 943 in 1989 according to the law No. 102/1983 of the protected areas in Egypt. Wadi Al-Hitan, which is managed as part of Wadi El-Rayan Protected Area, is one of the most iconic sites worldwide representing the record of life on Earth. The site was Inscribed in 2005 as a natural World Heritage Site (criterion viii), area 20,105 ha. It was also designated in 1989 as Nature Reserve IUCN category II and VI; Managed Resource Protected Area

b) If appropriate, list the IUCN (1994) protected areas category/ies which apply to the site (tick the box or boxes as appropriate):

Ia ; Ib ; II ; III ; IV ; V ; VI

c) Does an officially approved management plan exist; and is it being implemented?:

A management plan for the Wadi El Rayan Protected Area was designed in 2002. The main objectives of the plan aims to protection of the natural resources in accordance with the declaration decree of the protected area, improving control over water use in the lake system and coordination between the various public agencies active in the Protected Area.

d) Describe any other current management practices:

Local Protected Area Management Unit was established for strengthened through the enhancement of its administrative and technical capacities and increased financial sustainability.

The management centre aim to:

- Updating the management plan
- Provide basic level of protection of the park natural resources
- Provide a safe and satisfactory recreational experience for visitors and avoid damage to the Protected Area resources by unregulated visitor use.
- Provided all the staff with training in protected area management, ecological monitoring, lawenforcement and use of the participatory approach in dealing with the local population.

28. Conservation measures proposed but not yet implemented:

e.g. management plan in preparation; official proposal as a legally protected area, etc.

1. Tracks and signage
2. Birdwatching sites and facilities
3. Designated campsites

29. Current scientific research and facilities:

e.g., details of current research projects, including biodiversity monitoring; existence of a field research station, etc.

Inland Water and Aquaculture Branch in the National Institute of Oceanography and Fisheries (NIOF) has El Rayan Research Station which is located on the north of the second Lake beside the water falls. The station holds a scientific laboratory for analysis of hydrobiological samples and two boats used for sampling and sampling equipments. The station also has a guest house.

National Institute of Oceanography and Fisheries was carrying also regular programs for monitoring the ecosystem of the lakes such as physical, biological, chemical, toxic and life cycle data on the lake and their environs.

30. Current communications, education and public awareness (CEPA) activities related to or benefiting the site:

e.g. visitors' centre, observation hides and nature trails, information booklets, facilities for school visits, etc.

Wadi El Rayan Protected Area directorate made different kinds of Visitor Informations to Provide information to visitors to help them explore the protected area, have an enjoyable visit, and learn about the special resources and areas of tourism opportunities. These toolsincluded:

- PA leaflet (with the painting of the waterfalls on the front panel.)
- Re-design and update of the existing map in a bilingual format.
- Re-print of the English and Arabic posters for distribution to local schools and offices.
- A multi-lingual newspaper-style brochure that features stories and photos about the natural and cultural features of Wadi El Rayan Protected Area, places to visit, things to do, rules, and a centre-fold map.
- A detailed guide to Whale Valley WHS, including interpretation of the fossils and the past environments with photographs to aid in identification of the fossils and the site.
- A four-page bilingual newsletter issued periodically to stakeholders, government departments, NGO's and other interested people to describe planning and management proposals and to invite comments.

31. Current recreation and tourism:

State if the wetland is used for recreation/tourism; indicate type(s) and their frequency/intensity.

A Dutch-funded specialist study has identified the Fayoum Governorate as a region with high potential for the development of ecotourism. Increasingly, protected areas and natural settings are becoming popular tourist destinations and ecotourism is a rapidly expanding market worldwide. Wadi El Rayan has the highest number of visitors than any Protected Area in Egypt outside South Sinai and the highest number of Egyptian visitors than any Protected Area in the country. Current estimates, based on Protected Area monitoring data, indicate the visitor numbers to be over 250,000 per year.

Wadi El Rayyan is rapidly developing as a recreational area for Egyptians, with the shores of the southern lake boasting beaches, pleasure boats and waterfalls as well as good fishing and a large cafeteria area. The journey through the desert to reach the lakes is spectacular in the early morning.

The vast majority of visitors are Egyptians (probably over 95%) and demand for the WRPA as a recreational destination is likely to continue to rise, given the over-crowded and highly polluted conditions prevailing in many urban areas of Lower Egypt. Greater Cairo, with an estimated population of 16 million, is one of the world's largest cities and is situated less than 100 km away from the WRPA. Expected sustained economic growth in the region will increasingly give city dwellers the means to satisfy their rising requirement for recreation in open and clean spaces.

Wadi El Rayan has a unique combination of several important assets:

- World class fossil areas of Wadi Hitan and Jebel El Qatrani
- Rural environment with authentic living crafts
- Spectacular desert landscapes in the Wadi El -Rayan area supporting a unique bird population and other rare fauna such as fennek and dorcas gazelles
- Well preserved monuments from the different periods of Egypt's history, including Palaeolithic, Neolithic, Pharaonic, Graeco-Roman, Coptic and Islamic
- Migratory birds on the mud flats of Wadi El-Rayan

The main visitor area in the WRPA, widely known as the Waterfall Area, covers a stretch of beach of about one km along the northern shore of the Lower Lake. Existing infrastructures included three cafeterias, a tourist camp, a public WC unit, a small police station and a mosque. Overall, the environmental impact of this tourism infrastructure and activities was considered to be mild (IUCN, 1998d). The PAMU has redesigned the area in an attempt to transform it into a recreational area with a strong eco-tourist and educational vocation. A Visitor Centre has been constructed, offering interpretation and educational services to the visiting public as well as providing a hub for local tour-operators. Three new cafeterias and toilets have been built by EEAA and are operational.

32. Jurisdiction:

Include territorial, e.g. state/region, and functional/sectoral, e.g. Dept of Agriculture/Dept. of Environment, etc.

Wadi El Rayan protected area is under the jurisdiction of Nature Conservation Sector, Egyptian Environmental Affairs Agency, Ministry of State for Environment Affairs.

30 Misr-Helwan El-Zyrae Road, Maadi, Cairo, Egypt

33. Management authority:

Provide the name and address of the local office(s) of the agency(ies) or organisation(s) directly responsible for managing the wetland. Wherever possible provide also the title and/or name of the person or persons in this office with responsibility for the wetland.

Name/Title: Dr/ Mustafa Fouda

National focal point for Ramsar Convention

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34. Bibliographical references:

Scientific/technical references only. If biogeographic regionalisation scheme applied (see 15 above), list full reference citation for the scheme.

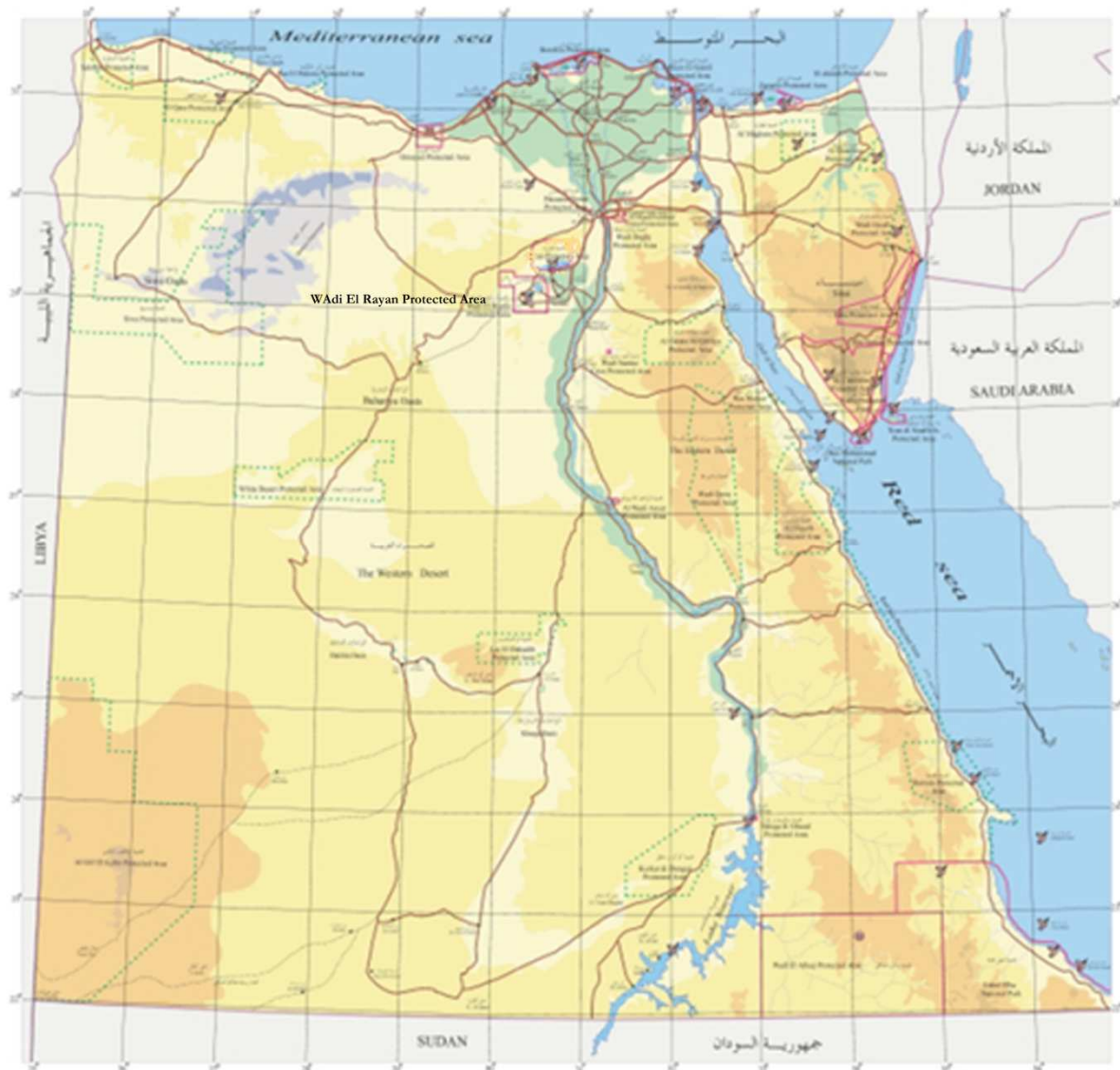
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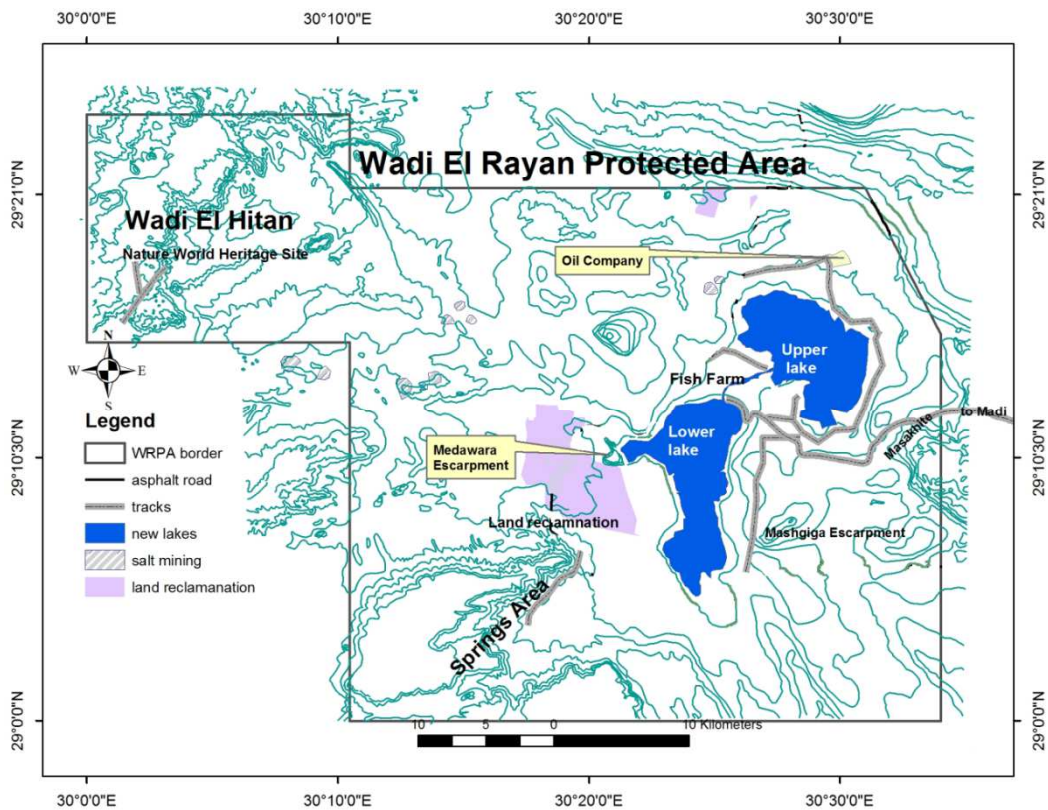
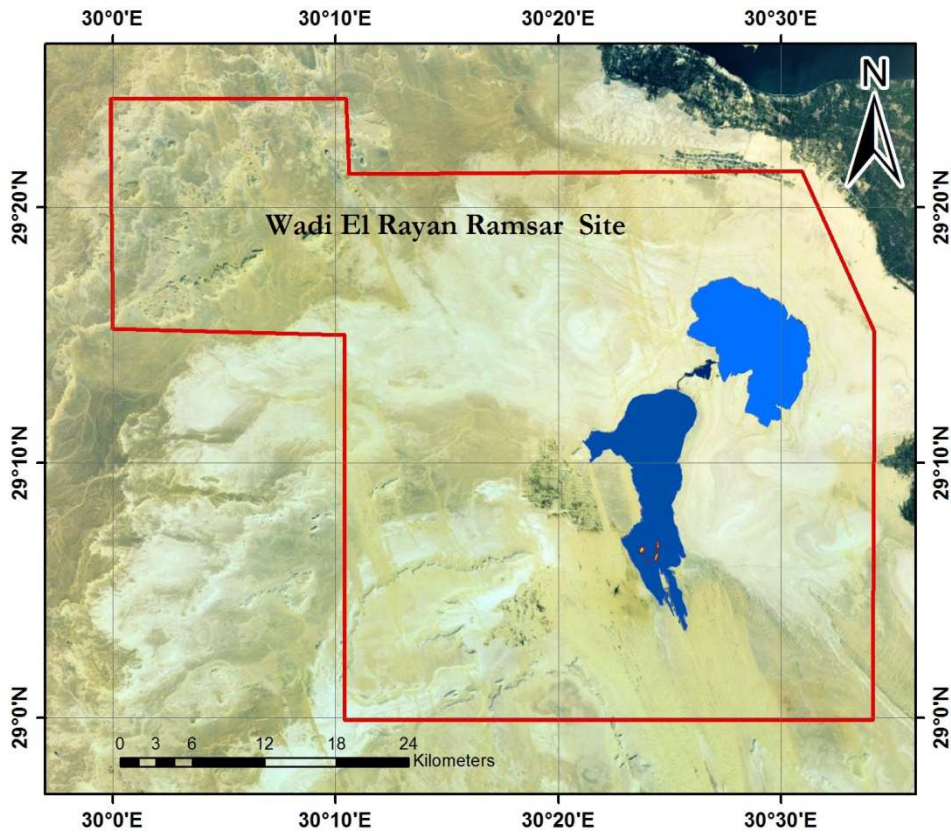
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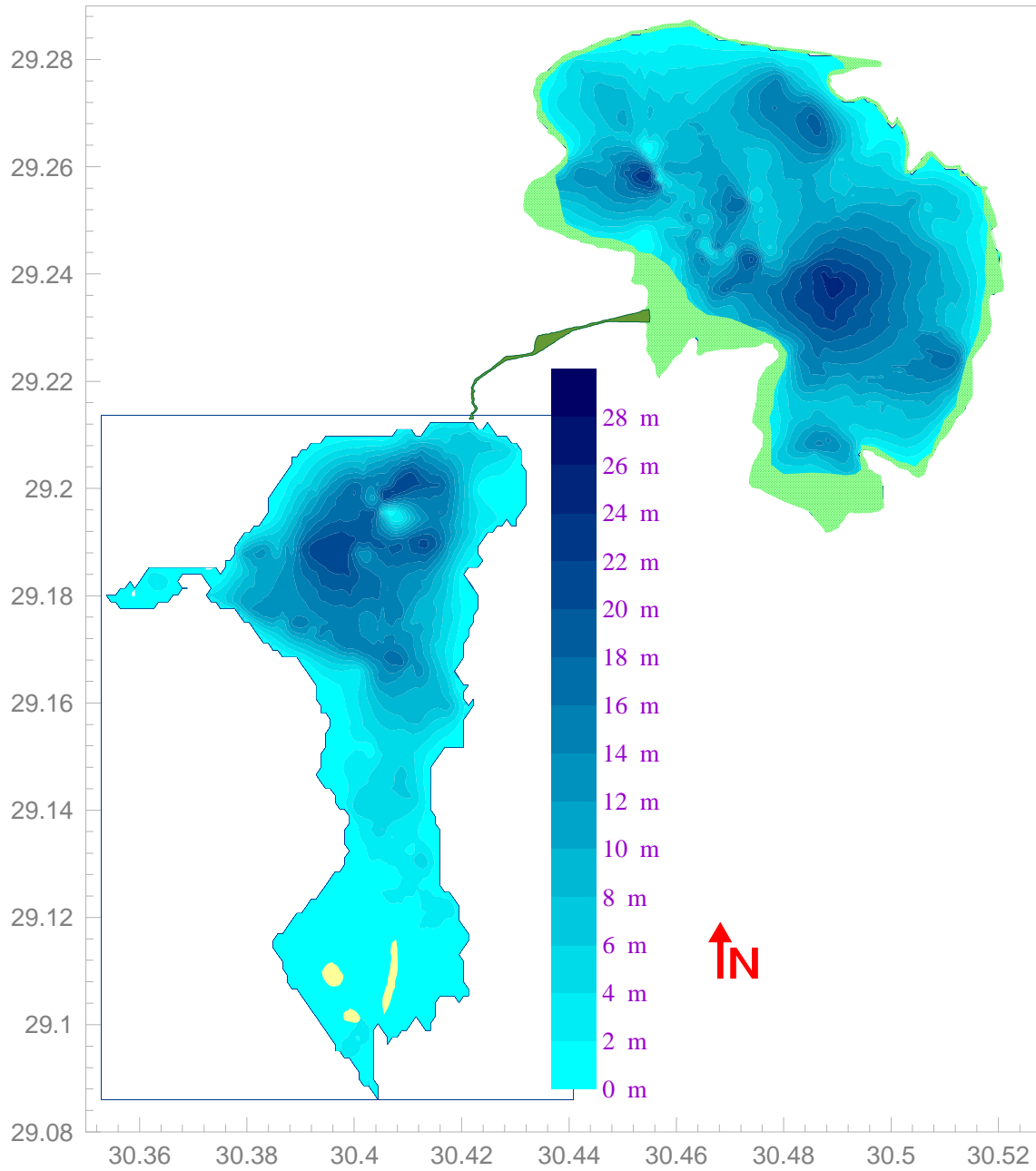
Appendix 1: Location Map



Appendix 2: Maps Showing Ramsar Site Boundary



Appendix 3: Map showing bathymetry of Wadi El Rayan Lakes (interval 5 meters)



Appendix 4: List of phytoplankton species recorded in Wadi El Rayan

Numbe	species
Chlorophyceae	
1	<i>Ankistrodesmus falcatus v. acicularis</i> (Braun.) West
2	<i>Chlamydomonas globosa</i> Snow
3	<i>Dictyosphaerium pulchellum</i> Wood
4	<i>Eutetramorus fottii</i> (Hindak) Komarek
5	<i>Kirchneriella irregularis</i> (Petyk.) Printz
6	<i>K. lunaris</i> (Kirch.) Moeb.
7	<i>Monoraphidium griffithii</i> (Berk.) Kom.-Leg.
8	<i>M. contortum</i> (thur.) Kom.
9	<i>M. dybowskii</i> Hindak
10	<i>Nephrocetium lunatum</i> West
11	<i>Oocystis borgei</i> Snow
12	<i>O. parva</i> West & West
13	<i>Pediastrum tetras</i> (Ehren.) Ralf.
14	<i>Scenedesmus acutus</i> Lemm.
15	<i>S. bicadatus</i> (Gugl.) Chod.
16	<i>S. denticulatus</i> Lagerh.
17	<i>S. eornis</i> (Ehren.) Chod.
18	<i>S. intermedius</i> Chod.
19	<i>S. protuberans</i> Fritch.
20	<i>S. quadricauda v. quadripina</i> (Chod.) Smith
Bacillariophyceae	
21	<i>Amphora coffeaeformis</i> Kutz.
22	<i>A. veneta</i> Kutz.
23	<i>Aulocoseira granulata</i> (Ehren.) Simon.
24	<i>Azpeitia africana</i> (Jan. ex Schm.) Fryx. & Watk.
25	<i>A. neocrenulata</i> VanLan.) Fryx. & Watk.
26	<i>Bacillaria paradoxa</i> Gemelin
27	<i>Chaetoceros curvsetus</i> Cleve
28	<i>C. lorenzianus</i> Grun.
29	<i>C. pseudocurvsetus</i> Mang.
30	<i>Cocconeis placentula v. englypta</i> (Ehren.) Cleve
31	<i>Cosinodiscus divisus</i> Grun.
32	<i>Cyclotella bodanica</i> Eulent.
33	<i>C. kutzingiana</i> Thwait.
34	<i>C. menghiniana var tenera</i> Kolbe
35	<i>C. ocellata</i> Pant
36	<i>C. operculata</i> (Agard.) Kutz.
37	<i>C. stelligera</i> Cleve & Grun.
38	<i>Cymbella affinis</i> Kuetz.
39	<i>Entomoneis alata</i> (Ehren.) Ehren.
40	<i>Epithemia sorex</i> Kutz.
41	<i>Fragillaria capucina</i> Desm.
42	<i>F. construens</i> (Ehren.) Grun.
43	<i>F. construens var veneter</i> Grun.
44	<i>Gomphonema olivaceum</i> (Lyngb.) Kutz.
45	<i>Navicula atomus</i> Nag.
46	<i>N. cari</i> Ehren.
47	<i>N. cocconeiformis</i> Greg.
48	<i>N. graciloides</i> May

Numbe	species
49	<i>Nitzschia agnita</i> Hust.
50	<i>N. amphibia</i> Grun.
51	<i>N. capitata</i> Ostr.
52	<i>N. closterium</i> Ehren.
53	<i>N. clausii</i> Hantz.
54	<i>N. communis</i> Cleve
55	<i>N. granulata</i> Grun.
56	<i>N. ovalis</i> Arnott
57	<i>N. palea</i> (Kutz.) Smith
58	<i>N. paleaeformis</i> Hust.
59	<i>N. panduriformis</i> var <i>minor</i> Grun.
60	<i>N. reversa</i> Smith
61	<i>N. tryblionellae</i> Hant.
62	<i>Pleurosigma elongatum</i> Smith
63	<i>Stephanodiscus astraea</i> (Ewhren.) Grun.
64	<i>Synedra acus</i> Kutz.
65	<i>Synedra delicatissima</i> (Smith) Grun.
66	<i>Thalassionema bacillare</i> (Heid.) Kolbe
67	<i>T. nitzschioides</i> Grun
70	<i>Thalassiosira</i> sp
Cyanophyceae	
71	<i>Chroococcus disperses</i> (Keiss.) Lemm.
72	<i>C. limneticus</i> Lemm (Kutz.) Nag.
73	<i>C. minutus</i> (Kutz.) Nag.
74	<i>Cylindrospermopsis raciborskii</i> Wolosz
75	<i>Lyngbya limnetica</i> Lemm.
76	<i>Merismopedia tenuissima</i> Lemm.
77	<i>Microcystis aeruginosa</i> Kutz.
78	<i>Oscillatoria brevis</i> (Kutz.) Gom.
79	<i>O. janus</i> Skuja
80	<i>O. kisselevii</i> Aniss.
81	<i>pbormedium frigidum</i> Fritsch
82	<i>.P mucicola</i> Huper-Pest. Et Naum.
83	<i>P. papillaterminatum</i> Kiss.
84	<i>P. toficola</i> (Nag.) Gom.
85	<i>Spirulina major</i> Kutz.
86	<i>Tetrachloris merismopedioides</i> Skuja
Cryptophyceae	
87	<i>Hillea fusiformis</i> (Schil.) Schil.
88	<i>Chroomonas salina</i> (Wills.) Butch
89	subtotal Chryptophyceae
Euglenophyceae	
90	<i>Eugleba acus</i> Ehren.
91	<i>Eugleba proxima</i> Dang.
92	subtotal Eugelnophyceae
Dinophyceae	
93	<i>Gymnodinium biconica</i> Skuja
94	<i>Peridinium bipes</i> Stein
95	<i>P. steinii</i> Jorg.
96	<i>Prorocentrum dentatum</i> Stein
97	<i>P. gracile</i> Schutt
98	<i>P. micans</i> Ehren.

Appendix 5: List of plants species recorded in Wadi El Rayan Protected Area

No	Latin Name	Common Name
1	<i>Adiantum capillus-veneris</i>	Kozbaarit el-beer
2	<i>Alhagi graecorum</i>	Aqool
3	<i>Arthrocnemum macrostachyum</i>	Shinaan
4	<i>Calligonum polygonoides</i> sub. <i>comosum</i>	Arta/Risoo
5	<i>Ceratophyllum demersum</i>	Nakshoosh el-hoot
6	<i>Cornulaca monocantha</i>	Shoak ed-deeb
7	<i>Cressa cretica</i>	Nadwa
8	<i>Cynanchum acutum</i>	Olleiq
9	<i>Cynodon dactylon</i>	Nigeel
10	<i>Cyperus laevigatus</i>	Sead
11	<i>Desmostachya bipinnata</i>	Halfa
12	<i>Haloxylon salicornicum</i>	
13	<i>Imberata Cylindrica</i>	Halfa deil el-qott
14	<i>Juncu rigidus</i>	Samaar morr
15	<i>Juncus acutus</i>	Samaar morr
16	<i>Launaea nudicaulis</i>	---
17	<i>Melilotus indicus</i>	Hendaqooq morr
18	<i>Myriophyllum spicatum</i>	Hamool el-maia
19	<i>Najas armata</i>	Hamool
20	<i>Nitraria retusa</i>	Gharqad/Ghardaq
21	<i>Phoenix dactylifera</i>	Hagna
22	<i>Phragmites australis</i>	Nakheel el-balah
23	<i>Pluchea dioscoridis</i>	Barnoof
24	<i>Polypogon monospliensis</i>	Deil el-qott
25	<i>Potamogeton pectinatus</i>	Hamool el-maia
26	<i>Ranunculus sceleratus</i>	Zaghlanta
27	<i>Rumex dentatus</i>	Khilla
28	<i>Salsola imbricata</i> subsp. <i>Gaetula</i>	Khareet/Kreesh
29	<i>Scirpus maritimus</i>	---
30	<i>Sonchus maritimus</i>	---
31	<i>Spergularia marina</i>	Samaar
32	<i>Sporopolus spicatus</i>	Nigeel shoaky
33	<i>Stipagrostis ciliata</i>	Homareet
35	<i>Typha domingensis</i>	Halfa/Bardi
36	<i>Zygophyllum album</i>	Rotreet
37	<i>Zygophyllum coccineum</i>	Rotreet
38	<i>Hyocyamus muticus</i>	Sakaran

Appendix 6: List of Zooplankton species recorded in Wadi El Rayan Lakes

	Protist
1	<i>Arcella</i> sp
2	<i>Helicostamella subulata</i>
3	<i>Globegrina inflata</i>
4	<i>Textularia</i> sp
5	<i>Cyclidium glaucoma</i>
6	<i>Didinium nasutum</i>
7	<i>Euplotes vannus</i>
	Rorifera
8	<i>Brachionus cf. rotundiformis</i>
9	<i>Synchaeta cf kitina</i>
10	<i>Keratella tropica</i>
11	<i>Synchaeta oblonga</i>
12	<i>Bedellioda</i> sp
	Copepoda
13	Nauplius larvae
14	Calaniod copepodide
15	Cyclopoid copepodide
16	<i>Paracartia latisetosa</i>
17	<i>Apocyclops panamensis</i>
18	<i>Canuella</i> sp
	Meroplankton
19	<i>Cirriped larvae</i>
20	<i>Free living Nematoda</i>
21	<i>Polychaete larvae</i>
22	<i>Ostracoda</i> sp
23	<i>Mollusc larvae</i>
24	<i>Fish embryo</i>

Appendix 7: List of Zoobenthos species recorded in Wadi El Rayan Lakes

Number	species
	Mollusca
1	<i>Cerastoderma glacuma</i>
2	<i>Melanooides tuberculata</i>
3	<i>Corbicula fluminalis</i>
4	<i>Cleopatra bulimoides</i>
5	<i>Semisalsa sp.</i>
6	<i>Bellamyia unicolor</i>
	Arthropoda
7	<i>Cypriids torosa</i>
8	<i>Chironomus larvae</i>
9	<i>Echinogammarus veneris</i>
10	<i>Corophium orientale</i>
	Annelida
11	<i>Hediste diversicolor</i>
12	<i>Chaetogaster limnaei</i>
13	<i>Ficompomatus enigmaticus</i>
14	<i>Limnodrilus sp.</i>

Appendix 8: List of fish species recorded in Wadi El Rayan Lakes

No	LATINE NAME	ENGLISH NAME
1	<i>Alestes nurese</i>	Imberi
2	<i>Aphanius disper</i>	Tooth carp
3	<i>Aphanius fasciatus</i>	Tominnow – Pastrica
4	<i>Altherina boyeri</i>	Silverside
5	<i>Altherina spp.,</i>	Silverside
6	<i>Bagrus bayad</i>	Forsskal catfish
7	<i>Bagrus docmak</i>	Catfish
8	<i>Bagrus spp.,</i>	Catfish
9	<i>Barbus bynni</i>	Barbel
10	<i>Clarias lazera</i>	African catfish
11	<i>Ctenopharyngodon idella</i>	Grass carp
12	<i>Cyprinus carpio</i>	Common carp
13	<i>Dicentrarchus labrax</i>	Seabass
14	<i>Dicentrarchus punctatus</i>	Spotted seabass
15	<i>Haplochromis spp.,</i>	Cichlid
16	<i>Hemichromis bimaculatus</i>	Cichlid
17	<i>Hemiramphus far</i>	Halfbeak
18	<i>Labeo nilotica</i>	Nile carp
19	<i>Lates niloticus</i>	Nile perch
20	<i>Liza aurata</i>	Golden grey mullet
21	<i>Liza ramada</i>	Thinlip grey mullet
22	<i>Mugil cephalus</i>	Flathead grey mullet
23	<i>Oreochromis aureus</i>	Tilapia
24	<i>Oreochromis niloticus</i>	Tilapia
25	<i>Sardinella spp.,</i>	Sardin
26	<i>Sarotherodon galilaeus</i>	Tilapia
27	<i>Sparus auratus</i>	Gilthead seabream
28	<i>Synodontis schall</i>	Barbel
29	<i>Tilapia zillii</i>	Green tilapia

Appendix 9: List of Bird species recorded in Wadi El Rayan Protected Area

No	LATIN NAME	ENGLISH NAME
1	<i>Accipiter brevipes</i>	Levant Sparrowhawk
2	<i>Accipiter nisus</i>	Sparrowhawk
3	<i>Acrocephalus arundinaceus</i>	Great Reed Warbler
4	<i>Acrocephalus dumetorum</i>	Blyth's Reed Warbler
5	<i>Acrocephalus schoenobaenus</i>	Sedge Warbler
6	<i>Acrocephalus scirpaceus</i>	Reed Warbler
7	<i>Acrocephalus stentoreus</i>	Clamorous Reed Warbler
8	<i>Actitis hypoleucos</i>	Common Sandpiper
9	<i>Alaemon alaudipes</i>	Hoopoe lark
10	<i>Alcedo atthis</i>	Kingfisher
11	<i>Anas acuta</i>	Pintail
12	<i>Anas clypeata</i>	Shoveler
13	<i>Anas crecca</i>	Teal
14	<i>Anas penelope</i>	Wigeon
15	<i>Anas platyrhynchos</i>	Mallard
16	<i>Anas querquedula</i>	Garganey
17	<i>Anas strepera</i>	Gadwall
18	<i>Anthus campestris</i>	Tawny Pipit
19	<i>Anthus cervinus</i>	Red-throated Pipit
20	<i>Anthus pratensis</i>	Meadow pipit
21	<i>Anthus spinoletta</i>	Water Pipit
22	<i>Anthus trivialis</i>	Tree Pipit
23	<i>Apus apus</i>	Commun Swift
24	<i>Apus pallidus</i>	Pallid Swift
25	<i>Ardea cinerea</i>	Grey Heron
26	<i>Ardea purpurea</i>	Purple Heron
27	<i>Ardeola ralloides</i>	Squacco Heron
28	<i>Arenaria interpres</i>	Turnstone
29	<i>Aythya ferina</i>	Pochard
30	<i>Aythya fuligula</i>	Tufted Duck
31	<i>Aythya nyroca</i>	Ferruginous Duck
32	<i>Botaurus stellaris</i>	Bittern
33	<i>Bubulcus ibis</i>	Cattle Egret
34	<i>Burhinus oedicnemus</i>	Stone-curlew
35	<i>Buteo buteo</i>	Buzzard
36	<i>Buteo rufinus</i>	Long-legged Buzzard
37	<i>Calidris alba</i>	Sanderling
38	<i>Calidris alpina</i>	Dunlin
39	<i>Calidris canutus</i>	Knot
40	<i>Calidris ferruginea</i>	Curlew Sand Piper
41	<i>Calidris minuta</i>	Little Stint
42	<i>Calidris temminckii</i>	Temminck's Stint
43	<i>Centropus senegalensis</i>	Senegal Coucal
44	<i>Cercotrichas glactotes</i>	Rufous Bush – Robin

45	<i>Ceryle rudis</i>	Pied King Fisher
46	<i>Charadrius alexandrinus</i>	Kentish Plover
47	<i>Charadrius dubius</i>	Little Ringed Plover
48	<i>Charadrius hiaticula</i>	Ringed Plover
49	<i>Charadrius leschenaultii</i>	Greater Sand Plover
50	<i>Chlidonias hybridus</i>	Whiskered Tern
51	<i>Chlidonias leucopterus</i>	White-winged Black tern
52	<i>Chlidonias niger</i>	Black Tern
53	<i>Ciconia ciconia</i>	White Stork
54	<i>Ciconia nigra</i>	Black Stork
55	<i>Circaetus gallicus</i>	Short-toed Eagle
56	<i>Circus aeruginosus</i>	Marsh Harrier
57	<i>Circus cyaneus</i>	Hen Harrier
58	<i>Circus macrourus</i>	Pallid Harrier
59	<i>Circus pygargus</i>	Montagu's Harrier
60	<i>Coracias garrulus</i>	Roller
61	<i>Corvus bruniceps</i>	Brown-necked Raven
62	<i>Corvus corone cornix</i>	Hooded Crow
63	<i>Coturnix coturnix</i>	Quail
64	<i>Cuculus canorus</i>	Cokoo
65	<i>Cursorius cursor</i>	Cream Colored Corser
66	<i>Delichron urbica</i>	House Matrin
67	<i>Egretta alba</i>	Great White Egret
68	<i>Egretta garzetta</i>	Little Egret
69	<i>Eremophila bilopha</i>	Temmink,s Lark
70	<i>Falco biarmicus</i>	Lanner
71	<i>Falco columbarius</i>	Merlin
72	<i>Falco concolor</i>	Sooty falcon
73	<i>Falco naumanni</i>	Lesser Kestrel
74	<i>Falco pelegrinoides</i>	Barbary's Falcon
75	<i>Falco tinnunculus</i>	Kestrel
76	<i>Ficedula albicollis</i>	Collared Flycatcher
77	<i>Ficedula hypoleuca</i>	Pied Flycatcher
78	<i>Fringilla coelebs</i>	Chaffinch
79	<i>Fulica atra</i>	Coot
80	<i>Gallinago gallinago</i>	Common Snip
81	<i>Gallinago media</i>	Great Snipe
82	<i>Gallinula chloropus</i>	Moorhen
83	<i>Gelochelidon nilotica</i>	Gull-billed Tern
84	<i>Glareola pratincola</i>	Collared Pratincole
85	<i>Grus grus</i>	Crane
86	<i>Himantopus himantopus</i>	Black-winged Stilt
87	<i>Hirundo daurica</i>	Red-rumped Swallow
88	<i>Hirundo rustica</i>	Swallow
89	<i>Hoplopterus spinosus</i>	Spur-winged plover
90	<i>Ixobrychus minutus</i>	Little Bittern
91	<i>Jinx torquilla</i>	Wryneck
92	<i>Lanius collurio</i>	Red backed Shrike

93	<i>Lanius minor</i>	Lesser Grey Shrike
94	<i>Lanius mridunals</i>	Southern Grey Shrike
95	<i>Lanius senator</i>	Woodchat Shrike
96	<i>Larus fuscus</i>	Lesser Black-backed Gull
97	<i>Larus genei</i>	Slender-billed Gull
98	<i>Larus ichthyaetus</i>	Great Black-headed Gull
99	<i>Larus ridibundus</i>	Black-headed Gull
100	<i>Limosa limosa</i>	Black-tailed Godwit
101	<i>Luscinia megarhinchos</i>	Nightingale
102	<i>Luscinia svecica</i>	Bluethroat
103	<i>Merops apiaster</i>	Eurasian Bee-eater
104	<i>Merops superciliosus</i>	Blue-cheeked Bee-eater
105	<i>Milvus migrans</i>	Black Kite
106	<i>Monticola saxatilis</i>	Rock Thrush
107	<i>Monticola solitarius</i>	Blue Rock Thrush
108	<i>Motacilla alba</i>	White Wagtail
109	<i>Motacilla cinerea</i>	Gery Wag Tail
110	<i>Motacilla flava</i>	Yellow Wagtail
111	<i>Muscicapa striata</i>	Spotted Flycatcher
112	<i>Netta rufina</i>	Red-crested Pochard
113	<i>Numenius arquata</i>	Curlew
114	<i>Nycticorax nycticorax</i>	Night Heron
115	<i>Oenanthe deserti</i>	Desert Wheatear
116	<i>Oenanthe hispanica</i>	Black-eared Wheatear
117	<i>Oenanthe isabellina</i>	Isabelline Wheatear
118	<i>Oenanthe leucopyga</i>	White-crowned Black
119	<i>Oenanthe monacha</i>	Hooded Wheatear
120	<i>Oenanthe oenanthe</i>	Norhten Wheatear
121	<i>Oriolus oriolus</i>	Golden Oriole
122	<i>Pandion haeliatus</i>	Osprey
123	<i>Passer domesticus</i>	House Sparrow
124	<i>Passer hispaniolensis</i>	Spanish Sparrow
125	<i>Phalacrocorax carbo</i>	Cormorant
126	<i>Phoenicopterus ruber</i>	Greater Flamingo
127	<i>Phoenicurus ochruros</i>	Black Redstart
128	<i>Phoenicurus phoenicurus</i>	Redstart
130	<i>Phylloscopus bonelli</i>	Bonelli's Warbler
131	<i>Phylloscopus collybita</i>	Chiffchaff
132	<i>Phylloscopus sibilatrix</i>	Wood Warbler
133	<i>Phylloscopus trochillus</i>	Willow Warbler
134	<i>Platalea leucorodia</i>	Spoonbill
135	<i>Plegadis falcinellus</i>	Glossy Ibis
136	<i>Podiceps cristatus</i>	Great Crested Grebe
137	<i>Podiceps nigricollis</i>	Black-Necked Grebe
138	<i>Porphyrio porphyrio</i>	Purple Gallinule
139	<i>Porzana porzana</i>	Spotted Crake
140	<i>Prinia gracilis</i>	Graceful Warbler
141	<i>Pterocles orientalis</i>	Black-bellied Sandgrouse

142	<i>Pterocles senegallus</i>	Spotted Sand Grouse
143	<i>Riparia riparia</i>	Sand martin
144	<i>Saxicola rubetra</i>	Whinchat
145	<i>Saxicola torquata</i>	Stonechat
146	<i>Scotocerca inquieta</i>	Scrub Warbler
147	<i>Sterna albifrons</i>	Little Tern
148	<i>Sterna caspia</i>	Caspian Tern
149	<i>Sterna hirundo</i>	Common Tern
150	<i>Streptopelia decaocto</i>	Collared Dove
151	<i>Streptopelia senegalensis</i>	Palm dove
152	<i>Streptotelia turtur</i>	Turtle Dove
153	<i>Sylvia atricapilla</i>	Blackcap
154	<i>Sylvia borin</i>	Garden Warbler
155	<i>Sylvia cantillans</i>	Subalpine Warbler
156	<i>Sylvia communis</i>	Whitethroat
157	<i>Sylvia curruca</i>	Lesser Whitethroat
158	<i>Sylvia melanocphalla</i>	Sardinian Warbler
159	<i>Sylvia rueppelli</i>	Rueppell's Warbler
160	<i>Tachybaptus ruficollis</i>	Little Grebe
161	<i>Tadorna tadorna</i>	Shelduck
162	<i>Tringa glareola</i>	Wood Sand Piper
163	<i>Tringa nebularia</i>	Greenshank
164	<i>Tringa ochropus</i>	Green Sandpiper

Appendix 10: List of Mammals species recorded in Wadi El Rayan Protected Area

<i>No</i>	<i>LATIN NAME</i>	<i>ENGLISH NAME</i>
1	<i>Hemiechinus auritus auritus aegypticus</i>	Long-eared hedgehogs
2	<i>Crocidura flavescens deitac</i>	Giant musk shrew
3	<i>Crocidura floweri</i>	Flower's shrew
4	<i>Gerbillus pyramidium pyramidium</i>	Greater gerbil
5	<i>Gerbillus andersoni andersoni</i>	Anderson's gerbil
6	<i>Gerbillus gerbillus gerbillus</i>	Lesser gerbil
7	<i>Dipodillus amoenus amoenus</i>	Charming dipodil
8	<i>Meriones lybicus lybicus</i>	Libyan jird
9	<i>Arvicanthis niloticus niloticus</i>	Field rat
10	<i>Rattus rattus</i>	House rat
11	<i>Rattus norvegicus</i>	Brown rat
12	<i>Nesokia indica suilla</i>	Bandicoot rat
13	<i>Jaculus jaculus</i>	Desert jerboas
14	<i>Mus musculus</i>	House mouse
15	<i>Canis aureus lupaster</i>	Golden jackal
16	<i>Fennecus zerada</i>	Fennec fox
17	<i>Vulpes vulpes Aegyptica</i>	Red fox
18	<i>Vulpes ruepelli Ruepelli</i>	Ruppell's sand fox
19	<i>Felis sylvestris libyca</i>	African wild cat
20	<i>Gazella dorcas Dorcas</i>	Dorcas gazelle
21	<i>Herpestes ichneumon</i>	Egyptian mongoose
22	<i>Mustela nivalis</i>	Weasel
23	<i>Lepus capensis Rothschildi</i>	Cape hare
24	<i>Felis chaus nilotica</i>	Jungle cat
25	<i>Gazella leptocerus leptocerus</i>	Slender horned gazelle