ENVIRONMENT & DEVELOPMENT GROUP

KOM OMBO 200MW PV PROJECT
ACWA Power

Baseline Survey – Ecology

February 2020

CONTENTS

TABLE OF FIGURES

TABLE OF TABLES

BASELINE ECOLOGICAL SURVEY

The objective of this task is to assess the existing environmental conditions at the proposed project site and its surrounding area. The assessment addresses environmental components that may affect or be affected by the proposed project or its activities during the construction process or the subsequent operation.

METHODOLOGY

Geographical Scope

The terrestrial survey methodology covers the project site proper as defined by the coordinated provided by the Client (Project Site) and a larger area (Study Area) extending several kilometers in each direction around the Project Site (Figure 1). The Study Area covered approximately 300 km^2 and extends from Nile's western bank fronting Faris Village to the Luxor – Aswan Western Road and about 10 kilometers each of the desert area north and south of the site. The study area was selected subjectively, but based on the "minimal area approach" for sampling habitat types within the general area. The minimal area is here defined as the plot size beyond which an increase in plot size does not result in a significant increase in the number of detected habitat types.

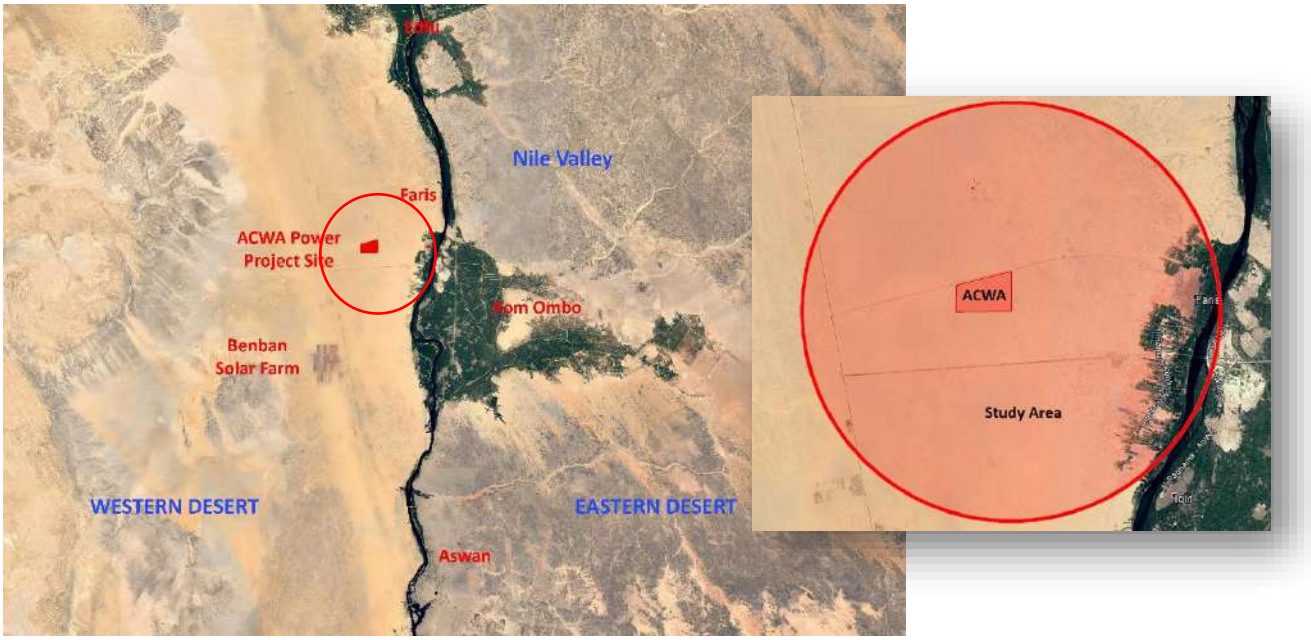


Figure 1. The ecological survey Study Area and the Project site.

Available secondary data specifically covering the Project Site or the Study Area is lacking in the scientific literature. Considerable secondary data, however, are available on the nearby but very similar area of the Benban solar farm. In addition, significant data is available on the Kom Ombo area within the larger geographical context of the southern region of the Western Desert of Egypt. Field survey was therefore, designed to collect site-specific data and to verify information available from the more "coarse grain" studies covering the southeastern region of the Western Desert.

Survey Methods

The overall goal of this task is to assess the existing environmental conditions at the project area based upon a combination of available secondary data and field surveys. The desktop review of secondary data consisted of thoroughly reviewing and analyzing all available data on the general area of the project as well as the proposed solar farm site proper. Reviewed material include reports, maps, topographic survey data, satellite images, climatic data, watershed analysis data, etc. Guided by the findings of the desktop review of available reports, maps and satellite imageries, field survey was planned and implemented to identify the structural and functional characteristics of available habitats and their biota in the area. Similarly, studies of the geomorphologic and geological settings of the area, which provides the baseline setting, are based upon the use of both remote sensing data and ground reconnaissance as described elsewhere in this report.

Survey of the habitat types at the regional scale was initially based upon the Egyptian national habitat type classification (Saleh, 1993) and review of satellite imageries data, but subsequently verified by field survey. Initial reconnaissance of the site and the surrounding area showed that the area is mostly barren, and life is restricted to small patches of vegetation of extremely low diversity and their associated fauna typical of extreme desert environment. Field survey covered, in addition to the Project Site, the surrounding desert area. It also covered the locally mesic habitats in the Nile Valley and the irrigated land in the vicinity of the Faris Village.

Biodiversity was assessed at the habitat and species levels. Vegetation cover, resident and transient fauna, including reptiles, birds and mammals, some invertebrates and their ecological relations were surveyed and described. The surveys identified key terrestrial biodiversity present at or near the area of the proposed solar farm, including endangered and protected species, if any, that may be impacted by the proposed development.

Location, structure, composition and type of plant communities were recorded whenever any significant natural vegetation cover is encountered. Data on the occurrence of vegetation cover, type of land surface sediments and elevation was recorded on geotagged images taken every 50 meters along a number of parallel belt transects using two GPS cameras mounted on a vehicle. The belt transect was 100 m wide and ran across the entire project site from north to south. In addition, photographic records of habitat types elsewhere in the study area were obtained and stored in geo-referenced electronic format. Plant species identification followed the taxonomic keys of Boulos (2005). Identification of plant communities followed the description given by Zahran and Willis (2009) and Zahran (2010). Habitat types were identified according to the system developed by the Egyptian National Biodiversity Unit (Ayyad and Ghabour, 1993; Saleh, 1993).

Animal species sampling was carried out at the project site and several localities in the nearby Nile Valley where relatively important habitats are located. Indicators of biodiversity in the form of mammals, birds, reptiles, scorpions and tenebrionid beetles were used to assess animal species richness. Seasonal changes in the occurrence or abundance of certain elements of the biota could not covered since the survey spans only one season.

Reptiles were captured by hand after following their tracks or dug out of their burrows. Identification was according to the keys of Saleh (1997). Observations on the avifauna were made using field glasses and identification was verified using appropriate field guides. Both resident breeders and migratory species

were identified and recorded. We searched for evidence of nesting, foraging or roosting at or near the project site.

Folding, Sherman live traps were used to sample trap rodents. Captured animals were identified and subsequently released at the point of their capture. The occurrence of small carnivores such as foxes and smaller cats was detected based on their tracks in the sand or direct observation. Based on the results of this survey, assessment of biodiversity elements (habitat, species and genetic diversity) of key conservation importance are identified. Scorpions and beetles were collected using pitfall traps and active search with UV light. Specimens' identification was carried out using taxonomic keys (Badry et al. 2018) and comparison with museum material as necessary.

THE FINDINGS

Habitats and Vegetation

Typical of all desert regions, habitats of the Project Site and the Study Area are limited in diversity and coverage. Habitable areas, even for the most hardy desert species, are restricted locations that have certain topographic features, which allow adequate moisture to be available at or near the ground surface. The Project Site and the surrounding desert land is mostly barren and supports a very little permanent animal and plant life.

Uni-specific patches of the shrub *Salsola imbricate,* scattered throughout the site represent the only vegetation cover in the area (Figure 2). Plants in these patches are thinly distributed and vary in heights between 50 cm up to about 150 cm. Several individual plants may grow together forming dense thickets that may reach more than 5 meters in diameter. Individual plants trap wind-blown sand forming phytogenic mounds of a moderate height, usually less than one meter. No other plants are found within the boundaries of the site and the surrounding desert.

Salsola imbricate is a very common plant throughout hyper-arid areas of the deserts of Egypt. Most often, it is the only plant encountered in the interior of the Western Desert. The distribution of the *Salsola imbricate* patches at the project site is shown in

Figure 3. All of the animal species recorded from the area came from the *Salsola imbricate* patches (Figure 4).

Ecological features of the site was surveyed along 14 transects across the site (Figure 5). The transects vary in length between 1. to 1.9 km and run across the project site from north to south. The distribution pattern of the *Salsola imbricate* patches cannot be correlated to any obvious attributes related to topography or the nature of surface sediments (Figure 6). This, coupled with the lack of surface drainage lines of any sort run through the site or the nearby area, suggests that local precipitation plays very little role, if any in providing the water needs for these plant and their associated animal communities.

Vegetation cover in the desert area surrounding Project Site is extremely sparse and restricted to the stands of *Salsola imbricate* similar to those found within the project site. No other species of plant was observed on the site or in the adjacent desert area.

The Nile Valley and the reclaimed desert land immediately west of it, are intensively cultivated with a variety of crops and fruit orchards. Except for weeds associated with agricultural crops, no wild vegetation is found in that area and no pristine habitats of any kind remain. The area has been fundamentally modified by human activities for thousands of years.

The *Salsola imbricate* habitat patches at the project site and the surrounding desert represent the only natural habitat in the area. These patches of vegetation and their associated fauna seem to be largely pristine, since the area, like most of the Western Desert interior has not been much affected by human activities. This type of natural habitats, however, is widespread throughout most of Egypt and is not considered in any way restricted or critical.

Habitats in the Nile Valley and the reclaimed desert to the east of the project site are largely anthropogenic. Although utilized by a variety of plant and animal forms, these densely populated, intensively cultivated modified habitats hold most of the biodiversity of the area. No threatened or restricted biodiversity (habitats and species) have been observed in these areas.

Figure 2. A *Salsola imbricate* vegetation patch at the project site.

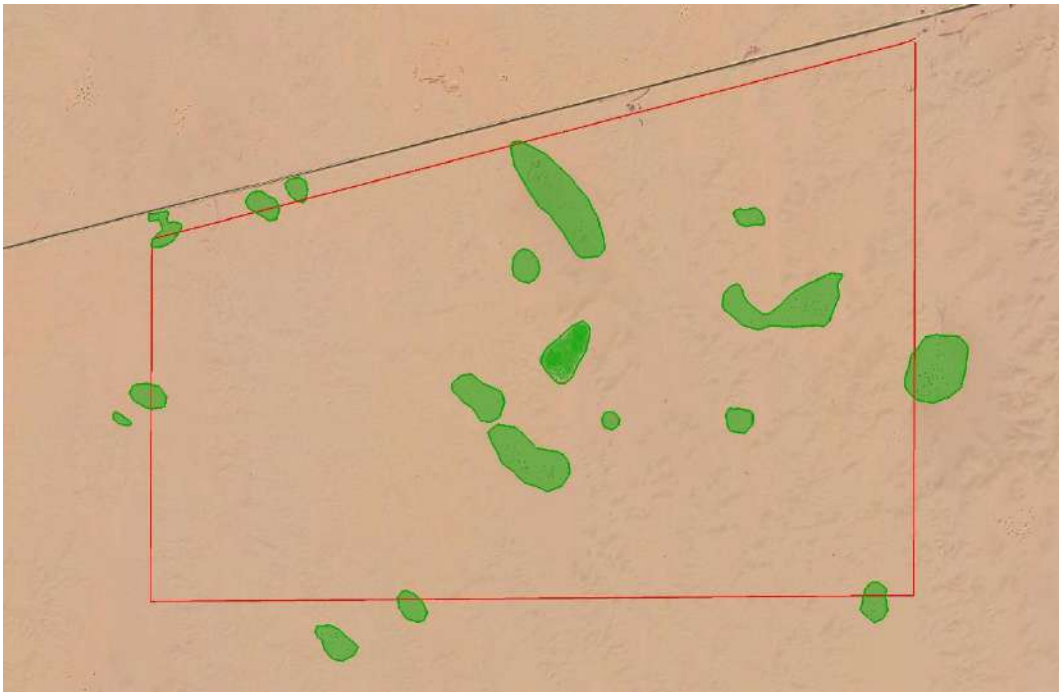


Figure 3. Distribution of *Salsola imbricate* vegetation patched at the project site.

Figure 4. *Salsola imbricate* vegetation patch at the project site. The rodent trap shown caught several specimen of the common rodent *Gerbillus gerbillus*.

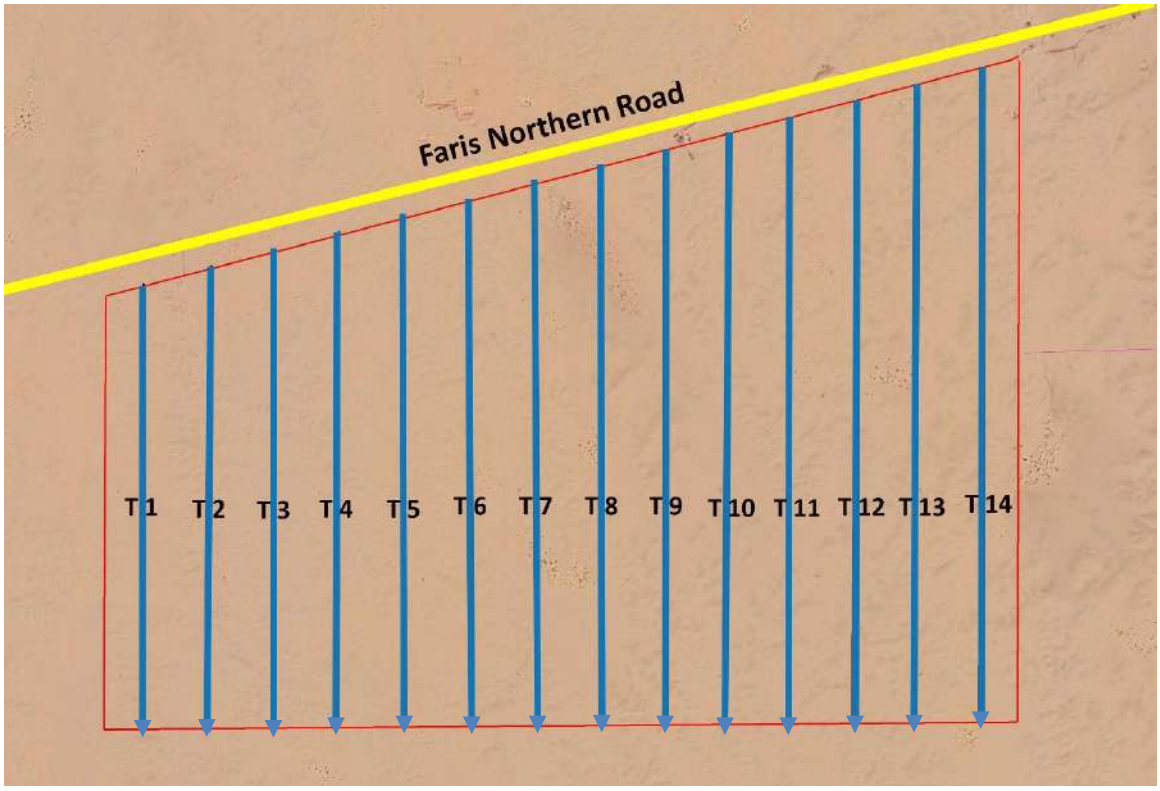


Figure 5. Locations of survey transects (T1 – T14) across the project site.

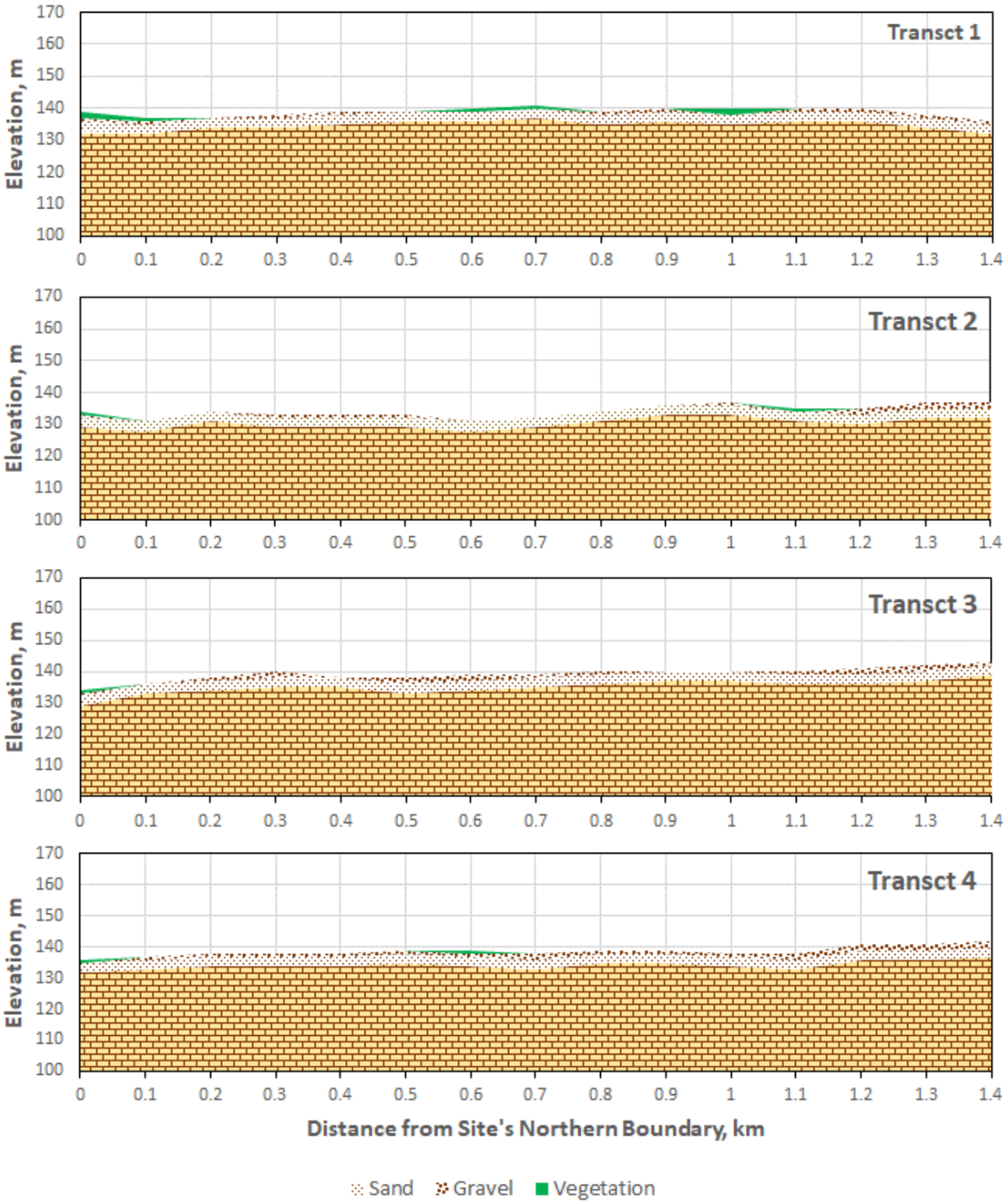
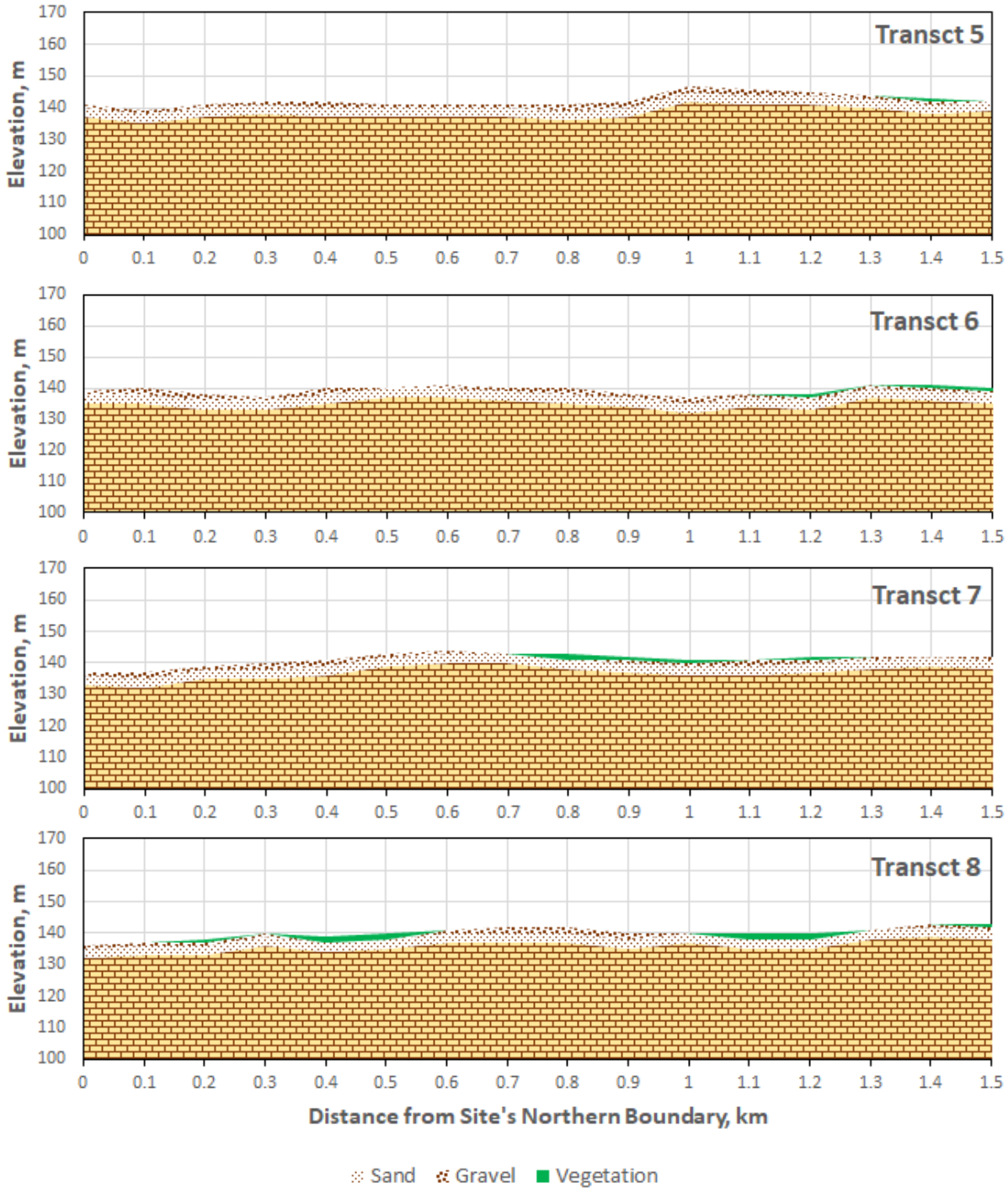


Figure 6. Elevation, land surface features and vegetation cover along survey transects across the project site.



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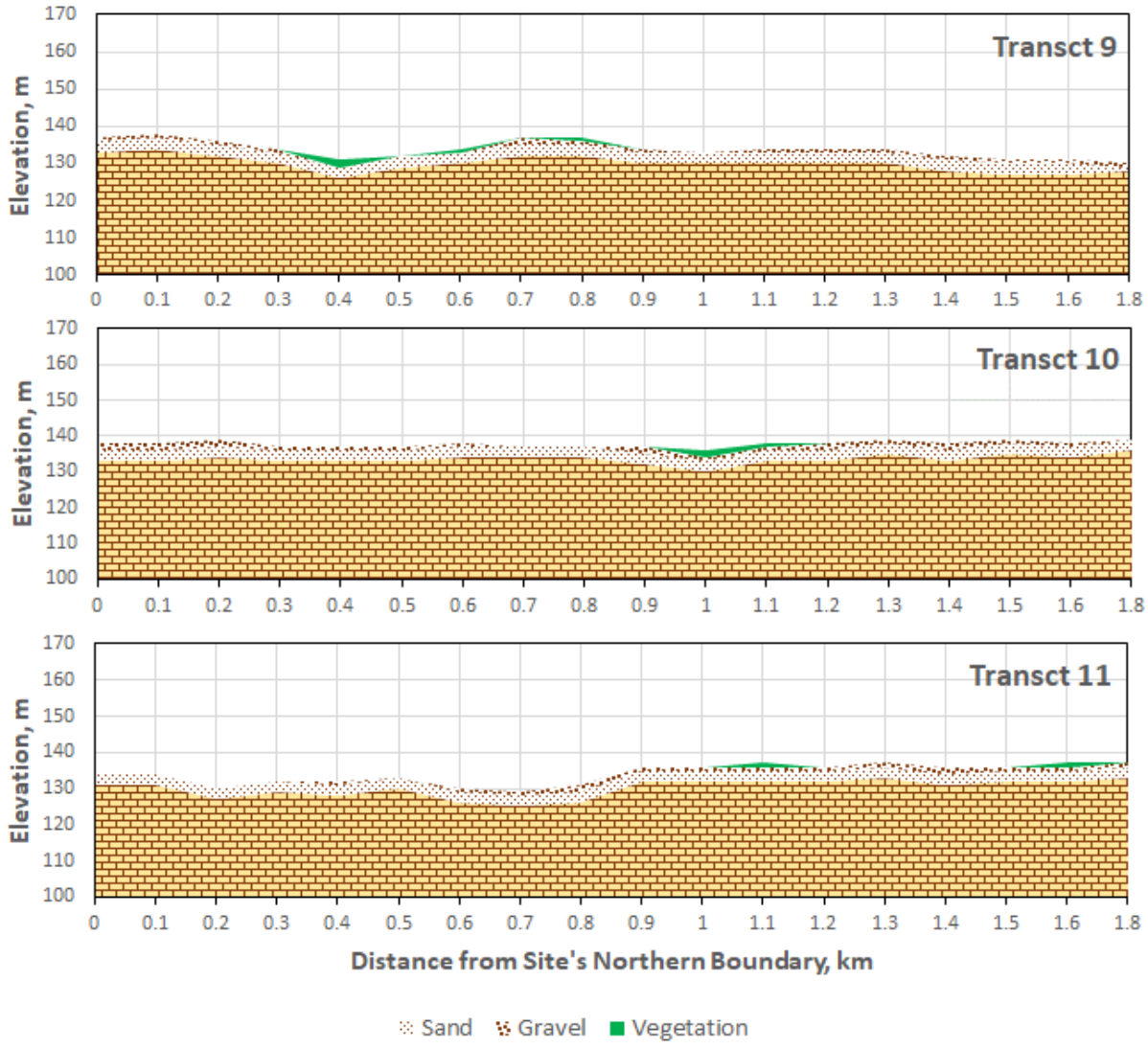

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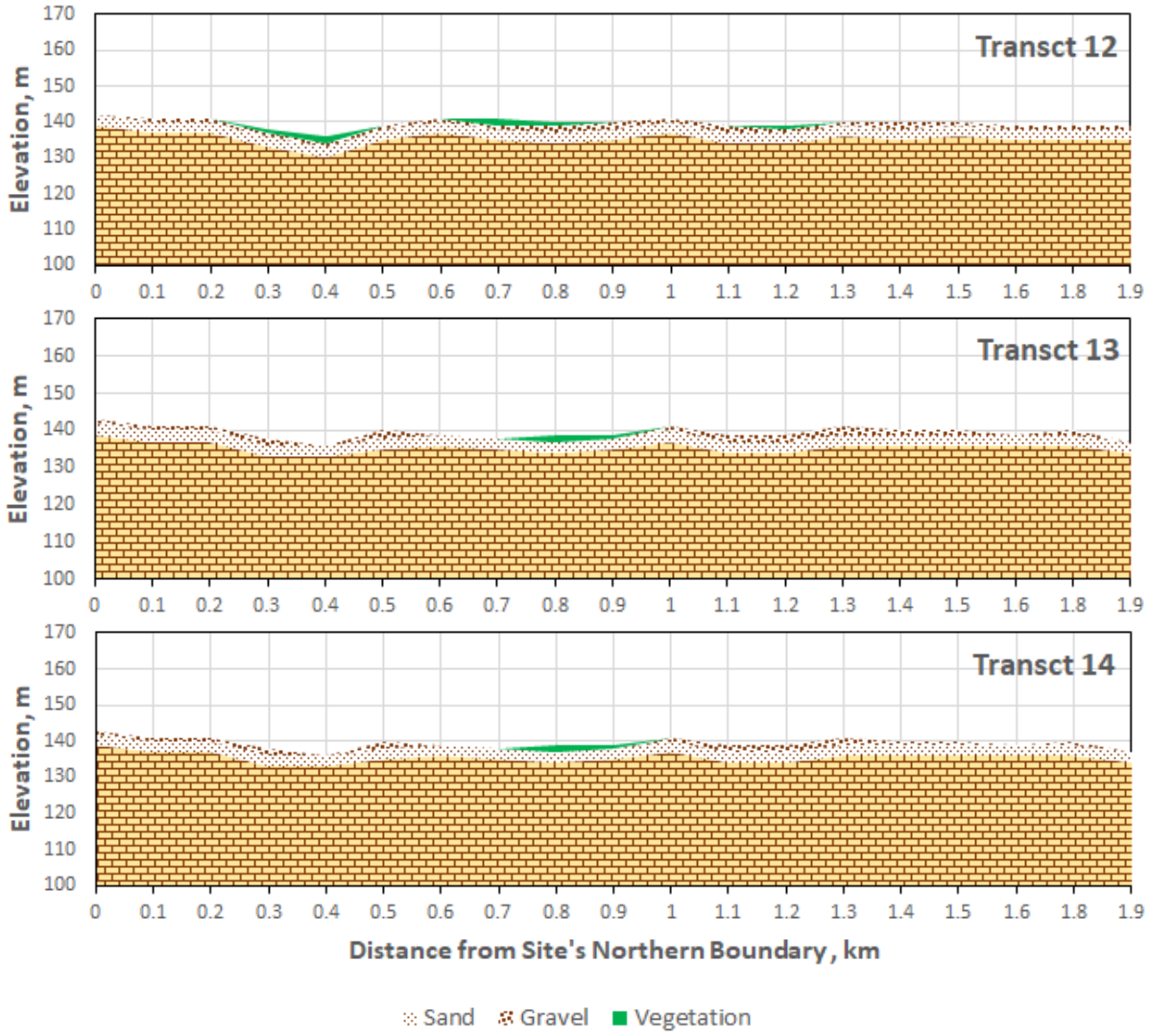


Figure 6, continued.

Fauna

Wild fauna of the Project Site is limited to few insects and other arthropods, reptiles, occasional birds and small mammals. Transient species are restricted to birds and insects, and represent a relatively low diversity of species.

Invertebrates

Invertebrate fauna of the project site is typical of that of the shallow sandy habitats of the Western Desert. Insects form the most diverse and numerically abundant invertebrate fauna in the project area. Insects belonging to orders Coleoptera, Homoptera, Hemiptera, Hymenoptera, Orthoptera, Lepidoptera, Neuroptera, Thysanura, Isopterta, diptera and Dictyoptera are represented at the *Salsola imbricate* habitats in the project site and the neighboring areas.

Arachnids including scorpions, spiders and ticks were recorded in the Project Site and nearby areas (Figure 1). Three scorpion species have been recorded in this part of the Western Desert; namely *Androctonus australis, Leiurus quinquestriatus* and *Orthochirus aristidis*. Only one species; *Orthochirus aristidis* was actually observed during this survey.

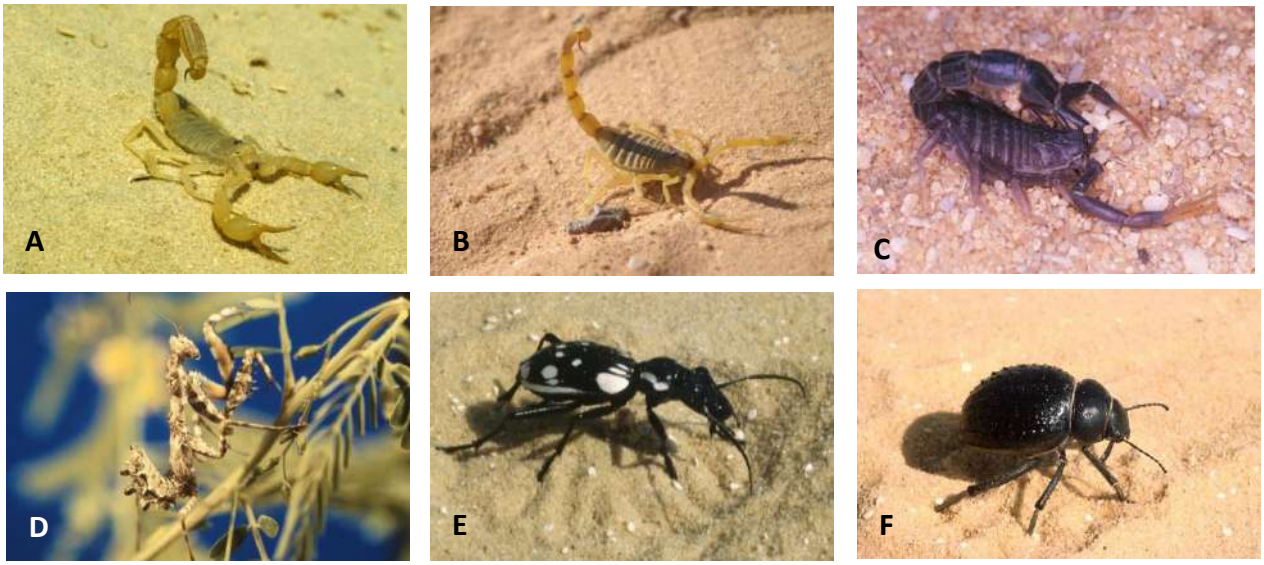


Figure 7. Scorpions and insects recorded/observed at the Project Site and adjacent areas. A. *Androchtonus australis,* B. *Leiurus quinquestriatus,* C. *Orthochirus atarensise,* D. a desert praying mantis (order Mantodea); E. *Anthia sexmacullata,* F. *Pimelia ungulate*.

Although the invertebrate fauna of the project site was not fully explored during these studies, particularly in terms of composition and abundance, it may be concluded that none of the observed invertebrates is considered threatened either locally or internationally. All of the species recorded at the site are common throughout the greater part of the Western Desert.

Reptiles

Reptiles are the most diverse vertebrate group in the desert part of the Study Area, and consist entirely of species typical of the extreme desert. Most of this herpetofauna is composed of lizards and snakes that are

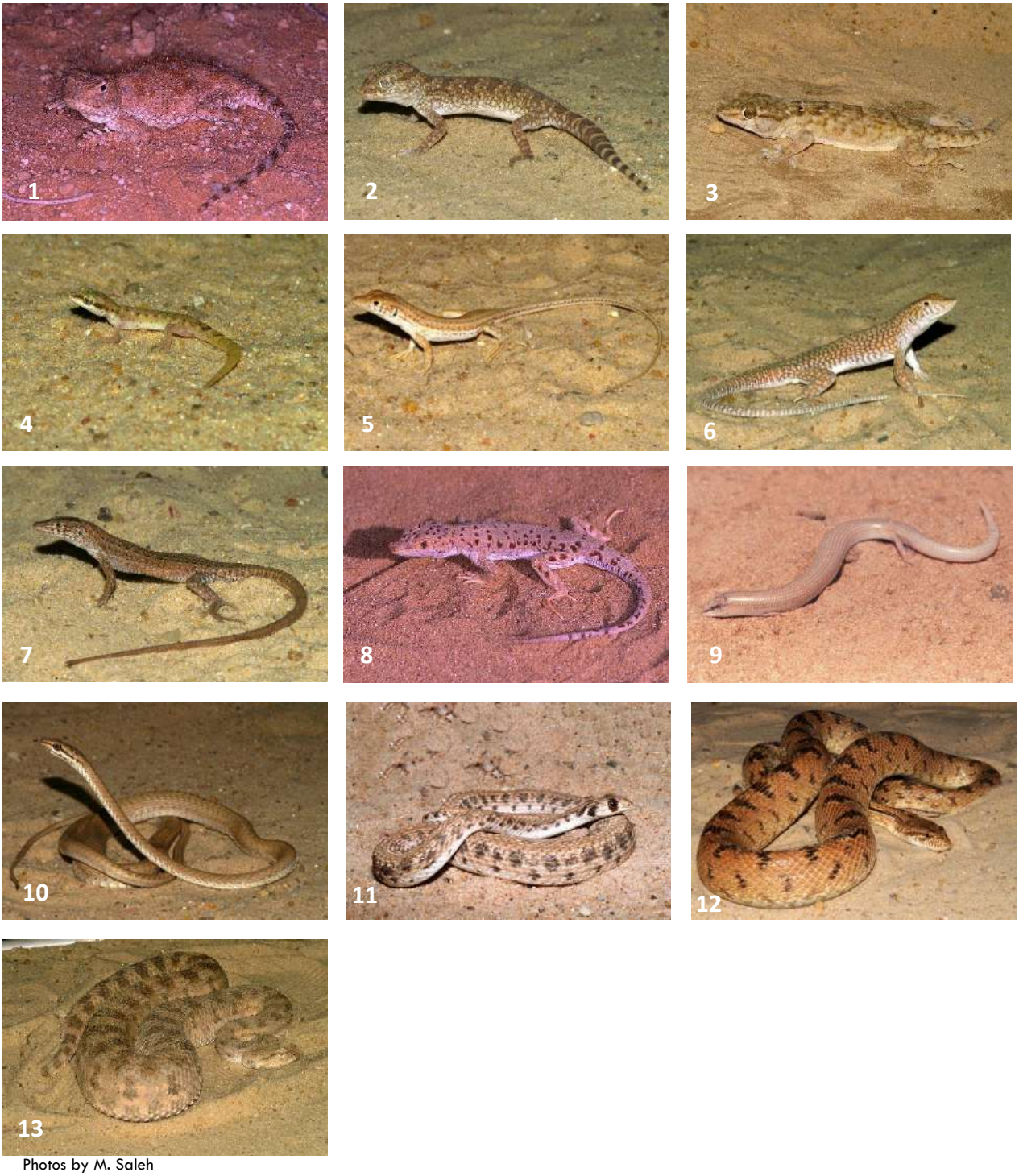
adapted to sandy desert habitats. A total of 13 species are known to occur in the general area and can potentially be found at the project site (Saleh, 1997). Table 1 shows a list of reptiles observed at the Site and the adjacent desert. These species represent four lizard families (10 species) and two snake families (four species). Among these potentially occurring species, five lizard species and two snake species were observed at the site. The density of reptile species recorded at the Project Site appears to be very low. During four days of working at the site, a total of 12 individual reptiles were seen. It is very likely, however, that much more individuals will be active on the ground surface during wormer times of the year. Figure 8 shows examples of reptiles of the Study Area.

All the species in Table 1 are common throughout the Western Desert of Egypt. The three snakes of the family Colubridae are among the more common, non-venomous snakes of Egypt, being widespread throughout the country. The snake family Viperidae is represented in the general area by one species of venomous snakes. The Horned Viper *Cerastes cerastes*, was actually encountered in the Project Site during this survey.

All the reptile species recorded from the area or those that are likely to occur in the area, are listed as Least Concern in the IUCN lists of threatened species. The development of the site is, therefore, not expected to significantly impact the herpetofauna of Egypt or any threatened species.

Table 1. Reptiles observed at the Project Site during this field surveyand those that are likely to occur in desert habitats in the vicinity of Kom Ombo (Saleh, 1997).

No.	Species	Project Site	Western Desert	IUCN Listing
	Agamidae			
1	*Trapelus mutabilis*		√	LC
	Gekkonidae			
2	*Stenodactylus sthenodactylus*	√	√	LC
3	*Tarentola annularis*		√	LC
4	*Tropiocolotes steudneri*	√	√	LC
	Lacertidae			
5	*Acanthodactylus boskianus*		√	LC
6	*Acanthodactylus scutellatus*	√	√	LC
7	*Mesalina guttulate*		√	LC
8	*Mesalina rubropunctata*	√	√	LC
	Scincidae			
9	*Chalcides sepsoides*	√	√	LC
	Colubridae			
10	*Psammophis aegyptius*	√	√	LC
11	*Malpolon moilensis*		√	LC
12	*Spalerosophis diadema*		√	LC
	Viperidae			
13	*Cerastes cerastes*	√	√	LC
	Total number of species	**7**	**13**	



Photos by M. Saleh

Figure 8. Reptiles of the ACWA Power Project Site. Refer to Table 1 for species names.

Avifauna

In this survey we recorded the numbers and distribution of all birds occurring at the Project Site or its immediate vicinity. Some observations were also made in the nearby areas of the Nile Valley and the agricultural area around Faris. The survey covers breeding, wintering and some migrant bird species using that area. The survey was carried out during the month of January, 2020.

A total of 28 bird species were recorded during this survey. It is likely, however, that more species occur in that area than those recorded during this relatively brief, four days survey, particularly during peak migration season. Throughout the survey period, none of the observed species seem to regularly visit/use the project site for foraging, nesting or other activities.

Table 2 shows a list of species observed during field survey, covering both desert and the Nile Valley habitats in the study area. This avifauna is typical of that of the southeastern region of the Western Desert and the upper Egypt Nile Valley.Figure 9 shows examples of the avifauna of the area.

In terms of numbers, we only observed very few birds at the Project Site proper and its immediate vicinity at any one time. None of these birds seems to regularly use the site and their occurrence there seems to be transient. This may be attributed to the limited vegetation cover and hence food resources at that site and its surrounding area. Encountered birds at the site and the study area included both migratory and resident species.

Most of the resident birds of the project site and the surrounding area (Table 2) are true desert species and are typical of the Western Desert. Like most desert animals, the great majority of the species are insectivorous. For most species, insects and reptiles are the most important food items, which also provide the bird with their water requirements.

Several bird species typical of the Nile Valley's mesic habitats have also been observed. Species such as the Palm dove (*Streptopalia senegalensis*), the house sparrow (*Passer domesticus*) and the Cattle Egret (*Bubulcus ibis*)[1] are typical throughout this region. Habitat segregation between birds of the Nile Valley and those of the desert is evident, with most species being restricted to habitats either the Nile Valley or the adjacent desert.

There is no evidence that any major migratory bird flyway passes through the southern region of the Nile Valley in Egypt. Although many species of migratory birds occur in the Aswan area during winter month, there is no evidence that large flocks of the East African/ Red Sea flyway pass through the southern region of the Nile Valley in Egypt. No migratory bird flocks were recorded during the observation period at the study area. One exception was the numerous individuals of the migratory, European Barn Swallow, which were observed around the Faris area throughout the survey time. The largest bird flocks observed in the area were those of the resident Cattle Egret, the largest of which including about 30 birds. No flocks of any size were observed over the desert area. The majority of observed migratory birds were individuals or in small groups of less than 5 individuals.

The area and the Project Site do not seem to intercept any large migratory bird flights. It may also be concluded that the project area is situated in an area limited importance to migratory or resident birds.

[1] Not observed during this survey but now very common throughout the Egyptian Red Sea coastal areas.

Furthermore, none of the bird species observed during this survey or those that are likely to occur in the area are listed as threatened locally or internationally (IUCN lists).

Table 2. Birds recorded at the Study Area in the vicinity of Kom Ombo, their breeding status (Goodman and Meininger, 1989) and IUCN listing (IUCN, 2016). Breeding status: RB = resident breeder; WV= winter visitor; PV = passage visitor).

No.	Species	Desert	Nile Valley	Breeding Status	IUCN Listing
	PELECANIFORMES				
1	*Egretta garzetta*		√	RB, WV	LC
2	*Bubulcus ibis*		√	RB	LC
	ACCIPTRIFORMES				
3	*Elanus caeruleus*		√	RB	LC
	FALCONIFORMES				
4	*Falco tinnunculus*		√	RB, PV	LC
	COLUMBIFORMES				
5	*Streptopelia senegalensis*		√	RB	LC
6	*Columba levia*		√	RB	LC
	STRIGIFORMES				
	Bubo bubo	√	√	RB	LC
	Athene noctua		√	RB	LC
	CORACIFORMES				
7	*Merops orientalis*		√	RB	LC
	Upupiformes				
8	*Upupa epops*		√	RB PV	LC
	PASSERIFORMES				
	Hirundo rustica		√	RB PV WV	LC
9	*Ptyonoprogne obsoleta*		√	RB	LC
	Phylloscopus collybita		√	WV	LC
	Prinia gracilis		√	RB	LC
10	*Galerida cristata*		√	RB	LC
	Ammomanes cinctura	√		RB	LC
11	*Ammomanes deserti*	√		RB	LC
	Alaemon alaudipes	√		RB	LC
	Anthus cervinus	√	√	PV	LC
12	*Motacilla alba*	√	√	PV WV	LC
13	*Motacilla flava*	√	√	RB PV WV	LC
14	*Oenanthe deserti*	√		RB PV WV	LC
15	*Oenanthe lugens*	√		RB, WV	LC
	Oenanthe monacha	√		RB	LC
	Oenanthe leucopyga	√		RB	LC
16	*Passer domesticus*		√	RB	LC
17	*Corvus ruficollis*	√		RB	LC
18	*Corvus corone orientalis*		√	RB	LC
	28	**12**	**20**		

Photos by M. Saleh

Figure 9. Examples of birds of the Kom Ombo area. Refer to Table 2 for species names.

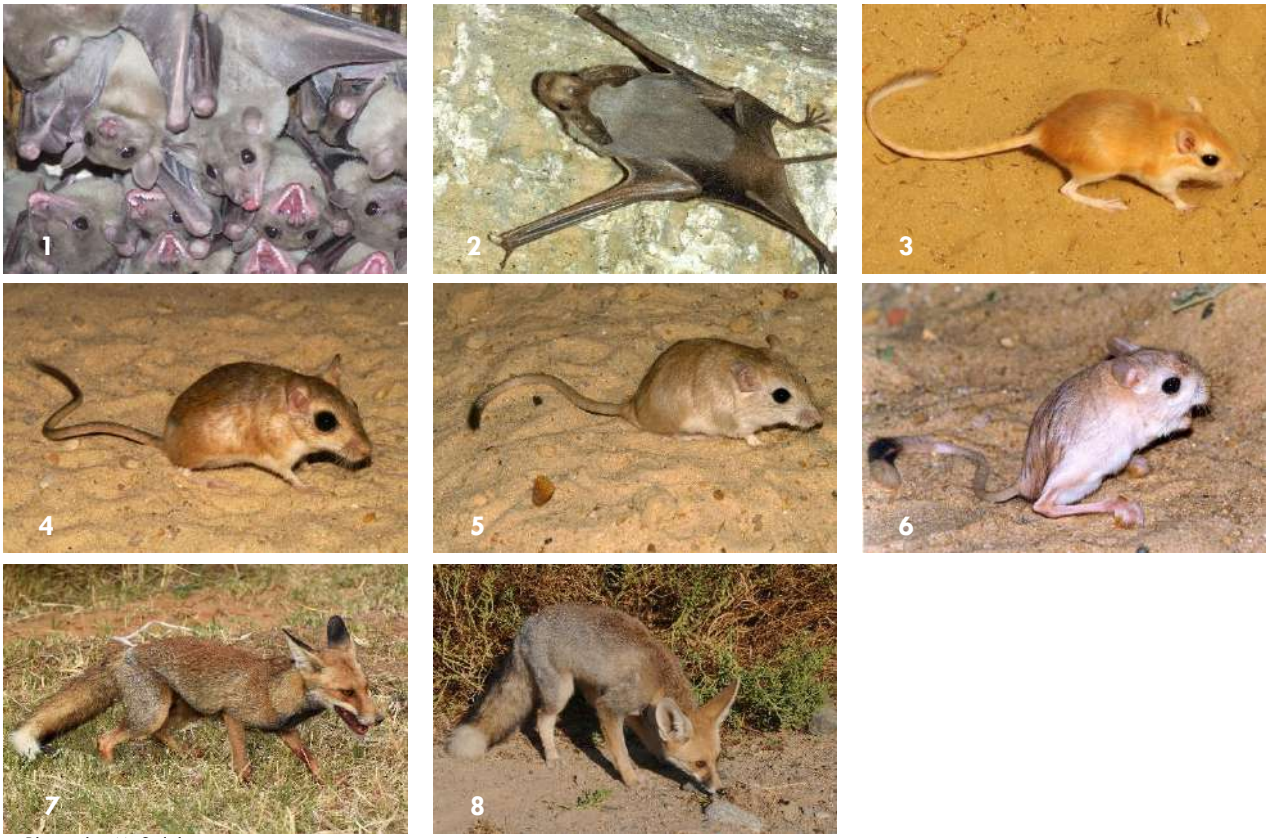
Mammals

Table 3 shows a list of the mammals recorded or observed at the project site and surrounding area. Nine mammalian species are listed. Three rodent species (*Gerbillus gerbillus, G. pyramidum and Meriones crassus*) have been live trapped at the project site proper during this survey. Abundance of these, usually common rodents, appears to be extremely low, and they are restricted to a vegetated, very small areas on the site. Tracks of the Red Fox (Vulpes Vulpes) and the Rüppell's Fox (*Vulpes rueppellii*) have been observed throughout the site. All records of observed or trapped animals came from the vegetation patches or the garbage area next to the buildings north of the site.

None of the recorded mammals are listed as threatened internationally or locally

Table 3. Mammals recorded from the Hamrawein – Quseir area and their IUCN status.

No.	Species	Project Site	Western Desert	IUCN Listing
	Chiroptera			
1	*Rousettus aegyptiacus*		√	LC
2	*Rhinopoma hardwickei*		√	LC
	Pipistrellus kuhlii		√	LC
	Rodentia			
3	*Gerbillus gerbillus*	√	√	LC
4	*Gerbillus pyramidum*	√	√	LC
5	*Meriones crassus*	√	√	LC
6	*Jaculus jaculus*		√	LC
	Carnivora			
7	Red Fox (*Vulpes vulpes*)	√	√	LC
8	Rüppell's Fox (*Vulpes rueppellii*)	√	√	LC
	Total number of species	**5**	**9**	



Photos by M. Saleh

Figure 10. Examples of mammals of the study area. Refer to Table 2 for species names.

Protected Areas

No protected areas are found near the site. The nearest Natural Protectorate is the Saluga and Ghazal islands in the Nile of Aswan about 80 km south of the site. The protected area was declared by a Prime Minister's Decree number 1969 of the year 1989.

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