

The reptile community of the Zaranik Protected area, North Sinai, Egypt with special reference to their ecology and conservation

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ABSTRACT

The structure of the reptile community in the Zaranik Protected Area was analyzed. Nine stations were chosen to represent the whole protected area and to involve all available habitats. A total of 21 reptile species was recorded. Lizards represented 66.7% of the total number of species, snakes 19%, tortoises 4.8% and the sea turtles 9.5%. Species showed a high variety in their spatial distribution. The most common species in the community were the sand skink *Sphenops sepsoides* and the lacertid lizards *Acanthodactylus scutellatus* and *A. longipes* followed by *Mesalina olivieri*. The most endangered species was the Egyptian tortoise *Testudo kleinmanni* and the most rare species *Stenodactylus sthenodactylus*. A population of the Fan-toed gecko *Ptyodactylus h. hasselquistii* was confined to the salt factory in the protectorate and recorded for the first time in North Sinai. *Trapelus savignyi* is an important species in Zaranik, since it is restricted only to North Sinai. The only venomous snake is the sand viper *Cerastes vipera* that is distributed in all loose sandy areas. No amphibians are known in Zaranik. However, more than one species is expected to occur in the future. Species were distributed throughout different kinds of habitats in Zaranik, with the largest number being in the area of the Visitor's Center and Abul Hussein village stations. Except for the endangered and rare species, the mean density for terrestrial species was $21.2 \text{ ha} \pm 44$ (range 2-24 ha).

KEYWORDS: Reptile, Zaranik, Sinai, Egypt.

INTRODUCTION

Sinai is the richest part of Egypt herpetologically (Flower 1933 & Saleh 1997), with 71 out of a total of 112 reptilian species represented. Since the time of Anderson (1898) who paid exceptional attention and spared no expense in appropriately illustrating his monographic study "Zoology of Egypt", many herpetofaunal studies and additions to the herpetofauna of Sinai have been made (Barbour 1914, Flower 1933, Haas 1943, Schmidt and Mark 1956, Hoofien 1957 & 1972, Mark 1968, Werner 1973 & 1982, Zinner 1974, Ibrahim 1990, 1997, 2000, 2001a-d, Ibrahim et al. 2000, Baha El Din 1992, 1994

& 1996 & Saleh 1997). Ibrahim (1997) studied a reptile community in sand dunes in the Al-Arish area. This community comprised 8 lizards and 4 snakes, they divided their resources by three dimensions, habitat, time and food. The most common species were *Acanthodactylus scutellatus* and *Mesalina olivieri*.

The Zaranik protected area occupies 250 km² and lies approximately 35 Km West of Al-Arish city. It resembles the Al-Arish area, in terms of dune habitats, climate (which is arid) and its vicinity to the Mediterranean Sea. In North Sinai, rain usually falls between October and April. The total precipitation in Al-Arish during the rainy months of the year 2000 was 279.4 mm which is considerably higher than that recorded in previous years (Ibrahim 1990). Habitats for the reptile populations in Zaranik are undulating sand and stabilized sand dunes, salt marshes, artificial lagoons, and Mediterranean sea water, in addition to the rocky terrain in some islands and concrete buildings. This habitat diversity reflects the richness of fauna and flora.

The vegetation in Zaranik comprises over 150 plant species (El Bana *et al.* 2000). The most common perennial species found in the stabilized and undulating sand dunes are *Artemisia monosperma*, *Asparagus stipularis*, *Cyperus conglomeratus* and *Noaea mucronata*, and the dominant annuals are *Ifloga spicata*, *Schismus barbatus*, *Buplurum semicompositum* and *Daucus littoralis*. Species found in the sand hummocks include *Zygophyllum aegyptium*, *Z. propinquum*, *Nitraria retusa*, *Halocnemum strobilaceum* and *Mesembryanthemum crystallinum*. In calcareous sand-dune habitat (e.g Fluseyyat Island), the following species are dominant: *Panicum turgidum*, *Retama raetam*, *Gymnocarpus decanderus*, *Echiochilon fruticosum*, *Thymalaea hirsuta*, *Ononis serrata* and *Plantago ovata*. A total of 15 halophytic species were recorded in wet salt marshes. The most important species are: *Arthrocnemum macrostachyum*, *Frankenia pulverulenta*, and *Salicornia europaea*. In marine water, two flowering submerged sea grasses are known, *Cymodocea nodosa* and *Ruppia cirrhosa* (El Bana *et al.* 2001).

Previous herpetological researches have been carried out in the Zaranik Protected Area (Baha El Din 1992, 1996; Ibrahim 1999, 2000, 2001c). By studying of reptile communities in different habitats within the protectorate, a species list of the existing reptiles can be compiled as a base-line study, enabling further detailed ecological study and evaluation of their importance and conservation.

The objective of this work was to analyze the structure of the reptilian community in Zaranik. Spatial distribution of reptiles and

available knowledge of their ecology and conservation were also considered.

MATERIALS AND METHODS

Study Site: The Zaranik Protected Area was divided into nine stations representing all available habitats as follows:

Station # 1: Stabilized sand dunes around the Visitors' Center. Station # 2: Fluseyyat Island (sandy area with gravel and ruins, surrounded by salt marshes). Station # 3: Matli Island (sand dunes surrounded by artificial lagoons and salt pans). Station # 4:Khowaynat (sandy area with ruins of Roman and Islamic monuments). Station # 5: Abul-Hussein village (sand dunes, human cultivated fields and palm trees). Station # 6 : Mazar village (undulating and stabilized sand dunes). Station # 7: Sebeeka (sandy area, with a salt factory and buildings of abandoned old railway station). Station # 8: North eastern shore (resembles a beach with very sparse vegetation). Station # 9: Mahasna Island (Abu Meheesen) in the Bardaweel Lake.

Sampling and identification: Fieldwork was conducted from 1st July to 6th November 2000. Animals were captured by hand, rubber bands and pitfall traps, and identified to the level of species and subspecies. A maximum of two individuals of each species (except for the endangered and rare species) were usually sampled for identification and preserved as a reference collection for the protectorate. Animal tracks were occasionally taken as indication of presence at the stations.

Population size: Two methods were used for estimating the population density of a species: 1)- Mark recapture method: Thirty six plastic container traps, each 40 cm deep, 35 cm in diameter at its widest part were buried in a total area of one hectare (100 x 100 m), distributed in 25 quadrats (20 x 20 m each). Each trap was placed in the middle of the quadrat. Traps were operated for 1-4 days. Trapped lizards were marked by toe-clipping, and released at the point of capture. The population size of lizards was estimated by the Jolly- Seber method (Krebs 1989). 2):A walking transect method (1000 x 10 m) was established for some species, especially those that rarely fall into traps. The population density of some species was roughly estimated by counting their tracks on the transect.

RESULTS

Species composition: Twenty one species of reptiles (14 lizards related to 11 genera and 6 families: 4 snakes (4 genera and 2 families); one tortoise, and two turtles (2 genera and 2 families) are reported from the Zaranik protected area. No reptiles are known on the man-made sand bar separating

the Bardaweel lake from the Mediterranean Sea. Table(1) shows the reptile community members with common and vernacular names and short notes on their ecology.

Spatial distribution of reptiles: The stations number one and five (Visitors' building and Abul Hussein village) attained the largest number of species (Table 2). Both sites are characterized by having a variety of different habitats such as stable sand dunes, coarse sand substrate, salt marshes, cultivated areas and human habitations. They also have the most endangered and rare species. On the other hand, the beach and Mahasna Island showed the lowest relative number of reptiles. Noticeably, Fluseyyat Island had a lower number of species than Matli and Khowaynat islands. Species are distributed in different kinds of habitats within the protectorate. Therefore, the habitat dimension is presumably one of the most important resources that reptiles partition in Zaranik.

Relative abundance: The approximate measurement of reptile density in Zaranik differed within species, reaching the highest for *Sphenops sepsoides* (165/ha), and the lowest for *Stenodactylus sthenodactylus* and *Spalerosophis diadema* (1/ha). The mean density for terrestrial species was $21.2/ \text{ha} \pm 44$ (range 2- 24/ ha).

DISCUSSION

Reptile community structure: The reptile community of Zaranik encompasses at least 21 species, comprising 84% of the herpetofauna recorded on the northern Sinai Mediterranean coast (Saleh 1997). The herpetofaunal species previously recorded in Al-Arish city and not found in Zaranik are the Green toad *Bufo viridis*, the Fan-toed gecko *Ptyodactylus guttatus*, and the Hardun *Laudakia stellio* (Ibrahim 1990). A single record of the Bean Skink *Mabuya vittata* (MNHN 2000. 5134) was reported from Al- Arish (Ghobashi *et al.* 1990), but no other individuals of this skink have since been reported from the northern Sinai. *Ptyodactylus hasselquistii* is not found in the Al-Arish area although it is found in Zaranik, the first report of the species in the northern Sinai (Ibrahim 2001c). Individuals of *P. hasselquistii* at Zaranik are very pale in color and almost patternless, as compared with the south Sinai geckos which are darker in color and more clearly cross- banded. This species is known to occur in south Sinai, but in the north is normally replaced by *P. guttatus* (Werner & Naomi 1994). The Natterer's gecko *Tropicolotes steudneri* was recorded in Al-Arish city; east of Zaranik (Flower 1933) and from Bir Al-Abd (approximately 50 km West of Zaranik) (Saleh 1997), but never

recorded in Zaranik. The Moorish gecko, *Tarentola mauritanica* was mainly observed on the walls of poultry farms along the Qantara- Al- Arish highway from Balouza to Bir Al- Abd (pers. observ) and its range does not extend to Zaranik. This is probably due reported to the scarcity of their habitats in Zaranik. Single records of three species were previously reported from Zaranik, but not reported in this study Varty and Baha El-Din (1991) found a road- killed juvenile individual *Uromasitx aegyptius* and a moila snake *Malpolon moilensis* in the southern extremity of Zaranik. The former species is known to occur in the gravel hard soil and rocky areas in the northern and southern Sinai. An old carcass of the leather-backed turtle, *Dermochelys coriacea* was also reported in Zaranik in 1985 (Baha El Din 1992). However, extensive field work during summer and autumn did not reveal the presence of any of these species in Zaranik or even a track. No amphibians are known in Zaranik However, the green toad *Bufo viridis* was expected to occur, especially in the green areas around the visitors' center where fresh water is available. It is also expected that the Egyptian toad *Bufo regularis* and the Mascarene frog *Ptychadena mascareniensis*, could be found in the future. Both species were recently recorded from Al-Arish area (Ibrahim 2001 a&b).

Spatial distribution of reptiles: The results showed that the species richness reached its maximum in the visitors center and Abul Hussein village sites. This may reflect the variety of habitats in these sites. The lowest number of species was found on the beach site because of the specific nature of the site (hard salty soil and little vegetation). Fluseyyat Island showed the lowest number of reptile species when compared to other islands. This may reflect the relative isolation of the island caused by surrounding salt marshes that may limit the free movement of lizards into the island. The habitat, which is the dimension first partitioned in amphibians and reptiles (Schoener 1974), is presumably one of the most important resources that reptiles partition in Zaranik. In addition, different habitat types in Zaranik segregated some species from others. For example, the marine turtles *Caretta caretta* and *Chelonia mydas* are segregated from the terrestrial reptiles in Zaranik. Being found in the Bardaweel lake islands, *Acanthodactylus boskianus* is also isolated. The arboreality of the rupicolous geckos *Hemidactylus turcicus* and *Ptyodactylus hasselquistii* separates them into their own habitats. In sand dunes, the psammophile species use the microhabitats in different ways, for example, the true sand skinks *Sphenops sepsoides* and *Scincus scincus*, are well adapted for occasional resting under ground, *Lytorhynchus diadema* has a great burrowing ability in the sand, and the sand viper, *Cerastes vipera* can

conceal itself completely by burrowing in the sand. Some lizards such as *Mesalina olivieri* are mainly associated with vegetation, more so than other species. *Chamaeleo chamaeleon* and *Trapelus savignyi* were reported on vegetation in both day and night and observed on soft and hard soils. *Varanus griseus* has a wide home range, being recorded in different microhabitat types in Zaranik, and swims and dives in the Zaranik lagoons. Another dimension is the time of activity of species, with 8 out of 21 species being nocturnal and crepuscular and the remainder diurnal. Food is certainly the third dimension. Ibrahim (1997) studied resource partitioning among the most common sympatric species, *Acanthodactylus scutellatus* and *Mesalina olivieri* in the northern Sinai sand dunes, reporting ample differences in the food type and size taken by both species. These factors might help the reptile species in Zaranik to coexist in a stable manner.

Conservation: Until recently, the major threats to the natural reptilian population in Zaranik were the commercial hunting and habitat degradation due to overgrazing. More recently, education and public awareness activities focusing on amphibians and reptiles and nature of Zaranik as a protected area have been carried out. However, the Egyptian tortoise, *Testudo kleinmanni* is still the most endangered species in the area and the nests of species have almost disappeared over the past few years. Unfortunately, a large market in the pet trade exists in Egypt for this species which is still in great demand, although they do not command high prices. There is an endangered species recovery project in Zaranik that involves conservation of *Testudo* ideally in the natural habitat (*in situ*), and also in captivity (*ex situ*). Efforts are also being undertaken to secure the last area of remaining habitat of the species as a natural reserve. Some species are of potential importance in Zaranik such as *Ptyodactylus hasselquistii*, and *Trapelus savignyi* because they are restricted only to North Sinai. *Cerastes vipera* is the only venomous snake in Zaranik, occurring in all sandy areas with highest density in summer and autumn. Very little is known about its ecology in the Al-Arish area (Ibrahim 1990), and its conservation in Zaranik might help researchers to study its natural history. The rarity of suitable habitat of the Elegant Gecko, *S. sthenodactylus* may reflect its paucity. The population of this gecko in Al-Arish city has been diminished by expanding new constructions in the area (Ibrahim 1990), so that special care should be taken to protect this species in Zaranik.

Acknowledgment: I would like to thank Mr. Saad Osman, the manager of Zaranik protected area, and his staff for offering available facilities and transportation within the protectorate. This research has been supported by the MEDWETCOAST project. I also thank Dr. Abdel Hamid Khedr for providing information on vegetation in Zaranik.

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Table 1: Reptile species in Zaranik Area with notes on their ecology

Species	Common name	Vernacular name	Status	Ecology notes
<i>Hemidactylus t. turcicus</i>	Turkish Gecko	Abul Ebraiss	uncommon	Nocturnal, sit-and wait predator, active immediately after sunset until the first light of the following day.
<i>Ptyodactylus h. hasselquistii</i>	Fan - Toed Gecko	Ebraiss abyadh	uncommon	nocturnal, but occasionally active during the day.
<i>Stenodactylus petrii</i>	Petrie's Gecko	Bors Ramly	common	Observed immediately after sunset. Its activity is shorter than that of <i>H. turcicus</i> and <i>P. hasselquistii</i> . No geckos were observed on the ground after 0100 h even in summer.
<i>Stenodactylus sthenodactylus</i>	Elegant Gecko	Bors Ramly	rare	An individual was accidentally captured during the daytime under a hard cover of dry waste products of sheep and goats.
<i>Trapelus savignyi</i>	Savignyi's agama	Ehbaina	uncommon	Mostly active between 0900 - 1100 h in summer and autumn, basking on bushes, facing the sun, a sit-and - wait forager, easily caught, found on small shrubs during the night.
<i>Acanthodactylus boskianus</i>	Bosc's Lizard	Orban	common	Entirely diurnal, large in size, preferring lightly vegetated areas with pebbles and stones
<i>Acanthodactylus longipes</i>	Saharan Fringe-Toed Lizard	Orban	common	A diurnal species, active in all seasons, coexisting with its congener, <i>A. scutellatus</i>
<i>Acanthodactylus scutellatus</i>	Nidua Lizard	Orban	very common	More active between 0900 and 1000 h. In hot weather <i>A. scutellatus</i> exhibits bimodal activity and both active and sit- and- wait foraging strategies.

<i>Mesalina olivieri</i>	Olivier's Lizard	Orban	Common	It spends most of its time on the ground, and climbs up into vegetation while foraging to find insects off the ground such as aphids.
<i>Chalcides ocellatus</i>	Ocellated Skink	Malaga Samra	Uncommon	A diurnal species, mainly observed in the morning before it becomes hot, being generally basking in the sun patches under bushes between 0900- 1100 h.
<i>Scincus s. scincus</i>	Sand Fish	Malaga Safra	Uncommon	A common sand diver, existing in soft sands. Individuals were often active in the early morning and late afternoon.
<i>Sphenops sepsoides</i>	Audoin's Sand Skink	Abul-Mallal	Abundant	Nocturnal, observed on pavement and roads, with an observation of an individual crossing the high way near Mazar at 2145 h on 22 June 1998.
<i>Chamaeleo chamaelon musae</i>	Chameleon	Herbaya	uncommon	Arboreal, however, some individuals were observed walking on the ground, even during midday in June and July. Gravid females were usually observed in October.
<i>Varanus g. griseus</i>	Desert Monitor	Waral	uncommon	Hibernates in October and November and emerges in March and April. Highest levels of activity were generally between 0900 and 1000 h
<i>Cerastes vipera</i>	Sand Viper	Herfesh	uncommon	Venomous, essentially nocturnal, frequently observed in loose sand on the top of the dunes/ and in the coarse soil in Fluseyyat Island.

<i>Lytorhynchus diadema</i>	Sand Snake	Ham Maslamani	uncommon	Common non venomous sand snake, nocturnal, mainly active immediately after sunset. No individuals were seen after 0100 h even in summer.
<i>Psammodphis schokari schokari</i>	Schokari Sand Snake	Ham Selimani	uncommon	Semi-venomous, mainly observed during the daytime in wadis and between sand dunes in areas with a relatively dense vegetation.
<i>Spalerosophis diadema cliffordi</i>	Clifford's Snake	Ham	rare	A diurnal, semi-venomous species, previously captured from sand dunes close to human settlements or in farms of edible vegetables
<i>Testudo kleinmanni</i>	Egyptian Tortoise	Lajah	endangered	No locality, or nest site is known for this species in Sinai
<i>Caretta caretta</i>	Loggerhead Turtle	Lajah Bahreyya	rare	Their nests comprise about 80% of turtles in the Mediterranean Sea. Young individuals were frequently caught in fishing nets.
<i>Chelonia mydas</i>	Green Turtle	Lajah Bahreyya	rare	Subsistence exploitation of this turtle occasionally occurred in Al-Arish city.

الملخص العربي

مجتمع الزواحف في محمية الزرانيق ، شمال سيناء ، مصر: بيئتها وسبل المحافظة عليها

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تم دراسة مجتمع الزواحف في محمية الزرانيق . قسمت المحمية إلى ٩ مناطق تمثل جميع الموائل المتاحة بها. تم تسجيل ٢١ نوعاً من الزواحف، كانت نسبة السحالي فيها ٦٦,٧% والثعابين ١٩% ، والسلاحف ٤,٨% والترس المائية ٩,٥%. أظهرت الأنواع تنوعاً عالياً في توزيعها المكاني. كانت أكثر الأنواع شيوعاً ، سحلية الرمل سفينويس سيبسويس ، والسققران /كانثوداكتيليس سكيوتيلاتس و/كانثوداكتيليس لونجبيز ثم ميسالينا أوليفيري. وجد أن أكثر الأنواع انقرضت هي السلحفاة المصرية، وأكثرها ندرة هو ستينوداكتيليس ثينوداكتيليس. لقد اقتصر وجود البرص أبو كف بتينوداكتيليس هاسيلكويستي على مصنع الملح بالزرانيق ويسجل هذا النوع لأول في شمال سيناء. يقتصر وجود النوع قاضي الجبل (ترايبيليس سافيني) على محافظة شمال سيناء . أما الحية القرعاء فهي السامة الوحيدة في المنطقة وتنتشر في جميع الأراضي الرملية . تنتشر الأنواع في مختلف موائل المحمية وخاصة منطقتي مركز الزوار وقرية أبو الحصين. بلغ متوسط كثافة الأنواع غير المنقرضة والنادرة ٢١,٢ للهكتار (٢-٢٤ للهكتار). كما اختلف تنوع الأنواع من منطقة إلى أخرى داخل المحمية، أما معامل التنوع فكان ٠,٦٥ .