

# The Herpetology of the Suez Canal Zone, Egypt

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## Abstract

The banks of the Suez Canal were surveyed for herpetofauna between 1999 and 2012. A total of 33 species from the west bank, 22 from the east and a sea turtle from the Suez Canal were recorded, with five and 18 new records from the west and east sides respectively. *Natrix tessellata*, inhabiting freshwater canals east of Bitter Lakes, is the first record for the Sinai Peninsula. The new records of amphibians and reptiles of the Suez Canal area are, in fact, a result of recent main changes to habitat. These new environmental changes have resulted in some cases, in more invasive herpetofaunal taxa expanding their ranges into new territories over the past three decades. The number of species occurring on the west bank was greater than on the east bank; this is presumably due to greater variety of habitat, increased urbanization, and a huge web of irrigation canals which have allowed several species to move from River Nile to the Canal zone. This study suggests the Suez Canal acts as passage for herpetofauna from west to east. Individuals of *Trapelus savignyi* on the west bank were patternless and juveniles had smooth ventrals. This phenotype was not previously known for the species.

## Key words

Herpetology, Suez Canal, Sinai, Egypt.

## Introduction

The Suez Canal opened for international navigation in 1869, with a freshwater canal originating at the River Nile (established in 1862) running parallel to the Suez Canal for supplying drinking water (Fig. 1). At that time, the Suez Canal area was almost uninhabited. After several years, population in the canal zone increased and green areas expanded, initiating new habitats that attracted some taxa, amphibians in particular, from the Nile valley to the west bank of the Suez Canal (ANDERSON 1898). Our knowledge of Suez Canal zone herpetology (western bank) has previously depended upon data presented by ANDERSON (1898), who listed one toad and 14 reptiles from the Suez Canal zone, and FLOWER (1933), who reported 19 species, including two frogs. MARX (1968) reported 23 amphibian and reptile species, seven of which were recorded in Ismailia and Port Saïd; the remaining species were recorded from the Suez area, other localities along the Suez - Cairo desert road, and the Gulf of Suez

(far from the Suez Canal). WERNER (1983) reported 13 species of reptiles comprising four new records. STEIN & HELMY (1994) reported nine species of snakes from the Suez Canal zone, including five species reported for the first time. SALEH (1997) considered the Suez Canal area an extension of the Eastern Desert of Egypt and reported three species from the area; his report relied mostly upon earlier publications in Egypt (ANDERSON 1898; FLOWER 1933; MARX 1968), and these publications depended largely upon animal hunters and their verbal reports. BAHÄ EL DIN (2006) mentioned 16 species from the Suez Canal area; much of his data for this region relied on previous literature (e.g. STEIN & HELMY 1994; IBRAHIM 2005). The Suez Canal cities have greatly expanded during the past three decades and doubled in size. According to the census of 2010, the population of the Suez Canal zone is roughly 2.5 million people. Additionally, millions of acres have been recently irrigated and cultivated.



Fig. 1. Main freshwater canal near Ismailia.

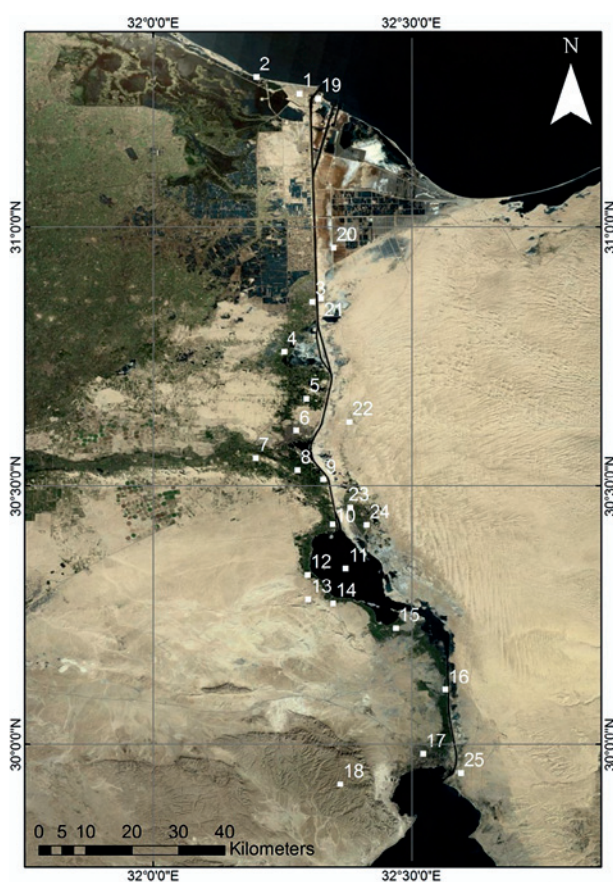


Fig. 2. Map of the Suez Canal zone showing study sites. 1. Port Saïd; 2. Al-Jameel; 3. Al-Qantara West; 4. Abu Khaleefa; 5. Al-Ferdan; 6. Ismailia; 7. Al-Manayef; 8. Dhabeyya; 9. Serapeum; 10. Déversoïr; 11. Bitter Lakes; 12. Fayid; 13. Al-Joza Al-Hamra; 14. Fanara; 15. Kabreet; 16. Shalloufa; 17. Suez; 18. Mount Ataqah; 19. Port Fuad; 20. Al-Cap East; 21. Al-Qantara East; 22. At-Taqaddom; 23. Al-Abtal; 24. Meet Abul Kum Al-Jadeeda; 25. Ash-Shatt.

The east bank of the Suez Canal, a western Asiatic boundary of the Sinai Peninsula, has never been surveyed herpetologically. Recently, some villages were established on the east side; cultivated land extended up to 10 km east of the Bitter Lakes and in Al-Qantara-Port Fuad sector 21 km deep into Sinai.

The Suez Canal Zone has a special and unique status in Egypt. It was a scene of military actions for decades beginning with First World War and ending in October 1973. During this time, the herpetology of the Suez Canal zone received little attention and no surveys or ecological studies were carried out. This is primarily because of the scarcity of researchers and the difficulty of accessing this region for research. Even now, conducting field research near the Suez Canal often requires special permissions. Large-scale surveys covering the entire region of the Suez Canal are needed to document in detail the distribution of amphibian reptile species so as to then understand the effect of increased human and agricultural presence and to capitalize on the region's recent stability for scientific purposes.

Therefore, I conducted herpetological surveys on both sides of the Suez Canal for more than ten years. During this period, several new herpetofaunal records were documented on both east and west of the Suez Canal and in Sinai.

The objectives of this project were to: (1) survey the present-day herpetofauna and compare distribution of species on both banks of the Suez Canal; (2) determine what species have moved from the Nile Valley, or other areas, to the Suez Canal zone; and finally, (3) test whether the Suez Canal acts as a bridge or barrier to the Sinai herpetofauna.

## Materials and Methods

**Study site:** The study site is comprised of (1) the western bank of the Suez Canal from Port Saïd city on the northern extremity to Suez city (the southern terminus of the canal; 168 km) and within a range of five km westward (occasionally up to 10 km) from the canal, covering at a minimum a total area of 1000 km<sup>2</sup>. The west bank of the Suez Canal includes three major cities, from north to south: Port Saïd (Port Saïd), Ismailia (Al-Isma'ileyya), and Suez (As-Suways), between which many towns and villages are located (Fig. 2); and (2) the eastern bank of the Canal from Port Fuad to Ash-Shatt (opposite Suez city) including the old city Al-Qantara East. The east bank includes a large area of alluvial land, natural swamps and sabkhas extending from Al-Qantara East up to Port Fuad. A desert strip extends from Al-Qantara southward to Ash-Shatt, but because this bank has been supplied with Nile water across the canal at two points (one near At-Attina north of Al-Qantara West and one near Déversoïr), a large amount of lands have been irrigated and cultivated and new villages were established.

Observations on the west bank of the Suez Canal were undertaken over eight roads from July 1999 to July 2009, but more extensively during spring and summer



**Fig. 3.** Ismailia-Port Said highway, near Al-Qantara West (Habitat of *Amietophrynus regularis*, *Ptydachna mascareniensis*, *Hemidactylus turcicus*, *Trachylepis quiquetaeniata*, *Chalcides ocellatus*, and *Natrix tessellata*).

(when reptiles are most active). Additional data were recorded through occasional field trips during the summers of 2010, 2011 and 2012. The sites containing all possible varieties of habitats were as follows:

**1.** Ismailia-Port Saïd highway (Fig. 3). This is ~75 km long, including several towns and villages (Al-Qantara West and Abu Khaleefa being the major towns).

This sector includes mango groves, crop farms and sabkhas (salt flats, Fig. 4) in addition to fish farms and poultry farms.

**2.** Ismailia-Suez highway. This connects Ismailia with Suez (90 km long); most of the western side of the road is still desert (Fig. 5). This sector is characterized by sand plains, undulating sand dunes, plateaus, swamps, and salt marshes, in addition to scant green patches. The greatest distance between the road and Suez Canal is approximately eight km.

**3.** Port Saïd-Suez freshwater canal road. This includes both sides of the Port Saïd freshwater canal (Fig. 6), which runs along the Ismailia-Port Saïd highway until Al-Qantara West where it runs adjacent to the Suez Canal road northward to Port Saïd; and extends along the Suez freshwater canal from Ismailia to Suez. Mango groves and green fields exist on both banks (Fig. 7). A large number of towns and villages are scattered along the way, especially on the eastern bank of the canal. The distance between the freshwater canal and the Suez Canal ranges from 13 m to 7.5 km.

**4.** Suez Canal road. This is adjacent and parallel to the Suez Canal from Port Saïd to Suez (Fig. 8).

This stretch includes a few residential areas, trees, green fields, and very limited sand dunes (Fig. 9) and sand patches.

**5.** Ismailia-Cairo highway. Three sand plain localities including 10 km southwest of Ismailia city; Ismailia

cemetery and Wasfeyya in addition to Al-Manayef village were studied.

**6.** Ismailia-Zaqaziq agricultural highway. Along the Ismailia freshwater canal, with green fields (Fig. 10) and scattered villages.

**7.** Suez-Cairo highway. A desert road along which three sites, including the Suez Canal University new campus, urban areas with cultivated farms within a range of five km west of the Suez Canal, and the Mount Ataqaq foot area (Fig. 11), were searched.

**8.** Port Saïd-Domyatt coastway. A sandy coastline from Port Saïd to Al-Jameel area (10 km west of Port Saïd) was examined.

At least 10 sites in the major cities of Port Saïd, Ismailia, and Suez, and their suburbs, were searched repeatedly. All existing highways and side roads were surveyed many times by car (looking for live or dead animals) both during day and at night.

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In total, 139 locations were visited on the west bank during about 260 days and at least 2000 man field hours recorded. Many of these locations were visited several times. Coordinates of places covered during the study on both banks of the Suez are shown in Table 1. Although surveyed, areas very close to locations visited during this work were excluded from the table.

On the east bank, observations were made along the Port Fuad- Ash Shatt, passing over Al-Qantara East (Fig. 12). The desert strip, urban areas, and cultivated lands within a range of five km (but occasionally up to 10 km) east of the Suez Canal were surveyed.

Sporadic visits to the east bank occurred between 1999 and 2005, while extensive field work was conducted between 2006 and 2008. Each site was surveyed at least once during the night. These sites included the old cities of Port Fuad and Al-Qantara East. Recently established villages, such as At-Taquaddom, Al-Abtal (formerly, Chinese farm), and Meet Abul Kum Al-Jadeeda, east of Serapeum, and the Bitter Lakes were surveyed as well. At least 42 sites were surveyed in about 80 days and approximately 700 man field hours. All these sites were visited more than once and some sites several times.

For identification, samples were collected by hand, and by using rubber bands and pit-fall traps. Tracks of species were also taken as a proof of existence. Distribution maps of species in the Suez Canal zone are illustrated.

## Abbreviations

HUJR Hebrew University of Jerusalem



**Fig. 4.** Ismailia-Port Said highway at Abu khaleefa showing dry sabkha and grasses (not cultivated land).

**Fig. 5.** Ismailia-Suez desert road, near Jeneeva (Habitat of *Acanthodactylus boskianus*, *Uromastix aegyptia*, *Tarentola annularis*, *Ptychocheilus guttatus*, and *Cerastes cerastes*).

**Fig. 6.** Port Said freshwater canal north of Ismailia.

**Fig. 7.** West bank at Kasfareet penetrated by fresh water canal (Habitat of *Amietophrynus regularis*; *Ptychadena mascareniensis*, *Cyrtopodion scabrum*, *Hemidactylus flaviviridis*, *H. turcicus*, *Trachylepis quenquitiensis*, *Chalcides ocellatus*, *Natrix tesellata*, *Ramphotyphlops braminus*, and *Spalerosophis diadema*); Little Bitter Lakes at the top.

**Fig. 8.** Canal Road north of Al-Qantara West, showing Suez Canal (left) on Port Said freshwater canal (right).

**Fig. 9.** Sand dune near Suez Canal (Habitat of *Acanthodactylus longipes*, *A. scutellatus*, *Stenodactylus petrii*, *Chalcides ocellatus*, *Scincus scincus*, *Sphenops sepsoides*, *Chamaeleo chamaeleon*, *Varanus griseus*, *Cerastes vipera*, *Lytorhynchus diadema*, and *Spalerosophis diadema*).



**Fig. 10.** Ismailia-Zaqaziq agricultural road, near Ismailia (Habitat of *Amietophrynus regularis*, *Ptychadena mascareniensis*, *Chalcides ocellatus* *Trachylepis quiquetaeniata*, *Ramphotyphlops braminus*).

**Fig. 11.** At the foot of Mount Ataqah in the gulf of Suez. Several ships can be noted in the far distance. (Habitat of *Tropicolotes steudneri*, and *Stenodactylus sthenodactylus*).

**Fig. 12.** Al-Qantara East city on the east bank of the Suez Canal (Urban habitat of *Cyrtopodion scabrum*, *Hemidactylus flaviviridis*, *H. turcicus*; and sand habitat, *Sphenops sepsoides*, *Stenodactylus petrii*, and *Lytorhynchus diadema*).

## Results

Thirty-four species of reptiles and amphibians were recorded from the Suez Canal zone, 33 terrestrial species from the west bank (three amphibians, 20 lizards and ten snakes), 22 species from the east (three amphibians, 14 lizards and five snakes), and one marine species from the Suez Canal (Table 2). Species reported herein were captured alive by the author or observed as road-killed. Anecdotal reports were excluded. The following is a checklist of herpetofaunal species collected on both banks of the Suez Canal.

## Class Amphibia

### Order Anura

#### Family Bufonidae

*Amietophrynus regularis* (REUSS, 1834) – Egyptian Toad

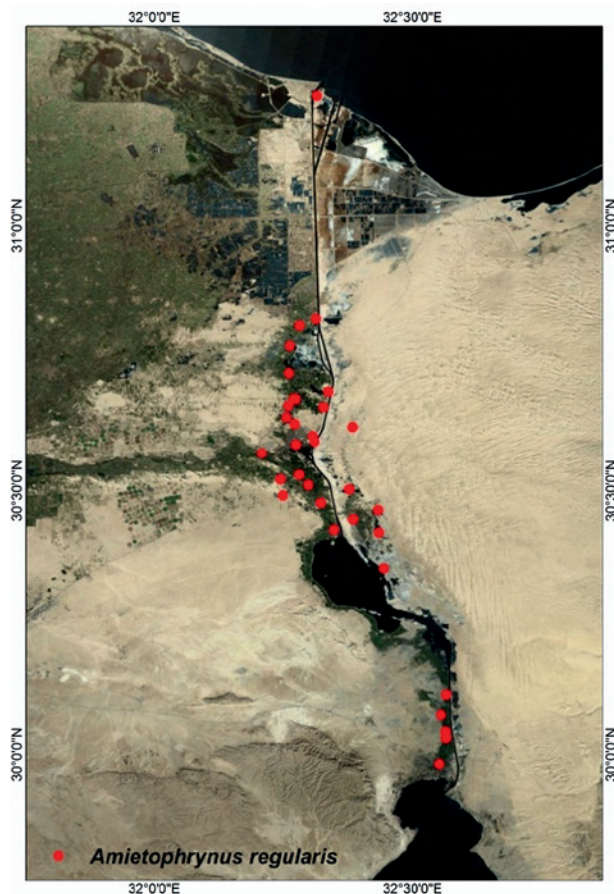
This was the most common amphibian species recorded; found along freshwater canals and irrigating channels, in public gardens, around human habitations and in Ismailia Sewage Station treatment basins near Serapeum. In mango groves, especially in the Al-Ganayen area, north of Suez, choruses of *A. regularis* were heard regularly in summer, irritating the residents. However, the number of toads seems to have declined remarkably during the past ten years. Individuals are no longer found in some areas where they were once common, particularly in Ismailia. Tadpoles were normally observed in June; some less than 7 mm SVL. On the east bank, this species has become wide spread, colonizing newly cultivated areas, especially in the large agricultural project east of Bitter Lakes up to 9 km into Sinai as well as in Port Fuad to the north (Fig. 13).

#### Family Ranidae

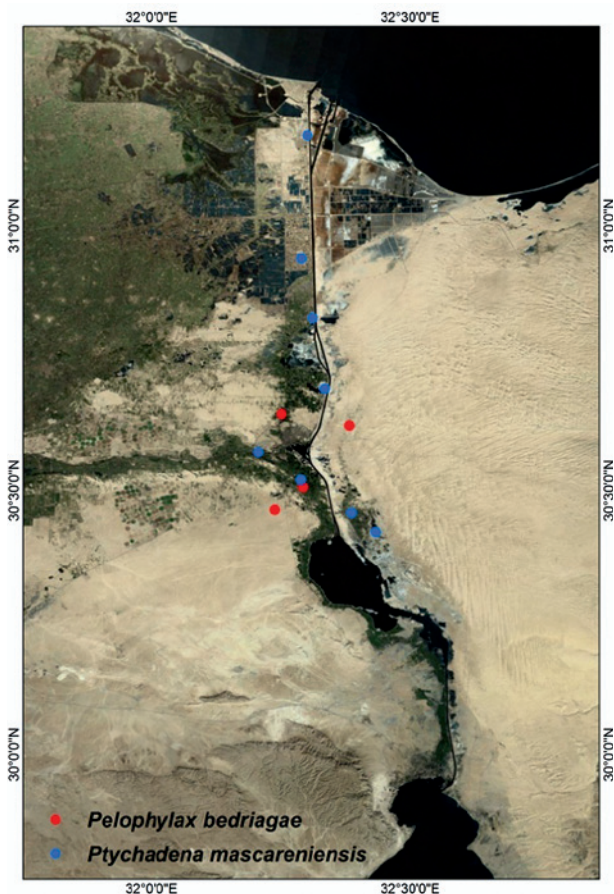
*Pelophylax bedriagae* (CAMERANO, 1882) – Levant Green Frog

Fig. 14

This frog was first discovered in a fresh water stream six km northwest of Ismailia and in the natural swamps



**Fig. 13.** Point localities showing geographic distribution of *Amietophrynus regularis* on both banks of the Suez Canal.



**Fig. 14.** Point localities showing geographic distribution of *Pelophylax bedriagae* and *Ptychadena mascareniensis* on both banks of the Suez Canal.



**Fig. 15.** Habitat of *Pelophylax bedriagae* near Serapeum.

with reed communities near Serapeum (Fig. 15) in 2008 (IBRAHIM 2011). This species must have a strong tolerance for pollution as it was found in highly polluted swamps containing organic wastes south of Ismailia. Frogs were seen just before sunset. On the east bank, *P. bedriagae* was discovered at At-Taqaddom village, opposite the Ferdan area, the first occurrence reported on the east bank of the Suez Canal. This occurrence extends its distribution range about 200 km from its previously known locality in Rafah in the northern Sinai.

#### *Ptychadena mascareniensis* (DUMÉRIL & BIBRON, 1841) – Mascarene Ridged Frog

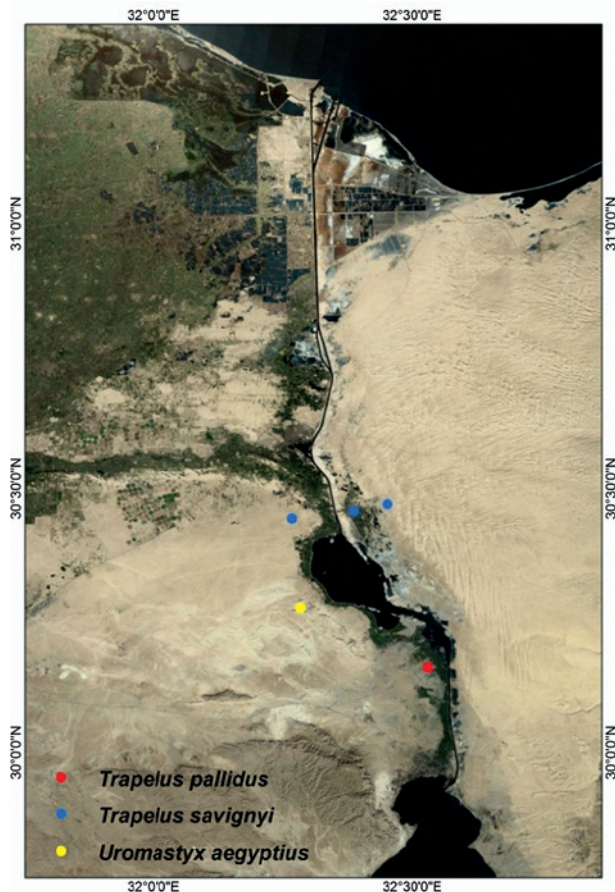
This species was observed in freshwater canals and cultivated fields (rice field in particular) from Al-Ferdan northward up to nine km south of Port Saïd (Fig. 14). In mango groves east of the freshwater canal from Bitter Lakes to Suez, isolated populations were encountered and their croaking was often heard at night during the summer. This species is also known to occur in rice fields south of Ismailia to near Suez on the road of freshwater canal. On the east bank, *P. mascareniensis* occurred in cultivated fields in Meet Abul Kom and Al-Abtal villages. This frog was found with *A. regularis*.

## Class Reptilia

### Suborder Sauria

#### Family Agamidae

*Trapelus pallidus* (REUSS, 1834) – Pallid Agama



**Fig. 16.** Localities at which *Trapelus savignyi*, *Trapelus pallidus*, and *Uromastix aegyptius* were recorded.

Three individuals were observed at different intervals on a hard-soil sandy plain with scarce vegetation in Shalloufa (Fig. 16). One individual was on a small shrub facing the sun at 1400 h in June where air temperature was 37.7 °C. Individuals were medium-sized, had a brownish dorsum with three distinct, dark brown, transverse bands, and a large faint band on the mid-dorsum; conspicuous large dorsal white scales were present between smaller scales. Venter white; throat with fairly dark reticulations.

*Trapelus savignyi* (DUMÉRIL & BIBRON, 1837) – Savigny's Agama

This species was found near Serapeum (Fig. 16). Individuals of *T. savignyi* were morphologically different at this site from those observed on the east bank of Suez Canal. One captured male had a patternless dorsum, the tail was not barred, and the keels on the tibia scales were arranged in somewhat regular rows (Fig. 17); the ventral scales of a juvenile were smooth which is different from any *T. savignyi* observed in Egypt.

Individuals of *Trapelus savignyi* from east of Bitter Lakes (Fig. 18) were morphologically similar to those in northern Sinai. The adults had dorsal coloration with brown transverse bands, ventrals were strongly keeled,



**Fig. 17.** *Trapelus savignyi* observed between Ismailia-Suez highway and Serapeum.



**Fig. 18.** *Trapelus savignyi* observed in Hebeeta area east of the Bitter Lakes.

and tail was barred; juveniles were more conspicuous in terms of strong dorsal and tail patterns.

*Uromastix aegyptia* (FORSSKÅL, 1775) – Egyptian Dabb Lizard

Fig. 16

A pregnant female was captured from a wadi with fairly scattered vegetation in the Jabal Al-Ghor area, west of the Bitter Lakes on 20 May 2008. An X-ray revealed that the clutch size was eight eggs. The lizard was released at the site of capture.

Family Lacertidae

*Acanthodactylus boskianus* (DAUDIN, 1802) – Bosc's Lizard

This species was recorded in fairly hard soil (dried salt marsh) 5 km south of Port Saïd and in a wadi with rather dense vegetation at Ammar, 4.5 km west of Bitter Lakes (Fig. 19). Each individual had the vertebral row of smaller dorsal scales that specify the subspecies.

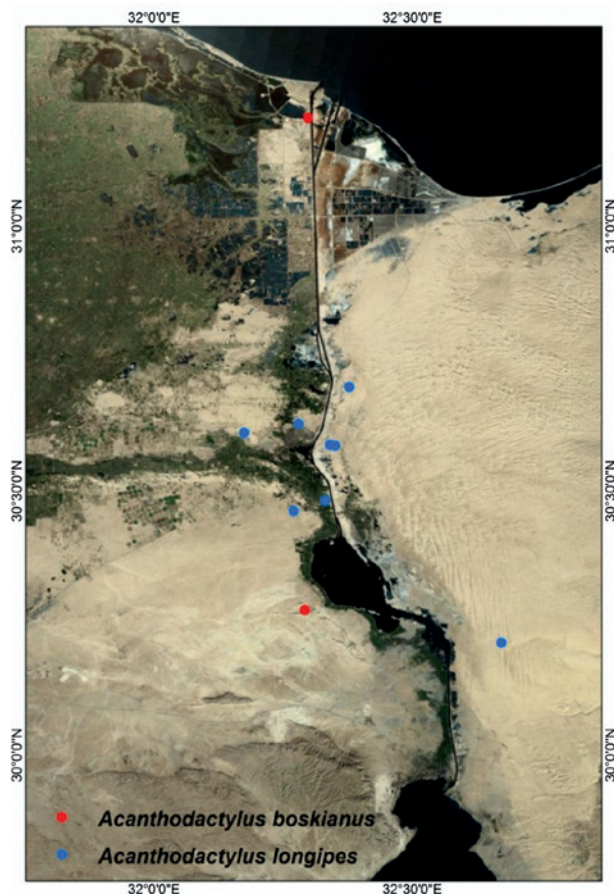


Fig. 19. Localities at which *Acanthodactylus boskianus* and *A. longipes* were recorded.

*Acanthodactylus longipes* (BOULENGER, 1918) – Long-footed Lizard

This species was found in soft sands near Ismailia and Serapeum (Fig. 19). On the east bank, it is more widely distributed because its apparent preferred habitat of soft sand prevails along most of the eastern strip.

*Acanthodactylus scutellatus* (AUDOIN, 1829) – Nidua Lizard

This lizard occupied sandy areas in the Ismailia desert and sand patches among cultivated fields near Suez Canal (Fig. 20). This species and its congener *A. longipes* were occasionally found in the same area, but the latter occupied sites of softer sand.

Family Gekkonidae

*Cyrtopodion scabrum* (HEYDEN, 1827) – Rough-tailed Gecko

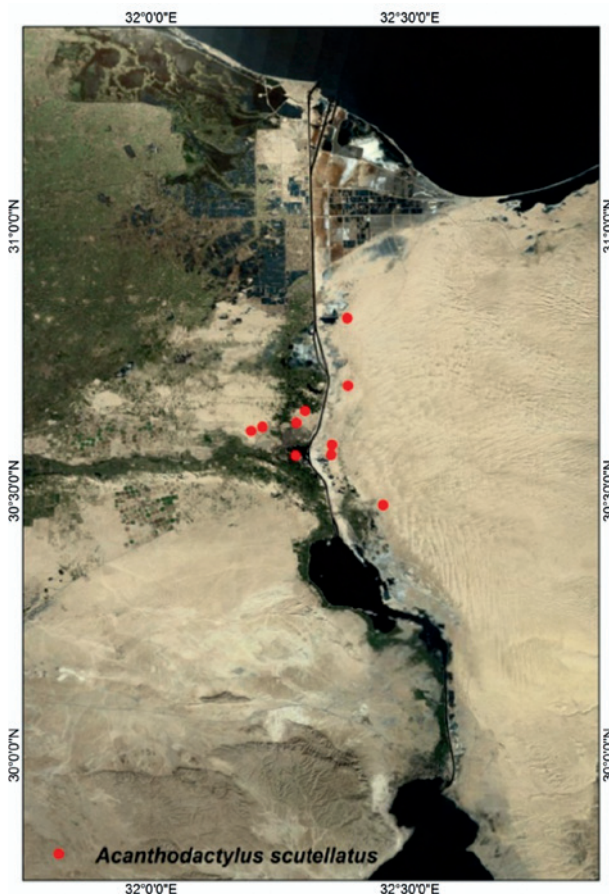


Fig. 20. Localities at which *Acanthodactylus scutellatus* was recorded.

This species occurred in and near urban settlements and abandoned bunkers east and west of the main freshwater canal from Serapeum south to Mount Ataqah. On the Suez University campus, female *C. scabrum* displayed communal nesting. On the east, *C. scabrum* colonized urban developments and abandoned buildings from Al-Cap southward to Metla Pass invading newly established villages east of Bitter Lakes (Fig. 21). They were observed up to 9 m off the ground. In Al-Cap, this lizard was most active during autumn and least active during winter; daily activity peaked at the first three hours following sunset. It is insectivorous, assuming both sit-and-wait and active foraging strategies. The reproductive season extends from March through September; females have single-egg clutches more frequently than clutches of two eggs (IBRAHIM, 2013).

*Hemidactylus flaviviridis* (RÜPPELL, 1835) – Indian-leaf Gecko

This is one of the most common geckos along the Suez-Ismailia desert road; on both banks of the freshwater canal from Suez north to 16 km north of Ismailia (IBRAHIM & GHOBASHY 2004) and along the Suez Canal in Ismailia

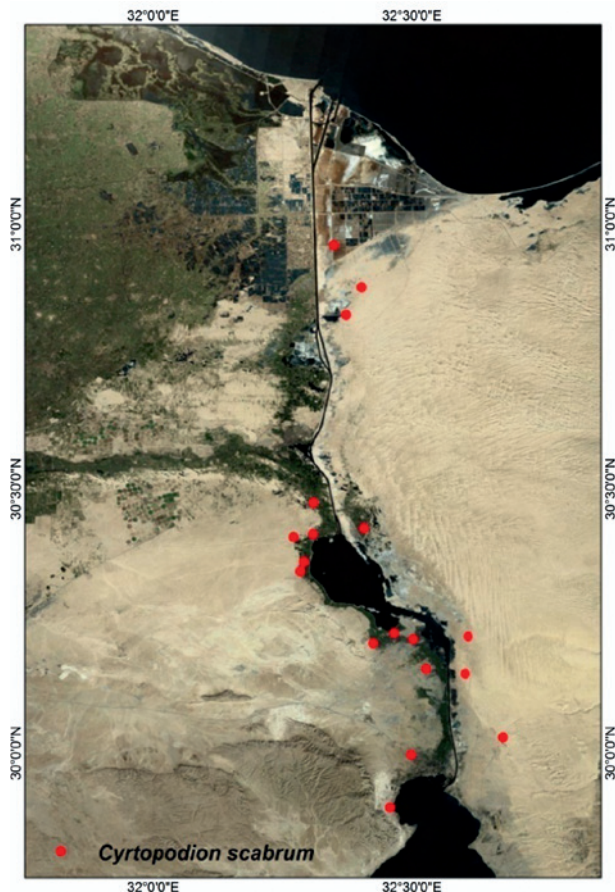


Fig. 21. Point localities showing geographic distribution of *Cyrtopodion scabrum*.

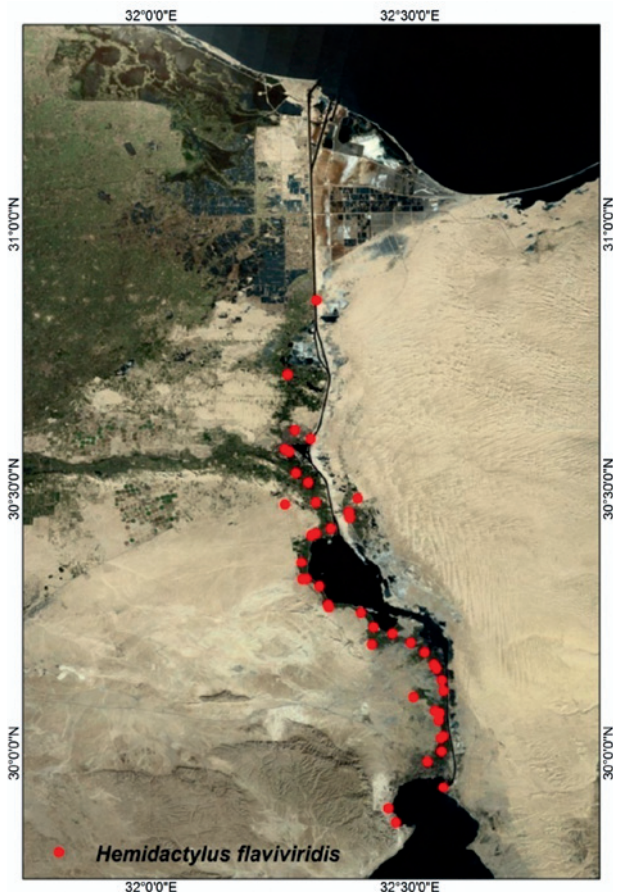


Fig. 22. Localities at which *Hemidactylus flaviviridis* was recorded.

City and Port Tawfeeq at Suez (Fig. 22). *H. flaviviridis* is a sit-and-wait forager, opportunistic and is mainly insectivorous. The breeding season extends from early March to the end of May. The smallest sexually mature male measured 60 mm SVL. The smallest ovigerous female containing white, partially-shelled, oviductal eggs measured 67 mm SVL and was collected in May. Females often lay two eggs per clutch. Juveniles appeared in late June and were abundant through July (IBRAHIM 2003). On the east bank, *Hemidactylus flaviviridis* was common in Al-Abtal village, Meet Abul Koum Al-Jadidah on the east, and close to the Suez Canal at Al-Qantara East.

#### *Hemidactylus turcicus* (LINNAEUS, 1758) – Turkish Gecko

This species was strictly scansorial; most dominant; found elsewhere in the Suez Canal zone, and was the only gecko occurring between Al-Qantara West and Port Saïd; a neonate was captured in Ismailia City in November suggesting that reproductive season (from mating to hatching) extends through autumn; longer than previously reported in Sinai (IBRAHIM 2007). The Turkish gecko occupied a large sector of the eastern bank from Port Fuad to Ash-Shatt opposite Suez City (Fig. 23). This was the only gecko species observed in old buildings of Chinese

farm and Tall Sallam east of Bitter Lakes. When observed on recent buildings, *H. turcicus* was occasionally in sympatry with *H. flaviviridis* and *Cyrtopodion scabrum*. Lizards from both sides of the Canal averaged 43.9 mm SVL (20.5–56 mm, S.D. = 16,  $n = 39$ ). No apparent significant morphological differences exist between populations, however, this awaits further verification.

#### *Ptyodactylus guttatus* HEYDEN, 1827 – Spotted Fan-toed Gecko

This lizard was recorded in Fayid, Al-Joza Al-Hamra Plateau west of Bitter Lakes and in the Ataqah area (Fig. 24). During the day, lizards were active, often seen in shade in bunkers, and in man-made caves on the Al-Joza Al-Hamra Plateau, as well as in natural habitat (on rocks and boulders) before sunset in Mount Ataqah. This species seems smaller in size than individuals from northern Sinai. However, this needs verification.

#### *Stenodactylus petrii* ANDERSON, 1896 – Petri's Gecko

This gecko was not uncommon in the Ismailia desert area, mostly in spring and early summer. On the east

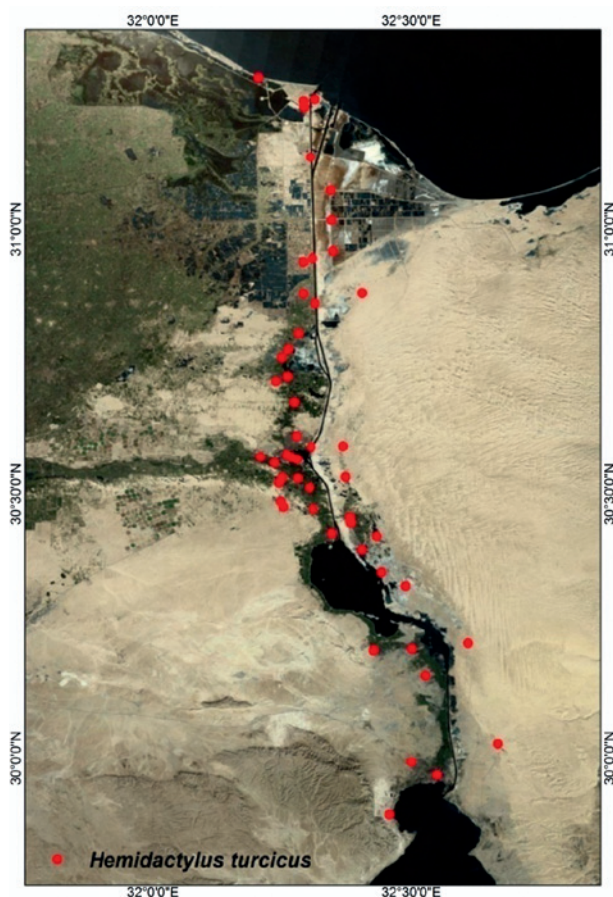


Fig. 23. Geographic distribution of *Hemidactylus turcicus*.

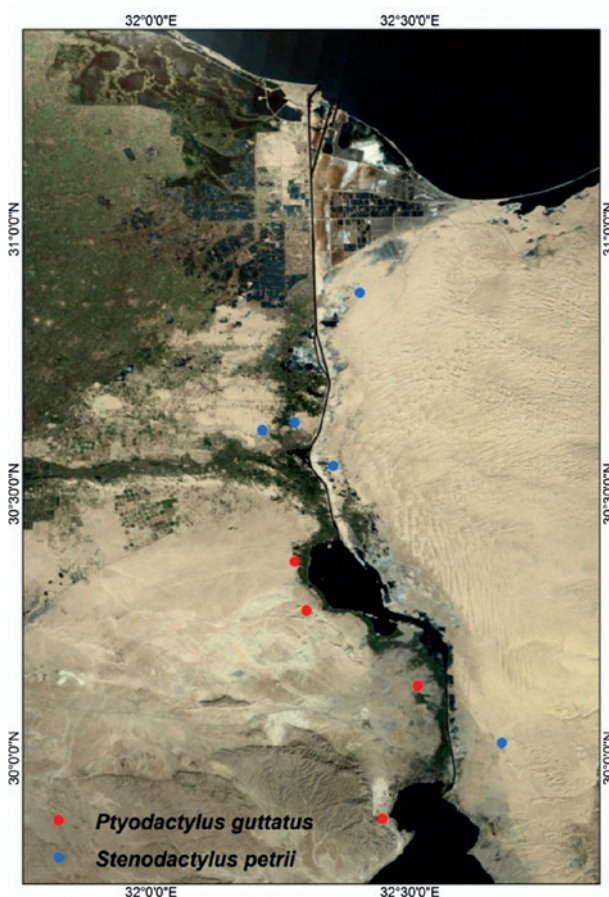


Fig. 24. Localities at which *Stenodactylus petrii* and *Ptyodactylus guttatus* were recorded.

bank, *S. petrii* was captured from Qantara East sand plains southward to Metla Pass (Fig. 24). This species becomes active just after sunset and continues until 0200 h in summer (pers. obs.) and it was frequently observed close to vegetation.

*Stenodactylus sthenodactylus sthenodactylus*  
(LICHTENSTEIN, 1823) – Elegant Gecko

This species was recorded in Ferdan, north of Ismailia, south to Mount Ataqah approximately 13 km SW of Suez. It was infrequently observed on paved roads. On the east side, this gecko was found east of Serapeum south to Metla Pass (Fig. 25). This lizard was commonly seen in spring and summer and was more active during the first three hours after sunset.

*Tarentola annularis annularis* (GEOFFROY DE ST. HILAIRE, 1827) – White-spotted Gecko

The distribution of *T. annularis* extends from 17 km north of Ismailia south to Mount Ataqah (Fig. 25) and was observed in its natural habitat in Fayid quarries. In Ismailia city, *T. annularis* is nocturnal and active throughout the year, with a peak of activity in autumn. It is generally a sit-

and-wait forager, opportunistic, feeding upon insects in addition to vegetation and spiders. The reproductive season extends from March through July; the smallest gravid female measured 69 mm SVL and the smallest male with enlarged testes measured 60 mm SVL (IBRAHIM, 2004). Although *T. annularis* occurs very close to the Suez Canal beach area at Ismailia, it was not observed from the freshwater canal eastward to the Suez Canal.

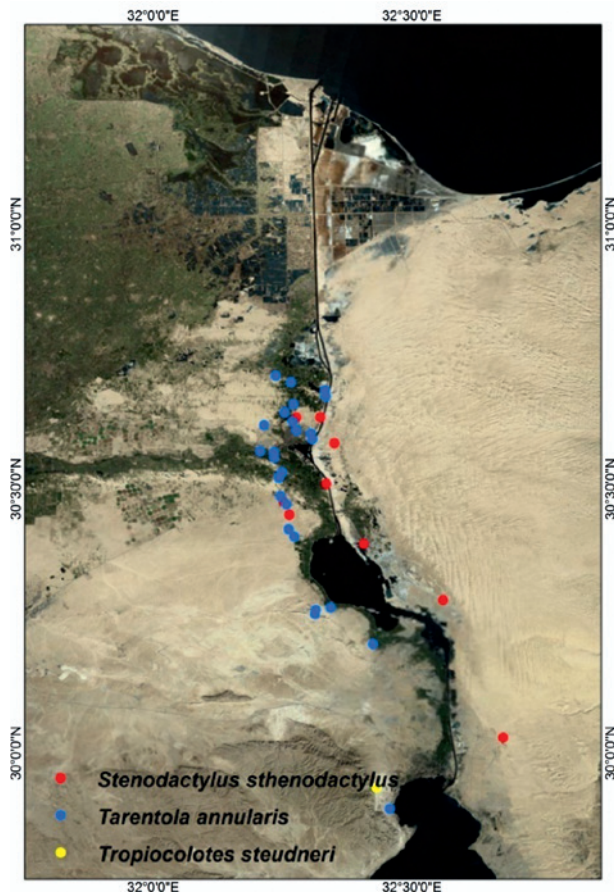
*Tropicolotes steudneri* (PETERS, 1869) – Steudner's Pigmy Gecko

This gecko was only recorded at the foot of Mount Ataqah (Fig. 25). Two individuals were collected from around a boulder at night in mid-summer with a specimen of *S. sthenodactylus*.

Family Scincidae

*Chalcides ocellatus ocellatus* (FORSSKÅL, 1775) – Ocellated Skink

This lizard was common in cultivated fields and around



**Fig. 25.** Point localities showing geographic distribution of *Stenodactylus sthenodactylus*, *Tarentola annularis*, and *Tropiocolotes steudneri*.

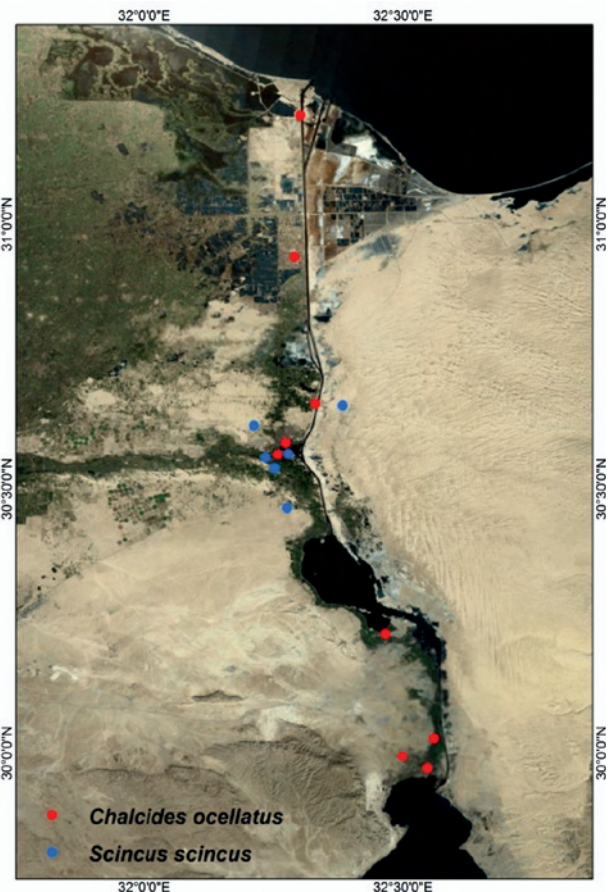
urban areas and seen elsewhere along the west bank of Suez Canal (Fig. 26). Individuals were seen active during the day, but more commonly in the morning from 09.00 to 11.00 h and late afternoon.

#### *Scincus scincus scincus* (LINNAEUS, 1758) – Sandfish

This skink inhabited soft sand in the Ismailia desert and its environs (Fig. 26). It was collected from Ferdan East on the eastern side of the Suez Canal. Lizards were captured in pit-fall traps, but in some areas, their distinctive tracks were utilized as proof of their occurrence.

#### *Sphenops sepsoides* (AUDOUIN, 1829) – Audouin's Sand skink

It was commonly observed in portions of the Ismailia desert not currently inhabited by humans, in abandoned sand-filled bunkers, and in sandy patches near Serapeum (Fig. 27). On the east bank, this skink is widely distributed from Al-Qantara East desert area south to Metla Pass. Occurrences of this species were documented by their prominent tracks on the sand and captured in pit-fall traps.



**Fig. 26.** Localities at which *Chalcides ocellatus* and *Scincus scincus* were recorded.

#### *Trachylepis quinquetaeniata* (LICHTENSTEIN, 1823) – Bean Skink

This species was common in Ismailia and Suez provinces along the banks of freshwater canals and as far east as the Suez Canal beach (Fig. 28). Lizards were active throughout the year with the least activity during winter. On the Suez Canal University Campus, this lizard was common, observed active throughout the day, moving from sunlit areas to shade, especially around mid-day during the summer. It is an active forager. Despite searching for reptiles for several years on the east bank, *T. quinquetaeniata* was not observed until 2008 and has subsequently been encountered elsewhere around inhabited areas and in cultivated fields.

#### Family Chamaeleontidae

#### *Chamaeleo chamaeleon* (LINNAEUS, 1758) – Common Chameleon

The nominal subspecies *Chamaeleo c. chamaeleon* (LINNAEUS, 1758) was ubiquitous on the west bank. Chameleons were seen active during the day, but more were

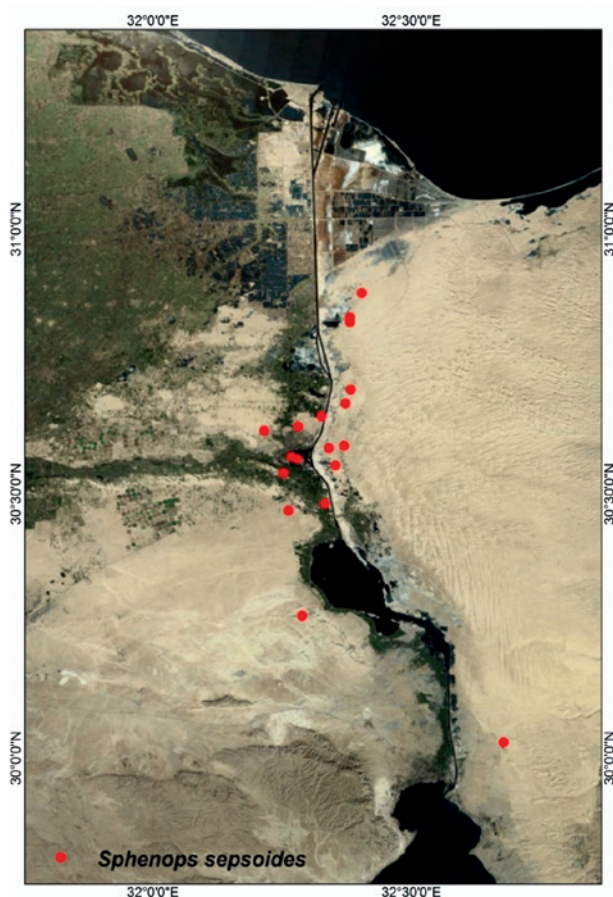


Fig. 27. Localities at which of *Sphenops sepsoides* was recorded.

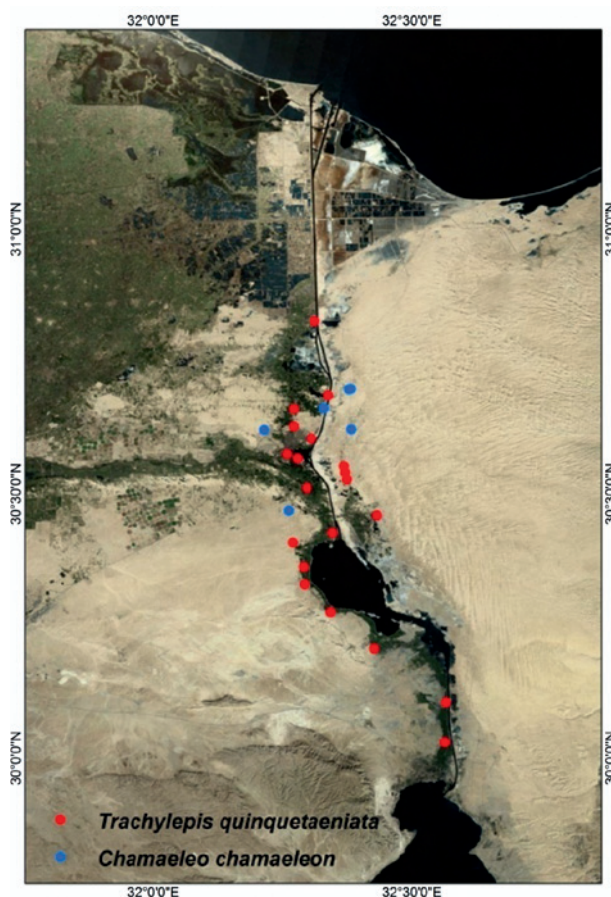


Fig. 28. Point localities showing geographic distribution of of *Trachylepis quinquetaeniata* and *Chamaeleo chamaeleon*.

captured during the night due to thier effective camo-  
flage which makes observation difficult. In the Serapeum  
desert, *C. chamaeleon* was observed walking on sand at  
mid-day in late spring while air teperature was almost  
30 °C. On the east bank, *Chamaeleo chamaeleon musae*  
(STEINDACHNER, 1900), a well-known subspecies in the  
northern Sinai (Fig. 28), was encountered. In Sinai, cha-  
meleons are mainly insectivorous, assuming both sit-  
and-wait and active foraging strategies. The reproduc-  
tive season of chameleons occurs from July to December  
with females producing a single clutch per year; ranging  
from 9 to 28 eggs (IBRAHIM, in press).

#### Family Varanidae

*Varanus griseus* (DAUDIN, 1803) – Desert Monitor

This lizard was identified by its conspicuous tracks in  
the Ismailia desert (Fig. 29). It is a well-known species  
on the east bank, recorded in Ferdan East. No specimens  
were collected.

### Suborder Serpentes

#### Family Viperidae

*Cerastes cerastes* (LINNAEUS, 1758) – Horned  
Viper

This species was captured near Fayid gravel quarry west  
of Bitter Lakes (Fig. 30). Four individuals were cap-  
tured from the east side of the canal opposite Ismailia  
and Ferdan; one of these was found freshly killed near  
an occupied compound at Ferdan East, and another was  
captured near a cultivated field. Individuals from the  
west were darker (grayish) in color than those with fairly  
sandy color occurring on the east bank.

*Cerastes vipera* (LINNAEUS, 1758) – Sand Viper

This snake was captured from sandy areas approximate-  
ly 10 km southwest Ismailia City. On the east bank, it was

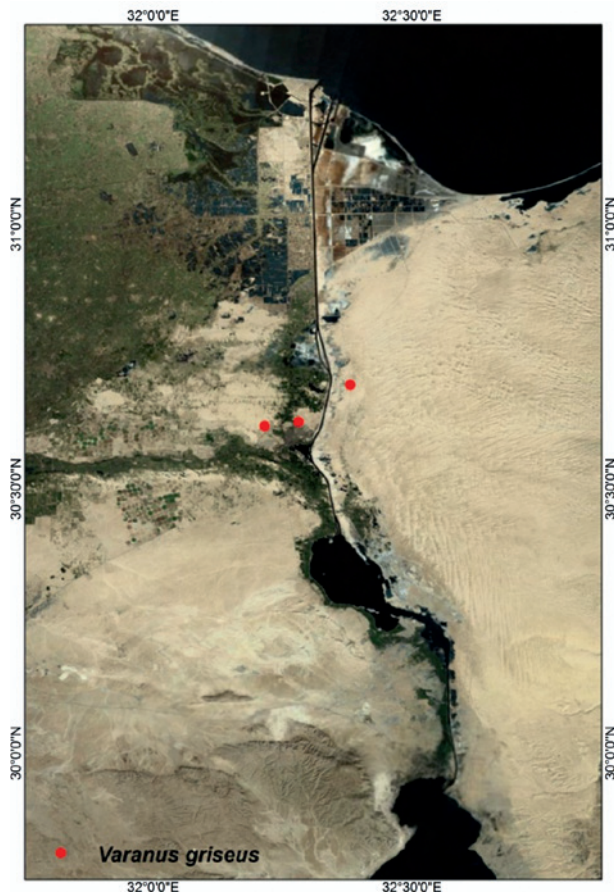


Fig. 29. Localities at which *Varanus griseus* was recorded.

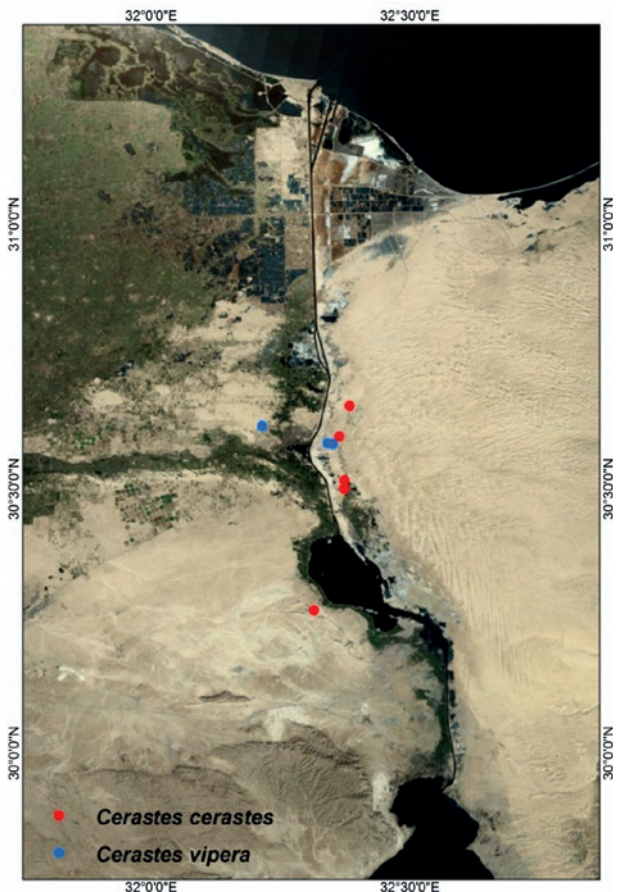


Fig. 30. Point localities showing geographic distribution of *Cerastes cerastes* *Cerastes vipera*.

captured from sandy areas east of Ismailia (Fig. 30). In Ferdan East, this species was found alongside its congener *C. cerastes*, but the latter was encountered in coarser sand soil.

## Family Colubridae

*Lytorhynchus diadema* (DUMÉRIL, BIBRON & DUMÉRIL, 1854) – Diademed Sand Snake

This snake occurs in the Ismailia desert (Fig. 31). Some individuals were captured by hand or found dead on roads. Tracks in the sand of this species were recorded on the east bank, near Al-Qantara East.

*Malpolon monspessulanus* (HERMANN, 1804) – Montpellier Snake

A single specimen of this species was captured at Ferdan, near the Suez Canal (Fig. 31).

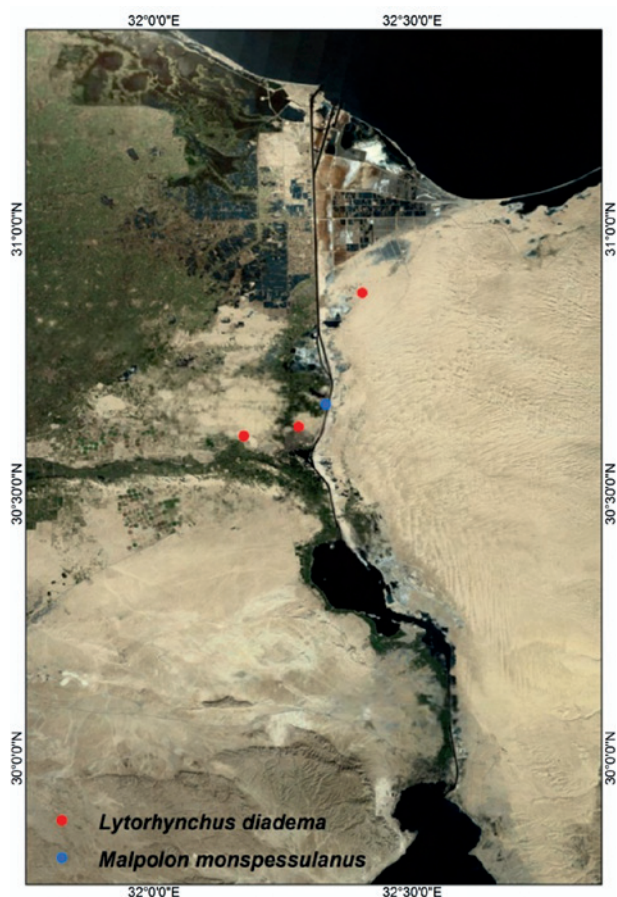
*Natrix tessellata tessellata* (LAURENTI, 1768) – Diced Water Snake

Fig. 32–34

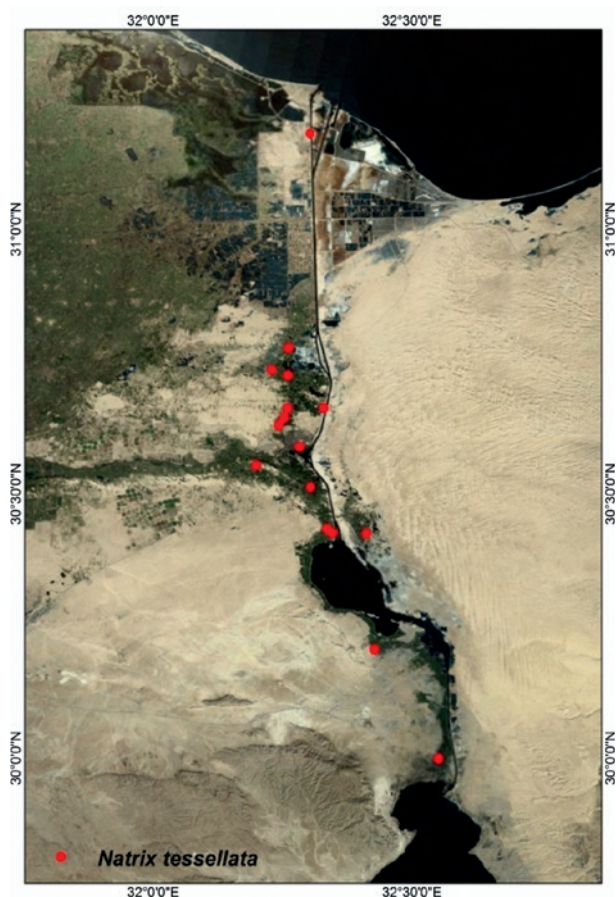
This species was often seen in the main freshwater canals from Port Saïd to Suez and branching irrigation canals on the west bank (Fig. 33). An individual was observed on the ground near the Ismailia freshwater canal at Ismailia; road-killed snakes were located on paved roads connecting villages, especially in summer. This is the first record of this snake for both Port Saïd and Suez provinces. The Dice snake was transported to the east bank of the Suez Canal through the west-east freshwater canal at Déversoir. It is frequently observed in irrigation channels extending through cultivated land east of Bitter Lakes (Fig. 34).

*Platyceps rogersi* (ANDERSON, 1893) – Spotted Racer

A single, freshly dead, young individual was collected from Suez New Campus about 5 km from Suez City (Fig. 35).



**Fig. 31.** Localities at which *Lytorhynchus diadema* and *Malpolon monspessulanus* were recorded.



**Fig. 33.** Point localities showing geographic distribution of *Natrix tessellata*.



**Fig. 32.** *Natrix tessellata* captured from Déversoir.



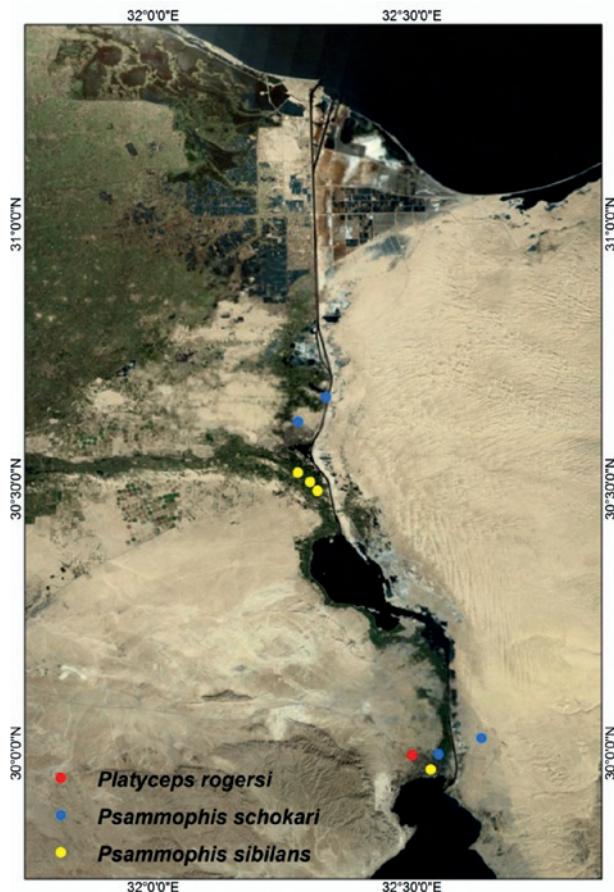
**Fig. 34.** The habitat and site of capture of *Natrix tessellata* in Sinai.

*Psammophis schokari schokari* (FORSSKÅL, 1775) – Schokari Sand Snake

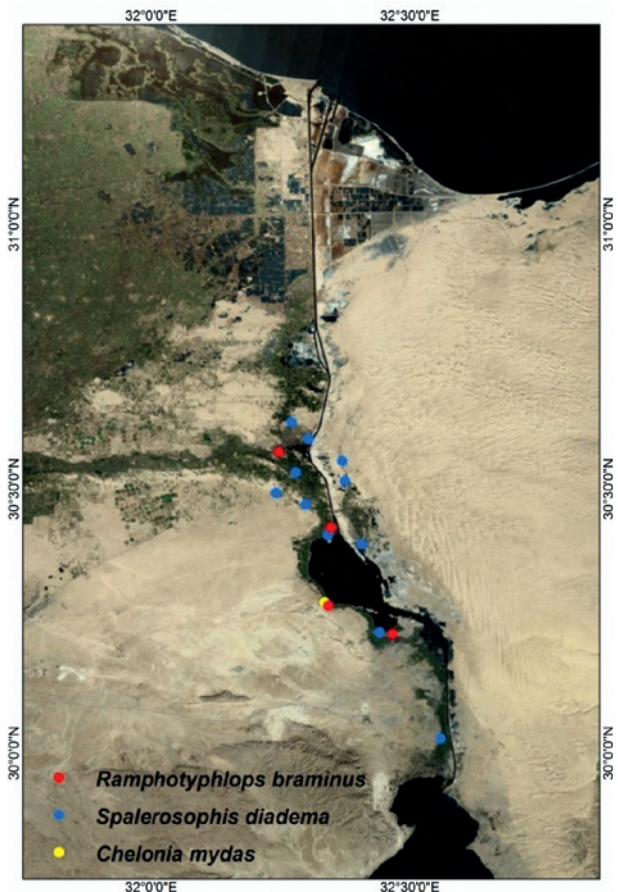
Individuals captured from Ismailia or the Suez desert had dark olive coloration on the dorsum and two long, dotted, dark stripes on the venter. A single snake, resembling those on the west was recorded from cultivated farm at the entrance of Metla Pass on the eastern side of Suez Canal (Fig. 35). Some individuals were found killed on roads.

*Psammophis sibilans sibilans* (LINNAEUS, 1758) – African Beauty Snake

This snake was first recorded in the Suez Canal zone when a freshly killed snake was found in a green field at Al-Abaddah village near Serapeum. The species and occasionally its skin sheddings were collected from Dhabeyya (13 km S. Ismailia) southward to Suez (Fig. 35).



**Fig. 35.** Localities at which *Platycephalus rogersi*, *Psammophis schokari*, and *P. sibilans* were recorded.



**Fig. 36.** Point localities showing geographic distribution of *Spalerosophis diadema*, *Ramphotyphlops braminus*, and *Chelonia mydas*.

*Spalerosophis diadema cliffordii* (SCHLEGEL, 1837) – Clifford's snake

This species is wide spread in the area. Many individuals were observed in sandy areas and green fields; a male snake killed by a farmer while it was moving sluggishly near Serapeum contained a large, freshly ingested black rat in its stomach. As on the west bank, *Spalerosophis diadema* was common, inhabiting sand plains and cultivated fields on the east (Fig. 36).

Family Typhlopidae

*Ramphotyphlops braminus* (DAUDIN, 1803) – Flower-pot Blind Snake

This introduced species was found under boulders or stones near cultivated fields south of Ismailia, in Fanara, and Kabreet (Fig. 36). The dorsal color was dark, brownish purple while the venter was somewhat lighter.

Suborder Chelonia

Family Cheloniidae

*Chelonia mydas* (LINNAEUS, 1758) – Green Turtle

A green turtle (Fig. 36) was captured by fishermen from the Bitter Lakes (Fig. 37) near Fanara on one occasion only.

Of the total of 30 terrestrial reptiles, the sand community includes 20 species inhabiting soft and coarse sand (Table 1); most of these species were found between Ismailia and Suez. The west bank has a greater diversity than the east with an additional eleven species of reptiles encountered (Table 1). All species recorded on the east bank also inhabit the west bank, and most of these are sand inhabitants (Fig. 38).

Urban expansion, destruction of habitat and overharvesting of amphibian species led to decline and threat



**Fig. 37.** A view of the Bitter Lakes near Fayid.

of these species populations. One of these species, the Egyptian toad, *Amietophrynus regularis*, has been considerably affected. Recently, the number of frogs seems to have increased due to governmental action against overharvesting and degradation of amphibian habitat in Egypt (IBRAHIM in press). A vast number of *A. regularis* was collected for teaching and research purposes and tens of tons of *Pelophylax bedriagae* were exported from Egypt each year to countries which exploit it as a food source. *Pelophylax bedriagae* inhabits the limited swamps on both banks; destruction or filling of these swamps will certainly threaten this species. The habitat of lizards occurring on sand substrates, such as *Trapelus savignyi* and *Acanthodactylus longipes*, on the west bank is under great developmental pressure; the remaining, scattered, and small patches of sandy area have been considerably reduced on the west bank. Therefore, these species are further threatened.

## Discussion

During this study, several new additions to the herpetofaunal community of the Suez Canal zone; some of them were published. One amphibian, *Pelophylax bedriagae* (IBRAHIM 2011); and four reptiles, *Tarentola annularis* (IBRAHIM 2000a), *Psammophis sibilans* (IBRAHIM 2002a), *Ramphotyphlops braminus* (IBRAHIM 2005), and *Chelonia mydas* were reported. Some species are also recorded for the first time for each one of the Suez Canal provinces. Two species, *Chalcides ocellatus* and *Natrix tessellata* (IBRAHIM 2012) are reported for Port Saïd; six species for Ismailia, *Acanthodactylus boskianus*, *Cyrtopodion scabrum*, *Hemidactylus flaviviridis* (IBRAHIM 2000b), *Malpolon monspessulana*, *Cerastes cerastes* and *C. vipera*; and two species for Suez, *Trachylepis quinquetaeniata* and *Trapelus pallidus* (ANDERSON 1898; FLOWER 1933; MARX 1968; SALEH 1997; BAHÄ EL DIN 2006).



**Fig. 38.** East side of the Suez Canal at Ferdan East (Habitat of *Acanthodactylus longipes*, *A. scutellatus*, *Scincus scincus*, *Chamaeleon chamaeleon musae*, *Varanus griseus*, *Cerastes cerastes*, *C. vipera*, *Lytorhynchus diadema*, *Psammophis schokari*, and *Spalerosophis diadema*).

On the east bank of the Suez Canal, all species reported herein are recorded for the first time except for *Cerastes cerastes*, *C. vipera* (ANDERSON 1898); *Varanus griseus* (FLOWER 1933), and *Acanthodactylus scutellatus* (WERNER 1973). *Natrix tessellata*, inhabiting freshwater canals east of Bitter Lakes, represents the first record for the Sinai Peninsula (IBRAHIM 2012). Additional new records for amphibians and reptiles of the Suez Canal area, especially on the east bank, is apparently a result of the recent major changes of the reptile habitat which, in some cases, initiated a new environment suitable for existence of more invasive herpetofaunal taxa over the three past decades. One major feature of this change is the reclamation and cultivation of large desert sectors, which have been ringed with freshwater irrigation canals.

The number of species seems to have increased in the canal zone by movement of some taxa from the Nile Valley via the main freshwater canal or from the Eastern Desert inland to the west bank of the Suez Canal. The movement of the Egyptian Toad, *Amietophrynus regularis*, and the Mascarene frog, *Ptychadena mascareniensis*, from the Nile Delta to the Suez Canal area shortly after the establishment of the Suez Canal (ANDERSON 1898) is a clear example. The hypothesis that some species moved from the Nile area to the west bank of the canal is based on these species being Nile Delta inhabitants, and are associated with Nile Valley fluvial habitat (SALEH 1997; BAHÄ EL DIN 2006), a habitat which was not found in the past in the Suez Canal zone. Further examples of these species are *Trachylepis quinquetaeniata*, *Natrix tessellata*, and *Psammophis sibilans*, which were recorded on the west bank many years after Anderson's time (WERNER 1983, IBRAHIM 2002a).

FLOWER (1933) speculated that some species such as *Chamaeleo chamaeleon* and *Trapelus savignyi*, had moved from the desert of Salheyia and Faqus (~15 and 45 km west of Suez Canal respectively) where they had been common to the central region of the Suez Canal

**Table 1.** Locality distribution of amphibians and reptiles on both banks of the Suez Canal with description of localities and their coordinates.

West Bank		
Locality	Description	Gazetteers of locations
Al-Jameel, 8 km W. Port Said	Dwelling district	31° 17' 16" N, 32° 12' 12" E
Port Said City	Urban area	31° 14' 35" N, 32° 17' 27" E
Ar-Raswa, 900 m S. Port Said	Building	31° 13' 53" N, 32° 17' 32" E
6 km S. Port Said	Urban area	31° 12' 24" N, 32° 18' 07" E
Domyat-Port Said Highway	Coarse sandy area	31° 12' 19" N, 32° 17' 53" E
8 km S. Port Said	On Canal road	31° 10' 54" N, 32° 18' 12" E
9 km S. Port Said	Cultivated land	31° 10' 14" N, 32° 18' 06" E
Ras Al-Esh	Close to freshwater canal	31° 08' 12" N, 32° 18' 17" E
16 km S. Port Said	Buildings	31° 06' 52" N, 32° 18' 00" E
Attina	Poultry farm buildings	31° 03' 06" N, 32° 18' 20" E
Water station	Buildings	31° 01' 12" N, 32° 18' 27" E
Al-Kap	Buildings and green lands	30° 56' 45" N, 32° 18' 33" E
Om Khalaf village, 35 km S. Port Said	Urban area	30° 56' 19" N, 32° 17' 25" E
Al-Bayyadeyya village	A buiding in cultivated lands	30° 52' 45" N, 32° 17' 25" E
Al-Qantara West	On the Canal road	30° 51' 39" N, 32° 18' 51" E
Al-Qantara West City	Urban area	30° 50' 57" N, 32° 18' 21" E
Ar-Rayyah, 3 km S. Al-Qantara	Cultivated lands near the Canal	30° 49' 33" N, 32° 18' 44" E
Area No. 4, S. Al-Qantara	Urban in green lands	30° 48' 49" N, 32° 16' 49" E
Km 30, Ismailia-Port-Said HW	Mango groves	30° 48' 16" N, 32° 16' 52" E
Attawwab village near Abu Khalifa	Urban area	30° 46' 30" N, 32° 15' 41" E
Abu Khalifa town	Residing area	30° 45' 32" N, 32° 14' 55" E
Km 17 Ismailia-Port-Said high way	Cultivated area	30° 44' 00" N, 32° 13' 42" E
Km 17, Qaryat Assama'ana	Urban area	30° 43' 23" N, 32° 15' 34" E
Km 16, west freshwater canal	Cultivated land with few buildings	30° 42' 56" N, 32° 15' 49" E
Fers village, Km 17 Osman road	Urban area and cultivated land	30° 42' 50" N, 32° 14' 15" E
Km 14 Ismailia-Port-Said high way	Urban area	30° 42' 05" N, 32° 16' 01" E
Ferdan	Sandy area close to the Canal	30° 41' 28" N, 32° 20' 07" E
Ferdan, on Canal road	Compound and large trees around	30° 41' 09" N, 32° 20' 19" E
West of Ferdan	Ferdan Mosque	30° 40' 29" N, 32° 16' 22" E
Km 12, Osman road	Urban and cultivated land	30° 40' 29" N, 32° 16' 09" E
Km 11, Osman road	Urban area	30° 40' 29" N, 32° 20' 03" E
Ferdan	On Canal paved road	30° 40' 14" N, 32° 19' 58" E
Ferdan	On the Canal road	30° 39' 42" N, 32° 19' 49" E
Km 8, Osman road	Urban and cultivated land	30° 39' 41" N, 32° 15' 30" E
km 9, Ismailia-Port-Said highway	Cultivated area	30° 39' 36" N, 32° 16' 17" E
Ferdan	West of Ferdan bridge	30° 39' 33" N, 32° 19' 36" E
Between Ismailia and Ferdan	Desert (sandy area)	30° 39' 01" N, 32° 17' 50" E
Ferdan	Sandy area near Suez canal road	30° 38' 51" N, 32° 19' 31" E
Km 6, Osman road	Mango groves and urban area	30° 38' 40" N, 32° 15' 15" E
Km 6, parallel to Ism-Port Said HW	Urban area	30° 38' 35" N, 32° 15' 07" E
Km 7, Ismailia-Port-Said highway	West bank of freshwater canal	30° 38' 23" N, 32° 15' 18" E
5 km north of Ismailia	Desert (Sandy area )	30° 38' 08" N, 32° 19' 25" E
3.5 km north of Ismailia	Desert (Sandy area )	30° 38' 05" N, 32° 16' 38" E
2 km N. Ismailia	Desert with sparse vegetation	30° 37' 40" N, 32° 16' 48" E
Suez Canal University new campus	Buildings and green areas	30° 37' 38" N, 32° 16' 11" E
6 km NW Ismailia	Sandy area with sparse vegetation	30° 37' 14" N, 32° 12' 52" E
8 km NW Ismailia	Sandy area	30° 36' 46" N, 32° 11' 34" E
Ismailia City	Dwelling area	30° 36' 38" N, 32° 16' 39" E
Ismailia New cemetery	Sandy area	30° 36' 38" N, 32° 10' 28" E
Suez Canal University new campus	Buildings, green areas	30° 36' 16" N, 32° 18' 20" E
Ismailia, No. 6 area	Sandy area	30° 35' 42" N, 32° 18' 17" E
Ismailia City	Suez Canal authority (SCA) hospital	30° 35' 39" N, 32° 18' 29" E
Ismailia City	SCA administration building	30° 35' 19" N, 32° 16' 56" E
Ismailia Al-Mallaha Public Parks	Green area	30° 35' 17" N, 32° 16' 26" E
Ezbet (village) Aid	Dwelling area	30° 34' 29" N, 32° 15' 29" E

Table 1 continued.

West Bank		
Locality	Description	Gazetteers of locations
Ismailia-Zagazig Rd.	Green and urban area	30° 34' 17'' N, 32° 12' 26'' E
Al-Hallous 5 km S. Ismailia	Dwelling area	30° 34' 13'' N, 32° 16' 01'' E
Abu Shehata, 4 km SW Ismailia	Dwelling and green areas	30° 34' 12'' N, 32° 14' 47'' E
Nafeesha village, 5 km SW Ismailia	Dwelling area	30 34' 11'' N, 32° 14' 03'' E
Ismailia, Camp El-Bomb	Sandy patch	30° 34' 00'' N, 32° 16' 43'' E
Abu Atwa, 4.5 km S. Ismailia	Dwelling area	30° 33' 54'' N, 32° 15' 29'' E
Al-Khashayna, 6 km SW Ismailia	Dwelling and green areas	30° 33' 34'' N, 32° 14' 04'' E
Al-Manayef near Ismailia-Cairo HW	Dwelling and sandy areas	30° 33' 13'' N, 32° 11' 54'' E
Abu Balah, 8 km SW Ismailia	Sandy area	30° 32' 18'' N, 32° 15' 06'' E
Abu Balah	Dwelling area	30° 31' 54'' N, 32° 14' 59'' E
Dhabeyya	Dwelling and green areas	30° 31' 48'' N, 32° 16' 47'' E
Sina bridge area	Cultivated land	30° 31' 17'' N, 32° 14' 36'' E
Ash-Sheikha Salma	Rice fields	30° 31' 11'' N, 32° 17' 21'' E
Ain Ghussein	Buildings	30° 30' 45'' N, 32° 18' 12'' E
Ain Ghussein	Urban and cultivated fields	30° 30' 39'' N, 32° 17' 49'' E
Tosson	Paved canal Road	30° 30' 36'' N, 32° 20' 07'' E
Near Ismailia trash factory	Sandy area with a swamp	30° 30' 20'' N, 32° 14' 19'' E
Al-Ababdah, Near Serapeum	Green fields	30° 29' 44'' N, 32° 19' 02'' E
Ismailia Sewage Station	Buildings and sewage pools	30° 29' 28'' N, 32° 14' 53'' E
Al-Hawashma, Serapeum	Sandy patch near Suez Canal beach	30° 28' 50'' N, 32° 19' 55'' E
Serapeum	Green fields	30° 28' 37'' N, 32° 19' 18'' E
Ismailia-Suez HW opposite Serapeum	Desert	30° 28' 33'' N, 32° 15' 06'' E
Serapeum	Urban	30° 28' 30'' N, 32° 19' 05'' E
Serpeum	Building with brick fences	30° 28' 19'' N, 32° 18' 36'' E
Ismailia-Suez desert Rd. near Serapeum	Poultry farm buildings	30° 28' 16'' N, 32° 15' 31'' E
Serapeum	Cultivated lands	30° 28' 14'' N, 32° 17' 54'' E
Ismailia-Suez desert road	Sandy area	30° 28' 03'' N, 32° 15' 41'' E
4 km W. Ismailia-Suez desert road	Poultry farm buildings	30° 28' 01'' N, 32° 14' 44'' E
Serapeum area	Sandy area	30° 27' 47'' N, 32° 16' 35'' E
Homydat village near Serapeum	Natural swamps and urban area	30° 27' 46'' N, 32° 17' 35'' E
East Ismailia-Suez desert road	Sandy area	30° 27' 40'' N, 32° 16' 14'' E
Serapeum, Ismailia-Suez road	Paved road and sandy area	30° 27' 05'' N, 32° 15' 49'' E
Ismailia-Suez desert road	Sandy area	30° 26' 35'' N, 32° 16' 05'' E
Déversoir	Urban area in mango groves	30° 25' 33'' N, 32° 20' 49'' E
Ismailia-Suez desert road	Sandy area	30° 25' 27'' N, 32° 15' 43'' E
Haseeba	Dwelling village	30° 25' 00'' N, 32° 19' 09'' E
Abu Sultan	Dwelling town	30° 24' 47'' N, 32° 18' 33'' E
Déversoir	Cultivated land	30° 24' 45'' N, 32° 20' 30'' E
Ismailia-Suez desert road.	Poultry farm buildings	30° 24' 36'' N, 32° 16' 24'' E
Fayid	Sandy area	30° 22' 20'' N, 32° 16' 37'' E
Al-Makhadha village	Urban area	30° 21' 42'' N, 32° 17' 25'' E
Assa'adeyya	3 km N. Fayid	30° 21' 40'' N, 32° 17' 30'' E
Fayid	Abandoned bunker	30° 20' 33'' N, 32° 17' 06'' E
Fayid, freshwater canal road	Dwelling zone	30° 19' 44'' N, 32° 18' 00'' E
Fayid	Downtown	30° 19' 42'' N, 32° 17' 32'' E
Between Fayid and Fanara	On Canal road	30° 18' 55'' N, 32° 19' 30'' E
Fanara	Urban area on freshwater canal	30° 16' 47'' N, 32° 20' 31'' E
Al-Joza Al-hamra	A plateau west of Bitter Lakes	30° 16' 46'' N, 32° 17' 59'' E
Fanara	Dwelling town	30° 16' 33'' N, 32° 20' 36'' E
Gabal Al-Ghor, W. Fanara	Plateau of lime stone	30° 16' 21'' N, 32° 17' 02'' E
Sad Abu Jamous W. Fanara	Plateau of lime stone	30° 16' 17'' N, 32° 18' 54'' E
Kasfareet	Urban area near freshwater canal	30° 15' 55'' N, 32° 24' 19'' E
Ammar	Fayid gravel quarries	30° 15' 48'' N, 32° 18' 48'' E
Between Kasfareet and Kabreet	On Canal road	30° 14' 18'' N, 32° 25' 46'' E
Al-Khawatra, 38 km N. Suez	Dwelling village	30° 13' 45'' N, 32° 26' 30'' E

**Table 1** continued.

West Bank		
Locality	Description	Gazetteers of locations
Kabreet near canal road	Urban area	30° 13' 34" N, 32° 27' 57" E
Kabreet Al-bahhara	Urban area on freshwater canal road	30° 12' 52" N, 32° 30' 09" E
Jeneeva	green area near railway	30° 12' 25" N, 32° 25' 35" E
Jeneeva	Urban area, freshwater canal road	30° 12' 23" N, 32° 25' 44" E
Shandoura	Urban area, freshwater canal road	30° 11' 27" N, 32° 31' 41" E
Al-Akrash, Al-Ganayen (gardens)	Urban area	30° 10' 04" N, 32° 32' 45" E
Near Hawees Ash-Shalloufa	Coarse sandy area	30° 09' 40" N, 32° 31' 45" E
Abu Shekeew, Al-Ganayen	Urban area	30° 08' 19" N, 33° 33' 39" E
Ismailia-Suez desert road, 20 km N. Suez	Sandy area	30° 08' 14" N, 32° 30' 57" E
Abu Shahhat	Buildings and mango groves	30° 07' 06" N, 32° 33' 52" E
Ash-Shalloufa, freshwater canal road	Dwelling area	30° 06' 55" N, 32° 33' 51" E
Ar- Ra'ed village	Dwelling area	30° 06' 25" N, 32° 30' 24" E
Abu Sayyal, 15 km N. Suez	Urban area	30° 04' 51" N, 32° 32' 51" E
Abu Orabi	Buildings and mango groves	30° 04' 37" N, 32° 33' 12" E
11 km N. Suez	Sandy area	30° 03' 46" N, 32° 33' 18" E
Awlad Attorsh, Al-Ganayen	Dwelling area	30° 02' 43" N, 32° 33' 46" E
Al-Ganayen	Buildings and mango groves	30° 01' 59" N, 32° 33' 49" E
Amer village	Dwelling area	30° 01' 45" N, 32° 33' 34" E
Ezbet Hasaballah	green fields	30° 01' 35" N, 32° 33' 29" E
Mansheyet Ali Hassan	Dwelling area	30° 00' 17" N, 32° 33' 37" E
Suez, Al-Ganayen	On freshwater canal road	29° 59' 53" N, 32° 33' 07" E
Suez Canal University campus at Suez	Buildings and green areas	29° 59' 48" N, 32° 30' 02" E
Al-Mothallath district, Suez	Buildings	29° 59' 07" N, 32° 31' 59" E
Near the end of freshwater canal road	Dwelling area	29° 59' 04" N, 32° 33' 02" E
Suez, Al-Zarayer	Urban district	29° 58' 11" N, 32° 32' 11" E
Port Tawfeeq, Suez	Urban area and gardens	29° 56' 10" N, 32° 33' 49" E
Mount Ataqah area	Gravel and stone area	29° 56' 08" N, 32° 25' 56" E
Mount Ataqah area	Urban area	29° 53' 10" N, 32° 26' 48" E
Al-Adabeyya Port, Suez	Buildings	29° 52' 08" N, 32° 28' 22" E

East Bank		
Locality	Description	Gazetteers of locations
Port Fuad, Port Said University campus	Buildings and green areas	31° 14' 47" N, 32° 18' 50" E
Water station compound Balouza?	Buildings with brick fences	31° 04' 26" N, 32° 20' 41" E
Water station compound	Buildings with brick fences	31° 01' 03" N, 32° 20' 47" E
Al-Kap, water station compound	Buildings with brick fences	30° 57' 34" N, 32° 20' 58" E
Al-Qantara East desert	Sandy area	30° 52' 49" N, 32° 24' 21" E
near Assalam bridge	Sandy area and buildings	30° 49' 32" N, 32° 22' 50" E
Between Ferdan and Qantara	Sandy area and buildings nearby	30° 41' 50" N, 32° 22' 40" E
Ferdan East	Sand dunes with sparse vegetation	30° 40' 19" N, 32° 22' 18" E
Ferdan East	Sandy area	30° 39' 30" N, 32° 23' 00" E
At-Taqaddom village	Urban area and water pool	30° 37' 17" N, 32° 22' 59" E
Ismailia East	compound	30° 36' 02" N, 32° 21' 48" E
5 km opposite Ismailia City	Building	30° 35' 31" N, 32° 22' 08" E
East of Ismailia	Recently cultivated land	30° 35' 16" N, 32° 20' 26" E
East of Ismailia	Green farm	30° 35' 12" N, 32° 21' 03" E
East of Timsah Lake	Cultivated farm (near salt marshes)	30° 34' 05" N, 32° 20' 58" E
3.6 km E. Suez Canal opposite Ismailia	Sand dune with large shrubs	30° 33' 10" N, 32° 21' 08" E
Al-Qantara East- Ash-Shatt S. Ismailia	Water Station	30° 32' 24" N, 32° 22' 17" E
Al-Qantara East- Ash-Shatt S. Ismailia	Building in Mango groves	30° 31' 58" N, 32° 22' 25" E
Opposite the Ismailia Olympic village	Water station with trees nearby	30° 31' 36" N, 32° 22' 29" E
East of Serapeum	Cultivated Farm	30° 30' 52" N, 32° 22' 26" E
Al-Qazzaz	Mango groves close to salty pool	30° 30' 10" N, 32° 22' 35" E

Table 1 continued.

	East Bank	
Locality	Description	Gazetteers of locations
Port Fuad, Port Said University campus	Buildings and green areas	31° 14' 47" N, 32° 18' 50" E
Water station compound Balouza?	Buildings with brick fences	31° 04' 26" N, 32° 20' 41" E
Water station compound	Buildings with brick fences	31° 01' 03" N, 32° 20' 47" E
Al-Kap, water station compound	Buildings with brick fences	30° 57' 34" N, 32° 20' 58" E
Al-Qantara East desert	Sandy area	30° 52' 49" N, 32° 24' 21" E
near Assalam bridge	Sandy area and buildings	30° 49' 32" N, 32° 22' 50" E
Between Ferdan and Qantara	Sandy area and buildings nearby	30° 41' 50" N, 32° 22' 40" E
Ferdan East	Sand dunes with sparse vegetation	30° 40' 19" N, 32° 22' 18" E
Ferdan East	Sandy area	30° 39' 30" N, 32° 23' 00" E
At-Taqaddom village	Urban area and water pool	30° 37' 17" N, 32° 22' 59" E
Ismailia East	compound	30° 36' 02" N, 32° 21' 48" E
5 km opposite Ismailia City	Building	30° 35' 31" N, 32° 22' 08" E
East of Ismailia	Recently cultivated land	30° 35' 16" N, 32° 20' 26" E
East of Ismailia	Green farm	30° 35' 12" N, 32° 21' 03" E
East of Timsah Lake	Cultivated farm (near salt marshes)	30° 34' 05" N, 32° 20' 58" E
3.6 km E. Suez Canal opposite Ismailia	Sand dune with large shrubs	30° 33' 10" N, 32° 21' 08" E
Al-Qantara East- Ash-Shatt S. Ismailia	Water Station	30° 32' 24" N, 32° 22' 17" E
Al-Qantara East- Ash-Shatt S. Ismailia	Building in Mango groves	30° 31' 58" N, 32° 22' 25" E
Opposite the Ismailia Olympic village	Water station with trees nearby	30° 31' 36" N, 32° 22' 29" E
East of Serapeum	Cultivated Farm	30° 30' 52" N, 32° 22' 26" E
Al-Qazzaz	Mango groves close to salty pool	30° 30' 10" N, 32° 22' 35" E
East of Serapeum	Mango groves	30° 30' 00" N, 32° 22' 22" E
Ezzbet Assaidah	Urban area	30° 28' 58" N, 32° 23' 55" E
Hebeeta	Sandy area	30° 28' 23" N, 32° 27' 00" E
5 km east of Al-Abtal village	Sandy area	30° 27' 47" N, 32° 25' 57" E
Meet Abul Koum Al-Jadidah	Cultivated lands	30° 27' 32" N, 32° 25' 57" E
Al-Abtal village	Cultivated lands	30° 27' 26" N, 32° 23' 14" E
Al-Abtal village	Urban area	30° 27' 25" N, 32° 22' 55" E
1.3 km S. Al-Abtal village	Cultivated land	30° 26' 45" N, 32° 23' 01" E
Meet Abul Koum Al-Jadidah	Near freshwater irrigating canal	30° 25' 28" N, 32° 24' 47" E
Meet Abul Koum Al-Jadidah	Cultivated lands	30° 25' 26" N, 32° 24' 28" E
Meet Abul Koum Al-Jadidah	Swamps	30° 25' 15" N, 32° 26' 02" E
Tall Sallam	Memorial military museum	30° 23' 44" N, 32° 24' 23" E
Suez water station #1	Building and drainage water	30° 19' 38" N, 32° 29' 23" E
Suez water station #2	Building, water and sandy area	30° 17' 25" N, 32° 33' 40" E
between Meet Abul-Koum and tunnel	Water Station and sandy area	30° 13' 11" N, 32° 36' 36" E
Um Khoshaib road, 9.5 km E. Suez Canal	Undulating sand dune	30° 12' 45" N, 32° 40' 23" E
Metla Pass	Urban area	30° 01' 49" N, 32° 40' 03" E
Metla Pass	Undulating sand dune	30° 01' 48" N, 32° 40' 39" E
Metla Pass	Compound	30° 01' 44" N, 32° 38' 04" E
Ash-Shatt	Building	29° 56' 05" N, 32° 38' 09" E
Near Oyoum Mousa	Buildings	30° 55' 04" N, 32° 36' 30" E

west bank at Al-Qantara, Ferdan, Ismailia, and Serapeum. Occurrence of *Chamaeleo c. chamaeleon* (which is known in the African side of Egypt) in Serapeum supports this suggestion.

The dorsal coloration of *T. savignyi* at Serapeum differs from that of individuals on the east bank (three km east of Suez Canal); these individuals look like those in the northern Sinai in terms of coloration and pattern (IBRAHIM 2002b) and southern Israel (WERNER 1995). This variation of dorsal coloration of the west bank individuals may be attributed to the isolation of these populations

since the opening of the Suez Canal in 1869. Moreover, a lizard so completely without pattern as in Serapeum has never been reported in Egypt (BAHA EL DIN 2006) or Israel (Y. WERNER, Person. Comm.); this may be a common type of geographical variation. Juvenile *T. savignyi* with smooth ventrals was not previously known for the species; therefore, this juvenile may just be an aberration or an extreme case of variation. In Anderson and Flower's time, most parts of the Suez Canal area were desert. Recording *Acanthodactylus boskianus* in large numbers on banks of the freshwater canal as well as

**Table 2.** Amphibians and reptiles recorded on both banks of the Suez Canal 1999–2009.

	West	East
1	<i>Amietophrynus regularis</i>	<i>Amietophrynus regularis</i> *
2	<i>Pelophylax bedriagae</i> *	<i>Pelophylax bedriagae</i> *
3	<i>Ptychadena mascareniensis</i>	<i>Ptychadena mascareniensis</i> *
4	<i>Trapelus pallidus</i> •	— — —
5	<i>Trapelus savignyi</i> •	<i>Trapelus savignyi</i> * •
6	<i>Uromastix aegyptia</i> •	— — —
7	<i>Acanthodactylus boskianus</i> •	— — —
8	<i>Acanthodactylus longipes</i> •	<i>Acanthodactylus longipes</i> * •
9	<i>Acanthodactylus scutellatus</i> •	<i>Acanthodactylus scutellatus</i> •
10	<i>Cyrtopodion scabrum</i>	<i>Cyrtopodion scabrum</i> *
11	<i>Hemidactylus flaviviridis</i> *	<i>Hemidactylus flaviviridis</i> *
12	<i>Hemidactylus turcicus</i>	<i>Hemidactylus turcicus</i> *
13	<i>Ptyodactylus guttatus</i>	— — —
14	<i>Stenodactylus petrii</i> •	<i>Stenodactylus petrii</i> * •
15	<i>Stenodactylus sthenodactylus</i> * •	<i>Stenodactylus sthenodactylus</i> * •
16	<i>Tarentola annularis</i> *	— — —
17	<i>Tropicolotes steudneri</i>	— — —
18	<i>Chalcides ocellatus</i> •	— — —
19	<i>Scincus scincus</i> •	<i>Scincus scincus</i> * •
20	<i>Sphenops sepsoides</i> •	<i>Sphenops sepsoides</i> * •
21	<i>Trachylepis quinquetaniata</i>	<i>Trachylepis quinquetaniata</i> *
22	<i>Chamaeleon c. chamaeleon</i> •	<i>Chamaeleon chamaeleon musae</i> * •
23	<i>Varanus griseus</i> •	<i>Varanus griseus</i> •
24	<i>Cerastes cerastes</i> •	<i>Cerastes cerastes</i> •
25	<i>Cerastes vipera</i> •	<i>Cerastes vipera</i> •
26	<i>Lytorhynchus diadema</i> •	<i>Lytorhynchus diadema</i> * •
27	<i>Malpolon monspessulana</i> •	— — —
28	<i>Natrix tessellata</i>	<i>Natrix tessellata</i> *
29	<i>Platycephalus rogersi</i> •	— — —
30	<i>Psammophis schokari schokari</i> •	<i>Psammophis schokari schokari</i> * •
31	<i>Psammophis sibilans sibilans</i> *	— — —
32	<i>Ramphotyphlops braminus</i>	— — —
33	<i>Spalerosophis diadema cliffordi</i> •	<i>Spalerosophis diadema cliffordi</i> * •
34	<i>Chelonia mydas</i>	

\* Species reported for the first time on the west bank of Suez Canal. • Species inhabiting sandy areas

*Coluber rogersi* (ANDERSON 1898) indicates that both sides of the freshwater canal were almost desert; most of their records referred to psammophile species or those adapted to desert life. However, *Stenodactylus sthenodactylus*, existing in sandy desert was not reported in their studies. *Natrix tessellata*, the only common water snake in the area was not reported from Suez Canal zone either, even before WERNER (1983). Absence of such records in previous literature reflects the insufficient herpetological surveys in this vast region. Moreover, most of herpetologists relied to a large extent, on professional animal collectors and did not collect specimens themselves. Later, surveying the Suez Canal zone was not reasonably feasible because of strategic and military reasons.

This study suggests that the Suez Canal is a passage for herpetofauna from west to east, but in parallel with the creation of suitable habitat on the east side. Individuals of different taxa or their eggs might have transferred to newly

altered regions on the east bank through continuous trips via the ferryboats crossing the Suez Canal or through As-Salam Bridge near Al-Qantara or Ahmad Hamdy Tunnel north of Suez. Major agricultural projects east of Bitter Lakes have led to the spread of some freshwater-linked taxa coming from the west bank, such as *Amietophrynus regularis*, *Pelophylax bedriagae*, *Ptychadena mascareniensis* and *Natrix tessellata*. Although it is difficult to know what reptile species were found on the east bank of the Suez Canal before this study, it is evident that some lizards, such as *Trachylepis quinquetaeniata* and *Hemidactylus flaviviridis* inhabiting the west bank have moved and colonized the eastern side of the canal due to the new availability of their preferred habitat. Frogs colonized successfully and faster than reptiles likely due to the flowing freshwater current from west to east, which facilitates transfer of frogs and probably their eggs and tadpoles faster to the east. The discovery of some taxa

in northern Sinai for the first time, such as *A. regularis* (IBRAHIM 2001a), and *P. mascareniensis* (IBRAHIM 2001b) lends support that these species were transported from the Suez Canal zone or neighboring areas through the Suez Canal. IBRAHIM (2001d) suggested that the Flowered Racer, *Platyceps florulentus*, was transported to the northern part of Sinai through the Suez Canal by vehicles carrying fodder. Presence of a sizeable population of *Cyrtopodion scabrum* in Al-Cap East (~10 km north of Al-Qantara East) is one of the examples that suggests that geckos or their eggs may be carried with building materials; this species was never seen north of Ismailia on the west bank. Likewise, IBRAHIM (2001c) ascribed the existence of the Nile Delta Fan-toed Gecko, *Ptyodactylus hasselquistii* in northern Sinai to the same reason.

IBRAHIM (2005) proposed that the Suez Canal may act as a barrier against herpetofauna moving from west to east. In fact, the unfavorable habitat, especially on the east side of the canal, was the key factor precluding some species from colonizing even if they had succeeded in crossing the Suez Canal. One clear example is *Trachylepis quinquetaeniata* which has recently prevailed on the east bank, unable to colonize the Sinai due to lack of suitable habitat (WERNER 1982). FLOWER (1933) did not find this species on the west bank, despite his thorough exploration; however, it was reported from Ismailia in 1942 and 1974 (HUJR 1429 and 12736, respectively; WERNER 1983). Now, it has spread elsewhere covering the west bank from Port Saïd to Suez. The most conspicuous west bank gecko, *Tarentola annularis*, was never reported from Sinai (WERNER 1982; BAHÄ EL DIN 2006). Absence of this species from the east bank of the Suez Canal, despite the establishment of new villages east of Suez Canal at Ismailia and Bitter Lakes, may be due to the following reasons: (1) The main freshwater canal on the west bank, which extends from Ismailia southward to Suez, may act as a barrier; this species does not occur in the green strip between the freshwater canal and Suez Canal. In the past, when both banks of the freshwater canal were desert, this gecko was not present (ANDERSON 1898; FLOWER 1933) because it was difficult to move from its natural habitat a few kilometers west of Bitter Lakes across the sandy terrain to reach the freshwater canal. (2) The Bitter Lakes (~23 km long, ~13 km width) may also act as a barrier. (3) Unfavorable habitat on the west bank north of Ferdan up to Port Saïd due to salt marshes and open hard soil terrain. (4) Unfavorable habitat on the east bank of the Suez Canal which is still a desert strip separating the Suez Canal from the dwelling buildings east of Bitter Lakes by at least 1.5 km; these buildings have been built of red brick, not of the Fayid quarry stones used for building west of Bitter Lakes, thus possibly transporting lizards or their eggs. (5) Inaccessibility of lizards to the east bank from places very close to the canal water (there are no ferryboats in these sites). Absence of *Ptyodactylus guttatus* from the east bank of the Suez Canal may be due to similar reasons despite its existence in northern and southern Sinai. Some species, such as *Psammophis sibilans* have been recently discovered on the west bank

(IBRAHIM 2002a) and *Chalcides ocellatus* are expected to occur on the east bank of the Suez Canal due to availability of cultivated fields, which represent a favorable habitat for these species.

The number of species recorded increased with the number of hours/time surveyed (Table 3). Ismailia Province, which administratively extends from Al-Qantara West to Fanara (~80 km along Suez Canal with the greatest variety of habitats) had the most diverse herpetofauna (31 species), representing 91.2% of total number of species found; while it was 58.8% and 17.6% in Suez and Port Saïd provinces respectively.

The number of species recorded on the west bank of the Suez Canal was greater than on the east bank simply because the freshwater canal irrigating the west bank was established about 150 years ago. This situation altered the Suez Canal zone and offered species the opportunity to move from Delta to the Canal area, while the freshwater irrigation canal running from the west to the east bank across Suez Canal at Déversoir was established less than two decades ago. This explains the occurrence of at least 11 species on the west side that are not found on the east side; all these species except for *Tarentola annularis* were previously reported from different habitats in Sinai (WERNER 1982; IBRAHIM 2002b; BAHÄ EL DIN 2006). Species on the east bank reported in the present study occur on the west because both sides were united and it is assumed that this area had essentially the same fauna before the establishment of the Suez Canal.

There are some reptiles reported in previous literature not found in the present study. ANDERSON (1898) reported the Sinai Agama, *Pseudotrapelus sinaitus*, and Small-spotted Lizard, *Mesalina guttulata*, from the Suez plain. The latter species was reported from Mount Ataqah in 1973 (WERNER 1983). This area was uninhabited desert until the late 1980s, but now it contains urban areas that reach to within a few kilometers from Ataqah. Additionally, the area around Ataqah is highly polluted, and seems to have negatively affected the biodiversity due to continuous quarrying activity. Dolomite dust covers the scant persistent plants and a thorough search at the foot of the mount resulted in only two species of reptiles (from under stones); traces of reptiles were seemingly covered because of flowing dust. WERNER (1983) reported a single specimen of Bridled Skink, *Trachylepis vittata*, approximately eight km south of Ismailia, and a Red-spotted Lizard, *Mesalina rubropunctata*, west of Suez City, but they were not observed in this study despite extensive searching. STEIN & HELMY (1994) reported four species of snakes, the Hooded Snake, *Macroprotodon cucullatus*, the Saharan Sand Snake, *Psammophis aegyptius*, the Egyptian Cat Snake, *Telescopus dhara obtusus*, and *Platyceps florulentus*, from Ismailia, and the Cairo Worm Snake, *Letotyphlops cairi*, from Suez. These snakes in the Suez Canal region were not reported in this study. Records of *M. cucullatus* from Ismailia City and *T.d. obtusus* from a beach south of Timsah Lake at Ismailia may be a result of erroneous location records. I agree with BAHÄ EL DIN (2006) that the *Psammophis*

**Table 3.** Number of west bank herpetofaunal species by year of survey.

Species	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
<i>Amietophrynus regularis</i>	*										
<i>Pelophylax bedriagae</i>										*	
<i>Ptychadena mascareniensis</i>		*									
<i>Trapelus pallidus</i>					*						
<i>Trapelus savignyi</i>											*
<i>Uromastix aegyptia</i>						*	*				
<i>Acanthodactylus boskianus</i>					*						
<i>Acanthodactylus longipes</i>								*			
<i>Acanthodactylus scutellatus</i>	*										
<i>Cyrtopodion scabrum</i>	*										
<i>Hemidactylus flaviviridis</i>	*										
<i>Hemidactylus turcicus</i>	*										
<i>Ptyodactylus guttatus</i>				*							
<i>Stenodactylus petrii</i>				*							
<i>Stenodactylus sthenodactylus</i>		*									
<i>Tarentola annularis</i>	*										
<i>Tropicolotes steudneri</i>							*				
<i>Chalcides ocellatus</i>	*										
<i>Scincus scincus</i>					*						
<i>Sphenops sepsoides</i>	*										
<i>Trachylepis quinquetaeniata</i>	*										
<i>Chamaeleo chamaeleon</i>		*									
<i>Varanus griseus</i>				*							
<i>Cerastes cerastes</i>							*				
<i>Cerastes vipera</i>				*							
<i>Lytrochynchus diadema</i>					*						
<i>Malpolon monspessulanus</i>		*									
<i>Natrix tessellata</i>	*										
<i>Platycephalus rogersi</i>									*		
<i>Psammophis schokari</i>		*									
<i>Psammophis sibilans</i>			*								
<i>Ramphotyphlops braminus</i>	*										
<i>Spalerosophis diadema</i>	*										
<i>Chelonia mydas</i>											*
Total number observed per year	12	5	1	4	4	1	2	1	1	1	2
Total number recorded for the area	<b>12</b>	<b>17</b>	<b>18</b>	<b>22</b>	<b>26</b>	<b>27</b>	<b>29</b>	<b>30</b>	<b>31</b>	<b>32</b>	<b>34</b>

snake reported by STEIN & HELMY (1994) is *P. schokari* not *P. aegyptius*. SALEH (1997) reported the Green Toad, *Pseudepidalea boulengeri*, from the Suez Canal zone. This report was probably based on MARX'S (1968) record of the species from Wadi Iseili on the Cairo-Suez desert road which is, in fact, quite far from Suez Canal.

On the other hand, Natterer's Pigmy Gecko, *Tropicolotes nattereri*, reported by BAHÄ EL DIN (2006) from eastern side of the Canal at Mitla Pass was not observed during this study.

species records to the west bank and 18 species records to the east bank, including one species catalogued for the first time in Sinai. At least six species have moved from Nile Valley to the west bank of the Suez Canal and six species likewise have expanded from the west bank to the east bank of the Suez Canal; most of these are water and vegetation-linked species. It is suggested that the Suez Canal is acting as a bridge rather than a barrier to Sinai herpetofauna.

## Conclusion

This study reports on the current status of extant amphibians and reptiles of the Suez Canal zone, and adds five

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