Reptiles and amphibians of the State of Kuwait

Zuhair S. Amr, Abdulrahman Al-Sirhan Alenezi, Amani Al-Zaidan and Mohammad A. Abu Baker

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IUCN is pleased to acknowledge the support of its Framework Partners who provide core funding: Ministry of Foreign Affairs of Denmark; Ministry for Foreign Affairs of Finland; Government of France and the French Development Agency (AFD); the Ministry of Environment, Republic of Korea; the Norwegian Agency for Development Cooperation (Norad); the Swedish International Development Cooperation Agency (Sida); the Swiss Agency for Development and Cooperation (SDC) and the United States Department of State.

This publication was developed through the project "Monitoring and documentation of Biodiversity in Kuwait", executed by IUCN Regional Office for West Asia in partnership with Environment Public Authority of Kuwait (EPA of Kuwait), and funded by the State of Kuwait.

Published by:	IUCN, Gland, Switzerland and Environment Public Authority, Kuwait, State of Kuwait
Produced by:	IUCN Regional Office for West Asia (ROWA)

Recommended citation:	Amr, Z,A., Alenezi, A.A., Al-Zaidan, A. and Abu Baker, M.A. (2022). *Reptiles and amphibians of the State of Kuwait*. Gland, Switzerland: IUCN, and Kuwait, State of Kuwait: Environment Public Authority.
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Acknowledgments

We would like to extend our deepest gratitude to the Environment Public Authority of Kuwait (EPA) represented by the Director General Sheikh Abdullah Al-Ahmad Al-Humoud Al-Sabah, and the Deputy Director General of Technical Affairs Dr. Abdullah Salem Al-Zaidan for supporting and overseeing the implementation of the project "Monitoring and Documentation of Biodiversity in Kuwait". We thank the Head of the Biodiversity Conservation Department Mrs. Lina Al-Awadhi, and the Head of Wildlife Monitoring Ms. Shereefa Al-Salem for their extended efforts in managing and facilitating the implementation of the project activities and field work.

Our appreciation goes to the project implementation team from the International Union for the Conservation of Nature, namely; Dr. Hany El Shaer (Regional Director IUCN ROWA), Eng. Natalia Boulad (Protected Areas, World Heritage and Biodiversity Programme Manager), and Eng. Hanna Haddad (Programme Assistant), for all their help, guidance and logistic support during this mission.

We would like to thank the EPA survey team which included: Tasneem Abdulaziz Theyab, Haya Alhandi, Alanoud Almesbah, Shoog Al-Hay, Sara Almutairi, Aisha Almarhoun, Abdulaziz, Iyousef, Ghadeer M Alhindi, Bedoor M Alqanoor, Adnan Qasim, Elham Abbas Karam, Jumana Alkhamees, Shorouk Almarzooq, Adel Alothman, and Sakina Boulayan for their contribution. We would like to thank Mr. Naseraldeen Asadallah and Mr. Mohammed Al Sayegh for supporting the field work and training as part of this work.

Our thanks are extended to Mr. Abdul Aziz Al-Yousef (EPA) for the excellent photographs of the reptiles taken from Kuwait. We also thank Dr. Abdulhadi Aloufi, Mr. Ahmad Ragab, Mr. Balazs Buzas, Mr. Csaba Géczy, Mr. David Raju, Mr. Ehab Eid, Mr. Lukáš Pola, and Mr. Sergé Bogaerts for providing photos. Finally, our thanks go to Mrs. Panayiota Kutulas for her effort in copy-editing and proofreading the document.

(Photo by Faisal Al-Nomas)

1 Introduction

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Herpetology is the science dealing with the study of amphibians and reptiles. Both groups are considered as one of the ancient vertebrates, with a wide range of distribution worldwide except the arctic regions. Reptiles are mysterious animals having several adaptations which allow them to survive in arid habitats.

Reptiles play an integral role in ecosystems where they live. They are part of the food webs especially in arid areas. Lizards and agamids feed on a wide range of arthropods including a wide range of adult and larvae of insects, and some are herbivores such as the Egyptian spiny-tailed lizard, *Uromastyx aegyptius*. Adult snakes, in particular, feed on small mammals and birds, amphibians as well as on other reptiles, while young and juvenile snakes feed on arthropods and small lizards. On the other hand, reptiles are a valuable food source for many raptors and birds of prey.

Diversity of reptiles reflects the health of the environment and is a good indicator for viable ecosystems. In arid regions, reptiles flourish and shows high diversity in terms of species composition and niche selection, that all pour into a diversified ecosystem.

In addition, reptiles, and particularly venomous snakes, are of health hazard to humans. Care should be taken when handling snakes. Typically, snakes do not attack humans, and snakebite accidents occur due to neglect or by mishandling snakes. In general, people dislike and fear reptiles. Consequently, many superstitions have stigmatised certain reptiles like geckos, which have been blamed as the cause of leprosy, or snakes that are believed to have the ability to cut a human in half, as well as others. Misunderstanding of these creatures is one reason that these animals have been persecuted by humans in the Middle East. In some cultures, reptiles are considered as a source of food. In this region, the Egyptian spiny-tailed lizard is consumed in Jordan and Saudi Arabia. Additionally, some reptiles are hunted for their skin to make belts, shoes and handbags. Recently, many hobbyists have been keeping reptiles, such as tortoises and different species of pythons as pets .

The reptiles of the Middle East have been receiving much attention during the past two decades. Regional field guides were published covering Jordan (Disi et al., 2001), Iran (Anderson, 1999), Qatar (Castilla et al., 2016), Oman the United Arab Emirates (Gardner, 2013) and Oman (Carranza et al., 2021). The previously published book on the Reptiles of Iraq by Khalaf (1959) is outdated and requires updates to meet the massive nomenclatural revisions.

(Photo by A. Alenezi)

(Photo by A. Al-Yousef)

2 Historical background on reptiles of Kuwait

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The first study on reptiles of Kuwait was published by Eissa and El Assy (1975), which included 29 species. Clayton and Pilcher (1983) incorporated elaborate images of the reptiles of Kuwait, however, no localities were mentioned of the photographed reptiles.

Additional records for of the reptiles of Kuwait were published within the past 15 years including: the melanistic whip snake, *Dolichophis jugularis* (Al-Mohanna et al., 2007), Murray's comb-fingered gecko, *Stenodactylus affinis,* and Gulf sand gecko, *Stenodactylus khobarensis* (Al-Sirhan, 2009; Metallinou et al., 2012), the web-footed sand gecko, *Stenodactylus arabicus* (Delima & Al-Nasser, 2007), and the small-spotted desert lizard, *Mesalina guttulata* (Al-Sirhan, 2008). Al-Sirhan and Brown (2010) gave an account on the distribution of two species of the genus *Phrynocephalus* in Kuwait.

The marine turtles of Kuwait received great attention, with several studies on their taxonomy and biology (Gasperetti et al., 1993; Al-Mohanna & Meakins, 1998, 2000a; 2000b; Meakins & Al-Mohanna, 2000, 2003; Bishop et al., 2007; Bishop & Alsaffar, 2008; Al Mohanna & George, 2010; Al-Mohanna et al., 2013; Rees et al., 2013).

Other studies focused on the biology of some desert species (*Agama persica = Trapelus persicus* and *Diplometopon zarudnyi*) (Cloudsley-Thompson, 1979). Sey and Al-Ghaith (2000) examined the helminths of the green toad and spiny-tailed lizard in Kuwait. Several papers on the hematology of Kuwaiti lizards were published, however, without providing localities for the studied material (Abdel-Fattah et al., 1974; Al-Badry, 1975; Al-Badry et al., 1975; Al-Badry & Al-Sdirawi, 1976; Al-Balool, 1976). The impact of oil pollution on body size, weight, timing of morning emergence, basking and foraging behaviors and substrate preferences of *Acanthodactylus scutellatus* in Kuwait was investigated (Al-Hashem et al., 2008; Al-Hashem & Brain, 2009a & b). Al-Sayegh (2018) conducted a study on its eco-physiological implications of conservation. A recent account on sea snakes of the Arabian Gulf with an illustrated key was published by Rezaie-Atagholipour et al. (2016).

Recently, Amr et al. (2021) identified the diversity of the freshwater, marine and terrestrial herpetofauna of the State of Kuwait. It consists of a total of 45 extant species; 44 species of reptiles and a single species of amphibian according to recent updated taxonomic studies. All specimens of reptiles collected and held in American and European natural history museums were documented. Four species were added to the herpetofauna of Kuwait including *Chalcides ocellatus, Hydrophis lapemoides, Hydrophis viperina,* and *Trapelus agnetae*.

(Photo by A. Al-Yousef)

(Photo by A. Alenezi)

3 Geographical setting

3 Geographical setting

The total area of the State Kuwait is 17,818 km^2 of land and about 1,000 km^2 of offshore islands. It is situated in the most northwestern corner of the Arabian Gulf (Figure 1). Kuwait is an arid country and consists mainly of desert land. It is bordered by the Kingdom of Saudi Arabia to the south and southwest and Iraq to the north and northwest.

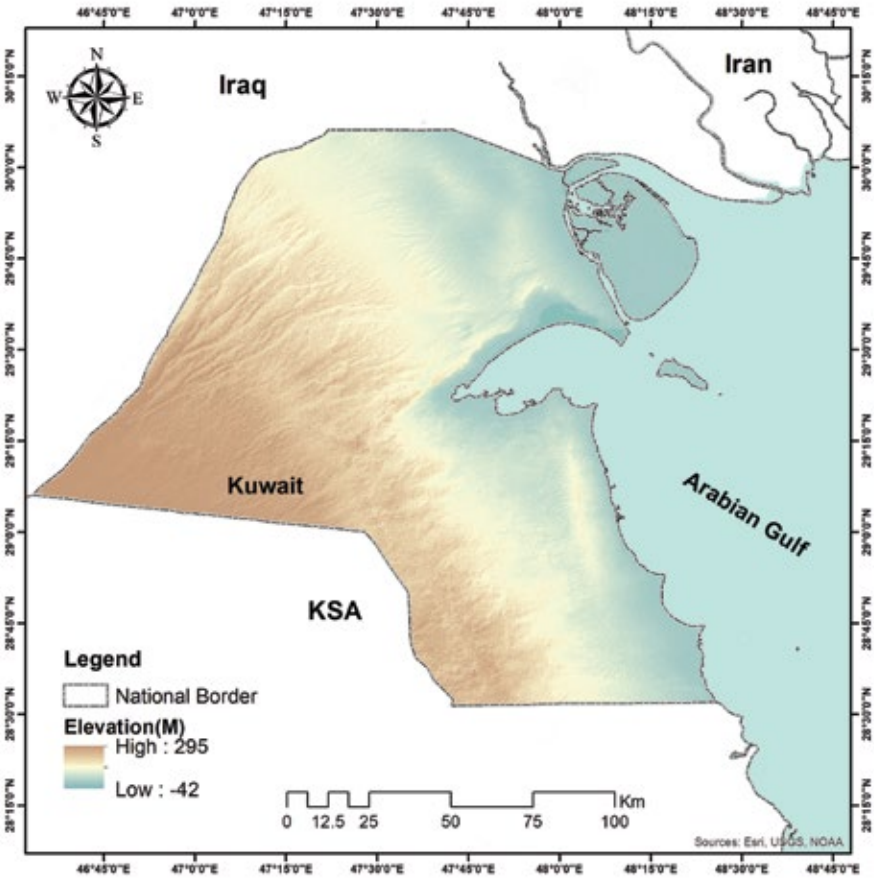

Figure 1: General map of Kuwait (Source: IUCN ROWA).

The landscape is relatively flat, broken only by occasional low sand dunes and shallow depressions. The surface elevates gently from east to west reaching about 300 m above sea level at Al-Shigaya and Al-Salmi. The eastern part of the State, including all the inhabited area, overlook the Arabian Gulf with the coastline that extends approximately 195 km. The surface consists of flat sandy plains interspersed with some low-rise hills, some of which reach a height of nearly 145 m. Moreover, in northern Kuwait, there are a series of hills

such as the Jal Al-Zour ridge, the hills of Al-Marw and Al-Liiah. In the south, hills in the form of domes are common in the regions of Warah and Burgan. Sand dune areas are mostly located in northwestern Kuwait along the Al-Huwamiliyah-Al-Nimritayn zone reaching the Al Atraf area. Several dry desert wadi systems, such as Wadi Al-Batin, crisscross Kuwait extending along the Kuwaiti-Iraqi borders about 150 km, and runs along the western borders of Kuwait, with a width in some parts reaching about 10 km and a maximum depth of about 57 m. To the north lies the Rawdatain Plain, consisting of flat land that slopes towards the east and the northeast (Figure 2).

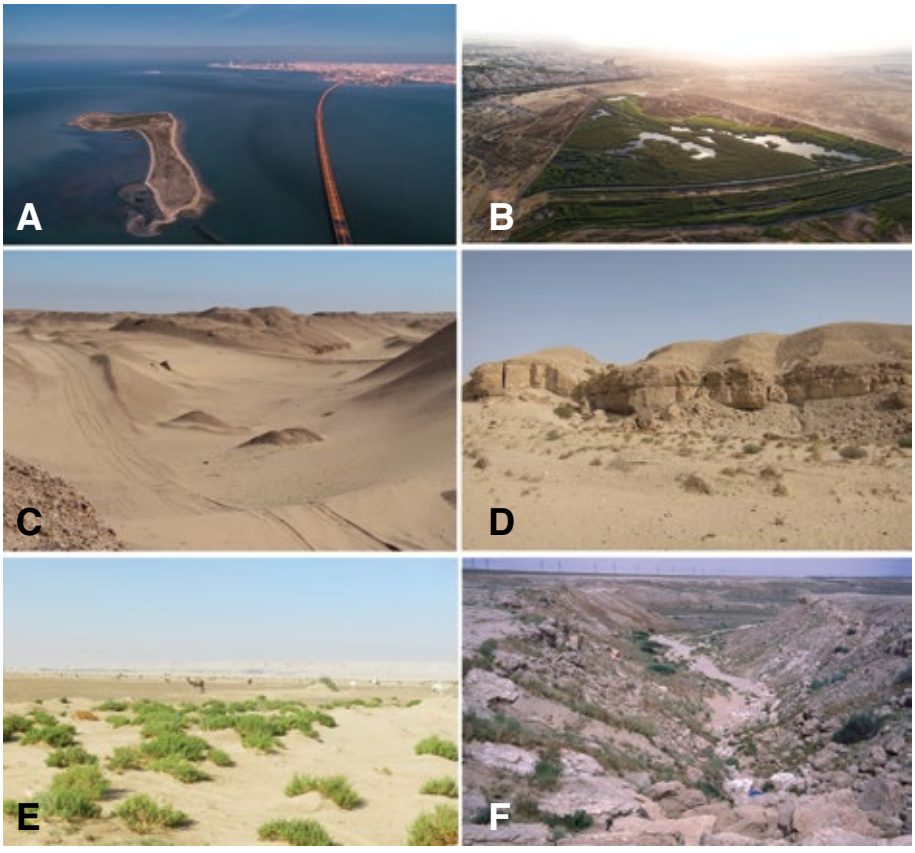

Figure 2: Habitats in Kuwait **A.** Water frontier on the Arabian Gulf **B.** Al Jahrah Nature Reserve **C.** Idrea'. **D.** The Jal Al-Zour Ridge **E.** Al Khawaiast **F.** Um Al Rimam (Photos by A. Alenezi).

Kuwait contains nine islands in the Arabian Gulf, the largest is being Bubiyan Island (683 km^2). The coastal strip extends for about 500 km, with numerous small bays and lagoons. The two largest bays are Kuwait and Kadhma and Sulaibikhat. Several lagoons; such as Abdullah, Boubyan, and Al Subiya Khawrs are located in the north, and Al Maftah and Al Amma Khawrs in the south.

(Photos by S. Al-Mohanna)

4 Methodology used for collecting reptiles

4 Methodology used for collecting reptiles

In arid regions, several methods are employed to study the diversity of reptiles. To have a reliable taxonomic identity for a certain species, specimens should be collected in order to verify their specific identity. This is true for many species of lizards (i.e. species of the genus *Acanthodactylus* and *Stenodactylus)* and geckos, whereas visual observation is not sufficient to determine exact identification.

Detailed methods on collecting reptiles and amphibians are summarised by Bennett (1999). He listed several methods including hand capture, catapults, noosing, and searching through leaf litter and animal holes.

4.1 Systematic day route

In the study area, selected grids representing all types of habitats are chosen at random. A team of at least three persons works together by moving in a sweeping route side to side with a constant distance of 10 m between them. The sweeping pace should be set to cover the largest area possible in the selected grids. The survey should cover the early morning hours between 06:00-08:00 for skinks and snakes, at noontime (12:00-13:00) for agamids and lacertids and at sunset (18:00-20:00) for crepuscular geckos, snakes and other lizards. At least two hours should be spent in each grid of an area of 25,000 m^2. All specimens identified should transferred to the data sheets with

Figure 3: Methods used in field surveys **A.** Systematic day route **B.** Opportunistic survey **C.** Car route **D**. Pitfall traps (Photos by Z. Amr).

their time of recording. Other notes, such as human activity and the GPS co-ordinates should be recorded in the selected grid.

4.2 Opportunistic survey

This survey method was based on foot sweeping: walking through randomly selected areas and recording all specimens and times found on the data sheets. The survey covered the early morning hours between 06:00 and 08:00 for skinks and snakes, at noontime between 12:00 and 13:00, for agamids and lacertids, and at sunset between 18:00 and 20:00 for crepuscular geckos, snakes and other lizards. At least two hours were be spent in each grid with three persons conducting the survey.

4.2.1 Opportunistic night route

This method was conducted by using two routes:

Foot route: The survey began after 20:00 in search of nocturnal species: geckos and snakes. Torches, both hand and head were used to locate the species in the study area. Each of the four persons in the team spent at least 3 hours each, totalling 12 hours of the team's survey work.

Car route: This method involved simply driving slowly (10-20km/hr) along a road while looking carefully for reptiles. If any reptile species ~~is~~ were spotted, light was shown on them for further identification.

Other standard methods such as pitfall traps are not suitable for arid regions like Kuwait, where temperatures may reach up to 50°C during daytime. During such extreme temperatures, animals in pitfall traps will become dehydrated and die.

High resolution images of observed or collected species, either in their natural habitat or in a terrarium after being caught, should be documented. Specimens representing all species in the country should be collected and preserved as a reference in 75% ethyl alcohol. This collection should be housed in a natural history museum or within the collection of the EPA, with all relevant data on collection date, species identification, locality and collector. With advances in molecular biology as a tool for identification, tissue samples should also be preserved in 95% ethyl alcohol for future studies.

4.3 Equipment needed for reptiles collecting:

- Insect nets with long handle.
- Snake sticks.
- Torches (hand and head).
- Plastic containers of different sizes.
- Cloth bags.
- Digital camera.
- GPS.
- Safety boots.
- Cloth gloves for handling collected animals.

(Photo by E. Eid)

5 Sea turtle handling, data recording and sample collection

5 Sea turtle handling, data recording and sample collection

5.1 Handling of roaming and nesting sea turtles

Roaming sea turtles are sited either by the naked eye and/or with binoculars. Once a roaming sea turtle is sited surfacing in coastal waters (Figure 4), it is slowly pursued by the watercraft. As it begins to tire, the watercraft slowly maneuvers slowly closer to the sea turtle and the boat engine is put in neutral. The turtle is carefully lifted from the gunwale of the watercraft. Sea turtles are never to be handled or lifted from their flippers. Small turtles are lifted on board using both hands (hand capture) to grasp the anterior edge of nuchal scute notch (front) and posterior (back) margins of the carapace. For large sea turtles, a net or a sling is used to hoist it on board with assistance of a winch/pulley if necessary. Once on board, sea turtles are to be kept in a safe shaded place. A wet towel is placed over the turtle's carapace, making sure not to cover the head, and periodically spraying the turtle with water to keep it hydrated. When all data is recorded (qualitative and quantitative data and photography), the turtle is ready to be returned to the sea. It is released gently into the water headfirst while still holding onto its carapace before being entirely released. The watercraft is only restarted when the turtle is at a safe distance from it.

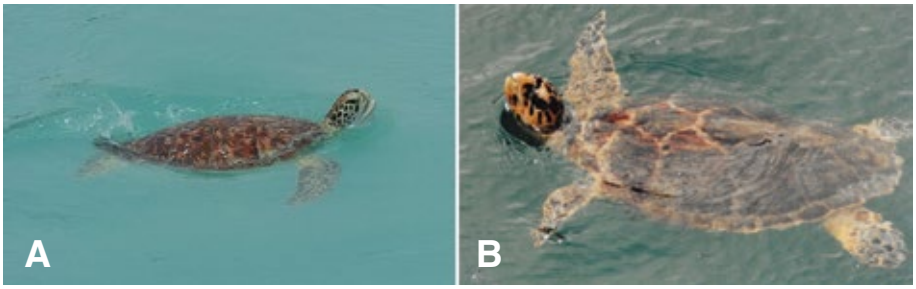

Figure 4: Roaming females pursued in territorial waters. **A.** Green sea turtle, *Chelonia mydas.* **B.** Hawksbill sea turtle, *Eretmochelys imbricata* (Photos by S. Al-Mohanna).

On nesting beaches, female turtles are approached as they are crawling towards the sea after nesting has occurred. Female turtles lay more than one clutch of eggs per season and might return to the same beach to lay another clutch within 2-3 weeks. Hence, it is vital to approach her slowly and calmly so as not to cause disorientation and abandonment of the entire nesting process. When on the beach, the use of torch/flashlights is to be limited. Light affects nesting females, altering their nesting behavior. Therefore, it is best to maintain the darkness or use a red/amber LED head light since it is less intrusive. If needed, photography is conducted from behind the sea turtle using a red camera flash diffuser (filter). If the turtle shows signs of distress, distance should be kept.

5.2 Data recording

The date and time of surveying, GPS coordinates and waypoint number of the location of roaming sea turtle/ nesting female, atmospheric variables on the day (atmospheric temperature, humidity, wind speed/direction using a portable multifunctional atmospheric datalogger), sea state (according to the Beaufort scale) and the lunar phase are recorded.

Size frequency of roaming sea turtles acts as an important parameter to determine the population's demographic structure, while that linked to nesting sea turtles allows for understanding female reproductive biology (sexual maturity, reproductive output, female size, etc.). Two standard measurements are commonly used: minimum curved carapace length (CCL_{MIN}) and curved carapace width (CCW); where CCL_{MIN} is measured from the anterior-most edge of the carapace (nuchal scute) to the rearmost edge of the carapace (supracaudal scute). Measurements are obtained using a flexible fibreglass tape read to the nearest 0.1 cm. Additional morphometric measurements can be recorded based on the objective of the study and are described in IUCN/ SSC Marine Turtle Specialist manual (Eckert et al., 1999) (Figure 5).

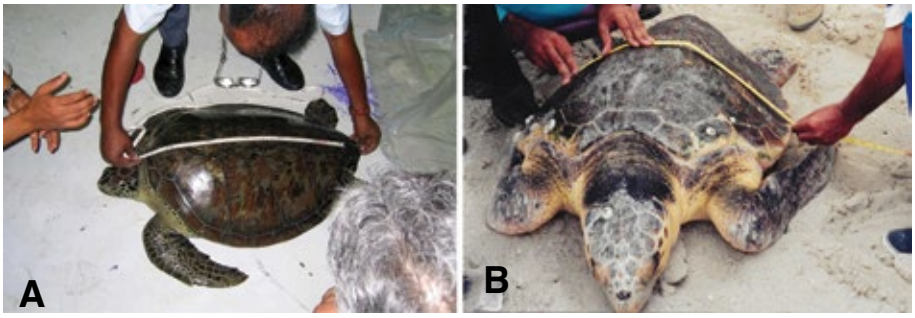

Figure 5: Measuring the sea turtles' carapaces. **A.** Green sea turtle, *Chelonia mydas,* curved carapace length, CCL. **B.** Curved carapace width, CCW, of the loggerhead sea turtle, *Caretta caretta* (Photos by S. Al-Mohanna).

On nesting beaches, once the female sea turtle has successfully deposited and incubated the eggs and morphometric data is recorded, the nest is then safely secured with caution tape and a warning notice to prevent trampling. Nests are numbered and their location is determined using a GPS. The nest's distance from high tide mark is measured using a distance-measuring wheel read to the nearest 5 cm. Images are a valuable source of data and an essential part of the documentation process, hence it is advised to capture several scaled photographical shots of the encountered females, their morphological traits, tracks and nests.

5.3 Tagging, satellite and bio samples (roaming and nesting)

During documenting and monitoring of roaming and nesting sea turtles, it

is advised to seize the opportunity to collect bio-samples (i.e. blood) and to administer tracking devices (flipper and satellite tagging) both of which are important techniques contributing towards the conservation of sea turtles. Both are conducted directly following oviposition as the female sea turtle is crawling away from the nest.

Blood samples can be used to identify species using a standardised gene region (DNA barcoding) and to understand the interactions of the genes with each other, and with the individual's environment through mapping of the organism's entire DNA (genome). Integrating both DNA barcoding and genomics with evolutionary biology and population genetics enables the understanding of turtle biology and the assessment of the species' genetic diversity geographically (Phylogeography) (Bowen & Karl, 2007; Komoroske et al., 2017). Small blood samples can also be used to verify the sex of neonate sea turtles using sex-specific markers (Tezak et al., 2020) thus eliminating the challenges associated with sex identification due to the lack of sexual dimorphism in hatchlings and juveniles. For blood collection in sea turtles, the vein located in the neck (dorsal cervical sinus) is a commonly used site. The head is pulled and outstretched forward to allow filling of the vein with blood (NOAA, 2008). A vacuum tube, needle and holder are used to collect the sample which is later kept on ice until transferred to the lab where it will later be stored at 80°C (Figure 6A).

Satellite telemetry and flipper tagging is used to track and monitor the movement of sea turtles allowing conservationists to understand sea turtle behaviour in relation to migration, feeding, and reproduction patterns, thus be able to protect their habitats and to improve their status. The route of sea turtles tagged with titanium flippers can only be determined if sea turtles are captured. Although more costly, satellite transmitters are more efficient and accurate in recording the sea turtle's long route at sea. An encountered sea turtle can either be (a) marked with a single Inconel tag at the front or hind flipper close to the junction with the body, using tag pliers (Figure 6B); or by

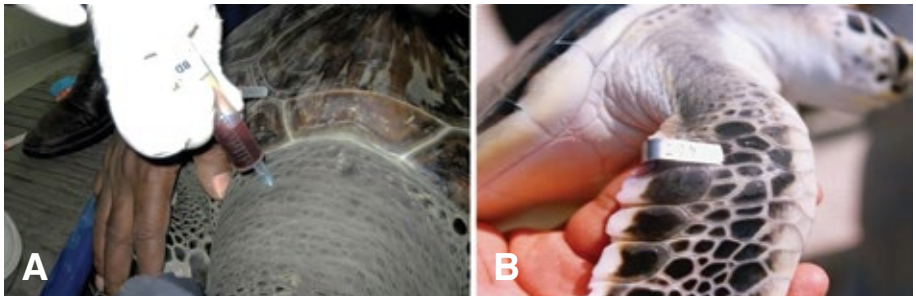

Figure 6: A. Blood sample withdrawal from a female green turtle, *Chelonia mydas.* **B.** Titanium flipper tag located on the front flipper of a juvenile green turtle, *Chelonia mydas* (Photos by S. Al-Mohanna)

(b) mounting a satellite transmitter, using Epoxy or fiberglass (NOAA, 2008; Rees et al., 2019), onto the section of the carapace which rises to a maximum point above the sea surface (between the first and second vertebrate scutes).

5.4 Hatchlings and nest excavation

Hatchlings' ID becomes the only resourceful method to identify nesting sea turtles in the case that the field group failed to encounter nesting females or could not make clear identification of the nesting species via tracks. Variation among hatchlings of various sea turtle species is detailed in Eckert et al. (1999). This identification method requires monitoring the nest during the incubation period on a regular basis, especially if the actual nesting date is unknown, to encounter hatchlings as they emerge. Incubation period for most sea turtle species in the Gulf region is approximately 60 days (50-61 days) from initial nesting; regular beach patrols are scheduled accordingly, from dusk until dawn, 45 days from nesting date to guarantee witnessing hatchling emergence. During this period, all artificial lights should be switched off as not to disorient the emerging hatchling since hatchling orientation is also affected by illumination of a new moon. The average maximum summer temperature during sea turtle nesting period in Kuwait ranges between 40°C and 46°C (MET KW, 2021); hence, it is critical to assist the emerging hatchlings if they fail to reach the water by dawn as to avoid death by exposure to scorching heat, consequently contributing to increasing hatchling survival rate. Other threats to hatchling survival on the island includes predatory birds and ghost crabs.

Post-hatching, preferably a week after the emergence of the first hatchlings, the nest is carefully excavated. Empty shells and unhatched eggs, which are either undeveloped or contain premature embryos, are retrieved and counted to determine clutch size and successful hatching rate. The nest dimensions (mouth width, bottom width, nest depth) can also be recorded and read to the nearest cm (Figures 7A-7B).

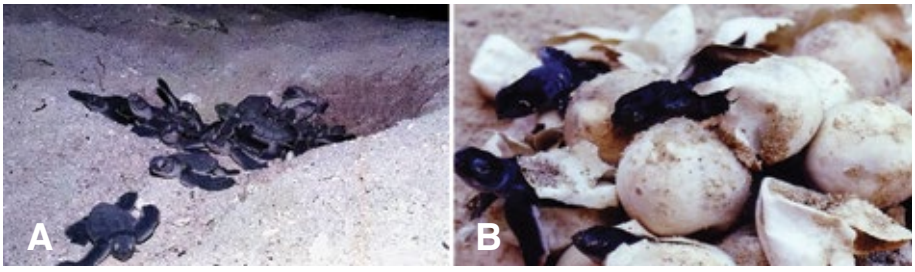

Figure 7: A. Emerging hatchlings. **B.** Content of excavated nest of a Green turtle, *Chelonia mydas* (Photos by S. Al-Mohanna).

(Photo by A. Al-Yousef)

6 Class Amphibia

6 Class Amphibia

6.1 Family Bufonidae

This family of toads is represented by a single species, *Bufotes sitibundus*. Kuwait lacks natural freshwater bodies. Species of this family are dependent on rainfall, and are found around agricultural areas and sewage treatment plants.

6.1.1 Genus *Bufotes*

Species of the genus *Bufotes* are usually small to medium-large toads, reaching 3.5-12 cm as adults. Females are usually larger than males, whereas males only have a vocal sack to produce calls. Skin is covered by granular glands and warts. Parotoid glands and the tympanum are very prominent. Colouration is usually brown, brown olive to greyish.

6.1.1.1 *Bufotes sitibundus* (Pallas, 1771)

Variable green toad

Figure 8: Variable green toad, *Bufotes sitibundus* (Photo by A. Alenezi).

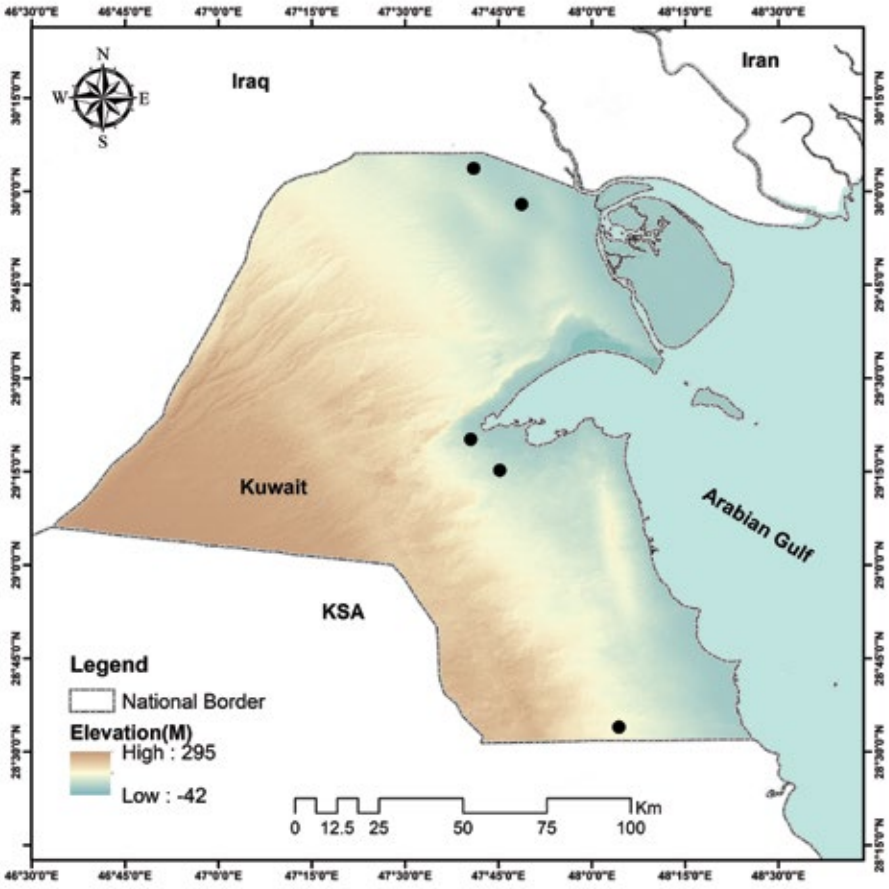

Figure 9: Distribution of *Bufotes sitibundus* in Kuwait (Source: IUCN ROWA).

Records from Kuwait: Abdali, Al Jahrah Farms, Al Wafrah, Bodais Farm, Sulaibiya.

Diagnosis: The pupil is vertical, and its colour is both variable and changeable; the dorsum varies from light gray to olive or green in colour, with or without olive to black blotches, often associated with dark edges. The blotches are of varying shapes, sizes and dispositions. A pair of green stripes extends from the eye to the nostril; a green spot on the upper lip under the eye; two green cross bars on the upper eyelids, running backwards along the medial edges of the parietal glands, which is a constant feature in the studied specimens. A faint vertebral stripe is occasionally present especially from specimens collected from arid zones. Also visible are a series of cross bars on dorsal parts of the limbs. A pair of interrupted laterodorsally glandular ridges, running from the mouth corners to the

groin. A well-defined continuous ulnar ridge and a prominent sharp tarsal fold. Ventrally, the colour is whitish and sometimes with dark spots. The tympanic membrane is relatively large and distinct. The flat parotid glands are prominent, elongated and kidney-shape, and almost parallel, posterior to the tympanum on the lateral side. Dorsum is angled with a blackish brown hard spine, and has numerous warts of varying sizes. The largest warts are amid similar smaller tubercles. It is characterised by short webbed feet; Tips of fingers and toes are brown.

Sexual dimorphism is obvious. In males, an internal resonator is found underneath the skin of the throat, and is surrounded by black pigmented muscles. In addition, males are characterised by their extended single keratinisation on the mesial side of the first finger.

Habitat. The variable green toad was collected from swamps, ditches and around agricultural areas. It occurs in Al Jahara Nature Reserve, and Al Wafrah farms.

Remarks: The taxonomy of the genus *Bufotes* is still not fully resolved. Previously, populations of the eastern Mediterranean were referred to the *variabilis* complex (Dufresnes et al., 2019).

(Photo by A. Ragab)

(Photo by A. Al-Yousef)

7 Class Reptilia

7 Class Reptilia

Marine turtles

Five species of marine turtles in two families (Cheloniidae and Dermochelyidae) are known to occur in the Kuwaiti waters (Gasperetti et al., 1993; Al-Muhanna & Meakins, 2000b; Bishop et al., 2007; Al-Mohanna & Meakins 2000; Al-Mohanna et al., 2013; Rees et al., 2019). The green turtle, *Chelonia mydas,* is considered as the most common species in the Arabian Gulf.

Key to the Marine Turtles of Kuwait

1. Carapace leathery, without scutes, head scales absent **Family Dermochelyidae**.....
.....*Dermochelys coriacea*
Carapace not leathery, with scutes, head scales present **Family Cheloniidae** 2
2. Carapace with four pairs of lateral scutes ……..……..……..3
Carapace with five or more pairs of lateral scutes…….....……..4

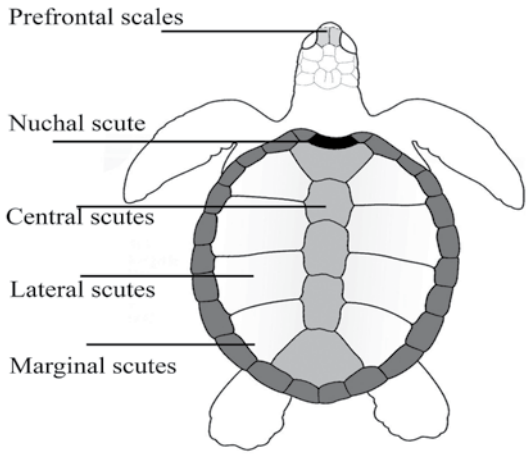

Figure 10: Marine turtle scale types (Redrawn after FAO, 2018).

3. Head with one pair of prefrontal scales, first pair of lateral scutes is not in contact with the nuchal scute, one claw on each flipper……..…….. *Chelonia mydas*

Head with two pairs of prefrontal scales, first pair of lateral scutes is in contact with the nuchal scute, two claws on each flipper…….....…….*Eretmochelys imbricata*

4. Carapace with five pairs of lateral scutes…….....……. *Caretta caretta*
Carapace with more than five pairs of lateral scutes …….....……*Lepidochelys olivacea*

7.1 Family Cheloniidae

The family Cheloniidae includes seven species of marine turtles within five different genera *(Caretta, Chelonia, Eretmochelys, Lepidochelys* and *Natator*). Species of this family have a worldwide distribution in all tropical oceans, in the Atlantic and the Indo-Pacific Oceans. The size of carapace ranges from 70-220 cm. The fore and hind limbs of these marine turtles have evolved into flippers to help in swimming. Four species of this family have been reported in Kuwait.

7.1.1 *Caretta caretta* (Linnaeus, 1758)

The loggerhead turtle

Figure 11: Loggerhead turtle, *Caretta caretta* (Photo by Ehab Eid).

Distribution range: All semi and tropical oceans.

Diagnosis: The carapace is heart-shaped when viewed dorsally, head large, wide and subtriangular with two pairs of prefrontal scales; and one inter-prefrontal scale. Beak horny and thick. Scutes of the carapace thin and hard. They consist of five pairs of lateral, five central and usually 12 or 13 pairs of marginal scutes, including the postcentral scute. Three pairs of inframarginal scutes are located under the plastron's bridge. Front flippers are relatively short and thick; with two claws while back flippers have two or three claws.

Carapace length ranges from 75-110 cm for adults, with a maximum weight up to 150 kg.

Biology: Females lay 40 to 190 eggs per nest in two to five clutches per season. The loggerhead turtle feeds mainly on fishes, and other crustaceans, mollusks and marine invertebrates.

Remarks: The loggerhead turtle is a rare species in the Kuwaiti waters. It was seen and reported once by Al-Mohanna and Meakins (2000) in the water near Shuaiba Industrial Area. Masirah Island, Oman, hosts the largest nesting aggregations worldwide, with thousands of individual turtles frequenting the island for nesting on a yearly basis (Ross & Barwani, 1995).

7.1.2 *Chelonia mydas* (Linnaeus, 1758)

The green turtle

Figure 12: Green turtle, *Chelonia mydas* (Photo by Ehab Eid).

Distribution range: All semi and tropical oceans.

Diagnosis: The carapace is visibly elevated or dome-like. From a dorsal view, it is heart-shaped, and slightly notched around the neck and front flippers, while deeply notched over the back flippers. The head is small and blunt, with one pair of elongated prefrontal scales and four postorbital scales at each side. The carapace scutes are as follows: five centrals, four pairs of laterals and 11 pairs of marginals. Scutes of the plastron consists of six pairs plus four inframarginals at each side. Each flipper has one claw. The colour of the

carapace is grey to black, with a blotched or radiating brown and olive pattern. Carapace length ranges from 90-120 cm for adults, with a maximum weight up to 250 kg.

Biology: Females lay several clutches per season with 110-115 eggs per clutch. The green turtle feeds mainly on algae and sea grasses (e. g. *Ulva, Polysiphonia* and others), and may consume cnidarians.

Remarks: This species was found to nest around Umm Al-Maradim and Qaruh islands (Al-Mohanna et al., 2013; Rees et al., 2018). Gasperetti et al. (1993) included a map showing several nesting sites in the Arabian Gulf on the coast of Saudi Arabia and the United Arab Emirates.

7.1.3 *Eretmochelys imbricata* (Linnaeus, 1766)

The hawksbill sea turtle

Figure 13: Hawksbill sea turtle, *Eretmochelys imbricata* (Photo by Ehab Eid).

Distribution range: Indo-Pacific and the Atlantic Ocean

Diagnosis: The carapace is heart-shaped to elliptical. Head is narrow and medium-sized with a prominent pointed beak. Head scales with two pairs of prefrontals, and 3 or 4 postorbital scales. Carapace scutes are as follows: five centrals, four pairs of laterals and 11 pairs of marginals in addition to one pair of postcentral. Plastron with five pairs of scutes. At the bridge, four poreless inframarginal scutes are present on each side. Front and back flippers have two claws. Carapace length ranges from 53-100 cm for adults, with a maximum weight up to 120 kg.

Biology: Females lay 120-200 eggs in 2-5 clutches per season. The hawksbill sea turtle feeds mainly on sponges, soft corals and other invertebrates associated with coral reefs communities.

Remarks: This is an uncommon species in the Kuwaiti waters. Few individuals were found to nest in Kuwait (Rees et al., 2018). Gasperetti et al. (1993) stated that this a rare species in the Arabian Gulf with nesting populations around the coasts of Saudi Arabia.

7.1.4 *Lepidochelys olivacea* (Eschscholtz, 1829)

The olive ridley turtle

Figure 14: Olive ridley turtle, *Lepidochelys olivacea* (Photo by Ehab Eid).

Distribution range: Tropical waters of the Pacific, Indian and south Atlantic Oceans.

Diagnosis: The carapace is almost round in shape. Head is medium-sized, and subtriangular in shape. Carapace scutes are as follows: more than five pairs of laterals, five centrals and nine marginals. Two pairs of prefrontal scales are present. Fore flippers have 1 or 2 claws. Colour of adult specimens is usually plain olive-grey dorsally, and creamy or whitish ventrally. Length may reach up to 75 cm, with a maximum weight up to 80 kg.

Biology: The olive ridley turtle feeds mainly on crustaceans, mollusks, jellyfish, and less frequently on seaweed and plants.

Remarks To date, this is the only record regarding Kuwait (Bishop et al., 2007). The olive ridley turtle is considered as a pan-tropical turtle of the Atlantic and the Indo-Pacific Oceans (Gasperetti et al., 1993). Tollab et al. (2015) gave recent observations about this species in the Arabian Gulf including the records from Kuwait and Bahrain.

7.2 Family Dermochelyidae

This family includes a single species, *Dermochelys coriacea,* one of the largest living reptiles. It is characterised by its spindle-shaped and leathery carapace, which is void of scutes as are present in other marine turtles.

7.2.1 *Dermochelys coriacea* (Vandelli, 1761)

The leatherback turtle

Figure 15: Leatherback turtle, *Dermochelys coriacea* (Photo by Ehab Eid).

Distribution range: All oceans except extreme cold waters.

Diagnosis: The carapace is spindle-shaped, leathery and without scutes. The carapace has seven dorsal longitudinal keels or dorsal ridges. Head is small and round with no scales. Plastron with five longitudinal keels. Flippers are large and paddle-shaped, whereas the fore Flippers reaches about the same length or more than half of the carapace total length. Colour of the dorsal side is usually black, with scattered white blotches along the keels. The ventral side is mostly whitish. Maximus length may reach up to 270 cm, with a weight up to 450 kg.

Biology: Females lay 61-126 eggs per clutch, and 4-5 clutches per season. The Leatherback Turtle is carnivorous, feeding mainly on jellyfish, as well as other soft-bodied invertebrates.

Remarks: This is a rare species in the Arabian Gulf and the Arabian Sea (Gasperetti et al., 1993). A dying specimen was collected from Bnadier, S Kuwait (Al-Mohanna & Meakins, 2000b).

Previous records: Bnadier, S Kuwait (Al-Mohanna & Meakins, 2000b).

7.3 Family Gekkonidae

This family is represented by six genera *(Bunopus, Cyrtopodion, Hemidactylus, Pseudoceramodactylus, Stenodactylus* and *Trigonodactylus),* including nine species. All species reported from Kuwait are desert adapted species known across Arabia. Species of the genus *Stenodactylus* were revised at the molecular level, including specimens from Kuwait (Metallinou et al., 2012).

Key to genera of family Gekkonidae

1. Digits dilated at the base, with of two rows of lamellae beneath (Figure 16A)..*Hemidactylus*
   Digits not dilated at the base, and not forming two rows of lamellae beneath (Figure 16B) …2

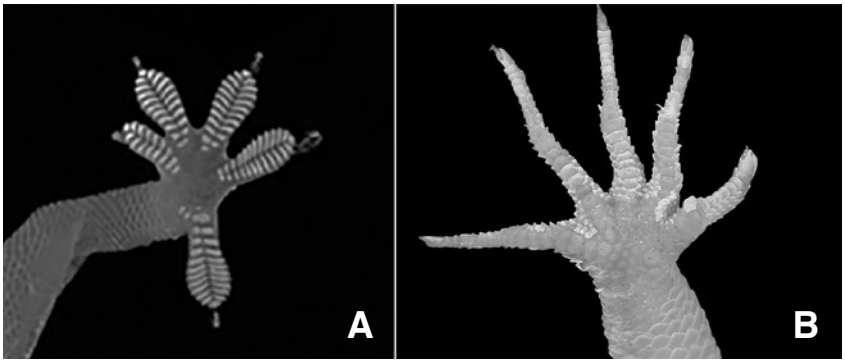

Figure 16: Shape of digits: **A**. Digits dilated at the base. **B**. Digits not dilated at the base (Photos by Z. Amr).

2. Dorsum covered by enlarged tubercles ……..…… 3
   Dorsum covered by small fine scales…….……..4
3. Two pairs of enlarged postmental scales present ……..…….. *Cyrtopodion scabrum*
   One small postmental scales is present (Figure 17)……..…….. *Bunopus tuberculatus*

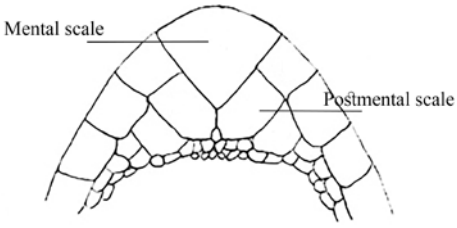

Figure 17: Two pairs of enlarged postmental scales (Photo by Z. Amr).

1. Digits with well-defined lateral fringe of elongated, flexible pointed scales 5
   Digits without fringe of elongated, flexible pointed scales..... *Pseudoceramodactylus khobarensis*
2. Femoral pore present, digits not webbed .....*Stenodactylus*
   Femoral pores absent, digits webbed ..... *Trigonodactylus arabicus*

7.3.1 Genus *Bunopus*

Digits are elongated and not dilated, with claws and a series of subdigital lamellae. Dorsal scales are juxtaposed with large keeled tubercles. Pupil is vertical. Males with preanal pores. Caudal tubercles in each semicircle of one segment are in contact with each other along the entire lateral edge, subdigital lamellae with a single transverse series of tubercles, particularly on the free margin under magnification (sometimes worn down in latter part of epidermal cycle); distal phalanges not compressed.

This genus includes several species distributed from Palestine to Pakistan, and across the Arabian Peninsula.

7.3.1.1 *Bunopus tuberculatus* Blanford, 1874

Baluch rock gecko

Figure 18: Baluch rock gecko, *Bunopus tuberculatus* (Photo by A. Alenezi).

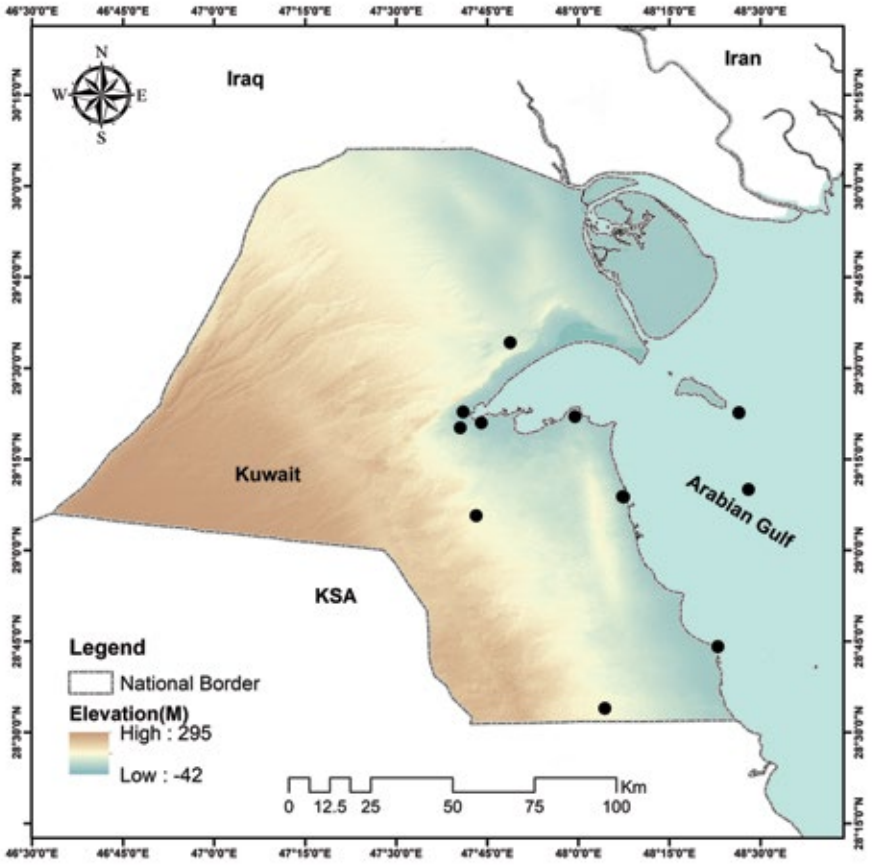

Figure 19: Distribution of *Bunopus tuberculatus* in Kuwait (Source: IUCN ROWA).

Distribution range: The Arabian Peninsula, Jordan, Palestine, Iraq and eastwards to Iran, Afghanistan and Pakistan (Arnold, 1986).

Records from Kuwait: Al Jahrah, Al Jahrah East Outfall, Ali Al Salem, Air Base, Auhha Island, Al Wafrah, Kabed Reserve, Kubbar Island, Mahboula, Khwaisat, Kuwait, Mina Al Zour, Sabah Al-Ahmad Natural Reserve.

Diagnosis: Head is elongated oval in shape, eyes are large with elliptical pupil. Ear opening is vertically oval in shape. Limbs are relatively short with moderately long figures lacking adhesive pads. Body is covered with small unequal granular scales, mostly trihedral tubercles of unequal size. Tail is moderately thick, slightly depressed at the base and longer than SV length. Postmental shields are absent; ventral scales small and smooth, subcircular and subimbricate in shape.

Habitat: It has been collected in several localities in Kuwait. It was observed

close to or hidden in vegetation and under small rocks as well as around entrances of rodent burrows. This species hides under vegetation for hunting and foraging. In islands of the UAE, Soorae (2004) found the Baluch Stone Gecko mostly under debris along shoreline. Menton (1966) encountered this species along a stream in Pakistan. Arnold (1980, 1984) stated that *B. tuberculatus* has a wide distribution in the deserts of Arabia and occupies a variety of habitats of soft and hard sandy areas but dominates on harder substrates.

Biology: *Bunopus tuberculatus* is a nocturnal species that is usually seen after sunset. It feeds on beetles (Andeson, 1999). Females lay two eggs (Werner, 1995). In the United Arab Emirates, remains of this species were recovered from the Little Owl pellets (Cunningham & Aspinall, 2001).

7.3.2 Genus *Cyrtodactylus*

Species of the genus *Cyrtodactylus* possess slender, curved toes. Pupil vertical; two or three pairs of postmental shields.

7.3.2.1 *Cyrtodactylus scabrum* (Heyden, 1827)

The rough bent-toed gecko

Figure 20: Rough bent-toed gecko, *Cyrtodactylus scabrum* (Photo by S. Bogaerts).

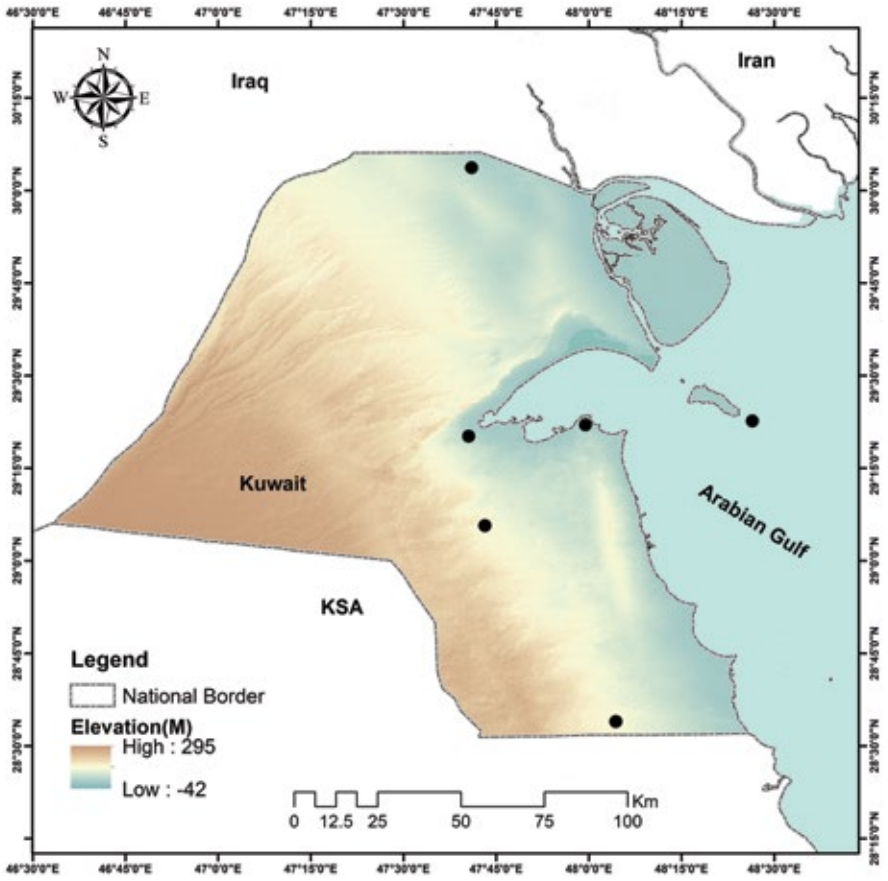

Figure 21: Distribution of *Cyrtodactylus scabrum* in Kuwait (Source: IUCN ROWA).

Distribution range: Arabian Peninsula, Red Sea coast of Egypt to northern Ethiopia, Jordan, Iraq, Iran, Afghanistan, and Pakistan (Arnold, 1986).

Records from Kuwait: Al Jahrah Farms, Al Jahrah East Outfall, Ali Al Salem Air Force Base, Auhha Island, Al Wafrah Farms, Jal Az Zour, Kuwait, Kabed Reserve, S Subahiya.

Diagnosis: Digits slender and clawed; with one row of smooth transverse subdigital lamellae; three or more rows of lateral scales are present on digits; no fringes or denticulations on lateral digital scales; not more than 30 scales are situated between the centers of the eyes; pupil vertical; two or three pairs of postmental shields are present, the first pair usually in contact behind the mental; males with preanal and/or femoral pores; segmentation of tail pronounced (Leviton et al., 1992).

Habitat: *Cyrtopodion scabrum* is a house gecko. It has been found on walls

both inside and outside of inhabited and abandoned buildings and in gardens. In Kuwait, it has been collected in areas of dry grassland, rocky hillsides and in moderate sand deserts with sparse vegetation (Amr et al., 2021). The rough-scaled gecko is a nocturnal species. During the day, it has been found concealed under rocks. In Kuwait, it is believed that this species is introduced through man-made constructions in remote areas.

Biology: This is a nocturnal species. Detailed behavioural observations of this species in eastern Saudi Arabia are given by Roos (1993). Ibrahim (2013) gave an account on the ecology of this species in the Suez Canal area, Egypt. He stated that *C. scabrum* is a solitary species with a small home range. Peaks of daily activity were observed during the first three hours after sunset. Air temperature was the main factor affecting its daily and seasonal activity. Fourteen orders of arthropod were found to be consumed by *C. scabrum,* whereas dipterans and hymenopterans were the most abundant in its diet. Reproduction commences in March and extends to September, with peak activity for both sexes in June and July. Female deposit single-egg clutches. Khan (2008) provided a detailed description for the mating behavior of this gecko in Punjab, Pakistan.

7.3.3 Genus *Hemidactylus*

Dorsal scales are either uniform or heterogeneous. Eye pupil vertical. Males possess preanal pores. Fingers and toes are equipped with a distal claw, dilated at the base, with two rows of lamellae beneath.

Key to species of the Genus *Hemidactylus*

1. Dorsal side with few enlarged tubercles or without tubercles…..... *Hemidactylus flaviviridis*
   Dorsal side covered with small granules and moderately large and strongly keeled tubercles...
   .....*Hemidactylus persicus*

7.3.3.1 *Hemidactylus flaviviridis* Rüppell, 1840

Yellow-belly gecko

Figure 22: Yellow-belly gecko, *Hemidactylus flaviviridis* (Photo by A. Alenezi).

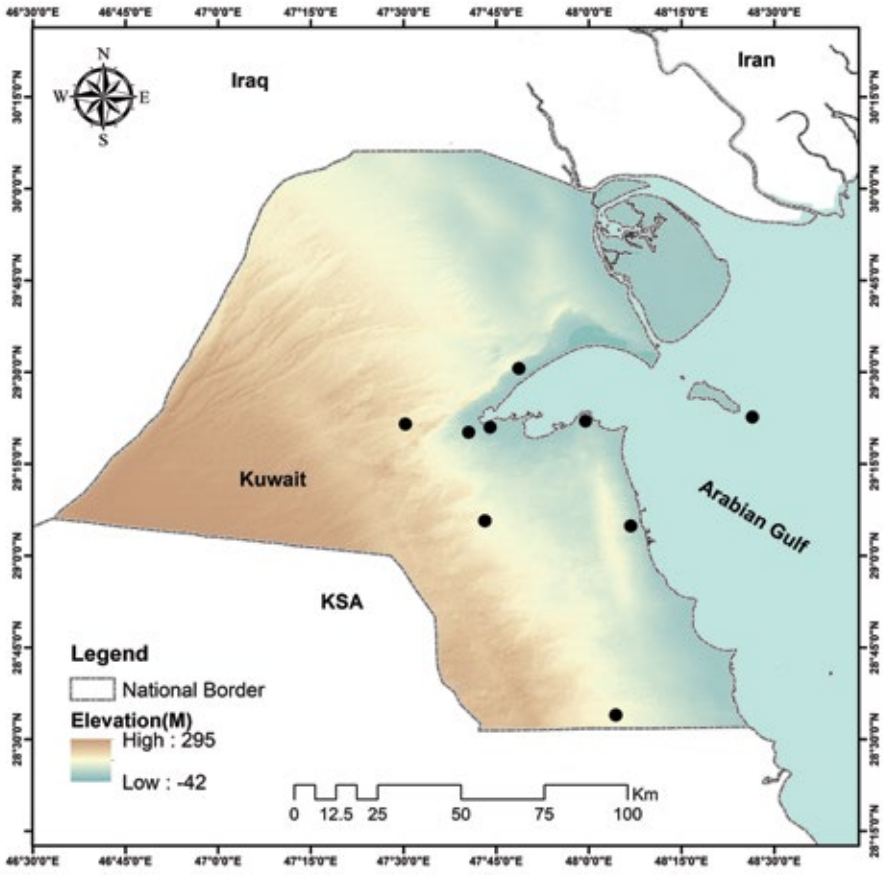

Figure 23: Distribution of *Hemidactylus flaviviridis* in Kuwait (Source: IUCN ROWA).

Distribution range: This species has a wide range of distribution extending from eastern Egypt, Somalia, Sudan, Ethiopia and Eritrea in Africa, across the Arabian Peninsula and Iraq reaching as far as India (Sindaco & Jeremčenko, 2008).

Records from Kuwait: Abdali, Al Jahrah Farms, Al Wafrah Farms, Auhha Island, Kabed Reserve, Kuwait.

Diagnosis: Medium-sized gecko reaching up to 180 mm in total length. Dorsal side with few enlarged tubercles or without tubercles. Tail is usually more swollen towards the base and lacks enlarged dorsal tubercles. 12-15 supralabials, 10-12 infralabials. Ten to fourteen lamellae under the fourth finger. In male, 5-14 femoral pores are present. Colour usually pale grey or greyish brown dorsally with indistinct markings and yellow ventrally.

Habitat: This species is associated with houses and abandoned buildings. They are known for their territorial behavior, where they feed on insects close

to electrical lights (Daniels, 2002). This is the largest gecko in Kuwait, and frequently observed at night on walls inside houses hunting insects and spiders.

Biology: Breeding is usually observed at the beginning of summer. Males call females during the breeding season. Daniels (2002) gave details on their courtship behaviour. One or three eggs are laid by a single female in crevices or holes.

7.3.3.2 *Hemidactylus persicus* Anderson, 1872

Persia leaf-toed gecko

Figure 24: Persia leaf-toed gecko, *Hemidactylus persicus* (Photo by A. Alenezi).

Distribution range: S Iran, Iraq, Kuwait, Saudi Arabia, N Oman, United Arab Emirates, Bahrain, Kuwait, Qatar, Pakistan and N India (Castilla et al., 2013).

Records from Kuwait: Kuwait.

Diagnosis: Tail without sharp, denticulated lateral edge; numerous enlarged, strongly keeled dorsal tubercles arranged in 14-16 more or less regular longitudinal series; 12-14 lamellae and pairs of lamellae under basal expanded portion of fourth toe; 10-12 supralabials and 8-10 infralabials; males with 9-13 preanal pores. The dorsal colour is pale yellowish brown-green and the upper surface is covered with small granules and moderately large and strongly keeled tubercles, arranged in an irregular longitudinal series. The tail is cylindrical with transverse rows of tubercles dorsally.

Habitat: The Persia leaf-toed gecko was found under wooden objects, rocks or dry leaves around trees and bushes (Castilla et al., 2013).

Biology: Castilla et al. (2013) observed a gravid female with two oviductal eggs.

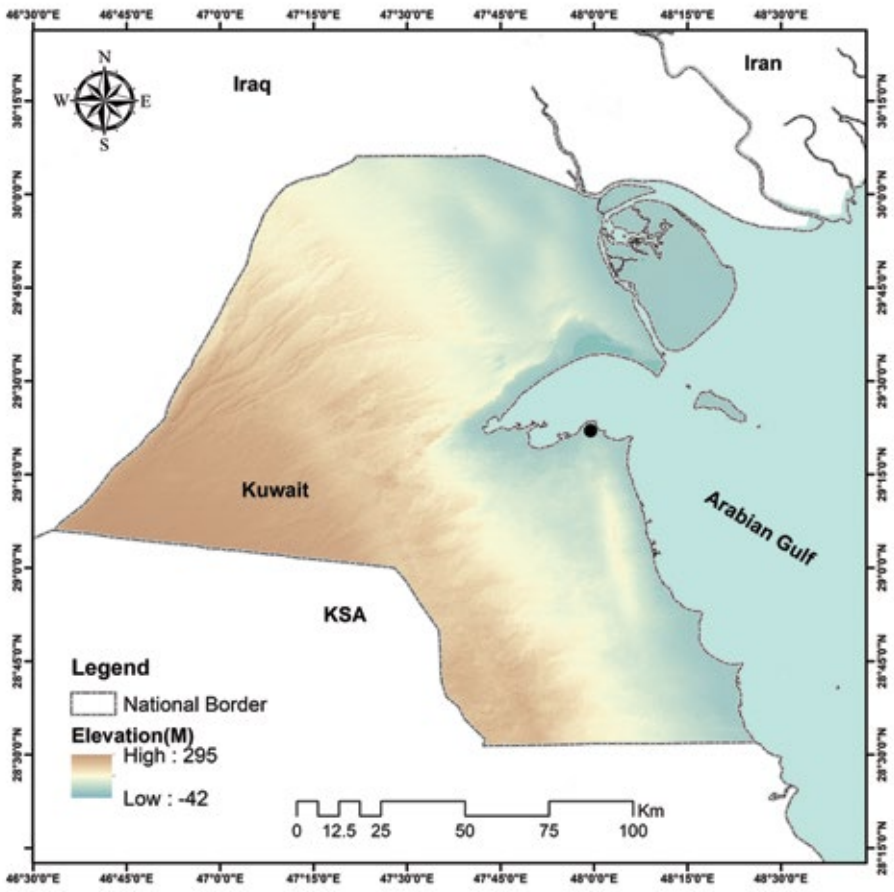

Figure 25: Distribution of *Hemidactylus persicus* in Kuwait (Source: IUCN ROWA).

Remarks: It seems that the record of *Hemidactylus turcicus* by Eissa and El Assy (1975) was considered as *Hemidactylus persicus* by Sindaco and Jeremčenko (2008) as shown in the distribution map for *H. persicus.* The Turkish gecko, *Hemidactylus turcicus* distribution is confined to Turkey and southern Europe (Greece, Italy and Spain) (Moravec et al., 2011).

7.3.4 Genus *Stenodactylus*

Digits with well-defined lateral fringe of elongated, flexible pointed scales. Dorsal scales uniform, not intermixed with tubercles. No enlarged postmentals; nostril not protuberant; posterior abdominal scales not larger than dorsal scales. This genus is represented by three species in Kuwait.

Key to species of the genus *Stenodactylus*

1. Toes on fore feet depressed, usually expanded at the base, with 5-13 longitudinal scales rows beneath ……..…….....……..…*Stenodactylus doriae*

   Toes on fore feet not depressed, and not expanded at the base, with three to seven longitudinal scale rows beneath .....……2

2. Nostrils do project anteriorly, back with 4 dark crescentic crossbars ….. *Stenodactylus affinis*

   Nostrils sometimes project strongly, dorsum with an inverted V shaped mark on top of the head ……..……..*Stenodactylus slevini*

7.3.4.1 *Stenodactylus affinis* (Murray, 1884)

Murray's comb-fingered gecko

Figure 26: Murray's comb-fingered gecko, *Stenodactylus affinis* (Photo by A. Alenezi).

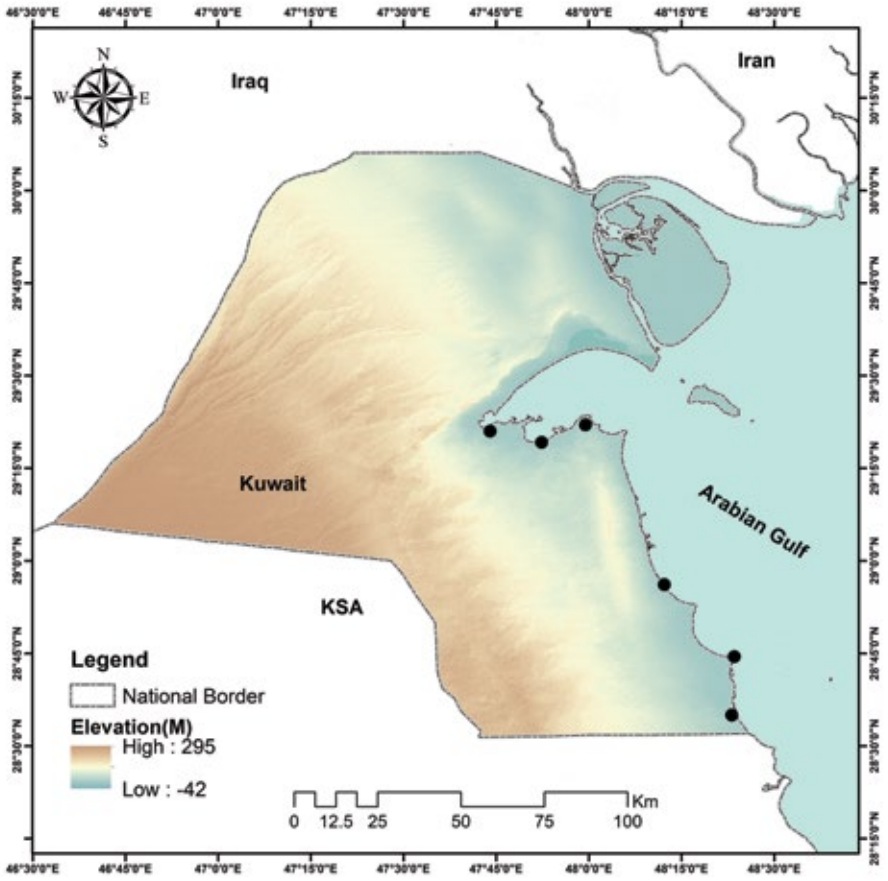

Figure 27: Distribution of *Stenodactylus affinis* in Kuwait (Source: IUCN ROWA).

Distribution range: This species is distributed throughout SE Iraq, Iran and Kuwait (Leviton et al., 1992).

Records from Kuwait: Al Dubaiya, Al Jahrah East Outfall, Al-Nuwaiseeb, Kuwait, Mina Said, W Sulaibikhat Reserve.

Diagnosis: This is a medium-sized gecko up to at least 60 mm from snout to vent; toes not depressed, at most slightly fringed, three rows of scales beneath; rostral and sometimes upper labial scales reach nostril which is directed forwards and sometimes upwards and somewhat outwards; 10-11 upper labials, preanal pores often present, cloacal tubercles in a single row. Tail with 6 to 8 dark bands (Arnold, 1980).

Habitat: Al-Sirhan (2009) found that this species is the dominant gecko species in Al Jahrah East Outfall, inhabiting areas with bushes of *Nitraria retusa.*

Biology: Females have larger body features than males, perhaps as a reproductive advantage for females for developing two large eggs (Torki, 2010).

Remarks: Metallinou et al. (2012) gave a comprehensive account on species of the genus *Stenodactylus* across its distribution range. They showed the existence of three major clades with high divergences.

7.3.4.2 *Stenodactylus doriae* Blanford, 1874

Middle Eastern short-fingered gecko

Figure 28: Middle Eastern short-fingered gecko, *Stenodactylus doriae* (Photo by S. Bogaerts).

Distribution range: Widespread in the Arabian Peninsula. Also recorded from southern Palestine, Jordan, southern Iraq, and southwestern Iran (Leviton et al., 1992).

Records from Kuwait: Al Abraq, Al Jahrah, Al Ritqa, Al Wafrah, Kuwait.

Diagnosis: Medium to large-sized, up to 83 mm from snout to vent; toes depressed with a distinct lateral fringe of pointed, toothed scales and 5-13 rows of scales beneath; rostral and often first upper labial scale reach nostril; 12-15 upper labials, preanal pores nearly always present, cloacal tubercles usually in two rows; autotomy restricted to tail base; prefrontal projection strong; epipterygoid well separated from skull roof in protracted skull; usually 24 presacral vertebrae, six nuchal ribs and six basal caudal vertebrae; clavicle expanded (Arnold, 1980).

Habitat: *Stenodactylus doriae* was collected from habitats with soft, windblown sand. This species is easily collected since it leaves a funnel-like depression at the site where it is hidden in the early morning. It is entirely nocturnal and peak activity is just after sunset. Sand-dunes are the perfect habitat for this species. Individuals are usually observed in open areas away from vegetation. When alarmed, the animal inflates its body with the forearms

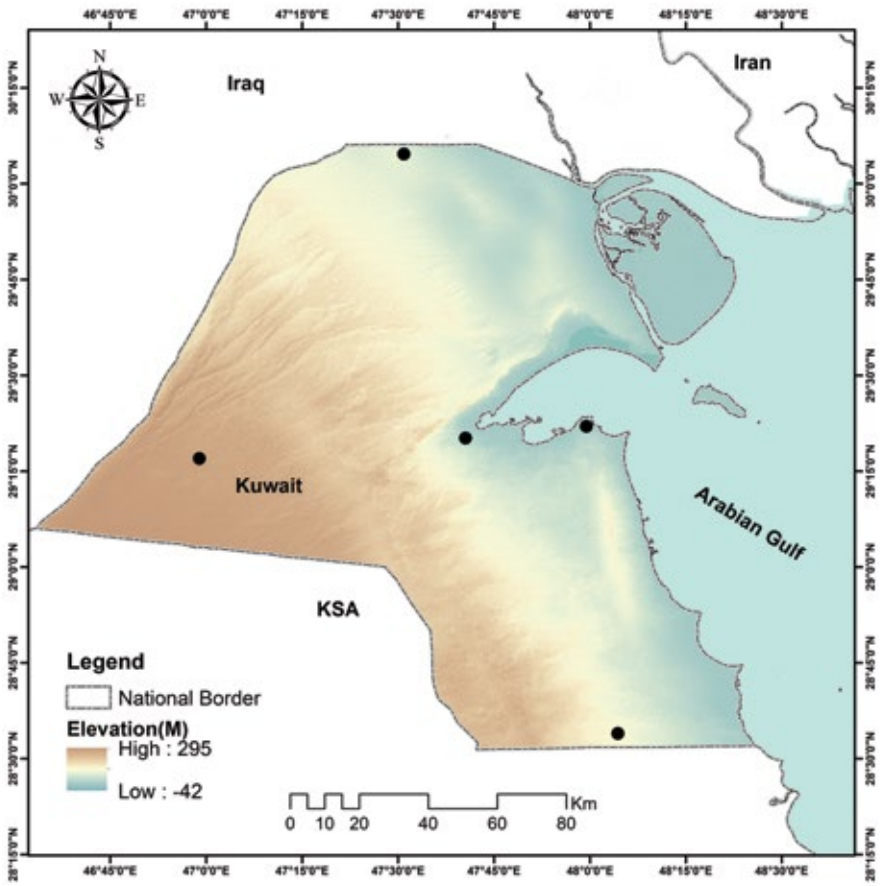

Figure 29: Distribution of *Stenodactylus doriae* in Kuwait (Source: IUCN ROWA).

extended to their full length.

Biology: In the United Arab Emirates, remains of this species were recovered from the Little Owl pellets (Cunningham & Aspinall, 2001).

Remarks: Metallinou et al. (2012) gave a comprehensive account on species of the genus *Stenodactylus* across its distribution range. They showed the existence of three major clades with high divergences.

7.3.4.3 *Stenodactylus slevini* Haas, 1957

Slevin's short-fingered gecko

Figure 30: Slevin's short-fingered gecko, *Stenodactylus slevini* (Photo by A. Alenezi).

Distribution range: It is widespread across Bahrain, S Jordan, S Iraq, Kuwait, Qatar, NW Saudi-Arabia, W United Arab Emirates and Yemen (Sindaco & Jeremčenko, 2008).

Records from Kuwait: Al Ritqa, Al-Salmi, SW Fintas Towers, Kuwait, Mahboula, Sabah Al-Ahmad Nature Reserve.

Diagnosis: Medium-sized, up to 63 mm from snout to vent; toes not depressed, without a distinct lateral fringe, three rows of scales beneath; rostral reaches nostril but first upper labial scale usually does not; preanal pores may either be present or absent; cloacal tubercles typically in a single row. Tail usually with 7-12 regular and conspicuous dark bands extending to the tip (Arnold, 1980).

Habitat: The Slevin's short-fingered gecko was found in sandy areas in Kuwait. It was also found to inhabit gravel plains.

Biology: No information is available on the biology of this species.

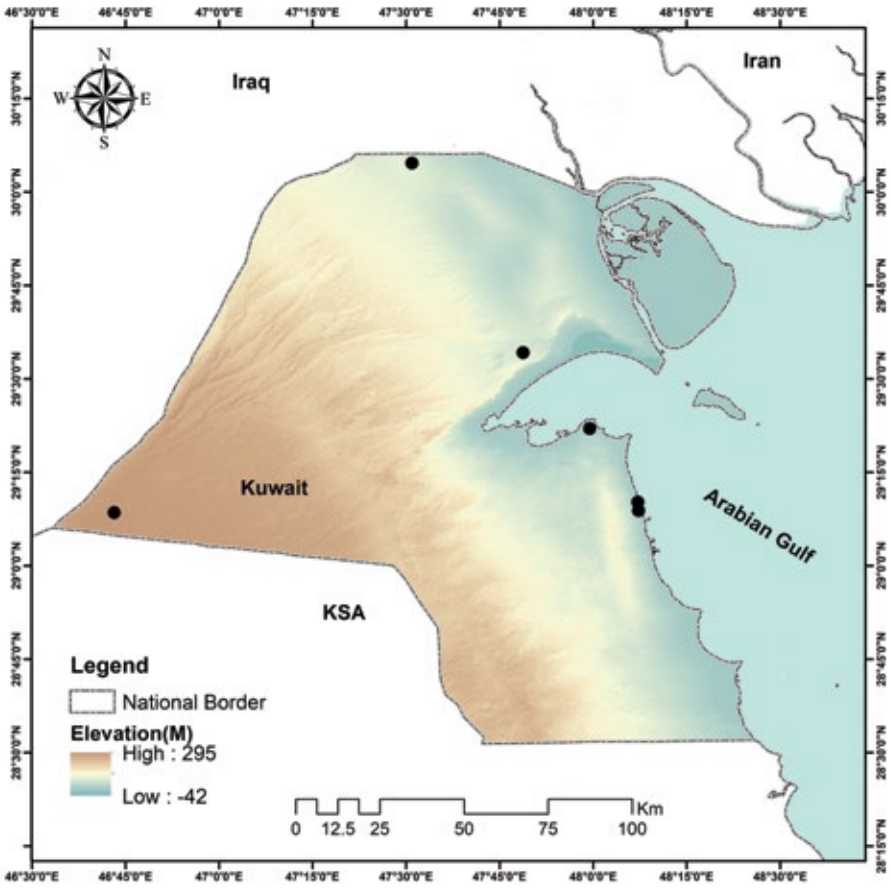

Figure 31: Distribution of *Stenodactylus slevini* in Kuwait (Source: IUCN ROWA).

Remarks: Metallinou et al. (2012) gave a comprehensive account on species of the genus *Stenodactylus* across its distribution range. They showed the existence of three major clades with high divergences.

7.3.5 Genus *Pseudoceramodactylus*

This is a monotypic genus wit a single species; *Pseudoceramodactylus khobarensis.* It is characterised by enlarged postmental scales, posterior ventral scales larger than dorsals and only a short series of caudal vertebrae with transverse processes. Medium-sized, up to 56 mm from snout to vent; toes not depressed or fringed, 10-15 rows of sharply pointed scales beneath; rostral scale reaches nostril but first upper labial excluded; preanal pores absent; cloacal tubercles usually in two or three rows.

7.3.5.1 *Pseudoceramodactylus khobarensis* Haas, 1957

Gulf short-fingered gecko

Figure 32: Gulf short-fingered gecko, *Pseudoceramodactylus khobarensis* (Photo by A. Alenezi).

Distribution range: Recorded in Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates and S Iran Metallinou et al. (2014).

Records from Kuwait: Al Jahrah East Outfall, Al Ritqa Police Station, Al Subiya, Al Wafrah Farms.

Diagnosis: Enlarged postmental scales, posterior ventral scales larger than dorsals and only a short series of caudal vertebrae with transverse processes. Medium-sized, up to 56 mm from snout to vent; toes not depressed or fringed, 10-15 rows of sharply pointed scales beneath; rostral scale reaches nostril but first upper labial excluded; preanal pores absent; cloacal tubercles usually in two or three rows.

Habitat: Valdeón et al. (2013) stated that this species was found to inhabit coastal areas in Qatar, but was also found in inland sabkhas. It is associated with ~~on~~ moist, salt-impregnated to solid, salt-encrusted flats, where it is considered as the sole dweller in such an extreme environment (Metallinou et al., 2014).

Biology: This is a nocturnal gecko associated with salt marches.

Remarks: This species was recorded in Kuwait by Al-Sirhan (2009). Metalli-

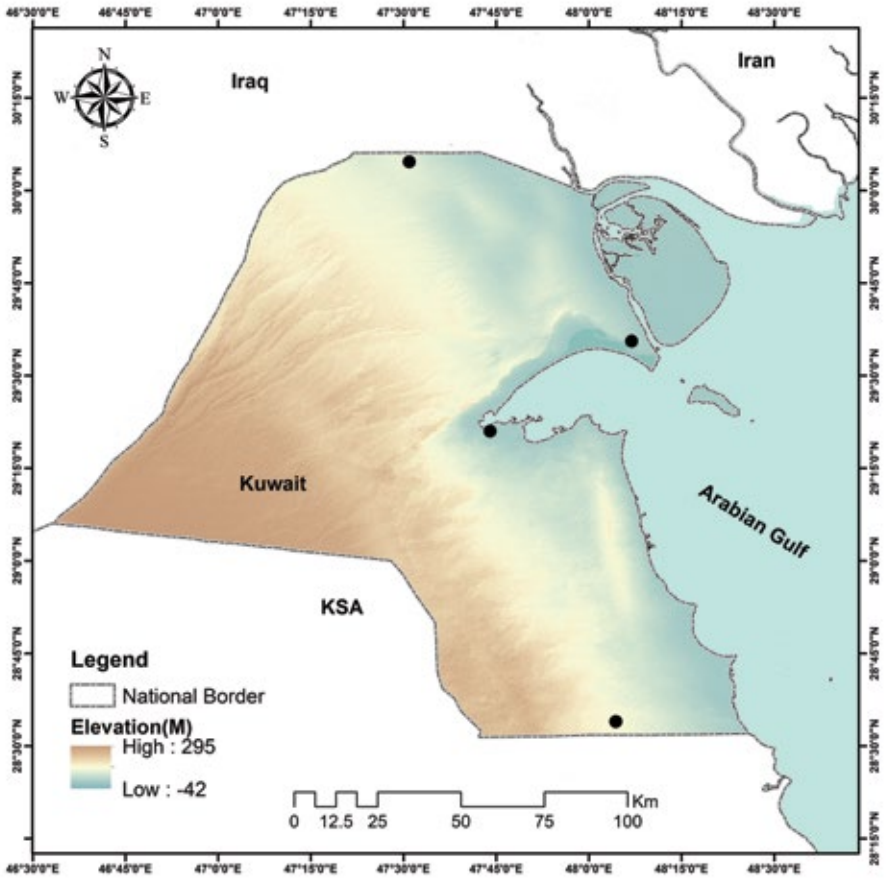

Figure 33: Distribution of *Pseudoceramodactylus khobarensis* in Kuwait (Source: IUCN ROWA).

nou et al. (2014) updated the distribution map of the gulf short-fingered gecko in the eastern Arabian Peninsula and Iran.

7.3.6 Genus *Trigonodactylus*

Body very slender and flattened. Head elongated and relatively narrow. Fingers and toes have large triangular elongated scales that form a web. Undersides of fingers are covered by small, imbricate and triangular scales. Dorsal scales slightly keeled and elliptical in shape. Ventral scales are slightly keeled. Femoral pores are absent.

7.3.6.1 *Trigonodactylus arabicus* (Haas, 1957)

Web-footed sand gecko

Figure 34: Web-footed sand gecko, *Trigonodactylus arabicus* (Photo by L. Pola).

Distribution range: The distribution of this species ranges across eastern Arabia including Kuwait, Saudi Arabia, Qatar, United Arab Emirates, S Oman, Bahrain and east to Iran (Sindaco & Jeremčenko, 2008).

Records from Kuwait: Agriculture Research Station at Kabed, Al Wafrah farms.

Diagnosis: This is a small gecko with snout to vent length not exceeding 40 mm. Feet extensively webbed and broad. Toes depressed with a lateral fringe of pointed scales and many scales beneath; Rostral and upper labials scales reach the nostril. Femoral pores absent; cloacal tubercles are usually arranged in a single row.

Habitat: In Kuwait, it was found in an area dominated by *Cyperus conglomeratus,* with loose, flat sand sheets (Delima & Al-Nasser, 2007). It is the only genus with interdigital webbing an adaption enabling it to walk on loose sand (Pola et al., 2021).

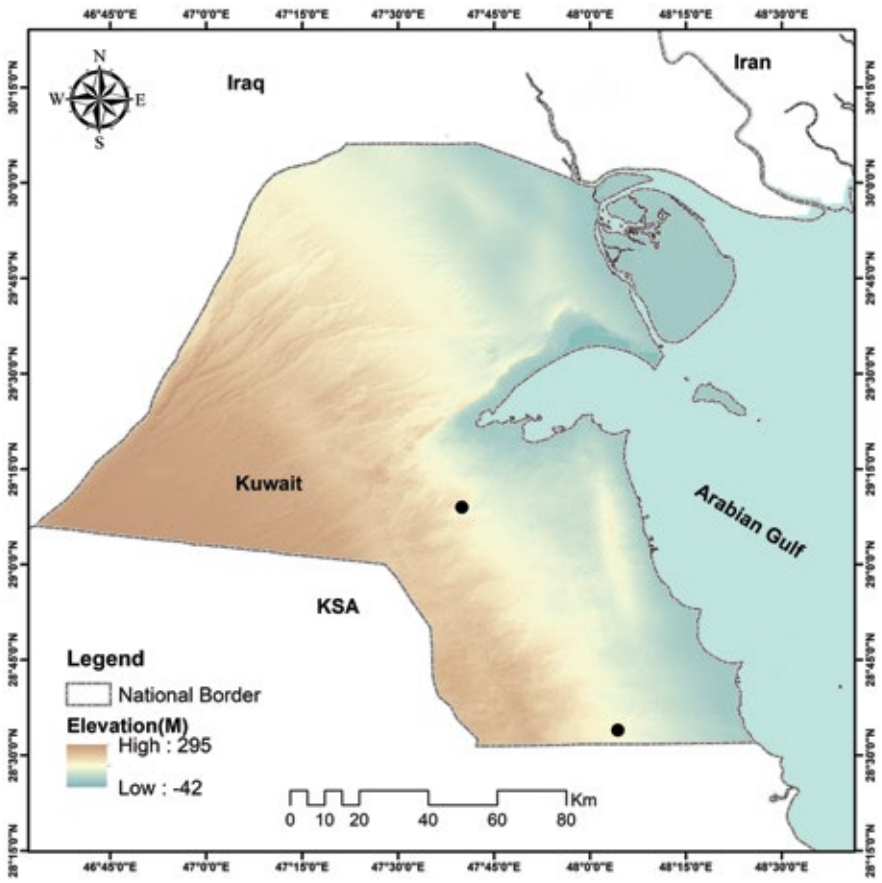

Figure 35: Distribution of *Trigonodactylus arabicus* in Kuwait (Source: IUCN ROWA).

Biology: This is a nocturnal species. It preys on small insects and other arthropods. Females usually lay a single egg per clutch. No data is available on its biology.

Remarks: This species was recorded by Delima and Al-Nasser (2007) for the first time in Kuwait. Previously, it had been listed as *Stenodactylus arabicus.*

7.4 Family Agamidae

Head covered dorsally by numerous polygonal scutes or scales; eyes have well-developed movable eyelids; eyes small, round pupil, nostril in a separate plate; tongue wide and short without notch anteriorly, smooth or covered with villose papilla, slightly incised in front; tail long, tapering, usually not breakable and may be regenerated; well-developed pentadactyl limbs; femoral pores present in *Uromastyx;* callose preanal scales appear when sexual maturity is reached, while absent in young specimens; scales on the dorsum imbricate or granular; spines if present mainly on the head and on tail.

Five species within three genera (*Phrynocephalus, Trapelus* and *Uromastyx*) were recorded from Kuwait. The Egyptian spiny-tailed lizard, *Uromastyx aegyptius,* is a species with special conservation value.

Key to Genera of Family Agamidae

1. Tympanum is covered, hidden under skin or absent; snout very short; no gular sac; tail rounded, depressed at base; preanal or femoral pores are absent..... *Phrynocephalus*

   Tympanum exposed; snout normal; digits without lateral denticulation.....2

2. Femoral pores present; dorsal scales uniform; tail thick, strongly depressed, shorter than snout-vent length, dorsally covered by whorls of very large spiny tubercles; two or more transverse rows of scales on the ventral side of the tail correspond to one on the upper surface ....*Uromastyx aegyptius*

   Femoral pores absent; dorsal scales may be heterogeneous; tail longer than snout-vent length....3

4. Ear opening large, often with one or two pointed scales on its anterior edge; third hind toe longer than fourth ..... *Pseudotrapelus*

   Ear opening small, may have denticulated scales; fourth hind toe longer than third; dorsal scales heterogeneous ..... *Trapelus*

7.4.1 Genus *Phrynocephalus*

Tympanum covered or hidden under thick skin; digits with lateral fringe; snout very short; head short, thick and high; nostrils are close to each other, and can be closed; ear opening and eyes small; eyelids thick; rostral absent, replaced by several supraciliary edge strongly projecting, forming a fringe over the eye; transverse gular fold but no gular sac; body depressed; no dorsal crest; dorsal scales very small; uniform or intermixed with larger ones, and tail rounded, depressed at base; no preanal or femoral pores.

Two species of the genus *Phrynocephalus* have been reported from Kuwait; *Phrynocephalus arabicus* and *Phrynocephalus maculatus.*

Key to species of the genus *Phrynocephalus* in Kuwait

1. Scales on the ventral side of the fourth toe, each with a single keel; the toes attain strong fringes of pointed scales; scales surrounding nostrils typically in contact on midline; often 3-4 rows of scales between eye and lip; scales on upper cheek region often strongly enlarged …… ……..……..…… *Phrynocephalus arabicus*

   Scales on the ventral of fourth toe each with several keels; fringes of pointed scales on toes moderate; scales surrounding nostrils typically separated from each other on midline; often five to six rows of scales between eye and lip; scales on upper cheek region not very enlarged ……..…… *Phrynocephalus maculatus*

7.4.1.1 *Phrynocephalus arabicus* (Anderson, 1894)

Arabian toadhead agama

Figure 36: Arabian toadhead agama, *Phrynocephalus arabicus* (Photos by A. Al Yousef).

Distribution range: SE Saudi Arabia, Qatar, United Arab Emirates, Kuwait, Oman, Iran, S Iraq, Jordan (Sindaco & Jeremčenko, 2008).

Records from Kuwait: Al Abatih, Al Atraf, Al Shigaya, Kabed and Umm Niqa.

Diagnosis: Dorsoventrally flattened body and round head; without a gular sac. Nasals are in contact and directed upwards. There are no cutaneous folds at angle of mouth; scales surrounding nostrils typically in contact on mid-line; sides of head and neck without projecting fringe-like scales; three to four rows of scales between eye and lip; scales on upper cheek region often

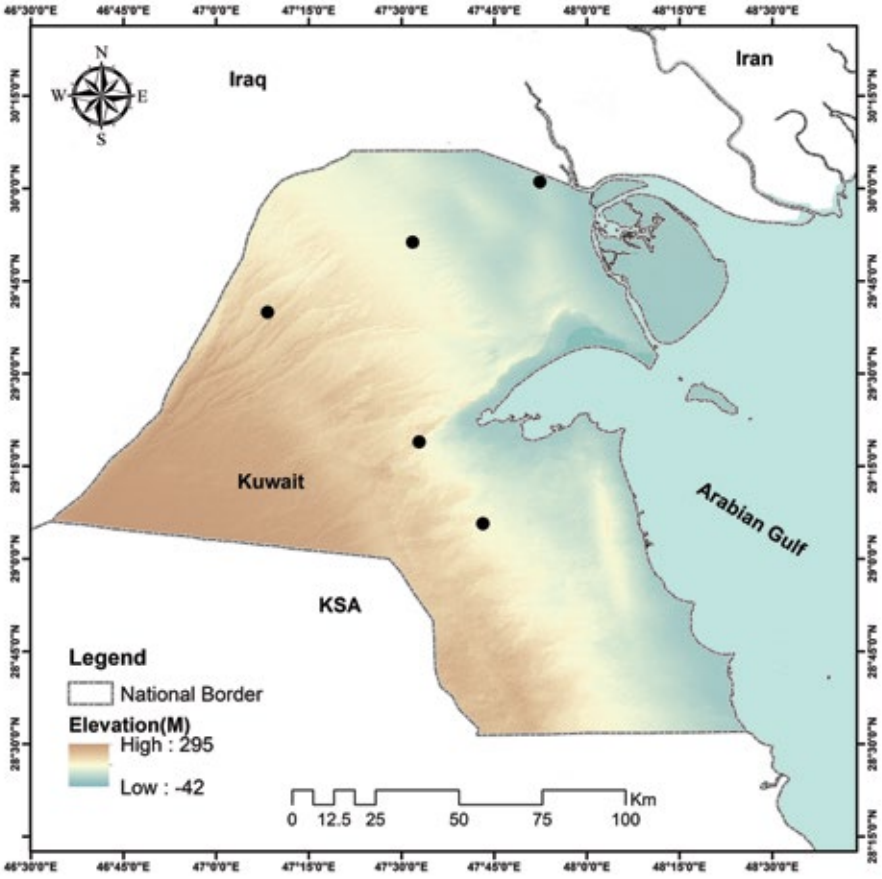

Figure 37: Distribution of *Phrynocephalus arabicus* in Kuwait (Source: IUCN ROWA).

strongly enlarged; dorsal scales smooth to weekly keeled and subequal, homogenous; scales on underside of forth toe with a single keel; the toes attain strong fringes of pointed scales. Tail is rounded, depressed at base.

Habitats: This is a diurnal species, typically found in soft, wind-blown sand habitats but can occupy harder and drier substrates with sparse vegetation.

Biology: Ross (1995) recognised three types of tail signals; territorial, aggression and submission/appeasement. The typical display behaviour of dominant males is curling the tail tightly up over its back and then uncurling it after that. It repeats this ritualised signal several times, even if it changes its place. Females use different tail signals (Ross, 1995). If it is pursued, it runs away and hides in small holes at the base of desert shrubs When threatened, it stands on fully erected limbs with opened mouth and the tail is rolled up or it quickly buries itself into the loose sand by rapidly shaking its whole body.

Breeding season starts in March-April (Ross, 1995). In two gravid females only one egg was found. Females usually produce one to two eggs (Arnold, 1984; Ross, 1995). It follows a “sit and wait” hunter foraging, and feeds on arthropods.

Remarks: The taxonomic status of the *Ph. arabicus* complex is still requires further evaluation for the populations in eastern Arabia. Melnikov et al. (2014) showed that at least three taxa of this complex occur within the Arabian Peninsula; *Ph. arabicus sensu stricto* for the southern Arabian populations, *Ph. nejdensis* from the northwestern Arabian populations including southern Jordan, and *Ph. macropeltis* representing the populations in eastern coastal Arabia.

7.4.1.2 *Phrynocephalus maculatus* Anderson, 1872

Blacktail toadhead Agama

Figure 38: The blacktail toadhead agama, *Phrynocephalus maculatus* (Photo by A. Alenezi).

Distribution range: Kuwait, N Saudi Arabia, Oman, United Arab Emirates, Iran, Turkmenistan, Syria, Jordan, Iraq, Afghanistan, Pakistan, Pakistan (Sindaco & Jeremčenko, 2008).

Records from Kuwait: Auhha Island, Al Ahmadi and Burgan hills, Jal Az Zour, Khiran, Kuwait, Sabah Al-Ahmad Natural Reserve.

Diagnosis: Nasals are separated by three scales, and nostrils are directed forwards. In the parietal area of the head, there are enlarged scales. Dorsal scales homogeneous, smooth grandular; no enlarged scales along flanks, fin-

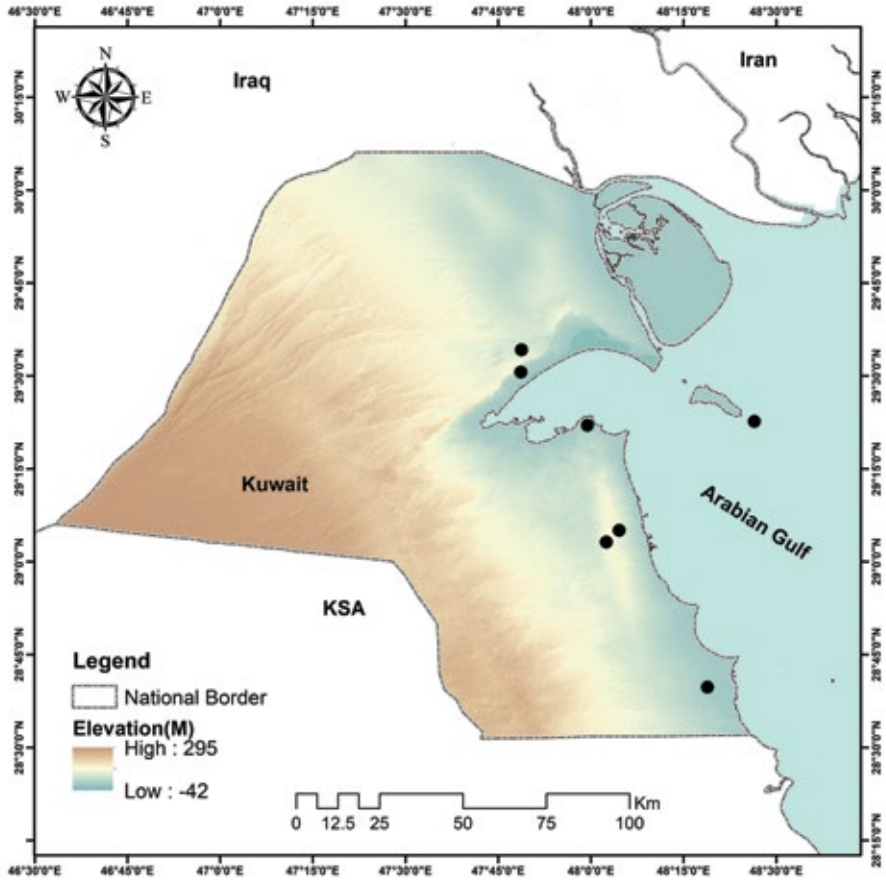

Figure 39: Distribution of *Phrynocephalus maculatus* in Kuwait (Source: IUCN ROWA).

gers show only moderate pectination. Scales on the underside of the fourth toe each with several keels, fringes of pointed scales on toes moderate; 5-6 rows of scales between eye and lip; scales on upper cheek region not strongly enlarged.

Habitats: Al-Sirhan and Brown (2010) stated that this species occurs in inland sandy desert but prefers firmer substrates, such as coastal sabkhas and rocky islands. This is true in Jordan, where it was found in open flat areas at the margins of salt mud flats known as *sabkha* (Abu Baker et al., 2005). In Iran and Pakistan, *P. maculatus* occupies flat desert with low scattered shrubs, and substrates of sandy gravel-strewn hammada, and on barren salt flats (Anderson, 1999). It was reported in SE Al-Samawa, Iraq on shrubs or buried in the soil (Al-Barazengy, 2014).

Biology: When alarmed, it curls its tail tightly upward over its back, and then uncurls it backwards. If further approached, it runs to nearby vegetation, and

may rapidly and fully bury itself in the sand by lateral oscillations (Abu Baker et al., 2005). *Phrynocephalus maculatus* uses their tails for intraspecific signaling by curling the tail upwards. It is a "sit and wait" hunter, utilizing its very good eyesight. In addition, sitting on a high area overlooking the surrounding habitat also helps it detect its prey. (Ross, 1989). *Phrynocephalus maculatus* avoids predation by having cryptic colouration of the dorsum with the substrate. Moreover, lying in a small depression or flat on the ground reducing its shadow is possibly the animal's first line of defense when threatened. It occupies open areas and thermoregulation by posture and possibly by adopting pale colouration as it becomes hotter. If approached by predators, it will sometimes face them stand high on its legs with its tail curbed upwards (Ross, 1989).

Remarks: This is a common species associated with mixed sand and gravel vegetated areas. Al-Sirhan and Brown (2010) gave an account of its presence in Kuwait.

7.4.2 Genus *Trapelus*

Head convex and short; ear exposed and its diameter less than half that of the orbit; toes not compressed and short; tail covered by enlarged scales not forming annuli; males with callous preanal scales only.

Key to species of the genus *Trapelus*

1. Dorsal scales imbricate and keeled mixed with strongly tubercular enlarged scales on the body and hind limbs .....……..*Trapelus agnetae*

2. Dorsal scales uniform without keels or tubercles, no enlarged scales on the hind limbs…..…… *Trapelus persicus*

7.4.2.1 *Trapelus agnetae* (Werner, 1929)

Figure 40: *Trapelus* agnetae. A. Male. B. Female (Photos by A. Al-Yousef).

Distribution range: This species is known to occur across Jordan, Iraq, N Saudi Arabia and Kuwait (Arnold, 1986; Sindaco & Jeremčenko, 2008).

Records from Kuwait: Al Liyah Reserve, Al Ritqa, Al Salmi.

Diagnosis: Body short, depressed; head triangular, longer than broad, very convex, short and thick; upper head scales nearly smooth, some enlarged scales, occasionally with feeble keels, on the temporal and supratemporal regions, a few occipital scales; without gular pouch; nasal shield flat; nostril slightly above the canthus rostralis; ear opening longer than high, nearly twice as long as high bordered above by a row of conspicuous spines (three to five arranged in one or two rows); these scales do not exist in the nominotypic form, upper labials 17-19; lower labials 17-19; third finger shorter than fourth, fifth not exceeding as far as the second ; third toe much shorter than fourth, fifth not extending as far as the first; males possess one to three rows (the most common two) of anal pores, total number of anal pores per row 9-13; while females without anal pores; body covered above with small irregular, imbricate, indistinctly keeled scales, intermixed with irregular scattered much larger ones each of which bears a short keel or spine, ventral scales smooth;

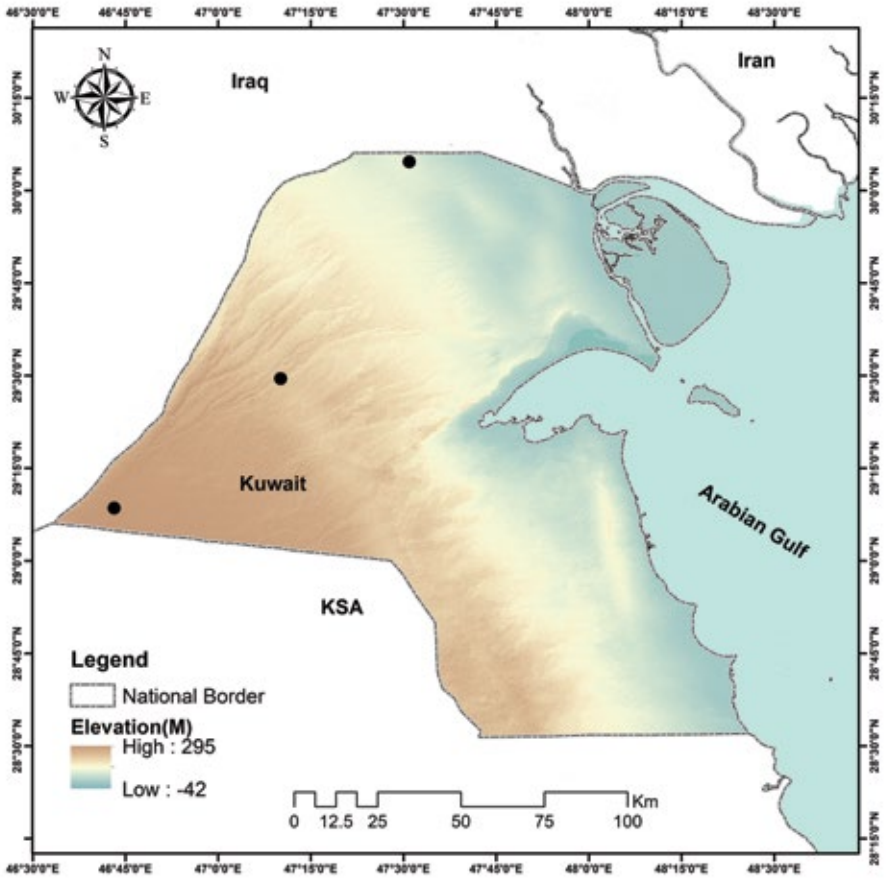

Figure 41: Distribution of *Trapelus agnetae* in Kuwait (Source: IUCN ROWA).

number of lamellae under fourth toe: 18-24 (21-22 the most common); tail rounded, depressed at base, not segmented, with keeled scales intermixed with enlarged ones at the base.

Habitats: *Trapelus agnetae* was found either on open flat areas with rocks or in depressions filled with fine sand and some vegetation as well as in loamy and gravely steppe areas.

Biology: It is a diurnal lizard and carries out its highest activity in the morning or afternoon. One of the following three responses may occur in defensive behaviour: Fleeing when the ambient temperature is high, the adaptive agama flattens its body to the ground and stays motionless; or performs aggressive behaviour facing the intruder with its mouth open. Females usually lay three to six eggs.

7.4.2.2 *Trapelus persicus* (Blanford, 1881)

Figure 42: *Trapelus persicus* (Photos by A. Al-Yousef).

Distribution range: Northern Saudi Arabia, Kuwait, Jordan, Syria, Iraq and most likely the Ahwaz plain in southern Iran (Anderson, 1999).

Records from Kuwait: Al Jahrah Governorate, Al Jalia, Al Wafrah, Kabed Reserve, Kuwait, Sulaibikhat, Umm Niqa, Zayed Reserve.

Diagnosis: Head convex; canthus rostralis continued as a superciliary ridge; ear exposed and not larger than the eye opening; upper edge of the ear with double rows of mucronate scales; few short spines on the temporal regions; distinct keeled scales on head; nostril is positioned in the posterior part of a flat nasal; barely above the canthus; large gular scales and nuchal crest in males; upper head scales are more or less keeled; there is a group of spiny scales in post-temporal region. Males with a double (sometimes single) row of false preanal pores; scales on the dorsum are unequal, rhomboidal, imbricate, keeled and shortly mucronate; back and flanks with intermixed scales of varying sizes; lateral and ventral scales are smaller than dorsals, ventral scales are distinctly keeled; 74-85 scales around the middle of the body; limbs are moderately long; fifth toe not extending as far as first; third finger shorter than fourth, fifth not extending as far as second; tail rounded, covered with equally keeled scales not forming annuli and about one and three-fourths to two and one-half times as the distance from the gular fold to vent.

Habitats: Field's agama is diurnal, heliophilous and has been recorded from areas on the fringe of dunes with low vegetation. Males bask at the top of the shrub and remain motionless for several hours at mid-noon when the ambient temperature exceeds 40°C. Females bask on lower parts of bushes. This species is ground dwelling, but often climbs small shrubs and twigs during hot summer days. Perched on bushes up to one metre height above the ground

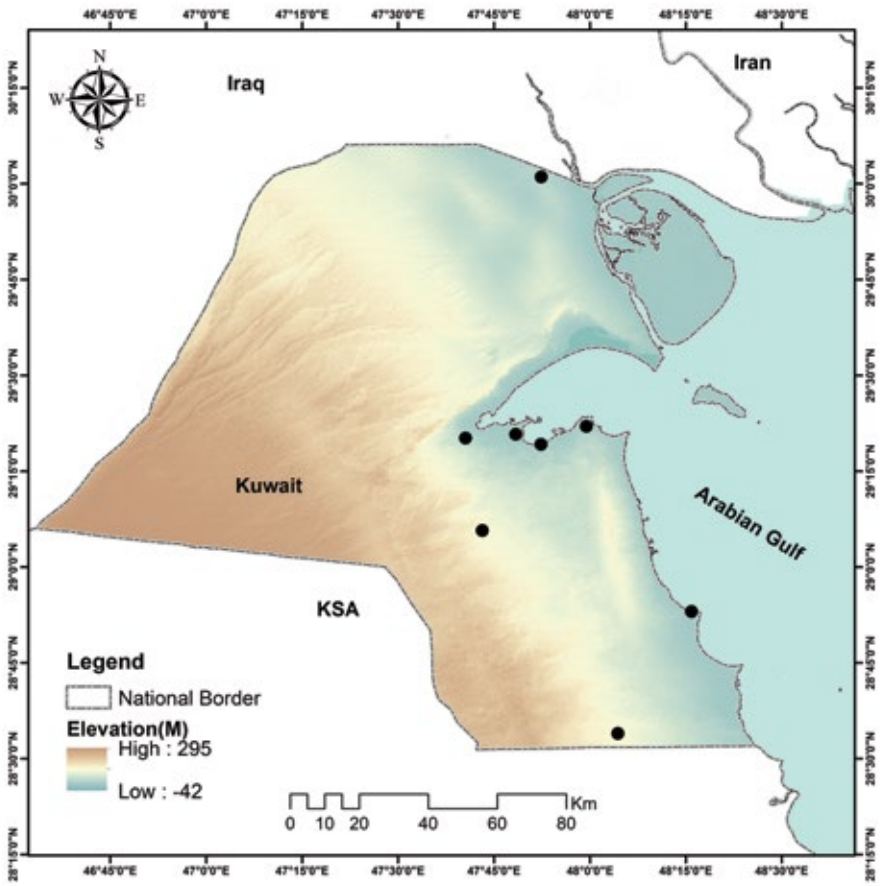

Figure 43: Distribution of *Trapelus persicus* in Kuwait (Source: IUCN ROWA).

for extended periods of time may provide convective cooling for these animals (Disi, 2002).

Biology: They are “sit and wait” foragers, feeding on different types of invertebrates. The proclaiming male stays on the highest twigs, as an observational point, for several hours and adjusts its body according to the orientation of the sun. Moreover, males can control their body temperature through different processes: by attaining light colouration at midday; different postures at different times of the day, and changing the distance between themselves and the plants which allow for an increase or decrease of the movement of air currents around their bodies. Females lay seven eggs.

Remarks: Leviton et al. (1992) noted the presence of nominotypic subspecies in Jordan which has not yet been confirmed. Anderson (1966) suggested the name *Agama blanfordi* instead of *Agama persica* citing priority of this name

as the reason. After splitting the genus *Agama* and reintroducing the genus *Trapelus,* the first specific name *persica* should be used. Rastegar-Pouyani (2000) published a controversial opinion on the identity of *T. persicus, where he* stated that the specific name *"ruderatus"* (Olivier, 1804) antedates *"persicus"* (Blanforld, 1804), and consequently, the new taxonomic combination is *Trapelus ruderatus ruderatus* (Olivier, 1804) (the former *T. p. persicus),* the western subspecies *T. p. fieldi* has a new taxonomic combination. The name *"persicus"* is no longer available and comes under the synonymy of *"ruderatus".*

Ananjeva et al. (2013) clarified the systematic position of *Trapelus ruderatus* in relation to *T. persicus,* and for constancy and to stabilize the taxonomy of this group, the International Code of Zoological Nomenclature ruled that these two species are separate.

7.4.3 Genus *Uromastyx*

Tympanum exposed, large, vertically elliptical; both preanal and femoral pores present in males, each pore surrounded by a complete circle of small scales; tail short, depressed, thick, covered with well-defined whorls of large spinous scales which do not extend on its ventral side; head small, short, rounded, feebly depressed, upper head scales smooth much larger than those on the body; nostrils small, closer to the end of snout than to the eyes; eyelids present; no gular pouch, presence of a transverse fold on throat; body depressed, without crest; dorsal scales small, granular, smooth, uniform or intermixed with larger ones; ventral scales small, smooth; limbs short and thick; spinous conical tubercles on hind limbs.

7.4.3.1 *Uromastyx aegyptius* (Forskål, 1775)

Egyptian spiny-tailed lizard

Distribution range: Arabian Peninsula, Syria, Palestine, Kuwait, Jordan, Iraq, North Africa, Egypt including Sinai Peninsula and southwestern Iran.

Records from Kuwait: Al Atraf, Al Salmi, Al Liyah, Al Mutla, Al Wafrah, SW Fintas Towers, Kabed, Kadma, Kuwait, Mahboula, Rhawdatain.

Diagnosis: The largest agamid lizards with a thick spiny tail. Head is cordiform with rounded short snout. Enlarged scales border the anterior side of the ear. Scales on body small; no enlarged scales on back or flanks; presence of preanal and femoral pores. Extremities are remarkably strong, with short toes and short thick claws. Whorls of spiny scales on upper surface of tail not separated by small scales; two or more transverse rows on lower surface of tail corresponded to one on upper surface; upper labials 13-15; lower labials 13-16; more than 300 scales around midbody number of whorls on the tail 20-23; femoral pores 18-20 on each side; lamellae under first finger 8-9, and 17-20 under fourth finger; lamellae under first toe 9-10 and 21-23 under fourth toe (Disi et al., 2001).

Figure 44: Egyptian spiny-tailed lizard, *Uromastyx aegyptius* (Photo by A. Alenezi).

Habitat: The Egyptian dabb lizard inhabits flat gravelly hard substrate and is never seen on sandy habitats. The dabb prefers plains and avoids moderate slopes.

Biology: The Egyptian spiny-tailed lizard is a generalist herbivore, usually feeds on a large variety of non-halophyte desert plants near its burrow in early spring. In summer, it switches to feeding on only one species, and prefers to feed close to its burrow, and that may reduce predation (Bouskila, 1985). Stomach content analysis showed that the adults feed on *Anabasis* sp. and *H. persicum.*

It is heliothermic. The lowest level of activity was recorded from December to mid-February, with the exception of the young. It has two major activity periods, a pre-noon and a pre-dusk during summer months. Wilms et al. (2009) gave a comprehensive account of the seasonal activity of *U. a. microlepis* in Saudi Arabia. A bimodal activity in spring and summer, with 73% total observed animals, occurred during these two seasons, while a unimodal activity was observed during autumn. Peak activity was recorded in early afternoon.

The Egyptian spiny-tailed lizard is mostly solitary, or lives in groups of different composition, but only with a dominant male. It spends most of its time sitting in a lookout posture close to the den. The dabb can regulate its body temperature by changing colouration as temperatures reache 39-40°C, or by changing its posture according to the orientation of the sun, or by panting and gular fluttering when the temperature reaches 42°C (Mendelssohn & Bouskila, 1989).

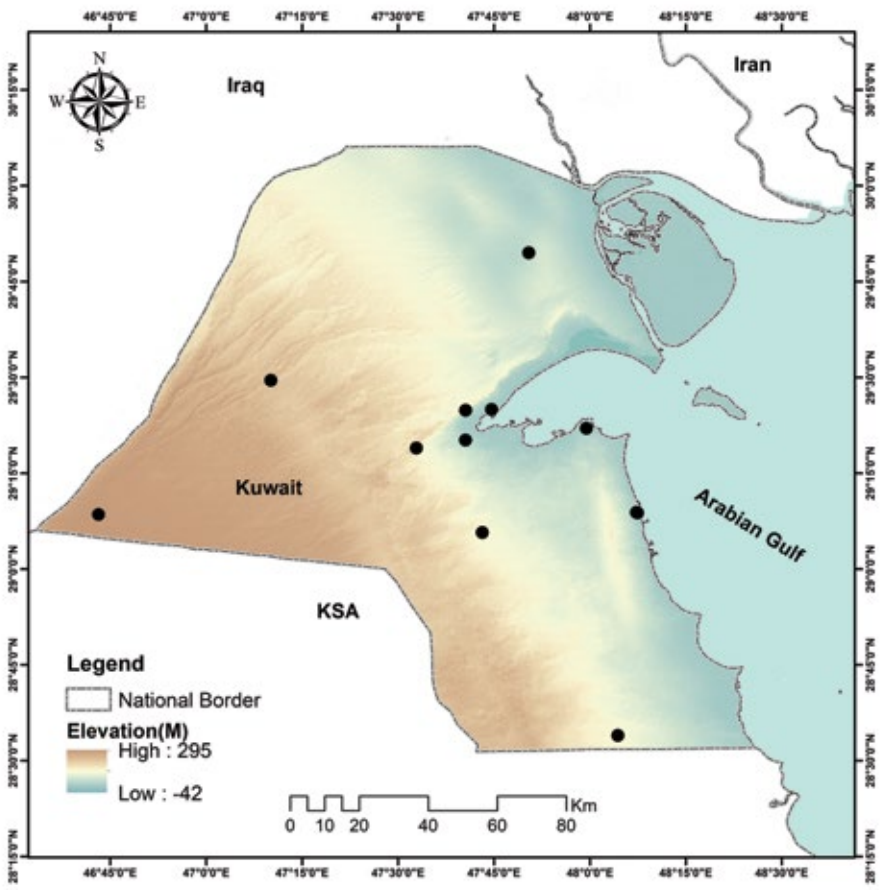

Figure 45: Distribution of *Uromastyx aegyptius* in Kuwait (Source: IUCN ROWA).

Moreover, *U. a. microlepis* controls its temperature by behavioural postures, climbing on stones, and colour changes in relation to the time of the day. Annually, in May females lay one clutch which consists of 17-41 eggs. It takes about nine weeks for eggs to hatch. Females usually lay eggs in separate nesting burrows, which are close to the main dwelling burrows of the female.

Remarks: This is a common species in the arid habitats of Kuwait with many records as mentioned above. The spiny-tailed lizard, *Uromastyx aegyptius,* was the focus of several studies. Food plants consumed by this species were studied by Robinson (1995). Wilms and Böhme (2007) revised the distribution and systematics of lizards of the genus *Uromastyx* in Arabia, including Kuwait. Al-Sayegh (2017) conducted a comprehensive study on the eco-physiological (body mass, tail volume, body temperature, and active hours) implications on the conservation of this species in two protected and two non-protected locations in Kuwait.

7.5 Family Trogonophidae

The Amphisbaenia is characterised by limbless burrowing lizards. Their phylogenetic relationship to other squamate remain poorly understood. This family is represented by a single species in Kuwait, zarudnyi's worm lizard, *Diplometopon zarudnyi.*

7.5.1 *Diplometopon zarudnyi* Nikolsky, 1907

Zarudnyi's worm lizard

Figure 46: Zarudnyi's worm lizard, *Diplometopon zarudnyi* (Photos by A. Alenezi).

Distribution range: This species was recorded in W Iran, S Iraq, Kuwait, N Saudi Arabia, Oman, United Arab Emirates and Qatar.

Records from Kuwait: Ahmad Al Jaber Air Base, Al Shlallal Farm, Al Subiya, Al Wafrah Kuwait, Mahboula, Ras Al-Ardh, Shiggat Ai-Awazin, Shuaiba Coast, Wadi Al-Tilha.

Diagnosis: Body is cylindrical in shape terminating with a tapering tail. Body is covered by small scales of almost equal size, forming rings around the entire body. Limbs are absent. Head with 4-5 large plates, and wedge-shaped.

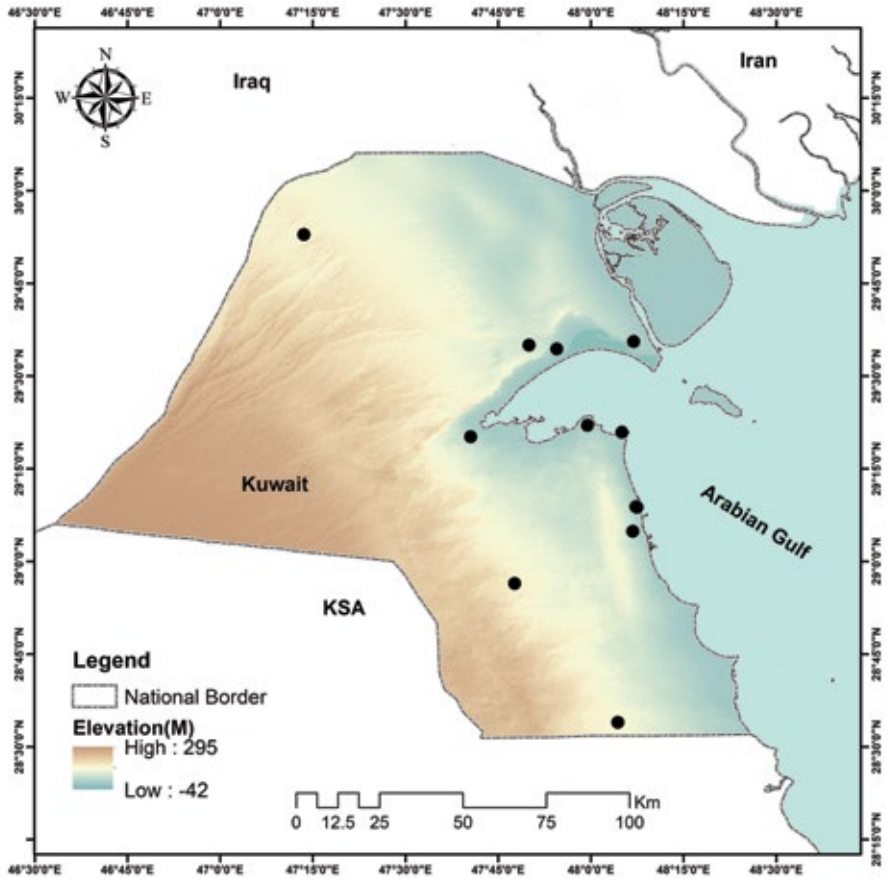

Figure 47: Distribution of *Diplometopon zarudnyi* in Kuwait (Source: IUCN ROWA).

Eyes are covered by translucent skin. Body colouration is usually pink to purple, speckled with dark brown spots or flecks.

Habitat: This is a fossorial species associated with sand deserts across its known range, it was found to inhabit sand dunes and sand sheets, as well as sandy beaches (Gardner, 2013). In Kuwait, it was collected and observed in sand areas across the whole country (Amr et al., 2021). It lives in deep sandy soil.

Biology: Zarudnyi's worm lizard is a nocturnal species. It feeds mainly on beetles and their larvae (Al-Sadoon et al., 2016). In Saudi Arabia, this species commences its activities at 20.00 hrs, where the ground temperature ranges between 30-32°C, and retreats between 03:00-04:00 hrs. It is evident that *D. zarudnyi* can tolerate a wide range of temperatures, keeping its mean body temperature within a narrow range (Al-Johany, 1999).

7.6 Family Scincidae

The skinks of Kuwait are exemplified in four species representing three genera (*Ablepharus, Chalcides* and *Scincus*). Species of the genus *Scincus* are strictly sand-dwelling species. Arnold and Leviton (1977) revised species of the genus *Scincus* in Arabia.

Key to Genera of Family Scincidae

1. Eyelids immovable, fore- and hindlimbs are present ..... *Ablepharus*
   Eyelids movable, limbs well-developed, reduced or absent 2
2. Digits fringed laterally ..... *Scincus*
   Digits not fringed laterally ..... *Chalcides ocellatus*

7.6.1 Genus *Ablepharus*

Eyelids are not movable, eye covered by a transparent disk. Ear distinct or hidden. Nostril pierced in the nasal; supranasal absent. Limbs nearly developed with five toes.

7.6.1.1 *Ablepharus pannonicus* (Fitzinger, 1823)

Asian snake-eyed skink

Figure 48: Asian snake-eyed skink, *Ablepharus pannonicus* (Photo by A. Alenezi).

Distribution range: Southern former states of the Soviet Union, Iran, Iraq, Oman, Afghanistan, Pakistan, Jordan, Syria, United Arab Emirates, NW India.

Records from Kuwait: Al Jahrah Farms, Abdali Farms.

Diagnosis: Head small and not broader than neck; limbs very short. Eye covered by a transparent spectacle. Midbody scales 18-20 around. Tail thick

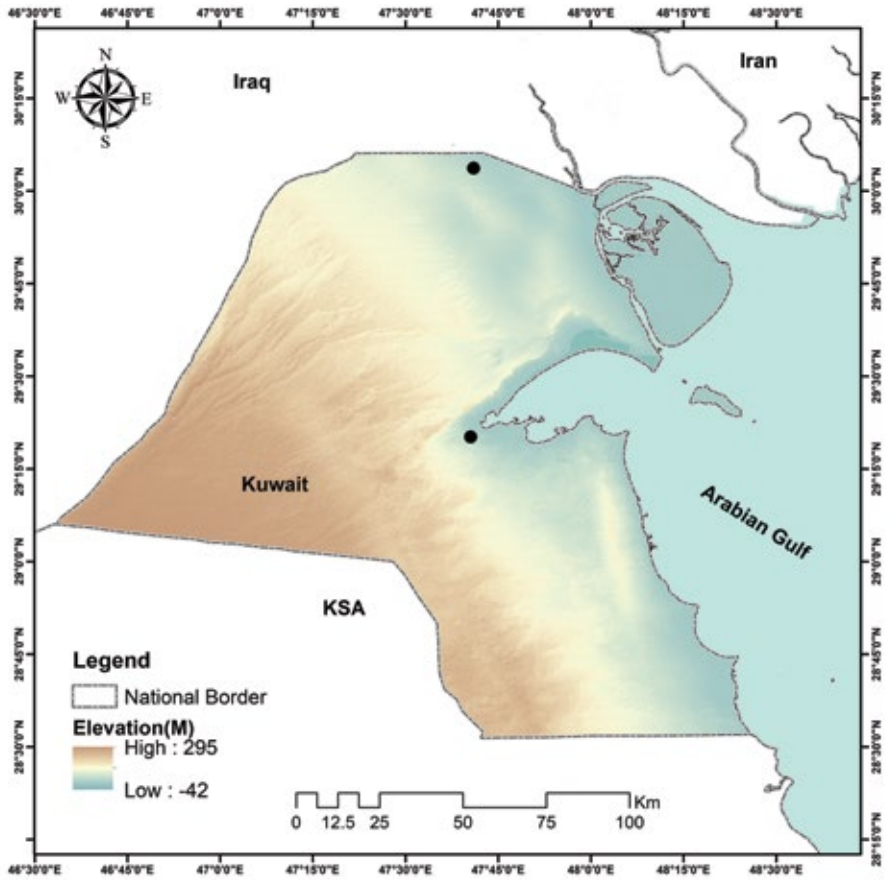

Figure 49: Distribution of *Ablepharus pannonicus* in Kuwait (Source: IUCN ROWA).

and long, about 2 times the snout-vent lenght. Color of the dorsum brownish, usually with two light dorsolateral stripes and a dark stripe from the nostril, through the eye and along the flank.

Habitat: Specimens were found under dead palm leaves in different locations (Amr et al., 2021).

Biology: This is a diurnal ground-dwelling skink. It usually feeds on insects and other arthropods. Females lay clutches of 3-4 eggs (Carranza et al., 2021).

Remarks*:* The only previously available documentation of this species is based on an image depicted by Clayton and Pilcher (1983) without a specific locality.

7.6.2 Genus *Chalcides* Laurenti, 1768

Lower eyelid with an undivided transparent disk. Ear opening more or less distinct. Nostril situated between the rostral; supranasals present; prefrontals and frontoparietals absent. Body very elongated; limbs short or rudimentary.

7.6.2.1 *Chalcides ocellatus* (Forskål, 1775)

Ocellated (bronze) skink

Figure 50: Ocellated (bronze) skink*, Chalcides ocellatus* (Photo by Z. Amr).

Distribution range: It has a wide range of distribution from southern Italy to the Middle East, to North Africa and the Sahara, eastwards to India (Sindaco & Jeremčenko, 2008).

Records from Kuwait: Kuwait.

Diagnosis: Snout obtuse, scarcely projecting beyond the labial margin; eyes moderate; ear opening much larger than the nostril, subtriangular or subquadrangular. Nostril pierced just above the suture between the rostral and the first labial; a postnasal, in contact with the first and second labial; supranasals distinct; frontal longer than broad; usually the fifth labial entering the orbit. Sides of belly rounded. Scales smooth or feebly striated, 28 to 34 around the

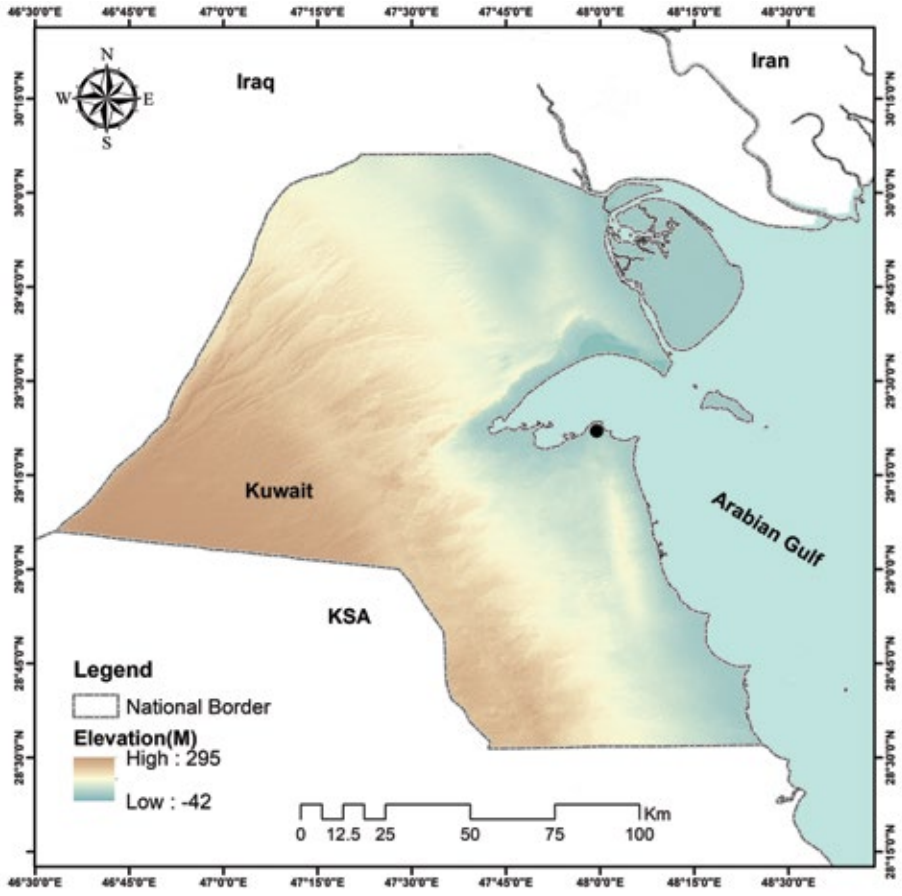

Figure 51: Distribution of *Chalcides ocellatus* in Kuwait (Source: IUCN ROWA).

middle of the body. Pentadactyl, limbs short but well-developed ; the length of the hindlimb is usually less than the distance from the end of the snout to the forelimb, and enters three and one-third to four and a half times in length from snout to vent. Tail is shorter than head and body.

Habitat: This species inhabits areas characterised by damp ground. Arnold (1980, 1984) indicates that this species is secretive but abundant in plantations and cultivated areas where the ground is damp. Furthermore, it inhabits buildings and gardens where it was observed under leaves (Amr et al., 2021).

Biology: This species feeds on insect larvae, coleopterans and orthopterans.

Remarks: This species was not listed by Eissa and El Assy (1975).

7.6.3 Genus *Scincus*

Heavy limbs, expanded lamellae on digits and phalanges, short-tailed. Conical head, convex in lateral view. Scales thick, separated by deep sutures. Two loreals, second fused with first of two presuboculars. Postnasal present. Palpebral and superciliary scales separated by groove. Typicallyfour or five pairs of nuchal scales. Medial preanal scales enlarged, lateral edges coincide with ventrolateral keels. Small, ventrally directed ear opening covered by several overlapping lobules.

Key to species of the genus *Scincus* in Kuwait

1. Ear opening clearly visible and relatively large, its upper border reaching the backward continuation of the line made by the lower edges of the upper labial scales ..... *Scincus conirostris*

   Ear opening very small but usually visible, nearly always situated well below the line made by the lower edges of the upper labial scales..... *Scincus mitranus*

7.6.3.1 *Scincus mitranus* Anderson, 1871

Arabian sand skink

Figure 52: Arabian sand skink, *Scincus mitranus* (Photo by A. Al Yousef).

Distribution range: Central and southern Arabian Peninsula east of the Asir and Yemen highlands, and north to Kuwait, Qatar, Oman, Pakistan, United Arab Emirates , Iran, Saudi Arabia.

Records from Kuwait: Kuwait**.**

Diagnosis: Head relatively small; external ear orifice very small but visible,

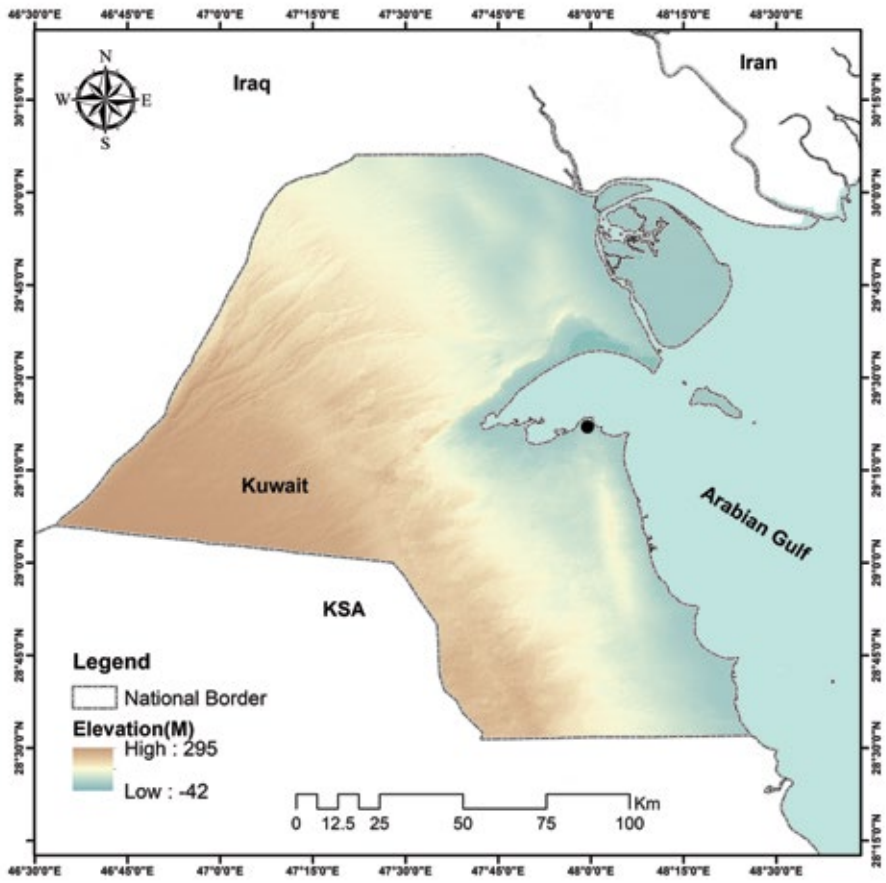

Figure 53: Distribution of *Scincus mitranus* in Kuwait (Source: IUCN ROWA).

usually situated well below level of line made by lower edges of upper labial scales and typically covered by two scales, the hind edges of which are usually serrated over the orifice. Eye with relatively small cornea and rounded pupil. Rostral scale broadly borders frontonasal. Dorsal scales smooth, mid-dorsals subequal to mid-ventrals. Twenty-six to thirty scales around mid-body. Adults and young without bold dorsal pattern, either almost uniform or with fine dappled pattern of lighter and darker spots; dark bars or spots present on flanks of nearly all adults. Nostril oval or crescentic, often in narrow contact with rostral shield. Often three loreals on each side; first loreal usually separated from frontonasal. Upper labials typically eight on each side, rarely seven to nine (After Arnold & Leviton, 1977).

Habitat: This is a sand dwelling species associated with soft sand. It hides in the sand during hot hours and emerges during the early morning hours.

Biology: The Arabian Sand Skink breeds between May and June, with one clutch annually.

Remarks: A specimen from Kuwait was depicted by Arnold and Leviton (1977). Its distribution is confined to south and east Arabia, including Saudi Arabia, Oman, Qatar, United Arab Emirates, and Yemen (Arnold & Leviton, 1977).

7.6.3.2 *Scincus conirostris* (Blanford, 1881)

Sandfish skink

Figure 54: Sandfish skink, *Scincus conirostris* (Photo by A. Aloufi).

Distribution range: Saudi Arabia, Iran, Oman, United Arab Emirates.

Records from Kuwait: Kuwait, Al Jalia, Al Sugaihia, Kabed Reserve.

Diagnosis: Snout often rather short and not as spatulate as in other forms of this genus, head frequently quite broad, rostral and loreals nearly always separated from frontonasal. Adults have fine, dappled dorsal pattern of lighter and darker spots, often interspersed with light, sometimes translucent scales that are yellow or orange in life, and are frequently arranged in short irregular transverse bars. No dark vertical bars or spots present on flanks. Rostral separated from frontonasal by the internasals. Supraoculars typically 6:6; supraciliaries usually 4:4. Nostril oval; three loreals on each side, the first nearly always separated from the frontonasal (After Arnold & Leviton, 1977).

Habitat: This is a sand dwelling species, usually associated with sand dunes.

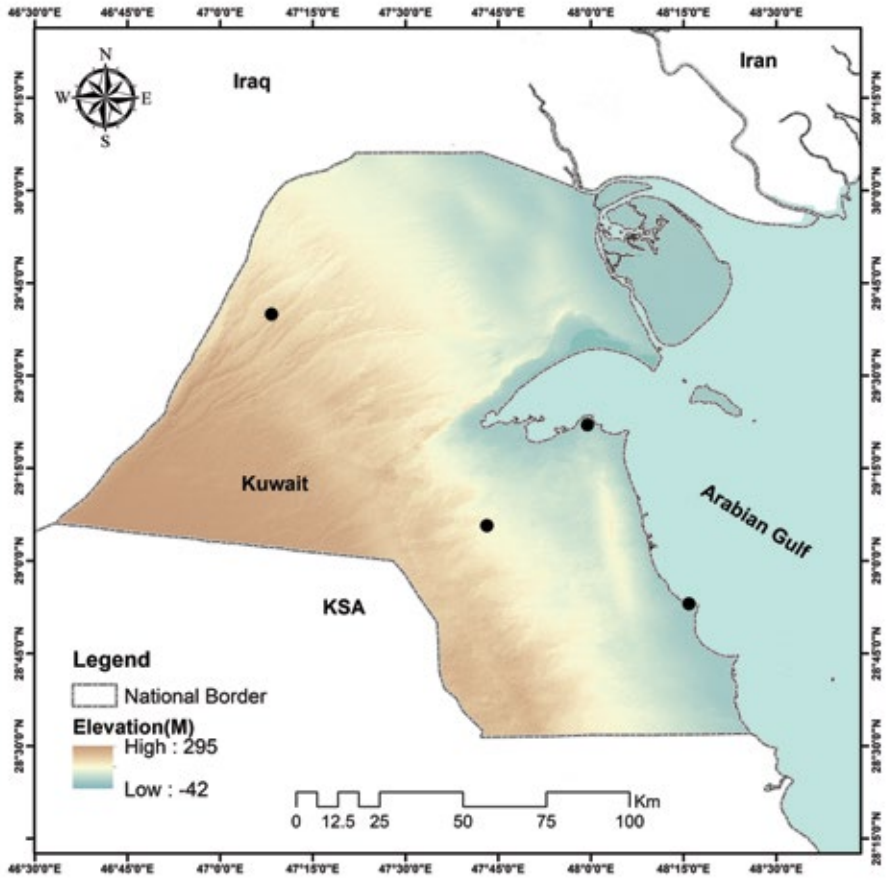

Figure 55: Distribution of *Scincus conirostris* in Kuwait (Source: IUCN ROWA).

Biology: This is a diurnal ground-dwelling skink. No data is available on this species biology.

Remarks: Previously recorded from Kuwait (Eissa & El Assy, 1975; Arnold & Leviton, 1977).

7.7 Family Lacertidae

Six species of lacertids occur in Kuwait, and belong to two genera; *Acanthodactylus* and *Mesalina.* The systematics of species belonging to the genus *Acanthodactylus* were revised by Salvador (1982) and at the molecular level by Tamar et al. (20116). Sindaco et al. (2018) revised the *Mesalina guttulata* species complex from Arabia, whereas the status of *Mesalina* in Kuwait remains unresolved.

Key to genera of family Lacertidae

1. Nostrils are in contact with the first upper labials (Figure 56A), digests with lateral fringes .... *Acanthodactylus* 3

   Nostrils are separated from the first upper labials (Figure 56B), digests without lateral fringes (Figure 57)..... *Mesalina*

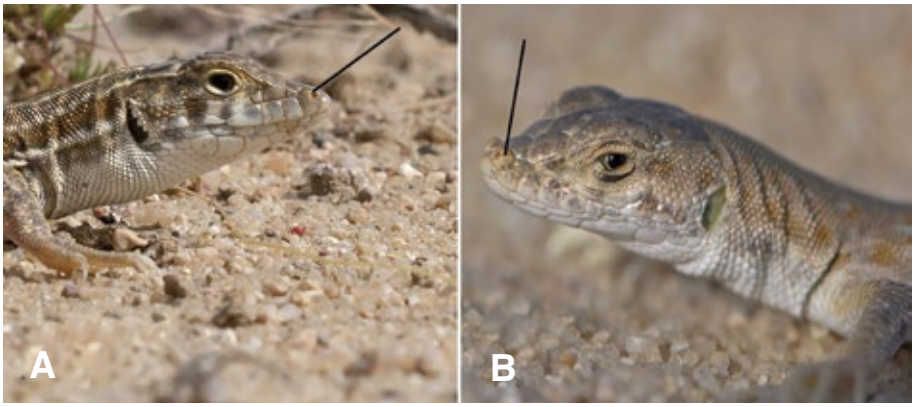

Figure 56: A. Nostrils are in contact with the first upper labials. **B.** Nostrils are separated from the first upper labials (Photos by Z. Amr).

Figure 57: Digits without lateral fringes (Photo by Z. Amr).

7.7.1 Genus *Acanthodactylus*

Occipital is absent, nostril is located between two nasals and the first upper labial, lower eyelid covered by scales. Digits with lateral fringes. Femoral pores are present. The genus *Acanthodactylus* forms a monophyletic group with known 42 species (Uetz, 2013). This genus was revised based on morphological features by Salvador (1982) and Arnold (1983) with different assignment of group complexes. In Kuwait, this genus is represented by four species.

Key to species of the genus *Acanthodactylus*

1. Fingers with three rows of scales……......2
   Fingers with four rows of scales…..……..…… *Acanthodactylus hardyi*
2. Two supraoculars are present…….....……3
   Four supraoculars are present …….....…..…… *Acanthodactylus schmidti*
3. Eyelid barely pectinate, fourth toe strongly pectinate, mid-dorsal stripe on the body forks before reaching head region ……..…..…….....……*Acanthodactylus boskianus*
4. Eyelid very pectinate, fourth toe scarcely pectinate, mid-dorsal stripe on the body runs without forming a fork reaching head region ……..…... *Acanthodactylus opheodurus*

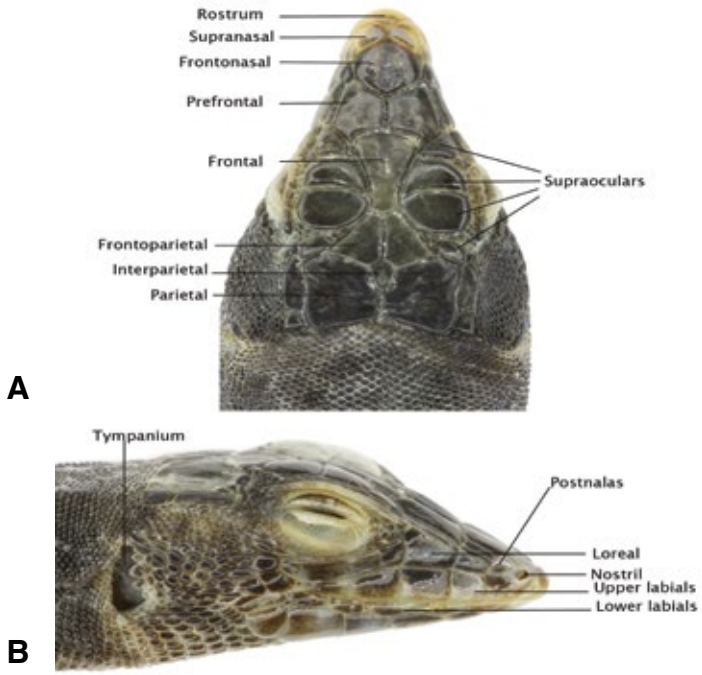

Figure 58: Terminology of lizard scales. **A.** Dorsal view. **B.** Lateral view (Photos by Z. Amr).

7.7.1.1 *Acanthodactylus boskianus* (Audouin, 1829)

Bosk's fringe-fingered lizard

Figure 59: Bosk's fringe-fingered lizard, *Acanthodactylus boskianus* (Photo by A. Alenezi).

Distribution range: It is distributed across North Africa, the Sahara, Sudan and Somalia and throughout the Middle East (Salvador, 1982).

Records from Kuwait: Al Abraq, Al Ahmadi, Al Jalia, Al Mutla, Al Wafrah, Kadma, Rhawdatain.

Diagnosis: Medium to large size species. Usually four entire supraoculars, sometimes, the first is divided. Pectinate anterior border of ear opening. Keeled temporals. Slightly denticulated eyelids. Conspicuous gular fold. Three series of scales on fingers. Ventrals arranged in 10 straight longitudinal rows. Very large, keeled, imbricate dorsals. Granular scalation on sides of the body. Moderate to intense pectination of fourth toe. Large, imbricate, and sharply keeled scales on the upper surface of the tail (Salvador, 1982).

Habitats: *Acanthodactylus boskianus* inhabits fairly hard substrates. In Egypt, it was exclusively recorded from coastal and urban habitats, and seemed to be highly abundant in sand dunes between sparse vegetation (Amer et al., 2008; Milto, 2017). It is one of the most abundant species in the arid regions of Jordan (Disi & Amr, 1998).

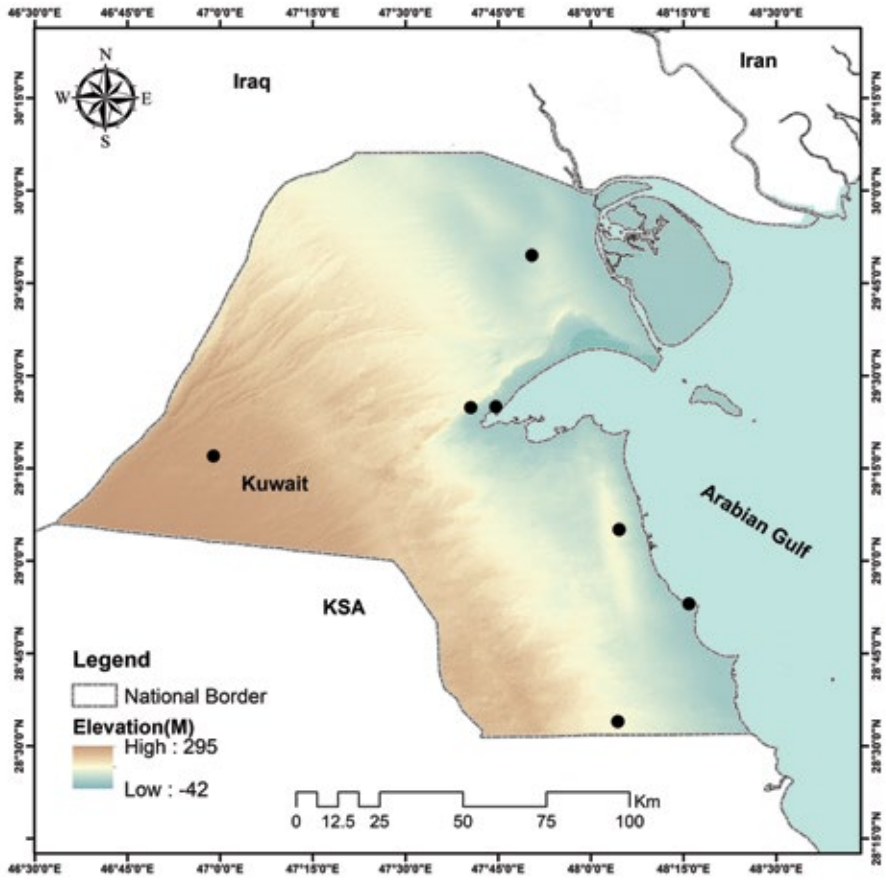

Figure 60: Distribution of *Acanthodactylus boskianus* in Kuwait (Source: IUCN ROWA).

Biology: This is a diurnal species. In Syria, *A. boskianus* was found to feed on the scorpion, *Buthacus tadmorensis* (Shehab et al., 2011). This lizard is reproductively active from March to June, with clutch size ranging from 3-4, with no evidence of multiple clutches among females (Goldberg, 2013). Femoral gland secretions are involved in intraspecific chemical communication, male territorial behaviour and sex recognition (Khannoon et al., 2010). Males of *A. boskianus* had a wider home range than females, whereas spring home ranges were larger than those during winter (Al-Johany & Spellerberg, 1989).

Remarks: This a common species in Kuwait and was recorded from several localities (Eissa & El Assy, 1975). Molecular and morphological results have indicated that *Acanthodactylus* descend from south-west Asia, and later invaded North Africa (Harris & Arnold, 2000). Further molecular findings show that both *Acanthodactylus schreiberi* and *Acanthodactylus boskianus asper* are paraphyletic (Tamar et al., 2014).

7.7.1.2 *Acanthodactylus opheodurus* Arnold, 1980

Snake-tailed fringe-toed lizard

Figure 61: Snake-tailed fringe-toed lizard, *Acanthodactylus opheodurus* (Photo by A. Alenezi).

Distribution range: This is a rather common species in the Arabian Peninsula, Jordan and Iraq (Sindaco & Jeremčenko, 2008).

Records from Kuwait: Al Ah'madi, Al Jahrah East outfall, Jal Al-Zour, Khiran, Kuwait.

Diagnosis: Small species with a wide head and a short snout. Rounded and protruding nasals. Four supraoculars. One row of granules between the superciliaries and the supraoculars. Very conspicuous subocular keel. Keeled temporal scales. Large ear opening bordered anteriorly by 3 or 4 scales. Intensely pectinate eyelids. Small tympanic present. Subocular separated from the lip and wedged between the fourth and fifth supralabial. Ventrals arranged in 10 straight longitudinal rows. Flat, keeled dorsals much larger than laterals, numbering from 29 to 36 across the middle of the body. Intense pectination of toes. Three rows of scales on fingers. Large, keeled scales on the upper side of the tail. Colour pattern with three dark dorsal bands.

Habitats: *Acanthodactylus opheodurus* is a euryecious psammophilous species found on coarse-grained sand among vegetation and flood plains of sparsely vegetated wadis in arid regions. In Oman, it was found in flat areas with small shrubs and hard sand substratum (Arnold, 1980).

Cunningham (2001) gave a detailed account on the ecology of *A. opheodurus* in the United Arab Emirates. It inhabits flat areas of hard compact soils and gravel with sparse vegetation of *Haloxylon salicornicum* and *Acacia tortilis.*

Biology: *Acanthodactylus opheodurus* is a diurnal ground-dwelling species.

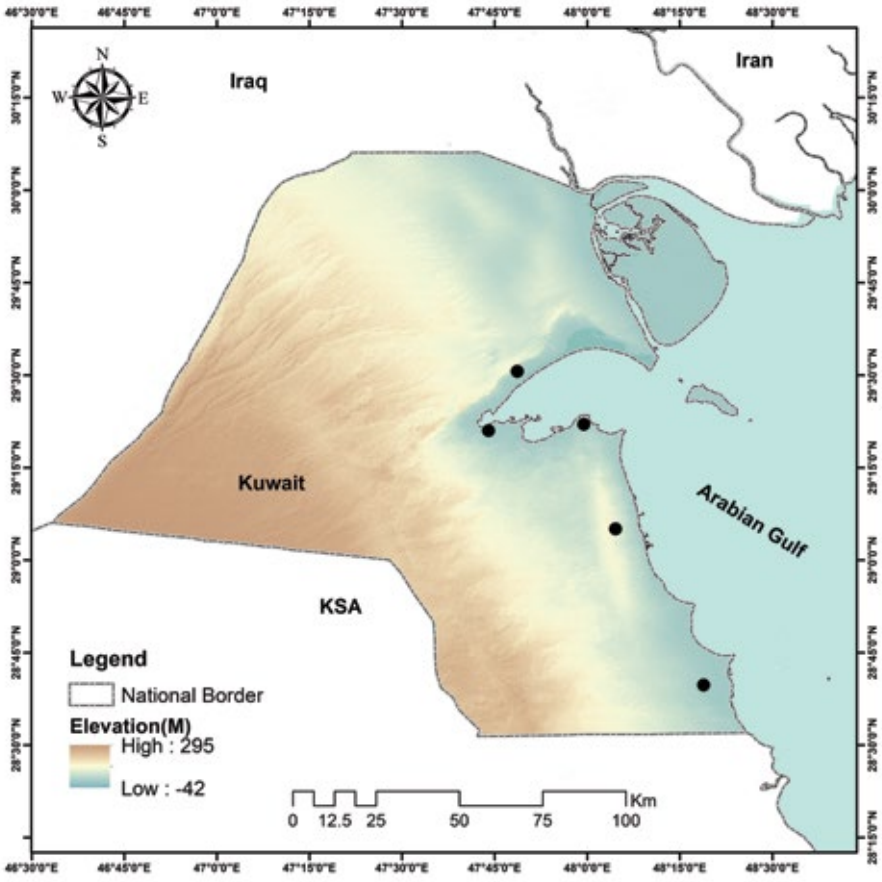

Figure: 62: Distribution of *Acanthodactylus opheodurus* in Kuwait (Source: IUCN ROWA).

Activity pattern during hot summer was recorded during the morning hours with ambient temperatures ranging from 35°C to 40°C, where most of the foraging time was spent under shade vegetation in the United Arab Emirates (Cunningham, 2001). The hunting strategy is a sit-and-wait approach. It chases its prey even when spotted at a distance and uses shadows of vegetation for cover (Cunningham, 2001). It frequently feeds on ants, and to a lesser extent on coleopterans. Females lay four eggs repeatedly in a season (Disi et al., 2001).

7.7.1.3 *Acanthodactylus schmidti* Haas, 1957

Schmidt's fringe-fingered lizard

Figure 63: Schmidt's fringe-fingered lizard, *Acanthodactylus schmidti* (Photo by A. Alenezi).

Distribution range: The distribution range of this species extends across the Arabian Peninsula, Jordan, SE Iraq and SW Iran (Sindaco & Jeremčenko, 2008).

Records from Kuwait: Al Ahmadi, Al Jalia, Al Mutla, Al Subiya, Al Wafrah, N Bubiyan Bridge, Kadma, Rhawdatain, Sabah Al-Ahmad Natural Reserve.

Diagnosis: Species of variable size. Pointed snout. First, second, and third supraoculars large; fourth usually divided into two. Five supralabials anterior to the subocular. Subocular not in contact with the upper lip and wedged among fourth, fifth and sixth supralabial. Two keeled supratemporals. Temporals sharply keeled. Ear opening with distinct anterior pectination. Scales on the sides of the posterior dorsum double the size of those in the center of the dorsum and those on the sides of the body. Thirty-two to fifty-four dorsals across the midbody. Ventrals arranged in 14 or 16 oblique longitudinal rows with the outer rows consisting of pointed scales. Fingers present. Four series of scales while toes are strongly pectinate. Reticulate colour pattern in both young and adults.

Habitat: *Acanthodactylus schmidti* inhabits areas of soft sand, partly stabilised by root systems of spiny bushes and uses places shaded by vegetation. It is considered a sand-dwelling species more than any other *Acanthodactylus* species. Burrows are usually located under bushes of *Haloxylon* sp. The

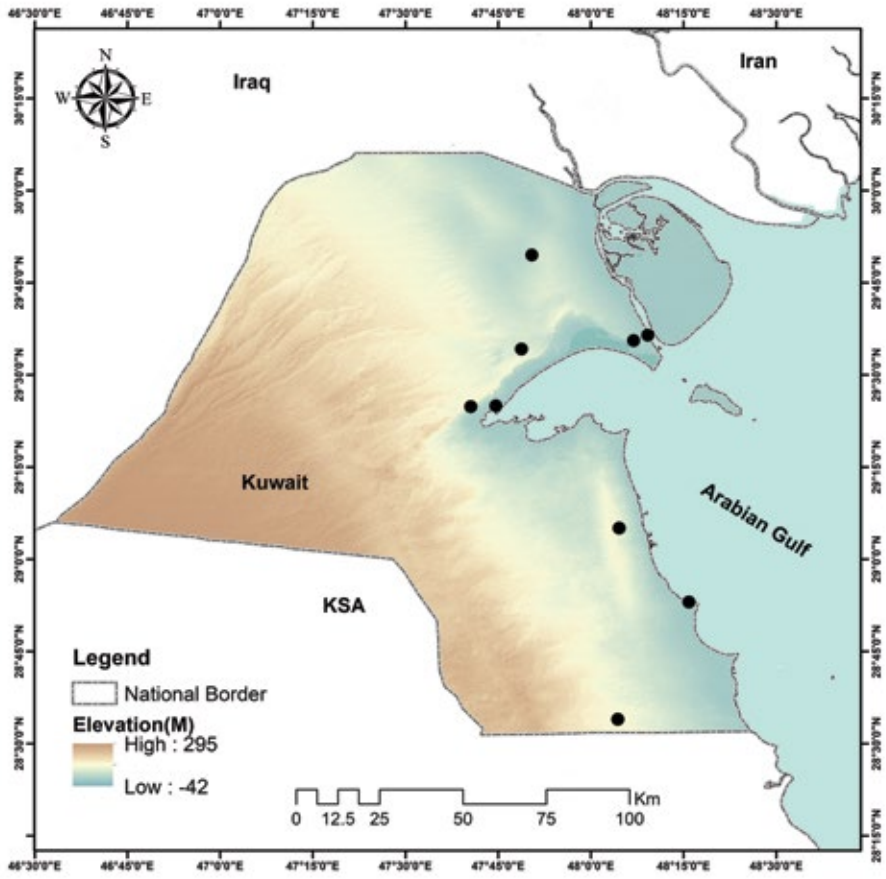

Figure 64: Distribution of *Acanthodactylus schmidti* in Kuwait (Source: IUCN).

pectinated digits help this lizard to move across sand. In the United Arab Emirates, this species is usually associated with relatively firm sand and observed close to bushes or low vegetation (Arnold, 1984).

Biology: It is active about four and a half hours after sunrise (Arnold, 1984). When hunting, it walks jerkily over the sand, touches regularly the ground by its snout and scents with its tongue. It feeds mostly on ants, isopterans, flies, insect larvae and coleopterans (Arnold, 1984; Ross, 1989). Al-Johany and Spellerberg (1989) reported on male lizards as having had larger home ranges than females reaching a maximum of 1000 m^2, and that spring home ranges were larger than winter ones. Ross (1989) gave a comprehensive account on the copulation behavior of this species.

Remarks: Collected from several localities in Kuwait (Eissa & El Assy, 1975).

7.7.1.4 *Acanthodactylus hardyi* Haas, 1957

Hardy's fringe-fingered lizard

Figure 65: Hardy's fringe-fingered lizard, *Acanthodactylus hardyi* (Photo by A. Alenezi).

Distribution range: This species occurs in Jordan, Iraq, Saudi Arabia and Kuwait (Tamar et al., 2016).

Records from Kuwait: Al Ahmadi, Al Asimah, Al Jalia, Al Mutla, Al Ritqa, Al Salmi, Al-Sugaihia, Al Wafrah, Hawalli, Kadma, Kuwait, Rhawdatain.

Diagnosis: flattened body and pointed snout, three supraoculars and a fourth broken up into granules and one row of granules between the supraoculars and the supraciliaries. Suboculars, with a distinct keel, are not in contact with the upper lip but are joined with the fifth and sixth supralabial. Temporals are small and granular. First three pairs of submaxillaries are in contact, ear opening is bordered anteriorly by three to five denticulated scales. The dorsal scales are very small, smooth and granular, arranged in 63-74 rows across the mid-body. Ventrals (counted without marginals) are arranged in approximately 12 straight longitudinal rows. Four rows of scales are present on fingers; the toes are strongly pectinate.

Habitats: This is a common species in Kuwait living in various habitats (Eissa & El Assy, 1975). This species was a subject of several studies in Kuwait; changed substrate preferences (Al-Hashem & Brain, 2009a), the effects of oil pollution on its body size, weight, emergence, basking and foraging behaviours (Hashem & Brain, 2009a; 2009b).

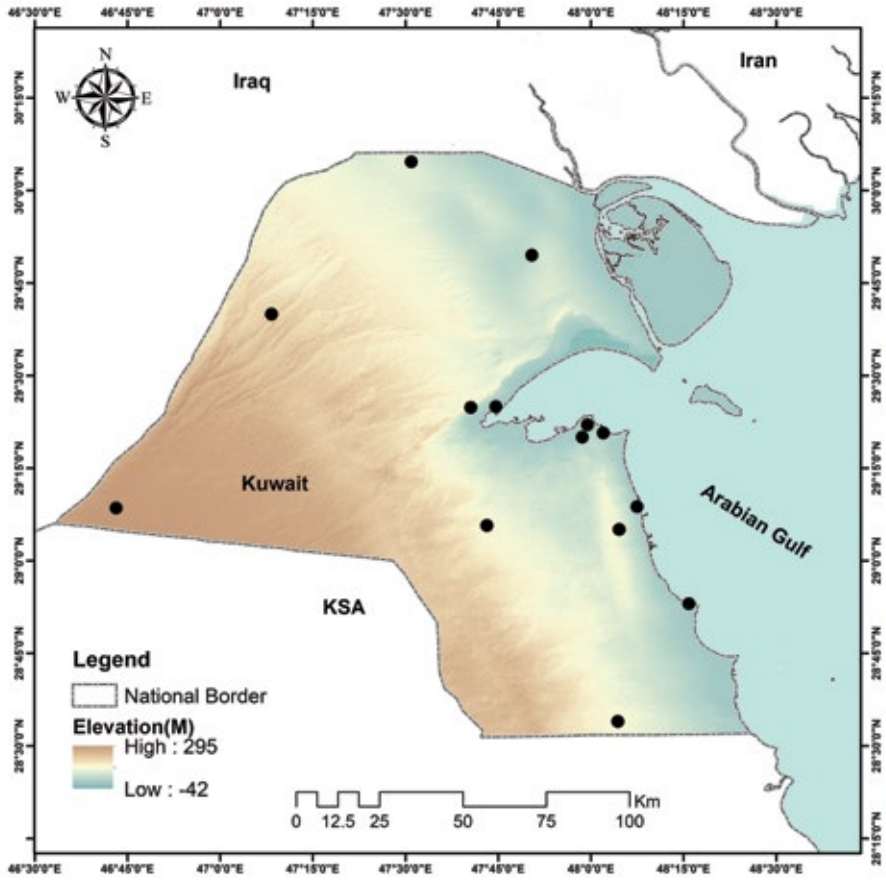

Figure 66: Distribution of *Acanthodactylus hardyi* in Kuwait (Source: IUCN).

Biology: No data are available on the biology of this species.

Remarks: Deemed a problematic species with unclear status. In 1957, it was originally described as a subspecies of *Acanthodactylus scutellatus* by Haas. From a taxonomic point of view, several authorities considered *A. hardyi* a member of the *scutellatus* group (Salvador, 1982; Tamar et al., 2016). All previous records which referred to this species as *A. scutellatus* should regard it as *A. hardyi.* Moreover, Arnold (1983) recognised *A. hardyi* as a member of the *A. scutellatus* complex group based on morphological features, whereas, Sindaco and Jeremčenko (2008) considered this species as a subspecies of *A. scutellatus.*

7.7.2 Genus Mesalina

Head shields normal and the occipital shield is usually present. Lower nasals are in contact with the first supralabials only; nostril located between 3 nasals and widely separated from supralabials; sometimes two or more transparent shields in lower eyelid; abdominal scales with parallel longitudinal rows (Yousefkhani et al., 2015).

1. Occipital absent or reduced (Figure 67A), dorsal scales exceed 50..... *Mesalina brevirostris*
   Occipital present (Figure 67B), dorsal scales less than 50..... *Mesalina guttulata*

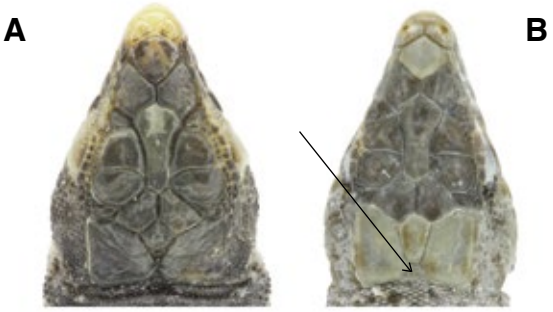

Figure 67: A. Occipital absent or reduced. **B.** Occipital present (Photos by Z. Amr).

7.7.2.1 *Mesalina brevirostris* Blanford, 1874

Blanford's short-nosed desert lizard

Figure 68: Blanford's short-nosed desert lizard, *Mesalina brevirostris* (Photo by A. Alenezi).

Distribution range: Sinai, Iraq, Jordan, Kuwait, Lebanon, Saudi Arabia, Syria, Turkey, United Arab Emirates to Iran and Pakistan.

Records from Kuwait: Al Ah'madi, Al Jalia, Al Mutla, Al Ritqa, Al Salmi, Al

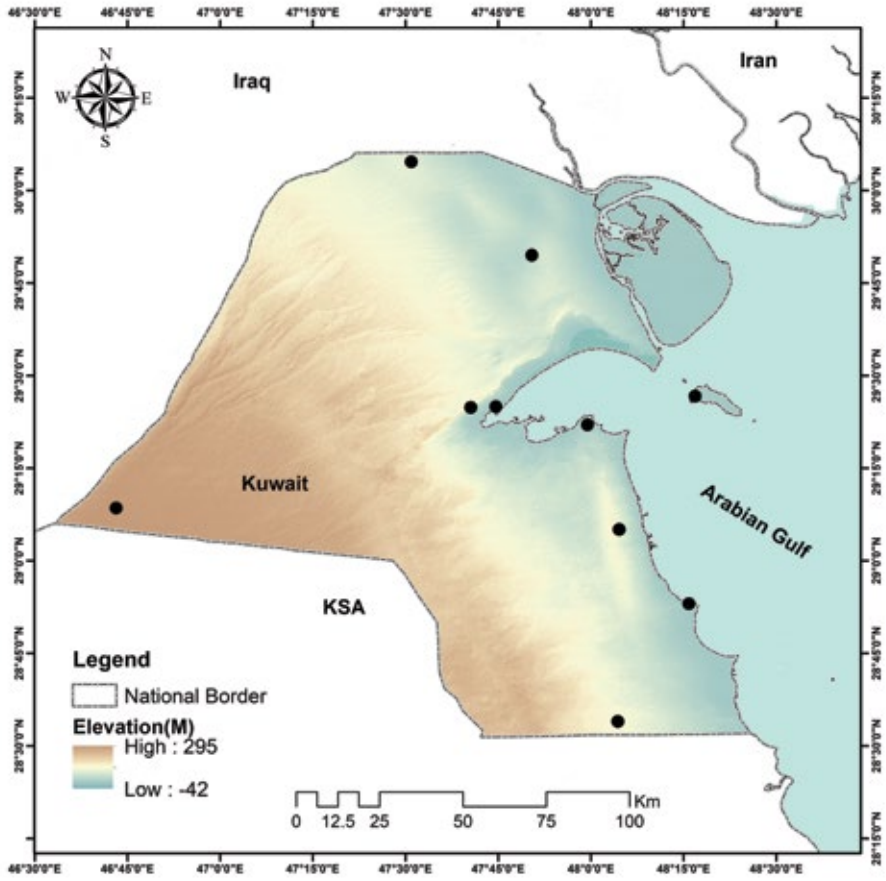

Figure 69: Distribution of *Mesalina brevirostris* in Kuwait (Source: IUCN ROWA).

Wafrah, Failaka Island, Kadma, Kuwait, Rhawdatain.

Diagnosis. Three nasals, lower in contact with rostral and first supralabial; ventral plates in 12 (rarely 10) straight longitudinal series; occipital absent or minute, not in contact with interparietal; collar curved or angular, free; head not strongly depressed, head width is 92% of head length; 51–53 scales across middle of back; 19-28 lamellae under fourth toe; moderately large lizard; snout-vent length 56 mm, tail 102 mm. Gray or grayish brown above, usually with numerous large whitish ocelli edged with black, pattern highly variable; sometimes small dark brown or rusty spots on back and larger ones on sides; tail with dark lateral spots; venter white (Leviton et al., 1992, Hosseinian-Yousefkhani et al., 2015).

Habitat: This is a diurnal species that occupies a fairly large habitat with hard substrates. This is a rather common species in Kuwait inhabiting gravelly des-

erts. This species has no preference for specific plants. If alarmed, it hides among plants or retreats into burrows. It inhabits gravel plains and often stays near the entrance of its burrow. Ross (1988) reports similar observations from Saudi Arabia. He indicated that this species appears to be the best environmentally adapted lizard since it occupies different habitats which include seashore, inland gravel plains and hill tops. Faraj and Banaja (1980) collected this species under rocks at Al-Wajh in Saudi Arabia. In Kuwait, it was reported in semi -arid regions (Eissa & El-Assy, 1975). However, Arnold (1984) found this species confined to moist areas with succulent halophytic vegetation in Saudi Arabia and Bahrain.

Biology: In 2011, den Bosch gave details on the courtship behaviour of this lizard. It includes biting of the female by the male at her groin region, followed by two series of tail motions. He reported that the female lays one to six eggs (average 3.9) in five clutches annually. During the hottest time of day, using its nails for support, it lifts its abdomen above the ground, and holds its body in an elevated position to avoid touching the ground with its high temperature.

7.7.2.2 *Mesalina guttulata* (Lichtenstein, 1823)

Small-spotted desert lizard

Figure 70: Small-spotted desert lizard, *Mesalina guttulata* (Photo by S. Bogaerts).

Distribution range: Wide distribution range across North Africa reaching as far as Afghanistan (Sindaco & Jeremčenko, 2008).

Records from Kuwait: Al-Salmi, Sabah Al-Ahmad Natural Reserve.

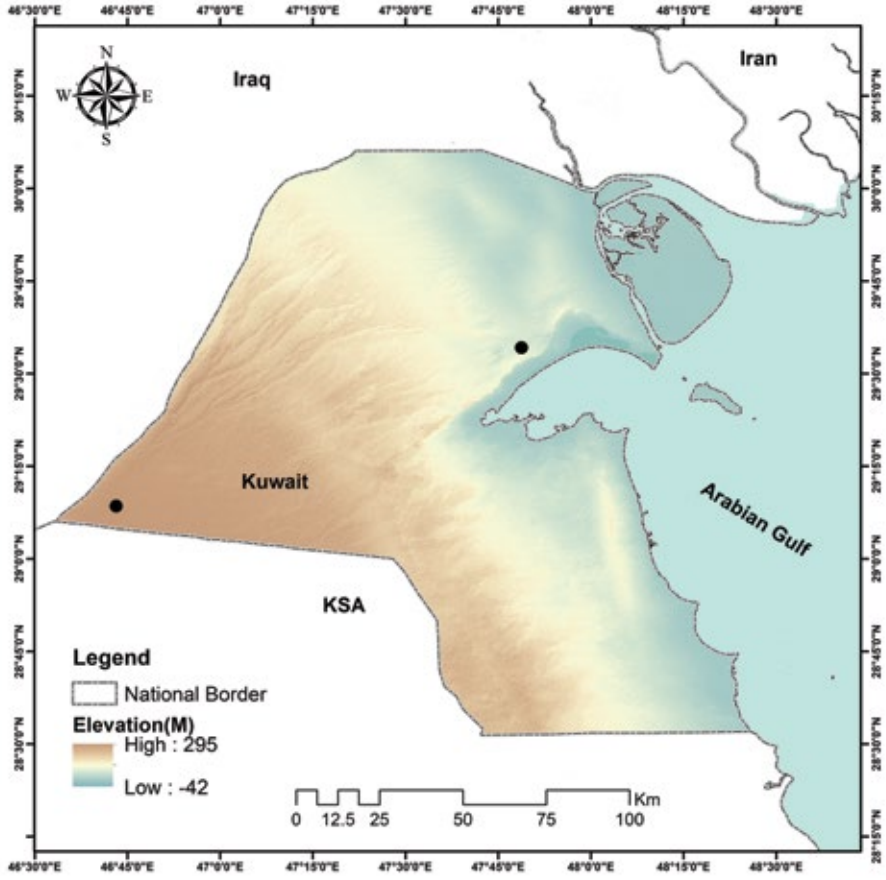

Figure 71: Distribution of *Mesalina guttulata* in Kuwait (Source: IUCN ROWA).

Diagnosis: Occipital is in contact with the interparietal; collar curved; the transparent disc of lower eyelid consists of two major scales, with a black vertical bar; usually four upper labials, rarely five, located anterior to subocular. Ventral scales are arranged in 10 straight longitudinal rows. Upper surface of the tibia with keeled scales. Scales ventral of the tail are smooth. Head shields are symmetrical. Nine to ten supralabials, 24 gulars. Forty-eight dorsal scales across midbody, ten ventral scales across belly. Twelve to thirteen femoral pores. Colouration of adult is generally greyish, with more or less distinct black-and-white ocelli, sometimes arranged in longitudinal or transverse rows (Schleich et al., 1996; Yousefkhani et al., 2015).

Habitat: The small-spotted lizard is a diurnal species. The areas inhabited by this species are characterised by hard substrates such as depressions filled with silt soils and bearing scattered vegetation, volcanic boulders, red sandstones, gravel plains and beds of wadis. Ross (1988) indicates that in Saudi

Arabia this species is often observed in wadis where the sides are steep and rocky with some vegetation.

Biology: Reproduction season extends from February to April, with several clutches per year with an average of 4.4 eggs per clutch (Schleich et al., 1996).

Remarks: Al-Sirhan (2008) reported this lizard to the herpetofauna of Kuwait.

7.8 Family Varanidae

One species of the family Varanidae was reported to occur in Kuwait. *Varanus griseus* is widely distributed across the Arabian Peninsula. Species of this family are characterised by having a long slender neck, a long body that exceeds 70 cm in length and a strong muscular tail. They also have well-developed, limbs with strong claws.

7.8.1 Genus *Varanus*

Species of the genus *Varanus* have a long, narrow head attached to a long neck. It has four strong legs, each with five sharp claws. Eyelids well developed, eyes with round pupil.

7.8.1.1 *Varanus griseus* (Daudin, 1803)

Desert monitor

Figure 72: Desert monitor, *Varanus griseus* (Photo by A. Ragab).

Distribution range: The esert monitor is a common species in the Arabian Peninsula, with distribution range extending from North Africa, arid parts of the Middle East reaching as far as India (Sindaco & Jeremčenko, 2008).

Records from Kuwait: Al Mutla, Kabed Nature Reserve, Kuwait (S along Persian Gulf strip), N Sabriya, Rhawdatain, Tulha.

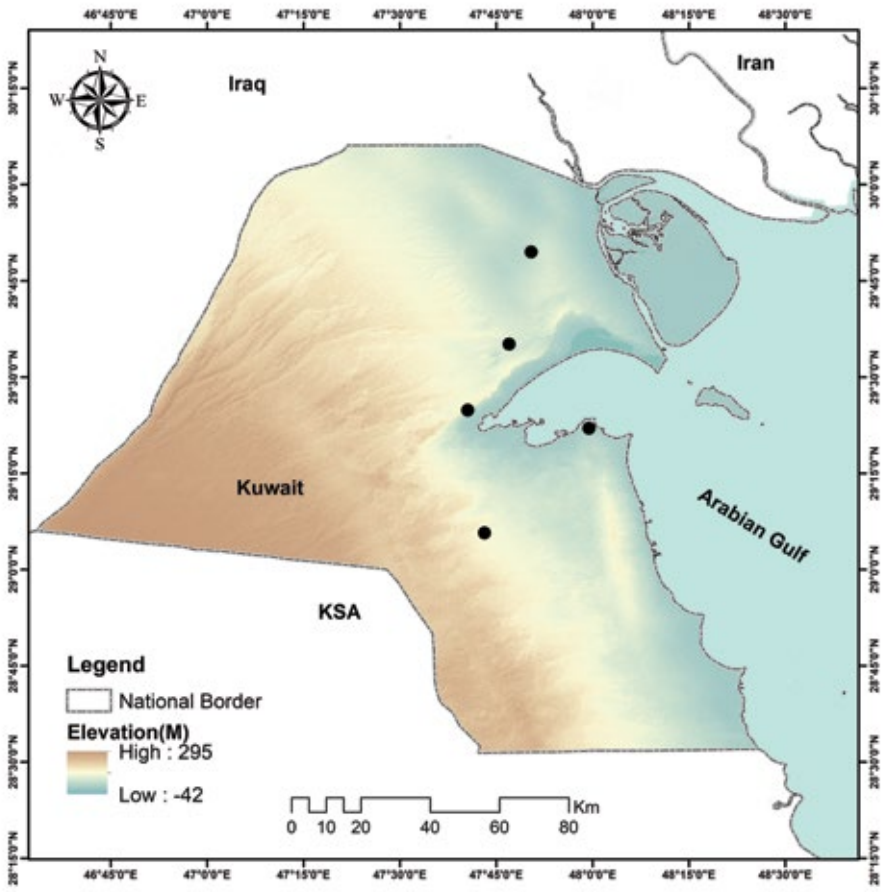

Figure 73: Distribution of *Varanus griseus* in Kuwait (Source: IUCN ROWA).

Diagnosis: Head is covered by with small polygonal scales, dorsum covered by round or oval scales. Nostril with oblique slit. Tail circular. Ventral scales range from 110-125 transverse rows.

Habitats: The desert monitor inhabits open areas with hard substratum. It is a ground-dwelling reptile that constructs deep burrows.

Biology: This is a diurnal species most active during hot hours of the day. Female produces 5-19 eggs in one clutch per year. It feeds on reptiles, rodents, as well as birds.

Key to the Families of Snakes in Kuwait

1. Ventral scales are not enlarged, eyes covered by scales, worm-like in appearance .....
.....Family Typhlopidae *Indotyphlops braminus*
Ventral scales enlarged, eyes not covered by scales, not worm-like in appearance 2

2. Head covered by small asymmetrical scales (Figure 74A) 3
Head covered by symmetrical head shields (Figure 74A) 4

3. Head not distinct from neck and ventral scales are narrow..... Family Boidae .. *Eryx jayakari*
Head distinct from neck and ventral scales are not narrow ..... Viperidae

4.Tail lateralley compressed ..... Elapidae
Tail not lateralley compressed..... 5

5. Hemipenis extremely reduced, short and thread-like …….....….....Family Psammophiidae
Hemipenis not reduced, short and thread-like…….....Family Colubridae

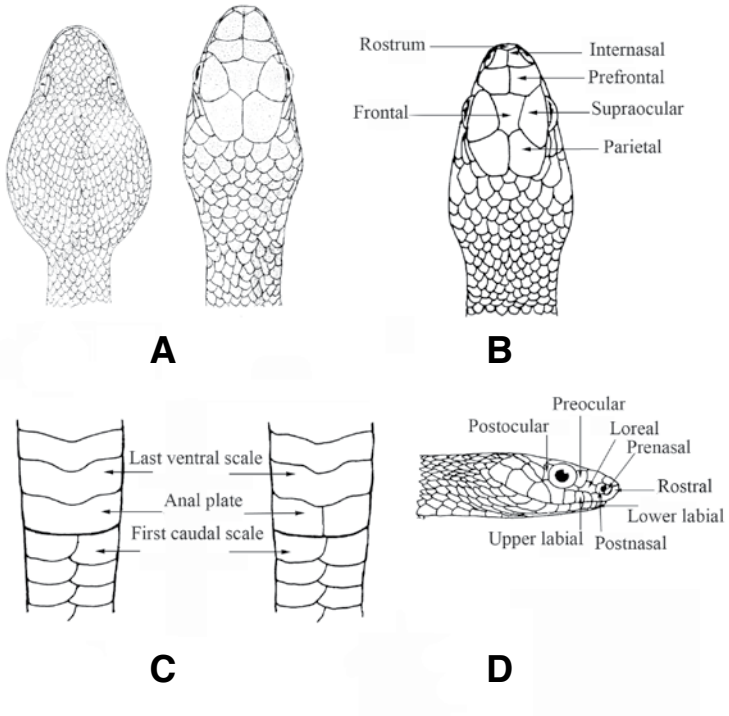

Figure 74: Scale arrangements and types used in snake classification. **A.** Type of head scale (with asymmetrical and symmetrical head scales). **B.** Dorsal view of the head showing names of head scales. **C.** Types of caudal scales. **D.** Lateral view of the head naming major scales (Photos by Z. Amr).

7.9 Family Typhlopidae

Blind snakes are small with a small head and a short, blunt tail. Ventral scales are not enlarged as in most snakes. Their rudimentary eyes and rather rigid, cylindrical bodies distinguish the blind snakes from other snakes. Typhlopids have toothed, movable maxilla, while the premaxilla is toothless and firmly articulated with the snout. The maxillae possess several teeth and are attached to the skull via mobile articulations. They are fossorial and feed on immature insects and other arthropods.

This family is represented by one species, *Indotyphlops braminus.* This Asian species is widespread and has become almost universal in distribution.

7.9.1 Genus *Indotyphlops*

Head is small and not distinct from neck; snout smoothly rounded. Teeth are present on only in the upper jaw. Eyes are rudimentary. The ocular scale does not reach the lip. Dorsal and ventral scales indistinguishable, smooth, shiny, and cycloid, with 20 rows at mid-body. Tail almost invesible, ending in a spine.

7.9.1.1 *Indotyphlops braminus* (Daudin, 1803)

Brahminy blind snake, flowerpot snake

Figure 75: Brahminy blind snake, *Indotyphlops braminus* (Photo by D. Raju).

Distribution range: Widespread and has become almost universal in distribution.

Records from Kuwait: Al Dbaiyyah, Al Jahrah, Al Jalia, Al Wafrah, Khwaisat, Rabiya.

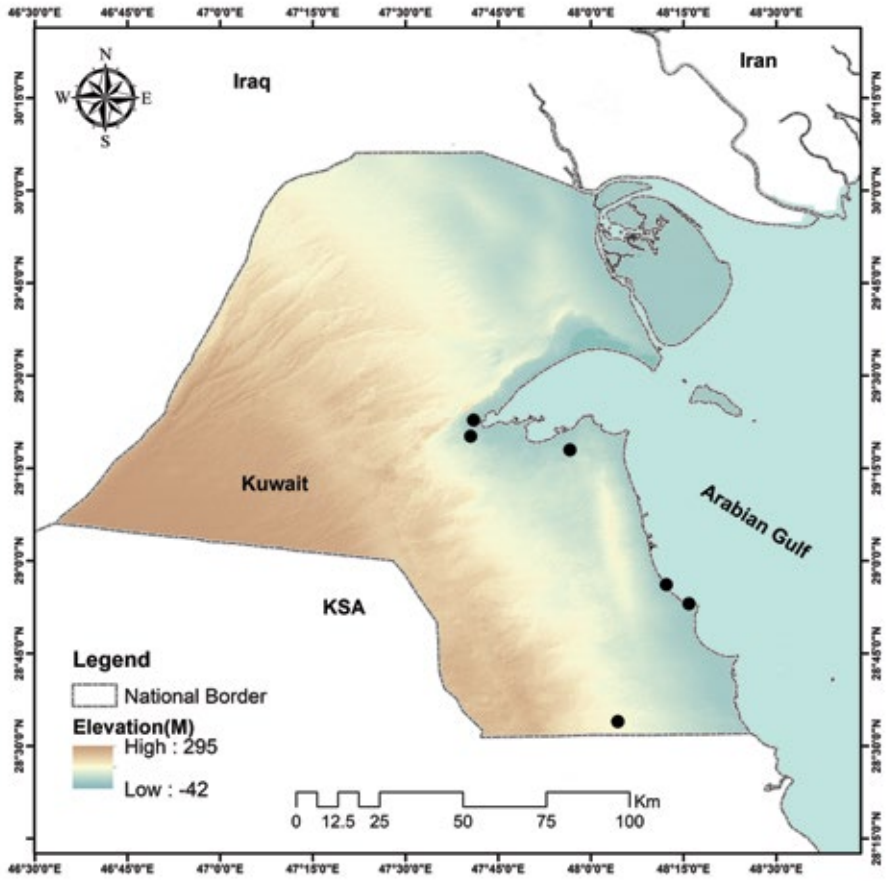

Figure 76: Distribution of *Indotyphlops braminus* in Kuwait (Source: IUCN ROWA).

Diagnosis: Head small, tail short and blunt with a pointed spur. Fourteen rows of dorsal scales around the body. Ventral scales are not enlarged as in most snakes. Their rudimentary eyes are covered by scales.

Habitats: This blind snake is associated with damps soil. It could be found in plant nurseries or gardens with imported plants and agricultural areas.

Biology: This species includes only females and is considered as an obligate parthenogenetic snake. This species feeds on larvae, eggs, and pupae of ants and termites.

Remarks: This is a widespread species with records from most of the world. It seems to be common in Kuwait, and it is believed to have been introduced into Arabia through imported plant pots (Egan, 2007).

7.10 Family Boidae

This family includes the boas and pythons. Boids feature thick bodies that help them in suffocating their prey. Head is covered by small scales and the ventrals are narrow. The dorsal scales are small and smooth. Eyes are very small with elliptical pupils.

This family is represented by a single species. *Eryx jayakari.* It seems to be common throughout the country. In the Arabian Peninsula, two species were recorded, *Eryx jaculus* and *E. jayakari* (Egan, 2007).

7.10.1 Genus *Eyrx*

The body is cylindrical terminating in a short conical tail. Head is not distinct from neck, and is covered by small scales. Eyes are very small with vertical pupils. Ventrals are narrow and all subcaudal scales are single.

7.10.1.1 *Eryx jayakari* Daudin, 1803

Figure 77: Arabian sand boa, *Eryx jayakari* (Photo by A. Alenezi).

Distribution range: The Arabian sand boa is distributed across the eastern part of the Arabian Peninsula (Kuwait, Oman, Saudi Arabia, United Arab Emirates), Iraq, SW Khuzestan and Iran (Egan, 2007).

Records from Kuwait: Al Wafrah New City, Al Ritqa, Auhha Island, Kuwait, Subiya.

Diagnosis: Mental groove present, eyes small with elliptical pupil, 11 upper

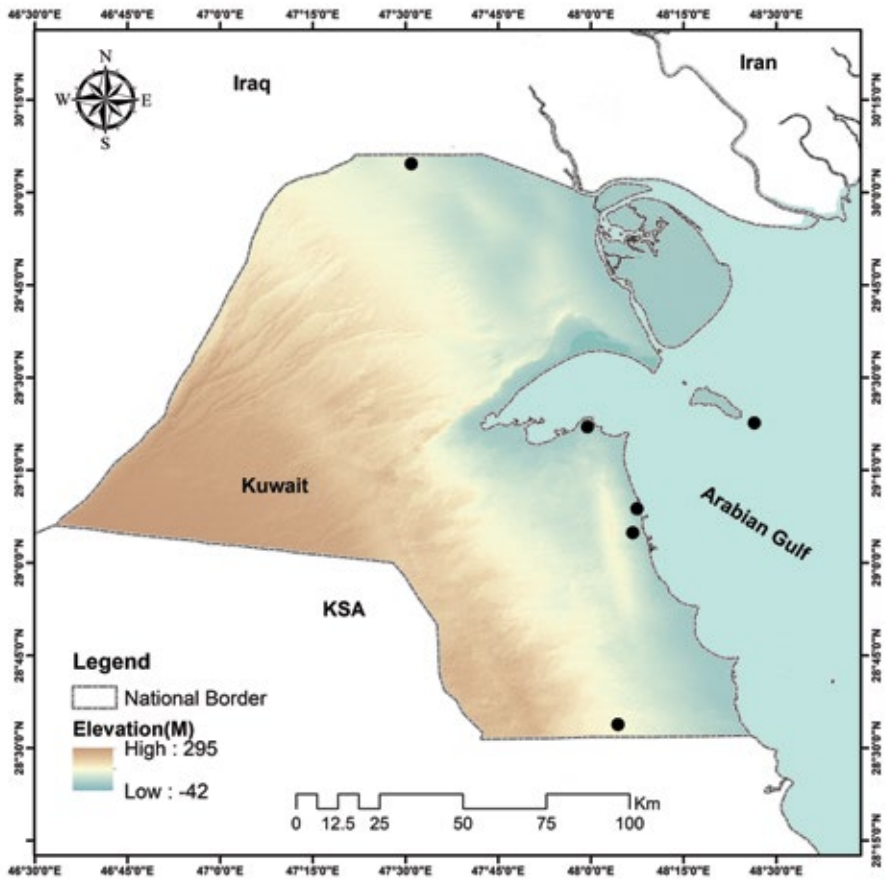

Figure 78: Distribution of *Eryx jayakari* in Kuwait (Source: IUCN ROWA).

labials, ventral scales 158-184, tail sharply pointed.

Habitats: The Arabian sand boa is a desert dwelling species, inhabiting sand or soft soil. It is rather common around sand dunes in many parts of Kuwait.

Biology: *Eryx jayakari* is a nocturnal forager, feeding mostly on lizards, rodents and arthropods.

7.11 Family Colubridae

Family Colubridae includes the highest number of species with worldwide distribution. In Kuwait, it is represented by four species in four genera *(Dolichophis, Lytorhynchus, Platyceps* and *Spalerosophis)*. Some colubrids are aglyphous (fangs are not grooved and the venom gland is absent), opisthoglyphous (some maxillary teeth are grooved and usually located under the eye level, and connected to a venom gland). Morphologically, this family exhibits a wide range in type and shape of dorsal and subcaudal scales, as well as in other external features.

Key to species of Family Colubridae

1. Upper labials not entering the eyes (Figure 79A) ..... *Spalerosophis diadema cliffordi*
   At least one upper labial entering the eyes (Figure 79B) *2*

Figure 79. A. Upper labial not entering the eye. B. At least one upper labial entering the eye (Photos by Z. Amr).

2. Rostral projecting outwards, wedge-shaped (Figure 80) ..... *Lytorhynchus diadema*
   Rostral not projecting outwards, not wedge-shaped *3*

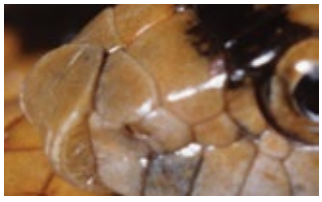

Figure 80. Rostral projecting outwards (Photo by Z. Amr).

3. Body uniformly black in adults with over 100 caudal scales ..... *Dolichophis jugularis*
   Body not uniformly black .....*Platyceps ventromaculatus*

7.11.1 Genus *Dolichophis*

No detailed descriptions are available for this genus. Species of this genus are relatively long snakes reaching more than 2 m long, with robust bodies. Eyes large with round red pupils. Eight upper labials, fourth and fifth entering the eye, and nine to ten lower labials are present. Two preoculars, one subocular, and two or three postoculars. Midbody scales 19.

7.11.1.1 *Dolichophis jugularis* (Linnaeus, 1758)

Figure 81: Large whip snake, *Dolichophis jugularis* (Photo by Z. Amr).

Distribution range: This species is common in Jordan, Lebanon, Palestine, Syria and Turkey (Amr & Disi 2011).

Records from Kuwait: Doha.

Diagnosis. Adults are long and stout. Eyes with round red pupils. Eight upper labials, fourth and fifth entering the eye. Nine to ten lower labials. Two postoculars, one subocular, two or three postoculars. Midbody scales 19, ventral scales 202-218, caudal scales 103-126. Anal divided. Maximum total length may reach 250 cm. Adult specimens are uniformly black dorsally. Immature specimens differ from adult specimens in having four to six rows of alternating, light coloured spots dorsally.

Habitats: This snake is anthropogenic; it is quite common around agricultural regions and grain storage areas.

Biology: They may feed on rodents and other reptiles that are usually associated with farming areas. When approached this snake hisses loudly and coils itself with its head elevated. Females are oviparous, laying 6-18 eggs.

Remarks: This snake was reported from Doha, Kuwait (Al-Mohanna et al. 1997). In southern Iraq, it was found in Al-Kufa district (Rhadi et al. 2017). Certainly, this snake represents a relict population in Kuwait.

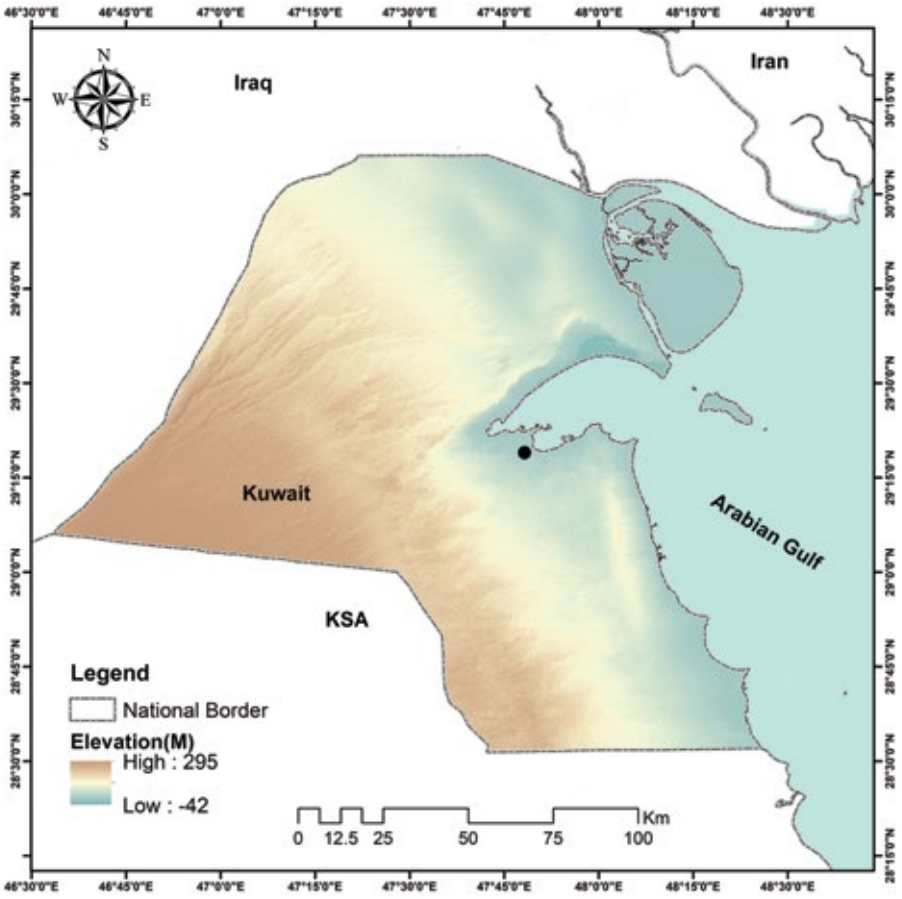

Figure 82: Distribution of *Dolichophis jugularis* in Kuwait (Source: IUCN ROWA).

7.11.2 Genus *Lytorhynchus*

Species of this genus are characterised by their projecting flat snout and large rostrum. Their eyes have elliptical pupils. The nostril forms an oblique slit between two large nasals. Six species belonging to this genus have been described, with a distribution ranging from North Africa to the Sahara in the west, through southern Turkey and the former Soviet Union to Pakistan and Afghanistan to the east (Gasperetti, 1988).

7.11.2.1 *Lytorhynchus diadema* (Nikolsky, 1907)

Crowned leafnose snake

Figure 83: Crowned leafnose snake, *Lytorhynchus diadema gaddi* (Photo by A. Alenezi).

Distribution range: This subspecies is known to occur in Saudi Arabia, Iraq and SW Iran.

Records from Kuwait: Al Jalia, Al Jahrah, Al Ritqa, Al Wafrah, Kuwait.

Diagnosis: Snout moderately long; rostral angularly bent, with straight horizontal edge, detached on the sides, the portion visible from above as long as its distance from the frontal; no lateral cleft in the rostral. Suture between the internasals much shorter than that between the prefrontals. Frontal nearly as long as its distance from the end of the snout, slightly shorter than the parietals. A small, squarish loreal. One or two preoculars, with or without a subocular below; two postoculars. Temporals 1 + 2 or 2 + 3; seven or eight upper labials, fourth, fifth or fourth and fifth, entering the eye. Three lower labials in contact with the anterior chin-shields; posterior chin-shields as long as or a little longer than the anterior and separated from each other by two series of scales. Scales smooth in 19 rows, ventral scales152-195; caudal scales 30-49. Anal divided.

Pale buff or cream colour above, with a series of 13-18 large transversely

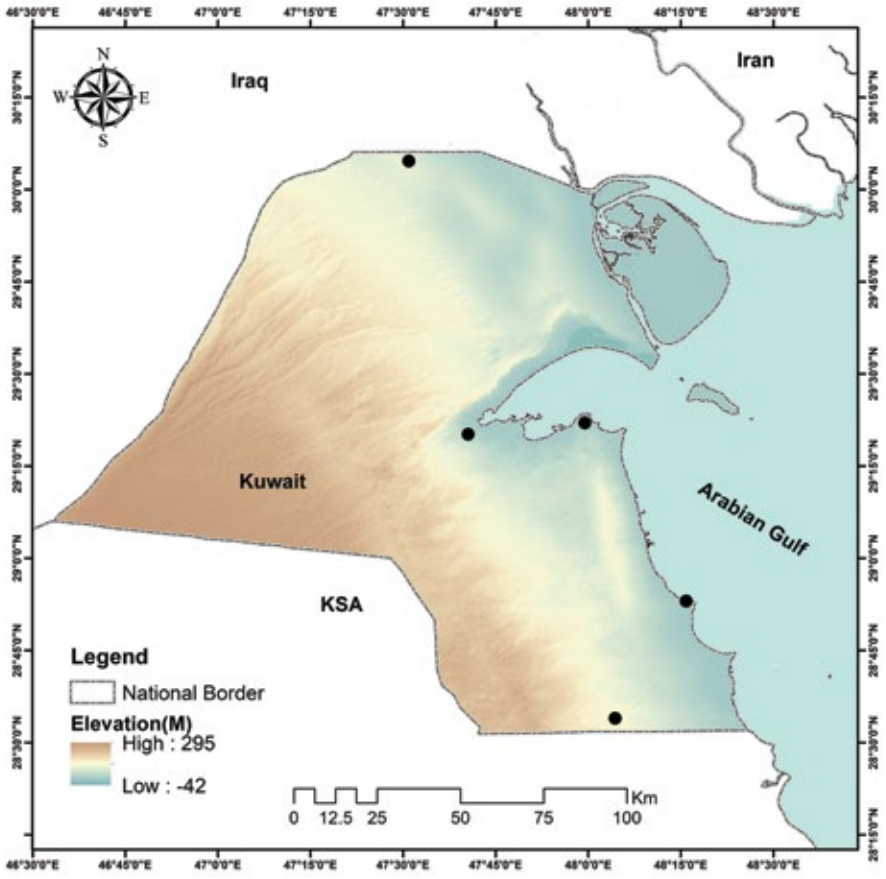

Figure 84: Distribution of *Lytorhynchus diadema gaddi* in Kuwait (Source: IUCN ROWA).

rhomboidal dark spots; a dark median band along the head and nape, sometimes confluent with an interocular transverse band; an oblique dark band from the eye to the angle of the mouth; lower parts uniform white.

Habitats: The diademed sand snake is a nocturnal species. It inhabits sand deserts, gravel plains and *sabkhah.* The modified rostral scale of this snake is an adaptation for its burrowing behavior in sandy habitats.

Biology: It feeds most frequently on animals inhabiting burrows or holes (Baha El Din, 1996). It seems to prefer nocturnal lizards, particularly geckos (Egan, 2007).

Remarks: Shafiei et al. (2015) showed that *L. d. gaddi* occurs to the west of Iran with localities bordering Iraq. This snake is associated with loose soil, preferably sand.

7.11.3 Genus *Platyceps*

This genus includes the racers, which are thin-bodied snakes. They are usually long and cylindrical with long smooth tails. The neck is hardly distinct from head. Eyes are small with round pupils. Body scales are smooth, with 19 midbody scales.

7.11.3.1 *Platyceps ventromaculatus* (Gray, 1834)

Glossy-bellied racer

Figure 85: Glossy-bellied racer**,** *Platyceps ventromaculatus* (Photos by A. Alenezi).

Distribution range: Iraq, Iran, Kuwait, Bahrain, Eastern Saudi Arabia and the United Arab Emirates.

Records from Kuwait: Al Jalia, Ali Al Salem Air Force Base, Judailiyat, Kabed Reserve, Kuwait.

Diagnosis: Nineteen longitudinal rows of scales at midbody, ventral scales

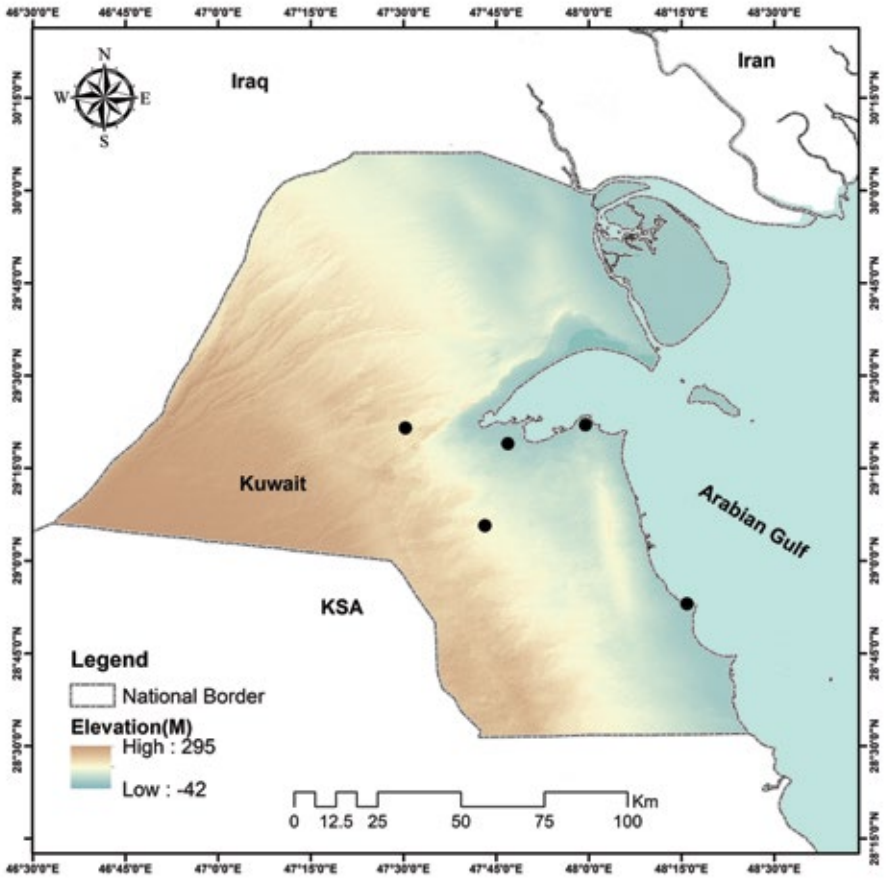

Figure 86: Distribution of *Platyceps ventromaculatus* in Kuwait (Source: IUCN ROWA).

194-211, caudal scales 82-119. Nine upper labials, ten lower labials. A black transverse interorbital bar of variable shape and irregular but mostly symmetrical mottling on the fronto-parietal region; a dark spot below the eye and an oblique stripe on the temple. Dorsum colour is usually greyish white, pale sandy, yellowish olive, brownish grey or reddish brown, with at least 74 transverse blotches.

Habitats: It can climb onto bushes, buildings, and rocks in arid regions. Little is known on its biology.

Biology: It is usually most active from sunset until about two hours after darkness. The glossy-bellied racer feeds on lizards, geckos, small mammals, including bats and shrews (Schätti & Schmitz, 2006).

Remarks: Schätti (2006) referred to the populations of this species inhabiting Iraq, Kuwait and Saudi Arabia as *Platyceps* cf. *ventromaculatus*.

7.11.4 Genus *Spalerosophis*

The orbit is completely encircled by 10-13 ocular scales and the upper labials are never in contact with the oculars, prefrontals and loreals are broken into several small-sized scales, temporals are divided into several scales, and usually the anal plate is undivided (Marx, 1959).

7.11.4.1 *Spalerosophis diadema cliffordii* Schlegel, 1837

Clifford's royal snake

Figure 87: Clifford's royal snake, *Spalerosophis diadema cliffordii* (Photo by A. Alenezi).

Distribution range: The Clifford's royal snake has a wide range of distribution extending from North Africa to western Iran, southern Turkey to the Arabian Peninsula (Amr & Disi, 2011).

Records from Kuwait: Al Atraf, Al Jalia, Amgara, Kuwait, Mula'a farm, Sabah Al-Ahmad Natural Reserve.

Diagnosis: Large and robust snake that may reach 130cm in length. Head is very distinct from neck. Eyes are relatively large with round pupils. Rostral as deep as broad or a little broader than deep, visible from above. Prefrontals usually broken up into several shields, there being frequently three transverse series of shields between the rostral and the frontal. Temporals small and numerous, scale-like. Three to five loreals. Two to four postoculars. Frontal one and one-fourth to one and a half as long as broad, as long as or slightly shorter than its distance from the end of the snout, and usually shorter than the parietals. Ten to thirteen upper labials, none is in contact with the eye. Five lower labials in contact with the anterior chin shields, which are nearly as long as the posterior. A series of suboculars separate the upper labials from the eye. Scale rows consists of 25-29 scales, ventral scales 205-254, caudal scales 64-82.

The background colouration of the head and body varies, but it is usually grayish, yellowish, sandy-beige or reddish. Dorsum covered with large dark to light

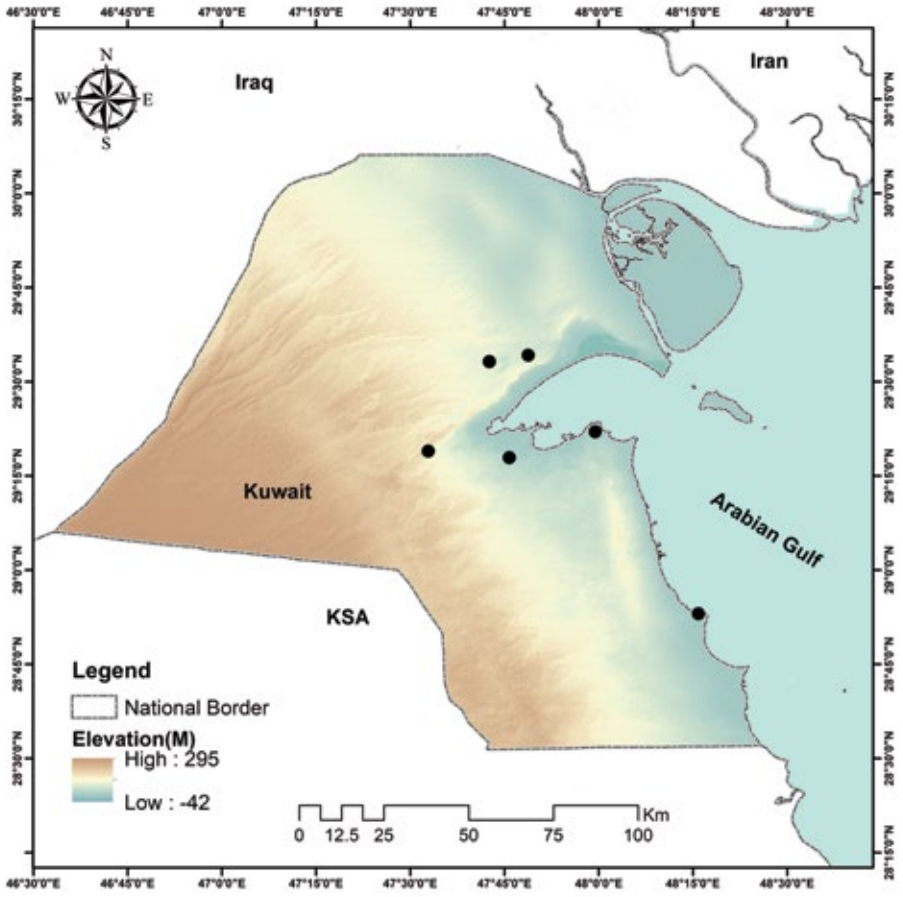

Figure 88: Distribution of *Spalerosophis diadema cliffordii* in Kuwait (Source: IUCN ROWA).

brown spots with white scales around the borders. Alternate smaller spots on flanks. Head markings, consisting of a dark band, which runs across the head between the eyes, behind which several irregular, dark spots may be present.

Habitats: This is an aggressive snake inhabiting arid regions.

Biology: It feeds on rodents such as mice and rats (Amr & Disi, 2011). Females lay up to 13 eggs. It is active during daytime in winter, and at night-time in summer.

7.12 Family Psammophiidae

This family includes two species in two genera *(Malpolon and Psammophis)*. Both species are desert adapted species. Species of this family were previously listed under Colubridae. Recent molecular studies supported the separation of this family as Psammophiidae. Species of this family are characterised by having an extremely reduced, short and thread-like hemipenis, and clearly different dentition in the upper and lower jaws, and loss of the ventral processes (Kelly et al., 2008).

Key to species of Family Psammophiidae

1. Head with a convex profile, number of subcaudal scales 48-73 ..... *Malpolon moilensis*
   Head without a convex profile, number of subcaudal scales over 90..... *Psammophis schokari*

7.12.1 Genus *Malpolon*

This genus includes back-fanged species, with one or two large, grooved fangs, situated approximately below the posterior border of the eye.

7.12.1.1 *Malpolon moilensis* Fitzinger, 1826

Moila snake

Figure 89: Moila snake, *Malpolon moilensis* (Photos by A. Al Yousef).

Distribution range: Algeria, Egypt, Sudan to Southwest Asia including southwestern Iran.

Records from Kuwait: Al Ahmadi Governorate, Al Jalia, Kuwait, Sabah Al-Ahmad Reserve.

Diagnosis: Opisthoglyphous. Body is elongated and cylindrical. Eyes are

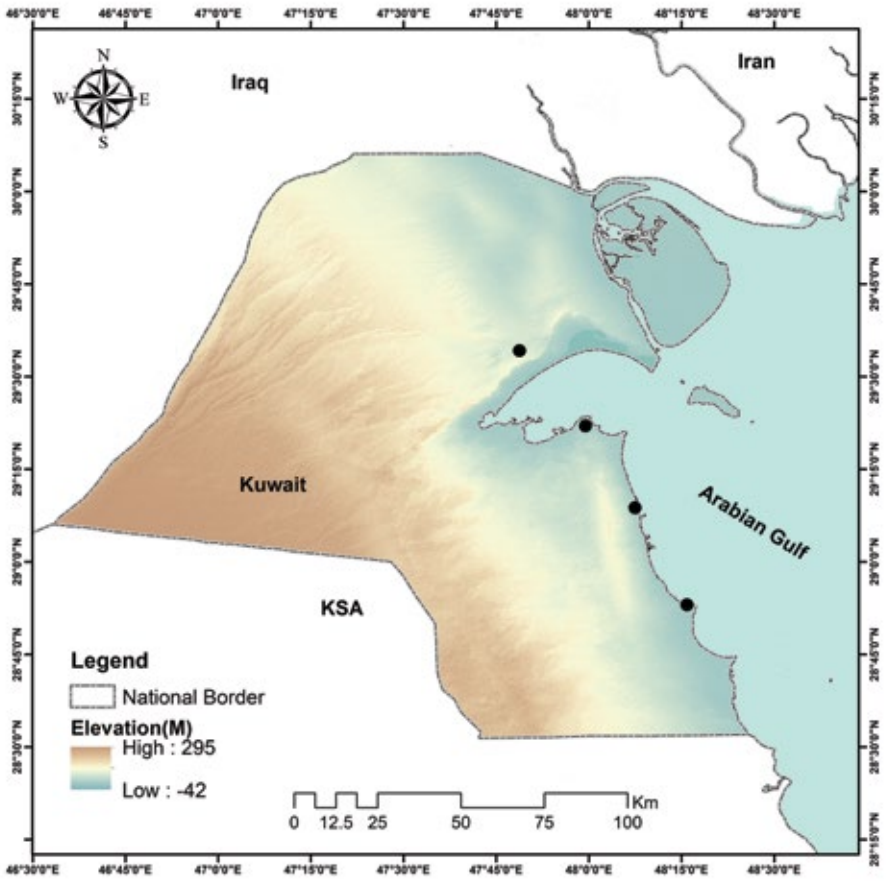

Figure 90: Distribution of *Malpolon moilensis* in Kuwait (Source: IUCN ROWA).

relatively large with round pupils. Head is elongated and is distinct from the neck. Snout protrudes over the mental and obtusely pointed. Rostral at least as deep as broad, wedged in between the internasals. Frontal as broad as the supraocular, twice as long as broad, its long as or a little longer than its distance from the end of the snout, as long as or a little longer than the parietals. Forehead is convex. One loreal, one or rarely two postoculars. Temporals 1 + 2, 2 + 3 or 2 + 4. Seven to eight upper labials, the fourth and fifth (or third and fourth) enter the eye. Four or five lower labials in contact with the anterior chin shields. Dorsal scales in 17 rows, ventral scales 152-180, caudal scales 48-73, scale smooth entirely. Anal divided.

Usually sandy, light to dark, with spots dorsally of irregular pattern. A dark brown spot located between the eye and the neck is very distinctive in this species.

Habitats: This snake is adapted for desert and arid environments. It occurs in all types of habitats in Kuwait. During the daytime it basks in the sun, and rests under desert bushes.

Biology: This is a diurnal snake; however, it becomes crepuscular during hot seasons (Gasperetti, 1988). It feeds on a wide variety of reptiles including lizards, geckos as well as other snakes, birds and rodents (Schleich et al., 1996). When alarmed, it exhibits cobra-like posture.

Remarks: This is a diurnal snake inhabiting gravelly deserts. Its distribution range extends from Algeria, Egypt, Sudan to Southwest Asia including south-western Iran (Amr & Disi, 2011).

7.12.2 Genus *Psammophis*

Opisthoglyphous. Two large, hollow fangs are situated below the posterior border of the eye. Head is elongate and distinct from neck. Eyes are relatively large with round pupils. Body is cylindrical, with a long tail, covered by smooth scales.

7.12.2.1 *Psammophis schokari* (Forskål, 1775)

Forskål's sand snake

Figure 91: Forskål's sand snake, *Psammophis schokari* (Photos by A. Alenezi).

Distribution range: Its distribution extends from North Africa to India, and from Syria to the Arabian Peninsula (Amr & Disi, 2011).

Records from Kuwait: Al Jahrah, Al Wafrah.

Diagnosis. Opisthoglyphous. Long, thin snake with a flat head. Eyes are relatively large with a round pupil. Eight to ten upper labials, fifth and sixth entering the eye. Rostral broader than deep, visible from above. Nostril between two or three shields; internasals much shorter than the prefrontals. Frontal twice to two and a half as long as broad, about half as broad, in the middle, as the supocular, as long as or a little longer than its distance from the end of the snout, as long as the parietals. Loreal three to four times as long as deep. One postocular (rarely divided), in contact with the frontal. Temporals 2 + 2 or 3 (rarely 1 + 2). Nine (rarely eight or ten) upper labials, third or fourth deepest, usually third, fourth and fifth in contact with the preocular, fifth and sixth (rarely

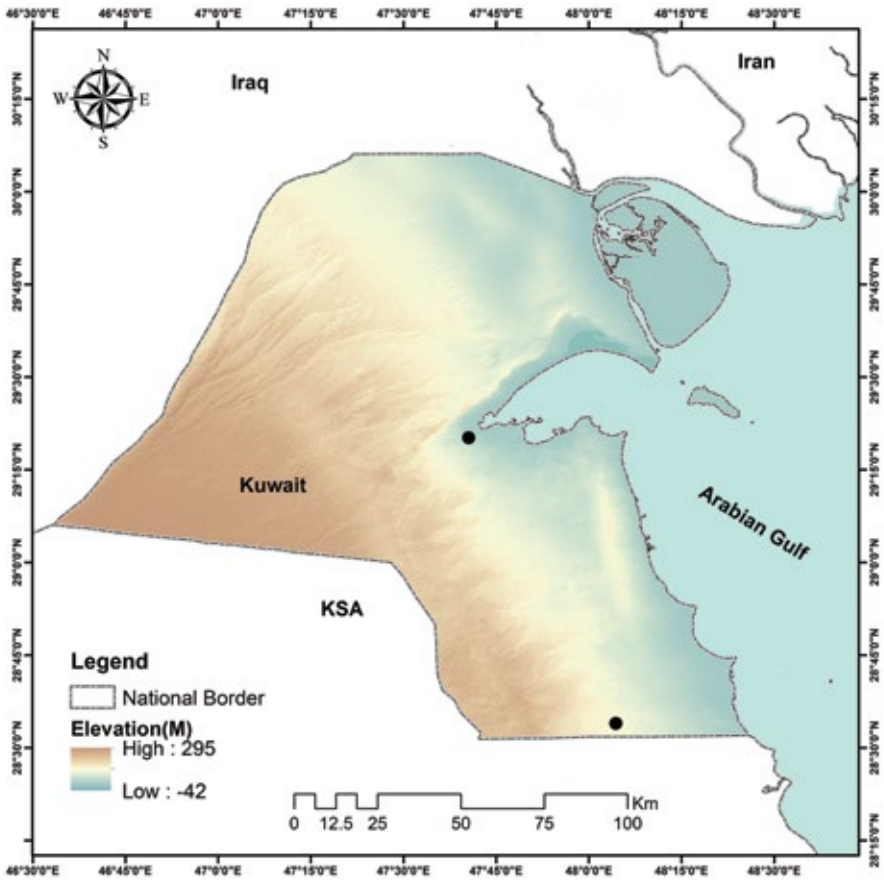

Figure 92: Distribution of *Psammophis schokari* in Kuwait (Source: IUCN ROWA).

fourth and fifth or sixth and seventh) entering the eye. Five or six lower labials in contact with the anterior chin shields, which are shorter than the posterior. One elongated loreal, three to four times as long as wide. Scale rows 17, ventral scales 162-194, caudal scales 95-149. Anal divided. Maximum length may reach 150 cm. Live specimens may show a green strip extending from the eye to the nape, a yellow line extends dorsally with parallel green and yellow lines. Ventral is usually sprinkled with very small reddish-brown spots. A dark, narrow longitudinal band extends on both sides of head.

Habitats: This is a common snake inhabiting arid habitats as well as temperate Mediterranean areas. It is usually observed during daytime under bushes or around rock piles.

Biology: *Psammophis schokari* is a diurnal species. It was observed in arboreal postures on bushes and shrubs. Females are oviparous, laying two to six eggs.

7.13 Family Viperidae

This family includes one species of the genus *Cerastes.* This genus is widespread across the deserts of northern North Africa eastward through Arabia and to Iran, with three species: *Cerastes gasperettii, Cerastes cerastes* and *Cerastes vipera* (Sindaco et al., 2013).

7.13.1 Genus *Cerastes*

The head is clearly distinct from the neck and covered with small juxtaposed feebly keeled imbricate scales. Eyes are large with vertical pupils and separated from the upper labials by four to fi ve series of small scales. Nostrils directed upwards and outwards. Dorsal scales are keeled with apical pits in 23-25 rows, and the ventral scales are feebly keeled on both sides. Tail is distinctly short, anal plate is entire and all subcaudals are paired. In some populations, a horny projection, consisting of a single scale, extends above the eye.

7.13.1.1 *Cerastes gasperettii* Leviton & Anderson, 1967

Arabian horned viper

Figure 93: Arabian horned viper, *Cerastes gasperettii* (Photo by A. Alenezi).

Distribution range: Known across the Arabian Peninsula, southern Iraq, Kuwait and Jordan (Amr & Disi, 2011).

Records from Kuwait: Abraj Khaitan, Al Ah'madi, Al Jahrah, Al Jalia, Auhha

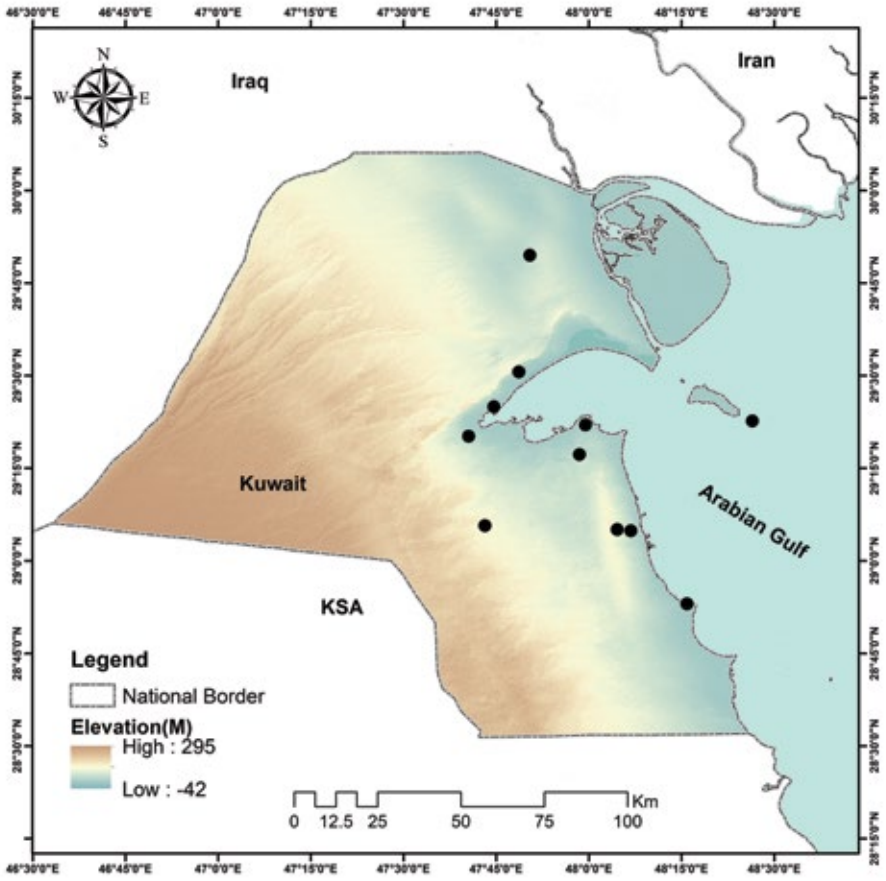

Figure 94: Distribution of *Cerastes gasperettii* in Kuwait (Source: IUCN ROWA).

Island, Jal Az Zour, Kabed Reserve, Kadma, S Kuwait, Rawdatain, Subiya.

Diagnosis: Head triangular and broad, wide flattened and clearly distinct from neck, covered with small irregular tubercularly keeled scales. *C. g. gasperettii* is characterised by a thick body and short tail. Pupil elliptical. Eyes separated from labials by rows of small scales; absence of the cluster of enlarged scales at midoccipital region of head between the eyes. A pair of supraocular horn-like spiny scales above the eye can be either present or absent. If horns are present, they point externally; four to five superalabials scale rows, the first supralabial is relatively small. 12-15 upper labials. Thriteen to fifteen lower labials. Number of scales in ocular ring 12-14. More than four to five rows of scales between the eyes. Dorsal scales heavily keeled with apical pits. Lateral scales are smaller laterally keeled serrated and arranged in an oblique series. Midbody scales 31-35; ventral scales 152-164; subcaudals divided and vary

from 33-37. Anal scale undivided. Colour varies by region, and can be reddish, yellowish or grey, depending upon the actual colour of the sand where a population lives. The pattern consists of indistinct brown spots in four to six longitudinal series, a dark streak on the tail and a variable head pattern. The head pattern is accentuated in some populations of *C. g. gasperettii,* in which case the dark band between the eye and the angle of mouth is accompanied dorsally by a light band.

Habitats: The Arabian horned-viper is a true psamophile species. It was seen and collected from sand dunes in various locations in Kuwait. During the daytime it hides in rodent borrows, and specimen has been seen buried in the sand with only its eyes protruding from the ground surface. It starts its activity after sunset and is active at night, moving across the sand searching for food, especially rodents. Side-winding trails are very characteristic of this viper.

Biology: It feeds mostly on rodents *(Gerbillus nanus, Gerbillus dasyurus,* and *Meriones crassus)* as well as *Scincus scincus* (Amr & Disi, 1998). *C. g. gaspretti* is oviparous, laying 8-23 eggs in abandoned rodent burrows.

Remakes: An illustrated guide to the horned-viper of Kuwait was published by Al-Fares and Al-Metairie (2014) with a series of photographs.

7.14 Family Elapidae

Subfamily Hydrophiinae

Ten species of the sea snake have been recorded from the Arabian Gulf (Castilla et al., 2017; Rezaie-Atagholipour et al., 2017; Buzás et al., 2018). Within the Kuwaiti waters, the presence of four species is confirmed. Rezaie-Atagholipour et al. (2017) presented a comprehensive account on the sea snake of the Arabian Gulf including identification keys and illustrations.

Key to sea snakes of Subfamily Hydrophiinae

Key is entirely based on Rezaie-Atagholipour et al. (2016)

1. Tip of rostral markedly tridentate (Figure 95 B and C); ventrals on mid-body larger anteriorly than posteriorly, markedly distinguishable from adjacent scales ……*Hydrophis viperinus*

   Tip of rostral markedly or slightly unidentate (Figure 95 D); ventrals on mid-body almost of same size, slightly distinguishable or indistinguishable from adjacent scales ……2

2. Markedly sharp contrast in colors of dorsal and ventral portions of head and body, dark brown or black dorsally, yellow ventrally; ventrals on mid-body more or less indistinguishable from adjacent scales ……*Hydrophis platurus*

   Not coloured as in four, usually banded body; ventrals on mid-body slightly distinguishable from adjacent scales ……3

3. Scales on thickest part of body juxtaposed or feebly imbricate, more or less hexagonal or quadrangular in shape; total length rarely exceeding one meter in adults …… *Hydrophis lapemoides*

   Scales on thickest part of body more or less imbricate with bluntly pointed tips; total length more than one meter in adults …… *Hydrophis cyanocinctus*

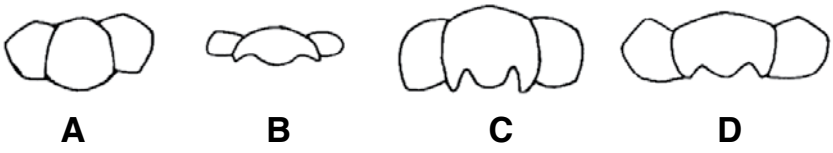

Figure 95: Various shapes of rostrals of sea snakes of the genus Hydrophis in the Arabian Gulf. A. Tip of rostral decurved and pointed. B and C. Tip of rostral tridentate. D. Tip o rostral unidentate (After Rezaie-Atagholipour et al., 2017).

7.14.1. Genus *Hydrophis*

Head shields large, nostrils located superiorly, nasals in contact with each others, body scales imbricate, or juxtaposed in 29-57 longitudinal rows at mid-body. Ventral scales small in size.

7.14.1.1 *Hydrophis cyanocinctus* Daudin, 1803

Annulated sea snake

Figure 96: The annulated sea snake, *Hydrophis cyanocinctus* (Photo by Csaba Géczy).

Distribution range: The Annulated sea snake is known from the Indo-West Pacific, from the Arabian Gulf to Japan (David & Ineich, 1999). Within the Arabian Gulf, it was recorded from the waters of all Gulf States (Castilla et al., 2017).

Diagnosis: Head small, 7-8 upper labials, whereas the second is in contact with prefrontal scale, third, fourth and fifth (or third and fourth, or fourth and fifth) are in contact with the eye; body elongate but not markedly slender anteriorly; 300-359 ventrals, body scales on thickest part of the body with round or bluntly pointed tips, slightly or distinctly imbricate; 25-31 scale rows on neck, 38-44 on body. Body dark olive, grayish, or dirty white, dorsally darker and ventrally paler; 51-56 black rings broader dorsally, or broader bands tapering to points on laterals, on body and tail; head black in juveniles, usually with a yellow horseshoe-shaped mark above; adults with head sometimes of same colour as body without the horseshoe-shaped mark (Rezaie-Atagholipour et al., 2016).

Habitats: Warm, shallow waters over reefs, seagrass beds or sand; also, in mangroves (Gardner, 2013; Buzás et al., 2018).

Biology: It feeds on a variety of species in the Arabian Gulf, including mudskippers, tail-eyed gobies (Gardner, 2013; Buzás et al., 2018).

7.14.1.2 *Hydrophis lapemoides* Gray, 1849

Persian Gulf sea snake

Figure 97: *Hydrophis lapemoides* (Photo by Csaba Géczy).

Distribution range: This snake occurs across the Indian Ocean, extending from the Arabian Gulf to the Malay Archipelago (Rasmussen 1987; Rezaie-Atagholipour et al., 2017). Within the Arabian Gulf, it was recorded from the waters of all Gulf States (Castilla et al., 2017).

Diagnosis: Head slightly small; 8 upper labials, second in contact with prefrontal, third and fourth or third, fourth and fifth touch eye; body elongate but not markedly slender anteriorly; 290-404 ventrals, slightly distinguishable from adjacent scales; body scales in thickest part of body more or less quadrangular or hexagonal in shape and juxtaposed; 29-31 scale rows on neck, 41-46 on body. Body olive-whitish, dirty white, darker dorsally and paler ventrally; 41-55 black rings broader dorsally, or broader bands tapering to points on the sides, on the body and tail; head black in juveniles, usually with a yellow horseshoe-shaped mark ; adults with head sometimes of same colour as body without the horseshoe-shaped mark (Rezaie-Atagholipour et al., 2016)

Habitats: Warm shallow waters, over reefs, seagrass beds or sand, often very close to shores (Egan, 2007; Gardner, 2013).

Biology: It feeds on eels, gobies and flatfish (Gardner, 2013).

7.14.1.3 *Hydrophis platurus* Linnaeus, 1766

Yellow-bellied sea snake

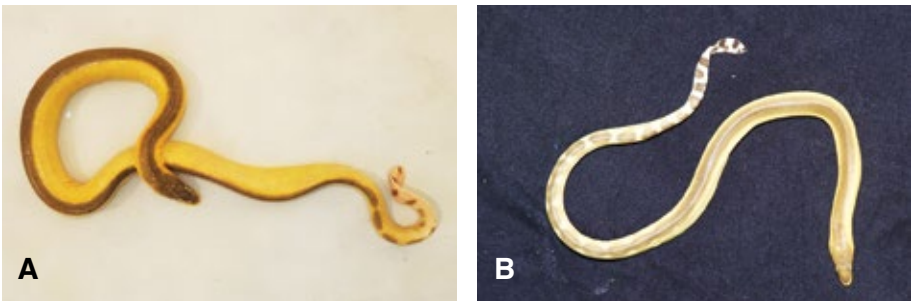

Figure 98: *Hydrophis* platurus. A. Dorsal view. B. Ventral view (Photos by Balazs Buzas).

Distribution range: The yellow-bellied sea snake occurs across the Indo-Pacific, from east and south of Africa as far as the western coasts of North and South America (Heatwole, 1999). Within the Arabian Gulf, it was recorded from the waters of all Gulf States (Castilla et al., 2017).

Diagnosis: Head narrow; snout elongate; 9-10 upper labials, second touches prefrontal scale, four and fifth separated from eye by suboculars or contact eye; body short, not stout; 330-333 small ventral scales], more or less indistinguishable from adjacent scales at mid-body. This species has a unique colour pattern making it stand out and identifiable from other sea snakes; dorsal half of head and body black, dark green or dark brown, ventral half of head and body yellow, a markedly sharp contrast between dorsal and ventral portions; tail yellow in ventral portion, spotted or barred in dorsal portion; sometimes with pale dorsal colour (Rezaie-Atagholipour et al., 2016).

Habitats: The yellow-bellied sea snake is usually found in clear, shallow warm waters, with weak surf and current movement (Egan, 2007; Gardner, 2013).

Biology: It feeds on a variety of fishes in the Arabian Gulf.

7.14.1.4 *Hydrophis viperina* Schmidt, 1852

Viperine sea snake

Distribution range: This sea snake occurs in the Indian Ocean, extending from the Arabian Gulf to the Malay Archipelago (David & Ineich, 1999). Within the Arabian Gulf, it was recorded from the waters of all Gulf States (Castilla et al. 2017).

Diagnosis: Head large, short and depressed; tip of rostral curved and mark-

edly tridentate; usually seven to eight upper labials, none in contact with prefrontal; 245-291 large ventrals, markedly distinguishable from adjacent scales, larger anteriorly than posteriorly; ventrals on anterior part of body wide and enlarged, half width of body, more or less rectangular in shape; 29-38 scale rows on neck. Dark gray dorsally, dirty white ventrally; with or without pale body bands broadest dorsally; tip of tail usually black (Rezaie-Atagholipour et al., 2016).

Habitats: open seas and oceans.

Biology: It feeds on a variety of fishes in the Arabian Gulf.

(Photo by A. Alenezi)

8 Conservation and threats of reptiles of Kuwait

8 Conservation and threats of reptiles of Kuwait

Very little information is available on the threats affecting reptiles of Kuwait. Four main categories of threats affect the amphibians and reptiles of Kuwait. Some specific threats are very dangerous for particular species' survival; while a combination of threats may lead to population decline.

8.1 Terrestrial habitats

8.1.1 Urbanisation

Kuwait is a small country with an increasing population that consists of Kuwaiti citizens and expatriates from many different countries. Within the past six decades, Kuwait's population has increased rapidly, affecting the overall natural habitats. For example, the black-tail toad-head agama, *Ph. maculatus,* will be driven into extinction, due to extensive development, which has resulted in the destruction of the species' *"sabkha"* preferred habitats by the construction of artificial lagoons and high-rise buildings. The same is true for the Egyptian spiny-tailed lizard, *U. aegyptius.*

8.1.2 Grazing

Previous studies showed that the number of domestic animals grazing in rangeland has increased by 36% for sheep and 100% for camels over a period of three years. About 45% of these animals come from neighboring countries. Most of the overgrazed areas are close to human settlements. In 2017, a total of 871,811 grazing livestock (sheep, goats, and camels) were observed in 2,473 grazing areas across Kuwait (Al Dousari et al., 2019).

8.1.3 Soil compaction

Off-road vehicle use is considered by far as one of the most adverse effects on desert habitats. During the Iraqi invasion, tanks and military vehicles caused extensive soil compaction all over the country. Consequently, natural vegetation was destroyed and soil compaction resulted.

This is especially true for sand dwelling species such as *A. schmidti, C. gasperetti, D. zarudnyi, E. jaculus, L. diadema, Ph. arabicus, S. mitranus, S. scincus* and *S. doriae,* as well as for other gravel inhalants such as *V. griseus* and *U. aegyptia.* In 2017, soil compaction was estimated at totalling 1390 km^2 which was caused by off-road vehicle tracks and grazing activities in Kuwait. This accounts for 7.8% of Kuwait's total area (Al Dousari et al., 2019).

8.1.4 Recreational activities and tourism

Camping and driving in the open desert areas is on the increase in Kuwait. Large vehicles are widely used for racing on sand dunes. This will certainly affect many sand-dwelling lizard and snake species and therefore, cause disturbance. In general, in this part of the world, reptiles and particularly snakes are disliked animals. During recreational activities in the desert, burrows of the spiny-tailed lizard, *U. aegyptia,* have been damaged.

8.2 Marine habitats

8.2.1 Pollution and marine debris

Plastic particles and tar pollution are among the most common forms of pollution of the marine environment of Kuwait (Shiber, 1989). This perhaps can affect the marine turtles frequenting the Kuwaiti waters. Extensive damage to the marine environment of Kuwait was caused after the Iraqi invasion. Millions of tons of oil from destroyed oil wells spilled into the marine ecosystems, killing many forms of marine life. Almost the entire shoreline surrounding Kuwait was damaged during the war (i.e. land mines, construction of concrete military structures and trenches) (Meakins & Al-Mohanna, 2000). This has led to a total habitat destruction of marine turtles.

8.2.2 Bycatch of marine turtles

The number of nesting Green Turtles, *C. mydas,* has declined over the years, with limited number of nesting individuals around Qaru and Failaka islands (Rees et al., 2013). This is mainly due to that the foraging habitat of the Green Turtles overlaps with a coastal trap-fishery. This issue is raising concern on the future of these small populations (Rees et al., 2013). Although no bycatch was recorded by the traditional *"hadra"* around the coasts of Kuwait.

8.2.3 Coastal development

Within the past decades, increasing pressure on the coastal and marine ecosystem to meet the demand for housing and port expansion, has impacted the sandy coastal areas that are suitable for nesting of marine turtles.

8.3 Legislative and public awareness

8.3.1 Enforcement

Law No. 42 of 2014 on Environmental Protection forbids hunting of all species of marine turtles in Kuwaiti's marine environment as well as all wild terrestrial animals. Article 100 of this Law states that "*It is prohibited to hunt, kill,*

catch, collect, harm, acquire or transport wild land and marine organisms, whether alive or dead or prejudice their juveniles, eggs, nests or their habitats, and the Executive Bylaw of this law shall determine the types and numbers of organisms allowed to be hunted or fished in certain seasons and specific areas. Hunting or fishing for scientific purposes shall be exempted after the approval of competent concerned authorities in coordination with the Authority".

Actual enforcement and implementation of this law is still very far from protecting animals and particularly reptiles. In fact, the spiny-tailed lizard, *U. aegyptia,* is included within the allowed hunted animals together with birds. Its hunting season is open from the beginning of August to the end of September outside the protected areas, with no bag limit. This ambiguity in the number of allowed animals caused massive hunting and killing of this vulnerable species. The broad spectrum of biological diversity requires trained individuals to reveal its importance for the country in various aspects; socio-economic, ecotourism, scenic and ethical perspectives.

(Photo by A. Ragab)

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Table 1: Localities indicated in the text and their coordinates.

Locality	N	E
Abdali	30° 03’ 41.90”	47° 40’ 59.60”
Abraj Khaitan	29° 17’ 13.51”	47° 58’ 26.42”
Agriculture Research Station	29° 08’ 59.82”	47° 39’ 57.70”
Ahmed Al Jaber Air Base	28° 56’ 26.70”	47° 47’ 38.40”
Al Abatih	29° 51’ 18.20’’	47° 31’ 46.20’’
Al Abraq	29° 17’ 00.10”	46° 58’ 54.50”
Al Ah’madi	29° 05’ 05.28”	48° 04’ 34.61”
Al Ah’madi Governorate	29° 08’ 46.65”	48° 07’ 26.28”
Al Asimah	29° 20’ 02.50”	47° 58’ 35.43”
Al Atraf	29° 18’ 56.40”	47° 32’ 50.81”
Al Dbaiyyah	28° 56’ 09.70”	48° 12’ 10.20”
Al Jahra East Outfall	29° 21’ 00.38”	47° 43’ 58.93”
Al Jahrah	29° 20’ 11.65”	47° 40’ 31.94”
Al Jalia	28° 53’ 02.60”	48° 15’ 51.50”
Al Liyah	29° 29’ 32.13”	47° 10’ 06.07”
Al Mutla	29° 24’ 50.52”	47° 40’ 33.27”
Al Nuwaiseeb	28° 35’ 00.80’’	48° 23’ 06.60’’
Al Ritqa	30° 04’ 39.20’’	47° 30’ 54.60’’
Al Salmi	29° 08’ 33.10”	46° 43’ 09.40”
Al Shlallal Farm	29° 34’ 23.50’’	47° 54’ 28.20’’
Al Subiya	29° 35’ 36.48”	48° 06’ 53.76”
Al Sugaihia	29° 39’ 56.80’’	47° 08’ 18.60’’
Al Wafrah	28°57.52 ‘33 ”	48° 04’20.73 ”
Al Wafrah New City	28° 33’ 48.03”	48° 04’ 21.77”
Ali Al Salem Air Force Base	29° 21’ 31.40”	47° 30’ 16.98”
Auhha Island	29° 22’ 39.98”	48° 26’ 25.66”
Benadier	28° 47’ 46.70”	48° 16’ 58.30”
Bodai’s Farm	29° 57’ 55.60’’	47° 48’ 42.90’’

Burgan hills	29° 03’ 10.34”	48° 02’ 29.13”
Doha area	29° 18’ 58.68”	47° 48’ 12.35”
Failaka Island	29° 26’ 40.04”	48° 16’ 51.30”
Hawalli	29° 20’ 43.06”	48° 01’ 58.73”
Jal Az Zor	29° 30’ 36.46”	47° 48’ 38.95”
Judailiyat	29° 19’ 00.06’’	47° 46’ 52.10’’
Kabed	29° 05’ 43.23”	47° 43’ 09.79”
Kadma	29° 24’ 58.30”	47° 44’ 36.00”
Khiran	28° 39’ 44.67”	48° 18’ 49.82”
Khwaisat	29° 22’ 48.10”	47° 40’ 59.70”
Kuwait city	29° 22’ 01.32”	47° 59’ 25.81”
Mahboula	29° 08’ 51.80’’	48° 07’ 15.3’’
Mina Al Zour	28° 44’ 08.60’’	48° 22’ 57.90’’
Mina Said (Mina Al-Zour):	28° 44’ 29.10’’	48° 23’ 30.50”
Mula’a Farm	29° 33’ 12.07”	47° 42’ 33.30’’
N Bubiyan Bridge	29° 36’ 28.06”	48° 09’ 11.00”
N Sabriya	29° 52’ 44.62”	47° 52’ 49.71”
NW Kubber Island	29° 10’ 00.90”	48° 28’ 00.23”
Qaruh Island	28° 49’ 03.20”	48° 46’ 35.70”
Rabiya	29° 17’ 57.53”	47° 56’ 35.86”
Ras Salmiya	29° 20’ 54.31”	48° 05’5 0.35”
Rhawdatain	29° 49’ 30.70”	47° 50’ 25.55”
Sabah Al-Ahmad Natural Reserve	29° 34’ 13.14”	47° 48’ 44.67”
Salmiya	29° 20’ 26.00’’	48° 04’ 17.00’’
Shiggat Ai-Awazin	29° 52’ 55.08”	47° 13’ 32.90”
Shuaiba Industrial Area	29° 02’ 36.79”	48° 09’ 23.54”
Subahiya	29° 04’ 52.00”	48° 06’ 46.50”
Sulaibikhat Reserve	29° 19’ 12.20”	47° 52’ 19.90”
Sulaibiya Pivot Fields	29° 15’ 12.60”	47° 45’ 11.30”
Tulha	29° 35’ 08.50”	47° 46’ 59.40”

Umm Al-Maradim Island	28° 40’ 48.46”	48° 39’ 06.28”
Umm Niqa	30° 01’ 04.10”	47° 52’ 23.10”
Wadi Al-Tilha	29° 35’ 00.92”	47° 49’ 58.73”
Zayed Reserve	29° 20’ 46.70”	47° 48’ 23.10”

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