

Reptiles from ‘Uruq Bani Ma’arid and Harat al Harrah protected areas in Saudi Arabia

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Abstract. Seventeen (17) and twenty-two (22) species of terrestrial reptiles were recorded from ‘Uruq Bani Ma’arid and Harat al Harrah protected areas, respectively. Eight sites in ‘Uruq Bani Ma’arid and eleven sites in Harat al Harrah were surveyed for the presence of reptiles. A comparison between the two protected areas’ reptile fauna is provided, with brief descriptions of their habitat preferences. *Uromastyx aegyptia*, categorised by the IUCN Red List as Vulnerable, occurs in both protected areas. *Ptyodactylus puiseuxi* is a new species record for the herpetofauna of Saudi Arabia. This study indicates the importance of protected areas within Saudi Arabia for the conservation of reptile biodiversity, the need for extension of the protected area network and additional biodiversity surveys in other regions. Studies on species richness, biology and population size for endangered species should be a priority for future studies.

Key words. Arabian Peninsula, Conservation, Diversity, Herpetofauna, Inventory.

Introduction

The terrestrial herpetofauna of the Kingdom of Saudi Arabia consists of about 113 species (Aloufi et al., 2019, 2020, 2021; Smid et al., 2021a, b). The vast area of this country with diverse habitats resulted in a heterogeneous assemblage of reptile species with different affinities (Aloufi et al., 2019).

Although 15 protected areas have been designated in Saudi Arabia, little is known about their herpetofauna species. The mammals of Harat al Harrah were studied by Seddon et al. (1997). Cunningham (2010a, b) published a checklist of reptiles which are expected

or reported from four protected areas in the Kingdom of Saudi Arabia, namely Farasan Islands, Mahazat as-Sayd, ‘Uruq Bani Ma’arid and King Khalid Wildlife Research Centre (previously known as Thumamah). Cunningham (2010a) reported a total of 21 species (6 confirmed, 12 expected and 3 of unconfirmed status) from ‘Uruq Bani Ma’arid Protected Area. Alshammari and Ibrahim (2015) reported on the reptiles of the historical Faid Protected Area (Faid Hema) where they recorded 22 species of reptiles, and nine were considered as new records to the Faid Hema. In the present study, we investigated the diversity of reptiles in two protected areas in Saudi Arabia: Harat al Harrah and ‘Uruq Bani Ma’arid.

Materials and Methods

Fieldwork. Through a mission for the Saudi Wildlife Authority, the first author was commissioned to undertake a herpetological survey to explore the reptile fauna of Harat al Harrah and ‘Uruq Bani Ma’arid Protected Areas (PA). Field trips were conducted during

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September-October 2017, and in September 2019 for Harat al Harrah, and during May 2019 for 'Uruq Bani Ma'arid (Fig. 1). Reptiles were visually observed and captured with a hand net during the day and night by a group of wildlife biologists from eight and eleven sites representing different habitats within 'Uruq Bani Ma'arid and Harat al Harrah PA, respectively. Transects of about one kilometre in length were surveyed during daytime with at least three hours of total effort for each site. At night, transects were surveyed for geckos and snakes using a flashlight with a minimum of one hour of total effort per site. As for sand dwelling species, such as skinks and vipers, tracks were traced and individuals were caught from under the sand by means of snake sticks or a hand net. Additionally, the presence of reptiles among bushes, crevices and within rocky areas was given more attention. All animals were released at the site of capture after identification and photographs were taken. For plant species, a wildlife biologist who is a trained botanist identified the species for each site.

Study areas. Harat al Harrah PA consists of steppe and black lava deserts with volcanic mountains of various

altitudes, with a total area of 13,775 km². It is located in the north of Saudi Arabia, near the eastern borders of Jordan (Fig. 1). Dominant vegetation includes *Achillea fragrantissima*, *Haloxylon salicornicum*, *Artemisia sieberi*, *Pulicaria undulata* and *Prunus arabica* (El-Sheikh et al., 2019).

The following sites were surveyed at Harat al Harrah:

1. Wadi Heseian (31.19687°N, 39.17723°E) (Fig. 2A): A wide sandy wadi system dominated by *Artemisia monosperma* and *Haloxylon salicornicum*.
2. Al Joraah (30.47898°N, 38.84247°E) (Fig. 2B): This site is surrounded by small volcanic heaps with sandy soil. Dominant vegetation includes *Haloxylon salicornicum*, *Calligonum crinitum* and *Panicum turgidum* bushes.
3. Al Desam (30.72831°N, 38.48356°E) (Fig. 2C): Hammada plains covered by rocks of variable size with poor vegetation. During spring season, it is covered by *Diplotaxis acris* and *Plantago* spp.
4. Lwaizeat Al Amoud (30.98601°N, 39.37852°E) (Fig. 2D): A wide wadi surrounded by black basalt

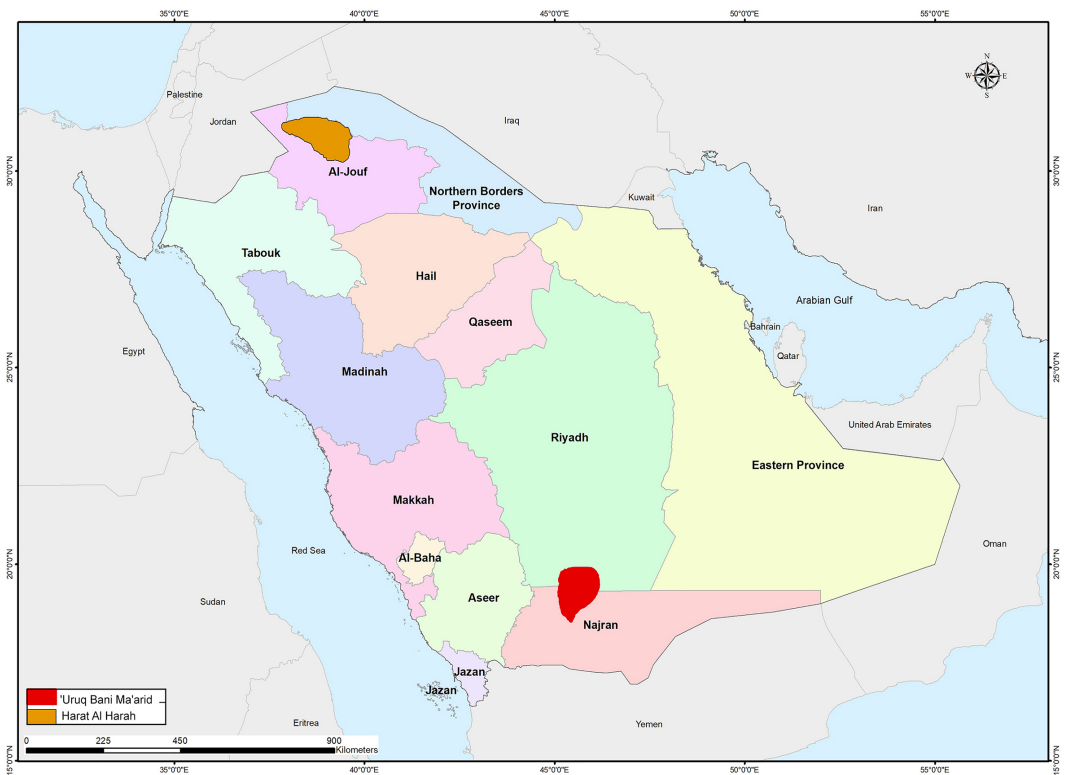


Figure 1. Map of Saudi Arabia indicating the locations of the two protected areas.

rocky hills from one side. It is characterised by a dense vegetation community of *Prunus arabica*, *Haloxylon salicornicum*, *Ochradenus baccatus*, *Astragalus spinosus* and *Diplotaxis acris*.

5. Al Nasleah (31.08175°N, 39.40933°E) (Fig. 2E): A depression bordered by Harrah from all sides. The substratum consists of hard gravelly soil covered by *Anthemis scrobicularis* and *Haloxylon salicornicum*, and *Zilla spinosa* bushes.
6. Al Sehemeah (31.22986°N, 39.08171°E): Small runoff wadi with volcanic rocky hills, dominated by *Artemisia judaica*.
7. Arnabeat (31.12394°N, 39.43611°E): This site is dominated by sand blown by wind, with dense community of *Haloxylon salicornicum* bushes.
8. Gaa Al Heno (31.09269°N, 38.40279°E): Playas flooded by rain, leaving behind a vegetation cover consisting of *Haloxylon salicornicum* and *Salsola* sp., *Artemisia* sp., *Astragalus* sp., and *Zilla spinosa*.
9. Khobara Aroos (31.11822°N, 39.52228°E): Sandy depression bordered by Harrah from all sides, usually covered by *Anthemis scrobicularis* during the spring.
10. Nemr (31.20802°N, 39.25978°E): This is a flat gravelly area bordered by a sandy valley dominated by *Haloxylon salicornicum* community, and with dense vegetation of seasonal plants such as *Anthemis scrobicularis*.
11. Wadi Amr (31.15946°N, 39.25973°E): A small rocky wadi system surrounded by black basalt rocky hills with *Prunus arabica* as a dominant vegetation cover.

The 'Uruq Bani Ma'arid PA is located in the southwest of Saudi Arabia, with a total area of 12,787 km². Elevations varies between 720–940 m, with a mean annual rain fall of less than 47 mm. The terrain is dominated by stretches of longitudinal sand dunes (linear dunes), that acquired the Arabic name ('Uruq, meaning troughs), that formed due to wind action. Its eastern side is bordered by the Empty Quarter (*Rub' al-Khali*). Within the gravel plains of the wadi systems, *A. tortilis* and *A. ehrenbergiana* are common, with scattered vegetation that consist mainly of *Calligonum crinitum* and *Haloxylon persicum*, *Moringa peregrina* and *Commiphora myrrha* (Hall et al., 2011).

The following is a description of the eight sites surveyed for this area:

1. Sodaer Al Janobi (19.195°N, 45.1392°E): A wadi systems dominated by *Ziziphus* sp., *Acacia tortilis* and *Panicum turgidum* reaching a height of about one and a half meters.
2. Sodaer Al Shamali (19.21962°N, 45.13695°E) (Fig. 3A): Wide wadi systems dominated by *Ziziphus* sp., *Acacia tortilis* and *Panicum turgidum* reaching a height of about one and a half meters.
3. Ghedhai (19.35278°N, 45.15417°E) (Fig. 3B): This site consists of sand dunes, with dense bushes of *Haloxylon persicum* and *Haloxylon salicornicum*.
4. Al Farwahah cave (19.69479°N, 45.22186°E) (Fig. 3C): This cave is located at the edge Tuwaiq Mountain range. It represents the most important depiction of the mountain environment in the reserve. The limestone downhill and protrusions provide shelter for many animals. It extends up to 60 meters longitudinally and with a height of about 4 meters.
5. Wadi Al Khashibi (19.04786°N, 45.16259°E) (Fig. 3E): It is a downhill of the Tuwaiq Mountains towards the east. It is located in the south of the reserve, heading from west to east. It is a deep valley surrounded by black limestone from its southern and northern sides. *Leptadenia pyrotechnica*, *Acacia hamulosa*, *Cadaba farinosa*, *Haloxylon salicornicum* bushes are spread among its sides.
6. Al Qarnaen (19.1329°N, 45.14085°E): This is an open wadi surrounded by sand dunes, with scattered *Acacia tortilis*, *Calligonum crinitum* and *Panicum turgidum*.
7. Al Hayal (18.96422°N, 45.15057°E): A small rocky wadi with a restricted community of *Moringa peregrina* trees.
8. Sheeb Moraekh (19.17364°N, 45.15774°E): A narrow wadi with rocky limestone sides. The dominant plant communities consist of *Leptadenia pyrotechnica* and *Acacia hamulosa*.

Results

A total of 29 species of reptiles were observed in both study areas. Seventeen and 22 species were recorded from 'Uruq Bani Ma'arid PA and Harat al Harrah PA, respectively (Table 1, Figs. 4, 5). Among the sample sites at 'Uruq Bani Ma'arid PA, the highest number of species (eight) was recorded from Wadi Al Khashibi, while the lowest were reported from four sites (Al Farwahah cave, Ghedhai, Al Hayal and Sheeb

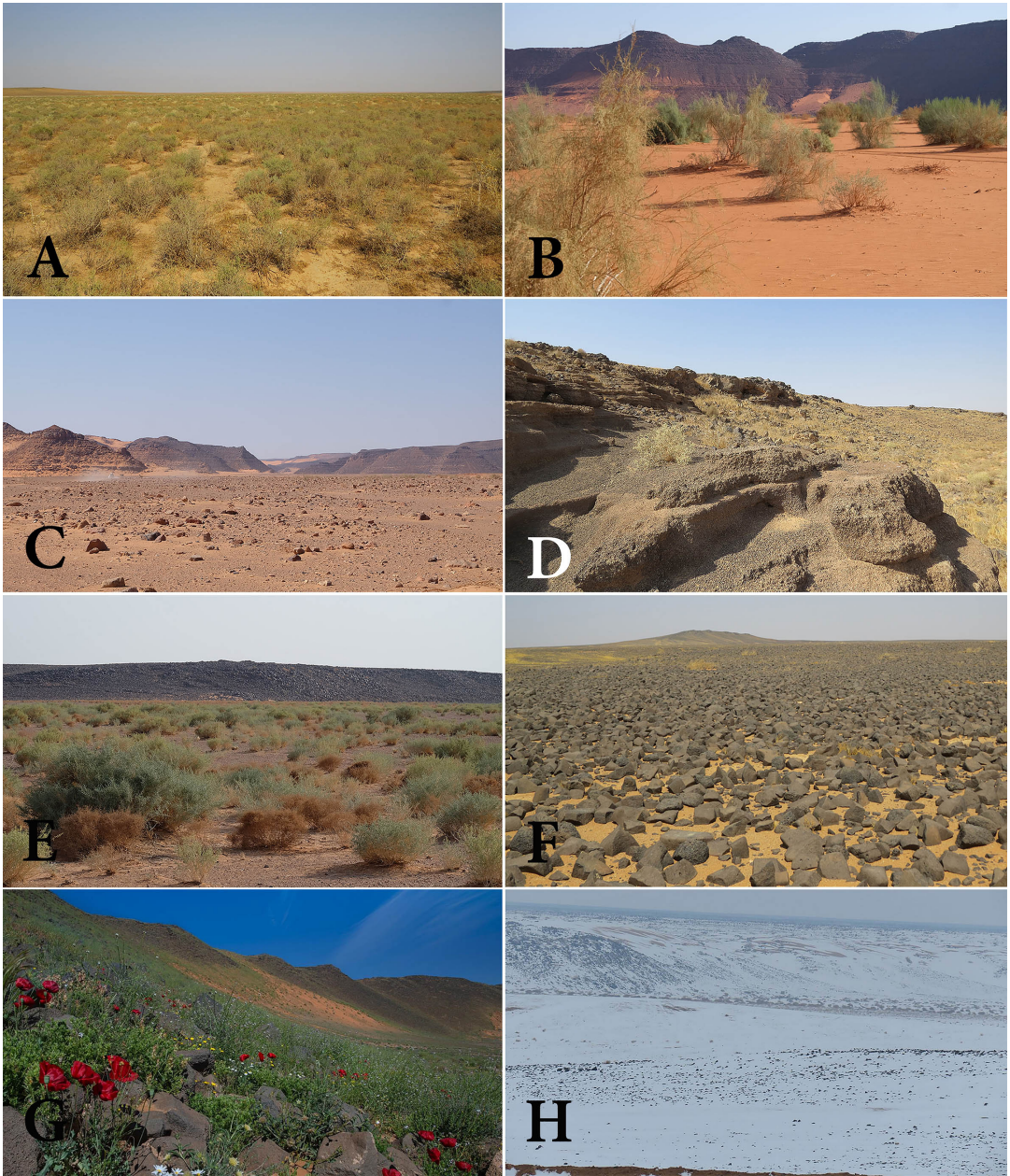


Figure 2. Harat al Harrah Protected Area: (A) Wadi Heseian. (B) Al Joraah. (C) Al Desam. (D) Lwaizeat Al Amoud. (E) Al Nasleah. (F) Black lava desert. (G) Early spring after rainfall. (H) Harat al Hara after a snow storm in 2017. Photos by Abdulhadi A. Aloufi (A–F), Khalaf Al Shamari (G), and Tami Al Shamari (H).

Moraekh) with a single species in each site (Table 1). As for Harat al Harrah, the maximum number of species (5) was recorded from three sites, with the least from Al Nasleah and Al Sechemeah with a single species in each site (Table 1).

In ‘Uruq Bani Ma’arid PA, geckos were represented by five species, two were in densely vegetated areas (*Bunopus tuberculatus* and *Stenodactylus doriae*), one from sandy habitat (*Phrynocephalus arabicus*), and two found in rocky areas and crevices (*Pristurus*



Figure 3. The 'Uruq Bani Ma'arid Protected Area: (A) Wadi Sodaer Al Shamali. (B) Ghedhai. (C) Al Farwahah cave near Twaiq Mountains edge. (D) and (F) linear dunes (*Uruq*). (E) Wadi Al Kheshibi. (G) Sand dunes covered by hailstones during 26-3-2017 (H) Lake formation after rainy season in April 2013. Photos by Abdulhadi A. Aloufi (A-F), and Hamad Al Qahtani (G, H).

sp. and *Ptyodactylus* sp.). *Acanthodactylus schmidti* was found in sandy areas only, while *Acanthodactylus boskianus*, *Mesalina* sp. 1, *Psammophis schokari*, *Uromastix aegyptia*, *Pseudotrapelus aqabensis*, *Varanus griseus* were collected from gravelly and

vegetated areas. *Scincus mitranus*, *Cerastes gasperettii* and *Phrynocephalus arabicus* were found in sandy wadi beds, while *Trapelus flavimaculatus* was found on Acacia trees (Table 1).

In Harat al Harrah PA, four species of geckos were

Table 1. Reptiles observed at sites in two protected areas. For 'Uruq Bani Ma'arid this includes: 1. Al Farwahah cave; 2. Al Qarnaen; 3. Ghedhai; 4. Al Hayal; 5. Sheeab Moraekh; 6. Sodaer Al Janobi; 7. Sodaer Al Shamali; 8. Wadi Al Kheshibi. For Harat al Harrah this includes: 1. Al Desam; 2. Al Joraah; 3. Al Nasleah; 4. Al Sehemeah; 5. Arnabeat; 6. Gaa Al Heno; 7. Khobara Aroos; 8. Lwaizeat Al Amoud; 9. Nemr; 10. Wadi Amr; 11. Wadi Heseian.

Species	'Uruq Bani Ma'arid								Harrat al Harrah										
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	9	10	11
<i>Bunopus tuberculatus</i> Blanford, 1874			•			•	•								•				•
<i>Cyrtopodion scabrum</i> (Heyden, 1827)												•				•			
<i>Pristurus</i> sp.				•			•	•											
<i>Ptyodactylus</i> sp.	•							•											
<i>Ptyodactylus puiseuxi</i> Boutan, 1893											•				•		•		
<i>Stenodactylus doriae</i> (Blanford, 1874)						•	•												
<i>Stenodactylus grandiceps</i> Haas, 1952														•					
<i>Trigonodactylus arabicus</i> (Haas, 1957)	•							•											
<i>Acanthodactylus boskianus</i> (Daudin, 1802)							•												•
<i>Acanthodactylus ophiodurus</i> Arnold, 1980															•		•		
<i>Acanthodactylus robustus</i> Werner, 1929															•				
<i>Acanthodactylus schmidti</i> Haas, 1957	•							•	•								•		
<i>Mesalina</i> sp. 1							•	•							•				
<i>Mesalina</i> sp. 2															•				
<i>Scincus mitranus</i> Anderson, 1871							•	•											
<i>Scincus conirostris</i> (Blanford, 1881)									•	•									
<i>Trapelus agnetae</i> (Werner, 1929)									•							•			
<i>Trapelus flavimaculatus</i> Rüppell, 1835							•	•											
<i>Phrynocephalus arabicus</i> Anderson, 1894							•		•										
<i>Pseudotrapelus aqabensis</i> Melnikov et al., 2012								•											
<i>Pseudotrapelus sinaitus</i> (Heyden, 1827)																•			
<i>Uromastix aegyptia</i> (Forskål, 1775)					•	•						•	•			•			•
<i>Varanus griseus</i> (Daudin, 1803)						•										•			
<i>Eryx jayakari</i> Boulenger, 1888	•								•										
<i>Psammodromus schokari</i> (Forskål, 1775)						•													•
<i>Malpolon moilensis</i> (Reuss, 1834)									•					•					
<i>Spalerosophis diadema cliffordii</i> (Schlegel, 1837)									•										
<i>Cerastes gasperettii</i> Leviton & Anderson, 1967	•										•						•		
<i>Pseudocerastes fieldi</i> Schmidt, 1930									•										•
Total No. of species	1	4	1	1	1	6	8	7	4	5	1	1	2	2	5	5	4	2	5

found (Table 1), of which *Ptyodactylus puiseuxi* represents a new record for the herpetofauna of Saudi Arabia. This species is associated with rocky black larva deserts. *Bunopus tuberculatus* and *Stenodactylus grandiceps* were found in densely vegetated areas. Six lacertids were found in a variety of habitats, including

gravelly areas (*Acanthodactylus robustus* and *Mesalina* sp. 1 and 2), while *A. schmidti* was confined to sandy areas. *Trapelus agnetae* and *Pseudotrapelus sinaitus* are both rock dwelling species. *Phrynocephalus arabicus* was found in areas with mixed sand and small rocks. The animal was seen basking on the stones, and when



Figure 4. (A) *Eryx jayakari*. (B) *Pseudocerastes fieldi*. (C) *Cerastes gasperettii*. Photos by Abdulhadi A. Aloufi.

alarmed it dives into the sand by shaking its body until it becomes invisible. *Uromastix aegyptia* was recovered around its burrows and seen from four sites. It prefers gravelly areas with dense vegetation. Six species of snakes were observed (Table 1), with *Pseudocerastes fieldi* as a typical dweller of the black larva desert.

Discussion

Cunningham (2010a) reported six confirmed species (*Phrynocephalus arabicus*, *Uromastix aegyptia*, *Pristurus gasperetti*, *Ptyodactylus hasselquistii*, *Scincus mitranus* and *Eryx jayakari*) from 'Uruq Bani Ma'arid PA, in addition to 11 expected species. Of these expected species, nine were confirmed in this study, while all

previously confirmed species were found, however, with taxonomic uncertainty remaining for the specific status of *Pristurus* sp. and *Ptyodactylus* sp. occurring in the area. Two additional species, *B. tuberculatus* and *P. aqabensis*, were recorded.

A molecular study of *Pristurus* species indicated that *P. rupestris* is polyphyletic and includes two clades: the western clade assigned as *Pristurus* sp. 1, distributed from central coastal Oman, through Yemen, Saudi Arabia and north to southern Jordan, and the eastern clade, occurring in the coastal regions of Iran and throughout northern Oman and eastern UAE (Badiane et al., 2014). The status of *Ptyodactylus* in the southwestern Saudi Arabia is not clear, and was assigned to *P. hasselquistii* complex (Metallinou et al., 2015).

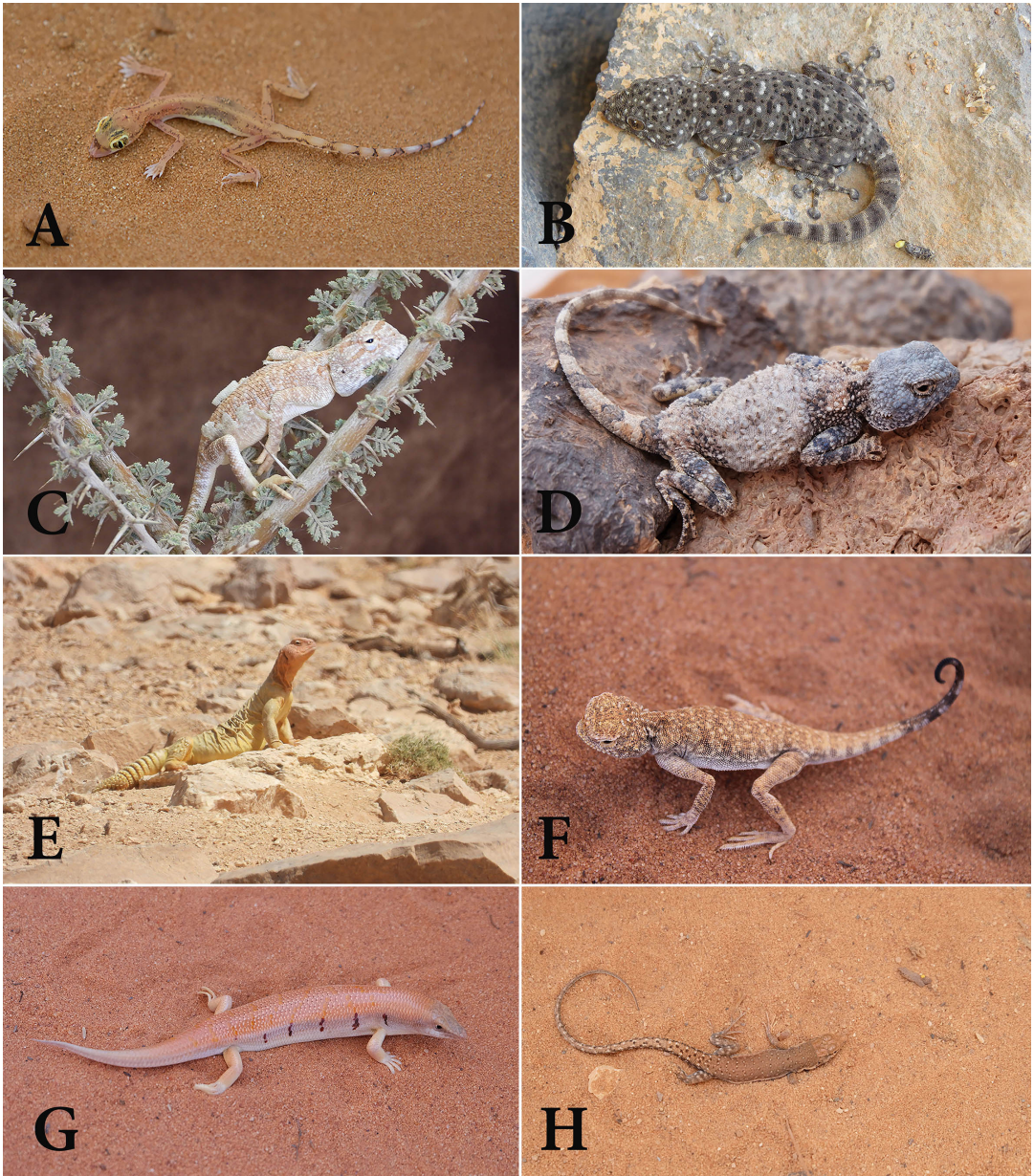


Figure 5. (A) *Trigonodactylus arabicus*. (B) *Ptyodactylus puiseuxi*. (C) *Trapelus flavimaculatus*. (D) *Trapelus agnetae*. (E) *Uromastix aegyptia*. (F) *Phrynocephalus arabicus*. (G) *Scincus mitranus*. (H) *Mesalina* sp. 1. Photos by Abdulhadi A. Aloufi.

This study documented the herpetofauna of Harat al Harrah for the first time. It is highly similar to that in the Jordanian black lava desert. Disi et al. (1999) reported 38 species of reptiles from the Jordanian Eastern Desert, with shared species such as *Ptyodactylus puiseuxi*, *Pseudotrapelus sinaitus*, *Trapelus agnetae* and *Pseudocerastes fieldi*. In this regard, *Ptyodactylus*

puiseuxi is reported for the first time for the herpetofauna of Saudi Arabia.

In other protected areas in Saudi Arabia, Alshammari and Ibrahim (2015) recorded 22 species of reptiles from the historical Faid Protected Area, Ha'il region. Cunningham (2010b) reported 10 species of reptiles from Farasan Islands. Cunningham (2010a) confirmed

the presence of 20 and 15 reptilian species from King Khalid Wildlife Research Centre (Thumamah) and Mahazat as-Sayd respectively, with other expected species.

At least four species of reptiles are considered endemics to Saudi Arabia including; *Tropicolotes wolfgangboehmei*, *Chalcides levitoni*, *Platyceps insulanus*, and *Lytorhynchus gasperetti* (Aloufi et al., 2019). Three additional species were newly described from Saudi Arabia; *Hemidactylus alfarraji* and *Hemidactylus asirensis* from southwestern Saudi Arabia (Šmíd et al., 2017), and *Mesalina saudiarabica* from Mahazat as-Sayd (Šmíd et al., 2017). These species should be included within protected areas or considered during Key Biodiversity Areas planning.

Further studies should be conducted on the other protected areas to identify key species of conservation importance as well as to the possible threats affecting the conservation of reptiles in Saudi Arabia. Boland and Burwell (2021) ranked and mapped vertebrate species of high conservation priority in Saudi Arabia, in which 55 reptile species were included. In addition, species richness, biology, habitat preference and population size for endangered species should be among priority future studies.

Acknowledgments. We thank His Highness the Prince Moteb Bin Fahad Al Faisal (Chief Executive Officer for King Salman PA) for his support and giving us permission to complete field studies in Harat al Harrah PA. We also thank Dr. Hany Tatwany (Vice President of Saudi Wildlife Authority (SWA) for his support and assistance during this research. Particular thanks are extended to Tami Al Shamari (Administrator of Harat al Harrah PA), Majed Al Aliah (head of rangers Harat al Harrah Protected Area), Hamad Al Qahtani (Manager of 'Uruq Bani Ma'arid PA) and Mubark Al Dawsery (Head of rangers, 'Uruq Bani Ma'arid PA) for hosting and helping us during the fieldwork. We wish to thank the anonymous reviewers for their critical comments that improved the manuscript, with special thanks to Jesse Erens, associate editor, for his comments.

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