



Reptiles and Amphibians along the Coastal Area of the Eastern Province, Saudi Arabia

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Abstract

Thirty-two species of amphibians and reptiles were reported during this study, including 16 families (Ranidae, Geoemydidae, Cheloniidae, Gekkonidae, Sphaerodactylidae, Phyllodactylidae, Agamidae, Lacertidae, Scincidae, Varanidae, Trogonophidae, Boidae, Colubridae, Psammophiidae, Viperidae and Elapidae). Family Gekkonidae was represented by the highest number of species (8), followed by families Agamidae and Scincidae (four species for each). *Trachylepis tessellata* is reported for the first time to the herpetofauna of Saudi Arabia.

Key words: Herpetofauna, Saudi Arabia, new record, *Trachylepis tessellata*.

Introduction

Saudi Arabia hosts a high number of reptiles owing to its diverse habitats. So far, the freshwater, marine, and terrestrial herpetofauna of the Kingdom of Saudi Arabia consists of 130 extant species and subspecies of reptiles and seven species of amphibians (Aloufi *et al.*, 2019, 2020, 2021, 2022a & b; Alshammari, 2021). Many other studies focused on the herpetofauna of the provinces of Saudi Arabia; Central, western, southwestern and northern regions (Frag & Banaja, 1980; Al-Sadoon, 1988, 1989; Tilbury, 1988; Schätti & Gasperetti, 1994; Al-Sadoon *et al.*, 1991, 2016a; Al-Shammari, 2012; Al-Johany *et al.*, 2014; Aloufi & Amr 2015; Aloufi *et al.*, 2021). The most comprehensive study on the snakes of Arabia was published by Gasperetti (1988). Arnold (1986) presented a list of lizards of the Arabian Peninsula, where some taxonomic treatment should be updated.

As for the eastern region of Saudi Arabia, *Stenodactylus slevini* and *Pseudoceramodactylus khobarensis* and *Acanthodactylus schmidtii* were originally described from Dhahran, Al Khobar and Dhahran by Haas (1957) respectively and *Acanthodactylus haasi* from Dhahran by Leviton & Anderson (1967). Several species were reported by Haas (1957, 1961), Mandeville (1967) and Haas & Werner (1969). A series of papers on the behaviour of lizards in the eastern region were published by Ross (1988, 1989, 1990, 1991,

1993). The herpetofauna of Al Jubail Wildlife Sanctuary and its vicinity was studied by Martens (1996). He reported a total of 24 species of terrestrial and marine reptiles. Later, Al-Sadoon (2010) recorded 34 species of reptiles from Al Hassa region.

The present study documents further records along the coastal region of eastern Saudi Arabia, covering several habitats that were not studied previously and review all previous studies on the region.

Material and Methods

1. Field methodology

Thirty-two species of amphibians and reptiles were either collected or observed during the study period (May-October 2023). Collected specimens were deposited at Taibah University, Department of Biology, Al-Madinah Al Munawwarah, Al-Madinah Zoological collection (EZC). Field trips were carried out and covered the main habitats with a total of 35 localities (Table 1). Observed animals were based on actual observations or through images send to us by the locals. Reptile's specimens held at King Fahd University of Petroleum and Minerals (KFUPM) collection were examined and included in the study. Most collected reptiles were examined, identified and then released at the site of collection.

2. Study Area

The Eastern Province is located in the eastern part of the Kingdom of Saudi Arabia and is the largest Province in the Kingdom with an area of approximately 518,300 km², overlooking the Arabian Gulf and a coastline of over 1,000 km and its maximum extent from north to south is approximately 1,300 km and the maximum extent from east to west is about 800 km.

Much of the eastern region consists of sandy deserts. Ad-Dahna Desert extends in an arc from north to south, then flows into Al Jafourah Desert and extends south to join the Empty Quarter Desert. Plateaus and Hills are exemplified by Dibdiba, Al-Suman and Shadgum. There are some small limestone mountains such as Jabal Al-Qara, Jabal Al Araba'a and Osba'a Judah.



Figure 1. Map of the study area showing studied sites.

Habitats include sand dunes, sedimentary formation resulted from sea retraction, freshwater lakes, irrigated canals, salt marshes “*Sabkha*” and agricultural areas (Figures 1 & 2). In addition, observations were made around some islands in the Gulf. Sandy plains like Josamen, are rich in vegetation, represented by *Leptadenia pyrotechnica*, *Calligonum comosum*, *Panicum* sp. and *Haloxylon* aff. *salicornicum*. The province's wetlands include natural springs in Al Hassa and Al Qatif, and lakes that are formed from irrigation such as Al Asfar, Al-Ayoun and Al Khuraes lakes.

Table 1. Localities from which materials were reported.

| | Locality | N | E |
|----|---|----------------|----------------|
| 1 | Abo Ma'an farms | 26° 37' 37.14" | 49° 48' 47.94" |
| 2 | Al Hassa National Park | 25° 26' 38.45" | 49° 43' 51.59" |
| 3 | Al Asfar Lake | 25° 31' 15.69" | 49° 46' 03.58" |
| 4 | Al Ayashi farms | 26° 32' 49.07" | 50° 00' 33.58" |
| 5 | Al Hanah | 26° 56' 41.12" | 48° 46' 49.11" |
| 6 | Al Jarari District | 26° 33' 33.60" | 50° 00' 9.30" |
| 7 | Al Judaedah valley | 25° 43' 47.44" | 49° 28' 45.17" |
| 8 | Al Mezerea farm | 26° 33' 13.26" | 49° 58' 37.64" |
| 9 | Al Qudaih Farm | 26° 34' 05.82" | 49° 58' 45.42" |
| 10 | Al Sarar | 26° 59' 53.44" | 48° 21' 54.03" |
| 11 | Al Suhaemeah farms | 25° 28' 34.00" | 49° 36' 14.10" |
| 12 | Al Zahra Dist | 26° 37' 21.66" | 50° 00' 24.96" |
| 13 | Al-Hofuf, Prince Faisal Bin Fahad Street | 25° 23' 12.07" | 49° 49' 39.44" |
| 14 | Badr street (Sehat) | 26° 33' 01.34" | 49° 59' 47.58" |
| 15 | Bar Al Qatif | 26° 32' 3.84" | 49° 50' 44.81" |
| 16 | Dhahran | 26° 11' 32.08" | 50° 04' 43.35" |
| 17 | D1 Agricultural Canal | 25° 24' 02.46" | 49° 43' 33.65" |
| 18 | Eastern Al Qudaih | 26° 34' 40.35" | 49° 59' 50.90" |
| 19 | Hejrat Al Oseferat | 26° 06' 31.33" | 49° 25' 38.81" |
| 20 | Jabal Al Araba'a Area | 25° 17' 24.11" | 49° 42' 54.11" |
| 21 | Jana Island | 27° 22' 07.68" | 49° 53' 54.33" |
| 22 | Josameen | 26° 53' 15.24" | 49° 43' 33.76" |
| 23 | Juraid Island | 27° 11' 54.86" | 49° 57' 29.94" |
| 24 | Karan Island | 27° 43' 05.52" | 49° 49' 36.23" |
| 25 | Khafra lake | 26° 47' 39.43" | 49° 34' 23.36" |
| 26 | Kurain Island | 27° 38' 57.74" | 49° 49' 12.40" |
| 27 | Manifah | 27° 31' 26.10" | 48° 54' 36.70" |
| 28 | Mulejah village | 27° 16' 27.71" | 48° 25' 43.19" |
| 29 | Osba'a Judah area | 25° 52' 03.39" | 48° 46' 25.23" |
| 30 | Prince Faisal Bin Fahad Street (Al Hassa) | 25° 23' 12.07" | 49° 49' 39.44" |
| 31 | Qatar highway farms | 25° 16' 48.61" | 49° 37' 30.08" |
| 32 | Research center garden, King Faisal University. | 25° 16' 39.73" | 49° 44' 05.74" |
| 33 | Sabkhat As Sahadah | 26° 43' 37.30" | 49° 37' 16.41" |
| 34 | Sheab Abo Reja | 26° 48' 37.48" | 49° 35' 38.50" |
| 35 | Tufaieh | 26° 43' 43.14" | 49° 37' 35.00" |

Systematics

Thirty-one species of amphibians and reptiles were reported during this study, including 16 families (Ranidae, Geoemydidae, Cheloniidae, Gekkonidae, Sphaerodactylidae, Phyllodactylidae, Agamidae, Lacertidae, Scincidae, Varanidae, Trogonophidae, Boidae, Colubridae, Psammophiidae, Viperidae and Elapidae).



Figure 2. Habitats of the eastern province. A. Shadgam limestone mountains. B. Al Qatif farms. C. Al Khuraes sand dunes. D. Al Khuraes lake in Al Qatif. E. Sabakhat Abo Ma'an, Al Qatif.

Family Ranidae

Pelophylax ridibundus (Pallas, 1771) Fig. 3A & B

Material examined: EZC005-006, Al Qudaih Farm, 1.6.2023.

Observed: Al Suhaemeah farms, 5.9.2023. D1Agricultural Canal, 5.9.2023.

Remarks: This is a common species observed in irrigation canals around Al Hassa area. Different morphs were seen, representing young and old animals. The distribution of this species is limited to eastern

Saudi Arabia and Abha region in southwestern Saudi Arabia (Balletto *et al.*, 1985; Al-Qahtania & Al-Johany, 2018). In eastern and central Saudi Arabia, it was reported from Dharan, Hofuf, Qatif (Haas, 1957, 1961), Al Qatif (Briggs, 1981) and around Riyadh, Deriyah, Oyainah, Al-Kharj, Al Majmaah and Unayzah (Al-Johany *et al.*, 2014). Currently, seven species of amphibians have been reported from Saudi Arabia, most of which are known from southwestern Saudi Arabia (Balletto *et al.*, 1985; Al-Qahtania & Al-Johany, 2018).

Family Geoemydidae

Mauremys caspica (Gmelin, 1774) Fig. 3C

Observed: Al Asfar Lake, 27.5.2023. Al Suhaameah farms, 5.9.2023. D1Agricultar Canal, 5.9.2023.

Remarks: Females of the Caspian turtle were seen while basking on stones in canals and in Al Asfar Lake. It is very common along irrigation canals and all forms of permanent water. Previous records include specimens from Dharan (Haas, 1957), Hufuf, Al Qatif and Al Uqayr, (Gasperetti *et al.*, 1993). Vamberger *et al.* (2013) recognized two eastern clusters of *M. caspica* based on molecular analysis; one is distributed in the Caucasus region and Iran, and a second in Saudi Arabia and Bahrain.

Aloufi (2009) studied the distribution of the Caspian turtle in the Eastern Province of Saudi Arabia. He reported that it was very common and widespread in Al Hassa region and extends from the northern to the southern and eastern villages. It was found to inhabit running water, drainage canals, stagnant water, lakes (Al-Asfar and Al-Ayoun), and swamps. Aloufi (2009) reported that the number of breeding sites of *M. caspica* was reduced from 159 sites in the early 1970s to about 19 in 2009, due to changes in irrigation schemes in Al Hassa region.

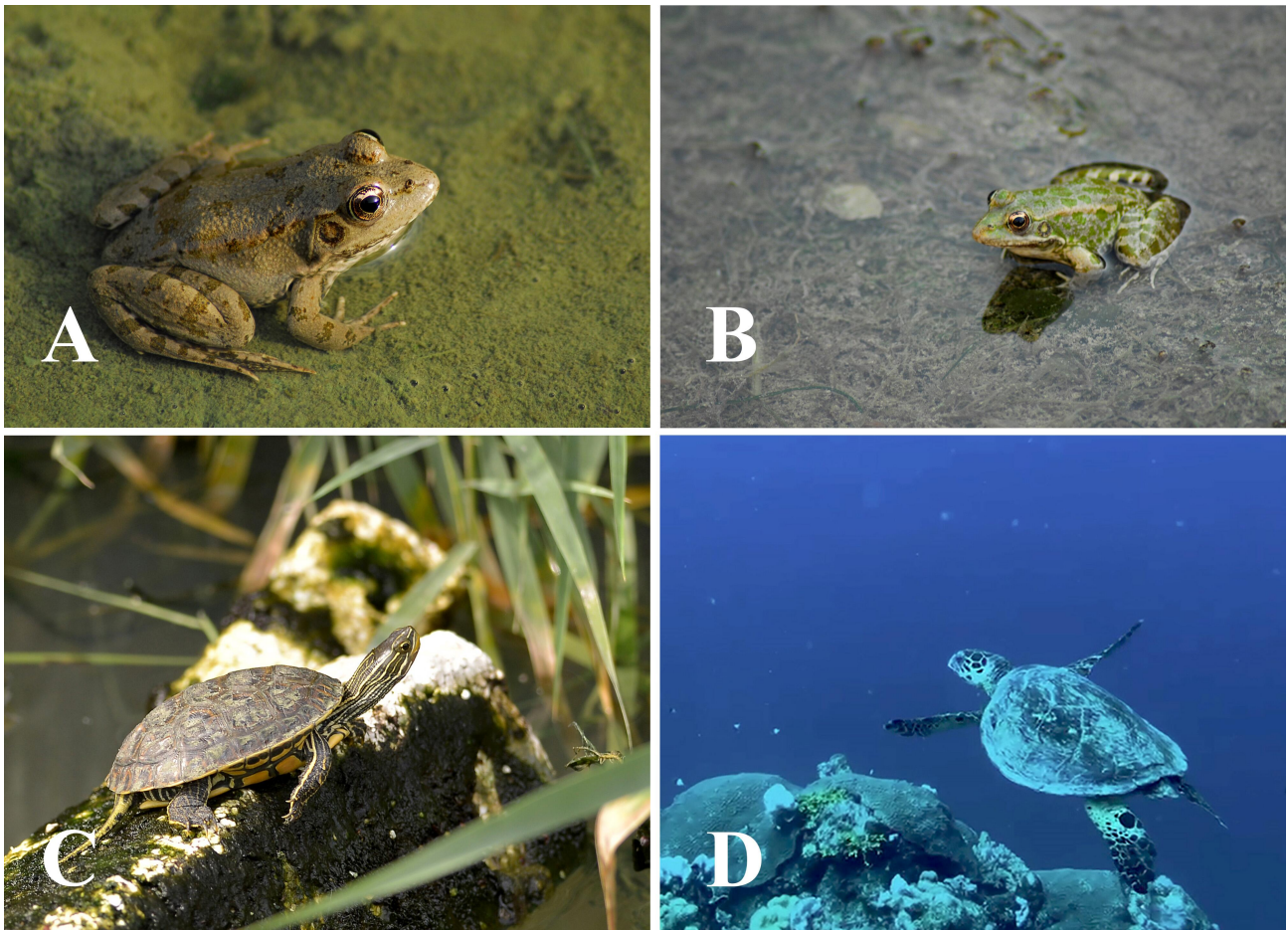


Figure 3. A & B. *Pelophylax ridibundus* from Al Qudaih Farm. C. *Mauremys caspica* from Al Asfar Lake. D. *Eretmochelys imbricata* near Al Jurayd Island (Photo by M. Alwani).

Family Cheloniidae

Eretmochelys imbricata (Linnaeus, 1758) Fig. 3D

Observed: Al Jurayd Island, 9.6.2023 and 16.7.2023.

Remarks: The Hawksbill Sea Turtle was observed around Al Jurayd island. It is known to occur in all subtropical and tropical oceans. Gasperetti *et al.* (1993) indicated several nesting sites in the Arabian Gulf on the coast of Saudi Arabia and the United Arab Emirates. Miller (1989) stated that the offshore islands (e.g. Jana Island) of Saudi Arabia is among the nesting sites for this turtle.

Family Gekkonidae

Bunopus tuberculatus Blanford, 1874 Fig. 4A

Material examined: EZC013, Bar Al Qatif, 1.6.2023.

Remarks: This a widely distributed species across arid regions in northern and eastern Saudi Arabia and the Middle East (Arnold, 1986). The Arabian desert gecko was reported around Riyadh (Al-Sadoon, 1988), Al Jubail (Martens, 1996), several localities in Al Hassa (Haas, 1957; Al-Sadoon, 2010), Tabuk (Aloufi & Amr, 2015), 'Uruq Bani Ma'arid and Harrat al Harrah (Aloufi *et al.*, 2022b). This species prefers sand habitats and becomes active at night.

Cyrtopodion scabrum (Heyden, 1827)

Material examined: EZC-003, Al Zahra District, 26.5.2023. EZC029, Josameen, 9.6.2023. EZC037, Al Ayashi (Al Jumailiah farm), 6.7.2023. EZC040-042, Hejrat Al Oseferat, 28.8.2023. EZC050, Al Judaedah valley, 1.9.2023. EZC056, Al Ahsa National Park, 4.9.2023. KFUPM collection, Jana Island, 15.8.2016. KFUPM collection, 2 specimens, Karan Island, 12.8.2016. KFUPM collection, Kurain Island, 15.8.2016.

Remarks: The rough bent-toed gecko has a wide range of distribution in the Middle East reaching the coastal regions of the Red Sea (Sindaco & Jeremčenko, 2008). In Saudi Arabia, it was recorded from several localities in the eastern province by Haas (1957). It is mostly associated with urbanized areas inside buildings in Al Jubail and Riyadh regions (Al-Sadoon, 1988; Martens, 1996). Carranza *et al.* (2021) stated that it is believed that the presence of this species in the Arabian Peninsula represents human introductions. This species was found along with *Hemidactylus persicus* in building's walls and agricultural areas in Hofuf and Al Aba, and copulation was observed in May (Ross, 1993).

Hemidactylus flaviviridis Rüppell, 1835 Fig. 4B

Material examined: EZC001, Al Mezerea farm, 22.5.2023. EZC014, Al Ayashi Farm, 28.5.2023. EZC035-36, Al Ayashi (Al Jumailiah farm), 6.7.2023.

Remarks: This is a very common species encountered in farms across the study area. The yellow-bellied gecko is rather common along the eastern region of Saudi Arabia. It is believed that it was introduced to Africa and Arabia (Carranza *et al.*, 2021). It is usually found around human settlements and avoids extreme desert habitats. It was not reported from Al Hassa (Al-Sadoon, 2010), however, reported from walls of buildings in Al Aba and Al Jubail (Ross, 1993; Martens, 1996). It was found on palm trees looking for a prey, and becomes active at 28 °C and disappears as the temperature reaches 38 °C (Ross, 1993).

Hemidactylus persicus Anderson, 1872 Fig. 4C

Material examined: EZC038, Al Jarari District, 6.7.2023. EZC061, Al Ayashi (Al Jumailiah farm), 6.7.2023. Al Suhaameah farms, 5.9.2023.

Remarks: The Persian leaf-toed gecko is a common species along the eastern part of the Arabian Peninsula reaching as far as Iraq (Carranza *et al.*, 2021). It was previously recorded from Al Khobar and Dhahran (Haas, 1957, 1961), Al Jubail (Martens, 1996), however, with no records from Al Hassa (Al-Sadoon, 2010).

Pseudoceramodactylus khobarensis Haas, 1957 Fig. 4D

Material examined: EZC036, Sabkhat As Sahadah, 6.6.2023.

Remarks: The distribution of the Gulf short-fingered gecko extends across eastern Arabia including Saudi Arabia, Qatar, United Arab Emirates, south Oman, Bahrain and to the east reaching Iran (Sindaco & Jeremčenko, 2008). This species was originally described from Al Khobar (Haas, 1957). It prefers salt-encrusted flats known as “*sabkha*” along the coastal areas, and areas with windblown sand along with dunes and scarce vegetation cover. Metallinou *et al.* (2014) presented a distribution map for this species in eastern Arabia.

Stenodactylus doriae (Blanford, 1874) Fig. 4F

Material examined: EZC024, Sabkhat As Sahadah, 6.6.2023. EZC044, Hejrat Al Oseferat, 24.8.2023.

Remarks: The Middle Eastern short-fingered gecko has a wide range of distribution across the deserts of the Middle East (Carranza *et al.*, 2021). It is one of the most common species in the sand deserts of Saudi Arabia (Arnold, 1986). In eastern Saudi Arabia, it was reported from Al Jubail (Martens, 1996) and Al Hassa (Al-Sadoon, 2010).

Stenodactylus slevini Haas, 1957 Fig. 4G

Material examined: EZC011-12, Bar Al Qatif, 1.6.2023. EZC025, Sabkhat As Sahadah, 6.6.2023. EZC030, Josameen, 9.6.2023. EZC043-47, Hejrat Al Oseferat, 24.8.2023.

Remarks: This species was originally described from Dhahran (Haas, 1957). Slevin's short-fingered gecko has a wide range of distribution extending from the eastern Arabian Peninsula, Kuwait, southern Iraq, reaching as far as southern deserts of Jordan (Sindaco & Jeremčenko, 2008). It was reported from two localities in Al Hassa (Al-Sadoon, 2010).

Trigonodactylus arabicus Haas, 1957 Fig. 4E

Material examined: EZC010, Bar Al Qatif, 1.6.2023. EZC031, Josameen, 9.6.2023.

Remarks: The Arabian sand gecko was found in dried salt marshes, known as “*sabkha*”. Its distribution range extends along eastern, central Saudi Arabia, eastern Arabia including Oman, United Arab Emirates and Qatar, Kuwait, Yemen, and southern Jordan (Pola *et al.*, 2021). It was reported from Al Jubail (Martens, 1996)

Family Sphaerodactylidae

Pristurus rupestris Blanford, 1874 Fig. 4H

Material examined: observed and photographed by J. Babbington from South Dhahran, 14.11.2021.

Remarks: This enigmatic species was the subject of several studies in past few years. Badiane *et al.* (2014) concluded that two clades of the Arabian form of this species occur in Arabia, one eastern clade around the Hajar Mountains in Oman and the United Arab Emirates, referred to as *Pristurus rupestris*, and clade two, *Pristurus* sp. 1, that describes populations of southwestern Oman, Yemen, the Red Sea mountains of Saudi Arabia, reaching as far as southern Jordan. Further molecular studies on this species along the Oman mountains revealed the presence of 14 candidate species within *P. r. rupestris* (Garcia-Porta *et al.*, 2017).

We maintain the use of *Pristurus rupestris* for the eastern populations of the Blanford's semaphore gecko in the study area. It was reported from rocky escarpments near Riyadh (Tilbury, 1988). Both Martens (1996) and Al-Sadoon (2010) did not record this species from Al Jubail or Al Hassa. Ross (1990) gave an account on feeding, activity patterns, avoiding predators and tail signalling among individuals of this species in Taroot Island, eastern Saudi Arabia.

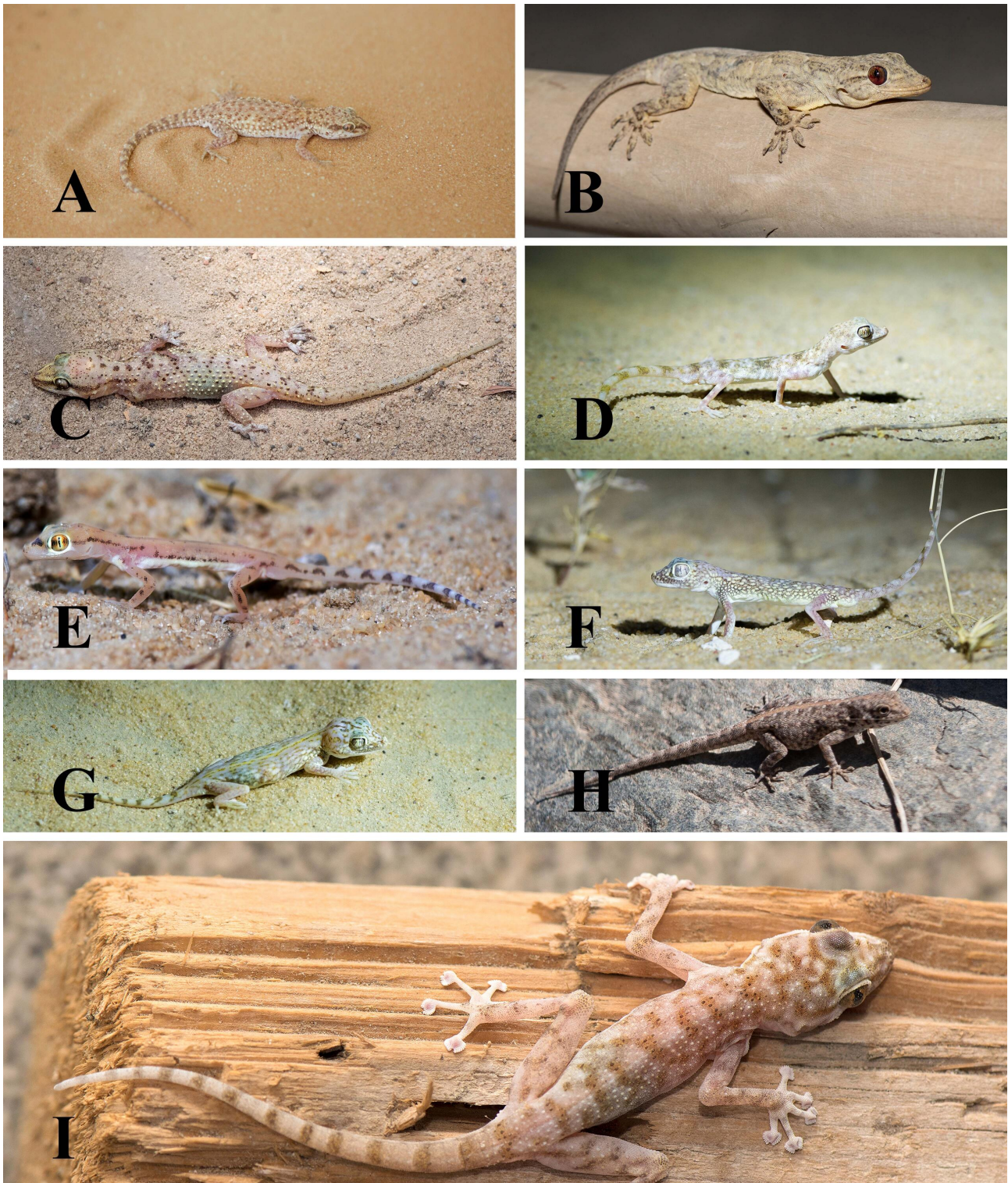


Figure 4. A. *Bunopus tuberculatus*. B. *Hemidactylus flaviviridis*. C. *Hemidactylus persicus*. D. *Pseudoceramodactylus khobarensis*. E. *Trigonodactylus arabicus*. F. *Stenodactylus doriae*. G. *Stenodactylus slevini*. H. *Pristurus rupestris* (Photo by J. Babbington). I. *Ptyodactylus cf hasselquistii*.

Family Phyllodactylidae

Ptyodactylus cf hasselquistii (Donndorff, 1798) Fig. 4I

Materials examined: EZC015, Al Ayashi Farm, 28.5.2023. EZC049, Al Judaedah Valley, 1.9.2023.

Observed: Al Hassa National Park, 3.9.2023. Jabal Al Araba'a, 5.9.2023. Hejrat Al Oseferat, 3.9.2023. Al Suhaemeah farms, 5.9.2023.

Remarks: This is a rather problematic species. Metallinou *et al.* (2015) referred to the Arabian populations as *P. hasselquistii* species complex clade A and B, whereas clade A refers to populations of western, central Saudi Arabia and Oman, while clade B indicates populations associated with the southwestern mountains of Aseer. Size and colour of specimens observed from eastern Saudi Arabia are very different from the typical *P. hasselquistii*. It was previously recorded from Al Dharan (Haas, 1957), and Al Hassa (Al-Sadoon, 2010).

Family Agamidae

Phrynocephalus arabicus Anderson 1894 Fig. 6B

Material examined: EZC052, Al Hassa National Park, 4.9.2023. **Observed:** Hejrat Al Oseferat, 3.9.2023

Remarks: It was previously collected from several localities around Riyadh (Al-Sadoon, 1988; Tilbury, 1988), Al Jubail (Martens, 1996), several sites in Al Hassa (Al-Sadoon, 2010), 'Uruq Bani Ma'arid (Aloufi *et al.*, 2022b). The Arabian toad-head agama was found in areas with mixed sand and small rocks. The animal was seen basking on small flat stones among the sand, and when alarmed it takes refuge in the sand by shaking its body until it becomes invisible.

Phrynocephalus longicaudatus Haas, 1957 Fig. 5C

Observed: Prince Faisal Bin Fahad Street, Al-Hofuf, 1.3.2023.

Remarks: Originally, the Arabian populations of *P. maculatus* was referred to as the subspecies *Ph. m. longicaudatus* (Martens, 1996). The spotted toad-headed agama has a wide range of distribution along the eastern coast of Arabia. This species was previously reported from coastal sabkha near Al Jubail (Martens, 1996). One specimen was observed on a rock near a salt marsh near Al Hassa.

Morphological and ecological features, along with molecular studies suggested that *Ph. longicaudatus* is a distinct species (Solovyeva *et al.*, 2014). Another molecular study indicated that *Phrynocephalus maculatus* is confined to the western part of the Zagros Mountains (Ebrahimipour *et al.*, 2021).

Trapelus persicus (Blanford, 1804) Fig. 5A

Material examined: EZC022, Khafra lake, 6.6.2023. EZC057, Qatar highway farms, 2.9.2023. **Observed:** Al-Hofuf, 2 specimens, 1.3.2023. Research Centre Garden, King Faisal University, 1.3.2023.

Remarks: This a rather common species with a wide range of distribution across eastern parts of Saudi Arabia. It was reported from Qatif and Abqaiq (Haas, 1957), several localities around Riyadh (Al-Sadoon, 1988), Al Jubail Martens (1996) and Al Hassa (Al-Sadoon, 2010). Ross (1991) gave an account on its ecology and behaviour in a site near Al Khobar, including colour changes in both males and females.

Uromastyx aegyptia (Forsskål, 1775) Fig. 5D &E

Material examined: Observed specimens: Al Hanah, 22.5.2023. Osba'a Judah area, 18.7.2023. Manifah, 8.10.2013

Remarks: The Egyptian spiny-tailed lizard is a common species inhabiting gravel deserts and flat and firm substratum of Saudi Arabia and adjacent countries. In the eastern region, it was recorded from Dhahran (Haas, 1957), Al Jubail (Martens, 1996) and Al Hassa (Al-Sadoon, 2010). This is a threatened species due to high demand on its meat and eggs that are consumed by the locals (Aloufi *et al.*, 2019).

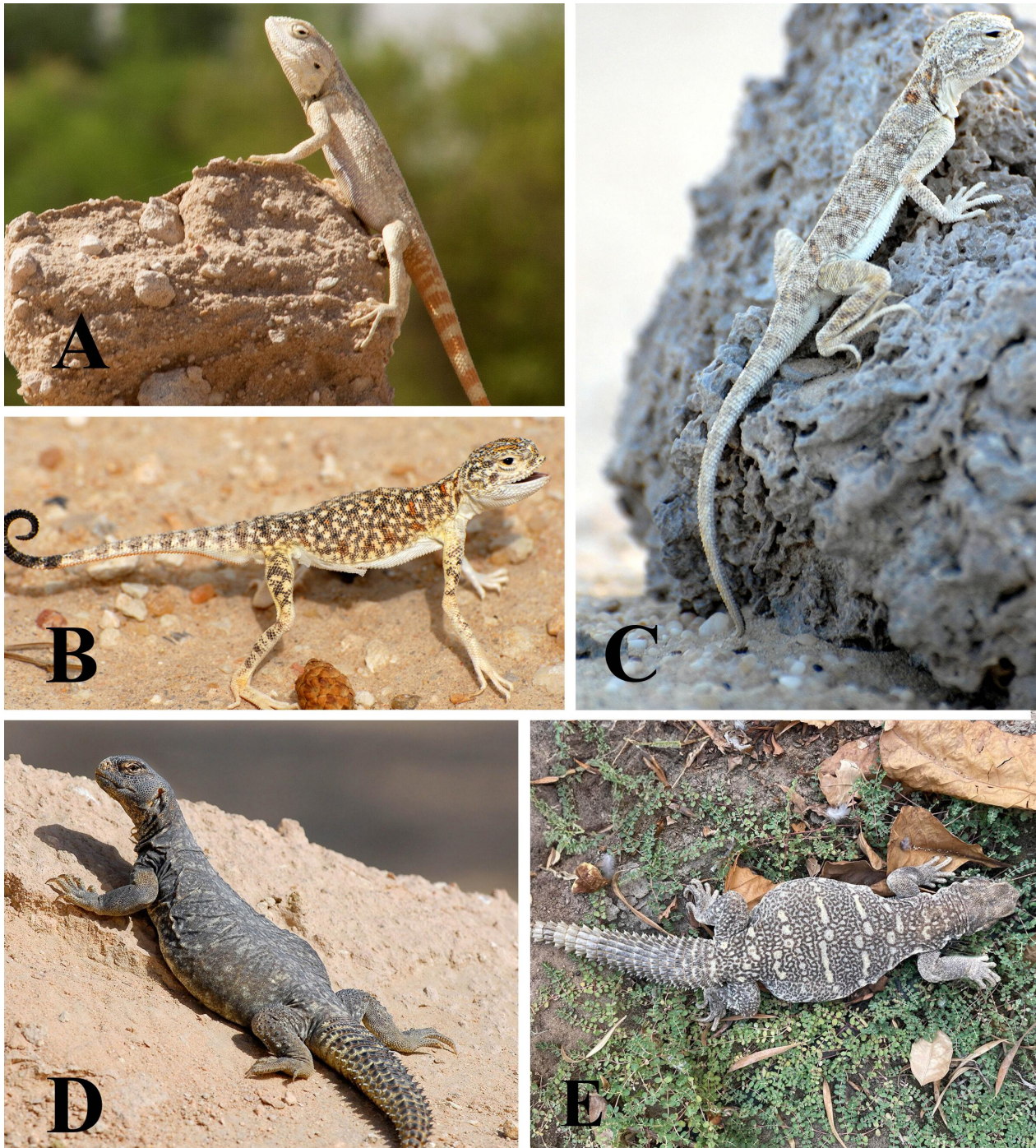


Figure 5. A. *Trapelus persicus*. B. *Phrynocephalus arabicus*. C. *Phrynocephalus longicaudatus*. D. Adult *Uromastyx aegyptia*. E. Subadult *Uromastyx aegyptia* (Photo by A. Almusabeh).

Family Lacertidae

Acanthodactylus hardyi Haas, 1957 Fig. 6A-D

Material examined: EZC021, Tufaieh, 3.6.2023. EZC027, Josameen, 9.6.2023. EZC 32-34, Josameen, 9.6.2023. EZC 055, Al Ahsa National Park, 4.9.2023.

Remarks: Haas (1957) described *Acanthodactylus scutellatus hardyi* from Hirmas station, north of Tabuk. Recent molecular studies showed that what was considered as *Acanthodactylus scutellatus* in the Middle East represents *Acanthodactylus hardyi*, while *A. scutellatus* is distributed across North Africa

(Tamar *et al.*, 2016). This species is quite common in Kuwait (Amr *et al.*, 2021). *Acanthodactylus hardyi* was previously recorded W of Hofuf (Salvador, 1982). All previous records of *A. scutellatus* in Saudi Arabia should be considered as *A. hardyi*.

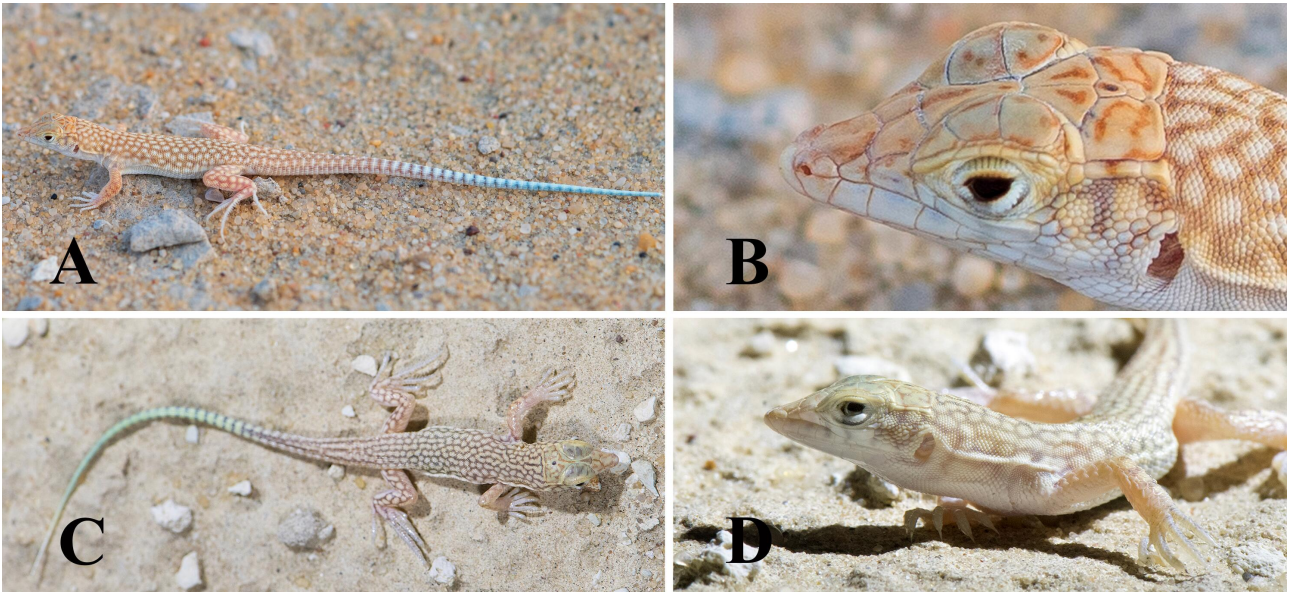


Figure 6. A & B. *Acanthodactylus hardyi* (Photos by F. Hajual). C & D. Juvenile *Acanthodactylus hardyi*.

Family Scincidae

Trachylepis brevicollis (Wiegmann, 1837) Fig. 7A & B

Material examined: EZC018-19, Abo Ma'an (Al Dhahi farms), 3.6.2023.

Remarks: This is an African species that penetrated to the north along the coastal area of the Red Sea reaching around Umluj (Aloufi & Amr, 2015). It was reported from southwestern Saudi Arabia (Arnold, 1986; Schätti & Gasperetti, 1994), Kharj and near Al Ha'ir (Tilbury, 1988), around Riyadh, several localities in Al Hassa (Al-Sadoon, 1988, 2010). The short-necked skink is a viviparous species, inhabiting humid areas with relatively dense vegetation and sand areas with bush cover. This species is characterized by the presence of two keels on the dorsal scales, five upper labial scales anterior to the eye, whereas the first supraocular scale is in contact with the frontal scale (Carranza *et al.*, 2021).

Six eggs were found in a female. This species prefers humid soil and vegetation cover as observed in farms.

Trachylepis tessellata (Anderson, 1895) Fig. 7C & D

Material examined: EZC007-009, and 016, Al Qudaih Farm, 1.6.2023. EZC059-60, and 62, Al Suhaemeah farms, 5.9.2023.

Remarks: The Tessellated mabuya was reported from Yemen, Oman, United Arab Emirates (Carranza *et al.*, 2021). This is the first record of this species to the herpetofauna of Saudi Arabia. It is considered as endemic species to southern Arabia. It is associated with farmlands with water resources and cultivated areas across its range (Carranza *et al.*, 2021). It differs from *T. brevicollis* by having 4 upper labials anterior to the eye, whereas the first supraocular scale is not in contact with the frontal scale and the dorsal scales have three keels (Carranza *et al.*, 2021). One examined female was found to have four eggs.

Heremites septemtaeniatus (Reuss, 1834) Fig. 7E & F

Material examined: EZC020, Abo Ma'an (Al Dhahi farms), 3.6.2023. EZC 058, Al Suhaemeah farms, 5.9.2023. KFUPM collection, Jana Island, 15.8.2016.

Remarks: The southern grass mabuya has a distribution range extending from the eastern Arabian Peninsula, Iraq, Iran, Armenia and southern Turkey (Sindaco & Jeremčenko, 2008). It was collected from irrigated and shaded areas with date palm trees in Al-Aba oasis near Al Jubail (Martens, 1996). Records from the eastern region includes Al Hassa and Hofuf (Arnold, 1986; Al-Sadoon, 2010). This species is characterized by having four upper labial scales anterior to the eye, three keels on the dorsal scales and with the first supraocular scale in contact with the frontal scale (Carranza *et al.*, 2021).

This species was found in sympatry with *T. brevicollis*. It was found in farmland with humid soil and abundance of vegetation. In two females, five eggs were found in each animal.

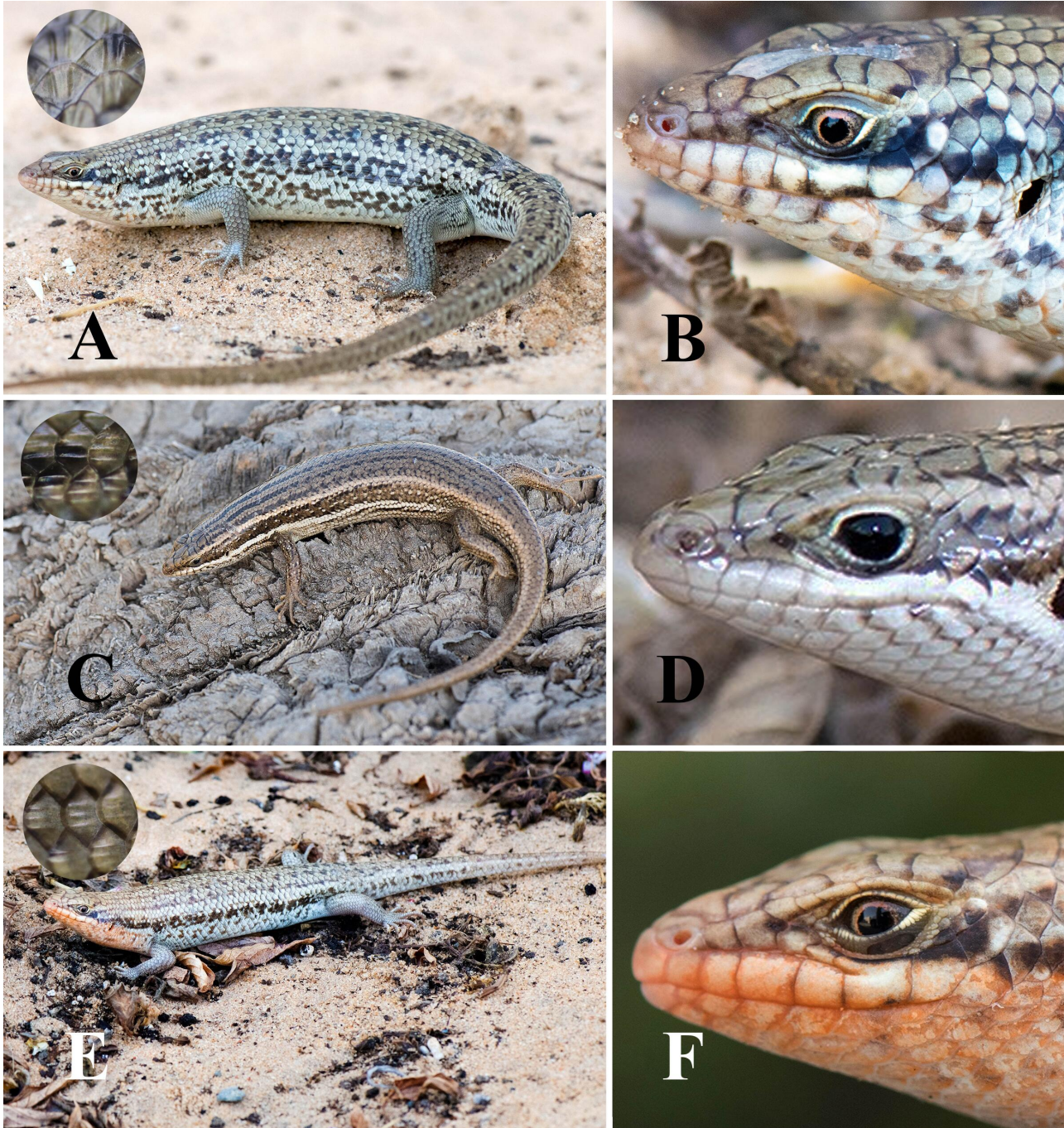


Figure 7. A. *Trachylepis brevicollis* with two keeled scales. B. Lateral view of *Trachylepis brevicollis* showing the upper labial and the first supraocular scale in contact with the frontal scale. C. *Trachylepis tessellata* with three keeled scales. D. Lateral view of *Trachylepis tessellata* showing the upper labial and the first supraocular scale not in contact with the frontal scale. E. *Heremites septemtaeniatus* with three keeled scales. F. Lateral view of *Heremites septemtaeniatus* showing the upper labial and the first supraocular scale in contact with the frontal scale.

Scincus mitranus Anderson, 1871 Fig. 8A

Material examined: EZC023, Tufaieh, 6.6.2023. EZC063, Al Ahsa National Park, 4.9.2023. Jabal Al Araba'a Area. EZC64, 5.9.2023.

Remarks: The Arabian sand skink is a sand dweller with distribution extending from the arid southern parts of Saudi Arabia to the east along eastern Arabia including Bahrain, Oman, Qatar and the United Arab Emirates, reaching as far as Kuwait (Arnold & Leviton, 1977; Carranza *et al.*, 2021). It was collected from Al Jubail along sand sheets (Martens, 1996), and from several localities in Al Hassa (Al-Sadoon, 2010). Three species of sand skinks are known to occur in the Arabian Peninsula; *Scincus mitranus* Anderson, 1871, in eastern and southern Arabian Peninsula reaching northwards to southern Iraq and southeastern Iran, *Scincus conirostris* (Blanford, 1881) in Iran and northern Arabia, and *Scincus hemprichii* Wiegmann, 1837 from southwestern Saudi Arabia (Šmíd *et al.*, 2021).

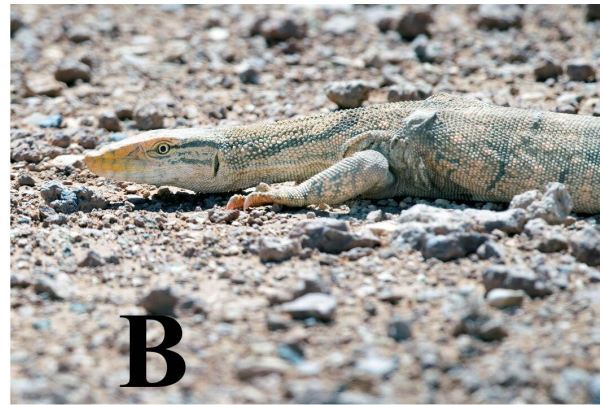


Figure 8. A. *Scincus mitranus*. B. *Varanus griseus*. C. *Diplometopon zarudnyi*.

Family Varanidae

Varanus griseus (Daudin, 1803) Fig. 8B

Observed: Bar Al Qatif, 17.4.2022. Al Sarar, 27.8.2023. Al Hassa National Park, 3.9.2023. Hejrat Al Oseferat, 3.9.2023. Qatar highway farms, 4.9.2023.

Remarks: The Desert monitor is a common species inhabiting open deserts of the Arabian Peninsula (Arnold, 1986). It was reported from Abqaiq (Haas, 1957), Al Jubail (Martens, 1996) and from four localities in Al Hassa (Al-Sadoon, 2010).

Family Trogonophidae

Diplometopon zarudnyi Nikolsky, 1907 Fig. 8C

Materials examined: EZC004, Al Mezerea Farm, 22.5.2023. EZC028, Josameen, 9.6.2023. EZC054, Al Hassa National Park, 4.9.2023. **Observed:** Tufaieh, 6.6.2023. Abo Ma'an (Al dhahi farms), 30.8.2023. Abo Ma'an (Al dhahi farms), 30.8.2023. Hejrat Al Oseferat, 3.9.2023. Al Hassa National Park, 3.9.2023. Jabal Al Araba'a area, 5.9.2023.

Remarks: This is an Arabian species distributed in western Iran, southern Iraq, Kuwait, north and eastern Saudi Arabia, Oman, United Arab Emirates and Qatar (Sindaco & Jeremcenko, 2008). Zarudnyi's Worm Lizard is a subterranean burrowing species inhabiting sand-blown and sand dunes habitats and found under wooden debris. It was reported from several localities along the coastal regions of the Arabian Gulf; Abqaiq and Salwa (Haas, 1957, 1961), and from Riyadh province (Al-Sadoon, 1988; Al-Sadoon *et al.*, 2016b), Al-Zulfi (Al-Sadoon *et al.*, 1991), Al Jubail (Martens, 1996), Al-Hassa region (Al-Sadoon, 2010), Ha'il (Al-Shammari, 2012).

Zarudnyi's worm lizard feeds mainly on *Dermestes* sp., *Dermestes maculatus* and *Rhynchophorus ferrugineus* (Al-Sadoon *et al.*, 2016b).

Family Boidae

Eryx jayakari Boulenger, 1888 Fig. 9A

Material examined: EZC053, Al Hassa National Park, 4.9.2023. **Observed:** Hejrat Al Oseferat, 3.9.2023. Al Hassa National Park, 3.9.2023. Jabal Al Araba'a area, 5.9.2023.

Remarks: Jayakar's sand boa is widely distributed across Arabia including Bahrain, Kuwait, Oman, Saudi Arabia, UAE and Yemen (Gasperetti, 1988; Carranza *et al.*, 2021). It was recorded from Dhahran and Abqaiq (Haas, 1957, 1961; Leviton & Anderson, 1967; Mandeville, 1967), Al Jubail (Martens, 1996) and from Al Hassa (Al-Sadoon, 2010).

The feeding behaviour of *E. jayakari* in Saudi Arabia was investigated by Al-Sadoon & Al-Otaibi (2014). It was found to feed on mainly on sand dwelling lizards and mammals (i.e. *A. schmidti*, *B. tuberculatus*, *S. slevinii*, *Gerbillus cheesmani* and *Gerbillus nanus*), in addition to beetles.

Family Colubridae

Lytorhynchus diadema (Duméril, Bibron & Duméril, 1854) Fig. 9B

Material examined: EZC065, Hejrat Al Oseferat, 24.8.2023.

Remarks: The crowned leaf-nosed snake has a wide range of distribution extending across North Africa, the Middle East reaching southwestern Iran (Carranza *et al.*, 2021). In the Arabian Peninsula, it is known from the sand deserts and sand dunes (Gasperetti, 1988). It was reported from Dhahran and Abqaiq (Haas, 1957, 1961; Mandeville, 1967; Leviton & Anderson, 1967) and Al Hassa region by Al-Sadoon

(2010). A sister taxon, *Lytorhynchus kennedyi* Schmidt 1939, was recorded from Ara'r region, northern Saudi Arabia (Alshammari, 2021).

Platyceps ventromaculatus (Gray, 1834) Fig. 9C

Material examined: EZC017, Abo Ma'an (Al Dhahi farms), 3.6.2023. EZC039, Eastern Al Qudaih, 24.7.2023. **Observed:** Al Ayashi (Al Huashem farm), 1.7.2023.

Remarks: In the Arabian Peninsula, the Hardwicke's rat snake is confined to eastern Arabia including all countries overlooking the Arabian Gulf (Gasperetti, 1988). Haas (1957, 1961) reported this species from Dharan, Al Hassa, Jabal Qara and Al Qatif, and from Al Jubail by Martens (1996). Several records were also reported around the eastern coast by Mandeville (1967), Gallagher (1971) and Gasperetti (1988). It was collected from two localities in Al Hassa (Al-Sadoon, 2010).

Spalerosophis diadema cliffordii (Schlegel, 1837)

Observed: Al Sarar, 13.4.2023. Hejrat Al Oseverat, 3.9.2023. Qatar highway farms, 4.9.2023.

Remarks: The diadem snake has an extensive range of distribution across North Africa reaching the Iranian plateau (Sindaco *et al.*, 2013). Recent molecular studies validated the presence of five species of this genus, and that *S. d. cliffordii* stands as a valid subspecies (Yadollahvandmiandoab *et al.*, 2023). It was not reported by Martens (1996) from Al Jubail, but reported from Hanidh (Mandeville, 1967) and from several localities in Al Hassa (Al-Sadoon, 2010) This is a rather common species with a wide range of distribution across Saudi Arabia (Gasperetti, 1988).

This snake is persecuted on the assumption that it is venomous owing to its large size and aggressive behaviour. All specimens recorded in this study were killed by farmers.

Family Psammophiidae

Malpolon moilensis (Reuss, 1834) Fig. 9D

Observed: Mulejah, Al Nairyah Governorate, 18.6.2023. Sheab Abo Reja, Al Jubail Governorate, 4.7.2023. Qatar highway farms, Al Hassa Governorate, 4.9.2023.

Remarks: This is a common species inhabiting deserts of Arabia and surrounding countries. Many records were reported from western, northern and central Saudi Arabia (Gasperetti, 1988). It was reported from Abu Hadriyah, Abqaiq, Hufuf and Dhahran (Haas, 1957; Mandeville, 1967; Gasperetti, 1988), Al Hassa (Al-Sadoon, 2010), and Batina Island near Al Jubail (Martens, 1996).

Psammophis schokari (Forsskål, 1775) Fig. 9E

Material examined: EZC066, Abo Ma'an, 3.6.2023. **Observed:** Badr Street, 16.6.2023. Hejrat Al Oseverat, 3.9.2023. Al Hassa National Park, 3.9.2023. Qatar highway farms, 4.9.2023.

Remarks: The Schokari sand racer is a common diurnal snake inhabiting a wide variety of habitats in Saudi Arabia, ranging from rocky to gravel areas with scarce vegetation cover (Gasperetti, 1988). It was reported from Dhahran, Qatif, Jabal Qara (Haas, 1957; Gasperetti, 1988), the islands around Al Jubail and Al-Aba oasis (Martens, 1996), and from several localities in Al Hassa (Al-Sadoon, 2010).

Family Viperidae

Cerastes gasperetti Leviton and Anderson, 1967 Fig. 9F

Material examined: EZC051, Ahsa National Park, 3.9.2023. **Observed:** Al Judaedah, 1.9.2023. Hejrat Al Oseferat, 4.8.2023 and 3.9.2023. Al Ahsa National Park, 3.9.2023. Jabal Al Araba'a, 5.9.2023.

Remarks: The Arabian horned viper is a very ubiquitous species in the sand deserts of the Arabian Peninsula (Gasperetti, 1988). Also, it inhabits sandy wadi beds surrounded by mountains. In the study area, it

was reported from Dhahran, Jafura desert and Abqaiq (Haas, 1957, 1961; Leviton & Anderson, 1967), Al Jubail in sandy areas with vegetation cover of *Haloxylon* sp., *Calligonum* sp. and *Rhanterium epapposum* (Martens, 1996), and from several localities in Al Hassa (Al-Sadoon, 2010).

The feeding behaviour of *C. gasperettii* was studied based on specimens collected around Riyadh (Al-Sadoon & Paray, 2016). Two species of rodents, *Gerbillus cheesmani* and *Mus musculus* were found in the stomach contents of this viper along with two species of reptiles; *A. schmidti* and *S. slevinii*.



Figure 9. A. *Eryx jayakari*. B. *Lytorhynchus diadema*. C. *Platyceps ventromaculatus*. D. *Malpolon moilensis*. E. *Psammophis schokari*. F. *Cerastes gasperetti*.

Family Elapidae

Hydrophis cyanocinctus Daudin, 1803

Material examined: KFUPM: 2 specimens from the vicinity of the eastern coast of Saudi Arabia, without date.

Remarks: The annulated sea snake has a wide range of distribution extending along the Indo-West Pacific, the Arabian Gulf, reaching Japan (David & Ineich, 1999). It was reported from the coasts of all countries overlooking the Arabian Gulf (Castilla *et al.*, 2017).

Discussion

The present study provides additional locality records for the herpetofauna of eastern Saudi Arabia, with a new record of *Trachylepis tessellata* to the herpetofauna of Saudi Arabia. Previously, Haas (1957, 1961) listed several species from eastern Saudi Arabia. Two studies outlined the herpetofauna in localized areas in eastern Saudi Arabia, Al Jubail (Martens, 1996) and Al Hassa (Al-Sadoon, 2010) and reported 24 and 34 species respectively. For example, other species that were previously reported, but not found during the present study include *Walterinnesia aegyptia* from Ain Dar and Al Mishab (Haas, 1957), and from two localities in Al Hassa (Al-Sadoon, 2010). *Eirenis arabica* (= *Eirenis coronella*) was recorded from Abqaiq, Al Hassa (Haas, 1957, 1961; Al-Sadoon, 2010), and *Indotyphlops braminus* (Daudin, 1803) from Hufuf (Gasperetti, 1988), in addition to other species. Table 2 shows a comparison of recorded reptiles from the eastern region of Saudi Arabia based on Al-Sadoon (2010) and Martens (1996). This brings the total of reported species from eastern Saudi Arabia to 49 species, including one amphibian, one freshwater turtle, three marine turtles, 28 lizards, one amphisbaenian, one varanid, and 14 snakes.

Table 2. Herpetofaunal comparison of previous studies and the current study.

| Species | Al-Sadoon (2010) | Martens (1996) | Present study |
|---|------------------|----------------|---------------|
| <i>Pelophylax ridibundus</i> | | | • |
| <i>Mauremys caspica</i> | | | • |
| <i>Eretmochelys imbricata</i> | | | • |
| <i>Phrynocephalus arabicus</i> | • | • | • |
| <i>Phrynocephalus longicaudatus</i> | | • | • |
| <i>Trapelus persicus</i> | • | • | • |
| <i>Trapelus pallidus</i> | • | | |
| <i>Uromastyx aegyptia</i> | • | • | • |
| <i>Bunopus tuberculatus</i> | • | • | • |
| <i>Cyrtopodion scabrum</i> | | • | • |
| <i>Hemidactylus flaviviridis</i> | | • | • |
| <i>Hemidactylus persicus</i> | | • | • |
| <i>Pseudoceramodactylus khobarensis</i> | | • | • |
| <i>Trigonodactylus arabicus</i> | • | | • |
| <i>Stenodactylus doriae</i> | • | • | • |
| <i>Stenodactylus slevini</i> | • | | • |
| <i>Ptyodactylus hasselquistii</i> | • | | • |
| <i>Pristurus rupestris</i> | | | • |
| <i>Acanthodactylus boskianus</i> | • | | |
| <i>Acanthodactylus gongrorhynchatus</i> | | • | |
| <i>Acanthodactylus hardyi</i> | | | • |
| <i>Acanthodactylus opheodurus</i> | • | • | |
| <i>Acanthodactylus schmidtii</i> | • | • | |
| <i>Mesalina adramitana</i> | • | | |
| <i>Mesalina brevirostris</i> | • | • | |
| <i>Mesalina guttulata</i> | • | | |
| <i>Chalcides ocellatus</i> | • | | |
| <i>Scincus mitranus</i> | • | • | • |
| <i>Trachylepis brevicollis</i> | • | | • |
| <i>Trachylepis tessellata</i> | | | • |

..continued on the next page

TABLE 2.

| | | | |
|---|-----------|-----------|-----------|
| <i>Heremites septemtaeniatus</i> | • | • | • |
| <i>Diplometopon zarudnyi</i> | • | • | • |
| <i>Varanus griseus</i> | • | • | • |
| <i>Eryx jayakari</i> | • | • | • |
| <i>Lytorhynchus diadema</i> | • | | • |
| <i>Eirenis coronella</i> | • | | |
| <i>Platyceps ventromaculatus</i> | • | | • |
| <i>Spalerosophis diadema cliffordii</i> | • | | • |
| <i>Psammophis schokari</i> | • | • | • |
| <i>Malpolon moilensis</i> | • | • | • |
| <i>Cerastes gasperetti</i> | • | • | • |
| <i>Echis coloratus</i> | • | | |
| <i>Walterinnesia aegyptia</i> | • | | |
| <i>Myriopholis macrorhyncha</i> | • | | |
| <i>Hydrophis cyanocinctus</i> | | • | • |
| <i>Hydrophis lapemoides</i> | | • | |
| <i>Hydrophis platurus</i> | | • | |
| No. of recorded species | 32 | 24 | 32 |

According to habitats, two species; *Ph. arabicus* and *T. arabicus* were restricted to dry salt marshes “*sabkha*”. The majority of collected species are sand dwelling species including *Ph. arabicus*, *S. doriae*, *S. slevini*, *C. gasperetti*, *D. zarudnyi*, *E. jayakari*, *A. hardyi*, *M. moilensis*, and *S. mitranus*. Freshwater habitats host two species that are dependent on permanent waterbodies; *P. ridibundus* and *M. caspica*. Marine habitats are exclusive to the three marine snakes and the hawksbill sea turtle.

The study area is void of rocky mountains, instead, remains of corals and seabed deposits can be seen in Shadgam limestone mountains. However, some rock boulders are scattered within the area, making it possible for rock dwelling species to bask during daytime such as *Ph. longicaudatus* and *T. persicus*. Several species were found in association with human habitations including houses and farms. These include *C. scabrum*, *H. flaviviridis*, *T. brevicollis*, *T. tessellata*, and *H. septemtaeniatus*.

The islands of Saudi Arabia were found to host some reptilian species such as *H. septemtaeniatus*, *C. scabrum*, *M. moilensis* and *P. schokari*. Soorae (2004) reported nine species of reptiles from 13 islands in the United Arab Emirate (UAE). Also, Bourquin (2011) recorded 13 species from Sir Bani Yas Island (UAE). *Pseudoceramodactylus khobarensis* was recorded from Al Aaliya and Al Saffia islands in Qatar (Valdeón et al., 2013). In this regard, further studies on the reptiles of the Saudi islands should be conducted.

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