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Recent Observations on Amphibians and Reptiles in the Hashemite Kingdom of Jordan

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Abstract: The herpetofauna of Jordan has been extensively studied over the past few decades not only by local herpetologists but by foreign ones as well. Additional information on the current status, distribution, and ecology of amphibians and reptiles is indeed crucial for the conservation authorities as it enables them to take an inventory of certain areas together with some protection and conservation actions. Herein, this study reports observations of three amphibians and thirty-two reptile species along with some distributional and ecological notes.

Keywords: Herpetofauna, Faunistics, New records, Levant, Middle East.

Introduction

The Hashemite Kingdom of Jordan together with other Levant countries (south-central Turkey, Syria, Lebanon, and Palestine) represents a geographical bridge that connects Africa, Europe, and Asia (Disi, 1996). In addition to having a long and complex geomorphological history, the Levant countries are well-known for their high level of biodiversity and endemism in the Western Palearctic region as far as many species are concerned including reptiles and amphibians (Sindaco and Jeremčenko, 2008; Ficetola *et al*., 2018).

For more than 100 years, herpetofauna of Jordan has attracted the attention not only of local and foreign herpetologists as well. This has resulted in publishing new records, observations, and inventories of protected areas (Wittenberg, 1992; Sindaco *et al*., 1995; Abu Baker *et al*., 2004; 2005), in addition to large overviews and checklists based on international collaboration (Disi *et al*., 2001; Disi and Amr, 2010; Amr and Disi, 2011). The use of DNA sequencing, modern molecular methods, and integrative taxonomy enabled researchers to reveal the cryptic diversity among certain species; some of which were later described as new species (Moravec *et al.*, 2011; Melnikov *et al*., 2012; Nazarov *et al*., 2013). This shows that despite the long and intense herpetofauna research in this country, there are still more research to be conducted and more faunistic gaps to be filled. Herein, this study reports additional records and observations of thirty-five recorded species of amphibians and reptiles.

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Materials and Methods

During late September of 2019, a group of four Czech naturalists conducted day and night surveys at thirteen localities in Jordan (Figure 1; Table 1) with the objective of observing and mapping the herpetofaunal diversity. The date, time, and number of individuals were documented. The geographical coordinates and altitude of all records were documented using GPS navigation. All observed species together with their habitats were photographed if possible (Figure 2).

All animals, if captured, were released

at the same place without any physical harm after being photographed. Most species were identified using the available literature and identification keys (Arnold, 1980b; Disi *et al*., 2001; Disi and Amr, 2010; Amr and Disi, 2011; Moravec *et al*., 2011). The species, which were not examined in details, were determined with respect to their distributional and ecological status and their species determination, is therefore, discussed. Records of certain species that were not summarized by Disi and Amr (2010) or Amr and Disi (2011) were considered in this study as new ones.

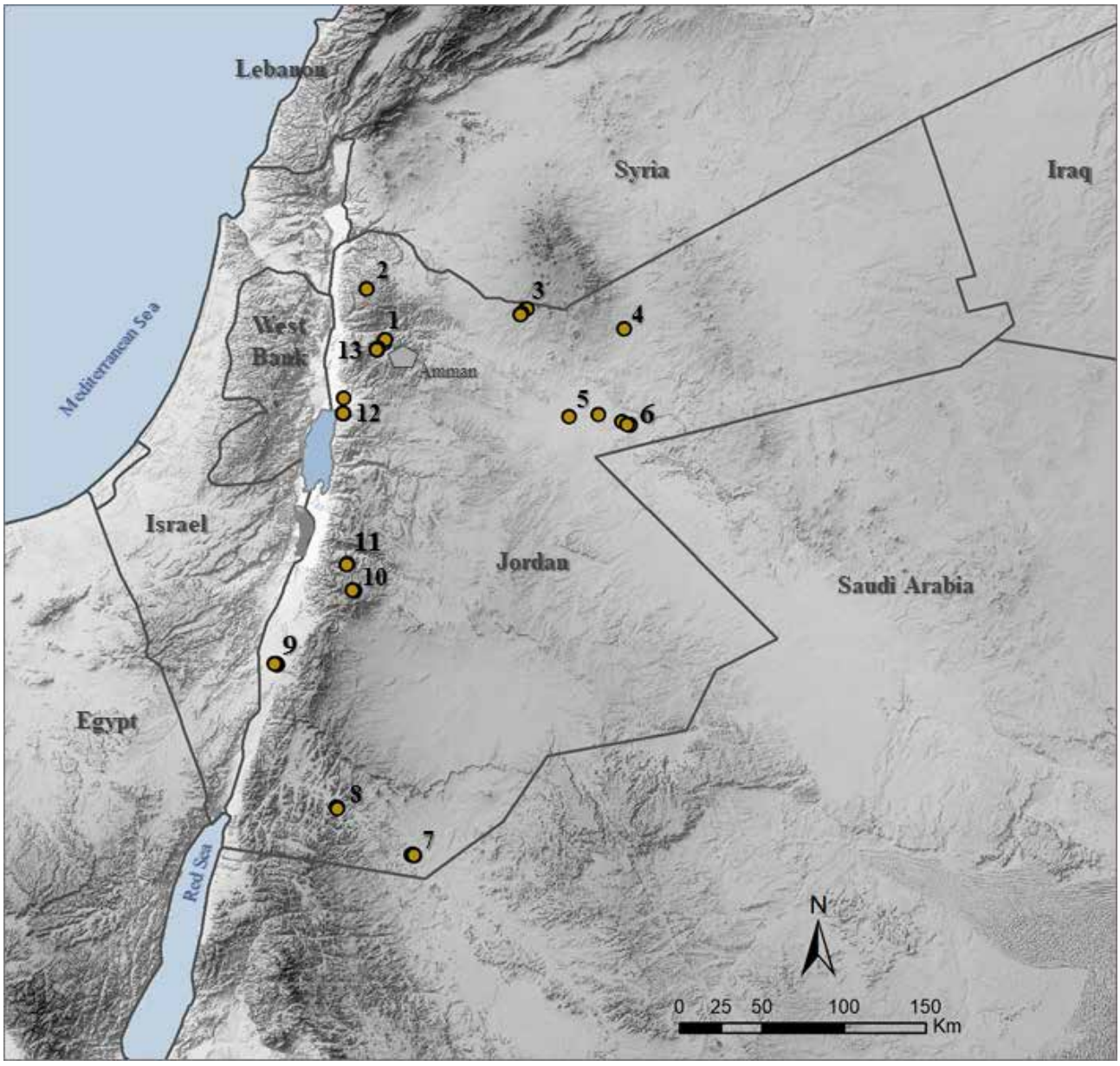


Figure 1. Map of the Hashemite Kingdom of Jordan. Dots with numbers represent visited localities. Numbers of localities correspond to the numbers in Table 1 and Table 2.

Results

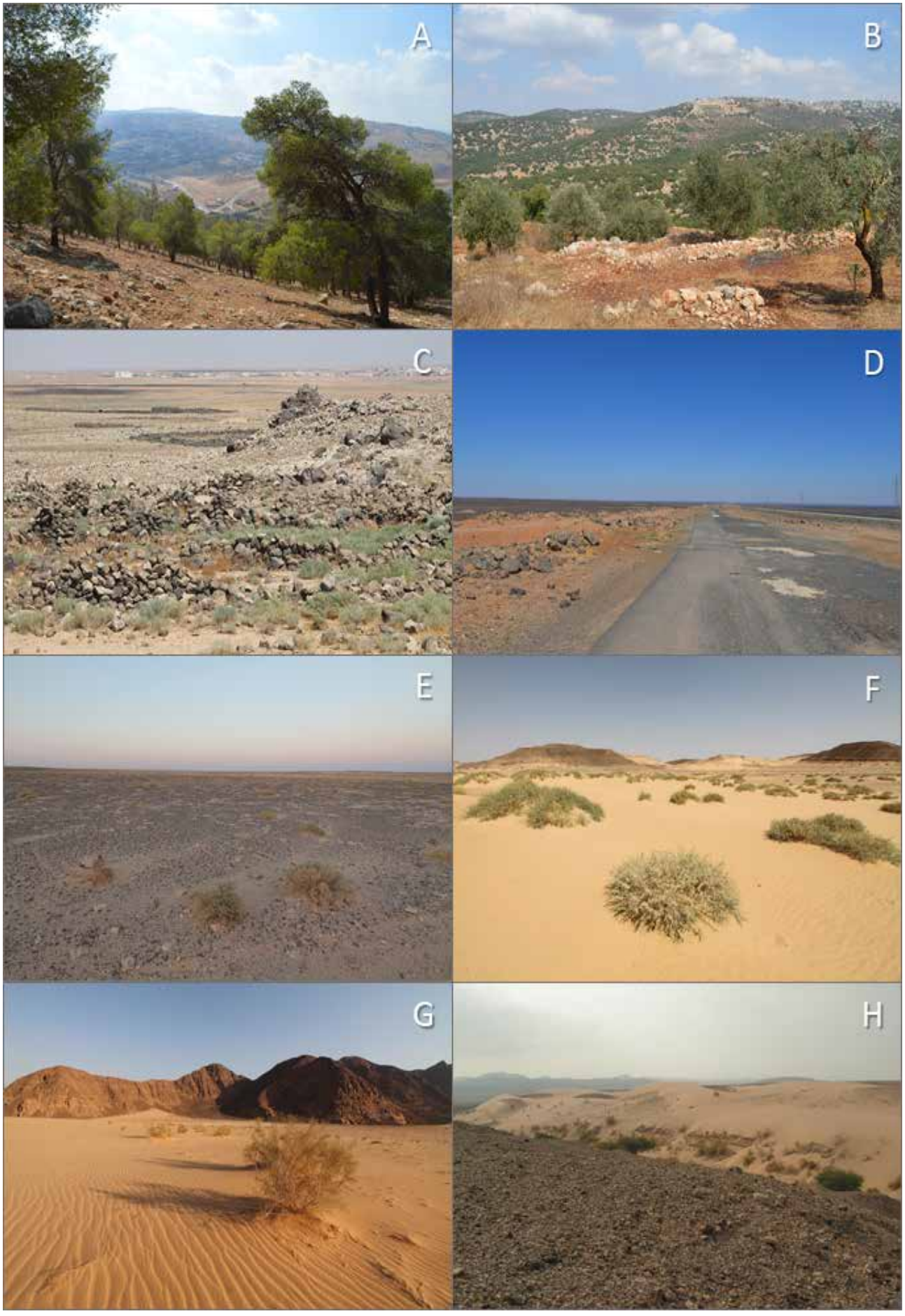
All of the thirteen visited localities with their GPS coordinates are shown in Table 1. A summary of the sympatrically observed species in each locality is presented in Table 2. The numbers of each locality in Table 2 correspond to the locality numbers in Table 1.

Amphibians

Family Bufonidae

Bufotes sitibundus (Pallas, 1771) – Figure 3A

Observed individuals: 1 (1.5 km E of Al Rumaymin); 4 (10 km NE of Tafila, wadi); 10 (Umm Al Quttein).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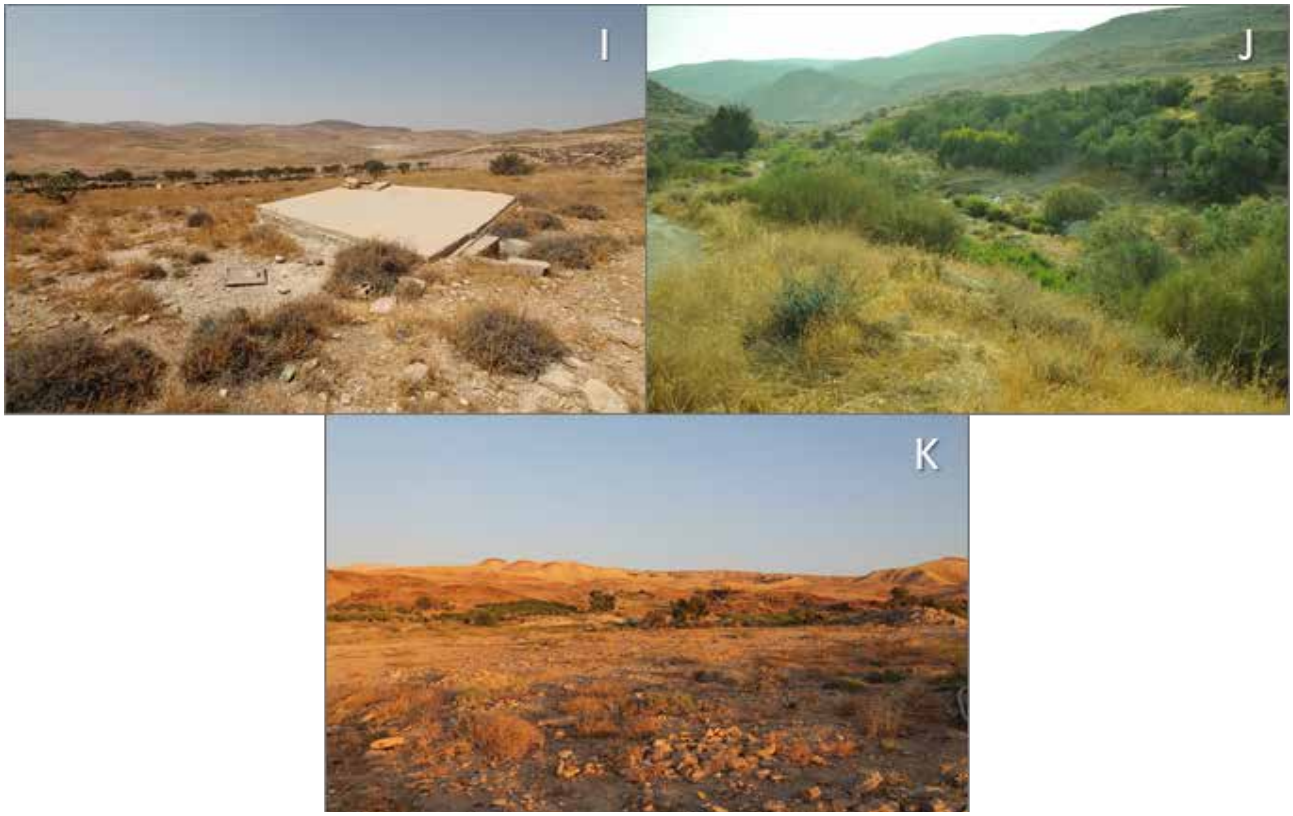

Figure 2. Variety of visited habitats. Numbers in parentheses correspond to localities in Fig. 1. A: 600 m NE of Rujm Shubayl (1); B: 1,5 km SW of Zubyia (2); C: Umm Al Qutein (3); D: 5 km NE of Safawi (4); E: 20 km NE of S. Arabia border crossing (6); F: 2 km E of Mudawwara (7); G: 2,5 km SE of Munayshir (8); H: Wadi Araba (9); I: 10 km SE of Tafila (10); J: 10 km NE of Tafila (11); K: 4 km SE of Swemeh, E of Dead Sea (12).

Occurrence in Jordan: Distributed over a variety of habitats, including semideserts, limited only to suitable breeding sites (see map in Disi and Amr, 2010).

Comments: The name, *B. variabilis,* to which Middle Eastern populations were traditionally referred, is a junior synonym of *B. sitibundus* (Pallas, 1771) (Dufresnes *et al*., 2019b).

Table 1. All 13 visited localities with their GPS coordinates. Numbers correspond to the numbers of localities in Figure 1 and Table 2.

Number and name of locality	GPS coordinates (latitude [N]; longitude [E])
1. 600 m NE of Rujm Shubayl	32.1509; 35.8565
2. 1.5 km SW of Zubyia	32.4270; 35.7522
3. Umm Al Quttein	32.3166; 36.629
4. 5 km NE of Safawi	32.2093; 37.1657
5. road from A5 to Al Hazim	31.7271; 36.8624
6. 20 km NE of S. Arabia border crossing	31.6830; 37.1956
7. 2 km E of Mudawwara	29.3159; 36.0023
8. 2.5 km SE of Munayshir	29.5792; 35.5916
9. Wadi Araba	30.3660; 35.2628
10. 10 km SE of Tafila	30.7675; 35.6858
11. 10 km NE of Tafila, wadi	30.9158; 35.6461
12. 4 km SE of Swemeh, E of Dead Sea	31.7425; 35.6242
13. 1.5 km E of Al Rumaymin	32.1036; 35.8153

Table 2. Summary of sympatrically observed species on each locality. Numbers correspond to the numbers of localities in Figure 1 and Table 1.

Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Bufotes sitibundus			•								•		•
Hyla felixarabica			•								•		
Pelophylax bedriagae													•
Pristurus sp.								•					
Bunopus tuberculatus						•	•						
Hemidactylus dawudazraqi	•		•							•	•	•	
Stenodactylus doriae							•	•					
Stenodactylus slevini							•						
Stenodactylus sthenodactylus												•	
Tropiocolotes nattereri								•				•	
Ptyodactylus cf. ananjevae							•						
Ptyodactylus guttatus									•	•	•	•	•
Ptyodactylus hasselqustii								•					
Ptyodactylus puiseuxi		•	•										
Phrynocephalus arabicus							•	•					
Pseudotrapelus sinaitus werneri				•									
Stellagama stellio picea			•										
Stellagama stellio ssp.	•	•								•			•
Trapelus ruderatus			•										
Trapelus agnetae					•	•							
Ophisops elegans	•	•											•
Acanthodactylus schmidti							•						
Acanthodactylus tilburyi							•						
Mesalina sp.				•									
Chamaeleo chamaeleon										•	•		•
Scincus scincus							•						
Testudo graeca	•		•										
Spalerosophis diadema							•						
Dolichophis jugularis											•		
Atractaspis engaddensis												•	
Malpolon insignitus		•											
Malpolon moilensis					•								
Walterinnesia aegyptia											•		
Echis coloratus								•	•				
Macrovipera lebetinus											•		

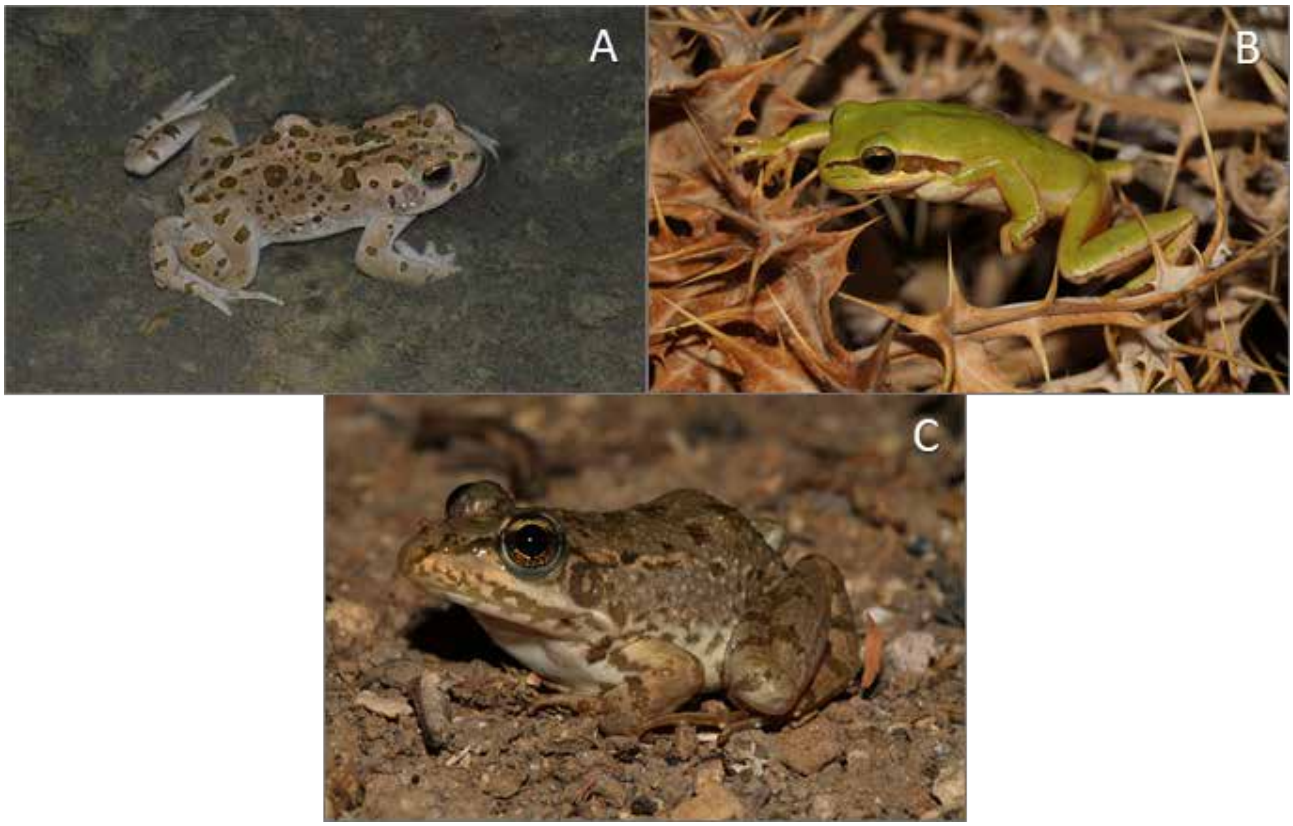

Figure 3. A: *Bufotes sitibundus*, 10 km NE of Tafila; B: *Hyla felixarabica*, 10 km NE of Tafila; C: *Pelophylax bedriagae,* 1.5 km E of Al Rumaymin.

Family Hylidae

Hyla felixarabica Gvoždík, Moravec, Klütsch and Kotlík, 2010 – Figure 3B.

Observed individuals: 10 (Umm Al Quttein); 5 (Tafila region).

Occurrence in Jordan: Wadi Mujib, Wadi Fidan, Zara, Wadi Hasa, and Wadi Dana (Gvoždík *et al*., 2010); it is questionable which records of *H. savignyi* sensu lato in Disi *et al*. (2001) and Disi and Amr (2010) represent in fact the new species *H. felixarabica* described by Gvoždík *et al*. (2010).

New records: Umm Al Quttein, Roman water source.

Comments: It should be taken into account that the observed specimens were not examined in detail or compared by molecular methods. Both localities are found in the east of the Rift Valley; based on the available literature (Gvoždík e*t al*., 2010; Dufresnes *et al.*, 2019a), these records were considered as *H. felixarabica* rather than *H. savigny* Audouin, 1827.

Family Ranidae

Pelophylax bedriagae (Camerano, 1882) – Figure 3C.

Observed individuals: 1 (1.5 km E of Al Rumaymin).

Occurrence in Jordan: Mediterranean habitats with an isolated population in the Azraq wetlands (Disi *et al*., 2001; Disi and Amr, 2010).

Comments: A single individual was observed at night in the vicinity of an olive orchard.

Reptiles

Family Sphaerodactylidae

Pristurus sp. – Figure 4A

Observed individuals: 8 (2.5 km SE of Munayshir).

Occurrence in Jordan: Described from the vicinity of Guweira (Haas, 1943); Wadi Rumm; Aqaba mountains (Disi *et al*., 2001).

Comments: Several individuals were observed on steep rocky slopes surrounded by sandstone cliffs. This species is diurnal

Figure 4. A: *Pristurus sp*., 2.5 km SE of Munayshir; B: *Bunopus tuberculatus*, 20 km NE of S. Arabia border crossing; C: *Hemidactylus dawudazraqi*, 600 m NE of Rujm Shubayl; D: *Stenodactylus doriae*, 2 km E of Mudawwara; E: *Stenodactylus slevini*, 2 km E of Mudawwara; F: *Stenodactylus sthenodactylus*, 4 km SE of Swemeh, E of Dead Sea.; G: *Tropiocolotes nattereri*, 12. 4 km SE of Swemeh, E of Dead Sea.

and heliothermic. They were found to be extremely shy and always prepared to hide when approached. All of them were found close to rocky crevices.

See Badiane *et al*. (2014), who provided more information regarding the phylogeny and taxonomy of this genus. According to their molecular phylogenetic analysis, *P. rupestris* is paraphyletic. The populations from Jordan together with other samples clustering in the so-called western clade are preliminarily marked as *Pristurus sp*. until more type specimens will be examined and taxonomic conclusions will be made.

Family Gekkonidae

Bunopus tuberculatus Blanford, 1874 – Figure 4B

Observed individuals: 1 (20 km NE of S. Arabia border crossing); 2 (2 km E of Mudawwarah).

Occurrence in Jordan: Wadi Araba; Wadi Rumm; Abar Al Hazim; Azraq; Shawmari NR (Disi *et al*., 2001; Disi, 2011).

New records: 2 km E of Mudawwarah.

Comments: It is questionable whether populations from Jordan and the rest of the Arabian Peninsula are conspecific with those from the type locality in southeastern Iran (Arnold, 1980a; Leviton *et al*., 1992). Červenka *et al*. (2008) and later on Khosravani *et al*. (2017), who studied the phylogenetic relationships of this genus, found *Bunopus tuberculatus* to be paraphyletic.

Hemidactylus dawudazraqi Moravec, Kratochvíl, Amr, Jandzik, Šmíd and Gvoždík, 2011 – Figure 4C

Observed individuals: 3 (4 km SE of Swemeh, E of Dead Sea); 3 (Wadi Araba); 2 (10 km NE of Tafila, wadi); 1 (Umm Al Quttein, ruins).

Occurrence in Jordan: Azraq; Wadi Mujib; Little Petra; Jawa (see map in Moravec *et al.* 2011); some of the previous records (see Disi *et al*., 2001) might represent records of other species from the *Hemidactylus turcicus* species complex.

Comments: The specimens were neither examined in details, nor compared by molecular methods; rather, all observed individuals were considered as *Hemidactylus dawudazraqi* based on the researchers' current knowledge of the distribution of both of these two species of the genus *Hemidactylus* known from Jordan up to date (*H. dawudazraqi* and *H. mindiae*). The third species *H. lavadeserticus* is highly expected to be present in the black lava desert in the north of the country (Disi *et al*., 2001; Amr *et al*., 2007; Moravec *et al*., 2011). *Hemidactylus dawudazraqi* was formerly thought to be the common Mediterranean synantropic species *Hemidactylus turcicus* (Disi *et al*., 2001). However, the integrative taxonomic approach revealed that it represents a cryptic species from the *Hemidactylus turcicus* species complex and was described as a new distinct species (Moravec *et al*., 2011).

Stenodactylus doriae Blanford, 1874 – Figure 4D

Observed individuals: 15 (2 km E of Mudawwara); 3 (2.5 km SE of Munayshir); 8 (Wadi Araba).

Occurrence in Jordan: Wadi Araba; Abar Al Hazim; Wadi Rumm; Mudawwarah (Disi *et al.*, 2001; Disi 2011).

Comments: Typical psammophilous species found in sandy deserts across the whole Arabian Peninsula. Wadi Araba represents its westernmost distribution limit on both sides of the valley (Werner, 1987). As mentioned by Arnold (1980b) and Metallinou *et al*. (2012), different species of the genus *Stenodactylus* may be found as sympatric in Jordan, however they differ in the ecological niche partitioning. *Stenodactylus doriae* is usually found on sands, whereas the smaller *Stenodactylus slevini* inhabits the transitional zone between the sandy and the stony deserts (Disi *et al*., 2001).

Stenodactylus slevini Haas, 1957 – Figure 4E

Observed individuals: 11 (2 km E of Mudawwara).

Occurrence in Jordan: Mudawwara; Batn Al Ghul; northern Badia (Disi *et al*., 2001; Disi, 2011).

Comments: Individuals were found in the

transitional zone between the sandy and the stony deserts.

Stenodactylus sthenodactylus
Lichtenstein, 1823 – Figure 4F
Observed individuals: 2 (4 km SE of Swemeh, E of Dead Sea).
Occurrence in Jordan: The Dead Sea region; Wadi Araba; Wadi Rumm (Disi *et al*., 2001; Disi, 2011).
Comments: Both individuals were found early after sunset foraging on the ground.

Tropiocolotes nattereri Steindachner, 1901 – Figure 4G
Observed individuals: 1 (2.5 km SE of Munayshir); 1 (4 km SE of Swemeh, E of Dead Sea).
Occurrence in Jordan: The Dead Sea region; Wadi Araba; Wadi Rumm (Disi *et al*., 2001; Disi, 2011).
Comments: Individuals were observed early after sunset foraging on the ground.

Family Phyllodactylidae
Ptyodactylus cf. ananjevae Nazarov, Melnikov and Melnikova, 2013 – Figure 5A
Observed individuals: 1 (2 km E of Mudawwara).
Occurrence in Jordan: check the information given below (Nazarov *et al*., 2013).
Comments: The specimen was neither examined in detail, nor compared by molecular methods. This record was considered as *Ptyodactylus cf. ananjevae* based on the published photographs, the vicinity of the type locality (Nazarov *et al.*, 2013), and its general look. This species was described from the *Ptyodactylus hasselquistii* species complex based on the specimens collected in the vicinity of Mudawwara. So far, it is known only from the material collected from the type locality (Nazarov *et al*., 2013). Further sampling is necessary to clarify the status of this species, its distribution range, and whether the records from Mudawwarah represent *Ptyodactylus hasselquistii* or *Ptyodactylus ananjevae*.

Ptyodactylus guttatus Heyden, 1827 – Figure 5 B
Observed individuals: 3 (Wadi Araba); 2 (10 km SE of Tafila); 2 (10 km NE of Tafila, wadi); 2 (4 km SE of Swemeh, E of Dead Sea); 2 (1.5 km E of Al Rumaymin).
Occurrence in Jordan: Irano-Turanian habitats; the Dead Sea region; Wadi Araba; Wadi Dana; Wadi Rumm (Disi *et al.*, 2001; Disi, 2011).

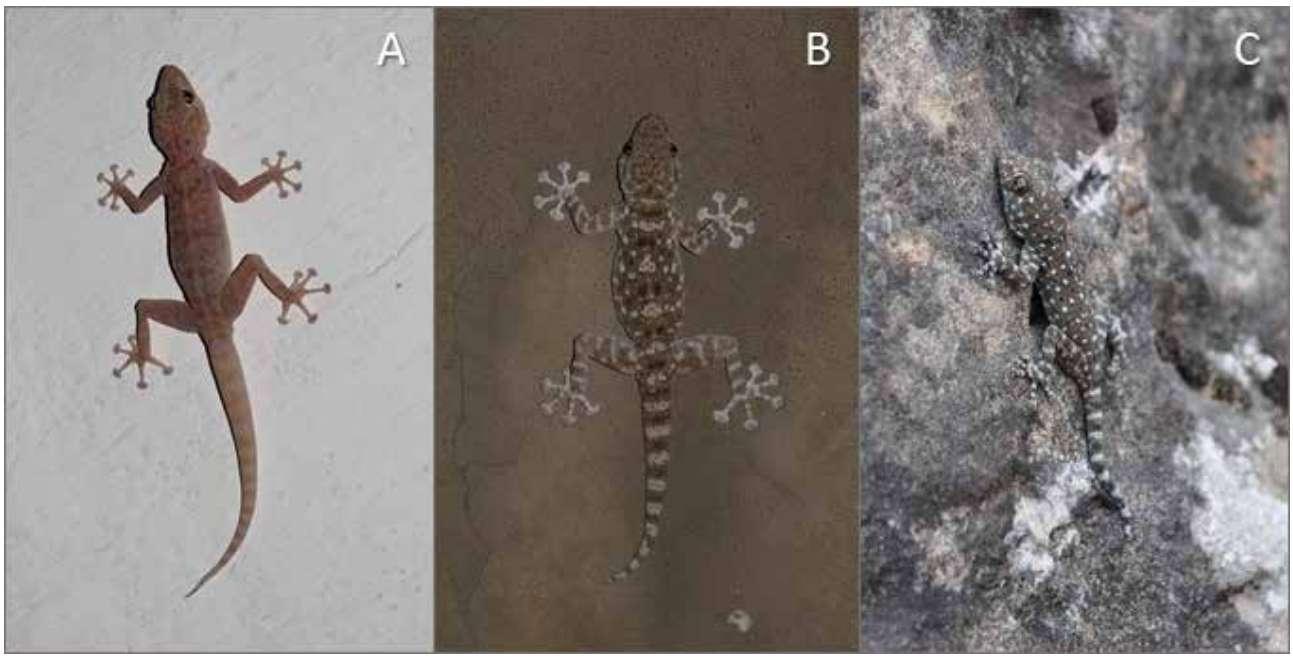

Figure 5. A: *Ptyodactylus ananjevae*, 2 km E of Mudawwara; B: *Ptyodactylus guttatus*, 1.5 km E of Al Rumaymin; C: *Ptyodactylus puiseuxi*, 1.5 km SW of Zubyia.

Comments: All individuals were observed early after sunset climbing on the rocks or walls.

Ptyodactylus hasselqustii (Donndorf, 1798)
Observed individuals: 5 (2.5 km SE of Munayshir)
Occurrence in Jordan: Wadi Rumm; lower parts of Wadi Araba; Aqaba mountains; Mudawwarah (Disi *et al*., 2001; Disi, 2011).
Comments: All individuals were found early after sunset on rocky boulders.

Ptyodactylus puiseuxi Boutan, 1893 – Figure 5C
Observed individuals: 3 (1.5 km SW of Zubyia); 1 (Umm Al Quttein, ruins); 9 (4 km SW of Umm Al Quttein).
Occurrence in Jordan: Mediterranean habitats in the western and north-western Jordan; Eastern desert = northern Badia (Disi *et al*., 2001; Disi, 2011).
Comments: It was observed in the morning hours basking on the rocks.

Family Agamidae
Phrynocephalus arabicus Anderson, 1894 – Figure 6A
Observed individuals: 6 (2 km E of Mudawwara); 1 (2.5 km SE of Munayshir).
Occurrence in Jordan: Wadi Rumm; Mudawwarah region (Disi *et al*., 2001; Disi, 2011).
Comments: This species is diurnal and heliophilous. All individuals were observed on the loose sand in the morning and in the late afternoon. When threatened, they run in the distance, where they dig themselves in the sand. In Jordan, this species was recorded for the first time in 1988 (Wittenberg, 1992). Another species *Phrynocephalus maculatus* was recorded in Jordan in 2003 in the northern Badia region (Abu Baker *et al*., 2005), and later it was recorded in the Mudawwarah region as well (Scholz *et al*., 2013). In comparison with *Phrynocephalus arabicus*, it inhabits hard soils and gravel plains (Abu Baker *et al*., 2005).

Pseudotrapelus sinaitus werneri Moravec 2002 – Figure 6B
Observed individuals: 1 (5 km NE of Safawi)
Occurrence in Jordan: *Pseudotrapelus sinaitus werneri* – Eastern desert (Moravec, 2002).
Comments: A single individual was observed at midday basking on a rock. Another species of the genus *Pseudotrapelus aqabensis* was described from Aqaba. Later, it was confirmed that it does not represent a closely-related species to *Pseudotrapelus sinaitus* (Melnikov *et al*., 2012; Tamar *et al*., 2016).

Stellagama stellio picea (Parker, 1935) – Figure 6C
Observed individuals: 3 (SW of Umm Al Quttein, along the road); 2 (4 km SW of Umm Al Quttein)
Occurrence in Jordan: Eastern desert = northern Badia (Disi *et al*., 2001; Disi, 2011).
Comments: This diurnal species was observed in the black lava desert on the rocks or walls in the morning hours.

Stellagama stellio ssp. (Linneaus, 1758)
Observed individuals: 1 (600 m NE of Rujm Shubayl); 1 (1.5 km SW of Zubyia); 2 (10 km SE of Tafila, abandoned building); 1 (3 km S of Al Kafrayn, along the road); 1 (1,5 km NE of Ayn Khunayzir); 1 (1,5 km E of Al Rumaymin).
Occurrence in Jordan: Mediterranean habitats and the western mountain region (Disi *et al*., 2001).
Comments: This diurnal species was observed on the rocks during daytime.

Trapelus ruderatus Olivier, 1804 – Figure 6D
Observed individuals: 1 (4 km SW of Umm Al Quttein).
Occurrence in Jordan: Mediterranean and Irano-Turanian habitats in western Jordan; northern Badia (Disi *et al*., 2001; Disi, 2011).
Comments: A single individual was observed among rocks in the morning hours.

Trapelus agnetae (Werner, 1929) – Figure 6E
Observed individuals: 1 (20 km NE of S. Arabia border crossing); 1 (road from A5 to Al Hazim).
Occurrence in Jordan: *Trapelus pallidus agnetae* – Eastern desert = northern Badia.

Figure 6. A: *Phrynocephalus arabicus*; 2 km E of Mudawwara; B: *Pseudotrapelus sinaitus werneri*, 5 km NE of Safawi; C: *Stellagama stellio picea,* Umm Al Qutein; D: *Trapelus ruderatus*, Umm Al Qutein; E: *Trapelus cf. agnetae*, 20 km NE of S. Arabia border crossing.

Comments: The taxonomy of agamids of the genus *Trapelus* in Jordan is not stable (Disi *et al*., 2001; Wagner *et al*., 2011). Several different names were used for this species including (*Trapelus pallidus agnetae*, *Trapelus palidus haasi,* and *Trapelus agnetae*). A comprehensive study is recommended with sampling across the Middle East along with molecular analyses to reveal whether the populations from Egypt and Palestine belong to the same species of the populations in east of Wadi Araba in Jordan. The species previously referred to *Trapelus pallidus* is distributed mostly in Irano-Turanian ecozone, but can also be found in Wadi Araba (Disi *et al*., 2001).

Family Lacertidae

Ophisops elegans Ménétries, 1832

Observed individuals: 10 (600 m NE of Rujm Shubayl); 3 (1.5 km SW of Zubyia); 1 (1.5 km E of Al Rumaymin)

Occurrence in Jordan: Mediterranean and Irano-Turanian ecozones; Eastern desert = northern Badia (Disi *et al*., 2001).

Comments: All individuals were observed

in the morning and around midday. When approached, they quickly ran under bushes, stones, or into rocky crevices.

Acanthodactylus schmidti Haas, 1957 – Figure 7A

Observed individuals: 3 (2 km E of Mudawwara); 1 (2.5 km SE of Munayshir).

Occurrence in Jordan: Southern Jordan (Batn Al Ghul, Mudawwarah region, Wadi Rumm) and Eastern desert = northern Badia (Abar Al Hazim area) (Disi *et al*., 2001; Disi, 2011).

Comments: Individuals were observed in the morning and in the late afternoon in sandy areas with a scattered bush vegetation.

Acanthodactylus tilburyi Arnold, 1986

Observed individuals: 1 (2 km E of Mudawwara).

Occurrence in Jordan: Mudawwarah region (Disi *et al.*, 2001) and northern Badia (Disi, 2011).

Comments: This small lacertid species was recorded in Jordan for the first time by Modrý *et al*. (1999). This species is active during the early morning hours until noontime.

Mesalina guttulata species complex – Figure 7B

Observed individuals: 1 (5 km NE of Safawi).

Occurrence in Jordan: Eastern desert; vicinity of Safawi (see Sindaco *et al*., 2018 for map of the sampled localities).

Comments: Populations from Jordan may represent an undescribed species (Sindaco *et al*., 2018).

Family Chamaeleonidae

Chamaeleo chamaeleon (Linnaeus, 1758) – Figure 7C

Observed individuals: 2 (10 km SE of Tafila, olive orchard); 1 (10 km NE of Tafila); 1 (1.5 km E of Al Rumaymin).

Occurrence in Jordan: Widespread in Mediterranean habitats but can also be found in Wadi Rumm and Azraq wetlands as relict populations (Abu Baker *et al*., 2004; Disi, 2011).

Comments: Populations from Jordan are referred to the subspecies *Chamaeleo chamaeleon recticrista* (Disi *et al*., 2001). In the Tafila region, the locals were surprisingly afraid of its presence in their orchard.

Family Scincidae

Scincus scincus (Linnaeus, 1758)

Observed individuals: 1 (2 km E of Mudawwara).

Occurrence in Jordan: Southern Jordan – Wadi Rumm; Mudawwarah region; Eastern desert = northern Badia – Abar Al Hazim area (Disi *et al*., 2001; Amr and Disi, 2011).

Comments: Populations from Jordan are referred to the subspecies *Scincus sincus meccensis* (Arnold and Leviton, 1977). Specimen escaped and unfortunately was not photographed.

Family Testudinidae

Testudo graeca Linnaeus, 1758 – Figure 7D

Observed individuals: 3 (600 m NE of Rujm Shubayl); 1 (4 km SW of Umm Al Quttein).

Occurrence in Jordan: Mediterranean habitats in western Jordan (Disi *et al*., 2001).

New records: 4 km SW of Umm Al Quttein.

Comments: The observation from 4 km SW of Umm Al Quttein represents an interesting record from the black lava desert and falls into Irano-Turanian ecozone. However, some previous records of this species from remote areas outside its Mediterranean distribution were considered as human introduced (Disi *et al*, 2001). It was reported in the black lava desert in SW Syria (Jabal ad Durūz Mountains) (Široký *et al*., 2007).

Family Colubridae

Spalerosophis diadema (Schlegel, 1837) – Figure 8A

Observed individuals: 1 (2 km., E of Mudawwara).

Occurrence in Jordan: Widely distributed in Jordan, where it inhabits a variety of different habitats (see map for this species in Disi *et al*., 2001 or Amr and Disi, 2011).

New records: 2 km E of Mudawwara.

Comments: A single individual was found early after sunset foraging on the ground.

Dolichophis jugularis (Linneaus, 1758) – Figure 8B

Observed individuals: 1 (10 km NE of Tafila, wadi).

Occurrence in Jordan: Mediterranean habitats and the western mountain region (Disi *et al*.,

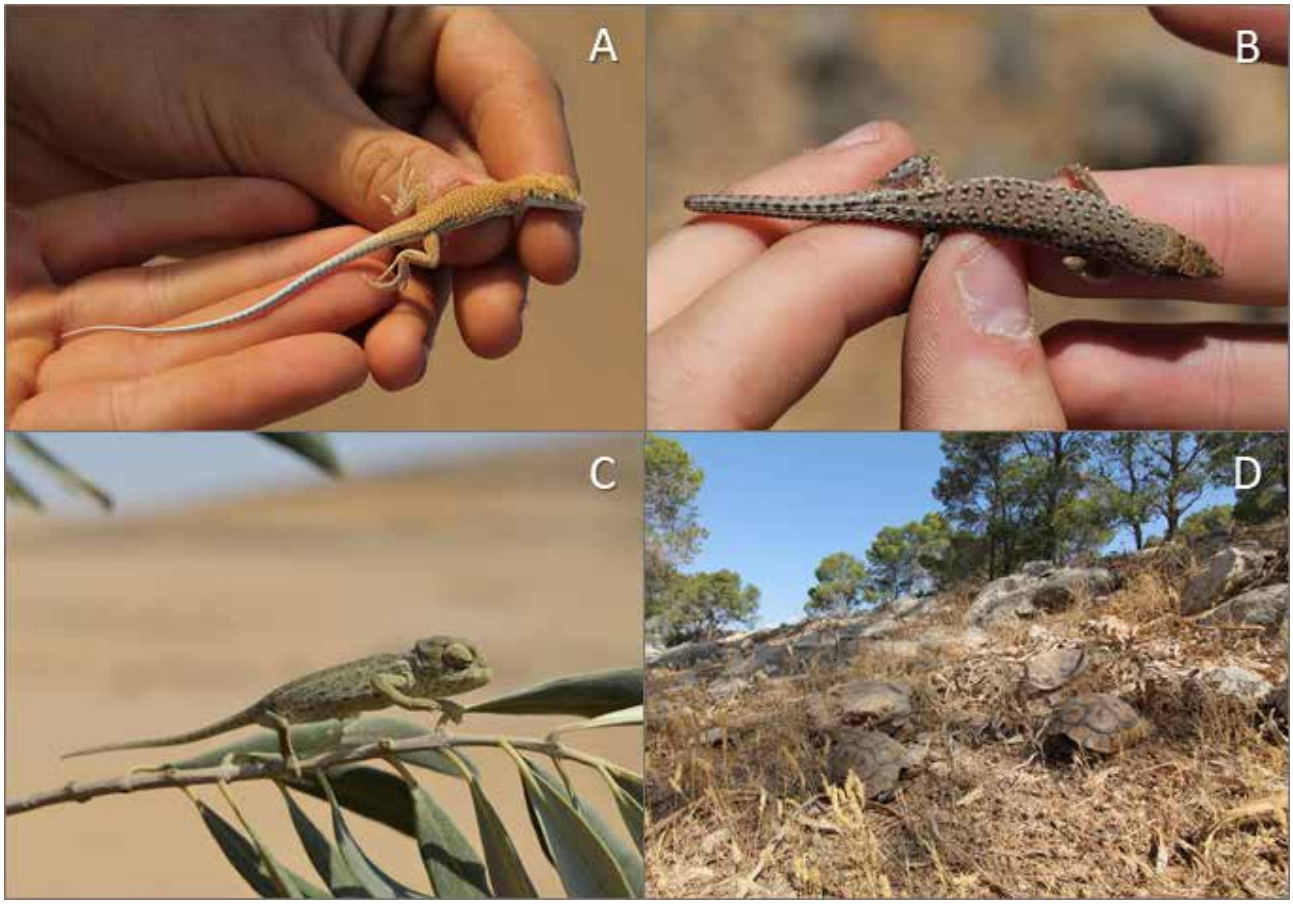

Figure 7. A: *Acanthodactylus schmidti*, 2.5 km SE of Munayshir; B: *Mesalina sp*., 5 km NE of Safawi; C: *Chamaeleo chamaeleon*, 10 km SE of Tafila; D: *Testudo graeca*, 600 m NE of Rujm Shubayl.

2001; Amr and Disi, 2011).
Comments: One juvenile was found in an olive orchard in the morning. Adults might be confused with *Walterinnesia aegyptia*, because of its uniformly black colour. However, young individuals have a spotted pattern, which disappears in adults. According to Disi *et al*. (2001), it is one of the most feared snake species by the local people, possibly because of its size and aggressiveness when cornered.

Family Atractaspididae
Atractaspis engaddensis Haas, 1950 – Figure 8C
Observed individuals: 1 (4 km SE of Swemeh, E of Dead Sea).
Occurrence in Jordan: The Dead Sea region (Wadi Faynan; Wadi Mujib NR; shores of the Dead Sea) (Disi *et al*. 2001; Amr and Disi 2011).
Comments: A single individual was found early after sunset foraging on the ground. This nocturnal and fossorial species was recorded for the first time in Jordan in the 1990s (Al Oran and Amr, 1995). Its distribution in Jordan might be associated with the Levant rift as almost all known records of this species come from the Dead Sea region and its close surroundings (Amr and Disi, 2011).

Family Psammophiidae
Malpolon insignitus (Geoffroy-saint. Hilaire, 1827) – Figure 8D
Observed individuals: 1 (1.5 km SW of Zubyia).
Occurrence in Jordan: Mediterranean habitats in western and north-western Jordan but can also be found in Irano-Turanian ecozone (see Disi *et al*., 2001; Amr and Disi, 2011).
Comments: One juvenile individual was observed around midday close to a stone wall bordering an olive orchard. In Jordan, it reaches its southernmost distribution range limit (Amr and Disi, 2011).

Malpolon moilensis (Reuss, 1834) – Figure 8E

Figure 8. A: *Spalerosophis diadema*, 2 km E of Mudawwara; B: *Dolichophis jugularis*, 10 km NE of Tafila; C: *Atractaspis engaddensis*, 4 km SE of Swemeh, E of Dead Sea; D: *Malpolon insignitus*, 1.5 km SW of Zubyia; E: *Malpolon moilensis,* 20 km NE of S. Arabia border crossing; F: *Walterinnesia aegyptia*, 10 km NE of Tafila; G: *Echis coloratus*, 20 km NE of S. Arabia border crossing; H: *Macrovipera lebetinu*s, 10 km NE of Tafila.

Observed individuals: 1 (road from A5 to Al Hazim).
Occurrence in Jordan: Wadi Araba; Eastern Desert = northern Badia (Disi *et al*., 2001; Amr and Disi, 2011).
Comments: In the late evening nearly before sunset, one individual was found under a bush in a flat gravel plain habitat with a scattered bush vegetation. The generic allocation is unstable; sometimes this species is considered to belong to the genus *Rhagerhis* showing some unique morphological diagnosis (Amr and Disi, 2011; Böhme and De Pury, 2011), other times, it is referred to *Malpolon* based on molecular evidence (Carranza *et al*., 2006; Kelly *et al*., 2008; Figueroa *et al*., 2016).

Family Elapidae
Walterinnesia aegyptia Lataste, 1887 – Figure 8F
Observed individuals: 1 (10 km NE of Tafila, wadi).
Occurrence in Jordan: Wadi Araba; the western mountain region; Eastern desert = northern Badia (Shawmari NR; Azraq; Qasr Burqu'; Al Karak; As Salt) (Amr and Disi, 2011).
New records: 10 km NE of Tafila, wadi.
Comments: A single individual was observed in a wadi with a flowing stream surrounded by pomegranate and olive orchards. At first sight, one may confuse it with *Dolichophis jugularis* or *Atractaspis engaddensis*, because of its uniformly black colour.

Family Viperidae
Echis coloratus coloratus Günther, 1878 – Figure 8G
Observed individuals: 1 (2.5 km SE of Munayshir); 2 (Wadi Araba)
Occurrence in Jordan: Aqaba; Mudawwara; Wadi Rumm (Disi *et al*., 2001; Amr and Disi, 2011); New records: Wadi Araba (although previously recorded as from Wadi Araba, the researchers' precise record corresponds with the known area of distribution reported by Disi *et al*. (2001) or Amr and Disi (2011).
Comments: All observed individuals were found early after sunset foraging among rocks.

Echis coloratus terraesanctae Günther, 1878
Observed individuals: 1 (4 km SE of Swemeh, E of Dead Sea).
Occurrence in Jordan: The Dead Sea region; The Jordan Valley (Babocsay, 2003; Amr and Disi, 2011).
Comments: A single individual was observed early after sunset foraging among rocks.

Macrovipera lebetinus (Linnaeus, 1758) – Figure 8H
Observed individuals: 4 (10 km NE of Tafila, wadi)
Occurrence in Jordan: Sail El Aina; Al Harir; 25 km SE of Al Karak; Dana NR (Disi *et al*., 2001; Amr and Disi, 2011); Karka (Al Saraireh and Ghyada, 2017).
New records: 10 km NE of Tafila, wadi.
Comments: Four adult individuals were observed early after sunset in a wadi surrounded by promergranate and olive orchards. In Jordan, this species was recorded for the first time in the 1990s from the Tafila region, and since then, it has been known only from few localities (Al Oran *et al*., 1998; Disi *et al*., 2001; Amr and Disi, 2011). It has been suggested that the population from Jordan is relict separated from the continuous area of distribution in southern Syria (Al Oran e*t al*., 1998; Disi *et al*., 2014). There might be also a competition with other large viperid snakes *Daboia palestinae*, which adapt better to human cultivated habitats than the former species. Populations from Jordan are generally referred to the subspecies *Macrovipera lebetinus obtuse*; however, this subspecific status was not proven by any molecular phylogenetic analyses, because no samples from Jordan were used (Stmpel and Joger, 2009).

Discussion and Conclusion
Despite the small amount of time spent in the field, the researchers have proved that Jordanian herpetofauna is very diverse and rich in species. Out of a total of 103 extant reptile and amphibian species recorded from Jordan (Disi *et al*., 2014), only 35 (three

species of amphibians and 32 species of reptiles in 13 families) were recorded. The current study provides new records for seven species (*H. felixarabica, B. tuberculatus, T. graeca, S. diadema, W. aegyptia, E. coloratus,* and *M. lebetinus*) that were not summarized before by Disi and Amr .2010; and Amr and Disi. 2011. These new records are generally not surprising because they are located in the areas with suitable environmental conditions or represent only a small range extension.

The researchers stress the need for more field surveys to be carried out in the yet unexplored parts of Jordan as these places still hold a potential for new discoveries.

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