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ORIGINAL ARTICLE

Survey of the reptilian fauna of the Kingdom of Saudi Arabia. V. The lizard fauna of Turaif region

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Abstract Turaif area located in the Northern border region of Saudi Arabia is one of the most important regions of the Kingdom. This work was proposed to throw light on the diversity of lizard fauna investigated through the collection and subsequent identification of specimens from different localities of Turaif region of Kingdom of Saudi Arabia. Sixteen species of lizards belonging to 5 families (Agamidae, Gekkonidae, Lacertidae, Scincidae and Varanidae) were recorded. Lacertidae was the most common family. Three species of lizards namely *Acanthodactylus orientalis*, *Acanthodactylus scutellatus* and *Acanthodactylus grandis* were reported for the first time in the Turaif region of Saudi Arabia. The geographical distribution of the collected species within this province was mapped.
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1. Introduction

The kingdom of Saudi Arabia is a vast and an arid country with different habitats from mountains to cleft to flat lands to valleys and deserts, as well as its geographical location between tropical and warm temperature zone makes the country a unique one in supporting a rich and diversified fauna (Al-Sadoon, 1988, 2010). Hence, several studies have been conducted on the diversity of reptiles of different environments of Saudi Arabia, however, the Northern Province in general and Turaif region in particular were the least studied area. The herpetofauna of Saudi Arabia consists of more than 100 species of lizards and 55 species of snakes (Al-Sadoon, 2010).

Various authors have described reptilian fauna from different regions of Saudi Arabia, including the Southern Hejaz (Parker, 1938; Farag and Banaja, 1980), Eastern Arabia and Northeastern Arabia (Mandaville, 1965, 1967), Central Arabia (Schmidt, 1941; Al-Wailly and Al-Uthman, 1971; Al-Sadoon, 1989), Riyadh region (Hussein, 1966; Al-sadoon, 1988), Al-Zulfi area (Al-Sadoon et al., 1991) and Al-Hassa region (Al-Sadoon, 2010) whereas little is known about the herpetofauna of the Turaif region. Farag and Banaja (1980) identified four anuran species, 28 species of lizards and 15 species of snakes, and mapped their distribution in the western region of Saudi Arabia. To the east of the study area, Al-Shammari (2012) mentioned 16 herpetological species from the Province of Ha'il and recently Masood (2012) and Masood and Asiry (2012) contributed to the herpetofauna of the Asir region. Most recently Aloufi and Amr (2015) studied the herpetofauna of Tabuk province, northwest Saudi Arabia.

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To the present author's knowledge, the reptilian fauna of Turaif area is the least studied region of Saudi Arabia. The study area is one of the richest regions of the Kingdom in the diversity of animals, characterized by the presence of a large group of wild animals belonging to different animal families. The present study is the fifth in a series of surveys of the reptilian fauna of Saudi Arabia. This survey was undertaken to investigate, survey and identify the barely known lizard fauna of Turaif region and the surrounding sites in waad Al Shamal project area in the Northern Province of Saudi Arabia.

2. Materials and methods

2.1. Study area

The study area of Turaif (31°40′39″ N 38°39′11″ E) is located in the northern west border province of the country, close to the border with Jordan, with a total area of 20,400 km^2 (Fig. 1). Different types of habitats are found in Turaif region, including Sandy habitat, Highland habitat, Mountain habitat, Sabkha (Qa'a) habitat and Wetland habitat. Approximately 40 km toward the Northeast of Turaif, the Umm Wu'al Mine and Waad Al Shamal Phosphate Industrial Complex project sites are located close to the border of Jordan.

Most of the areas were visited during different seasons of the year (November, 2014–June, 2015) to collect animals under various climatic conditions. The most favorable time for collection was between March and June, when the environmental conditions were most suitable for the presence of animals. Four field visits were made to different locations of Turaif region of Saudi Arabia. The animals were mostly observed and collected between dawn and midmorning, or shortly before sunset. Different collection methods like hand capturing, noosing method or traps were applied during this survey. Lizards were identified by the author based on previous experience and using the keys of Arnold (1986). Live animals were kept in the Animal Facility Room of the Zoology Department, King Saud University, Riyadh.

2.2. Climatological aspects

Turaif area has a continental weather that is extremely hot in summer and cold in winter. The temperature ranges from a maximum of approximately 45 °C in summer (June–August) to below freezing point in winter (January). The relative humidity ranges from 15% in July to 71% in January. A mean annual precipitation ranges from 14.3 mm in December–5.4 mm in March and to 0 mm in June–July.

3. Results

Table 1 shows the lizard species recorded in different surveyed sectors of Turaif region and their co-ordinates: latitude, longitude and altitude recorded by a GPS. A total of 128 specimens

Figure 1 Location map of Saudi Arabia showing Turaif region toward the Northern border.

Table 1 Co-ordinates: Latitude, longitude and altitude, of the collected specimens by a GPS.

Scientific name	Status in study area	Coordinates					
Uromastyx a. microlepis	Rare	N 31 58.809	N 31 46.954	N 31 47.034	N 31 47.029		
		E 039 00.424	E 038 55.925	E 038 54.825	E 038 54.795		
Agama (*Trapelus*) *pallidus hassi*	Highly abundant	N 31 38.754	N 31 44.064	N 31 43.996	N 31 43.996	N 31 43.903	N 31 48.326
		E 039 04.967	E 039 00.554	E 039 00.554	E 039 00.880	E 038 57.460	E 038 59.323
		N 31 48.326	N 31 45.264	N 31 41.057	N 31 48.299	N 31 48.326	N 31 47.606
		E 038 59.323	E 038 55.263	E 038 57.739	E 038 58.457	E 038 58.447	E 038 56.132
		N 31 45.720	N 31 56.944	N 31 57.877	N 31 47.420	N 31 39.320	N 31 48.305
		E 038 54.925	E 039 01.130	E 038 59.902	E 038 55.647	E 038 58.117	E 038 54.410
Bunopus tuberculatus	Abundant	N 31 46.244	N 31 44.291	N 31 46.512	N 31 44.211	N 31 46.451	N 31 58.201
		E 039 00.336	E 039 05.162	E 038 54.120	E 038 56.021	E 038 58.001	E 039 00.301
Ptyodactylus h. hasselquistii	Rare	N 31 46.954	N 31 45.064				
		E 039 01.925	E 039 55.554				
Stenodactylus slevini	Rare	N 31 44.064	N 31 47.877				
		E 039 56.554	E 038 02.902				
Acanthodactylus schmidti	Common	N 31 46.113	N 31 46.072	N 31 44.408	N 31 44.551	N 31 44.395	N 31 40.549
		E 039 04.931	E 038 59.552	E 039 05.185	E 039 02.493	E 039 06.184	E 039 06.184
		N 31 38.399	N 31 39.746	N 31 42.605	N 31 45.422	N 31 58.458	N 31 58.573
		E 39 00.833	E 039 06.734	E 039 04.639	E 039 03.062	E 039 01.918	E 039 00.507
Acanthodactylus boskianus	Common	N 31 57.223	N 31 57.530	N 31 57.925	N 31 57.976	N 31 58.603	N 31 40.251
		E 039 00.333	E 038 58.986	E 038 59.902	E 038 59.140	E 039 01.088	E 39 00.150
		N 31 57.976	N 31 44.452				
		E 038 59.140	E 038 02.140				
Acanthodactylus opheodurus	Highly abundant	N 31 46.058	N 31 46.072	N 31 44.408	N 31 39.448	N 31 51.452	N 31 44.771
		E 038 59.317	E 038 59.552	E 039 05.185	E 039 03.491	E 039 01.951	E 038 55.231
		N 31 47.419	N 31 58.409	N 31 58.597	N 31 58.458	N 31 45.720	N 31 56.944
		E 038 55.647	E 039 00.665	E 039 00.968	E 039 01.918	E 038 54.925	E 039 01.130
		N 31 57.223	N 31 57.307	N 31 58.570	N 31 58.581		
		E 039 00.333	E 039 01.073	E 039 00.498	E 039 01.088		
Acanthodactylus orientalis	Highly abundant	N 31 45.519	N 31 48.762	N 31 48.768	N 31 47.384	N 31 42.221	N 31 51.452
		E 039 01.628	E 039 00.599	E 039 00.543	E 038 55.821	E 038 55.145	E 039 07.951
		N 31 39.448	N 31 45.720	N 31 44.057			
		E 039 03.491	E 038 54.925	E 038 54.331			
Acanthodactylus scutellatus	Highly abundant	N 31 48.762	N 31 48.768	N 31 42.221	N 31 45.294	N 31 45.313	N 31 45.368
		E 039 00.599	E 039 00.543	E 038 55.145	E 039 04.315	E 038 59.336	E 038 54.286
		N 31 45.720	N 31 44.057				
		E 038 54.925	E 038 54.331				
Acanthodactylus grandis	Highly abundant	N 31 44.910	N 31 48.262	N 31 48.437	N 31 48.210	N 31 45.018	N 31 44.914
		E 038 57.296	E 038 59.425	E 038 59.954	E 038 58.970	E 038 55.340	E 38 55.231
		N 31 45.368					
		E 038 54.286					
Acanthodactylus robustus	Highly abundant	N 31 44.064	N 31 48.234	N 31 44.768	N 31 44.910	N 31 48.681	N 31 44.914
		E 039 00.554	E 038 59.992	E 038 57.433	E 038 57.296	E 038 59.896	E 038 55.231
		N 31 45. 336	N 31 45.313				
		E 038 54.670	E 038 59.336				
Mesalina brevirostris	Highly abundant	N 31 44.408	N 31 47.093	N 31 44.299	N 31 45.018	N 31 44.985	N 31 58.458
		E 039 05.185	E 038 54.648	E 038 55.696	E 038 55.340	E 038 55.384	E 039 01.918
		N 31 56.944	N 31 57.534	N 31 57.530			
		E 039 01.130	E 039 01.698	E 038 58.986			
Mesalina guttulata guttulata	Highly abundant	N 31 57.534	N 31 57.530	N 31 47.093			
		E 039 01.698	E 038 58.986	E 083 54.700			
Scincus scincus conirostris	Common	N 31 45.476	N 31 45.656	N 31 44.493	N 31 58.458		
		E 039 01.704	E 039 04.200	E 038 55.357	E 039 01.918		
Varanus griseus griseus	Highly abundant	N 31 44.300	N 31 48.824	N 31 47.459	N 31 45.476	N 31 45.533	N 31 58.436
		E 039 05.153	E 039 00.345	E 038 00.652	E 039 01.704	E 039 02.006	E 039 01.906
		N 31 58.458	N 31 46.908	N 31 43.686	N 31 42.954	N 31 42.675	N 31 42.908
		E 039 01.918	E 038 57.857	E 039 02.492	E 039 02.424	E 039 02.404	E 038 57.856
		N 31 47.029	N 31 57.115	N 31 57.976	N 31 58.581	N 31 46.925	N 31 41.360
		E 038 54.795	E 038 59.867	E 038 57.140	E 039 01.088	E 038 54.393	E 038 58.001

belonging to 16 species were collected during the study period. These 16 species belong to five families viz, Agamidae, Gekkonidae, Lacertidae, Scincidae and Varanidae of order Squamata. Their generic representation is quite variable. Among the five families, one family is represented by 9 genera (Lacertidae), another by 3 genera (Gekkonidae); the third

represented 2 genera (Agamidae). Two families are represented by one genera each (Scincidae and Varanidae). From the standpoint of species richness within the described families of the region, family Lacertidae represented 56% ($n = 9$) of the total species ($n = 16$) collected from the studied area.

3.1. Family: Agamidae

Members of this family are characterized by their triangular shaped head, wide-body covered by small scales and fleshy broad tongue. Two species of this family were recorded in Turaif region.

3.1.1. Uromastyx aegyptius microlepis (Forskal, 1775)

This spiny tailed lizard is a largest species of lizards in the Arabian Peninsula. Four specimens of this lizard were collected from different locations of the study area inhabiting plain graveled places. They are characterized by their bigger sizes weighing up to 2–3 kg. This lizard has a triangular head provided with strong jaws and horny small teeth. It has a wide body with cone shaped tail characterized by serrated sharp thorns. The animal has front and rear limbs that end with five clawed fingers used to dig burrows. The dorsal body color is ground yellowish or greenish.

3.1.2. Agama (Trapelus) pallida hassi (Werner, 1971)

Fourteen specimens were collected from the study area. This species was found in rocky areas and open plains, preferring vegetation areas. This lizard has a medium-sized body up to 15 cm in length, with a tail up to 30 cm. This pale lizard was mostly found in the southern part of the study area, however, a few species were observed in other locations as well. The general body color is light gray, characterized with rhomboidal strikes on the back with dark rings on the tail. The head is relatively large and triangle shaped. The limbs end with the long sharp clawed fingers.

3.2. Family: Gekkonidae

Members of this family are characterized by oblate body, granular scales, large head and prominent eyes. Some geckos have suckers at the end of their fingers helping them to stick at the smooth surfaces such as walls and rocks. This family is widely spread in tropical, warm and temperate regions of the world. Three species of this family were collected in Turaif region.

3.2.1. Bunopus tuberculatus (Blanford, 1874)

Six specimens of this Rock Gecko were collected in the study area. This lizard was found in desert areas hidden under stones and small plants. It is a desert animal, medium-sized, with dark-brown color and spots connected to each other as white lines on the back. It has white abdomen with clear tubers especially on the sides of the body. It has triangle head, large circular eyes and small limbs ending with small clawed fingers.

3.2.2. Ptyodactylus hasselquistii hasselquistii (Donndorff, 1798)

The common fan-footed gecko is a familiar lizard and lives with humans since ancient times. Two specimens were collected from mountainous regions of the study area. It has medium-sized body about 8–9 cm in total length. The lizard has triangle shaped head with relatively large eyes. It has yellowish brown transparent skin which can be seen through but the desert lizard is blackish in color. Limbs end with five fingers with suckers for the stability on the smooth surfaces during movement on the walls or ceilings.

3.2.3. Stenodactylus slevini (Hass, 1957)

Two specimens of this thin-toed gecko were collected from Turaif found inhabiting open plains. It is a small-sized animal up to 8 cm in length. The head is small as well as the body; there are two small V shaped lines on the head. The tail has medium length with dark rings, and the body has limbs ending with a small finger nails.

3.3. Family: Lacertidae

Members of this family are called the lizards of the ancient world and widely spread in Asia, Africa and Europe characterized by a good cylindrical body and a long tail. It has good four configured limbs. Nine species belonging to this family had been recorded in the Turaif region.

Table 2 Global and Regional assessment for reptilian species in the Turaif region.

Scientific name	Family	IUCN Red list Category	Regional	Endemic in Arabia
Uromastyx a. microlepis	Agamidae	Vulnerable	Vulnerable	No
Agama (Trapelus) pallidus hassi	Agamidae	Least Concern	Least Concern	No
Bunopus tuberculatus	Gekkonidae	Least Concern	Least Concern	No
Ptyodactylus h. hasselquistii	Gekkonidae	Least Concern	Least Concern	No
Stenodactylus slevini	Gekkonidae	Least Concern	Least Concern	No
Acanthodactylus schmidti	Lacertidae	Least Concern	Least Concern	No
Acanthodactylus boskianus	Lacertidae	Least Concern	Least Concern	No
Acanthodactylus opheodurus	Lacertidae	Least Concern	Least Concern	No
Acanthodactylus orientalis	Lacertidae	Least Concern	Least Concern	No
Acanthodactylus scutellatus	Lacertidae	Least Concern	Least Concern	No
Acanthodactylus grandis	Lacertidae	Least Concern	Least Concern	No
Acanthodactylus robustus	Lacertidae	Least Concern	Least Concern	No
Mesalina brevirostris	Lacertidae	Least Concern	Least Concern	No
Mesalina guttulata guttulata	Lacertidae	Least Concern	Least Concern	Yes
Scincus scincus conirostris	Scincidae	Least Concern	Least Concern	No
Varanus griseus griseus	Varanidae	Data Deficient	Data Deficient	Yes

3.3.1. *Acanthodactylus schmidti (Hass, 1957)*

The blue tailed fringe-toed sand lizard or spiny toed lizard is one of the most prevalent species of lizards found in sandy plains and rocky areas with loose soil. Twelve specimens of *A. schmidti* were collected from the different regions of the study area. These lizards were mostly found in sand dunes after digging the burrows around small shrubs. It is a medium-sized lizard of 10 cm in length. The tail is usually 1.5–2 times as the body length. The animal body is sandy dark in color with white dots on the entire back and dark rings on the tail. The animal has elongated head, large eyes and somewhat short front limbs.

3.3.2. *Acanthodactylus boskianus (Daudin, 1802)*

A. boskianus is widespread in many areas and seven specimens of this species were collected from the study area. This lizard lives in open desert areas, especially such environments where trees and shrubs are abundant to enable them to disappear under twigs and search for food. It is medium-sized animal up to 10 cm in length, and the tail is 1.5 times as long as the body. It has an elongated head with tapering mouth and has no neck. Limbs end with fleshy scaled fingers. The body is gray or light brown in color, with the presence of light lines extending along the body.

3.3.3. *Acanthodactylus opheodurus (Arnold, 1980)*

The striped fringe-toed lizard is widespread in Arabian Peninsula and sixteen specimens were collected from different regions of the study area inhabiting open desert rocky terrain and valleys with small shrubs. Snout vent length (SVL) was recorded 5.5–5.8 cm and tail length (TL) was 9.6–10.5 cm. These lizards have a basic back pattern consisting of five dark stripes.

3.3.4. *Acanthodactylus orientalis (Angel, 1936)*

Nine specimens of *A. orientalis* were collected from different locations of the study area inhabiting sandy places in stream beds and canyons and prefer less rocky areas. This study represents the first record of the species in Turaif province. Snout vent length (SVL) is 5.9–7.5 cm and tail length (TL) equals 1.4–1.7 of SVL. Dorsal background is beige colored. Light of organ spots are arranged into four pairs of longitudinal series of dark gray, speckled with light spots edged by black colors. The blackish interspaces form a reticulum of irregular dark longitudinal transverse or oblique connection and incomplete line seen on back and lateral sides. Tail is speckled with light spots. Tail base is mottled by dark spots and arranged in a semi-stripe pattern. Limbs are reticulated and Ventrum is whitish gray.

3.3.5. *Acanthodactylus robustus (F. Werner, 1929)*

Eight specimens of *A. robustus* were collected from the study area. SVL 6–7 cm and VT 7.2–8.4 cm were recorded. Dorsal background is beige to sandy reddish; laterally lighter than the back and with gray spots. Light large spots are arranged into four irregular rows with certain reticulation. Alternation light and dark blotches are one each side of the tail. Ventrum is white.

3.3.6. *Acanthodactylus scutellatus (Audouin, 1809)*

Eight specimens of this Nidua spiny-footed lizard were collected from different parts of the study area. This study represents the first record of *A. scutellatus* in Turaif province. It inhabits wadi beds and both flat sand plain and sandy dunes with scattered bushes. The lizard is medium-sized with slender body, short, depressed and elongated pointed snout; neck is as broad as the head. SVL was 6.6 cm and tail was 11.0 cm. The ground color is beige yellowish with reticulated pattern on dorsum consisting of white and dark dots. Ventrum is white.

3.3.7. *Acanthodactylus grandis (Boulenger, 1909)*

Seven specimens of Giant fringe-toed lizard collected from the study area inhabit the hard substrates with scattered vegetation. This study represents the first record of *A. grandis* in Turaif region of Saudi Arabia. They have stout, heavy body depressed and nasals strongly swollen. SVL is 6.7–10.1 cm and VT 11.0–14.1 cm. Dorsal side is light brown to sandy pale pink with black spots arranged in eight regular pale bluish longitudinal rows.

3.3.8. *Mesalina guttulata guttulata (Lichtenstein, 1823)*

Three specimens of small-spotted desert Racer lizard were collected from the study area. It was usually seen on the lower slopes of rocky escarpments and the sides of Wadis. It has two disconnected dorsal lines on both sides of vertebral line; it possesses irregular black blotches with white ocelli. Ventral side is bluish gray. Tail may have dark vertebral bars on the sides and SVL is 4.5 cm and VT is 6.5 cm.

3.3.9. *Mesalina brevirostris (Blanford, 1874)*

Nine specimens of this short-nosed Desert Lizard were collected from the study area in rocky areas and gravel plains. It is almost the smallest size lizard not more than about 3 cm in length, while the tail is two times as long as the body with dark rings. It has small head, a crocodile-like in profile. The front limbs are small and the rear ones are medium-sized. The body has ground or sandy color with small red spots on the back, while the abdomen is white.

3.4. *Family: Scincidae*

This family is widely spread in Australia, Africa and Asia. It lives in most environments. The members of this family have cylindrical bodies with conical heads and non-distinct neck from the trunk. They have short limbs and the body is covered by smooth and shiny solid scales. Only one species of this family was recorded in the study area.

3.4.1. *Scincus scincus conirostris (Blanford, 1881)*

Four specimens of this species were collected from different locations of the study area in sand dunes areas. It is characterized by its glossy yellow body color. The largest specimen was about 17.2 cm in length. The body is cylindrical in shape, like the rest of the family members with smooth scales, enabling it to dive in the sand to disappear easily from enemies. The spade on the head facilitates diving in the sand with short fingers and conical tail.

3.5. *Family: Varanidae*

This family has only one genus including about 30 species. Widely spread in Africa and Australia. Members of this family

had a long head ending with narrow mouth. They have strong limbs and their fingers end with claws. The tail is long and strong. They have long forked tongue similar to the snakes, with sharp and strong teeth. Only one species was recorded in Turaif region.

3.5.1. Varanus griseus griseus (Daudin, 1803)

Desert monitor (*Varanus griseus*) is a creepy animal distinguished by its large size. This lizard was found all around the Turaif region. Seventeen specimens of this species were collected in the open plains and sandy areas. The head, as well as the body were elongated, and it has a strong long tail with dark rings. It has acute medium-sized eyes. The mouth has strong teeth and long dividend tongue and the body has sandy color with a splattered small back spot on the back.

4. Discussion

Animal diversity has been studied in different regions of Saudi Arabia, yet not enough studies were made to provide basic information about the species richness and diversity of reptiles, especially the geographical distribution and dispersions of Turaif region. For the implementation of this study, various field visits were made during the different seasons of the year to study the lizard fauna of the Turaif region of Saudi Arabia.

The data presented in this survey is confirmed by reports of several other authors like Farag and Banaja (1980), Al-Sadoon (1988, 2010), Hussein (1993), Wilms and Bohme (2007), Masood (2012), Masood and Asiry (2012) and Aloufi and Amr (2015) who observed similar species for other surveys carried in different regions of Saudi Arabia. Hussein (1993) reported that Arabian region from northeast Africa to southwest Asia were characterized by the abundance of geckos (family Gekkonidae), skinks (family Lacertidae), agamas (family Agamidae), monitors (family Varanidae) and colubrid snakes.

The parameters affecting the distribution of reptiles are climatic conditions, altitude, soil moisture index and vegetation (Desi, 2011). The topography or the height and shape of the land, can play an important part in the distribution of species (Chapman and Reiss, 1995). Ecological changes caused by the project sites Umm Wu'al Mine and Waad Al Shamal Phosphate Industrial Complex have resulted in a rapid decline of natural habitats due to overgrazing, urban expansion, infrastructure development and mismanagement of the highlands of the Turaif region. All these factors have affected the distribution of lizards in the Turaif area.

As per our survey, 16 species of lizards were recorded during the study period of lizard diversity in the Turaif area. Lizards occupy specific habitats within the different ecozones of this region, which suit their environmental requirements. The distribution of these species differs in terms of abundance. Among the recorded species from this region, some were extremely rare and poorly known and were collected from a single locality (*S. conirostris* and *V. griseus*), while others were collected from different regions of the studied area. The most abundant family recorded in the present survey was Lacertidae with 9 species. However, 6 and 5 species of lizards belonging to the same family were recorded in Al-Hasa region and Riyadh province by Al-Sadoon (2010, 1988), respectively. The abundance and presence of more Lacertids in the study area may be mainly related to the availability of low shrubs, since vegetation may be utilized as a refuge or foraging site.

Global and Regional assessment for lizard species recorded in Turaif region is presented in Table 2. As per IUCN Red list category, *Uromastyx a. microlepis* has been listed vulnerable, while all other species recorded in the study area are least concern. Three species of lizards, *A. orientalis*, *A. scutellatus*, and *A. grandis* reported for the first time in the Turaif region of Saudi Arabia was the highlight of this study. We believe that the Turaif area may represent the focal point of evolution of these three *Acanthodactylus* species recorded first time in the area, since these species have already been reported from the Jordan which is the extension of the Northern part of the Arabian Peninsula.

This is the first detailed study dealing with the lizard fauna of Turaif region of Saudi Arabia, although certain aspects may still need further elaboration. Thus, still more field work and detailed investigations are required for better understanding of the true distribution of various species. Anthropogenic effects caused by the mining sites operational in the study area resulted in changes in the abundance, diversity and distribution of lizard populations in Turaif area are other problems to be faced.

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