

## RESULTS OF HERPETOFAUNAL INVENTORY OF WADI RAMM PROTECTED AREA, WITH NOTES ON SOME RELICT SPECIES

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In the course of the faunistic inventory in Wadi Ramm Protected Area, a total of 34 species of reptiles representing nine families (Gekkonidae, Chamaeleonidae, Agamidae, Lacertidae, Scincidae, Varanidae, Leptotyphlopidae, Colubridae, and Viperidae) were recorded from different habitats in Wadi Ramm and its closest vicinity. Three species (*Lacerta cf. kulzeri*, *Chamaeleo chamaeleon*, and *Ablepharus rueppellii*) are considered to represent relicts from earlier, more humid periods. Habitat preferences for collected species are included.

**Keywords:** Reptilia, diversity, distribution, relicts, Wadi Ramm Protected Area, Jordan.

### INTRODUCTION

Despite the extensive studies on the herpetofauna of southern Jordan (Amr et al., 1994; Modry et al., 1999; Al-Oran, 2000; Disi et al., 1999, 2001), Wadi Ramm area still remains poorly studied. This area has unique geological formation at the northern periphery of the Arabian Peninsula. From a herpetological point of view, Wadi Ramm offers a wide spectrum of diverse habitats and constitutes the northernmost range of distribution for some Arabian species (Fig. 1).

The present study reports on the reptilian diversity with focus on three species of relict reptiles in Wadi Ramm in southern Jordan.

### MATERIAL AND METHODS

**Study area.** Wadi Ramm area (Fig. 1) consists of precipitous, sandstone and granite mountains, which are isolated from each other by flat corridors covered with mobile sand-dunes. It spans 800 – 1750 m in altitude.

The vegetation is typical of sandy Saharo-Arabian desert, dominated by a sparse scattering of *Haloxylon persicum* bushes up to 2 m high, *Retama raetam*, and *Panicum turgidum*. Rainfall is low, scarce and irregular (less than 200 mm annually). Mountains are mostly barren, with relict Irano-Turanian/Mediterranean flora and scattered juniper *Juniperus phoenicea* trees. Small patches of trees and bushes such as *Acacia*, *Ziziphus*, *Retama*, *Phoenix*, etc. (Barsotti and Cavalli, 1989) are supported by ground water. Wadi Ramm massifs are formed by several types of sandstone, which was deposited by braided rivers running from south to north during the lower Cambrian and lower Ordovician. Sedimentation continued during the Ordovician and Silurian periods. The area was subjected to the present day phase of lift up. The sand of Ramm is originated from the wind erosion of the Paleozoic sandstone rocks (Abed, 2002)

During June 1999 to July 2000, an extensive survey of the reptiles of Wadi Ramm was conducted. All types of habitats were surveyed during different intervals (day and night time). Over 20-night and 90-day surveys were conducted. Regarding the conservation aspects, voucher specimens were collected and preserved only in indicated cases and are deposited in herpetological collections. In all other cases, the animals recorded were collected, and identified in the field using recent available keys (Leviton et al., 1992; Disi et al., 2001) and were subsequently released.

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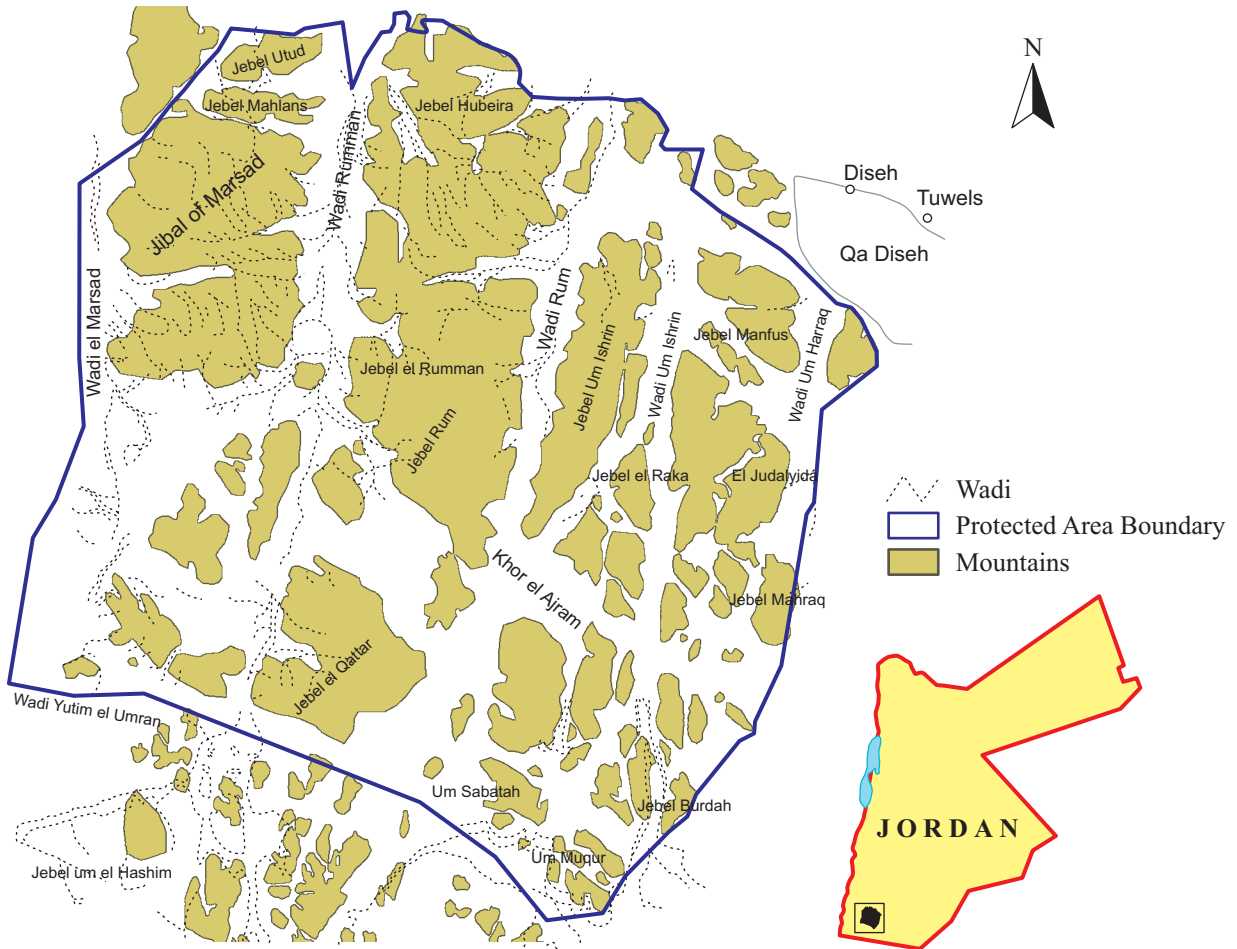


Fig. 1.

## RESULTS

### Reptiles of Wadi Ramm Protected Area

A total of 34 species of reptiles representing nine families (Gekkonidae, Chamaeleonidae, Agamidae, Lacertidae, Scincidae, Varanidae, Leptotyphlopidae, Colubridae, and Viperidae) were collected from different habitats in Wadi Ramm and its vicinity (Table 1). Wadi Ramm area is a mosaic of diverse habitats, ranging from sand dunes, open sand, rocky slopes and cliffs, mud flats, open gravel, caves, etc. The majority of reptilian species exhibit relatively low dependence on the character of substrate and thus, they are confined to various substrates and, typically, to the transitional zone between pure sand dunes and rocky beds of wadis. Moreover, three reptilian species found recently in the area represent relicts of former humid periods. Observed af-

finities of collected species to different types of habitats are summarized in Table 1.

### Reptilian Species of Suggested Relict Origin

Regardless arid character of the Wadi Ramm region, three reptile species might be considered to be relicts of former more humid periods in the history of the area: *Chamaeleo chamaeleon*, *Ablepharus rueppellii* and *Lacerta cf. kulzeri*. These species inhabit limited and fragmentary habitats and their significance and special protection should be emphasized.

#### *Ablepharus rueppellii* (Gray, 1839)

A single population of Festa's Skink was found in Wadi Shallaleh. The area consists of a humid hilly area with abundance of vegetation and small dripping springs. The vegetation cover is dominated by *Ficus pseudo-sycomorus*, *Retama raetam*. Other plant species

TABLE 1. List of Reptiles Collected from Wadi Ramm and Their Affinities to Main Types of Habitats

| Species   | Sand | Rocky slopes | Hammada | Transitional zone | Relict |
|---|------|--------------|---------|-------------------|--------|
| <b>Family Gekkonidae</b>  |      |              |         |                   |        |
| <i>Bunopus tuberculatus</i> Blanford, 1874                      | +    |              | +       | +                 |        |
| <i>Hemidactylus turcicus</i> (Linnaeus, 1758)                   |      | +            |         |                   |        |
| <i>Pristurus rupestris</i> Blanford, 1874                       |      | +            |         |                   |        |
| <i>Ptyodactylus guttatus</i> Heyden, 1827                       |      | +            |         |                   |        |
| <i>Ptyodactylus hasselquistii</i> (Donndorff, 1788)             |      | +            |         |                   |        |
| <i>Stenodactylus doriae</i> (Blanford, 1874)                    | +    |              |         |                   |        |
| <i>Stenodactylus sthenodactylus</i> (Lichtenstein, 1823)        |      |              | +       |                   |        |
| <i>Tropicolotes nattereri</i> Steindachner, 1901                |      |              | +       | +                 |        |
| <b>Family Chamaeleonidae</b>                                    |      |              |         |                   |        |
| <i>Chamaeleo chamaeleon</i> (Linnaeus, 1758)                    |      |              |         |                   | +      |
| <b>Family Agamidae</b>  |      |              |         |                   |        |
| <i>Laudakia stellio</i> (Linnaeus, 1758)                        |      | +            |         |                   |        |
| <i>Phrynocephalus arabicus</i> Anderson, 1894                   | +    |              |         |                   |        |
| <i>Pseudotrapelus sinaitus</i> (Heyden, 1827)                   |      | +            |         |                   |        |
| <i>Uromastyx aegyptia</i> (Forskål, 1775)                       |      |              | +       |                   |        |
| <b>Family Lacertidae</b>  |      |              |         |                   |        |
| <i>Acanthodactylus boskianus</i> (Daudin, 1802)                 |      |              | +       | +                 |        |
| <i>Acanthodactylus opheodurus</i> Arnold, 1980                  | +    |              |         | +                 |        |
| <i>Acanthodactylus schmidti</i> Haas, 1957                      | +    |              |         |                   |        |
| <i>Lacerta cf. kulzeri</i> Müller and Wettstein, 1932           |      |              |         |                   | +      |
| <i>Mesalina brevirostris</i> Blanford, 1874                     |      |              | +       | +                 |        |
| <i>Mesalina guttulata</i> (Lichtenstein, 1823)                  |      |              | +       |                   |        |
| <i>Mesalina olivieri</i> (Audouin, 1829)                        |      |              | +       | +                 |        |
| <b>Family Scincidae</b>   |      |              |         |                   |        |
| <i>Ablepharus rueppellii</i> (Gray, 1839)                       |      |              |         |                   | +      |
| <i>Chalcides ocellatus</i> Forskål, 1775                        |      |              |         | +                 |        |
| <i>Scincus scincus</i> (Linnaeus, 1758)                         | +    |              |         |                   |        |
| <b>Family Varanidae</b>   |      |              |         |                   |        |
| <i>Varanus griseus</i> (Daudin, 1803)                           | +    |              | +       | +                 |        |
| <b>Family Leptotyphlopidae</b>                                  |      |              |         |                   |        |
| <i>Leptotyphlops macrorhynchus</i> (Jan, 1861)                  |      |              |         | +                 |        |
| <b>Family Colubridae</b>  |      |              |         |                   |        |
| <i>Coluber elegantissimus</i> (Günther, 1878)                   |      |              |         | +                 |        |
| <i>Coluber rhodorachis</i> (Jan, 1865)                          |      |              | +       | +                 |        |
| <i>Coluber sinai</i> (Schmidt and Marx, 1956)                   |      |              |         | +                 |        |
| <i>Eirenis coronella</i> (Schlegel, 1837)                       |      |              | +       |                   |        |
| <i>Lytorhynchus diadema</i> (Duméril, Bibron and Duméril, 1854) | +    |              |         | +                 |        |
| <i>Psammophis schokari</i> (Forskål, 1775)                      |      |              | +       | +                 |        |
| <i>Spalerosophis diadema</i> (Schlegel, 1837)                   | +    |              | +       | +                 |        |
| <i>Telescopus dhara</i> (Forskål, 1775)                         |      |              | +       | +                 |        |
| <b>Family Viperidae</b>   |      |              |         |                   |        |
| <i>Cerastes gasperettii</i> Leviton and S. Anderson, 1967       | +    |              |         |                   |        |
| <i>Echis coloratus</i> Günther, 1878                            |      | +            |         |                   |        |

that occur in the area include: *Asphodelus tenuifolius*, *Rhamnus dispermus*, *Ononis natrix*, *Urinea maritima*, *Ochradinus baccatus*, *Podonosma orientalis*, *Colutea istria*, *Periploca aphylla*, *Gomphocarpus sinaicus*, *Hyo-scyamus aureus*, *Inula viscose*, *Adiantum capillus-venereis*, *Teucrium leucocladum*, and *Galium canum*. Culti-

vated figs and pomegranates fields with rock terraces are common on the western slopes of this area.

***Lacerta cf. kulzeri***

This wall lizard was discovered along the walls of a narrow canyon in Khazali Mountain. The mountain is

about 600 m in altitude, the canyon extends over 500 m deep reaching a maximum width of 4 m. The ground flora consists of few solitary *Ficus pseudo-sycomorus* with sand soil with interrupted medium-sized stones. Three specimens were collected among bushes of *Adiantum capillus-veneris* and *Podonosma orientalis*. Similar habitats can be found along Wadi Ramm escarpment, and may host other population of this wall lizard.

### ***Chamaeleo chamaeleon* ssp.**

A single chameleon specimen was video-taped near Jabal Moharraq on the eastern border of the reserve among bushes of *Retama raetam* on the substrate consisting of hard sand surrounded by sand stone rocks.

## **DISCUSSION**

The herpetofauna of Wadi Ramm comprises 34 recorded species that accounts for about 38% of the total diversity of terrestrial reptiles of Jordan. This assemblage consists of reptiles of different zoogeographical affinities; Arabian (*B. tuberculatus*, *P. guttatus*, *S. doriae*, *T. nattereri*, *A. opheodurus*, *A. schmidtii*, *P. arabicus*, *C. elegantissimus*, *C. sinai*, *E. coronella*, *C. gasperettii*, and *E. coloratus*), African (*C. chamaeleon*), and Mediterranean elements (*Ablepharus rueppellii*, *Lacerta* cf. *kulzeri*).

Southern Jordan represents the most northern range of distribution of several Arabian reptilian taxa. Sands of Wadi Ramm then form also the westernmost limit of the range of these species. Within the herpetofauna of Wadi Ramm, *P. arabicus*, *Scincus scincus meccensis*, and *Pristurus rupestris reaches* there the absolute margin of their range. Interestingly, two other psammophilous Arabian species (*Acanthodactylus tilburyi* and *Stenodactylus slevini*) were recorded from Mudawarah, an outstretch to the south-east of Wadi Ramm (Modry et al., 1999; Disi et al., 2001) but not from the Wadi Ramm itself.

In the Near East, several faunal components seem to reflect geological formation as well as the ancient natural history. For example, herpetofauna of Jabal Al-Arab in Syria includes several Palaearctic relicts such as *Vipera lebetina* and *Lacerta kulzeri* (Bischoff et al., 1998). Similarly, Mount Hermon harbors several Palaearctic reptiles, *Elaphe hohengeri* and *Elaphe quatuorlineata*, *Vipera bornummuelleri* in addition to the endemic *Cytodactylus amictopholis* (Sivan and Werner 1992). All these taxa are considered to represent the remnants of the postglacial retraction.

At least three reptile taxa in herpetofauna of Wadi Ramm might be considered to be relicts of former more humid periods in the history of the area: *Ablepharus rueppellii*, *Lacerta* cf. *kulzeri*, and *Chamaeleo chamaeleon* ssp.

*Ablepharus rueppellii festae* was already reported from Wadi Ramm (Sindaco et al., 1995). However, Disi and Amr (1998) were sceptical on this record and did not include it among the localities given for this species. *A. rueppellii festae* is typically associated with oak and mixed forests in western Jordan and reflects the distribution of this ecosystem. It reaches the southernmost limit of its continuous distribution in the area of Ash Shawbak (Disi et al., 2001).

Among Jordanian *Lacerta* spp., only *Lacerta kulzeri* is associated with cliffs and rocky outcrops. In Jordan, it was, so far, reported from limited number of localities within the mountains forming the eastern margin of the Jordan Valley/Dead Sea/Wadi al Arabah rift. In recent review (Bischoff, 2001), Jordanian populations are considered to represent *Lacerta kulzeri petraea*. The Wadi Ramm population is similar in overall morphology to latter subspecies, however, it may rank a subspecific status. The southernmost published record of *L. k. petraea* is from the Petra region (Bischoff and Müller, 1999), however, both Petra and Wadi Ramm populations are geographically well isolated.

The occurrence of *Chamaeleo chamaeleon* is also noteworthy. Areas of western Jordan, considered to belong to the Mediterranean ecozone are inhabited by *C. chamaeleon recticrista* Boettger, 1880 (Disi et al., 2001). On the other hand, Hillenius and Gasperetti (1984) and Schatti and Gasperetti (1994) reported on the presence of *Chamaeleo chamaeleon orientalis* Parker, 1938 from extreme Northwest Saudi Arabia near Haql and the Harrat south of Mekkah. The locality of Haql lies only about 30 km south-east of Wadi Ramm. On the other hand, the closest Mediterranean chameleon population is located around Ma'an, some 70 km north-west of Wadi Ramm. The Wadi Ramm population may either represent the most southern limit for distribution of *C. c. recticrista* or the most northern extension of the range of *C. c. orientalis*. Thus, the tentative association of the presence of chameleon in Wadi Ramm with Mediterranean relicts should be preceded by elucidation of its taxonomic status and phylogenetic affinities.

A wealth of literature documents the oscillation of climatic conditions in the Near East over the past million years (Neev and Emery, 1967; Begin et al., 1974; Danin, 1999). Each period of a more humid climate could have allowed the Mediterranean flora and fauna to penetrate into the desert. Periods wetter than today's were re-

corded from ~780,000 years ago. Probably the best documented is the wet, pluvial period between 70,000 and 20,000 BP (before present) (Horowitz, 1979, Danin, 1999). More recently, between 10,000 and 8,000 BP, an increase of summer rainfall led to a generally more humid climate as well (Tchernov, 1998). Nevertheless, associating the relict occurrence of Mediterranean herpetofaunal elements in Wadi Ramm with any of the mentioned humid periods without further data is purely speculative. Hopefully, future molecular phylogenetic analysis may help to estimate the separation of the Wadi Ramm populations from the nearest populations/taxa.

Effort should focus on conservation measures implementation within Wadi Ramm Protected Area to preserve the current population of the surviving reptiles. Such measures include zoning fragile habitats that harbour relict species of limited distribution (e.g., Jabal Khazali, Wadi Shallaleh, Jabal Moharraq). Vehicle movement within the protected area should be very limited to avoid habitat destruction.

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